

To 88/✓

APOLLO 8 MISSION COMMENTARY, 12/21/68, CST: 5:21A

1/1

PAO This is Apollo/Saturn Launch Control, T-1 hour 13 minutes and counting. The boost protective cover was just place atop the hatch on the Apollo 8 spacecraft just several minutes ago, and the crew in the white room are now securing the white room area. They've been alerted by the Spacecraft Test Conductor to secure the area in preparation for their departure. Once the crew does depart at a designated time the swing arm that is now attached to the spacecraft with the white room at its top will be moved some 3 feet, actually 12 degrees, from the spacecraft and it will remain in that standby position until the T-5 minute in the countdown when the swing arm is retracted fully to the side of the umbilical tower at the pad. The purpose here is to have the white room standing close by in the event an emergency condition developed which would require the astronauts to depart the spacecraft we could bring the white room in just from 3 feet away. It is fully retracted at the 5 minute mark in the countdown. The astronauts aboard the spacecraft now participating in this test of the stabilization and control system of the Apollo 8 spacecraft. As they move their hand controllers, which would provide maneuvers in space, we're checking the performance here on the ground. All aspects of the mission still are GO, weather is satisfactory, the various tracking elements all GO at this time. T-1 hour 28 minutes 20 seconds and counting, this is Launch Control.

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del
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END OF TAPE

PAO This is Apollo/Saturn Launch Control at T-1 hour 21 minutes 07 seconds and counting, our countdown continuing and still aiming toward the planned lift-off time at 7:51 am Eastern Standard Time. In fact, it's been going very well and some functions are actually ahead of the count-down procedures at this time. The prime crew for the Apollo 8 mission, astronauts Frank Borman, Jim Lovell, and Bill Anders are aboard the spacecraft, the hatch has been closed, and the boost protective cover has been in place. The close-out crew at the 320-foot level at the pad above the launch base are now securing the White Room that's attached to the spacecraft. The White Room will later be removed in the count-down. Our countdown still going satisfactorily. At this point, Spacecraft Test Conductor Dick Proffitt, participating with the astronauts in some checks of the stabilization and control system of the spacecraft itself. During this test, the astronauts actually maneuver the hand controllers aboard the spacecraft. The hand controllers are used to maneuver the spacecraft in flight. This is Launch Control -

END OF TAPE

PAO This is Apollo Saturn launch control at T minus 1 hour 14 minutes and counting. The close out crew at the 320 foot level - the spacecraft level at the launch pad now has departed from the white room and count down is still proceeding satisfactorily at this time. In progress here in the firing room are some major tracking checks in progress at this time. These are checks working with the Air Force Eastern Test Range checking out the tracking beacons and the instrument unit of the Saturn V launch vehicle. The crew here in the firing room are also performing some telemetry checks at this time and calibrations to insure that the readouts that we get from the launch vehicle in flight will actually be correct ones. Our count-down has been going very satisfactorily. Now at 1 hour 13 minutes 6 seconds and counting on the Apollo 8 mission still aiming for the plan liftoff at 7:51 am eastern standard time on a flight direction of 72 degrees. This is launch control.

END OF TAPE

PAO This is Apollo Saturn Launch Control our countdown for the Apollo 8 mission is proceeding satisfactorily at this time. At T minus 1 hour 4 minutes 52 seconds and counting. Just a matter of minutes ago the spacecraft commander Frank Borman asked spacecraft test conductor Dick Proffitt hows the weather out there and Proffitt reported that the weather looks real clear at this time. Our countdown is still proceeding satisfactorily. About 10 minutes from this time we expect we will pull back the swing arm that is still attached to the Apollo 8 spacecraft at this time. This is swing arm 9 and it's the top swing arm at the pad at this time at the 320 foot level, the white room is attached to the tip of this swing arm. When the arm is pulled back it will first be taken back to a standby position some 3 feet from the spacecraft, actually 12 degrees from the spacecraft. The arm will be fully retracted at the T minus 5 minute mark in the count. In fact while we were making this announcement the spacecraft test conductor just advised Frank Borman that the arm, in fact, would come back about 10 minutes early in the count which would be at about the 55 minute mark. Checkouts of the various tracking systems in the Saturn V launch vehicle are continuing and coming up shortly will also be some command checks from the Mission Control Center in Houston. This is the system by which Mission Control Center, Houston can send real time commands to the launch vehicle during the powered phase of flight. We check out the systems to be sure that the signals can get through. We are now at T minus 1 hour 3 minutes 16 seconds and counting, still aiming toward our plan liftoff time at 7:51 AM Eastern Standard Time. The is launch control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, T-61 min, CST 5:52a 5/1

PAO This Apollo/Saturn Launch Control, T-61 minutes and counting. Our countdown so far is proceeding satisfactorily. The Spacecraft Test Conductor has just been advised that area at Pad A is now cleared and we will be pulling back the spacecraft swing arm to its parked position about 5 minutes from this time. Tracking and telemetry checks still in progress in the Firing Room, and all is going well with the Apollo 8 countdown at this time, still aiming for our planned lift-off at 7:51 am Eastern Standard Time on a flight azimuth, or direction, of 72 degrees. This is Launch Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, T-56 min, CST 5:55a 6/1

PAO This is Apollo/Saturn Launch Control at T-56 minutes 23 seconds and counting. The spacecraft swing arm, arm number 9, now has been retracted from the Apollo 8 spacecraft. It is being placed in its standby, or park, position and will be located some 3 to 5 feet away from the spacecraft hatch. Once this is accomplished, within a matter of minutes, we will arm the 155 pound thrust launch escape tower atop the command module. The swing arm has now been pulled to its standby position. It will be fully retracted at T-5 minutes in the count. The purpose, of course, is to have the White Room nearby in the event an emergency condition did occur that could require the astronauts to depart from the spacecraft. Once the arm is retracted, the escape tower is armed, in case of a catastrophic condition where an abort could be advised. Our countdown still proceeding satisfactorily at T-55 minutes 18 seconds and counting. This is Launch Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, CST; 5:36 A 7/1

POA This is Apollo Saturn Launch Control at T minus 48 minutes and counting, T minutes 48 and we have go for the Apollo 8 countdown at this time. The crew on the spacecraft still performing some final checks. Astronaut Frank Borman, the spacecraft commander, just a few minutes ago gave a weather report of his own when he reported that the three man crew could barely see what looked like some pink clouds out the window. Borman had earlier asked for the weather report from spacecraft test conductor Proffitt. Meanwhile here in the firing room at the launch control center some three and one half miles from the launch pad, the countdown is still progressing satisfactorily here and the crew gearing up for some final checks of the range safety command destruct system. These are the destruct elements aboard the various stages of the vehicle that would destroy the vehicle in flight if required, if vehicle went off its trajectory. Of course the astronauts would be aborted from the vehicle if such an event did occur. During this period working with the Air Force Eastern Test Range tracking elements we do check out the command safety receivers to insure if such a condition were required the abort system and the destruct system would actually be able to receive the signals and accomplish the job. The countdown is still proceeding, we still aiming toward 7:51 AM Eastern Standard Time. This is Launch Control.

END OF TAPE

PAO This is Apollo/Saturn Launch Control at T-39 minutes and counting, T-39, and we are GO for our countdown for the Apollo 8 mission to the moon at this time. Just in progress as this announcement came up was another key milestone in our countdown preparations, the power transfer test. This is where we go from external power to the flight batteries aboard the Saturn V launch vehicle to assure that they are all working properly. Then in order to conserve these batteries we return again to external power. The final switch to internal power on the batteries occurs about the 50 second in the count. There are some 14 batteries in the Saturn V. The Apollo 8 crew of astronauts Frank Borman, Jim Lovell, and Bill Anders standing by in the spacecraft as this test is in progress. T-38 minutes 6 seconds and counting, this is Launch Control,

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, T-31 min, CST 6:20a 9/1

PAO This is Apollo/Saturn Launch Control at T-31 minutes and counting, T-30 and our countdown proceeding satisfactorily, still aiming our planned lift-off time of 7:51 am Eastern Standard Time. The Apollo 8 crew, astronauts Frank Borman, Jim Lovell, and Bill Anders standing by in their spacecraft, 320 feet above the launcher base at Pad A, complex 39 here at the Kennedy Space Center. The astronauts are standing by for another major function that will be coming up shortly and that is pressurization of the propellant for the engines they will use in space. These are thrusters, so-called quad thrusters, there are 16 of them, located on the service module portion of the spacecraft. These are the thrusters that enable them to maneuver in space. We appear to have had a successful power transfer test with the launch vehicle, in which we went to internal power on the flight batteries, but then we turned to external power in order to conserve those batteries. Just a moment ago, astronaut Frank Borman asked his Spacecraft Test Conductor how the launch vehicle was doing and the report that came back was the launch vehicle is doing fine. The overall countdown doing fine at this time. We are go for weather, all the tracking elements ready, as well as the launch vehicle and spacecraft, here at Pad 39. This is Launch Control.

END OF TAPE

PAO This is Apollo/Saturn Launch Control at T-26 minutes and counting. We are proceeding at this time. In progress at this time, we are pressurizing the propellant for the spacecraft engine systems that would be used in a space environment. Astronaut Jim Lovell, the man who sits in the middle seat and who is the Command Module pilot, is reporting back to spacecraft test conductor Dick Proffitt on the status of the propellants. We pressurize these propellants with helium. The countdown has been going very well since it was picked up at 10:51 p.m. eastern standard time last night. Shortly before we resumed the count the 9.8 million pound mobile service structure was moved to its park position some 7000 feet from the pad. About an hour later we began the propellant loading of the Saturn V launch vehicle. IN some 4 and a half hours we loaded close to a million gallons total of liquid oxygen and liquid nitrogen aboard the 3 stages of the Saturn V. We now have a vehicle standing 360 feet, 363 feet that is, and weighing 6.2 million pounds on the launch pad here at the Kennedy Space Center. We are continuing a top off the liquid oxygen and liquid nitrogen supplies because they must be maintained under extremely cold temperatures. They will continue to boil off and we will continue to replenish the supply down to the final minutes of the count. Astronauts Frank Borman, Jim Lovell, and Bill Anders were awakened in their crew quarters this morning at 2:36 a.m. Eastern Standard time. They went down the hall from the crew quarters here at the Kennedy Space Center and took a physical examination, a brief launch day examination, and were declared physically fit by the 3 examining physicians, Dr. Allen Harter, Dr. Jerry Joiner, and Dr. Jack Teegan. The astronauts then sat down to breakfast. They had a menu of filet mignon, scrambled eggs, toast, coffee, and tea. Guests at the breakfast included George Low, Director, Apollo Program Director at the Manned Spacecraft Center; Donald K. Slayton who is Director of Flight Crew Operations at the Manned Spacecraft Center; two of the backup pilots for the Apollo 8 mission, Astronauts Neil Armstrong and Buzz Aldrin; Astronaut Jack Schmidt also attended the breakfast. Following the breakfast, the astronauts went to the suit room where they donned their spaced suits. The crew departed from the crew quarters at 4:32 a.m. this morning, and began to board the spacecraft starting at 4:58 a.m. at the 320 foot level. First over the sill was the commander, Astronaut Frank Borman. He was followed by the Lunar Module Pilot, Astronaut Bill Anders at 5:02 a.m., and finally the man who sits in the middle seat, Jim Lovell, came aboard at 5:07 a.m. The hatch on the Apollo 8 spacecraft was closed at 5:34 a.m. Since tha time our

APOLLO 8 MISSION COMMENTARY, 12/21/68, CST: 6:25A 10/2

PAO countdown has been progressing very
satisfactorily, We are still GO for launch attempt at
7:51 a.m. eastern standard time. This is Launch Control,

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"said" ~~the~~ Commentator Jack King,

APOLLO 8 MISSION COMMENTARY, 12/21/68, T-21 min, CST 6:30a 11/1

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PAO This is Apollo/Saturn Launch Control at T-21 minutes and counting and we are go for the Apollo 8 mission at this time. We really have a beautiful morning for the flight to the moon. The weather conditions are very satisfactory for a launch attempt. Surface winds in the area are from the northwest at 7 knots, the temperature is about 60 degrees. We appear to have some scattered clouds from 10 to 12,000 feet high. All aspects of the mission are go at this time. Weather is also satisfactory in around-the-world tracks where the contingency areas will be located. Weather is satisfactory in both the Atlantic and Pacific Oceans. We are still aiming toward a planned lift-off time of 7:51 am Eastern Standard Time. Coming up shortly will be a transfer to full internal power aboard the Apollo 8 spacecraft. This is going full on the fuel cells and removing an external power that had been sharing a load earlier. This is Launch Control. GPO

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, CST: 6:35 A 12/1

PAO This is Apollo Saturn Launch Control at T minus 16 minutes and counting. The Apollo 8 space vehicle is GO for our plan liftoff at this time. We have just completed our transfer to full internal power with the fuel cells for the Apollo 8 spacecraft. This was confirmed by spacecraft commander, Frank Borman, Final checks from the flight azimuth going on at this time and we're also synchronizing the clocks in the spacecraft with the mission control center in Houston. Following are some of the highlights that will be coming up with the final phases of the count. We'll have a final status check at about 5 minutes and 30 seconds and at the 5 minute mark the Apollo access arm, the top arm will be fully retracted to its fall back position. The countdown sequencer will be armed at 4 minute and 30 seconds and we'll get a clearance for launch from the range at the 4 minutes mark in the count. The key event will come at 3 minutes and 6 seconds. It's identified in the procedures as the firing command and it's the start of an automatic sequence. It starts at 3 minutes 6 seconds and leads up to the ignition of the five engines in the first stage of the Saturn V. Those engines, the sequence, the engine ignition, will start at 8.9 seconds. As we build up the thrust, we should get a commit that we have satisfactory thrust coming out of all five engines and it build up a thrust level close to seven and a half million pounds of thrust required for this rocket. We should get a liftoff at zero. We are now T minus 14 minutes 22 seconds and counting. All aspects of the mission, GO at this time. This is Launch Control

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, T- 11 min, CST 6:40a 13/1

PAO This is Apollo/Saturn Launch Control at T-11 minutes and counting, T-11 and that count is still GO at this time. Coming up shortly, about 5 minutes from this time actually, we will retract to its full fallback position the spacecraft access arm, which is at the 320-foot level at the spacecraft. The astronauts, astronauts Frank Borman, Jim Lovell, and Bill anders, going through some final communications checks with the crew here in the Control Center. These are checks of the VHF communication, the very high frequency communications that will be used at the lift-off. We want assure ourselves that they will be operating satisfactorily. Also coming up, the astronaut crew will be busy on some final checks of astrocomm circuit, this is a special circuit in which abort recommendations could be given to the astronauts if the indications were received as such here in the Control Center some 3-1/2 miles from the launch pad. Also, Mission Control Center in Houston can send the same recommendation. We have now passed the 10-minute mark in our countdown. We are 9 minutes 51 seconds and counting, all aspects of the mission GO at this time. Still aiming for a launch time of 7:51 am Eastern Standard Time on a flight azimuth of 72 degrees. The flight azimuth has been verified in the instrument unit, the guidance system for the launch vehicle and we have also had an update to assure that we had the correct flight azimuth in the spacecraft. This has been confirmed by the crew and we are proceeding. T-9 minutes 21 seconds and counting, this is Launch Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 644 730p 14/1

CAPCOM 5, 4, 3, 2 - this is Apollo Saturn launch control C minus 7 minutes 30 seconds and counting, still aiming toward our planned liftoff time. The spacecraft's test conductor Dick Proffitt has just to completed a status check of all elements concerning the spacecraft operations, all reported GO and there were three particularly strong and loud GO's from the three astronauts in the spacecraft 320 feet above the base of the launcher at complex 39. Jim Lovell reported just a few minutes ago that he could see a blue sky and it looked like the sun is out. The spacecraft test conductor reported that that it's a very fine day, We are at T minus 6 hours 50 minutes 6 minutes 50 seconds and counting and we are proceeding at this time. This is launch control.

END OF TAPE

PAO This is Apollo/Saturn Launch Control at 5 minutes 30 seconds and our count is still GO at this time. We just completed further status checks here in the Firing Room at the Control Center. Here in the Control Center, we have had our status checks and the range has given a GO as has the Launch Director Rocko Petrone. We are still counting and are GO coming up on the 5-minute mark in the count. Mark T-5 minutes and counting, T-5. At this point, the Apollo access arm should be coming back and it is now moving back at 320-foot level to its fully retracted position high atop the tower at Pad A. Our countdown still proceeding at this time. At the 4-minute mark in the countdown, the overall count will be turned over the Launch Vehicle Test Conductor. Ray Roberts. The Launch Vehicle Test Conductor, will conduct the final 4 minutes as all different aspects move over to the Launch Vehicle Test Conductor's channel. The automatic sequence, as reported, will come in at the 3-minute and 6-second mark in the countdown. We are standing by at 4 minutes 16 seconds in counting. This is Launch Control.

PAO This is Launch Control coming up on 3 minutes and 30 seconds and counting. Mark T-3 minutes and 30 seconds and counting. We have completed our communications checks with the Apollo 8 astronauts in the cabin and the communications are GO. Coming up shortly will be in the automatic sequence, where we have a completely automatic checkout of the launch vehicle from 3 minutes and 6 seconds down. We have firing command. The firing command is in, we are now in the automatic sequence, T-3 minutes and counting. During this period, once we do get the firing command, the various tanks within the three stages of the Saturn V launch vehicle begin to pressurize. They must all be under pressure before ready to launch. We have a sequence status report here in the Control Room, it will give us readouts on the overall status of the space vehicle as we reach the terminal phases in the countdown. Now 2 minutes and 32 seconds and counting. Our status report indicates that all aspects are ready. The instrument unit is ready, the spacecraft is ready - is ready. A final check of the emergency detection system, that ready light also on. First stage preparations are completed. Two minutes 15 seconds and counting, the tanks continuing to pressurize in the vehicle. Not as many reports coming now as we all stand by in the Launch Vehicle Test Conductor's channel. Coming up on the 2-minute mark in the Apollo 8 mission. Two minutes and counting. T-2 minutes and counting, we are still proceeding. We now have recorded that the first stage liquid oxygen tank has been pressurized and the pressure still building up. One minute 45 seconds and counting, we have a vehicle

APOLLO 8 MISSION COMMENTARY, 12/21/68, T-5:30 min, CST 6:45 15/2

weighing 6.2 million pounds on the pad. Interesting enough, some 1200 pounds of that weight is just frost on the side of the vehicle created by the extremely low temperatures of the propellant. Coming up on 90 seconds. Mark T-90 seconds and counting. The Apollo 8 crew standing by, spacecraft commander Frank Borman, Jim Lovell, and Bill Anders. We now have a report that the liquid hydrogen tank in the first stage is pressurized. One minute 15 seconds, all third stage propellants pressurized at this time as we come up on the 60-second mark on a flight to the moon. T-60 seconds and counting, the vehicle is now completely pressurized. We are coming up on Apollo transfer shortly, T-50 seconds and counting. We have the power transfer and are now on the flight batteries in the launch vehicle. Forty-five seconds, final reports coming from Frank Borman at this time, a final look at the switch list aboard the -

END OF TAPE

PAO 5 seconds, final reports coming from Frank Borman at this time, final look at the switch list aboard the spacecraft, 35 second and counting. We'll lead up to a ignition sequence start at 8.9 seconds, which will lead up as we build up the thrust to a liftoff, if all goes well, at zero. We just passed the 25 second mark in the count, 20 seconds, all aspects we are still GO at this time, T-15, 14, 13, 12, 11, 10, 9, and we have ignition sequence start, the engines are on. 4, 3, 2, 1, 0, we have commit, we have liftoff, liftoff at 7:51 a.m. eastern standard time. We have cleared the tower -

PAO Tower clear at 13 seconds, 20 seconds now we get a loud and clear from Frank Borman. 32 seconds. Booster says the S-IC, the first stage, looks good. The crew confirms their progress at 50 seconds into the flight. One minute out and Mike Collins tells the crew, "We're looking good." One minute 15 seconds, and we're a little more than half a mile into the sky and about - nearly 4 miles down range. One minute 40 seconds, all looks great. A mile and 6/10th into the mission and Frank Borman has confirmed each event as it's been passed to him by Mike Collins at this point. The crew has been given a GO for staging. Inboard out on time Frank Borman says. The inboard engines. 2 minutes 25 seconds. We see an S-IC, the first stage cutoff, S-II has ignited, we can confirm, and the thrust looks good, all engines all sources show that second stage is burning perfectly. 2 minutes 51 seconds into the mission, and at 3 minutes into the flight the range safety console has been released at the Cape. 3 minutes into the flight we are 50 miles high and about 10 miles down range. 3 minutes 25 seconds we have verified that the tower has jettisoned. The crew has verified the tower has jettisoned. Frank Borman says staging was smooth and the ride now is even smoother. Coming up on 4 minutes into the flight and the communications thus far have been excellent. It's been a little sparse, but it's been quite sharp and clear. 70 miles altitude, and about 20 miles or more down range. Correction, let's make that 200 miles down range. Flight Director Cliff Charlesworth gets an enthusiastic GO from both trajectory and booster at 4 minutes 50 seconds into the flight. Mark, 5 minutes, and the crew is advised their trajectory and guidance are looking good and Frank Borman came back with a very chatty, "Thank you, Michael." He's talking to Michael Collins, who would be in the center seat today except for an operation several months ago. 5 minutes 20 seconds into the flight. 300 miles down range, we're nearly nearing 100 miles altitude, and everything looks just grand. And Collins gives the crew another GO on trajectory and guidance, which at this point are the most critical elements. At 6 minutes 10 seconds

PAO into the flight, our down range distance now 400 miles. Our velocity in feet per second, nearly 15 000 feet per second. We've achieved nearly 60 percent of the velocity required to make orbit. 57 percent right now, and we're 96.5 miles above the earth. The surgeon reports he likes everything he sees, 7 minutes into the flight, and we're nearing the second stage - nearing the point where we will drop off the second stage and light the third stage. That event is to come at about 8 minutes and 40 odd seconds into the flight. We have now achieved 70 percent of the velocity required to obtain orbit. Our present velocity is 18 600 feet per second, and we're 100 miles above the earth, 100 even. 625 miles down range. Coming up on 8 minutes, mark 8 minutes. 20 400 feet per second, 101.7 miles above the earth, 734 miles down range. And the crew is advised they look good for staging, and Borman says, "Same here." We've got S-II cutoff, we've got S-IVB ignition. Borman confirmed S-IVB ignition. And thrust looks good to us at 9 minutes into the flight. We now have 89 percent of the velocity required, we're 920 miles down range, and we're 9 minutes 20 seconds into the flight. Flight Dynamics Officer says our altitude is nominal

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PAO The flight dynamics officier says our altitude is nominal which is the great conservative word for very nearly a perfect mission as nearly as we can observe at this point. Nine minutes 50 seconds and we've just gone to what we call mode 4 if any trouble should develope now we would go ahead and burn into orbit with our service prulsion engine. The crew is now being advised that we plan to cut off the third stage engine at 11 minutes 28 seconds into the flight, we're now at 10 minutes, 10 seconds. We are at 103.7 nautical miles above the earth, our velocity is at an even 24 000 feet per second, which is very, very close to orbital velocity, that's 95 percent of it and we're 1200 miles down range, which would put us a little bit out of Bermuda. Ten minutes and 50 seconds and we've heard from Bill Anders for the first time, he simply said, how do you read Houston." He gets a looking good comment from Mike Collins. Eleven minutes, 20 seconds, and we're hearing a little something from Jim Lovell, a reading from one of his meta gages. We have ~~SECO~~ says Frank Borman. SECO and I would call it 11 minutes, 30 seconds, that will be an estimate, 11 minutes, 30 seconds. Our launch digital data shows our velocity now, 25 577 feet per second. The data now has been reduced and we show an altitude of 102.5, and the crew has been given a GO for all but they responded enthusiastically that they too, in fact, were GO. Jim Lovell has just now read us down what he saw on his instrumentation, he's shows an apogee of 102.6, a perigee of 96.8 and a cut-off velocity of 25 560 feet per second. That's within a hundredths of a percentage point of what we are reading on our scales here in Houston. And now the crew has been advised, we have settled on an orbit of 103 apogee by 99 miles perigee. We were shooting for something a little close to 100 nautical miles circular. We have now the tape of the entire launch sequence and we will play it for you at this time.

SC	The clock is running.
CAPCOM	Roger, clock.
SC	Roll and pitch program.
CAPCOM	Roger.
SC	How do you read Houston?
CAPCOM	Loud and clear.
CAPCOM	Mark mode 1 bravo, Apollo 8.
SC	Mark mode 1 B.
CAPCOM	Apollo 8, you are looking good.
SC	Roger.
CAPCOM	Mark mode 1 charlis, Apollo 8.
SC	Mode 1 C.
CAPCOM	Apollo 8, Houston, you are a GO for

staging, over.

SC Roger.
SC Staging.
SC Have just complete them.
CAPCOM Roger, understand.
PAO This is Apollo Control here, 21 minutes,
41 seconds into the flight and we're out over the Canary's.
The crew, which is, sounds likely strickly business. It's
main spokesman during this pass in the last minute or two
has been Jim Lovell
and we will now begin that very anxious
business of making sure that all of the systems are settled
down and calabrating them. From all appearances they certainly
are. The first one of major concern, of course, is the
platform alignment. Right now, we think we see something
on the order of a point two-hundredths or two-tenths of a
degree out of alignment, which is nothing at all, that's
alignment. The communication has been nothing short of
outstanding. I don't recall a time of when the communication
from a simulator was this sharp and this clear as it is today
from this spacecraft. Here's how the conversation is going
as we proceed across the Carary Islands.
CAPCOM Apollo 8, Houston through the Canary's.
How do you read me?
SC You are loud and clear Houston over the
Carary's.
CAPCOM Good, you are clear too. How is it going?
SC Fine, we seem to be going along very
well. We noticed about a 10-pound Delta-V between the
oxygen fuel in the SPS zone.
CAPCOM Apollo 8, Houston, that is normal, that's
just about what we expected, over.
SC Roger. Standby for the (garble). Okay,
main valve closed.
CAPCOM Apollo 8, Houston. Say again.
SC Negative, we didn't say anything. Go
ahead Houston.
CAPCOM I think you were transmitting, Jim was
transmitting and disregard.
SC Roger.
CAPCOM Apollo 8, Houston.
SC Go head Houston, Apollo 8.
CAPCOM Roger, you have one minute to LOS Carary's.
Everything is looking good onboard the spacecraft and the
S-IVB, we will see you over Tananarive at 37 minutes, over.
SC Roger, thank you Houston, Apollo 8.
CAPCOM Apollo 8, Houston, you have the tape
recorder low bit rate, over.
SC Thank you.
CAPCOM You are welcome.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, 3700 GET, CST 7:28a 18/1

PAO This is Apollo Control Houston at 37 minutes into the flight. We are standing by, we expect contact to occur just momentarily through the Tananarive station. The surgeon reports during the launch phase that Frank Borman had a peak heart rate of 130 beats per second, that's fairly early on in the mission. 130 was his max. Now we have acquired the crew. Let's cut to the crew.

CAPCOM - still have you 103 by 99 on your orbit from my low speed data, and everything is looking good, over.
SC Roger.

PAO And this is Apollo Control. Much quieter pass than we expected, but perhaps it's understandable. The crew is quite busy, with their postorbital insertion checklist. Frank Borman, well, all three of them, have probably by now removed their helmets and gloves. We have not heard that locally confirmed, but I think it's a fair assumption. That event could have come as early as 15 minutes into the mission, while they were still out over the Atlantic. Borman would be probably now mounting a sighting instrument in his window. Lovell is working his navigation equipment, he has to jettison the cover off his optics through he observes stars and horizons. Anders performed a wide variety of systems tests, looks at all of his major systems, and does a quick check on the fuel cell purging operation. So it is safe to assume the crew is very busy. Again, Borman's heart rate, we had him on the biomed loop during launch, the peak rate was 130. We have confirmed to the crew that orbit we gave them shortly after insertion 103 by 99 stacks up and refines a good and acceptable and stable orbit. As soon as Lovell is able, he will go through a detailed instrument - inertial measurement alignment through several major computer programs. Now we are cutting back to some talk with the crew. Let's switch to that.

CAPCOM - 1 minute to LOS Tananarive. We will see you again over Carnarvon at 5209, over.

SC Roger. We do have the optic covers jettisoned (garble).

CAPCOM Roger. Optics cover jettisoned, thank you.

PAO And this is Apollo Control at 42 minutes into the flight. That will wrap up the communications from Tananarive. We will be back with them at 52, 10 minutes from now. 52 minutes into the flight, Carnarvon should acquire. This is Apollo Control Houston.

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APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 5500, CST 7:46a 19/1

PAO This is Apollo Control Houston here at 55 minutes into the flight. We have switched our biomed harness selector to Bill Anders and we are watching him breathe and watching his heart beat here on the scope. We've also put in an establishing call with the crew. There has been no flow of conversation since that point but let's establish it in any case and come back when there is something more. Let's hear the tape.

CAPCOM Apollo 8, Houston.
SC Roger. I read you loud and clear.
CAPCOM Roger. You're loud and clear over Carnarvon. We would like to take DSE away from you for a second.
SC Roger. Go ahead.
CAPCOM Thank you.
SC Houston, this is Apollo 8.
CAPCOM Houston here, Apollo 8. Go ahead.
SC Roger. The torquing angles 00026, that is + 00026 + 00035 + 00119.
CAPCOM Roger. Apollo 8, Houston. Copy -- and copy + 00026 + 00035 + 00119.
SC Roger. We checked on stars 6 and 15 and the error was + 00001.
CAPCOM Sounds pretty good.
SC Pretty good for a beginner here.
CAPCOM Roger.
CAPCOM Apollo 8, Houston.
SC Roger, you are loud and clear.
CAPCOM Roger. You are loud and clear over Carnarvon. We would like to take the DSE away from you for a second.
SC Roger, go ahead.
CAPCOM Thank you.

PAO This is Apollo Control Houston. You heard Mike Collins say we want to take the DSE away from you. That is the onboard tape recorder. The ground wanted to check its function and is proceeding to as the spacecraft moves across southern Australia. Via Honeysuckle, we should have additional communications and we will just stand by for those.

END OF TAPE

Handwritten signature: Mike Collins

PAO This is Apollo Control Houston at an hour and 4 minutes into the flight. Over the last couple of minutes, we've been - had a little whisper of a problem through the Honeysuckle station, Australia. It has been fixed. The problem was crew was not receiving us on the relay through Honeysuckle. We could hear them loud and clear but they were not receiving us. There was a period of about 2 minutes where they advised us several times of several readings, obviously in the blind and not getting the confirming information from our CAPCOM Mike Collins. The problem has been cleared up, I want to emphasize. Hawaii, this morning is receiving for the first time, received for the first time a live television picture of the launch and we understand from talking to some people out at the station at Pearl Harbor that they are quite enthusiastic about it. They plan to go out and try to watch the TLI burn which is to occur at 2 hours 50 minutes. It should occur almost directly over Hawaii, and under ideal lighting arrangements. The local time will be about 5:55 or 6 am. Darkness out on earth and just the first streaks of dawn. So if the clouds are cooperating, they may see it. We have some tape from the Honeysuckle pass, which will clarify the comm problem we had, which toward the end of the pass, gets altogether cleared up. Here is the tape.

SC Hello, Houston, Apollo 8. How do you read?

CAPCOM Loud and clear, Apollo 8. Houston, here. Apollo 8, Houston, loud and clear, over.

SC Houston, Apollo 8. How do you read?

CAPCOM Reading you loud and clear, Bill. How me?

SC Houston, Apollo 8. Over.

CAPCOM Apollo 8, Houston, loud and clear. Over. Apollo 8, Houston. Over. Apollo 8, this is Houston, over. Apollo 8, this is Houston, over. Apollo 8, this is Houston, over.

SC Houston, Apollo 8 on S-band and do you read? Everything is GO.

CAPCOM Roger, understand Apollo 8. Apollo 8, this is Houston, over.

SC Roger, Houston, read you loud and clear.

CAPCOM We are reading you loud and clear also, Bill. The problem here over Honeysuckle has been on the ground. Your spacecraft equipment is all working fine. We are going to have LOS in about a minute and we will pick you up over Guaymas at 12813, over.

SC Roger. 12813, thank you.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 010400, CST 7:55a 20/2

CAPCOM
you, Apollo 8.
SC

Roger. We are giving the DSE back to

Roger, thank you.

END OF TAPE

PAO This is Apollo Control Houston, 1 hour, 19 minutes into the flight. We have had no additional contact with the crew since we left Honeysuckle Creek, and before we reach the States, we want to play for the second time for the Broadcast pool, the lift-off tape through about 5 minutes. Through some technical difficulty, it was missed the first time around, so now we are going to repeat both the picture and the audio track on the early minutes of lift-off. I'm sure other members of the media in the newsroom will understand. Could you roll the tape please?

CAPCOM Lift-off.
SC Roll and pitch program.
CAPCOM Roger.
SC How do you read, Houston?
CAPCOM Loud and clear.
CAPCOM Mark, mode 1 bravo, Apollo 8.
SC Mode 1 B.
CAPCOM Apollo 8, you are looking good.
SC Roger.
CAPCOM Mark, mode 1 charlie, Apollo 8.
SC Mode 1 C.
CAPCOM Apollo 8, Houston, you are GO for staging,
over.
SC Roger.
SC Staging, I have just completed them.
CAPCOM Roger, I understand.
SC Roger.
SC Houston, how do you read, Apollo 8.
CAPCOM We read you loud and clear, Apollo 8.
SC Okay, the first stage was very smooth,
and this one is a little smoother.
CAPCOM Understand, smooth and smoother. Looks
good here. Apollo 8, Houston, you're trajectory and guiding
for GO, over.
SC Thank you Houston, Apollo 8.
CAPCOM Apollo 8, Houston, you're trajectory and
guiding for GO, over.
SC Thank you, Michael.
CAPCOM You're looking real good.
SC Very good.

END OF TAPE

PAO This is Apollo Control here, 1 hour 29 minutes into the flight. The first call from Mike Collins to Apollo 8, as yet without response. This will be - this pass across the States this time should last 15 or 20 minutes should be a major checkpoint on all systems, particularly that guidance and navigation system. Jim Lovell will be a very busy boy and so will Frank Borman and - insuring that all the checks are accurate. In the course of it, Bill Anders is to perform a backup communications check, switching to alternate channels should anything develop or go wrong in the primary communications mode. As the spacecraft moves across the Atlantic the crew then will proceed into their translunar injection checklist in preparation for the burn on the next rev. Again, we've put in a call, we've not heard anything, let's just open a line and stand by.

CAPCOM Apollo 8, this is Houston, over.
SC Houston, Apollo 8, over.
CAPCOM Roger. How do you read me?
CAPCOM Apollo 8, this is Houston, over.
SC Roger, Houston, Apollo 8. Standing by for a GO for the backup comm check, over.
CAPCOM Roger. Standby one, Bill.
CAPCOM California, inhibit VHF downlink.
CAL California inhibited.
CAPCOM Apollo 8, Houston. Go ahead with backup voice check.
CAPCOM Apollo 8, this is Houston. Go ahead with backup voice check, over.
CAPCOM Apollo 8, Houston. Go ahead with backup voice check, over.
SC Roger, Mike. I gave you a count. I'll give you another one. Standing by.
CAPCOM Roger, standing by.
SC Roger. This is Apollo 8 through backup voice 1, 2, 3, 4, 5, 5, 4, 3, 2, 1, over.
CAPCOM Roger, Bill. Reading you weak but clear. Go ahead with normal S-band voice check.
SC Roger.
CAPCOM Apollo 8, Houston, over.
SC Houston, this is Apollo 8 on normal S-band, 1,2,3,4,5,5,4,3,2,1. How do you read? Over.
CAPCOM Apollo 8, Houston. Reading you loud and clear normal S-band. How me?
CAPCOM Apollo 8, Houston, reading you loud and clear on normal S-band. How me? Over.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 013000, CST 8:19a 22/2

CAPCOM Apollo 8, Houston, over.
SC Houston, this is Apollo 8, reading you loud and clear on normal S-band.
CAPCOM Roger. Reading you loud and clear on normal S-band. How me?
SC Clear.
CAPCOM Apollo 8, Houston, over.
SC Houston, this is Apollo 8. How do you read on VHF? Over.
CAPCOM Apollo 8, Houston. Reading you loud and clear. We are also reading you loud and clear on S-band normal. How me? Over.
SC Roger. I'm reading you loud and clear. I'll give you another count on S-band normal. 1,2,3,4,5,5,4,3,2,1. How do you read me?
CAPCOM Roger. That's loud and clear, Bill. California, would you enable the VHF downlink, please?
CAL California enabled.
PAO That is Bill Anders and Mike Collins doing those voice checks.
CAPCOM Apollo 8, Houston, over.
SC Go ahead, Houston.
CAPCOM Roger. We are going to rewind your tape recorder and we have the TLI plus 90 and TLI plus 4-hour fans at your convenience, over.
SC Roger. Ready to copy.
CAPCOM Roger. TLI + 90, SPS slash G&N, 63531 - 164 + 129. Are you with me so far, over.
SC Roger, we're with you.
CAPCOM Okay. 004174265 - 04402 - 00001 + 48387 178169359, not applicable, + 001854858760348383062027250 -
PAO The information that Mike Collins is passing to Jim Lovell is procedural numbers and angles should abort become necessary at two discrete periods after the translunar injection burn. Ninety minutes after and then 4 hours after and we should hear quite a few numbers.
CAPCOM -- + 1123 - 0300012313344940174739, north set stars roll 068, pitch 097, yaw 356, ullage none. Other, high speed procedure not required, over.
SC Houston, this is Apollo 8. We missed a portion of that maneuver pad. Can you start with HP and go down to northside star, over.
CAPCOM Roger. I say again, HP + 00185, are you with me?
SC Roger, we're with you.
CAPCOM 4858760348383062027 --

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 14000, CST 8:29A 23/1

CAPCOM 062027250 and the border site star is Earth's center, over.

CAPCOM Apollo 8, Houston, did you copy?

SC Roger, Houston. this is a TLI plus 90 as follows, minus, the weight will be plus 63531 minus 164 plus 129004174265 minus 04402 minus 0001 plus 48387178169359 plus 001854858760348383. We will have to get the sextant information later. 123 minus 030.

CAPCOM Apollo 8, Houston, over.

SC Houston, did you copy.

CAPCOM Apollo 8, Houston, we are picking you up now over Bermuda, I did not copy your readback after Delta V. That was the last point of the (garble).

SC Roger, Houston, could you give us the sextant information again, the sextant star information.

CAPCOM That's affirmative. The sextant star, 06, shaft 2027, trunion 250, over.

SC Roger, starting out with the sextant star, 06 2007 250, earth's center, down 123, right 22 plus 1123 minus 03000 12313 34494 017 47 39, north set, roll 068, pitch 097, yaw 356, no others.

CAPCOM Roger, Jim, on your sextant star, the shaft should be 2027, 2027, over.

SC Roger, copy, 0227.

CAPCOM Apollo 8, Houston, would you go to P00 and accept please, we want to send up the (garble) zero.

SC We are in ACCEPT.

CAPCOM You are in ACCEPT.

SC Roger, go ahead, we are in P00 and ACCEPT.

CAPCOM Thank you. I have your TLI plus 4 hour band, when you are ready to copy and your TLI band also.

SC Roger, ready to copy.

CAPCOM Okay, TLI plus 4 hours, SPS/G and N. The weight is still 63531 as printed, the pitch and yaw minus 164 and plus 12 niner. Are you with me so far?

SC We are with you.

CAPCOM GETI, 00647277 niner minus 015 niner 4 plus 00000 plus 52885178155000, not applicable plus 001 niner 252 niner 0 niner. Are you with me? Apollo 8, Houston, over.

SC This is Apollo 8, You are braking lock on S-band and again, you got cut-off, just at HB.

CAPCOM Okay, HB plus 001 niner 252 niner 0 niner 627526 niner 4, are you with me, over.

SC Yes.

CAPCOM Roger, sextant star, 121037211, earth center, down 063, right 23 plus 1068 minus 1650012505350610264257 north set stars, roll 068, pitch 0 niner 7, yaw 356, ulage none, high speed procedure not required, over.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 14000, CST 8:29A 23/2

SC Roger, Houston, TLI plus 4. Weight remains the same, minus 164 plus 129006472779 minus 01594 plus all ball plus 52885178159000 NA plus 001925290962752694121037211, first thiner, down 063, right 2.3 plus 1068.

PAO And this is Apollo Control Houston here while we are still in communication by the Vanguard, I wanted to pass on to you some real-time telemetry we are getting on a few cabin functions. The cabin pressure has been holding at a rock steady 5.2 pounds per square inch since launch. We've switched now to the bio-med, switched the bio-med harness over to Jim Lovell, on the center couch. His heart has been running around 69 to 70 beats per minute. He's breathing at a steady 25, 20 to 25 respirations per minute. He's been doing alot of talking, alot of writing down there, trying to copy all of those numbers. The cabin temperature is a very comfortable 62 degrees. All of the other sources, the oxygen pressure is still slightly more than 100 percent, we normally launched about 105 to 106 percent, it's showing 104 percent. All other sources in the cabin the bio-med area look quite good. Let's go back now and here even more numbers as we complete this TLI onboard information.

SC Zero niner 1, yaw 001, comments TLI plus -

END OF TAPE

Get 1:25 - 1:50

APOLLO 8 MISSION COMMENTARY, 12/21/68, CST: 8:39A 24/1

CAPCOM Yaw is 001. Comments, TLI plus 10 minutes abort attitude is 199 degrees, and I don't believe you've got time to read that back, we'll see you over Canaries at 1:50 GET. Adios.

PAO You heard Mike Collins, after a conversation that started at 1 hour 25 minutes into the mission, is now 1 hour - nearly 1 hour 50 minutes, to give you some understanding of the extraordinarily long periods that we can hold the spacecraft during these state side passes, and Mike bobbed that conversation off with an "Adios" and said we would pick them up in 1 minute over the Canaries. So essentially we've got, well let's say, on the order of 35 to 40 minutes of continuous communication starting with Guaymus and running through the Canary station. Let's just leave the circuit up. We'll have them back in just a very few seconds.

CAP COM Apollo 8, Houston, over.

SC Roger, Houston, Apollo 8, read you loud and clear. TLI (garbled) 24136 179 005 001 515 105196 35569 357 091 001. TLI plus 10 abort attitude 199 on the pitch.

CAP COM Roger Apollo 8, that is correct. We'd like to double check one number on the TLI plus 90 minutes. When you can dig that out let me know.

SC Roger, go ahead.

CAPCOM Okay, it's the sextant shaft angle should be 2027. Over.

SC Roger. Sextant shaft is 2027.

CAPCOM Thank you, sir.

PAO This is Apollo Control Houston. The flight director has just advised the room that the booster, the S-IVB, all consumable, every bit of data we have looked at and examined indicate we should proceed with the TLI burn. Go back to the crew.

CAPCOM Looking good, both from a guidance and a consumable viewpoint, it all looks GO.

SC Roger.

CAPCOM The DSP is all yours, Bill.

SC Thank you.

CAPCOM Apollo 8 Houston. We will have LOS in 1 minute. We'll pick you up again over Tananarive at 209.

SC Roger, Michael, thank you.

CAPCOM Roger. How does it feel up there?

SC Very good, very good. Everything is going rather well. It looks just about the same way it did three years ago.

CAPCOM Does Bill have time from playing with his tape recorder to look out the window?

SC Roger, we had one little incident here. Jim Lovell inadvertently popped one light, so we've got one full May West over here.

APOLLO 8 MISSION COMMENTARY, 12/21/68, CST: 8:39A 24/2

CAPCOM Roger, I understand.

PAO This is Apollo Control Houston. That will apparently wrap it up via Canary Islands. Tananareve we are due to acquire at 2 hours and 9 minutes into the flight, about 15 minutes from now. You heard on the tag end of that conversation a fairly relaxed Borman commenting that it looked very much like it did three years ago when he and Jim Lovell were flying Gemini 7, and he also reported that inadvertently a May West had been inflated. We're not just sure whose May West it was, but the supposition here is that one tank or one side of the life jacket on the command pilot might have been inadvertently triggered, and we're sure it's causing no difficulty and it will be deflated and stowed at the proper time with the suits. So we will be back at Tananareve at about 10 to 12 minutes. This is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 21500, CST 9:06A 25/1

PAO This is Apollo Control Houston, at 2 hours, 15 minutes into the flight. We have had a flight with the crew over Tananarive and among other things, Frank Borman reported that he was Gemini 8, which caused a few smiles. Some wag finally added, "remember you're Gemini 7, not Gemini 8" and here is how the conversation went.

CAPCOM Apollo 8, Houston through Tananarive, over.

SC Apollo 8.

CAPCOM Roger, Apollo 8, we don't have anything for you, we are just standing by. You're looking real good.

SC Thank you.

CAPCOM Apollo 8, Houston.

SC Gemini 8, correction Apollo 8.

CAPCOM Roger, Gemini 8, Houston, we would like to bring you up to date on the comm situation while we've got some quite time here. We'll be LOS Tananarive in another 2 minutes. We'll be picking you up over Carnarvon at 2 hours, 25 minutes and 22 seconds. LOS Carnarvon will be 23155, then we've got ARIA number 1 coming in about 23730 and after that we will have a hand-off to Mercury to Hawaii to Goldstone, and we should have continuous comm, over.

SC Very good, thank you.

CAPCOM Thought you were Gemini 7, not 8.

PAO And that wrapped up the conversation via Tananarive. We'll be back at, standby one here, 2 hours, 25 minutes; 8 minutes from now by Carnarvon.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 22600, CST 9:17A 26/1

PAO This is Apollo Control Houston at 2 hours, 26 minutes into the flight. We have just acquired by Carnarvon, and here is how that conversation is going.

CAPCOM Apollo 8, Houston.

SC Go ahead Houston.

CAPCOM Alright, you are GO for TLI, over.

SC Roger, we understand we are GO for TLI.

PAO This is Apollo Control Houston, running through an unusually quiet pass across Carnarvon with very little more than establishing call signs. Our orbital digitals, which we are reading out from Australian sites, show that present velocity is 25 569 feet per second, showing an apogee of 105.5 nautical miles; and our translunar injection burn will have the effect, here's that comm going up, let's catch up with it.

SC The following.

CAPCOM Alright, we will have LOS in about 30 seconds and we will pick you up over ARIA 1 at 237 and 1/2.

SC Roger.

PAO Apollo Control back here. The TLI burn will add 10 500 feet per second, perhaps a foot or more per second; but that is pretty close. Ten thousand, five hundred feet per second to the present 25 570. The duration of the burn will be slightly more than 5 minutes. It will occur 2 hours, and 50 minutes into the flight. Now, a combination of stations will be seeing it. The ship Mercury will see it, parked about a thousand miles south of Hawaii. Hawaii should also see it. In a very few minutes, as the spacecraft starts away from the earth, the big dish in Goldstone, Calif., will acquire. At 2 hours, 33 minutes into the flight, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 024200, CST 9:33a 27/1

PAO This is Apollo Control 2 hours and 42 minutes into the flight. We attempted to establish some conversation through one of our instrumentation aircraft. We heard them, they heard us, but it was just barely. We are now waiting, which we should have in about 2 minutes, through the good ship Mercury. It is entirely appropriate that the ship Mercury should be the relay point for this historic burn which is planned for in about 6 minutes. Flight Director has just advised we should standby to receive Mercury data and that's precisely what we are doing. We will be back to you in about 2 minutes. This is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston 2 hours 45 minutes into the flight. We are now getting data from the ship Mercury and everything looks good. The booster has advised that the tanks have repressurized properly and here goes the first call up to Apollo 8.

CAPCOM -- through the Mercury and you're looking good down here. Everything looks good.

SC Roger. Understand. Our O2 flow is a little bit higher than I thought, but Bill says that it's just about what he expected.

CAPCOM Roger, understand.

CAPCOM Your O2 flow looks good from down here.

SC Thank you.

PAO Here in the Control Center, two big charts dominate the front of the room, and two of the walls. One of them will present the data as it climbs. It's a plot of velocity versus altitude, so we will be able to track that for you. The other plots show the angle of the burn - is following. Still another shows the ever-so-slight out of plane maneuver. Standby one.

PAO Immediately following the burn, we should get a detailed report on it from Frank Borman. Meanwhile, Bill Anders, during the course of the burn, will operate the onboard flight recorder and on which any various comments from the various crewmembers will be recorded. We will undoubtedly hear some comments from them during the course of the burn. Immediately following the burn, Jim Lovell is to start stowing the many items of camera gear, lenses, mirrors, cables, all that matter of camera equipment, including a spotmeter. The Apollo 8 has been advised once again that they look good for the burn. About every minute, the Flight Director is pulsed, the booster man in this Control Center to get his status.

PAO Thirty seconds to TLI. And Mike Collins gives them the mark 20 seconds to ignition. Now he is counting, 4, 3, 2, we see ignition. Lovell confirms ignition and the thrust is okay, booster says. Flight Dynamics says we look good, Flight - watching the thrust build, trajectory guidance, flight dynamics, everybody in the front, what's called the front trench of this Control Center says they are happy. That includes the booster. Comm says you are looking good. Two hours 51 minutes and 30 seconds, that would put us about 1 minute into the burn. Apogee now 800 miles and climbing.

PAO Hawaii confirmed that they got a very solid lock and Borman almost nonchalantly says Roger, we look good here, at 2 hours 52 minutes.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 024500, CST 9:36a 28/2

PAO Flight Dynamics says we are exactly nominal. Cutoff is now predicted, 2 hours 55 minutes and 58 seconds. The crew has been advised that they look - all values look exactly nominal or just exactly what we hoped they would be. Their present altitude is now about 3000 miles and we are GO and these three crewmembers are traveling faster than man has ever flown before. There is very little conversation with the crew, but let's cut now to the crew and see what we can pick up.

CAPCOM Apollo 8, Houston. You are looking good here. Right down the centerline.

SC Roger. Apollo 8.

PAO Their velocity is now about 32,000 feet per second, 32,000 feet per second. Velocity is now 33,000 feet per second. From Hawaii we are getting a visual report that people in Hawaii are observing the burn from on the ground.

CAPCOM Apollo 8, Houston. You are looking good. Right down the centerline.

SC Roger. Apollo 8.

PAO We are about 40 seconds from cutoff here. The spacecraft is moving at nearly 35,000 feet per second, cutoff is 30 seconds. Present altitude, 35,000 miles.

PAO 60,000 miles we are approaching. We have passed the 60,000 miles and we are very nearly - Borman says we got SECO. Cutoff was right on the second.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, CST: 9:46A 29/1

PAO At 2 hours and 57 minutes here. All the sources again are being looked at and compared. All are exactly what we had hoped to see and more than once we've heard Chris Kraft, the Director of Flight Operations say, "You're on your way. You're really on your way now." We don't have a exact cutoff figure yet feet per second, but we should be getting it very soon from the flight dynamics officer.

CAPCOM Everything is looking real good down here.

FLIGHT California inhibit VHF down link.
CALIF Inhibited.

CAPCOM Apollo 8 Houston.

SC Go ahead Houston, Apollo 8.

CAPCOM Your cutoff looked very good down here. We have a whole room full of people that say you look good.

SC Roger, thank you. The only situation we have here is the 02 is (garbled) high, 02 is (garbled) high.

CAPCOM Roger, understand 02 flow high.

SC We'll get to first status report here shortly.

CAPCOM Roger.

CAPCOM Apollo 8 Houston. Your booster configured normally, and we're not concerned with the 02 high. We think it's normal.

SC Okay.

SC Houston, Apollo 8.

CAPCOM Go ahead Apollo 8.

SC Roger. The DELTA-TIG looked like it was right on. Burn time appeared to us to be about 2 seconds longer 517 DEX reads 95485 when we got it. The attitude was nominal. DI was reading 35452 at cutoff. H dot 04552 and H 01791 DE -VC on the MS was minus 20.6.

CAPCOM Okay, we copy that, Jim, and I've got some times here for you.

SC Roger, go ahead.

CAPCOM Merger begins maneuver to set attitude at 3 10 55. Takes 5 minutes to arrive at 3 15 55, and set time 3 20 55. Your set attitude the gimbal -

PAO This is Apollo Control. We are getting a post TLI report from the crew. I apologize, I reported some erroneous figures during the course of the burn. Our present altitude is about 240 miles and very shortly we will get a more precise fix on that. I believe in the course of the burn they quoted some features in thousands of miles which should have been in thousands of feet. I apologize. Our new displays are getting a good workout and some of the people reading those new displays are getting a very good

PAO workout.
SC Houston, Apollo 8, over.
CAPCOM Apollo 8, Houston. Go ahead.
SC Roger. Going to start charging

battery B.

PAO This is Apollo Control here. We're watching the altitude plot now. Now it's a good solid trace coming to us through Goldstone. We're up to 879 miles. Our present ground elapsed time into the flight is 3 hours 03 minutes. At the same time we are already beginning to see the velocity begin to recede slightly. It's now 32 418 feet per second, and we'll continue to see that slight lowering in the velocity reading and a constant elevation of the apogee. Now 934, 961, and every 10 seconds it seems to be adding about 30 to 40 miles. That spacecraft right now, in relation to the earth, is just south of the Goldstone station which has it in solid lock. We are now seeing our first midcourse charts, early estimates of what we will be working with, numbers at midcourse, and like so many of our data displays, by the time we get locked up on it with our own eye balls it moves to another channel. At 3 hours and 5 minutes into the flight, this seems to be a convenient stopping point for the action right now. We will be back shortly.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 3:08, CST 10:00A 30/1

PAO This is Launch Control. And our present planning we are aiming toward the postlaunch press conference at Press Site 39 at about 11:30 am this morning. The participants in this conference will be as follows: Lt. General Samuel C. Phillips, the Apollo Program Director, from NASA Headquarters. Dr. Kurt H. Debus, Director Kennedy Space Center, Dr. Werner von Braun, Director Marshall Space Flight Center, Dr. John Clark, Director of Goddard Space Flight Center, Dr. Robert R. Gilruth is back in Houston. We will see if arrangements can be made to include Dr. Gilruth in on the conference. 11:30 for the postlaunch conference. This is Launch Control.

END OF TAPE

PAO This is Apollo Control Houston, we estimate another 7 or 8 minutes before the spacecraft will separate from the S-IVB. We have not heard from the crew in the last few minutes, they're busy doing post TLI duties and we are looking at data here and everything we see is quite comforting. That is the next major event, separation from the booster. For now, the pool has asked us to replay the communication during translunar injection, which you heard live. Here it is.

CAP COM Apollo 8, Houston. You are looking good.
SC Roger.
CAP COM Apollo 8. Coming up on 20 seconds to
ignition. Mark it, and you are looking very good.
SC Roger. (Pause) Ignition.
CAP COM Roger, ignition.
SC ... we have had TLI ignition.
Fido, Flight.
CAP COM Go Flight. Do you look okay?
We look go. Look good Cap Com.
Flight booster, all systems go.
CAP COM Roger.
Flight Fido, after 800 miles, we are go.
CAP COM Roger. And climbing.
What have you got Flight? The antenna?
Looks good Flight.
CAP COM The booster?
Hawaii confirms they have got a very
solid lock. And Borman almost nonchalantly says Roger.
CAP COM Apollo 8, Houston, we are predicting cutoff
2 55 58 and it looks exactly nominal here.
SC Roger.
CAP COM Apollo 8, Houston. That predicted cutoff
2 55 52 - 52 and that is exactly as it should be.
SC 2 55 52
PAO This is Apollo Control Houston. 3 hours
22 minutes into the flight. Exactly 1 minute ago we observed
separation from the S-IVB. The crew immediately turned around
and had a look at the S-IVB and we are watching that pitch -
pitch attitude right now and telemetry coming through over
the Eastern Test Range. And as the vehicle climbs it will -
from a flat map projection appear to swing to the south and
west which, of course is a little unusual for our pass flight -
the earth orbital tracks which invariably take us to the east.
But we will observe as swing down starting across the Atlantic
and back across the upper part of South America. We are now
trying to establish a call with Apollo 8. Let's - let's see
what we can get.
CAP COM Apollo 8. This is Houston. Over.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 31700, CST 10:08A 31/2

SC This is Apollo 8 on VHF and S-band. How
do you read?

CAP COM Hear loud and clear, Bill. How me?

SC Read you loud and clear. We have sep and
looking good.

CAP COM Looking good here. (Pause)

PAO This is Apollo Control here. No additional
communications with crew, but while we have been sitting here
in the last few minutes, the Mission Control Center has gone
to what we call the translunar phase map. The new display -
those of you watching in the News Center will observe that the
elongated figure 8 map which shows the earth-moon transit and
it also shows the numbers, the small flashing light now being
portrayed to us in black and white. And we would estimate
our distance at something on the order of 3,350 miles from
earth. It will carry us out in increments of 20,000 miles
out to - on out to lunar distance. And we will be able to
observe the declination or the general angle in relation to
the earth-moon system for the entire flight path of the space-
craft. Again, we confirmed S-IVB spacecraft separation at
about 3 hours 21 minutes into the flight. And at this time
3 hours 27 minutes into the flight, all looks satisfactory.
This is Apollo Control, Houston.

END OF TAPE

PAO This is Apollo Control Houston. The crew seems to be pretty settled down after their translunar injection burn and they are getting some time on the window. We just heard Jim Lovell report he could see Florida perfectly. By the way, they are at about 6500 miles above the earth now. He said he had a beautiful view of Florida and then his gaze roamed a little bit to the other side of the window and he could also see Gibraltar. The crew reminded the Control Center here that Pete Conrad and Dick Gordon would have to step aside. Their altitude record has been exceeded. Let's pick up this conversation now as it unfolds.

SC Houston, Apollo 8. How do you read?

CAPCOM Read you loud and clear, Frank. How us?

SC Roger, loud and clear. We are taking pictures of the S-IVB, the postseparation sequence is completed and we seem to have a high gain.

CAPCOM Okay, fine.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger. Is Bill ready for his VHF test?

We can configure any time he is.

SC Okay, stand by.

CAPCOM Apollo 8, Houston.

SC Go ahead, Apollo 8.

CAPCOM Roger. We would like to ask whether you did a VERB 66 enter to transfer the state vector from CSM to LM slot. We didn't copy that down here.

SC We did not.

CAPCOM Okay.

SC Do you want us to do that now?

CAPCOM At your convenience.

SC Roger.

CAPCOM (cut off)

SC We see the earth now, almost as a disk.

CAPCOM Good show. Get a picture of it.

SC We are. Tell Conrad he lost his record.

SC We have a beautiful view of Florida now.

We can see the Cape, just the point.

CAPCOM Roger.

SC And at the same time, we can see Africa.

West Africa is beautiful. I can also see Gibraltar at the same time I'm looking at Florida.

CAPCOM Sounds good. Get a picture of it.

What window are you looking out?

SC The center window.

CAPCOM Roger.

CAPCOM Are your windows clear so far?
CAPCOM Apollo 8, Houston.
SC Go ahead, Houston.
CAPCOM How about your VHF check? We would like
to get that done before you get too much further away.
SC Okay.
SC Roger, we are listening on VHF now for
(garble).
CAPCOM Apollo 8, Houston. Say again.
SC We are listening on VHF alpha simplex.
CAPCOM Okay, good, thank you. VHF alpha simplex
and we will get configured for it and in between times, give
us a clue as to what it looks like from way up there.
SC Roger. Well, Mike, I can see the entire
earth now out of the center window. I can see Florida, Cuba,
Central America, the whole northern half of Central America,
in fact all the way down through Argentina and down through
Chile.
CAPCOM They picked a good day for it.
SC Stand by. We are going through the separ-
ation maneuver checklist here.
CAPCOM Roger, standing by.
SC Houston, this is Apollo 8. We've lost
sight of the S-IVB here. The separation maneuver may be de-
layed slightly or else we will go ahead and make it without
having her in sight.
CAPCOM Roger, understand, Frank.
SC Houston, Apollo 8.
CAPCOM Apollo 8, Houston. Go ahead.
SC When does the S-IVB do their blowdown
maneuver?
CAPCOM Stand by one.
CAPCOM Apollo 8, Houston.
SC Go on.
CAPCOM Your blowdown will be 1 hour from now, a
little more than 1 hour from now.
SC Roger. We have the S-IVB in sight again
now. We have done the separation maneuver.
CAPCOM Good show. Thank you.
CAPCOM Apollo 8, Houston.
SC Go ahead, Houston.
CAPCOM We would like to take control of the DSE
for a while, Bill.
SC Go ahead.
CAPCOM Thank you.
CAPCOM Apollo 8, Houston. We would like to get
an approximate GET of your sep maneuver to use for our ephemeris

CAP COM tracking data.
SC Roger. Was 3 hours 40 minutes zero seconds.
CAP COM 3 40 and a foot and a half - feet per
second. Right?
SC Roger. About that.
CAP COM Okay --
SC --We have the - Mike, we have the exact
callout here for you and a burn status report.
CAP COM All right.
SC All right, delta VX minus 0011, delta VY
plus 0002, delta VZ minus 0002, roll 0, pitch 180, yaw 0.
Over.
CAP COM Yes, Roger.
CAP COM Apollo 8. Houston.
SC Go ahead Houston. Apollo 8.
CAP COM Roger. At your convenience, would you
please go PU and accept with an update to your W matrix?
And also when you get a chance we would like to know about
the SLA panels. Did they all depart? And do you have any
comments about the SLA?
SC They all departed and they worked fine.
CAP COM Okay, thank you.
SC We are in PU and accept.
CAP COM Thank you.
SC Houston. Apollo 8. Will you give us
the information when you want us to stop the venting and so
on.
CAP COM Apollo 8. Houston. Roger.
CAP COM Apollo 8. Houston.
SC Go ahead, Houston.
CAP COM Roger. What is the venting information
are your inquiring about, the O2 flow high out through the
waste tank or waste compartment or you talking about your
evaporator?
SC Evaporator. We are configuring.
CAP COM Okay.
CAP COM ... concur in that.
CAP COM Apollo 8. Houston. You can go back to
the block. We have gotten in the load to the W matrix update.
SC Roger.
SC Houston. Apollo 8. The backpressure
valve is closed and the water flow is off.
CAP COM Backpressure valve closed and water
flow off. Thank you.
SC Houston. Apollo 8 here.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 033600, CST 10:27a 32/4

CAPCOM Apollo 8, Houston. Go ahead.

SC Roger. It looks like I might have to do a couple more small maneuvers to stay away from the front of this S-IVB the way we are ending up now. Do you want me to do these with our P-47 if we have to do them?

PAO This is Apollo Control Houston 3 hours 55 minutes into the flight. We have additional comm here, but at this point, we are going to join a postlaunch press conference at the Cape. Let's switch to the Cape.

END OF TAPE

PAO This is Apollo Control Houston at 4 hours, 21 minutes into the flight. In the last half-hour, we've had a very interesting interchange with the crew. They've given us a good discription of what has been going on; but more than that, we've been occupied with trying to understand what the proper maneuver would be to give us added separation from the S-IVB. Borman reported some 15 to 20 minutes ago, that he thought the S-IVB was staying a little bit to close for comfort. He estimated that its distance from the spacecraft 500 to 1000 feet and he said he was viewing quite alot of venting, not propulsive venting, but just great clouds of venting coming from the S-IVB. He later reported that it had stopped. In the course of the last 20 to 25 minutes, we have been playing music on the VHF by VHF out of California, and the crew reports Herb Alfred sounds great. It's being beamed to him just a little bit north of his native Tituana. So that system, we are trying to find out just how far out in space the VHF will carry. Certainly the quote that stopped us all, more so than anything else came from Borman. I'm sure it was by accident, but at one point he, in trying to configure for a slight burn to give him added seperation from the S-IVB, Borman says "as soon as we find the earth, we'll do it", and that brought a loud clap of laughter here. Here is quite alot of tape going back over the last 17 or 18 minutes.

CAPCOM Standby. That's affirmative Frank on this P47.

SC Okay, and give me the time again when it starts to damp please.

CAPCOM Roger. We're working on an exact GET of that Frank.

SC Right.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM I'd like to give you some idea of your trajectory. It looks like a mid-course direction number 1, trajected out to TLI plus 6 hours, would be only 7 feet per second. So any further maneuvers you do would add to that which is probably good.

SC I just want to stay from away from in front of this thing.

CAPCOM Roger. we concurr. Looks like it is safe now.

SC Yes. OMNI B. Starting to vent now, slowing down.

CAPCOM Apollo 8, Houston, say again.

SC The S-IVB is really venting.

CAPCOM Roger, understand that is a (garble) nonpropulsive vent. The big blow-down maneuver, its starts

CAPCOM maneuvering to blow-down attitude at
44455 and the vent occurs at 50755.
SC 50755.
CAPCOM Roger.
SC That is the nonpropulsive vent, but it's
pretty spectacular. It's spewing out from all sides like a
huge water sprinkler.
CAPCOM Roger, get some pictures of it.
SC Say again that big vent time, so I can
write it down Houston.
CAPCOM Big vent time, 50755 and it will be
maneuvering to vent attitude beginning at 44455. Bill has
got the tape recorder back.
SC Roger. We're receiving VHF music now,
Houston, thank you.
CAPCOM Yes, you took the words right out of
my mouth Frank, and we would like to know also how far you
are away from the S-IVB you are now.
SC I guess we are between 500 to 1000 feet.
CAPCOM Roger.
SC Herb Alpert seems pretty good.
CAPCOM Roger.
SC Houston, Apollo 8.
CAPCOM Apollo 8, Houston.
SC Roger, I believe we are going to have
to vent or thrust away from this thing, we seem to be getting
closer.
CAPCOM Roger, understand Frank, go ahead whenever,
just give us some idea of when you did it and how much.
SC Roger.
CAPCOM Apollo 8, Houston. Did you, standby 1,
we are working on something here.
SC Okay.
CAPCOM Apollo 8, Houston. Apollo 8, this is *radial*
Houston, over. Apollo 8, this is Houston, over.
SC You are loud and clear Mike, go ahead.
CAPCOM Okay Frank, on your additional separation
maneuver, we recommend that you make a radio burn, point your
X-axis toward the earth and thrust minus X for three feet
per second, over.
SC I don't want to do that.
CAPCOM The reason we want a radio burn is to
increase your mid-course direction, so we can use the SPS.
Standby on it.
CAPCOM Apollo 8, Houston.
SC Go ahead.
CAPCOM How close to a radio burn can you get,
without losing site of the S-IVB burn.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 42100, CST 11:12a 33/3

SC Well, I don't know because I can't -
CAPCOM Okay.
SC We can pitch down some, Jim has the Earth
and the optics, so we could pitch some and get pretty close
to one, I guess.
CAPCOM Apollo 8, Houston.
SC Go ahead, Houston, Apollo 8.
CAPCOM We can give you a pitch gimbal angle
on the radio direction if -

END OF TAPE

CAP COM Apollo 8. Houston.
SC Go ahead, Houston. Apollo 8.
CAP COM We can give you a pitch gimbal angle on radio direction, if that would be a help. It's 181 pitch gimbal angle would be exactly radial at 4 hours and 10 minutes. I don't know whether that solves your visibility problem or not.
SC 181?
CAP COM That's affirmative. S-band.
SC Zero would be just as good, wouldn't it?
CAP COM Frank, if you used zero, then make the sep if possible in the +X thrusters. That's the direction of the burn we are going.
SC Well, can't do that. I'll thrust right square into that S-IVB.
CAP COM Yeah, okay, understand.
SC What would you maneuver to as far as the gimbal angle for his blowdown?
CAP COM Apollo 8. Houston. That blowdown, that S-IVB should be oriented to perform a retrograde blowdown. Along the local horizontal. Is it still chasing. Does it look like it is closing or anything?
SC It is about the same. The trouble is it is pointed at us pretty well.
CAP COM Roger. Understand.
CAP COM Frank, what we want to do is get a radial upward burn and as long as you can through the optics or some other means out the window, figure out where the earth is, then use the appropriate thrusters, to thrust upward, radial upward for 3 feet per second, that is what we are looking for for trajectory.
SC Okay, understand. I just - as I say, I just can't very well do that now. I don't want to lose sight of this S-IVB.
CAP COM Roger. We concur with that. I just thought perhaps Jim, through his optics or you could get some feel for where the earth is. That's what we want to do is radial upward.
SC Okay, as soon as we find the earth we will do it.
CAP COM Thank you.
SC Houston. The venting on the S-IVB is terminated.
CAP COM Roger. Thank you.
CAP COM Apollo 8. Houston.
SC Go ahead Houston. Apollo 8.

CAP COM Roger. Frank, do you think you are going to be able to do this burn radially. We would like to add to its magnitude if you are going to make it in some other direction. Over.

SC No, I am not even sure we are going to do it yet, Mike. If I can get - if we seem to be drifting away from this thing a little bit, although it is still pointing at us quite closer than I like.

CAP COM Roger. Understand.

CAP COM Apollo 8. Houston. We would like you to do some additional maneuvers. It is just a question of how much and which direction.

SC Okay, our gimbal angles are about 190 and pitch is about 320 and yaw is about oh, 340. We could certainly do it in this position. That would be alright.

CAP COM Stand by. We will check those.

CAP COM Apollo 8. Houston. Frank, you could help us out if you would explain where you are relative to the booster. In other words, with respect to the earth and the radius back there. Are you above or below or one side or where exactly is the booster relative to you?

SC Well, it's as I said before. We can't definitely find the earth. I think we are in front and a little bit above - a little bit above the - almost in front of the - directly in the front of the booster.

CAP COM Roger. Understand. Almost directly in front of the booster.

SC Perhaps a little bit horizontally displaced towards the - let's see - Houston, to help you, we are looking right directly above the S-IVB with the sun - it's on the right side of the S-IVB and on our left number one window.

CAP COM Okay, understand. The sun is on the right side of the S-IVB and coming in your number one window. And are you - when you give us those angles, that means that your +X-axis is pointed at it with those angles. Is that affirm?

SC Roger.

CAP COM Okay.

SC The earth is in our +Y, +Z-direction now
Mike.

SC Roger. And a little minus X.

CAP COM That's okay.

SC Houston. For information, I am looking through the scanning telescope now and I see millions of stars. Most of them - the venting of the S-IVB.

CAP COM Right. Are you having trouble telling which are the stars and which are the S-IVB particles?

SC We are in sunlight and it looks like they are all S-IVB. We don't know. I am going to attempt a B-52 realign at this time and see what I can do.

CAP COM Understand you.

SC Mike, anything more on separation maneuver you're on?

CAP COM We are working on it. Frank, we are are trying to compute what radially outward will be in close terms. Now, you still have the earth - as I understand plus Y and plus Z quadrant. In other words, it's down below you on your right and slightly to your rear? Is that still true?

SC That's right. Quite a bit to our rear and down below us. Copied right.

CAP COM Okay, well, we - of course, in that attitude you want to burn some upward and some to the left and we are trying to be more precise than that. Frank, is it still about the same distance away? Are you opening or closing?

SC It sure is staying close.

CAP COM Understand.

SC Mike, can you just tell us which way the S-IVB pitches and how far it will pitch to the sling shot maneuver attitude.

CAP COM Stand by. Frank, the S-IVB is within 10 degrees of its final attitude at this time.

SC Houston. Are you ready to copy the IMU align information?

CAP COM Go ahead.

SC Star ID is 03, and star 36, star angle difference point 01. Torquing angle X minus 00034, Y minus 0027, Z plus 00100. Over.

CAP Okay, thank you for Y, I just got four digits here. 0027.

SC Three zero's. 00027.

CAP COM Thank you.

SC Houston. We are going to have to hold up on this lunar navigation until after this next little maneuver.

CAP COM Roger. Jim. We understand. (Pause) Apollo 8, Houston.

SC Go ahead now, Mike.

CAP COM Can you give us an updated readout in your gimbal angle. What your plus X-axis is pointed toward the booster, please.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 43100, CST 11:22A 34/4

SC Roger. Stand by.

CAP COM Apollo 8. Houston.

SC Go ahead, Houston.

CAP COM Did you give us those gimbal angles,
Frank, when you have a chance?

END OF TAPE

CAPCOM Apollo 8, Houston.
SC Go ahead, Houston.
CAPCOM Could you give us gimbal angles when
you get a chance?
SC I'm getting the COAX on it right now so
it will be accurate.
CAPCOM Thank you.
SC Okay, with the COAX right on the S-IVB,
the roll reads 105, the pitch is 275, and the yaw is about
325.
CAPCOM Roger. Copy roll 105, pitch 275 and
yaw 325.
SC Roger. That should be 115 for the roll.
CAPCOM Thank you. 115 for the roll.
SC Houston, Apollo 8, over.
CAPCOM Apollo 8, Houston, go ahead.
SC Roger. If it will help you any, Mike,
the earth is +Y about 45 degrees in a -X, I can see it
out my side window and it's a beautiful view with numerous
cloud vortex.
CAPCOM Thank you, Bill, thank you. Understand
+X 45 degrees halfway between +Y and +Z and slightly -X.
SC Negative. It's 45 degrees in the +Y,
in the X-Y plane towards -X, over.
CAPCOM Roger. Understand the X-Y plane, toward
X 45 degrees.
SC 45 degrees from +Y to -X.
CAPCOM Roger, thank you.
SC It's behind us to the right, if that
will help.
SC I can still see the Cape and glimpses
of Central America.
CAPCOM Roger, understand, Frank, what we want
on this burn is 8 feet per second, 8 feet per second. We
want it radially upward and we want you to use whatever
thrusters are required to burn radially upward at 8 feet
per second.
SC Why do you want to use - why do you want
to do so much, Mike?
CAPCOM Because of the separation distance we
would like to achieve between now and the time of S-IVB
blowdown.
SC Okay. Mike, do you want me to go ahead
and try to do this, or do you want to give me some gimbal
angles.
CAPCOM Apollo 8, Houston. Go ahead and do it
without gimbal angles if you can do that. Over.

SC Okay. I don't understand why you want so many feet per second on it, but I think I can - with just a little maneuvering I can get away from it a lot simpler than that.

CAPCOM Well, we would like the radial upward for trajectory reasons and the magnitude because of the separation distance which we're predicting you will have at S-IVB blowdown.

SC Okay. VHF sounds good.

CAPCOM Roger, on the VHF.

SC Omni B.

CAPCOM Understand Omni B, Baker.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger. About 12 minutes before your big blowdown, there is a small continuous vent which opens at a GET of 45555. You may notice that on the booster, 12 or 15 pound thrust.

SC Okay.

CAPCOM And Apollo 8, could you give us your burn information whenever you have it?

SC Roger. We are maneuvering to the attitude now.

CAPCOM Okay.

SC Okay, Houston. I understand you want 8 feet per second burn, is that right?

CAPCOM Roger. 8 feet per second, radially upward.

SC Well, we are as close to being radially upward as we can determine.

CAPCOM Roger.

CAPCOM Apollo 8, Houston. Are you going to use P-47 to monitor the burn?

SC Yes. We are putting it in right now.

CAPCOM Thank you.

SC Maneuvering now.

CAPCOM Thank you.

SC Houston, we made the burn at 7.7 +X + 0001 Y and Z's are all zeros. Gimbal angles, roll 180, pitch 310, and yaw 020.

CAPCOM Roger. I copy +X, 7.7, Y 0.1 and roll, pitch and yaw 180, 310, and 20.

SC Did you get that information, Houston?

CAPCOM Apollo 8, Houston. How do you read me?

SC Read you loud and clear. Did you get the information?

CAPCOM I say again, we copied +X 7.7, 1/10th in

Y, no Z, roll, pitch, and yaw, 180, 310, and 020.

SC Roger. The burn was made at - initiated at 445.

CAPCOM Roger, copy 445 .

SC Okay. Do you want us to transfer that to CM - LM state vector or just leave it alone? You -

CAPCOM - the primary, Frank, we would like you to transfer from the CSM to the LM state vector.

PAO And this is Apollo Control. That brings us up to the live action at 4 hours 49 minutes into the flight. You heard Jim Lovell say we would have to postpone his navigation - cislunar navigation task which involved plotting several stars, which had been planned during this last one-half hour and its place went the separation maneuver, an 8 foot per second separation maneuver to insure adequate separation from the S-IVB. In the course of the last half hour, we lost, the ground lost lock with beacon on the S-IVB. That was a VHF beacon. Our present altitude, their distance from earth is 17,200 miles and they are still hearing VHF, which is being piped music via VHF out of the Goldstone, California, station. Now we are asking them again about the booster. Let's listen.

SC - and we must be out a thousand feet and moving out.

CAPCOM Roger. Understand 90 degrees from its X-axis and about 1000 feet and separating.

SC Plus or minus a couple of thousand.

CAPCOM Understand.

PAO Apollo Control here. As we started to say, the distance from earth, 17,400 miles. Our velocity now has slowed in relation to the earth down to 14,384 feet per second and constantly slowing. We just heard from the command pilot and he says they will resume the flight plan now with their navigation tasks. At 4 hours and 52 minutes into the flight, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston 5 hours 3 minutes into the flight. The spacecraft is 18 nearly 19 000 miles from earth nearing the synchronous point, which it will just start on through, of course. Velocity continues to slow, it's now 13 860 feet per second. In the last 10 minutes we had another beautiful view type statement from the crew. We heard from both Lovell and Frank Borman, and the view indeed must be extraordinary. They described the cloud cover over Africa, over all of South America, and the affects over much of North America. Frank Borman issued a special little weather warning. He suggested the people in Tierra del Fuego area at the tip of South America better get their rain coats out. Here is the tape of that conversation.

SC Houston, Apollo 8 with a BRD reading.

CAPCOM Go ahead.

SC Roger. At 4 hours 4 minutes Commander is 0, CMP .64, LMP .02.

CAPCOM Got that, copy left to right: 0, .64 and .02 at 4 hours and 4 minutes. Thank you.

SC Roger. At 4 53 it was .01, 064, .03, and negligible on the survey meter.

CAPCOM Roger, thank you.

SC I have a beautiful view of the S-IVB and the earth here on one. I'll try and get a picture for you.

CAPCOM Okay.

CAPCOM Apollo 8 Houston. We've got you about a minute away from the continuous vent open, and 14 minutes away from the big dump, and and we would like an estimate on your distance now per unit.

SC Standby. Our distance is about 3000 feet we would estimate.

CAPCOM Thank you.

SC And we can see the vent.

CAPCOM Apollo 8 Houston. Say again.

SC We can see the vent.

CAPCOM Thank you.

SC Houston, Apollo 8.

CAPCOM Go ahead, Jim.

SC Boy, it's really hard to describe what this earth looks like. I'm looking out my center window, which is the round window, and the window is bigger than the earth is right now. I can clearly see the terminator. I can see most of South America all the way up to Central America, Yucatan, and the Peninsula of Florida. There is a big swirling motion just off the east coast, and then going on over toward the east I can still see West Africa, which has a few clouds right now. We can see all the way down to Cape Horn in South America.

CAPCOM Good grief, that must be quite a view.

SC Yes. Tell the people in Sierra del Fueago to put on their rain coats. Looks like a storm is out there.

CAPCOM Roger, will do. Do you care to give them a 24 hour forecast?

SC Might be as good as any other.

SC Houston, Apollo 8.

CAPCOM Apollo 8 Houston. Go ahead.

SC You might be interested to know the center window is pretty well fogged up, but the other seems to be in pretty good shape.

CAPCOM Glad to hear you've got 4 out of 5, and your big dump will be coming up in 2 minutes.

SC Roger, we're standing by.

SC The S-IVB has started dump.

SC Houston, Apollo 8.

CAPCOM Go ahead Apollo 8.

SC Roger. Mike did you say star 14?

CAPCOM Yes. Standby while I give you that time again. Star number 14 should be good for about another 8 minutes, Jim. 7 minutes.

SC Okay, now be advised on this calibration it is very difficult to do because of all the other little stars floating around here. Might do a (garbled) bypass it and do it at the end.

CAPCOM Roger, Apollo 8, understand.

CAPCOM You should have the rockets out now, Apollo 8.

SC Houston this is 8. I'm looking through the scanning telescope on the LOX and I'm just blanked out completely (garbled)

CAPCOM Understand.

SC It's a fantastic sight. Looks the S-IVB has (garbled)

CAPCOM Roger, understand.

PAO Apollo Control here. And we are 5 hours 9 minutes into the flight and we, as you heard the crew record, the S-IVB is doing it's propulsive vent and now we should see pretty dramatic separation between the two vehicles. The S-IVB will remain on a path which will take it, essentially, if you consider the moon straight ahead of your for analogy purposes, it will take the S-IVB to the right of the moon while the spacecraft will veer into the left and slightly ahead of the moon. Earlier in that conversation you heard Anders reporting his PRD reading and it's the personal radiation Dosemeter, and perhaps another Dosemeter and they were down on the negligible range as we anticipated they would be. Although the crew at this point has passed through the thickest portion of the Van Allen Radiation Belt as it departs the earth. It will continue to go through some

END OF TAPE

PAO This is Apollo Control Houston, 5 hours, 33 minutes into the flight. We are now 22 500 miles from Earth, our velocity 12 700 feet per second. In the course of his recent remarks, Jim Lovell said that he had alot of difficulty in finding the proper stars, various star checks from, because of the competition of the S-IVB venting. Apparently that is setting off big splashes of light, which drown out the stars; however, they should be seperating at the last reading they were 3000 feet from the S-IVB, and that distance should be growing. The crew has just advised that they can no longer hear the music we have been piping to them by VHF out of California. At the last report, they were getting our 18 - 19 000 miles. We just cleared them and they said they were not hearing it. We got quite alot of tape backed up, we'll play it for you now.

CAPCOM Apollo 8, Houston.

SC Standby.

SC Ready to copy.

CAPCOM Okay, we are about 510 BT, where we will record the block data TLI plus 4 and TLI plus 11. The TLI plus 4 pad that we gave you before is perfectly alright, we will not require that one and we will have the TLI plus 11 out for you shortly. Then at 545 or 6 hours on that high gain antenna check-out. Roger, standing by.

SC We are on OMNI B and we heard, we lost you after TLI plus 4 was okay.

CAPCOM Okay, the TLI plus 4 hour pad is okay, we will have the TLI plus 11 hour pad for you shortly and at 550 for your high gain antenna check-out, we would like you to leave that switch in wide beam with reference to our conversation the other day, leave it wide.

SC Roger, don't want to zap your receivers.

CAPCOM No, it has to do with some loss of tracking data, so it is better to leave it blank.

SC Okay.

SC Houston, Apollo 8. Are you recording what we are getting out of 23?

CAPCOM Standby 1 minute and I'll check.

CAPCOM That is affirmative, Jim, we are copying your P23.

SC Pretty big numbers there.

CAPCOM Well, we think that is because you bypassed the trunion test.

SC Roger. Houston, we are really getting some big numbers (garble).

CAPCOM Right, understand, Jim.

SC Do you want us to proceed with this, or do you want us to leave them alone?

CAPCOM Apollo 8, say again.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 53300, CST 12:24p 37/2

SC Do you want us to accept these, or should we leave them alone.

CAPCOM Standby.

SC Go ahead, Houston.

CAPCOM Roger, we do not wish you to accept those marks. This is due to the fact that in by passing the trunion bias check, you still have big numbers left in those registers, so you go ahead, when, after you do the trunion bias check, those numbers will become small later, but do not accept them right now.

SC Understand Houston.

CAPCOM We have a TLI plus 11 update for you when you are ready to copy.

SC Standby.

SC TLI plus 11.

CAPCOM Roger Bill, TLI plus 11, and this assumes no mid-course direction number 1. It's an SPS/G and N 63330 minus 163 plus 12 niner, are you with me so far?

SC Roger.

CAPCOM Okay, 01356475 niner minus 0048 niner, plus 00000 plus 47250177144000 not applicable plus 001 niner 74725355447050121278256023 up 265 left 18, are you with me so far?

SC Roger.

CAPCOM Okay, plus 11 niner 7 minus 1650012681356080504653. GDC aline north, set stars, roll 068, pitch 0 niner 7, yaw 356, ullage none, other 1, fast return T37, Delta V equals 7 niner 00, for Indian Ocean. Number 2, high speed procedure not required. Number 3, assumes no mid-course directions number 1, over.

SC Roger, TLI plus 11, SPS/G and N 6330 minus 163 plus 12 niner 01356475 niner minus 0048 niner plus 0000 plus 47250, you copy so far?

CAPCOM Yes, I'm with you so far.

SC Roll.

CAPCOM Apollo 8, Houston. Affirmative, I'm with you.

SC Roll 17714400 NA plus 001 niner 7472535544705012127826, section 256023, up 26 -

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 054400, CST 12:34P 38/1

SC 023 up 265, left 18, copy so far?
CAPCOM Yes, I'm with you so far, Bill, go ahead.

SC Plus 1197, minus 16500 12681 35608
0506, correction 050 46 53 north set 068 097 356 0 ullage,
note 1, fast return. B 37, DELTA-V 7900 Indian Ocean.
2. High speed procedure not required. 3. (garbled) tubes
to MCC 1. Over.

CAPCOM That's all correct, Bill.
SC Roger.
SC Houston, Apollo 8.
CAPCOM Go ahead Apollo 8.
SC Roger Mike. I'd like to give some
comments on B23 data. The auto maneuver was quite accurate
Looks like we got some (garbled) in the maneuver. Auto
optics put Canopus straight where it should be. A bit of
in mode control worked as advertised. At the altitude at
which I started to do the sighting they have a definite hazy
band line. The filter gives the earth a glow, sort of an
orange glow. It's very indefinite of where to put the star
but there does seem to be a solid line where you might
expect the horizon to be that appears through the haze, so
we expect the atmosphere to be. I know the procedure which
we had done up at MIT about 2 lines atop the haze layer
a definite line for these (garbled). In regards to
the optics calibration, it was very difficult to find a
star in the landmark line-of-sight in the venting of the
S-IVB.

CAPCOM Roger, Apollo 8. We copied that, and
we'd like for you to do that trunion test, that calibration
prior to your next set of sightings.

SC Roger, will do. Canopus just disappeared
from view, and maybe when we get a little time here I'll
try to get a calibration the first time.

CAPCOM Understand.
SC And Houston we've rewound the tape,
you can dump it at your convenience.

CAPCOM Roger, Bill, thank you. Are you still
picking up anything on the VHF?

SC Are you playing anything?

CAPCOM Affirmative.

SC No, I'm not picking anything up.

CAPCOM Roger, thank you.

SC What's our altitude now?

CAPCOM Well, you're about 20 000 miles.

SC Okay.

CAPCOM Give or take a thousand feet.

SC I'll go ahead and turn VHF off in the
neck ring.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET Q54400, CST 12:34P 38/2

CAPCOM Roger, Bill, thank you,
SC It was some pretty nice music while
it lasted.
CAPCOM Yes, I bet so.
CAPCOM Apollo 8, Houston.
SC Go ahead, Houston.
CAPCOM We're going to have to wait until we
get the high gain antenna locked on again to dump the tpe.
SC And are you about ready for us to to the
PPC attitude?
CAPCOM Standby one.
CAPCOM Apollo 8 Houston.
SC Go ahead.
CAPCOM We'd like to hold off on the PPC and
get some more P23 information. We'll have some more
details of that for you shortly.
SC Alright. Mike, what I'm doing now
pointed over to the star Sirius (garbled)
CAPCOM Apollo 8 Houston. You faded out completely,
Jim. I heard Frank but it faded when you began talking.
Say again.
SC Roger. I have switched to Sirius, the
second star in the first set to see if I can't get an optics
calibration on it at least.
CAPCOM Roger. That's fine. We'll have some
more good words for you shortly.
CAPCOM Apollo 8 Houston.
SC Go ahead.
CAPCOM Jim, on your P23, we'd like to go ahead
and do the calibration and then use star number 15 and take
three sets followed by star number 16, 2 sets. Over.
SC Roger, Houston, that's what we're trying
to do. I'm trying to get 15 for an optics now. It's been
very difficult with the bright earth to find a star that
we can get into the sextant. I'm trying to use the auto
optics on P23 to get the star. We have that now, we're
trying to maneuver the spacecraft to bring the trunion to
zero so we can get the lamp on line-of-sight.
CAPCOM Roger, understand. And I also have
your PPC attitude, which is different than you have. I'll
give that to you whenever you get a free moment.
SC Ready to copy.
CAPCOM Alright, PPC attitude will be Pitch, 242,
yaw is Q20. Over.
SC Pitch, 242, yaw Q20, copy.
CAPCOM Very good, thank you.
SC Houston, Apollo 8, over.
CAPCOM Apollo 8 Houston, go ahead.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 054400, CST 12:34P 38/3

SC Okay, we'll hold up on the high gain
check until we get out of peak.

CAPCOM Roger, Bill, thank you.

CAPCOM You may have to enjoy your lunch a little
bit. Are you hungry?

CAPCOM First time I ever heard you say that.

PAO This is Apollo Control Houston, 5 hours
52 minutes into the flight. You undoubtedly heard Frank
Borman say that they would delay temporarily the checkout
of the high gain antenna. And that - we just got an estimate
from the crew on the distance of the S-IVB. Frank Borman
estimates 50 miles, about 50 miles away. And then he
corrected it and said in view of the international aspects
of this flight let's make it 80 kilometers. Meanwhile,
Lovell is checking his navigational programs and assuring
that he can see the ← making sure that his optics are
operating properly. At 5 hours - the high gain antenna,
by the way, is of course of considerable interest to many
of our data transmission including the transmission of
televised data. So it was programmed to be checked out
at 5 hours and 40 minutes into the flight. It will be
delayed slightly, perhaps 15 or 20 minutes. This is
Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston at 6 hours 08 minutes into the flight. We've pretty settled here in the Control Center on the first midcourse correction which is presently planned as an SPS burn. Purposely wanted to get some early indication of its performance, the service propulsion system, and fortunately, the other events seemed to have worked in their favor. We are presently planning an SPS burn of 2 to 3 seconds duration. We will be putting 24 feet per second into the overall velocity. This event is presently scheduled to occur at about 9 hours into the flight. Beyond that, we still have no other indication of - we don't know any better just when the high gain antenna checkout will be made, but it should be done shortly. We have some tape from the last few minutes. We will play it for you now.

SC Okay, Houston. We did an optics calibration, we get zeros all the time.

CAPCOM Roger. Understand optics calibration and zeros all the time. Good.

SC It takes a lot longer to do it though. I had to go to a star like Sirius to finally see it.

CAPCOM Roger, understand. We are real glad you got that so we can get a horizon calibration to put in the computer.

SC Looks like the number 5 window is starting to fog up, Houston.

CAPCOM Roger. Understand it's the number 5 is fogging up.

SC Houston, P-23 coming through Sirius.

CAPCOM Roger, thank you.

SC - a little better. These numbers are a little better.

CAPCOM We would expect so.

SC Houston, how do you read, Apollo 8.

CAPCOM Houston, go ahead.

SC Roger. A downlink on the P-23?

CAPCOM That is affirmative.

SC Okay. Now how much longer do you want us to hold our - to PTC?

CAPCOM I also have your PTC attitude, which is different than you have. I'll give that to you whenever you get a free moment.

CAPCOM Stand by one, Frank.

CAPCOM Apollo 8, Houston.

CAPCOM Apollo 8, this is Houston, over.

SC Roger. Are you recording all these data from 23 or do you want some read down to you?

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 060800, CST 12:59a 39/2

CAPCOM Stand by, Jim. We think we are getting it all. We are confirming now. That is affirmative, Jim. We are getting all that is coming down. How is it going?
SC It's working very nicely. I finished - one set was Sirius with three stars and one set with Procyon or two sightings, three sights with Sirius and two with Procyon.

END OF TAPE

PAO This is Apollo Control Houston. At 6 hours 29 minutes into the flight. At the present time, here in Mission Control Center, we are in the process of changing shifts. Flight Director Milton Windler, and his Maroon Team of flight controllers coming on to relieve Flight Director Clifford Charlesworth and the Green Team. We have had some brief conversations with the Apollo 8 crew. Primarily concerning the onboard navigation exercises that they are involved in at the present time. The crew attempting to sight on two stars, Sirius and Canopus and take sightings on - angular sightings between the stars and the horizon. Conversations also concerned putting the spacecraft into passive thermal control mode and we expect shortly to begin test on the high-gain antenna. We will play back the tapes that we recorded of the conversations with the spacecraft and then pick up with whatever conversation is going at the time.

SC Go ahead Houston. Apollo 8.

CAP COM Roger Frank. What we are doing down here is this. We'd really like the horizon calibration. We would like to go to a 15 mark, you know, three sets on one star, two on the other. On the other hand, we are balancing that with the need to go to PPC and we are not losing sight of the fact that you want to go to PPC right away. So if you will bear with us another couple of minutes, we are trying to decide whether to actually go back and do some more of ... or whether to clear you at this time to go to PPC. Over.

SC Okay, we started maneuvering to PPC. We are getting kind of far behind and what I am concerned about Mike, Jim is now taking off his pressure suit.

CAP COM Roger. Understand. How about you and Bill?

SC Well, we are standing by till he gets through.

CAP COM Understand. And you are maneuvering to PPC. That's fine.

SC Well, I would prefer to do that, but we will ---

CAP COM Okay. Stand by just one.

CAP COM Apollo 8. Houston.

SC Go ahead Houston. Apollo 8.

CAP COM Roger. We would like to hold off on the passive thermal control until 7 hours GET and in the meantime to get as many more P23 marks as we can starting with the first star. And doing two sets of three marks each.

CAP COM And then going to the second set we gave you and concurrent with that. If possible, we would like Bill to run this high-gain antenna checkout as well as attitude. It's compatible with those.

SC They have not been to date. We are almost to the passive thermal control attitude now. And Jim is just half way through taking his suit off.

CAP COM Roger. Understand.

SC Let's hold off here for a minute.

CAP COM Roger. Frank. And the reason for this is the horizon calibration requires a number of points to give you and data for the onboard nav coming on.

SC Roger, we understand. We will be right back with you. Just wait a minute, here.

CAP COM Roger. Thank you.

SC That failing to separate from the S-IVB kind of fouled us up a little.

CAP COM Understand.

SC Houston. Apollo 8. How do you read?

CAP COM Apollo 8. Go ahead.

SC Roger. We are standing by. Are you about ready for the high-gain antenna trial?

CAP COM Okay. Just a second we will check on that. Are you in a position to where you can go back to the star sightings?

SC Well, we will be, but we can't until Jim gets AP COM Okay, we will stand will you give us a mark on that. In just a second I will check on the antenna. Okay, it looks like we are ready to go on the high-gain antenna check. And we can either go with commands called out from the ground and you can monitor it or you can be talked through. Which ever you prefer.

SC Well, stand by. I guess we are not quite in a proper attitude yet.

CAP COM Roger.

SC We are slowly getting it.

SC Houston. Apollo 8.

SC Houston. Apollo 8.

CAP COM Apollo 8. Houston. Did you call?

SC High-gain antenna on wide auto.

CAP COM Roger.

PAO This is Apollo Control. At the present time the spacecraft is nearing 30,000 miles altitude. The displays here in Mission Control Center show our current altitude at about 29,228 nautical miles. This is Apollo Control at 6 hours 35 minutes into the flight.

END OF TAPE

PAO This is Apollo Control Houston at 7 hours 11 minutes now into the flight. During the change of shift press conference we had a very quiet period relatively quiet period here in Mission Control Center. Astronaut Tom Mattingly now acting as capsule Communicator and we had some communication with the Apollo 8 crew primarily concerning some minor modifications to their flight plan to get them back on the flight - back on the flight plan. Frank Borman also reported that the S-IVB appeared to be tumbling. That observation was confirmed from the ground and we appear to be getting good data from the high gain antenna. At least preliminary indications are that it is working as planned. The crew is scheduled to come up shortly on an eat period. They will be getting their first meal of the mission in space. And they also, prior to that time, plan to get completely out of their suits. We have some tape of the conversation. We'll play that back for you now.

SC Houston, Apollo 8.

CAP COM Go ahead Apollo 8.

SC Are you getting input from our high gain antenna?

CAP COM Apollo 8, Houston. Affirmative we are getting your data and we may have a beam width change but stand by on that.

SC All right we're standing by. Jim's about ready to go back to the P23.

CAP COM Roger. We have a GO until 7 hours on the start of the PPC.

CAP COM Roger, seven.

SC Houston, Apollo 8.

CAP COM Go ahead Apollo 8.

SC We're on the PPC mode waiting for Jim and I noticed that out my window now I can see Iran very clearly even though the sun is bright in the other window.

CAP COM Roger.

SC I didn't mean to say that but its true.

CAP COM Rog.

SC The number 5 window is getting pretty well obscured and the number 3 window is unuseable.

CAP COM Roger, understand, number 3 is unuseable and number 5 is obscured. Can you make out any definition at all or do you have a target to look at?

SC Well I can see the sun. Wait til it comes around the earth and I'll give you a better hack on that.

CAP COM Okay.

CAP COM Apollo 8, Houston. We're going to go ahead and try to dump your tape right now. Circuit

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 71100 CST 2:00 P 41/2

CAP COM margins aren't too good at our present configuration. We're going to take a look at it. If it doesn't work we may have to do something again later - configuration.

SC Roger.

SC Houston, Apollo 8. We're maneuvering back to do another P23.

CAP COM Roger, thank you.

SC Houston this is Apollo 8. I'll do two more sets on 15 and then we'll do 1 set on -

CAP COM Roger.

CAP COM Apollo 8, Houston.

SC Go ahead Houston, Apollo 8.

CAP COM Okay Apollo 8. I'd like to fill you in on things we're thinking about doing in the next couple of hours, first chance you get there.

SC Go ahead.

CAP COM Okay in relationship to the midcourse correction we'd like to put that one off until about 11 hours and it will be approximately a 25 foot per second burn. The reason we're delaying the burn time is to allow for better tracking as a result of the seven and one half foot per second you put in on the separation. We'd like to take a little more time to look at the tracking data. And the dispersions in your correction arc are going to be growing pretty fast here. What we'll do then is to delete the map sightings that occur about 9.10 in the flight plan and this will be getting us back on to the normal flight plan sequence. So we'll go ahead and finish the P23 and the 7 hour limit on that P23 is due to the range limits on this test. Over.

SC Is due to the what did you say?

CAP COM The 7 hours on the P23 problem is due to the fact that we want to get these sightings into the minimum range. Over.

SC Roger, Understand.

CAP COM If you have any comments on that proposal, why go ahead and pass them down, and we'll feed them in.

SC No I think that's fine. We need to get out of the suits and get something to eat here too.

CAP COM Roger. Looks like we'll be back on the flight plan by 11 hours. We'll be holding up on the updates and pads because of the later burn.

SC Houston, Apollo 8.

CAP COM Go ahead Apollo 8.

SC Hi Cap, I believe we - the SIV-B in flight it's -- would appear to be tumbling and every once in a while are getting very bright reflections from it off - the star off the front.

CAP COM Is that right?
SC Houston, APOLLO 8, are you getting the
data from the P-23?
CAP COM Stand by one.
CAPCOM Affirmative, Apollo 8.
SC Okay.
CAPCOM Apollo 8, Houston.
SC Roger.
CAP COM Roger. We're copying your P-23 progress.
AND FAO advises that it looks like you are finishing your
first star and we'll need one more set on the second star,
and this 7-hour cutoff isn't affirmed, so we would like for
you to go ahead and complete the second star if you can.
SC We're on the last setting of the second
star right now.
CAP COM Okay. Real fine. And we've got a - it's
about time for a cryo fan cycle.
SC Okay. We'll do them one at the time for
about 4 minutes on each of them.
CAP COM All right.
SC We've got the cryo fan on in H2 tank
number 1.
CAP COM Roger.
SC Houston, Apollo 8. We've just got finished
taking two sets six sightings on Sirius and one set on Procyon.
CAP COM Roger. I understand that's six on Sirius
and one on Procyon.
SC Two sets.
CAP COM Roger.
SC And we're maneuvering now the PTC attitude.
CAP COM Oh roger, we follow you.
CAP COM And Apollo 8, when you get a chance down
in the lower equipment bay it looks like you're using the
flood lights in the dim 2 position. And that one is a time
limited item. We would like for you to do your standard
running in the dim 1 position. Over.
SC Roger. Just turned them off.
CAP COM Okay. Anytime you have one running dim 1
position, prefer them to the LAB.
SC Thank you.
SC Houston. We have the cryo fan on the
number 1 H2 tank was on 0 sub 01. You can give us the enact
when you want it - when you're ready for it to be turned off.
CAP COM Wilco.
CAP COM Okay, Apollo 8, you can terminate that
one and go to the other pact.
SC Roger. Okay, H2 number 2 is on.
CAP COM Roger.
SC Houston, Apollo 8.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 71100 CST 2:00 P 41/4

CAP COM Go ahead.
SC Are you having any problem on the ground
with your comm?
SC Negative. You're coming in loud and
clear.
SC Okay. We seem to be breaking lock inter-
mittently up here.
CAPCOM All right, we'll keep our eye on it. It
sounds good though.
SC Okay, Houston, Apollo 8. We've initiated
the PTC.
CAPCOM Roger.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 072100, CST 2:10P 42/1

SC Okay, Houston, Apollo 8. We initiated a PTC.

CAPCOM Roger. Okay Apollo 8, you can terminate the fans and the hydrogen and we're ready to start on the oxygen tanks.

SC Okay.

CAPCOM Apollo 8, we are through with the dump, you can have the tape recorder back.

SC Roger, thanks.

CAPCOM Apollo 8, Houston, we are ready to go to the second O2 tank.

SC Okay.

CAPCOM And for your information, it's Cleveland 24 to 10, and know what we plan to do?

SC Say again.

CAPCOM That's Cleveland 24 to 10, not over yet.

SC Thank you.

CAPCOM Okay Apollo 8. Looks like you can terminate your cryo fans now. And we're going to leave you alone for a while and let you get caught up. Things we have onboard, the high gain antenna check-comm mode check-that you have listed at 7 hours we'll put off and do whenever you are ready for it. So that's at your convenience. During the high gain DELTA we've performed using a wide band we were still getting real good data at 36K, which is little bit further than circuit margins that were predicted for it, and we've got our SPS burn coming up somewhere about 11 hours. and we'll give you more information on that later.

SC Roger. Right night we're on the program 21 now determining ground track for LOI it was that we did not make in 5 hours.

CAPCOM Alright, thank you.

FAO During that conversation with the crew you heard Frank Borman refer to the windows on the spacecraft clouding up. He mentioned that the number 3 window was completely clouded over and that the number 5 window was partially clouded. Those windows, as seen from the inside of the spacecraft, number from 1 to 5 beginning with the commander's side window, left hand side of the commander's couch. Number 2 window would be the docking window above the commander's position. The number 3 window is the hatch window, and number 4 would be the docking above the Command Module, or rather Lunar Module pilot, and number 5 would be the Lunar Module pilot's right hand window. You also heard some references there to P23. Now this refers to a computer program and indicates that the crew is involved - or refers rather to onboard navigation activities. We've had no other conversation with the crew and we anticipate they will be involved in eating shortly. This is Apollo Control at 7 hours 25 minutes.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 073500, CST 2:20p 43/1

SC Houston, Apollo 8.
CAPCOM Go ahead, Apollo 8.
SC Omni B.
CAPCOM Roger, omni B. Apollo 8, is that Bravo
or Delta?
SC Dog.
CAPCOM Roger.
SC Program 21 to integrate up to LOI just
stalled out around 69 hours and 02 minutes.
CAPCOM Roger, they are watching it.
SC Houston, Apollo 8.
CAPCOM Go ahead, Apollo 8.
SC Roger. Do you want us to stop the in-
tegration via VERB 96, over.
CAPCOM That is affirmative, VERB 96.
SC Roger, will do.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 74900, 44/1

PAO This is Apollo Control at 7 hours 49 minutes into the flight. We have a very quiet period since our last announcement. The crew scheduled to conduct their first midcourse correction at about 11 hours into the mission. This had originally been scheduled for 9 hours and we slipped it for about 2 hours to offer some additional tracking on the spacecraft prior to the burn. At present time, Apollo 8 is at an altitude of about 36,000 nautical miles and as our altitude continues to climb, the velocity continues to decrease. The speed at present time is about 10,000 feet per second. That would translate to about 6800 miles per hour. This is Apollo Control and 7 hours 50 minutes.

END OF TAPE

PAO This is Apollo Control at 8 hours 01 minute into the flight. The crew has been involved in some housekeeping chores aboard the spacecraft. Changing out the lithium hydroxide canister and we had a brief conversation with them during which the ground passed up the score of the - fourth quarter score of the Cleveland-Dallas game and we will play back that conversation now and stand by for any further comments from the spacecraft.

SC Houston, this is Apollo 8.

CAPCOM Apollo 8, Houston. Go ahead, Apollo 8.

SC 52 realignment also?

CAPCOM Yes, that is affirmative, CAPCOM. We want to do that a couple of hours when it is related to the maneuver, midcourse.

CAPCOM That is affirmative, Apollo 8. Let's try to maneuver and we will hold off and do that all in normal premaneuver sequence. And we have got a score here in the fourth quarter 31 to 13. And I've got some words on your P-21 discrepancy any time you are interested. And I'd like to confirm - Before I get off on that one, I'd like to confirm that you use the VERB 37 procedure to go to P00.

SC Roger.

CAPCOM Okay, on P-21, we making runs at - you had a slight error in your state vector at the time you started and when that was integrated out, it intercepted the lunar surface where it locked up and this is contained in a fairly recent program node.

SC Okay. Now, we've closed waste vent, so we should the this 02 come down now.

CAPCOM Okay, understand you closed the waste vent and how about the lithium change? Have you done that one?

SC Roger, that's done.

CAPCOM Okay, thank you. T-comm flight, did you copy that?

TECH COMM This communication is great. We won't have to have debriefing.

CAPCOM That's pretty outstanding. Did you copy that?

PAO This is Apollo Control. At the present time, the spacecraft altitude is 37,749 nautical miles and our velocity down to 9800 feet per second. We don't hear any more conversation from the crew. We will stand by to pick up again should any communication develop between the ground and the spacecraft. This is Apollo Control at 8 hours 04 minutes.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 83000, CST 3:20p 46/1

This is Apollo control at 8 hours 30 minutes into the mission. We continue to have a very quiet period here in mission control center. On board the spacecraft, the crew also getting a bit of a chance to relax and get out of their spacesuits. We also anticipate they will be getting something to eat at this period. The midcourse correction maneuver, the first run of the service propulsion system engine which is anticipated to be about 2 to 3 seconds in duration, is currently scheduled for about 11 hours ground elapse time. That's about 2 hours later than it was originally planned in the flightplan. We anticipate that following that burn we will be back on the nominal flightplan. We do have some communication between capsule communicator, Ken Mattingly, and the crew and we'll play that back for you now.

SC Houston, Apollo 8.

CAP COM Go ahead, Apollo 8.

SC Roger. Dump before the burn. Will that foul your tracking up.

CAP COM Okay, let me run that one by.

Apollo 8, Houston. We don't have any objections to going ahead with the urine dump now. And for your information, the waste water dump, our schedule, we plan to put it off till about 11:30 and this will get you up to approximately 90 percent in your waste tank. It's a little higher than normal but we wanted to put this off until after the burn was completed. And some of the other things that we've got coming up about 9 hours you have oxygen fuel cell purge. And we've already mentioned the deletion of the star landmark sightings. From 10 to 11 we have put aside for the burn preparations. And a final score is 31 to 20.

SC Reed won over Dallas, huh?

CAP COM How about that?

SC Houston, how do the circuit margins on the S-band look as compared to your preflight calculations?

CAP COM Okay, Apollo 8. It's a little bit early to give you any real numbers on your com performance. Looks like its working as good as predicted and everything else seems to be doing better so this may be doing better too after we have done our next com checks some of these other things will have a better handle on, I can give you a quantitative answer to your question.

SC Roger.

SC Houston, this is Apollo 8. How do you read me?

CAP COM Loud and clear, Apollo 8.

SC Roger. Sure got a nice view of the earth from here. We can see Baja California and about where San Diego ought to be.

CAP COM Very good.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 83000, CST 3:20p 46/2

SC I can't see my dad's flight pool out there today, though.

CAP COM We'll tell the doctors about that.

PAO And that is the extent of that bit of communication with the crew. At the present time the spacecraft is approaching 40 000 miles in altitude. We're about 39 500 and the velocity continuing to drop off down now to about 9600 feet per second. At 8 hours 35 minutes into the mission, this is Apollo Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 90000, CST 3:40 47/1

PAO This is Apollo Control at 9 hours into the mission. At the present time the spacecraft has covered about 42, almost 43 thousand of the some 200 thousand miles separating Earth and Moon. It's now traveling at a speed of about 92 hundred feet per second or about 62 hundred miles an hour. Up till now the mission has gone extremely well. The spacecraft is performing nominally in all respects, and we continue to have a relatively quiet period, both here on the ground and from the communications with the astronauts on the spacecraft. We did have one brief communication a short while ago concerning data transmission from the spacecraft. And we'll play that back for you now.

CAPCOM Apollo 8, Houston. Okay, we dropped off a high gain on the OMNI there for a bit and went to a low bit rate, and we're getting ready to command you back to a high bit rate. Do you want us to keep you posted every time we change tape speeds?

SC We're not recording now anyway, Houston.

CAPCOM Roger, understand, but when we go to high bit rate, do you want to be kept informed every time we transfer? We hadn't planned on it.

SC I think if we need to record, we'll ask you on it.

CAPCOM Okay.

PAO That appears to be about all the conversation on that tape. At the present time the flight plan, the updated flight plan, shows the crew in an eat period and are interspersed with that activity for Bill Anders. He will also be doing some checks on the monitoring equipment onboard the spacecraft to observe the service propulsion system midcourse correction burn. That will be occurring in just a less than 2 hours from now as currently planned. At 9 hours 3 minutes, this is Apollo Control.

END OF TAPE

PAO This is Apollo Control at 9 hours 24 minutes. The spacecraft at this time is about 45 thousand nautical miles from Earth. The velocity currently about 89 hundreded feet per second. We just had a rather brief communication with the spacecraft. Astronaut Lovell OMNI optics, the onboard system to assist him navigation - midcourse navigation, and reported that the sky around the Moon viewed through the sextant, the 28 power optical device on the spacecraft, appeared to be a light blue rather than black as he had expected. Lovell also reported that he was not able to see as many stars at various sun angles through the scanning telescope as he had expected and also that some light refraction apparently from the sun also interfered somewhat with his ability to see as much of the Moon through the sextant as he had anticipated prior to flight. We'll play back the tape to that conversation for you now.

SC Houston, Apollo 8.
CAPCOM Go ahead.
SC Roger, how does your tracking look on us?
CAPCOM On flight, tracking still in progress and a little to soon to give you a firm answer on the results, but everything looks nominal so far.
SC Is it working okay?
CAPCOM Seems to be. Apollo 8.
SC Go.
CAPCOM Okay, sometime when it's convenient for you now, I would like to see a oxygen fuel cell purge. And do you have an estimate on when you might be getting around to this com test.
SC Well right now we're right in the middle of trying to get something to eat, Ken. I guess we can do the fuel cell purge.
CAPCOM Apollo 8, there's no rush, just didn't know what you were doing at the time. Give us a call when you have a free moment, we'll pick up.
SC I'm fixing to start the O2 purge now, if you wish.
CAPCOM Okay, that'll be fine. And I'll keep track of the time for you.
SC Okay, that would be good. Turned on O2 now on fuel cell 1.
CAPCOM Okay, thank you. Apollo 8, Houston, that's about 2 minutes on your first fuel cell.
SC Roger, it's up, and number 2 on now.
CAPCOM Roger. Go ahead.
SC We're a long ways from my turn at the water gun, I might give some comments on the optics. There seems to

be quite a band of light that goes all the way across the scanning telescope anywhere in the vicinity of the sun. Just a little while ago we were in the position where I could pick up the Moon in the scanning telescope. And then I looked at it in the sextant, and the sky the space around the Moon was a very light blue, just about as light blue as we have back on Earth. And it's not black in that sun angle with the Moon.

CAPCOM Understand this light blue showed up in the sextant.

SC That's affirmative. I maneuvered the optics so I could pick up the Moon in the sextant and the space around the Moon is a light blue.

CAPCOM Roger, can you make any kind of estimate about the proportion of the radius, how far out that seems to extend?

SC Well, it extends the full length of the sextant. Actually I could see us coming as we moved across because the band of light in the scanning telescope cut across where the Moon was, and it moved in this area. I believed it's caused by the refractional light inside the optics themselves.

CAPCOM Roger.

SC Also I've been occasionally looking out to see if I could see stars at various sun angles, and at this particular altitude it's very difficult. In the scanning telescope the sun is very bright and the Earth is very bright. And if I looked at the Earth and tried to look for stars, I lose my dark adaptation very quickly.

CAPCOM Roger, do you have any problems seeing the Moon.

SC No problem seeing the Moon. When I looked for the star landmark line of sight, I - it very sudden present but it was very visible.

CAPCOM Roger, you say area illuminated in Earth shine show up?

SC Not at this altitude, and that's strange I thought I could see that. At this altitude the refractional light in the optics themselves due to the reflection of the sunlight I suspect or Earth's light completely blanked out the dark side of the Moon to this altitude.

CAPCOM How about that.

SC Maybe we have an atmosphere illuminate.

CAPCOM Okay, Apollo 8, looks like that ought to terminate fuel cell purging.

SC Roger.

PAO This is Mission Control, Houston. Some very interesting comments there from Astronaut James Lovell

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 92400, CST 4:15 48/3

on the optical system for the Guidance and Navigation system aboard the spacecraft. The assessment here in Mission Control Center is that there is no problem associated with the minor anomalies Lovell mentioned. And this is verified by the fact that the crew has been able use the optics aboard the spacecraft to do the sightings that have been required. At 9 hours 32 minutes into the mission, the Apollo 8 spacecraft is now some 45 686 nautical miles in altitude. The vehicle has a total weight of 63 295 pounds and we would expect that to remain quite constant until the first significant use of the service propulsion, the first burn of the service propulsion system. At 9 hours 32 minutes 38 seconds, this is Apollo Control.

END OF TAPE

PAO This is Apollo Control at 10 hours into the mission. At the present time activity here in Mission Control is beginning to pick up as we prepare for the first operation of the spacecraft service propulsion system engine, and matching that activity here on the ground is also heightened activity in the spacecraft. At the present time the crew is involved in making preparations for that burn scheduled to be a 2.4 second burn of the service propulsion system engine. That will occur in just about an hour from now. Scheduled to occur at 11 hours ground elapse time. During the next hour the crew will be involved in aligning the platform on the spacecraft. This is the stable reference in the Guidance and Navigation system which the spacecraft G&N system uses to tell it what attitude it is in. Also provides that information to the crew. At the present time while we're reading up from the ground the burn information which the crew will insert into the computer such things as the length of the burn and the time of ignition. We also have some recorded communication with the crew. We'll play that back and then pick up with the conversation as it progress.

CAPCOM Go ahead Apollo 8.

SC You want to get started here around 10 hours, is that what you said?

CAPCOM Well, what we had planned was to use the 10 to 11 hour period as your preburn preparation just as we would have done normally. And -

SC Fine, we can go ahead and do that.

CAPCOM And if you can work in this com check before that it would be desirable but that's not a concern.

SC What do you want in the way of a com check, George?

CAPCOM Okay. What we've got here is a couple of DTO com checks. We'll be switching around to five different modes and only one of them will interrupt your activities. In that case we'll be switching to the uplink backup voice and that's the one time that you might lose temporary uplink voice com, you'll have downlink voice com throughout the entire procedure. And it ought to take you I guess 10 to 15 minutes max. The only requirement being that we should stay on a high-gain antenna.

SC Why don't we go ahead and start now then?

CAPCOM Okay, that sounds pretty good. Okay, Apollo 8 another couple of minutes and we'll be ready to go into our com check. And for your information looks like the signal strength is 3 to 4 dB better than expected on the wide range on the wide beam mode, and approximately that gives you 1.4 increase in your range.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 100000, CST 4:50 49/2

SC Roger, let's not increase by 1.4. more than.

CAPCOM Okay. I now feel like take a look at - as you go through the PTC we have some who would like to know if you can see any detectible effect on the windows in the form of their fogging. Particularly does the sun seem to vary fog intensity, does it increase it or decrease it or make you go in patches or anything like that that you might be able to notice.

SC The sun doesn't seem to change it much, however, the different incidents of the sun's rays magnify the fogging. Or at least change it.

CAPCOM Okay, Apollo 8. I'm sorry would you say again please.

SC The sun doesn't seem to have any effect on the windows themselves, but the different incidence - angles of incidence of the sun's rays change the relative amount of obscuration caused by the fogging.

CAPCOM Okay. Okay, Apollo 8, we're ready to go into the com check now, and it's your option we can call out switches and let you position them, or we can command it from the ground. In either event there will be a couple of switches that you will have to throw for us.

SC You command them, and we'll throw what we have to.

CAPCOM Okay, I'll keep you posted on what we're doing. The first test is an uplink voice and ranging with fold downlink which is essentially what your doing right now, used for a baseline.

SC Roger.

CAPCOM Okay, we're starting on test number one, and if you would verify that S-band normal voice switch is in voice.

SC Roger, we're in voice.

CAPCOM Okay. And the up telemetry data to data.

SC Roger, data.

CAPCOM Okay, and up telemetry command to normal.

SC Normal.

CAPCOM Roger, how about high-gain antenna track to auto.

SC We're on OMNI now, we've got to wait till we get around the other way.

CAPCOM Okay, what's your estimate?

SC We're at 15 minutes from it.

CAPCOM Okay.

SC Maybe we had better hold the com check till after the midcourse because we'd better get fired here at 10

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 100000, CST 4:50 49/3

if we want to burn at 9.

CAPCOM Roger, affirm. We're viewing that right now. Okay, Apollo 8, we're postponing the com test till after the burn.

SC Thank you. Houston, Apollo 8, are you ready to go - for us to go through with the P52 now?

CAPCOM That's negative Apollo 8, we would like to update things first, and we're going to give you a LM state vector and then an external DELTA-V.

SC Roger.

CAPCOM And if crew will accept while we'll go ahead and work on that.

SC Roger.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Okay, we've got your pads we're ready to read up to you. And we're standing by to flank your state vector and external DELTA-V when ever you're ready to give us accept.

END OF TAPE

CAPCOM We are ready to read up to you, and we are standing by to uplink your state vector and external Delta-V whenever you are ready to us ACCEPT.

SC Roger. Just stand by one and we will get the pad.

SC We will put the TM in ACCEPT now. At this time.

CAPCOM Roger.

CAPCOM Okay Apollo 8 we didn't copy that last one. We are sending you State vector up now.

SC Roger we say we are ready to copy the pass.

CAPCOM Okay, The PAD will be a maneuver PAD MCC one and this will be an SPS G & N beginning with the weight 63295 minus 163 plus 1 2 9 zero one zero 5 9 58 3 zero plus zero zero one 36 minus zero zero zero 45 plus zero zero 2 zero 2 345 188 343 99999 plus zero 1685 zero zero 248 zero zero 2 zero zero one 86 23 2 zero 23 164 zero zero one 2 up 276 left 04 November Alpha for the remainder of that column. In the comments. North stars zero 68 zero 97 356a no ullage start and a single bank burn on bank alpha over.

SC Houston, Apollo 8. MCC one maneuvers SPS G & N 6395 minus 163 plus 129 zero one zero 59 583 zero plus zero zero 136 minus zero zero zero 45 plus zero zero 2 zero 2 345 188 343 99999 plus zero 1685 zero zero 248 zero zero 2 zero zero 186 23 2 zero 13 164 zero 12 up 276 left 04 November Alpha for the remainder. North stars zero 68 pitch zero 97 yaw 356 no ullage single bank alpha.

CAPCOM Roger Apollo 8 that is correct. And I have a TLI plus 11 PAD for you.

SC Roger. Go ahead.

CAPCOM Houston, Apollo 8. Go ahead.

SC Roger. Apollo 8. Lung clear now. Are you ready to copy?

CAPCOM Roger. Ready to copy.

SC Okay, this is a PLI plus 11 FBS g and m. This assumes a mid-course correction number 1 631 40 minus 163 plus 12 niner to zero 13 56 48 97 minus zero, zero 5 minerniner plus zero zero zero zero zero plus 47 zero 16 177 143 zero zero zero november alpha plus zero zero 1 niner 7 47 zero 2 zero 5 51 468 18 12 1283 257 zero 23 up 263 left 17 plus 11 95 minus 165 zero zero 126 83 356 zero 8 zero 5 zero 47 zero 5. North stars zero 68 zero niner 7 356 no ullage. For the fast return P 37 delta V 79 zero zero for the Indian Ocean. High speed procedure not required for the MS. This assumes midcourse correction 1 over.

CAPCOM Standby.

SC Roger.

CAPCOM Houston, Apollo 8 to the revact, are you ready?

SC Go ahead.

CAPCOM GLI plus 11 SDSG and N 63140 minus 163 plus 129 13 56 4897 minus zero zero 599 plus zero zero zero zero zero. And I believe it's plus 47016.

SC That's affirmative.

CAPCOM 177 143 zero zero zero NA plus zero zero 197 47 zero 2 zero 551 46818 12 128.3 257 zero 23 up to 63 left 17 plus 1195 minus 165 zero zero plus 126 23 356 zero 8 zero 5 zero 47 zero 5.

SC The north vat roll 68 pitch 97 yard 356 no ullage. P 37 high speed 79

END OF TAPE

SC P-37 high speed 7900, Indian Ocean and high speed procedures for the EMS are not required, assumed MCZ1.

CAPCOM Roger, Apollo 8. Two corrections on on the PETI. The hour is 013, springs to go EMS.

SC 013.

CAPCOM Roger. Copy that and the rings to go in the EMS 126 83. Over.

SC 12683.

CAPCOM That's correct.

SC Houston, this is Apollo 8. We advised that we doubted that it would be possible to use the stars to get our backup alignment. We haven't been able to see any stars through the scanic telescope yet.

CAPCOM Roger. Okay, and another comment for you Apollo 8, like for you to use verb 37 to select two and then wait for your computer activity light to go off prior to unzap of the LM man to CSM slot.

SC Roger. Are you ready for us to do that now?

CAPCOM Affirm

SC Houston, this is Apollo 8.

CAPCOM Go ahead.

SC Okay, now we'll go ahead and start back of the flight plan around 8 hours here of T52, right?

CAPCOM Affirmed.

SC We have transferred the state vector to the LM SLA already before we did T52. So we're going to do the 52 now.

CAPCOM Okay, Apollo 8, that's good procedure and

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Rog. Will you check your up-telemetry switch to block please?

SC Houston, block.

PAO This is Apollo Control during that lengthy string of numbers which was read up to the crew from the ground, included in that information was the data that they would need to return to Earth should that be necessary at a point following the mid-course correction and assuming that they were unable to communicate with the ground. This type of information is passed up routinely to the crew during the course of the mission at specified intervals and is kept by the crew for use should it become necessary because of some contingency to return to Earth. At the present time, the mission is proceeding nominally. All the spacecraft systems are functioning very well and we have no problems to speak of at the present time. The crew is very heavily

APOLLO 8 MC, 12/21/68, GET 102000, CST 5:10pm, 51/2

PAO involved at this time and preparing for that mid-course correction, the first use of the Service Propulsion System engine. That is scheduled to occur at 11 hours ground elapsed time or about 33 minutes from now. Now that burn is a planned 2-1/2 second burn a very short ignition of the 20 500 pound thrust SPS engine. It will give them a velocity change of about 24 or 25 feet per second. At this time Apollo 8 is about 50 000 nautical miles from Earth and they're traveling at a speed of about 8500 feet per second or around 5 700 miles per hour. We'll stand by to pick up any conversations that develop with the crew prior to this mid-course correction. At 10 hours 27 minutes this is Apollo Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 1045, CST 5:35, 52/1

PAO This is Apollo Control, at 10 hours 25 minutes into the flight of Apollo 8. At the present time, our spacecraft is at an altitude of 51,595 nautical miles, traveling at a velocity of about 8300 feet per second. Flight Director, Milton Windler, has just gone around the room here at the Mission Control Center. We viewed the status of the spacecraft and our flight for the first mid-course correction burn and we've passed up a GO to the crew for that maneuver scheduled to occur in just about 15 minutes from now at 11 hours ground elapsed time. And that burn will be a very short one, about 2.4 seconds and will add about 24 or 25 feet per second of velocity to the trajectory. Most of that will be in a posigrade direction, velocity added rather velocity subtracted and there will be also some minor direction change in that most of the velocity is an increase. At the time of ignition, the spacecraft will be at an altitude of about 52,770 nautical miles. We do have a recording of some conversation with the crew over the past 15 or 20 minutes. We'll play that back for you now and then stand by to monitor any conversations that develop.

SC Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAP COM Okay, we've got a telescope alignment I'd like to give it a try. Your sextant star is still good but if you had problems with that, suppose it worked out that if you look through the telescope at 10:35, we have a shaft and trunnion that you point to the center of the Earth, if you would like to give that one a try.

SC Okay.

CAPCOM Okay, at 10:35, the shaft (garble) 006.2, trunnion 18.9. Over.

SC Roger, 10:35, shaft 006.2, trunnion 18.9.

CAP COM Affirmative.

CAP COM Apollo 8, Houston.

SC Go ahead.

CAP COM Okay, We don't forget a fan, a cyro fan cycle in here before the burn. About 1 minute on each will be fine.

SC Roger. I've already given 2 minutes 02 and 1 and 2 and 021 and I've just started 022.

CAP COM Roger. Thank you.

CAP COM Apollo 8, Houston. We'd like to dump your tape prior to the burn.

SC Roger. It's only been running here about 15 minutes

CAP COM Okay, Apollo 8. That's correct. You're on high bit rate and we're afraid you may run out before the burn so we'd like to dump it and get it back to you with a

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 1045, CST 5:35P, 52/2

CAP COM . . . full load before the burn.
SC Roger. And give us a comment on the
voice quality.
CAP COM Wilco.
SC Houston, Apollo 8.
CAP COM Go ahead.
SC Roger. We plan to stop charging battery
B in about another 5 minutes. Concur?
CAP COM That's affirmative.
SC Okay, you might just remind us.
CAP COM Wilco.
CAP COM Apollo 8.
SC Go ahead. Go ahead, Houston, you were
cut out.
CAP COM Okay, Apollo 8. All your systems are
GO and we were about to tell you you can go ahead and termi-
nate the battery charge and you beat us to the punch.
SC All that on your mind and it's showing
37 volts right now.
CAP COM Okay.
PAO This is Apollo Control. We had a
relatively quiet period for the last few minutes between
the ground and the spacecraft and we imagine that the crew
is rather actively involved in getting, making final prepa-
rations for their first midcourse correction enroute to the
Moon. That engine ignition is now scheduled to occur about
2 1/2 minutes. Correction, about 6 and 1/2 minutes from
now at 11 hours ground elapsed time. All the batteries
aboard the spacecraft have been fully charged up and they
will be brought on the line during preparation and during
the burn, are to assist in carrying the electrical load
at that time. This is a normal procedure during a maneuver
where the entire guidance and navigation system is required.
We'll stand by to monitor the burn and pick up any communi-
cations with the spacecraft as we go through the final
systems checks and await that midcourse correction.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 105500, CST 5:45 53/1

CAPCOM Apollo 8, Houston, you'll put your high bit rate we'll give you a tape recorder back.

SC Roger.

PAO Here in Mission Control the Guidance Officer has just advised the Flight Director that the spacecraft gimbal motors positioning the SPS engine are in the proper attitude and everything looks go for the burn scheduled to occur now in about 3 minutes. We'll continue to monitor for conversation with the crew.

CAPCOM Affirmative Apollo 8.

SC Apollo 8, command reset to get the motion are now normal.

CAPCOM Roger. Apollo 8, stand by for a MARK at 1 minute.

SC Roger.

CAPCOM Ten seconds, five seconds, 2, 1, MARK 1 minute.

SC Roger.

PAO 1 hour 30 seconds from ignition of the SPS engine for that 2.4 second burn. That maneuver will be primarily to control the altitude of the spacecraft as it goes around the back side of the Moon at perigee. Targeting for there is 60 nautical miles. 10 seconds now till the burn. 5, 4, and we have confirmation of SPS ignition. Thrust looks nominal says the Flight Dynamics Officer. And we should have shut down also, we'll have confirmation of that shortly. And the Guidance and Control Officer advises the Flight Director the burn time was 2.4 seconds exactly nominal, just what was planned. That should have given us a velocity increase of about 24 or 24 feet per second. We've now taken the batteries off the line, their job done in assisting in carrying the heavy - heavier than normal electrical loads during a major maneuver of this sort, even though a very short maneuver. They will then be recharged to bring them up to full charge for the next maneuver or use of the SPS system. The initial indication was that the service propulsion engine which all ground testing and previous flights has shown to be extremely reliable and appears to have demonstrated that reliability once again in this ignition, the first time that engine has been used on this mission. Of course, the Flight controllers here in Mission Control Center are monitoring very closely the performance of the engine and also happy to have this opportunity prior to inserting the spacecraft into lunar orbit. Of course that is the engine that would be required to put the spacecraft into lunar orbit and also to take it out of lunar orbit and send it back to Earth. At 11 hours 2 minutes this is Apollo Control.
END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 110800, CST 5:58 54/1

PAO This is Apollo Control at 11 hours 08 minutes and we've just gotten a preliminary assessment of the performance of the SPS engine from here in the Mission Control Center and from the indication of the burn the SPS looks to be completely go on the words of the guidance officer and the other flight controllers also concur. The burn was completely nominal in all respects. We also had a post-burn report from Astronaut Jim Lovell aboard the spacecraft and we'll play that back for you now and stand by for any further communication with the spacecraft.

SC Houston, Apollo 8.

CAPCOM Go ahead.

SC Roger. The burn time was on time about 2 seconds. We had residual of 4.4X. We burned it out to .2. Attitudes were nominal. The Delta V stay before the residuals were taken out is minus 2.4. I have transferred the state vector to the LM slot in the verb 67.

CAPCOM Roger. Copy 4.4 per X and 2.4 on the V and negative residual on Y prior to the trim, is that affirmed?

SC That's affirmative. We took out the 4.4 residual down to .2.

CAPCOM Roger.

SC Houston, Apollo 8. Do you want us to start charging Battery A, now?

CAPCOM Stand by.

CAPCOM Apollo 8, let's go back to Battery Bravo, and we'll finish that one off before we start in on Alpha.

SC Roger. Battery Bravo. Houston, Apollo 8, Do you want us to maneuver to any particular attitude for a water dump or do you want us to go to PGC attitude?

CAPCOM Okay, let's go PPC.

SC And give me the angles, please.

CAPCOM Okay, Apollo 8, let's do the same angles we had before - that's pitch 242 and yaw 20 on the PPC attitude.

SC 242 yaw 20. Roger.

SC Houston, we're preparing to dump our waste water now.

CAPCOM Roger.

PAO During that conversation you hear Jim Lovell refer to the residuals, now this is the amount of velocity remaining to be added or taken out of the trajectory following the ignition of the SPS engine and we nominally expect a small residual. We did have residuals of about 4.4 feet according to Lovell, and as per the normal procedure, these were removed by burning the Reaction Control System thrusters - a very short direction burn on those to in effect peak up the affects of the burn and put the spacecraft velocity

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 110800, CST 5:58p 54/2

PAO right on the preplanned. At this time
Apollo 8 is at an altitude of some 53 200 nautical miles
and traveling at a speed of 8134 feet per second. This is
Apollo Control at 11 hours 12 minutes into the flight.

END OF TAPE

PAO This is Apollo Control, 11 hours 30 minutes into the flight of Apollo 8. We have some further refinements on the results of that service propulsion system midcourse correction, the first midcourse correction planned on route to the Moon. The effect of the burn was to give us a perisynthetosis or low point closest approach to the Moon of 69 nautical miles. We've been targeting for about 60 nautical miles. This information of course will be evaluated further and refined. This is the preliminary Flight Dynamics Officer analysis of the effects of the burn. And we would expect some update to that. The burn also gives us a time of closest approach to the Moon of 69 hours 10 minutes ground elapse time. The preflight analysis had placed that time at 69 hours 7 minutes, or just 3 minutes different from what we have from the results of the translunar injection and the subsequent midcourse correction. There are four midcourse corrections nominally planned in the flight plan. All of which or none of which could be used on route to the Moon. And depending upon the results of the final analysis on the results of this burn it would be decided whether or not subsequent midcourse corrections would be required. We would anticipate that any subsequent corrections would be quite small. We also had a brief communication with the spacecraft in the last few minutes, and we'll play that back for you now.

SC Houston, Apollo 8.

CAPCOM Go ahead 8.

SC We noticed on our systems test battery vent pressure that when we opened the battery vent valve, we get an immediate drop-off to pressure which nulls out at about 2 tenths of - to 3 tenths of a volt. And we think this is zero and the battery manifolds. You concur.

CAPCOM Okay, stand by and let us check it out. Apollo 8, I cut you out there, what did you say on the last one.

SC It looks like probably that zero psi corresponds to about 3 tenths of a volt on the test meter. We've had it happen a couple of times where the pressure would drop rapidly to this setting as if it were zero, over.

CAPCOM Roger, we'll look at our data here and let you know what we think. You go on ahead with the water dump now.

SC Roger, we'd - we're pausing here on the water dump though just to verify that the battery met - the line is clear as indicated by a battery vent pressure of zero.

CAPCOM Okay, stand by. Apollo 8, Houston.

SC Go ahead, Houston.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 113000, CST 6:20 55/2

CAPCOM Okay, number 1 on the list of things is that the flight plan shows CDR should hit the sack. Number 2 kind of a summary of your burn. All your SPS and systems look go. The trajectory shows that you have a CPA with a mode of 69.67 miles and the time of parasynthean is 69 plus 10. You do have capture on a good free return. It's a little bit early to completely evaluate the trajectory for carter control. You'll have no update to the TLI plus 11 block data. After looking through the cal curves it looks like the battery vent pressure is actually zero at .2 to .3 volts, so that - we agree with you there and you can go ahead with the water dump. We still have the com check to do when every we get ourselves in a good high gain look angle and whenever it's convenient for you, over.

SC Thank you very much. That was a very fine resume you sent in. We're right now in the process of trying of dump out the water and the USDA and so on and so on. So we'll get with you on the high gain as soon as we can.

CAPCOM Okay, good burn.

SC Houston, what do you want to dump the waste tank down to.

CAPCOM Apollo 8, I would like you to dump the waste tank to 25 percent.

SC Okay. we're dumping now Houston.

CAPCOM Okay, thank you.

SC We finally got some stars to see.

CAPCOM Apollo 8, Houston.

SC Go ahead Houston, Apollo 8.

CAPCOM Roger, do you folks have your water quantity switch in the portable or the waste water tank position now?

SC We're in the waste tank position now, and we're dumping UTCA's first, Houston.

CAPCOM Okay, we weren't watching any waste quantity decrease and it looked like the nominal temps indicated that something was going on, and we were trying to figure out what was going on.

SC We'll there's a lot of stuff going on I'll tell you. How do nominal temps look?

CAPCOM Oh, about 81.

SC Okay, we'll keep on going then.

PAO Communications continue to be excellent with the spacecraft. We're continuing to track with the 85 foot antenna at Goldstone - Goldstone, California. The crew reported earlier that the signal strength indication that we had was above normal, above what they would expect. And up to this point we've had extremely good results from the unified S-band communications system. Spacecraft is presently about 50 thousand nautical miles from Earth as shown on the

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 113000, CST 6:20 55/3

large plot board here in the front center of Mission Control Center. We expect the crew will begin a series of relatively relaxed activities aboard the spacecraft. Commander Frank Borman after a very long day is scheduled to have a 7 hour sleep period, and he should be in that sleep period at the present time. Following Borman's sleep cycle, Lovell and Anders will get their sleep period in about another 6 and a half hours. At 11 hours 39 minutes this is Apollo Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 120400, CST 6:55p, 56/1

PAO This is Apollo Control at 12 hours 04 minutes into the mission. The flight of Apollo 8 continues to progress very smoothly at this point. Both, here in the mission control center and in the spacecraft things have quieted down considerably since that mid-course correction maneuver. At the present time Commander Frank Borman is scheduled to begin a 7-hour sleep period, and his fellow crewmen, Jim Lovell and Bill Anders, are presently involved primarily in some housekeeping functions aboard the spacecraft, managing the systems, and also apparently from the communications with the ground, they are involved in taking some pictures. We have several minutes cumulated tape on communications with the spacecraft over the past 30 minutes and we'll play that back for you now.

SC Okay, Houston. We're going to dump the waste tank on down to about 25 percent.

CAPCOM Okay, thank you.

SC Houston, Apollo 8. Do you copy?

CAPCOM Affirmative, Apollo 8.

SC Okay, tell Zeke Thomas to wake up and keep an eye on the waste tank servicing.

CAPCOM That'll take a minute to think of something appropriate.

SC You're slowing down.

CAPCOM So are you guys.

SC How do the nominal temperatures look in Houston?

CAPCOM Stand by.

SC Now you're looking pretty small down there now, Houston.

CAPCOM We're carrying a big stick, though.

SC We can just barely make out Clear Lake.

CAPCOM And your nominal temperatures have dropped from about 94 to around 66.

SC Okay. I'm showing just a little bit above 50 percent here and we'll keep on going and if it looks too cold, give us a call.

CAPCOM Okay, we'll do that.

SC Houston, we had a momentary O2 high at 12 and we think it's due to all the purging of the water lines we're doing here in the cabin.

CAPCOM Roger. We concur.

CAPCOM Apollo 8, Houston, we show you down to 25 percent of your waste water.

SC Okay, I'm about 28 - Houston stand by just a minute. Okay, waste dump stopped and then purge again.

CAPCOM Roger, waste dump stopped.

SC Rog.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 120400, CST 6:55p, 56/2

SC Houston, we're on a high gain and it might be a good time to try the intercom check.

CAPCOM Apollo 8, we're going to go ahead and crank up to a comm test now, and we will be a little bit late on your update for 12 hours.

SC Okay.

CAPCOM Do you still want our - have us command as much as we can on the ground or would you like to move the switches yourself?

SC Oh, you can have the fun of doing it.

CAPCOM I like your drag in there.

SC They're using test to ground bar. We're using 1/250 on an F-11 on CEX and CMAX for Earth shots, do you verify me?

CAPCOM Okay. You got going before I got my pencil up. How about saying it again?

SC F-11 and 1/250th for CEX 16 mm and C 70 mm.

CAPCOM Okay. Thank you.

SC How about running in by the back room, boy. My light meter doesn't seem to be helping out too much.

CAPCOM Okay.

CAPCOM Okay, Apollo 8, We're starting in setting in for our first comm test. This is going to be a mike-link voice, linking and fold-down link, which is not anything really different than what you have onboard. I would like for you to verify that the S-band nominal mode voice switch is in voice.

SC Roger. Voice.

CAPCOM Okay, and the up telemetry data to DATA.

SC Roger. DATA.

CAPCOM Up telemetry command in NORMAL.

SC Roger. NORMAL.

CAPCOM High gain antenna to AUTO TRACK.

CAPCOM Correction. That's

SC AUTO

SC We're in AUTO and you can go ahead and dump the tapes.

CAPCOM Okay, I'd like for you to go to narrow beam.

SC Okay, going to narrow beam now.

CAPCOM Rog.

CAPCOM Okay and I'll give you a call when we get ready to work on the tape.

SC Okay. We're still in PTC, so we're only going to have it for about 10 or 15 minutes.

CAPCOM Okay, we've had some problems with our displays and I think they're straightened out now, but you may have to keep us advised if we run out of limit in case we display again.

CAPCOM we went through that display again.
SC Rog.
CAPCOM Say, while we're standing by here, Apollo 8, the service module quantities that we had listed, we're going to try to update them, if you want to call all your quantities. Have you checked them with your charts?
SC Negative. I haven't gotten around to that. Stand by.
CAPCOM Okay. here's no hurry on that. I just wondered if you had done it, we will check it against what we've got on our nova 9.
SC I'm showing a SPS helium pressure, about 35 70, indicated onboard.
CAPCOM Rog.
SC And fuel LOX tank pressures are 177 and 176 respectively.
CAPCOM Okay.
SC M2A is 2400 B 2500.
CAPCOM Okay.
CAPCOM Okay, and our back room tells you that you've got the right f stop.
SC Okay, then we'll keep using it. SPCT attitude really isn't the greatest for taking pictures of the Earth.
CAPCOM Rog.
SC Or of the Moon.
CAPCOM Apollo 8, Kinda stand by for a burst of noise as we change configurations on the ground. We're going into test 1. You'll still have up and down link and we'll be in this mode for 2 minutes. You may hear some burst of noise as we change.
SC Roger.
CAPCOM Okay, Apollo 8, we're in the middle of our first test and how about giving me a voice check.
SC Roger, Houston. This is Apollo 8. One, two, three, four, five. Five, four, three, two, one all the way up.
CAPCOM Roger and read you loud and clear. This comm is unbelievably good.
SC Good.
CAPCOM Okay, Apollo 8, we've finished the first test and we're now going to change the up link mode to up link command and ranging, and we'll be going without up voice. We'll be in this mode for 2-1/2 minutes and will be sending a test message. It'll have no affect on either your computer or your panel switch configuration. What you might see will be the 3-band noise that's associated with the break locks. However, you should still have a good signal on your power meter. This is not a loss of signal, but rather just a loss

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CAPCOM of the voice modulation, and I'll do you a mark just before we do that so that you can turn your S-band volume down if you so desire, and we'll be back up in this mode that we're in now in 2-1/2 minutes.

SC Roger.

CAPCOM Apollo 8, Houston. We're about to disable the voice modulation uplink and we'll be back up no later than 12:13.

PAO This is Apollo Control at 12 hours 14 minutes into the mission now. Apollo 8 is presently some 57 000 rather 58 000 nautical miles from Earth, 58 334 according to our displays here in Mission Control Center, and the spacecraft is traveling of 7700 feet per second. We do expect probably for the rest of the night we'll have a rather quiet period, here in Mission Control Center. The commander, Frank Borman, is in his 7-hour sleep period

END OF TAPE

PAO The commander, Frank Borman, is in his 7 hour sleep period now. He should be about 1 hour along. Following that we will have sleep periods for command module pilot, Jim Lovell, and for lunar module pilot, Bill Anders. Most of the tasks throughout the night, at least night here in Houston will be housekeeping chores. There will also be eat period for the command module pilot and lunar module pilot before they begin their sleep period. And they will be doing some navigation exercises onboard. And primarily monitoring systems and doing housekeeping chores aboard the spacecraft. At 12 hours 15 minutes into the flight, this is Apollo Control.

END OF TAPE

PAO This is Apollo Control Houston at 12 hours 45 minutes into the flight. At the present time, Apollo 8 is just beyond 60,000 miles from the Earth, 60,536 nautical miles and the spacecraft velocity is continuing to decrease gradually. At the present time, the speed is about 7,500 feet per second. During the past 30 minutes, we recorded about 5 minutes of conversation with the spacecraft. We'll play that back for you now.

CAP COM Apollo 8, Houston. Voice check.
SC Read you fine, Houston.
CAP COM Apollo 8, Houston.
SC Roger, Houston. Read you loud and clear.
CAP COM Okay, loud and clear. We're back up with you, completed our second test. Okay?
SC (Garble)
CAP COM Okay, our next test will be a test of the uplink voice and ranging with downlink voice and ranging on low bit rate, so we'll be changing bit rate on you and we'll be making a voice check in the middle.
SC Okay. You probably had it on the high gain - you might try to get it in but it's going to hit the skin level at any second.
CAP COM Okay, Apollo 8. We'll try to get all our information before we lose the high gain.
SC Okay, we'll just leave it go.
CAP COM Roger.
SC We're at the scan limit. We'll let it go, Houston.
CAP COM Okay, Apollo 8. Go ahead and switch to the omni.
SC Are you through with your test?
CAP COM Okay, we've got 3 steps of the test. We'll have to pick up the rest next time we get a look at high gain.
SC Okay.
SC Houston, Apollo 8.
CAP COM Go ahead, Apollo 8.
SC Roger. Reading on P-21 at 269 10 indicates a parallel of about 67.4 miles. I guess we can carry her.
CAP COM You guys are getting pretty good.
SC That's a lot better than our first answer.
CAP COM We don't care if we're right, just so your is right.
SC Houston, Apollo 8.
CAP COM Go ahead, Apollo 8.

SC Roger. I'd like to ask a question about this TLI plus 11 maneuver that we copied. In the remarks, you have P-37, delta V 7900. Is this the delta V that we would use with P-37.

CAP COM Let's see, that's the option that you used with minimum time.

SC Roger. What I'd like to do is check on our P-37 with your TLI maneuver update.

CAP COM Okay, Apollo 8. We'd like to make sure that we don't have a misunderstanding with the 7900 feet per second is the delta V. It's not associated with the high speed work around procedure - it's just the standard P-37 delta v.

SC Roger. But was that the delta v that you used to give us the TLI plus 11 - okay, I see, you win.

CAP COM Apollo 8, that's not the one that the maneuver pad was based on. That's the number you put in for the minimum time.

SC Roger. Understand.

CAP COM Okay. Sounds like a good idea if you want to go ahead and check out the 37. We're standing by to work on COM as soon as that high gain is available.

SC Roger.

SC Okay, Houston, you got . . .

SC Houston, do you read? Apollo 8, over.

CAP COM Apollo 8, Houston.

SC Roger. High gain yours.

CAP COM Okay. And if you're ready, we are.

We'll go right ahead with our COM test.

SC Go ahead.

CAP COM We're starting in now on our fourth test. Like for you to put your telemetry input switch to PCM high.

SC Carry on.

CAP COM Okay, and now we're going to switch, I think, to the upvoice backup for about 2 minutes and it may take a couple of seconds when you get up here where it's lost. So, you can place your up telemetry switch to upvoice crackup and if all of this doesn't work out too well, I'm reading 1247 on my clock now and let's meet back in our present configuration no later than 1250.

SC Roger, on upvoice backup.

CAP COM I'll be right back.

CAP COM Apollo 8, Houston.

SC Roger, Houston, read you loud and clear.

CAP COM Okay. That's pretty good. That's up-voice backup and will you confirm again the narrow beam on high gain?

SC Roger. Copy.

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 12:45, CST 7:35P, 58/3

CAP COM Okay. Thank you. We've got to continue with tracking and watching high gain antenna for a couple of minutes. Then, I'll give you a call when we're ready to go back.

SC Roger.

CAP COM Apollo 8, Houston. We have completed this test. We'll be switching back to full up link. When you hear the noise associated with the loss of modulation, you can go back from the up-telemetry switch to data.

SC Okay. Apollo 8.

CAP COM Okay, loud and clear.

SC How's everything looking down there?

CAP COM Real fine. We've just got one to go if you'll put your telemetry input PCM switch to LOW.

SC Roger. Go in LOW.

CAP COM Okay, that will be your next configuration for about 2 minutes and then we'll be completed with the COM test.

SC Roger.

CAP COM I have some service module RCS quantities if you would like to take them sometime and check them against your onboard tabulations.

END OF TAPE

PAO This is Apollo Control at 13 hours 16 minutes into the flight. We are in communication now with the spacecraft. And we have some accumulated tapes of previous conversation during the past 30 minutes. We will play back the tape first and then pick up with whatever conversation is going on when we finish.

SC Roger. Ready to copy. Could you give quad A, B, C, and D in that order?

CAP COM Okay, will do. And I give you weights and pounds and percentages. Quad A 231 for 76 percent.

SC Roger. Stand by. What time is that for?

CAP COM Oh, 12:15.

SC Okay, go ahead.

CAP COM Okay, quad Bravo 251, 82 percent. Quad Charlie 240, 79 percent.

SC Slow down.

CAP COM Quad Delta 245, 81 percent. P and C advises that these numbers are still good, even though it is a 12:15 time. And we are completed with the com test. You can take your high-gain antenna and go back to medium.

SC Roger. Medium.

CAP COM Apollo 8. We would like to dump your tape again. If you are not using it. And the reason we want to do this is we had some - we didn't completely get dumped before the burn. We would like to get that and get the rest of the burn data. There is no hurry on it. We can do it whenever it is convenient for you.

SC You got it.

CAP COM Okay, thank you. Apollo 8. Houston. Do you call?

SC Negative - negative. Negative, Houston.

CAP COM Okay, thank you. Say. We're curious. What did you do about your May West?

SC We thought we might bleed the CO2 down into the vacuum connector here in our next water dump. We forgot it last time. Did you copy?

CAP COM Roger. Doesn't seem like there is any problem with going ahead and dumping it in the cockpit if you like.

SC It is CO2, isn't it?

CAP COM That's fine. Apollo 8. Houston. We asked it again, and it looks like no problems at all with going ahead and blowing it down in the cockpit. And then if you need it again on entry or after entry, well, we can blow it up with oral tube.

SC Roger. Understand.

CAP COM Apollo 8. Houston. Apollo 8. Houston.
Apollo 8. Houston. Apollo 8. Houston.

SC Houston. Apollo 8. Read you loud and
clear. How us?

CAP COM Okay, loud and clear. Didn't get you
there for a while.

SC We have been reading you all along,
Houston.

CAP COM Roger. Did you attempt to transmit or
were you just not getting through?

SC Roger, we attempted to transmit and it
sounded like you had a stuck mike there for a little while.

CAP COM Okay, that shouldn't make any difference
to us on that duplex mode. Okay, what I was calling for
Apollo 8, we have got a maneuver path that is TLI plus 25.
I would like to read up to you when you are ready for it.

SC Go ahead, Houston. TLI plus 25.

CAP COM Okay, TLI plus 25 and this will be in
SPS G&N. 63087 minus 162 plus 129 027 56 29 64 minus 001
63 plus 00001 plus 527 59 177 137 001 November Alpha plus
00201 527 59 623 525 43 14 2347 337 023 up 195 left 17
plus 11 45 minus 165 00 127 80 358 90 074 3816 North Star
068 097 356 no ullage. For the fast return P37 Delta V,
79 00 to the Indian Ocean. High speed procedures are not
required. Over.

SC Houston. Apollo 8. Maneuver path

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 132600, CST 8:15 60/1

SC Houston, Apollo 8. Maneuver plan as follows,
how do you read, over?

CAPCOM Loud and clear.

SC Roger, TLI plus 25, SPS, G&N 63087 minus 162
plus 129, 027 56 2964 minus 00163 plus 00001 plus 52759 177
137 001, not applicable, plus 00201 52759 623 52543 14 2347
337 023 up 195 left 1.7 plus 1145 minus 16500 12780 35890
074 38 16. North set 068 097 356 DELTA-H P37 past return of
7 - 700 and 7900 DELTA-V Indian Ocean high speed not required.

CAPCOM That's correct Apollo 8. And we'll have
a couple more things for you before too long. We're working
on a flyby pad at this time. And we're going to be talking
some more to you about the problems of looking at stars in
the sextant and telescope. And what we'd like to do as soon
as the block team comes on the mocker, while we have two teams
here, we like to get a rehash from you on exactly what you see
and what you don't see under what conditions. And see if we
can define it so that everyone here understands what you've
been telling us. And if you have any comments concerning the
timeline knowing that we got off our timeline before the burn.
If you have any comments about that method of getting back on
schedule, we'd like to hear those too.

SC Roger, we have one request. CDR would like
to get clearance to take a Seconal.

CAPCOM Okay, Apollo that a Go.

SC Roger, And Houston this is 8, we might
go over our future map siting schedule if it's going to be
revised at all.

CAPCOM Okay, Apollo 8, no plan revisions.

SC Roger.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Okay, have your flyby pad now so I can
give that to you whenever you're ready for it.

SC Stand by. Ready to copy.

CAPCOM Okay, Apollo 8, may we go on a flyby
maneuver pad. This will be an SPS G&N 63087 minus 162 plus 129
060 59 4804 plus 009 62 plus 005 68 minus 020 77 000 000 000
November-Alpha plus 00202 02359 022 02282 03 0399 314 013
up 048 right 37 plus 1418 minus 16500 129 04 361 60 146 2911
North stars 323 090 056 no ullage. Remarch number one this
requires realignment to preferred reset reference. Two this will
raise the parallel to 5 50 nautical miles, over.

SC Roger, read back.

CAPCOM Go ahead.

SC Flyby SPS G&N 63087 minus 162 plus 129
060 59 4804 plus 009 62 plus 00568 minus 02077 000 000 000
NA. Are you with me so far.

APOLLO 8 MISSION COMMENTARY 12/21/68, GET 132600, CST 8:15 60/2

CAPCOM Keep going.
SC Plus 00202 02359 022 02282 03 0399 314
013 up 048 right 37 plus 1418 minus 16500 129 04 361 60 146
2911 North 323 090 056 no ullage. Realign for preferred
ref set. At perigee is 50.

CAPCOM That's a parallel to 5 50.

SC Understand 550.

CAPCOM Firm and that parallel.

SC Roger.

CAPCOM Apollo 8, Houston.

SC Go ahead Houston.

CAPCOM Okay, we've completed the dump and the
tape recorder is yours and we listened to the call data voice
playback and you've been given a go for your first test in
creative writing.

SC Roger, are we in low bit rate now?

CAPCOM That's negative, you're in high bit and
you understand that it's your tape recorder.

SC Roger, are we going to stay in high bit
all along or we going to get back to low here soon, not that
it matters much to us really.

CAPCOM Okay, we plan to stay in high bit rate
we're going to ask you if it mad any difference and you read
our minds. That's pretty good for 63 K.

SC Roger. That's an altitude record for
mind reading. Houston, Apollo 8.

CAPCOM Go ahead Apollo 8.

SC Roger, onboard calculations indicate that
at 15 hours 30 minutes GET we are now 64 200 miles above the
Earth. That's using alternate slide rule.

CAPCOM We've got 63 855.

SC Houston, this is Apollo 8. We're going
to try to keep the conversation down here for awhile so the
CDR can go to sleep.

CAPCOM Okay, we would like to get some comments
from you before you sign off concerning the telescope, sextant
and verification that you have done something with the seal 2
in your May West and comment on the window status.

END OF TAPE

CAP COM ... some comments from you before you sign off concerning the telescope sextant and verification that you have done something with the CO2 in your May West. And comment on when the status.

SC Roger. Is it a requirement that we do something with the CO2 at this time? Over.

CAP COM No, I would it ...

SC Roger. We have maintained the same condition. We have left it as it was. And we will take care of it later.

CAP COM Okay.

SC Let me at this time go over the comments about the navigation as I see it so far.

CAP COM Go.

SC In the beginning, the operation with the S-IVB precluded immediate starting up of our sighting as scheduled since we had another evasive maneuver. The dumping of the S-IVB caused a tremendous amount of - of psuedo stars in the area which made a objects calibration practically impossible. The measures which we had worked out did not seem to work too well. The method which I finally used was to go into P23, go to Sirius, which was our brightest star get the shaft in trunion and then fly the spacecraft up to Sirius. To use that for objects now, which we did at a later time. With regards to light scatter, it appears that at almost any attitude during our passive thermal control we are receiving light scattering in the scanning telescope. It takes the form mostly of a wide band of light right across the center of the scope about 10 degrees either direction of zero. It is very difficult to see stars in this area. The realignments have been good. I have been able to pick up the star in the sextant to do the alignment, but I was not able to identify the star which we used in such cases as Regor or Menkent in the scanning telescope. The first star sighting, which I took of the earth showed a very indistinct horizon. But there did appear to be very - or somewhat sharp line between what appeared to be the earth's horizon and the atmosphere. The landmark line-of-sight filter appeared to help out this horizon definition. There is a very hazy and indistinct horizon through, between the space and the top of the atmosphere itself. And this is a very difficult one to use. As I said before, at times, looking at the moon with the sun in the near vicinity, the area around the moon, the space around the moon is not dark, but it light - appears as a light blue. And this is also the same case in looking into the sextant during alignments with the star -

SC with the sun in somewhat vicinity of the object. However, I have no difficulty in finding these stars in the sextant. I also had no difficulty in spotting the stars I used such as Sirius, Procyon or Canopus against the earth during our star-horizon measurements. I can see all three of those stars against the earth background. I believe it will be very difficult to do a backup GDC alignment using the north set stars, since Navi is not too bright of a star. I was able to spot star constellations in the scanning telescope if they were very bright and and well known, such as Cetus and Orion, stars of this nature. I was not able to proceed other constellations. That's about the only comments I have at this time. Over.

CAP Okay, fine. Thank you very much.

SC We are going to do - Houston - future maneuvers for P23 in a lower - slower mode of auto maneuver. Essentially, we are going to load the DAP with 1101 to save fuel.

CAP COM That will be a 11101 DAP mode.

SC Roger. We are going to try to save fuel that way.

CAP COM Good show.

SC With respect to the window, Houston. The windows 1 and 5 have marred haze on them. Satisfactory for visual observation, but possibly not for photography. Windows 2 and 4 are clear. Windows 3 is almost opaque. Over.

CAP COM Okay, thank you.

SC And how does battery B looking to you?

CAP COM Apollo 8. Houston. It looks like it may take another 6 hours on this battery B charge. It turns out that the charge rate is less than what we are getting on our ground current, but it is still above the Apollo 7 curves and it looks like it is going along now in good shape. And I would like to have verification that the timeline leading up to the midcourse correction was satisfactory from your point of view.

SC Roger. Seemed quite satisfactory.

CAP COM Okay, thank you. And we will stay off the loop until you give us a call.

SC Roger. You don't bother us, but our replies make a lot of noise.

CAP COM Okay.

PAO This is Apollo Control. During that rather lengthy series of conversations with the spacecraft we heard Commander Frank Borman request permission from the ground to take a Seconal tablet, that is a short acting

PAO sleeping pill. Frank was scheduled to begin his sleep period at about 11 hours GET or about 12 hours - or rather of about 2 hours 45 minutes ago. We also during that pass heard a number of sequences of number passed up to the spacecraft. This is part of the block data updates that are routinely sent up at specified periods in the flight plan. So that the crew always has onboard data that they can use in the computer to reenter or return to earth should it be necessary for any reason and assuming that they do not have any communications with the ground. At the present time Apollo 8 is at an altitude of about 64,600 nautical miles. The speed on the spacecraft is continuing to decrease more slowly now as we move farther from the earth. That velocity at present time is reading 7,236 feet per second. At 13 hours 44 minutes into the flight this is Apollo Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 141428, CST 9:05p, 62/1

PAO This is Apollo Control, Houston at 14 hours 14 minutes 28 seconds now into the flight of Apollo 8. Here in Mission Control Center we've just had a change of shift briefing. The Black team is now aboard. The black team with Flight Director Glynn Lunney now relieving Milton Windler and his maroon crew. At the present time Mr. Lunney is going around the room talking to his flight controllers who have been briefed for the past 40 plus minutes by the earlier team, talking over the situation which is very nominal at the present time. We've had no conversation with the crew whatsoever since the last report. However, this is consistent with their desires as they're going into a quiet period of flight at the present time. Apollo 8 continuing very well on its trajectory course. We copied from our displays an altitude of 66 705 nautical miles velocity continuing to slow down. Our current reading of 7101 feet per second in velocity. This is Apollo Control at 14 hours 15 minutes 46 seconds now into the flight of Apollo 8.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 143607, CST 9:27p, 63/1

PAO This is Apollo Control, Houston 14 hours 36 minutes 07 seconds now into the flight of Apollo 8. We're continuing in our quiet mode with the crew. There has been no conversation since our last report - no conversation. Things are settled and quietly paced in the Mission Control Center at the present time with Glynn Lunney discussing various aspects of the mission that has preceded this shift with his various flight controllers. One thing that has been truly remarkable has been the communication thus far in the mission. Our prime acquisition site at the present is a wing site at Honeysuckle, Australia. This is being located at Tidbinbilla, Australia, but a comment or two has been made in the control center that the communications have, in fact, even surpassed those we found in simulations with the crew in the Apollo mission simulator at the Cape. We repeat at this time we've had no further contact with the crew. The Apollo 8 spacecraft at the present time in excess of 68 000 nautical miles in altitude, velocity continuing to decrease. We currently read about 7000 feet per second. At 14 hours 37 minutes 44 seconds into the flight of Apollo 8, this is Apollo Control, Houston.

END OF TAPE.

APOLLO 8 MISSION COMMENTARY,12/21/68,GET 153322,CST 10:25P 64/1

PAO This is Apollo Control Houston at 15 hours 33 minutes 22 seconds into the flight of Apollo 8. The Apollo 8 spacecraft, at the present time, is 72 032.7 nautical miles in altitude. Our current velocity reading on Apollo 8 is 6764 feet per second, continuing to slow down. During this status time since our last conversation, we've had a brief contact with the crew, with Bill Anders, and we'll play that for you now.

SC Houston, Apollo 8.

CAP COM Apollo 8, you called?

SC Roger. readout temp on fuel cell 2 would be about 90 degrees and on 1 and 3, it would be slightly more - maybe 75 or 80 degrees. But, an hour ago, about fuel cells performance, it looks like 1 and 2 are lower performance than 3. Over.

CAP COM All right. We show the same numbers on outlet temperatures and we've got the sensor for you. We've been watching the thing and we'll keep you advised of anything we see.

SC Okay.

CAP COM And on the performance, you're right - they are not quite the same, 1 and 2 are a little bit lower but all of these are sitting within the ballpark.

SC Roger. Fuel Cell 1 has shown slightly a proportionately higher H2 flow and O2 flow all day long.

CAP COM Okay.

SC I'm showing .062 H2 and .8 O2.

CAP COM All right, Bill. We'll take some cal curves on those.

SC Okay. These things look weak and we'll keep looking at them. However, readout shows about .43 as opposed to your .48 on the oxygen and we'll keep an eye on the cal curves and just sort of watch it for you.

SC Okay, thank you.

CAP COM If you'd like to set up some kind of a COM check time or specified time like every 30 minutes or so on these quiet periods, that would be okay with us. Might help to let us know that we're still in business.

SC All right. Just give me a call every now and then.

CAP COM Okay.

PAO This is Apollo Control Houston and that's our conversation concluded. Our capsule communicator on that during that discussion, by the way, was Ken Mattingly. Ken is due to be relieved shortly. His relief, Jerry Carr, is now aboard. As you can tell, they were cross-checking, both from the spacecraft and the ground, various systems readings. We look very good, at this time, as we continue with a relatively calm and quiet period in this, the Apollo 8 mission at 15 hours 36 minutes 54 seconds into the flight of Apollo 8. This is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 160140 CST 10:52p, 65/1

PAO This is Apollo Control, Houston 16 hours 01 minute 04 seconds into the flight of Apollo 8. The Apollo 8 spacecraft at this time 73 818.6 nautical miles in altitude our current velocity reading 6659.5 feet per second. Bill Anders and Jim Lovell should be finishing up on an eat period very shortly here, while spacecraft commander, Frank Borman, still in his sleep period, has about 2 hours to go. About 30 minutes from this time, the Apollo 8 crew is scheduled for a guidance and navigation platform alignment, with that coming at approximately 16 hours 30 minutes into the flight. We've had no further contact with the crew and at 16 hours 02 minutes 10 seconds we will continue to monitor and this is Apollo Control Center, Houston.

END OF TAPE.

PAO This is Apollo Control Houston. 16 hours 20 minutes 25 seconds now into the flight of Apollo 8. The Apollo 8 spacecraft, at this time, 75 thousand 34.9 nautical miles in altitude. Velocity reading on our display is 65 hundred to 88.7 feet per second. We've had a brief contact with Jim Lovell aboard the Apollo 8 spacecraft. This we will pass along to you now.

CAP COM Apollo 8. Houston.

SC Go ahead Houston. Apollo 8 here.

CAP COM Okay, Jim. Got an update here to the flight plan. You got that 16 55 star visibility check and what we have got on that looks like Navi is still our star. And the numbers associated with that are roll 102.6, pitch 328.9, yaw 346.3. That gives you a shaft and trunion of zero. And if you think you can - if you think you can do something with this, why we would like to go ahead and give it a try and see if we can verify it or maybe learn something if we try it. If you can't do it with Navi.

SC Roger. Stand by one. Houston. Apollo 8. Over.

CAP COM Apollo 8. Houston. Go.

SC Roger, we will maneuver at this present time and try to pick up that attitude and get Navi, although I think it's a waste of time, but we will give it a try.

CAP COM Roger. Standing by for results.

PAO This is Apollo Control Houston. 16 hours 22 minutes. That concluded our conversation with Jim Lovell and the Apollo 8 spacecraft. From the ground, by the way, that was Ken Mattingly, our Capsule Communicator. They have just exchanged head sets only moments ago. The discussion dealt with the star visibility sightings that are due to take place in ground elapsed time of 16 hours 55 minutes. Some 30 minutes from this time. So at 16 hours 23 minutes 8 seconds into the flight of Apollo 8, continuing on its precise course, very nominal, very good, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/21/68, GET 164832, CST 11:41
67/1

PAO This is Apollo Control Houston, 16 hours
48 minutes and 32 seconds now into the flight Apollo 8. The
Apollo 8 spacecraft at this time 76 800 nautical miles in
altitude; our velocity now down to 6489.6 feet per second.
We've had a brief conversation with the Apollo 8 crew and
we'll play that for you now.

SC Houston, Apollo 8.

CAP COM Apollo 8, Houston. Go.

SC Roger, we're out at attitude right now
and looking through the scanning telescope. I can barely
see three stars at all and every time that the thruster will
fire, you know, just completely blanks out my vision.

CAP COM Roger, understand.

SC Now, the attitude is good, Houston as
far as not having glare on the optics and it might be
a certain amount of Data adaptation required here.

CAP COM 8 Houston. Roger, copy.

PAO That was command module pilot Jim Lovell
who had - was describing results of his star visibility
exercise. At 16 hours 50 minutes into the flight, still
looking good, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston. 17 hours 19 minutes 58 seconds now into the flight of the Apollo 8. Apollo 8 now at an altitude of 78,339.1 nautical miles. 78,339.1 nautical miles away from the earth. Its velocity at this time around 6383 feet per second. We've had a conversation with Jim Lovell aboard the spacecraft and we will play that now.

CAP COM Apollo 8. Houston.
Apollo 8. Houston. Over.
Honeysuckle Houston com tech Honeysuckle ...
CAP COM Apollo 8. Houston. Over.
GODDARD Houston. Goddard voice. Negative twin
dark keys.
CAP COM Apollo 8. Houston. Over.
SC Go ahead Houston. Apollo 8 here.
CAP COM Apollo 8, this is Houston. We have got
a new PPC attitude for you when you finish P23. Give you
a better look at the earth. Over.
SC Roger. Ready to copy.
CAP COM Okay, pitch 224 yaw 20
SC New PPC is pitch 224 yaw 20.
CAP COM We confirm.
SC Houston. Apollo 8.
CAP COM Apollo 8. Houston. Go.
HONEYSUCKLE Houston. com tech Honeysuckle negative

...

Roger.
CAP COM Apollo 8. This is Houston. Over.
Apollo 8, Apollo 8. Houston. Over.
Apollo 8, Apollo 8. Houston. Go ahead.
SC Roger. We are taking our time going to
this new P23 attitude, going to Navi is quite a ways away
from the attitude we need for P23. I have a correction to
make on Navi after getting dark adapted you can pick out
Cassiopeia and you can pick out Navi itself. It is difficult
to see what stars are around. We are still - have quite a
bit of particles that are floating with the spacecraft.
Especially when we move the optics and shaft. It seems
to throw off a lot of particles.
CAP COM Roger. We copied that. What's your
spacecraft lighting situation inside now?
SC We have the center window the round
window covered and we have the other windows are opened.
CAP COM Roger. We copy.
PAO ... barbecue mode - slow roll that the
spacecraft undergoes to give even sun distribution to the

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 172000, CST 12:11a 68/2

PAO skin of the spacecraft. Also you heard a description from Jim Lovell on his efforts in the star sighting area. Otherwise, very quiet, it's the only conversation we have had in the past 20 minutes or so. At 17 hours 23 minutes 54 seconds, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 173645, CST 1227a 69/1

PAO Apollo Control Houston, 17 hours 36 minutes 45 seconds now into the flight of Apollo 8. The Apollo 8 spacecraft is now at an altitude of 79 761 nautical miles, velocity at the present time is 6329 feet per second. We've just had another conversation with Jim Lovell and we'll pass that along now.

CAP COM Apollo 8, Houston.

SC Go ahead Houston.

CAP COM Apollo 8, Houston. While you're maneuvering for your P-23, we have an update for Delta H for you if you're ready to copy.

SC Roger, stand by. Roger, Houston. Say you have a Delta H update for us? Is this what you mean?

CAP COM Roger. Delta horizon update.

SC Roger. Go ahead.

CAP COM Ah, this is as a result of your P-23 calibration, the update follows. Verb 24, Noun zero one enter 1354 enter all balls enter 21450 enter comment continue to mark on the horizon destination that you've used previously, your marks are looking very good.

SC Roger, Delta H update as follows. Verb 24 noun zero one enter 1354 enter all zeros enter 21450 enter. Understand those are two ought zero numbers.

CAP COM That's affirmative ...

SC Roger. When do we get the maneuvers here ... quad 23 and I'll put these in then I'll ...

CAP COM Okay. Apollo 8, Houston. There's no requirement for you to leave P-23, you can enter those right now if you want to.

SC Roger.

PAO Apollo Control Houston. That concluded the conversation. We did observe on our displays that Jim Lovell did punch in his Delta Horizon update and at last report was proceeding with his program 23 ... navigation. Incidentally our current weight of the spacecraft in flight now reads 63 045 pounds. At 17 hours 39 minutes 50 seconds into the flight, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 180305 CST 12:54 70/1

PAO This is Apollo Control, 18 hours, 3 minutes, 5 seconds now in the flight of Apollo 8. Apollo 8 at the present time 81, 348 nautical miles in altitude, current velocity reading will be our displays, 6200 47.4 feet per second. We've had a brief conversation with Jim Lovell which we'll play now.

SC Houston, we're in low bit rate now.

PAO Apollo 8, Houston, you're in high bit rate.

SC Roger. We'd like to record on this P-23 stuff.

CAPCOM Okay.

SC How about commanding low bit rate with record forward.

CAPCOM Roger. Low bit rate, record forward.

SC All right, Houston, have you said those commands yet?

CAPCOM Apollo 8, Houston, they have been sent.

SC All right, Roger. Thank you. I am on the other side, too lazy to go over and get it.

CAPCOM Apollo 8, Houston. We'd like to go back to high bit rate in order to get this P-23 data recorded. Over.

CAPCOM All right, checklist, Houston, there is low bit rate, Houston. If you want high, you can get it.

CAPCOM Roger. We're going high bit rate.

PAO We have a correction. That gentlemen onboard the spacecraft was not Jim Lovell. That was in fact Bill Anders, the lunar module pilot. We're at the time in the flight plan now when Frank Borman should be awake shortly. However, this will probably turn out to be a crew option. At the present time, Jim Lovell - is still performing certain aspects of cislunar navigation program. That's program 23. So at 18 hours, 5 minutes, 2 seconds into the flight of Apollo 8, this is Apollo Control Houston.

END OF TAPE

A/8, Mission Commentary, 12/22/68, 1:17 a.m., 18:25:45, 71/1

PAO This is Apollo Control Houston, 18 hours 25 minutes, and 45 seconds now into the flight Apollo 8. We've had additional conversations with the Apollo 8 crew and we'll pass those along now.

CAP COM Apollo 8. Houston.

SC Clear Houston

CAP COM Apollo 8 Houston. Do you want us to turn off your DSE for you? It's probably about half full or getting high bit rate now.

SC Do you want to get the rest of this data?

CAP COM We're getting good high bit rate now.

SC Roger go ahead.

CAP COM OK and also we're, your state vector is now based on about 5 hours of tracking. We have you on a pericynthian of 69.7 miles with a free return. Your entry flight path angle looks like about minus 14. You will need a few feet per second to get you back on a nominal entry angle.

CAP COM Apollo 8 Houston. Did you get the words on the state vector?

SC Houston did you read Apollo 8, we got a lot of noise.

CAP COM Apollo 8 Houston go ahead. Apollo 8 Houston go. Apollo 8 Houston reading you fairly weak. Repeat the state vector information. Your state vector is now based on 5 hours, more than 5 hours of tracking. We show you on a pericynthian of 69.7 miles with a free return with entry path flight angle of minus 14 degrees. Will only need a few feet per second at the lunar distance to get you back on a nominal entry angle. Over.

CAP COM Roger.

PAO This is Apollo control. We've had no definite indication yet from the crew as to change of shift on there sleep wake cycle. However we suspect that at this point in time command module pilot Jim Lovell and lunar module pilot Bill Anders are just about ready for their sleep period. They were awakened at the cape this morning at 2:36 eastern standard time. Its been a long day. Its been a day that so far has carried them to an altitude of 82 thousand 867 nautical miles. Our velocity reading at this time 61 hundred 69.7 feet per second. At 18 hours 29 minutes 5 seconds into the flight. This is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 185300, CST 1:50 72/1

PAO This is Apollo Control, Houston,
18 hours, 53 minutes and now into the flight. During the
past several minutes we've had conversations with - the
Apollo 8 crew. They have just shifted their sleep wake
cycle. And we'll pass on those conversations at this time.

CAPCOM Apollo 8, Houston, GO.

SC Roger. The PTC maneuver now. Like a
distance status how the battery looks and how the fuel cells
look and et cetera. Over.

CAPCOM Roger.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 185430, CST 151a 73/1

CAP COM Apollo 8, this is Houston. We figure your battery B will be charged in about two to three hours. All your systems look GO, your RCS usage so far is about 60 pounds, six zero pounds over nominal. Over.

SC Roger. How about fuel cell two, is that looking alright now?

CAP COM Roger. Fuel cells are all looking good.

SC Okay, ... systems should behave now ... minding the store so you might have everybody keep an extra sharp eye on ...

CAP COM Roger, Bill, you think you're going to be able to sleep okay?

SC Yeah, I think we kinda warmed up to a good sleep here by now. Houston, Apollo 8.

CAP COM Go ahead.

SC Onboard navigation indicates a ... altitude of 38.4 miles.

CAP COM Understand, 38.4 miles.

SC That's (too faint)

CAP COM Roger, copy. Apollo 8, Houston.

SC Go ahead, Houston.

CAP COM Apollo 8, Houston be advised here down-link now is getting very noisy. Apollo 8, this is Houston with some comments on navigation.

SC Go ahead Houston.

CAP COM Apollo 8, this is Houston. We're wondering about your GDC backup align, we'd like your opinion on the possibility of doing this align using Sirius and Rigel rather than Navi as its in the north set at this time. Over.

SC Stand by one.

CAP COM Roger.

SC Houston, this is Apollo 8. We concur. Sirius and Rigel would be two stars that would be much better than Navi and Polaris, however, I did ... after I became adapted but I'm afraid that the time required to do that type of alignment would be extensive if we had to go to that alignment.

CAP COM Roger, Jim, we understand. We'll go ahead and work in that direction and we'll quit bothering you. Good night. Apollo 8, this is Houston.

SC Go ahead, Houston, this is Apollo 8.

CAP COM Apollo 8, Houston, at 19 GET we're due for another cycle two on the cryo fans. Over.

SC Roger.

CAP COM Roger, give us a call when your complete.

PAO This is Apollo Control. We've just played out the conversation and it turned out this is one of those rare occasions, at least this time of the morning, over.

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 185430, CST 151a 73/2

PAO a brief span of time where conversation took place with all three crew members. No doubt Jim Lovell and Bill Anders are in the early phases of their sleep period. At the present time, Apollo 8 84 593.7 nautical miles in altitude, velocity reading sixty, ah correction six zero eight four that's 6084 feet per second and decelerating. At 18 hours 58 minutes and 30 seconds into the flight of Apollo 8, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 191650 CST 2:07 74/1

PAO This is Apollo Control, Houston,
19 hours, 16 minutes, 50 seconds now into the flight of
Apollo 8. Apollo 8 at the present time 85,600 and 85 nau-
tical miles above the earth. Current velocity reading
6,030 feet per second. We have a short strip of conversa-
tion with spacecraft commander Frank Borman. We'll play
for you now.

CAPCOM Apollo 8, Houston, GO.

SC Give me a call will you when it is time
to quit charging the battery. I can't watch it very well
over there.

CAPCOM Wilco.

SC And start with the band up.

CAPCOM Roger, copy.

SC Hydrogen 1 first.

CAPCOM Roger.

SC Okay, Houston, we back up through the
path...battery charges.

CAPCOM Roger. Apollo 8, Houston, the battery
charges have been completed around 21 hours.

SC Okay, just give me a call.

CAPCOM Okay.

PAO That's it. We expect - spacecraft
commander Borman is presently having breakfast. We should
be hearing from him again before too awfully long with a
report a crew status report. At 19 hours, 18 minutes,
34 seconds into the flight this is Apollo Control, Houston.

END OF TAPE

A/8, MC, 12/22/68, 194140, 2:31 a.m., 75/1

PAO This is Apollo control Houston, 19 hours 41 minutes, 40 seconds now into the flight of Apollo 8. We now read an altitude on Apollo 8 of 87 thousand 109.9 nautical miles. Our current velocity on spacecraft Apollo 8 59 hundred and 62.8 feet per second. Spacecraft commander Frank Borman has delivered a short status report to capsule communicator Jerry Carr and we'll pass that along now.

CAP COM Apollo 8 Houston go ahead.

SC Roger Houston. Your status report here We're behind on water and food and we don't seem to have too much of an appetite. We're trying to stay up with the water but the food is, not to say anything is wrong with the food but we're just not very hungry.

CAP COM Roger, understand, Frank.

SC CDR at 5 hours of midcourse sleep and rest and the other two people are trying to sleep now.

PAO That's the end of the conversation. Commander Borman indicated that he received or took advantage of about 5 hours of sleep and his fellow crew members are trying to sleep now. And you can readily appreciate an absence of appetite since these are the first three gentlemen to have been 87 thousand 201 nautical miles above the earth. At 19 hours 43 minutes 30 seconds this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 21018, CST 3:09 76/1

PAO This is Apollo Control, Houston,
20 hours, 10 minutes, 18 seconds now into the flight of
Apollo 8. Apollo 8 now 88,735.6 nautical miles in altitude.
Its current velocity 5886.8 feet per second. We had no
conversation with Apollo 8 since our last announcement. But
this is understandable to quickly recap our status. Com-
mander - spacecraft commander, Frank Borman is currently
awake. The other two crew members, Jim Lovell and Bill
Anders are in their sleep period. There are no scheduled
events for the flight plan with the ground at least for a
period of time. And at 20 hours, 11 minutes, 15 seconds,
this is Apollo Control, Houston.

END OF TAPE

A/8, MC, 12/22/68, 204100, 3:32 a.m., 77/1

PAO Apollo control Houston. 20 hours 41 minutes now into the flight of Apollo 8. The Apollo 8 spacecraft now 90 thousand 4 hundred 65 nautical miles in altitude. Our current velocity 58 hundred and 7.8 feet per second. We've had no conversation since our last announcement with spacecraft commander Frank Borman. We've had no requirement for conversations so we have not bothered him. At 20 hours 41 minutes 45 seconds into the flight all systems continued to look GO. This is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY,12/22/68,GET 210100,CST 352 78/1

PAO This is Apollo Control Houston, 21 hours one minute now into the flight Apollo 8. Apollo 8 now at 91 576 nautical miles in altitude, now a velocity of 5758.1 feet per second. We've had a brief contact with the crew or with Commander Frank Borman I should say and passed on some procedural information, let's pick up that conversation.

CAP COM Apollo 8, Houston.

SC Go ahead Houston, Apollo 8.

CAP COM Apollo 8, this is Houston at 21 hours we'd like you to terminate the battery B charge and start battery A charge and then begin an O2 purge. Over.

SC Roger, understand. Terminate battery B, start battery A and an O2 purge.

CAP COM Roger, O2 fuel cell purge.

SC Thank you. Charging battery A and say again about the purge.

CAP COM Apollo 8, Houston, roger. Copy your battery charge setup, now begin a fuel cell O2 purge. Over.

SC Fuel cell O2 purge. Roger.

PAO That was the conversation between the capsule communicator Jerry Carr and spacecraft commander Frank Borman otherwise very quiet here in Mission Control Center at 21 hours 2 minutes 48 seconds into the Apollo 8 mission. This is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 211939, CST 4:11 a 79/1

FAO This is Apollo Control Houston. 21 hours and 19 minutes and 39 seconds into the flight of Apollo 8. The Apollo 8 spacecraft at the present time is 92,600 nautical miles altitude. Our velocity display shows 57 hundred and 12 point 9 feet per second. Speed of 57.9 - 5712.9 feet per second. Cap Comm, Jerry Carr, has described to spacecraft commander, Frank Borman, what his trajectory - what the Apollo 8 trajectory looks like and we will pass along that conversation.

SC Houston. Fuel cells are all purged.

CAP COM Regen. Frank.

SC How's the tracking coming, Jerry?

Houston? Apollo 8.

CAP COM Apollo 8. Houston.

SC How's the tracking looking?

CAP COM It's looking good Frank. We just took in another batch of data and we are processing it. It looks initially like we won't even need a midcourse number two. As soon as we process this data, we will have some confirmation for you. It should take anywhere from 15 to 30 minutes to finish the job.

SC Thank you.

CAP COM Apollo 8, Houston.

SC Go ahead.

CAP COM Apollo 8. This is Houston, we are showing your pericythian 64 nautical miles. Your next midcourse at 28 will be less than 1 foot per second. We will have a firm confirmation on that in about 2 hours.

FAO As you heard, the present track appears quite good. The point of closest approach to the moon predicted 64 nautical miles. And this consideration of the midcourse correction, the midcourse correction, if one were made for MCC two, at least at this point in time appears to be one of less than a foot per second. Therefore, it appears unlikely that we will do a second midcourse, but the flight dynamics officer here in Mission Control will continue to look over the data for a couple more hours before we make such a decision. At 21 hours 22 minutes 18 seconds into the flight of Apollo 8, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 215144, CST 444a 80/1

PAO This is Apollo Control Houston, 21 hours 51 minutes 44 seconds now into the flight Apollo 8. Apollo 8 now showing a velocity of 5637.5 feet per second. Its current altitude 94 351 nautical miles. Members of the Green Team of flight controllers are now being briefed in the Mission Operations Control Room by their Black Team counterparts, we're due for a change of shift here shortly. There will be no change of shift news briefing with the Black Team. We repeat, there will be no change of shift news briefing with the Black Team. And during this past 30 minutes or so we've had no conversations with the spacecraft commander Frank Borman. At 21 hours 52 minutes and 50 seconds into the flight of Apollo 8, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 222728, CST 5:20 A 81/1

PAO This is Apollo Control, Houston, 22 hours, 27 minutes, 28 seconds now into the flight of Apollo 8. The Apollo 8 spacecraft up to now 96,265 nautical miles in altitude. Its velocity reading at this time 5556 feet per second, 5556 feet per second. Again as has been characteristic - during this shift we've had no conversation with spacecraft commander Frank Borman since our last report. Meanwhile in our Mission Control Center, Cliff Charlesworth's team of flight controllers have taken over. And they're going to - Flight Director Cliff Charlesworth is now going around the room discussing - various aspects of the mission with each of his key flight controllers. During the black team change - black team shift we found Colonel Borman asleep for a good segment of that period. And he reported approximately 5 hours of sleep and then at about 18 hours, 40 minutes GET astronauts Bill Anders and Jim Lovell had their first opportunity to - relax since awakening at 2:36 Eastern Standard time Saturday morning. Otherwise, all systems appear to be functioning quite smoothly. And at 22 hours and 29 minutes, 48 seconds, this is Apollo Control, Houston.

END OF TAPE

A/8, MC, 12/22/68, 225048, 5:41 a.m., 82/1

PAO This is Apollo control Houston. 22 hours 50 minutes 48 seconds now into the flight of Apollo 8. The Apollo 8 spacecraft at this time 97 thousand 513 nautical miles in altitude. Its present velocity reads 5504.2 feet per second. We have, a short while ago broke our communications silence with spacecraft commander Borman He called down and asked a question. Lets play that for you.

SC Houston. Apollo 8

CAP COM Apollo 8, Houston. Go ahead.

SC How'd you read?

CAP COM Yeah, read you loud and clear Frank.
Good morning, how are you doing?

SC Just fine. We just broke lock for a minute and I wondered why.

CAP COM Apollo 8 Houston.

SC Go ahead.

CAP COM Roger. Your break lock is due to the fact we switched antennas over from Honeysuckle to Madrid.

SC Roger. Thank you.

PAO That crisp and chipper voice from the ground was Mike Collins who has taken over the capsule communicator's role here in mission control center. Meanwhile at 22 hours 52 minutes 28 seconds into the flight of Apollo 8 we're looking good and this is Apollo control Houston.

END OF TAPE

PAO Apollo Control here at 23 hours 10 minutes into the flight. And on behalf of the Green Team, good morning. We have had a shift change in the Control Center. And our capsule communicator, Mike Collins, is about to engage Frank Borman in a conversation in which he will cover, among other things, the fact that based on the tracking of the last 12 hours, we see only a need for another midcourse on the order of .7 feet per second. Which is so small - within our ground rules to bother with. And that is the position we will take. Don't really expect the crew would have a different view. All the other data sources, all the data looks quite consistent with flight plans and hopes to this point - we've had a relatively quiet period over the last few hours. Very little communication with this crew. Here goes the first call. Let's listen.

SC Go ahead Houston. Apollo 8.

CAP COM Roger. Frank. We would like to bring you up to date on your trajectory. This midcourse coming up at 28 hours GET turns out to be very small, .7 feet per second. And we would like not to do it, but our data is looking extremely good and extrapolating forward, it shows the midcourse number 4 at LOI minus 8 hours would be about 4 feet per second. In the meantime the free return trajectory has it looking very good with a water splash point off the coast of Africa. So it looks like you are right down the old water line and we propose not to do the next midcourse. Over.

SC Fine with us.

CAP COM Okay. And in regard to your timeline here. We suggest that you let Bill and Jim sleep for an extra period of time and don't wake them up until 2630 GET. And that would cause deletion of P52 and P23 at 26 hours GET. Over.

SC Roger. Understand. Delete P52 and P23.

CAP COM Affirmative. Delete those at 26 hours, wake the other two guys up at 2630 at which time they can eat and then chlorinate the water supply after they have eaten.

SC Roger.

CAP COM That would put us back on nominal flight plan at 28 hours GET. Over.

SC Roger.

CAP COM How does all that grab you?

SC Fine.

CAP COM Okay.

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 231000, CST 6:01a 83/2

PAO Apollo Control here. That apparently wraps up the conversation with this opening shift period this morning. We're - one other item of interest. We are rapidly nearing the 100,000 mile point presently. 98,891. And we will certainly note the passage of the 100,000 mile mark the big yellow line extending on our earth/moon map system is now roughly half way to its target. A small little white dot off in the far right, which is out at the 210,000 mark. For our mapping purposes. And all in all, that's our status at 23 hours 17 minutes into the flight.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 234800, CST 6:38a 84/1

PAO This is Apollo Control Houston. 23 hours 48 minutes into the flight. Mike Collins has been chatting with Frank Borman about this net for the past few minutes and here is how that conversation is going.

CAP COM Apollo 8. Houston. Over.

SC Go ahead Houston.

CAP COM Roger. We are switching the antennas again at 2340 GET. You can expect a momentary break lock and also we would like to bring you up to date on the passive thermal control. We expect to keep the same PTC attitude until 28 hours GET. Over.

SC Fine, thank you. How is the thermal control working?

CAP COM Looking good Frank. I can give you some details if you want it.

SC Go ahead. I am all ears, Houston. Go ahead with the details.

CAP COM Okay. Stand by one until we switch antennas, Frank. We will be right with you.

SC Roger.

CAP COM Apollo 8. Houston. Over.

SC Go ahead.

CAP COM On your PPC quads A, C, and D seems to be just about identical. Quad B is running quietly cooler but only very slightly so. The temperature readout in all respects are normal. Apparently the PPC is working well from a thermal viewpoint and as far as the fuel consumption goes, it is minimal. Just about like we expected. Have you got any comments about PPC? How does it seem to you?

SC It's fine. Seems to be working all right. I just wondered how the readouts from the SPS were to.

CAP COM Apollo 8. Houston. The SPS temperature is normal. If anything, it is slightly warmer than we expected. So, you are in real good shape in that respect.

SC Thank you.

CAP COM Frank, the PU valve temperature is running about 72 degrees, which is better control that we got here in this room.

SC Roger.

CAP COM Apollo 8. Houston. Over.

SC Go ahead Houston. Apollo 8.

CAP COM Roger, it is time to do a cryo fan cycle, Frank, on all four fans, a short burst from each of them as you did before.

SC Understand, 2 minutes each on all cryo fans.

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 234800, CST 6:38a 84/2

CAP COM Right.

PAO Apollo Control here. Apparently Borman -
Lovell, and Anders are sleeping quite soundly. We can almost
detect that Frank Borman is keeping his voice in a low
measured tone to avoid rousing them. We have suggested that
their sleep period be extended as much as an hour - hour and
a half. They were up nearly 24 hours, in fact, probably
every bit of 24 hours due to the fact that they were roused
about 2:30 yesterday morning Cape time and they went to
sleep, oh, about 6 hours ago. It sort of made for a long
day and apparently had no trouble sacking out. We have
passed the 100,000 mile mark. We are now 100,738 miles from
earth. This is Apollo Control Houston.END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 241100, CST 7:01A 85/1

SC	...Houston.
CAPCOM	Apollo 8, Houston, go ahead.
SC	There's a...cycle.
CAPCOM	Okay, thank you then.

END OF TAPE

A/8, MC, 12/22/68, 241500, 7:06 a.m., 86/1

PAO Apollo control Houston here. 24 hours
15 minutes into the flight and since we last talked to you
the only contact we've had from the crew is a brief con-
firmation from Frank Borman that the cryo fans had indeed
been cycled, as discussed about an hour ago. We're a hundred
and two thousand miles from the earth and all is well.
This is Apollo control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 243000, CST 7:21A 87/1

CAPCOM	Apollo 8, Houston, over.
SC	Go ahead Houston, Apollo 8.
CAPCOM	Ah, just a COMM check Frank, do you
read me alright?	
SC	Loud and clear.
CAPCOM	Same here.
SC	Thank you.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 24:37:00, CST 7:28a 88/1

CAP COM And this is Apollo Control, Houston, 24 hours, 37 minutes into the flight. We have had one establishing call since we last talked to you 20 minutes ago and it was nothing more than an establishing call. We're 103,000 miles from earth at this point, and let's cycle through some of our consumables and other items this morning and we'll just look at them on our monitor and tell you what we see. The first chart we come to, and this is data, live data coming to us via Madrid. The bio-medical harness is well, a moment ago it was on Frank Borman but apparently it's been switched off now. We do know from this readout that the cabin pressure is an even five pounds and the cabin temperature is 62 degrees. Let's try another chart. We are looking at our radiation chart now, let's first get the time of it. The current reading, and it looks to me very much like there's no observable change, it breaks out from yesterday. It does break out the proton, the various classes of protons, and also three classes of alpha radiation. And for each of those classes, gives an interpretative flux. Total, and all this comes down to the lower count is in the proton area, a dep dose of point 11 rems, rems or, then that is further reduced or rated with the alpha readings, and we wind up with a dep dose of point 03, a skin dose of point 02. That's the entire cumulative total to this time, which is essentially negligible. Now we come to our command module service module RCS summaries, and they follow the exact curve, the usage curve that we plot in our press kits and in our flight plan. Our environment control system tabulation, well let's see, again a confirmation of the cabin pressure, five pounds, and we see a reading of 47 pounds per square inch in the glycol pumping area. The environmental control system radiator temperature is 72.8 degrees. In all, this looks quite normal. And here's the bio-medical comparative data, and this would be the command pilot just before the switch was switched off here only moments ago, Frank Borman's mean heart rate, 74, high of 77, a low of 71, and respiration is running about 15 per minute. That seems to cover the consumable priority for us, we'll later get a quantity reading on our remaining onboard propellant, that chart is not available to us right now. Our velocity now is down to 5,274 feet per second. Now we have got a call from the spacecraft, let's bring it up.

SC How've you been reading our tape dumps?

CAP COM Stand by one, Frank, we know that you've got your PPC attitude freaked up a bit, and I'll check on your tape dump.

CAP COM Apollo 8, Houston, the quality of the tape dumps has been very good. We have about 15 minutes

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 24:37:00, CST 7:28a 88/2

to dump, which we will do any time we get high gain.

SC How's the voice quality been?

CAP COM It's been very good, Frank.

SC Okay. We'll send you something new

here shortly.

CAP COM And apparently that concludes the conversation with the crew at this time. This is Apollo Control at 24 hours, 45 minutes.

END OF TAPE

to 181/1

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 245900, CST 7:50a 89/1

PAO This is Apollo Control Houston at 24 hours and 59 minutes into the mission. Within the last few minutes, we've heard from Jim Lovell and Bill Anders. Jim Lovell sounds the sleepest of the group and over a 140,000 mile of intervening space. Here's the conversation as it has progressed.

CAPCOM Apollo 8, Houston. Over.
SC Roger, Houston.
CAPCOM Frank, on this tape recorder, we have the tape motion stopped right now. If you would like to record some, we will give you the tape in motion so that you may do so. Is that what you would like? Over.
SC Roger. Houston, why don't you just give us salvo so we can control the switches here.
CAPCOM Okay, stand by.
SC - PCM low and stop.
CAPCOM You should have it now. Over.
SC Roger.
SC Houston, Apollo 8.
CAPCOM Apollo 8, Houston. Over.
SC Houston, Apollo 8. Over.
CAPCOM Apollo 8, this is Houston. Over.
SC Roger. Are you capable of taking a high bit FM dump for voice on the omnis?
CAPCOM That is negative, Bill. Not quite on the omnis.
SC Okay. We will catch you next time around, then.
CAPCOM Roger, thank you.
SC Good morning, Mike. How are things going down there?
CAPCOM Hi, Jim. Things are going real fine. How are you doing up there? Did you get a good night's sleep?
SC Oh, you know. The first night in space all the time -
CAPCOM The old man woke you up earlier than he needed to.
SC Well, we just couldn't sleep any longer.
CAPCOM Roger, understand.
CAPCOM Apollo 8, Houston. The next time you are locked on the high gain, give us a call and we will configure for a dump. Over.
SC Roger. We would like an evaluation of the voice comments. Over.
CAPCOM Roger, understand. So far, it's been very good. We will evaluate this one as soon as we can.

SC Houston? How are the systems looking down there,
Houston?
CAPCOM Apollo 8 Houston. Go ahead.
SC Roger. I asked how the systems looked
CAPCOM Everything is looking real good, Bill.
SC Okay.
SC How much longer do you expect on charge
of battery A?
CAPCOM Stand by, Bill. We will get you an
exact number on it.
SC Just a rough estimate. And also, have
you seen any more on that sensor problem on fuel cell 2?
CAPCOM Stand by one. I'll get the latest
scoop on it for you. Bill, there is nothing new on fuel
cell number 2. We don't think there is anything at all
wrong with the fuel cell. It's some sort of a sensor prob-
lem, but we don't have any new information on it.
SC Okay. They all look pretty good from
here, Mike.
CAPCOM Roger. Thank you. I've got some up-
dates for you whenever you are ready to copy.
SC Stand by.
CAPCOM Okay.
SC What kind?
CAPCOM Well, I've got a TLI + 35 hour update,
and then I have an update to Jim's checklist.
SC Let's have the TLI + 30 before we get
the checklist update.
SC They never give up on the checklist, do
they?
CAPCOM Okay. This - when you get your maneuver
pad book, the last maneuver pad we gave you for the flyby
pad still remains valid. We would just like to remark that
the entry angle, the gamma, is slightly steeper than we con-
sider ideal, but it's within our - sort of our noise level
of our ability to predict at this time. So that flyby man-
euver pad remains valid. Over.
SC Roger, Houston
CAPCOM Okay. Now on that page with the flyby
maneuver under your north set of stars, I have some new
numbers for you, because we've changed those stars from
Navi and Polaris. As you recall, we changed to Sirius and
Rigel, so - and that also, by the way, is the checklist up-
date which I will give you later. But on that maneuver pad,
I have got three new angles for you, using Sirius and Rigel,
when you are ready to copy those.

CAPCOM Apollo 8, Houston. How do you read?
Over.
CAPCOM Apollo 8, Houston. Over.
SC Houston, Apollo 8. Over.
CAPCOM Roger, Apollo 8, Houston. You are loud
and clear now. We had a lot of background for a few minutes.
How are you reading me?
SC Roger. I'm reading you okay, Mike and
I read you the last time you asked me that, so I guess maybe
I wasn't getting through to you.
CAPCOM Okay. Well, did you copy on this flyby
maneuver pad? We've got three new angles. Are you ready
to copy those?
SC I'm ready to copy the flyby angles.
CAPCOM Okay. Roll 137, pitch 310, yaw 340.
Over.
SC Roger. Roll 137, pitch 310, yaw 340.
CAPCOM That's affirmative. I have the TLI +
35 hour pad when you are ready for it.
SC Roger. Ready for the TLI + 35.
CAPCOM Roger. TLI + 35 hours, SPS slash G&N,
63023 - 162 + 129. Are you with me so far?
SC Loud and clear.
CAPCOM Good. 037565138 + 00068 + 00000 + 46420
178134001, not applicable, + 002024642054746211. Are you
with me? Over.
SC Roger, loud and clear.
CAPCOM Good. 121383327023 up 172 left 22 +
1293 - 1650012905361 --

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET: 250900, CST 8:00a 90/1

CAPCOM 1290536180 074 11 16. Comments:
on your stars Sirius and Rigel, roll 010, pitch 294, yaw
320. No ullage. Other, 1. Sat return P37, DELTA-V equals
7821. For Mid-Pacific landing for MTL: 2. High Speed
procedures not required. Over.

SC Alright. Are you ready for the read
back?

CAPCOM All set.

SC TLI plus 35 SPS G&N 63023 minus 162
plus 129 037 56 5138 plus 00068 plus 00000 plus 46420
178 134 000 NA. Are you with me?

CAPCOM Yes, I'm with you, Bill. That last
one should be 001.

SC Roger. Y, 001 NA plus 00202 46420
547 46211 12 1383 327 023 Up 172 left 22 plus 1293 minus
16500 plus 12905 plus 36180 0741116. Sirius, Rigel. 010
204 320 no ullage, fast return P37 7821. Mid Pac. High
speed not required. Over.

CAPCOM That's about the size of it. You're
getting pretty good at this thing, Bill, for a rookie.

SC Not bad. I just learned to read about
a year ago.

CAPCOM Well, say, I've got a flight plan update
for Jim. It's on page G George, 82 Able of this check list
Over.

SC Roger, I've got it open. Go ahead, Mike.

CAPCOM Okay, it's simply changing these north
set of stars around. For Navi substitute Sirius, which
is number 15, and for Rigel - correction - for Polaris
substitute Rigel, number 12.

SC Roger. Substitute Rigel for Polaris
and Sirius for Navi. How about shaft and trunion remain
the same?

CAPCOM Your shaft and trunions remain the
same. Sirius remains on the 50 degree line just like
Navi used to be. Rigel is down 1.3 degrees from your
horizontal - from your N line. Over.

SC Roger, Understand.

CAPCOM Okay, and let me know if it gets to be
breakfast time. I've got a newspaper to read up to you
if you give a ring.

SC We've ready.

CAPCOM Okay, I've got a Haney special here
for you. The Interstellar Times latest edition says the
flight to the moon is occupying prime space on both paper
and television. It's THE news story. The headlines of
the Post says "Moon, here they come". We understand that
Bill Anders will be in private conversation or communication

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET: 250900, CST 8:00A.90/2

CAPCOM today with an old man who wears a red suit and lives at the North Pole. A suspect in the Miami kidnapping was captured late yesterday, and the 11 GIs that have been detained 5 months in Cambodia were released yesterday, and will make it home in time for Christmas.

SC Roger, with reference to the first, we saw him earlier this morning and he was heading your way.

CAPCOM Roger, we'll pass the word along. David Eisenhower and Julie Nixon were married yesterday in New York. He was described as "nervous".

SC Right.

CAPCOM The Browns took Dallas apart yesterday 31 to 20. We're sort of curious, who do you like today, Baltimore or Minnesota? Over.

SC Baltimore.

CAPCOM How many points are you giving?

SC He's not making many points at home with that comment.

CAPCOM Roger, understand. Oh, I've got another score for you when you are ready to copy. Are you ready to copy?

SC Stand by. Go Hahead.

CAPCOM Roger. Navy 14, Army 21. Would you like for me to repeat that?

SC You are very garbled. Houston, I'm unable to read. Will call you back in another year.

CAPCOM Okay. We also notice the University of Houston lost their first home basketball game in three and a half years last night. Illinois x-ed them out 97 to 84. And some really big news, the State Department announced only a few minutes ago that the Pueblo crew will be released at 9 PM tonight.

SC Sounds good. Outboard calculations indicate that Apollo 8 at 25 hours is 104 000 miles from home.

CAPCOM Yes, your prop board shows a similar number.

SC Mighty nice view from here.

CAPCOM We're showing about 104 800 miles, and we're guessing another 8 to 10 hours on your battery charge.

SC Okay.

CAPCOM Frank, say again about the view. You were blocked I think.

SC This is a mighty nice view we have down there today. A little bit more than a half earth. Looks like Africa and the Red Sea is visible, we're not quite sure as there is quite a bit of cloud cover. But even through the hazy windows it's mighty nice.

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET: 250900, CST: 8:00A 90/3

CAPCOM How are your windows? Do you have a couple left that are real clear?

SC The rendezvous windows are good. The others are all about the same as they were when we last reported. 1 and 5 have a slight haze and a little fog on the inside.

SC Roger, understand.

PAO And at 25 hours 16 minutes into the flight - oops, here goes some more. We'll cut back.

CAPCOM Roger, just as a matter of curiosity for Bill, would you say a few words about the heaters for the cryo tanks, and also for the fans. We notice that the heaters are doing their thing normally cycling on and off, and as time goes by this cycle rate increases indicating a little bit of stratification in the tanks, and then when we've been burning the fans on every 4 hours for a couple of minutes this stirs things up and the heaters been cycling on and off again more slowly so while - until again a little bit of stratification occurs and the cycling become slightly more rapid. This of course normal, we just pointed it out as a curiosity to you. Over.

SC Roger. I haven't really been following it that close. But one thing I have noticed is when you turn the fans on you get a glitch in the quantity, which might correspond to a glitch in AC. Maybe the next time we'll look at the AC volts and see what happens.

CAPCOM Our experts say that's not the reason the the glitch. They say their stratification shakes out the capacitants (garbled)

SC I knew they would have some big deal answer for me.

CAPCOM (Garbled)

SC I'll buy that. Roger.

CAPCOM Any other information you want us to send up to you?

SC No, we're going to zap with the high gain here shortly.

CAPCOM Okay.

PAO And at 25 hours 18 minutes into the flight that apparently wraps up a very communicative period for this early Sunday morning. In the meanwhile the Control Center humorists are busy, of course, trying to come up with music appropriate under the occasion. One title suggested is "Shine On Harvest Earth". I don't know how far that will get. At 25 hours 19 minutes into the flight this is Apollo Control.

END OF TAPE

PAG And this is Apollo Control Houston at 25 hours, 41 minutes into the flight. Our velocity is down to 5162 feet per second. We are 106 270 miles from home, and here is some conversation recorded in the last 20 minute time block.

SC Houston, Apollo 8, how do you read on the high gate?

CAPCOM Reading you loud and clear Bill, how about me?

SC I'm reading you loud and clear. I ought to go ahead and dump this. You might want to listen to it in real time, to evaluate the voice.

CAPCOM Okay, we will do that, as soon as we can.

SC Give me a call when you are ready.

CAPCOM Do you want to dump it by your command, or would you like us command the dump, over.

SC Oh, you can go ahead and command whenever you are ready.

CAPCOM Okay, we are starting now, thank you.

SC I've already rewound.

CAPCOM Roger.

SC Roger, I've already rewound. There is only about 5 minutes worth on the tape in Houston.

CAPCOM Roger, understand. You promised me you would wait 3 days before you started doing this Bill.

SC It has been a long trip.

CAPCOM Apollo 8, Houston.

SC Go ahead Houston.

CAPCOM Roger, Bill, I've got your dump and the voice quality is very good. We are going to take about 20 minutes or so to get it back to Houston to play it.

SC Roger. Where are you taking it through, Houston?

CAPCOM It comes through Madrid and then Ascension, Bill.

SC Okay.

CAPCOM Apollo 8, Houston. Apollo 8, Houston, over. Apollo 8, Houston, over. Apollo 8, Houston, over. Apollo 8, this is Houston, over. Apollo 8, this is Houston, over.

SC Houston, Apollo 8, how do you read?

CAPCOM Roger, Bill we are reading you loud and clear. We had an antenna problem down here. We had an unexpected switch of antenna's switch, which probably caused your high-gain to quit. Apollo 8, Houston, over.

SC Go ahead Houston, Apollo 8.

CAPCOM Roger Jim, we lost our antenna down here. We interrupted your tape dump, so we are in the process of doing some rewinding and continuing the dump, in case Bill

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 254100, CST 8:32A 91/2

CAPCOM is wondering what is going on with the
tape recorder.

SC Okay, no strain.

PAO And at 25 hours, 46 minutes into the
flight, that is our status. This is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68 GET 260600, CST 8:57a 92/1

CAP COM Apollo Control, Houston, you are 26 hours, six minutes into the flight. We are 187,400 miles from home, and our velocity 5,118 feet per second. In the past 15 or 20 minutes, we have recorded this brief conversation.

CAP COM Apollo 8, Houston, over.

SC Roger

CAP COM Roger. AT 26 hours GET we'll be switching our antennas back again at Madrid and you can expect the goods on your com ribbon.

SC Roger. Houston, Apollo 8.

CAP COM Go ahead, Jim.

SC I noticed that you skipped the I&G alignment for about 26 hours because we were still asleep. Do you want to include that in here, or do you think it is required?

CAP COM Roger, Jim. We think it is going to be required prior to the next set of P23 sightings, and we're suggesting that it be put in at 2745 rev in the flight plan. We'll have a more complete flight plan update in here shortly.

SC Okay, fine. We're in the process of having breakfast.

CAP COM Roger, understand.

CAP COM Apollo 8, Houston,

SC Go ahead, Houston.

CAP COM The tape dumps completed at 31, you can go ahead and record and in a little bit send it down.

SC Roger, will do.

CAP COM And that wraps it up for this period. This is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 262700, CST 9:18A 93/1

PAO This is Apollo Control Houston, 26 hours, 27 minutes into the flight. We are 108 400 miles out. The velocity now is 5080 feet per second. We have had no conversation with the crew the past 20 minute period. We do have this advisory however, on the trajectory of the S-IVB. At this particular point in the mission, 26 and one-half hours, the S-IVB is placed by our best estimates at a point 800 miles - it's moving on a track - 800 miles outboard of the spacecraft and 1200 miles behind the spacecraft. I'll say again, it is 800 miles outboard of the spacecraft and 1200 miles behind, diagonally behind the spacecraft. Both are nautical references. The point of closest approach of the S-IVB and Apollo 8 will be according to our trajectory experts, at a point of when the spacecraft rounds the Moon for the first time, the S-IVB will go by - they will pass each other and they will be approximately 1800 nautical miles between the two of them at a point just as the spacecraft is acquired by the Earth after its first around, and as its completing its first trip around the Moon. The path of the S-IVB will be outboard of the Moon and it will move on into its solar orbit. The distance again, the point of closest approach is the two move about the Moon, the S-IVB moving off on the Sun side of the Moon, the spacecraft making its first pass around. They will come within 1800 nautical miles of each other. And that would occur at roughly, about 73 hours into the flight. That is based on a LOI of about 72 hours. At 26 hours, 29 minutes into the flight, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston at 26 hours 51 minutes into the flight. We are - I'll have to estimate, based on the wall map, 112,000 miles out. We have had this brief conversation in the last few minutes.

CAPCOM Apollo 8, Houston.
SC Go ahead, Houston. Apollo 8 here.
CAPCOM Disregard. We were going to talk about the high gain, but you beat us to it.

SC Okay.
CAPCOM Apollo 8, Houston.
SC Go ahead, Houston.
CAPCOM Roger, Jim. We would like to take control of the tape for a few minutes to make sure that we got all that last dump. Over.

SC Okay, stand by one.
CAPCOM Roger.
SC You've got it.
CAPCOM Thank you, sir.
SC Houston, Apollo 8.
CAPCOM Apollo 8, Houston. Go ahead.
SC All right. I just noticed that I can hear those RTC's coming through on normal voice.

CAPCOM What does it sound like, Bill?
SC It's weak --
CAPCOM Apollo 8, Houston. Over.
SC Go ahead.
CAPCOM Roger. I have a flight plan update for you at your convenience.

SC Ready to copy.
CAPCOM Apollo 8, Houston. Will you copy? Over.
SC Roger, ready to copy.
CAPCOM Okay, Bill. This will be on page 2 dash 22 of your flight plan. For the command module pilot, I've already mentioned it to him, but at the top of the page, at about 27, 45 actually, we would like him to do a P-52 and IMU alignment. And then, the P-23 should be done as scheduled. Those four stars, Procyon, Regulus, Alphard, and Spica, we realized Alphard may not be too good a star, Regulus is about 3 degrees above the horizon, and Spica is at a 48-degree trunnion angle, so I guess what we are saying is if Jim has difficulty doing one set on each of those four stars, we suggest that he omit whichever he is having difficulty and pick it up by doing two sets on some other star that he likes. Over.

SC Roger, understand.
CAPCOM All right. In the lower right hand corner of page 222 the passive thermal control attitude should

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 265100, CST 9:42a 94/2

read pitch 224 degrees, yaw 020.

SC Roger, copy.

CAPCOM And at the next stage, at about 29 hours, you can resume the normal flight plan. We would like to make one addition at 2930, add a waste water dump, even though one is not really required at that time. We would like to get the dump out of the way so we can track you uninterruptedly without any dumping, you know, as we are coming up on midcourse correction number 3. Over.

SC Roger.

CAPCOM That's about all, Bill. You got any questions on this?

SC No, it looks pretty good. We've been saving up some water of our own to dump here, so that will work out all right.

CAPCOM Very good. And don't ruin Jim's optics.

SC Right.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger. We would like POOACCEPT please. We would like to send you up a P-27. It's a LM state vector, going into the LM slot only, and we do not want you to transfer it over to the CSM. Apollo 8, Houston. Did you copy?

SC Roger, you got it.

CAPCOM Okay, we got it. We're sending you a LM state vector and we would like you not to transfer over to the CSM slot.

SC Roger.

CAPCOM Thank you.

CAPCOM Apollo 8, Houston.

SC Apollo 8. Roger. Are you still planning an MCC-2 at 28 hours? Over.

CAPCOM Stand by one, Bill. Bill, negative. That midcourse correction number 2 has been cancelled. It's magnitude was less than 1 foot per second, so we decided not to do it. Over.

SC Okay, thank you.

CAPCOM And you've got the computer again, if you go to BLOCK.

SC Okay. --

PAO This is Apollo Control again, 109,9 - let's make it 110,000 even - miles out. Our velocity 5028 feet per second. Our spacecraft weight now is down to 63,000 pounds, 63,023 pounds. I think in the course of that conversation, you heard that we see no further need for any more midcourse corrections between now and their journey to the moon. At 26 hours 57 minutes, that is our status.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 272300, CST 10:13A 95/1

PAO This is Apollo Control Houston, 27 hours,
23 minutes into the flight. A few minutes ago, Mike Collins
had this conversation with the crew.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, go ahead.

SC Are you still computing the pericynthian
time of 6 and 9/10th.

CAPCOM Standby, we will get an update for you.

SC Okay.

CAPCOM Apollo 8, Houston, your 6 and 9/10th
pericynthian is still good plus or minus a minute and we
will get it down to (garble).

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 274500, CST 10:36a 96/1

PAO This is Apollo Control Houston at 27
hours 45 minutes. We are 112,000 miles out. Our velocity
is 4900 feet per second, and in the last few minutes, we
recorded some - a very brief conversation on a star update
to the crew. Here is that conversation.

CAPCOM Apollo 8, Houston.

SC Roger. This is Apollo 8.

CAPCOM Okay, Bill. We just got your readout
on your voice tape and we will be back with you on it shortly.
Over.

SC Okay. Houston, I'm going to be doing
my alignment at this time. I'm in a good position for
viewing the stars.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 280800, CST 10:59A 97/1

PAO This is Apollo Control Houston, 28 hours,
8 minutes into the flight. It has been quiet during this
most recent period, we have not heard from the crew. Our
present distance, 113 000 nautical miles from Earth, our
velocity 4909 feet per second. This is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston, 28 hours 29 minutes into the flight. I want to clear up a velocity reading. Apparently I gave a reading earlier which either was in error, or I read it wrong. Our present feet per second is 4875. I say again 4 8 7 5, and our altitude is 114,000 nautical miles. Within the last hour in a private conversation we have learned that there is some -- a little nausea aboard. Frank Borman reported an upset stomach, but Chuck Berry tells me it is getting better. That is all we know about it right now. Here is some tape conversation just recorded.

CAPCOM Apollo 8, this is Houston with voice check. Over.

SC Houston, Apollo 8. Read you loud and clear now. How us??

CAPCOM Oh, good! Reading you loud and clear, 1 2 3 4 5 5 4 3 2 1. Am I cutting in and out still? Over.

SC Nope. All the numbers are coming up nicely.

CAPCOM Okay. Thank you, Jim.

CAPCOM Apollo 8, Houston. We are going to switch antennas at 2820. Stand by for our blitz.

SC Roger Houston. And we will start passing thermal control, and we are maneuvering to P-23.

CAPCOM Roger, understand, maneuvering to P-23, I understand.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, go.

SC Roger. You copy 100 bit rate now for this P-23?

CAPCOM Negative, Bill. We are getting low bit rate now.

SC If you go high bit rate we will not bother recording it.

CAPCOM Roger. We just went to high bit rate.

PAO This is Apollo Control again. I say again on the nausea, Frank Borman reported an upset stomach. He has taken some medication, and he is apparently feeling better. He so reported to Dr. Berry. Bill Anders reported that he was not feeling his best. We don't know whether it is some sort of virus or just what, but I am sure that Chuck Berry will have more for us at the Change of Shift Briefing today. I say again the situation was reported to us within the last hour in a private voice tape down, that Frank Borman was reporting some stomach upset and not feeling particularly well. From strictly a layman's point of view it sounded like the symptoms of the Asian Flu, but I am not going to attempt to diagnose it. At the same time Bill Anders was reported not feeling not completely himself either. but no overt signs of a cold or flu. Jim Lovell on the other

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 282900 CST 10:20a 98/2

PAO ... within -- since the original communication an hour ago, the crew has reported that they are generally feeling better. At 28 hours 32 minutes into the flight, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 291800, CST 12:09P 100/1

PAO This is Apollo Control Houston, 29 hours, 18 minutes into the flight. Our velocity, 4790 feet per second. Our distance, 116 658 nautical miles. In recent minutes, we have recorded this conversation and we have every reason to believe that it will be a continuing conversation, because we have just heard additional calls. Let's have the tape.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, over.

CAPCOM Apollo 8, this is Houston, over.

SC Roger, cislunar nav accomplished. We did two sets on stars 16, two sets on 22, and one set on 21.

CAPCOM Roger, understand P23 completed, two sets on 16, two on 22, and one on 21.

SC Roger, it was getting a little late, so we didn't want to start on 26.

CAPCOM Roger, understand Jim.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, go ahead.

SC Is our previous PTC attitude okay for the next session?

CAPCOM Roger, Bill. The one that we updated an hour or so ago, IE pitch 224, yaw 020 is a good one.

SC 22420, Roger.

CAPCOM Roger.

CAPCOM Apollo 8, Houston, we will change antennas in about 2 minutes. You can expect a glitch in your comm.

SC Roger.

CAPCOM Roger.

SC How are all of the systems looking down there, Houston?

CAPCOM Apollo 8, Houston, you are looking good here in all respect. Apollo 8, Houston, over. Apollo 8, this is Houston, over. Apollo 8, this is Houston, over.

PAO This is Apollo Control. We are looking presently at the bio-med readout on Bill Anders, and it looks like this, a mean heartrate of, around between 68 and 69. The highest the system has seen, in this sample period of roughly an hour is about 88, the lowest its seen is 51. His mean respiration rate is 10, and, let's see, that's all of the data we have on that chart. No additional conversation since we gave you those readings. At 29 hours, 21 minutes, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 294249, CST 12:33a 101/1

PAO This is Apollo Control Houston. Within the last half-hour, several members of the crew here have had another conversation with the Apollo 8, in private, regarding their medical situation and apparently it is much improved. We will have this tape for you shortly, but in general, Borman reports feeling much, much better. We'd estimate it will be 15 minutes before we have the tape. This is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston 29 hours 47 minutes. I would like to amplify a bit more on this most recent taped conversation. Mike Collins opens it and this was a private conversation conducted from the communication room in this building, building 30. Collins asked the crew for additional detail on their condition and Frank Borman comes on the line and he describes his problems and he also says he has had several hours of rest this morning and is feeling much, much better. Jim Lovell, in the conversation, also reveals, for the first time, that he apparently wasn't feeling too well when they first went into orbit yesterday, and this was the first we had learned of that. He, of course, said that this was a momentary thing and he describes it in very finite terms. Let's see, that covers everybody but Bill Anders and he reports just generally feeling better and apparently a case of the butterfly stomach or some such this morning. Borman elaborates a bit and says he thinks he had a 24-hour virus. He says he noted some diarrhea, an upset stomach, and he describes some vomiting. Our head physician, Dr. Berry, gets on the line with Borman and presses him for additional detail, which is forthcoming but, in the end, Berry feels that the situation is considerably better than when we first learned of it, perhaps an hour or more ago. Within perhaps 5 or 10 minutes we should have the tape, which is now in route to our news center in building 1, on the line for you to play, prior to our news conference, which will be at 1:15 Houston time. Other than that, we are right on the flight plan and we are still scheduled for a television pass, beginning at 2:06 Houston time. As we have been talking, we have recorded this additional communication from Apollo 8 and we will play it for you now.

SC Houston, Apollo 8, how do you read?
 SC Houston, Apollo 8.
 SC Houston, Apollo 8.
 CAPCOM Roger, Apollo 8, Houston. Go ahead.
 SC Roger. We are dumping some water we collected here and we are ready to dump the waste water down to 25 percent. Do you concur?
 CAPCOM Roger, we concur. We are standing by for your dump.
 SC All right. We've already started the other.
 CAPCOM Roger, thank you.
 CAPCOM Apollo 8, Houston.
 CAPCOM Apollo 8, this is Houston, over.
 CAPCOM Apollo 8, this is Houston, over. Roger.
 We are getting geared up down here to do the first of the

comm tests. We will be doing an omni comm test, which is on your flight plan, listed mode 7.8 and we will let you know when we are ready to proceed.

SC Roger.

PAO This is Apollo Control Houston. That conversation concluded very briefly there a great amount of static, but we now have the conversation in which we have alluded to in two earlier announcements, a rather full development on examination of the crew medical problems. You will hear first Mike Collins, the capsule communicator, he is talking with Bill Anders. Then he talks to Frank Borman, then Chuck Berry, who I believe identifies himself, comes on the line. Here is that tape now.

CAPCOM Apollo 8, this is Houston. Over.

SC Go ahead, Houston. How do you read?

CAPCOM Roger. We are reading you loud and clear. We are on a private loop now and we would like to get some amplifying details on your medical problems. Could you go back to the beginning and give us a brief recap, please?

SC Mike, this is Frank. I'm feeling a lot better now. I think I had a case of the 24-hour flu, intestinal flu.

CAPCOM Roger, understand. When did you first notice it? Or can you go back to P00 and start us out at the beginning of your problem?

SC Roger. About, I guess about 20 hours, 19 hours yesterday.

CAPCOM Roger. Understand about 19 hours yesterday. We were confused by something Jim said in reference to getting out of the suits. He said that he felt a little bit uneasy when he first got out of the couch and started to get out of the suits and that passed away and that you and Bill had, we think, noticed similar things when you took your suits off. Is this so?

SC Just when you get out of the seats and start moving around for a while.

CAPCOM Roger. Understand. We understand this does cause nausea, in all three of you. You have all three noticed it when you've gotten out of the suits for the first time or any time, is that right?

SC Roger. Uneasiness, not nausea really, but a sort of awareness of motion, like the zero g airplane.

CAPCOM Roger, understand.

CAPCOM Apollo 8, this is Houston.

SC Go ahead.

SURGEON Frank, this is Chuck. The story we got from the tape and from Jim a while ago went like this. At

some 10 to 11 hours ago, you had a loose BM, you vomited twice, you have a headache, you've had some chills, and they thought you had fever. Is that firm?

SC Everything is true, but I don't have a fever now. I slept for a couple hours and the nausea is gone, and controlling the loose BM. I think everything is in good shape right now.

SURGEON Did you have a sore throat?

SC The roof of my mouth was sore, Roger.

SURGEON And as we understand it at the moment, Frank, neither Bill nor Jim have anything at the present time except some nausea. Is that right?

SC No, none of us are nauseated now. We are all fine now.

SURGEON Okay, and you have taken the Lomatil?

SC No, no we haven't. Pardon me, yes they have.

SURGEON They have and you have not?

SC Roger. I just woke up, Chuck. They took them while I was asleep.

SURGEON Okay, I think you ought to take one Frank, and the Marezine will help if that nausea returns. The Marezine will knock that -

SC Houston, we are going to start doing this waste water dump down to 25 percent. Do you concur?

CAPCOM We don't know, Bill. If you can stand by one, we're isolated from those experts at this time.

SURGEON Frank, did you read that you are to take the Lomatil and the Marezine can be used if you do get nauseated, any one of the three of you.

SC Okay, thank you.

CAPCOM Apollo 8, Houston. We are closing this circuit down and we will be up in our normal voice loop in about 5 minutes and then we will get on with the water dump.

SC Roger, and you are still cutting out, Houston.

CAPCOM Roger, understand.

PAO This is Apollo Control Houston. That concluded the private conversation to determine the medical status of the crew. We learned, of course, in the conversation, obviously we learned about some things that were going on yesterday, much earlier in the flight, I think the report was 19 hours, which we had not learned until this point. We are satisfied now that the crew, the situation is certainly improving and certainly settled down. At 29 hours 57 minutes into the flight, we are 118,400 miles out, and we are moving at a velocity of 4739 feet per second. This is Apollo Control Houston.

END OF TAPE

SC Roger, Houston. We are dumping waste water now out of these nozzle templet.

CAPCOM Standby. Looks good Bill, 64 degrees, over.

SC Roger, we just got an O2 low high from purging to vent line on the cabin.

CAPCOM Roger, understand.

SC How is everything in Houston.

CAPCOM Oh, everything down here is GO, how are you?

SC Fine, what is the news?

CAPCOM Well, did you get the INTERSCHOLASTIC NEWS SUMMARY we sent up to you a couple of hours ago, it might have been during your rest period. We gave you a couple of football scores. One of them in particular was Army 21, Navy 14, over.

SC 1, 2, 3, 4, 5, 6, 7, testing out. I got that one.

CAPCOM Good, the Cowboys were destroyed by the Cleveland Browns yesterday. The Pueblo crew is expected to be released. And I now hear our air to ground has got alot of background noise, standby, we are going to go through these comm test modes on tape 223 of the flight plan, over.

SC Roger.

CAPCOM Apollo 8, Houston, would you go S-band OFF switch to down voice backup, over.

SC Down voice backup, Roger and out.

SC Houston, be advised that it looks like your twin bars are clipping your voice during your transmission.

CAPCOM Roger, understand. Are we still experiencing this intermittent condition that was there a few minutes ago?

SC Not always, but often in the beginning and in the end of your transmission.

CAPCOM Roger, understand. I'll give it a little extra time.

CAPCOM Apollo 8, Houston, over. Apollo 8, Houston, could you try to find us a better OMNI antenna, over.

Apollo 8, Houston, we are unable to read you on this OMNI antenna, over. Apollo 8, this is Houston, over. Apollo 8, Houston, we understand you're are copying us. While we are trying to reestablish contact with you, would you put your optics switch to 0. We show you are drifting off in trunion and request that you zero your optics. Apollo 8, Houston, we copy your optics 0, and how are you reading us now, over.

CAPCOM Apollo 8, Houston, we are down to 25 percent on your waste water dump and ready to terminate, over. Apollo 8, this is Houston, over. Roger. Our next comm test is arranging all of the test. I have four switches I would

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 294500, CST 12:34P 103/2

CAPCOM like you to throw, which will cause you
to lose voice communications for approximately 3 minutes, over.

CAPCOM Alright, the first one is S-band normal
mode voice OFF, the second S-band normal mode PCM OFF, the
third S-band normal mode ranging switch to RANGING, and forth
the S-band ox tape switch OFF, over.

END OF TAPE
^

PAO This is Apollo Control at 31 hours 5 minutes into the mission. We are standing by at this time to receive the first television transmission from the spacecraft. Now there is a certain amount of uncertainty just as to when that signal will be received at the station at Goldstone and transmitted to Houston. Now the spacecraft at the present time is in a slow roll as part of the passive thermal control program to maintain temperatures, and as soon as the high-gain antenna is in the proper position we expect to begin getting pictures. We will stand by and pick up the picture as soon as we have any solid video lock on them. At this time our estimate is that it will be about one minute before we pick up our TV transmission. When we begin this television transmission the spacecraft will be at a range from Earth of about 120 623 nautical miles. We will be traveling at a velocity of about 4668 feet per second. We are still standing by to receive the first indications that a picture is about to come through. We now estimate about 15 more seconds. As I said before there could be some variation in that depending on the position of the high-gain antenna. We have gotten a call from the crew we will pick that up and then stand by for pictures. That sounded like Bill Anders putting in a call to the Control Center here. We still do not have pictures. We will continue to monitor. We are getting a good signal through from Goldstone, but we still have not received any video from from the spacecraft. Now we will continue to monitor and also to monitor the audio loop for any conversations from the crew.

SC Houston, Apollo 8. How do you read?
CAPCOM Apollo 8. Loud and clear and standing
by.

SC Say again.
CAPCOM We read you loud and clear and we are
standing by.

SC Okay. Are you receiving television
now?

CAPCOM Apollo 8, Houston. We just got it.

SC You are getting it?

CAPCOM Apollo 8, we have a good picture.

SC We are rolling her. Okay, we are rolling around to a good view of the Earth, and as soon as we get to the good view of the Earth we will stop and let you look out the window at the scene we see. Jim Lovell is down in the Lower Equipment Bay preparing lunch. Bill is holding the camera for us here for us both. Bill is going to take the camera down in the Lower Equipment Bay with Jim.

CAPCOM Roger. Okay, We are getting a pretty good picture, but if you would move it a little slower -- every time you move it around it breaks up on the scan

SC We got you. This is known as preparing lunch and doing P-23 at the same time.

CAPCOM You have everybody standing on their heads down here.

SC How so? You have it turned upside down? you got the wrong rest band.

capcom Well we all have our problems.

SC How is the picture now, Houston?

CAPCOM They are really good.

SC Okay, now we are coming up on the view that we really want you to see. That's the view of the Earth. If you will break for just a minute, Bill is going to put on the large lens. So we will be right back with you.

CAPCOM Okay, thank you.

PAO And we momentarily lose our picture while this lens change is in progress. We will stand by for that shot of Earth.

SC Houston, we are now showing you a view of the Earth through the telephoto lens.

CAPCOM Okay. We are not receiving a picture of it now.

SC How about now?

CAPCOM Okay. We don't have a picture yet.

SC Are you seeing anything at all, Houston?

CAPCOM Okay, Apollo 8, we don't have a picture yet.

SC All right, we will put the other lens back on, and we will show you through that.

CAPCOM Apollo 8, how about standing by that for just a minute. We will check our ground link. Apollo 8, we have a picture now.

SC Okay. Let's try the other lens again then.

CAPCOM Okay, thank you.

SC Do you have a picture now?

CAPCOM That's negative. Apollo 8, belay that.

SC Okay, do you have anything Houston? We have it on the Earth.

CAPCOM We are having no showing.

SC Okay. Stand by. Okay. How about now, Houston?

CAPCOM Still no showing.

CAPCOM You don't have a lens cover on there do you?

SC No, we checked that as a matter of fact. Anything?

CAPCOM Still no showing.

SC How about now?
CAPCOM Still no showing. There is a picture. We have a picture -- okay it is a little difficult to see what we have.
SC That is the Earth, but it is not the telephoto lens, unfortunately it is just an inside lens.
CAPCOM Okay, it is coming in as a real bright blub on the screen. It is hard to tell what we are looking at.
SC You are looking through some haze on the windows too, unfortunately. And the Earth is very bright besides.
CAPCOM Okay, we got the Earth in about the center of the screen and a little bit low. It looked like there were some objects that moved across it -- the screen at the same time. Do you have any comment on those?
SC That is some of the water -- ice. It is coming off the vent nozzle.
CAPCOM Roger.
SC How does it look now?
CAPCOM Still the same thing it is -- the target is extremely bright and it is very difficult to make out what we are looking at.
SC It is unfortunate that we do not have -- we can't make the other lens work here. I don't what the problem is.
CAPCOM Okay, Apollo 8 would you verify that the ALC is on?
SC We have tried it both ways.
CAPCOM Oh, okay, thank you. What we are getting now is a good picture.
SC Say again.
CAPCOM Okay, that is a real good picture. That is the best one that we have had. How about just going ahead and just leaving your pictures inside until we can think some more of what we can do to adjust for that light?
SC Roger. Jim what are you doing here? Jim is fixing dessert. He is fixing up a bag of chocolate pudding. You can see it kind of floating by. Bill is coming up from the Lower Equipment Bay. It is unfortunate that this telephoto lens doesn't work. Show them the lens that is the culprit. This lens doesn't seem to be working right I can't understand why we're not ... problem of light transmission through it. This transmission is coming to you approximately half way between the Moon and the Earth. We have been 31 hours and about 20 minutes into the flight. We have about less than 40 hours to go to the Moon. You can see that Bill has his toothbrush here. He has been brushing

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 310500 CST 1:56p 104/5

PAO During that TV transmission we got some very enthusiastic comments from the crew on the view from some 120 000 miles from Earth. Borman described the Earth very beautiful looking blue, covered with white clouds. He also reported that all three crewmen at this point are in very good shape and all feel fine. At 31 hours 24 minutes into the mission this is Apollo Control.

END OF TAPE

PAC

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 313900, CST2:30p, 105/1

CAPCOM This is Apollo Control, Houston. at 31 hours 39 minutes into the mission. At the present time, we have completed the shift change at Mission Control. Our Flight Director Milton Windler has relieved Clifford Charlesworth and our capsule communicator is astronaut Ken Maddingly. This is a relatively quiet period in the flight plan, it is a sleep period for Commander Frank Borman, and we do not have any significant activities listed for the other two crewmen until some 33 hours 30 minutes into the mission. Just about, two more hours before any significant crew activities are scheduled in the flight plan. On hand is an accumulated tape of conversations that occurred prior to the press conference and during the change of shift press conference. We'll play that back for you now, and then pick up with whatever conversation is going on with the crew at the time.

CAPCOM Apollo 8, Houston, request S-band normal mode ranging to OFF, and S-band normal mode PCM to PCM. I say again, S-band normal mode ranging OFF, S-band normal mode PCM to PCM.

SC Apollo 8 to Houston, will stand by in this configuration for a moment.

CAPCOM Apollo 8, Houston, three communications switch positions good. S-band (garble) to down voice backup. S-band normal mode PCM pm off. Telemetry input PCM pm high. I say again S-band tape to down voice backup. S-band normal mode PCM to OFF. Telemetry input PCM to high. Reading you weak, but clear now Bill.

SC (Too low to be understood) Apollo 8, Houston.

CAPCOM Apollo 8 Houston, Go ahead.

SC (Too low to be understood)

CAPCOM Apollo 8, Houston. Unable to copy. After about 1 minute of this configuration, we're going to return to normal voice and at that time we should be able to hear you better.

SC Roger. What telemetry is the (garble) going through right now?

CAPCOM Roger. We are in mode 7-10 in the comm test modes in tape 223.

CAPCOM Apollo 8, Houston. Free switch positions. Telemetry input PCM switch to LOW, S-band normal mode voice to VOICE, S-band normal mode PCM to PCM. I say again Telemetry input PCM switch to LOW, S-band normal mode voice to VOICE, S-band normal mode PCM to PCM. Over.

CAPCOM Reading you very weak.

SC Reading you loud and clear. Houston.

CAPCOM Apollo 8, Houston. Requesting S-band

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 313900, CST 2:30p, 105/2

CAPCOM normal mode ranging to RANGING. I say again. S-band normal mode ranging to RANGING. Over.

CAPCOM Apollo 8, Houston. Requesting S-band normal mode ranging to RANGING. Over.

CAPCOM Apollo 8, Houston. Over.

SC Houston, Apollo 8. How do you read?

CAPCOM Beautiful, Frank. I'm reading you loud and clear. How me?

CAPCOM Apollo 8, Houston. How do you read? Over.

CAPCOM Apollo 8, this is Houston. Over.

CAPCOM Apollo 8, this is Houston. Over.

SC Go ahead, Houston. Apollo 8.

CAPCOM Roger. Reading you loud and clear. How me?

SC You're loud and clear, Michael.

CAPCOM Okay. We're still looking for the S-band normal mode ranging to RANGING.

SC I guess we didn't hear that one. Going to RANGING.

CAPCOM Roger.

SC We're in RANGING now.

CAPCOM Thank you.

SC Houston, Apollo 8. What size antenna are you going to now?

CAPCOM Apollo 8, Houston. We're working to extension a 30-footer. Over.

SC Okay. Our signal strength for our AGC is pretty low up here.

CAPCOM Roger. I understand.

CAPCOM Apollo 8, Houston. Requesting S-band off state to OFF. This should put us back in the normal configuration. Over.

CAPCOM Apollo 8, Houston. Over.

SC Go ahead, Houston. Apollo 8.

CAPCOM Okay. S-band off state to OFF. That returns us to normal for configuration and we need a couple of items from you. First, the PMC and LMC status report (including PIV readings on all three crewmembers) and we'd like to know did you chlorinate the water after your last meal. Over.

SC No, we haven't chlorinated the water, yet and we'll get the other for you.

CAPCOM Roger. Thank you.

SC Houston, do you show a FM - Houston, Apollo 8. Do you show the FM on now?

CAPCOM Stand by and we'll check it, Bill.

SC Because our S-band off state has been OFF for possibly - we don't have control of it.

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 323900, CST 2:30p, 105/3

CAPCOM Apollo 8, Houston. We've switched and all the communications switch functions are operating normally Bill.

SC Okay, Mike, thank you.

SC Mike, the PRD readings for the CDR are
4 - that's .04, for the CMP is .64, and for the LMP is .25.

CAPCOM Good. I copy .04, .64, .25. Thank you.

SC Rog.

CAPCOM Go ahead, Apollo 8.

SC Oh, hi, Gene, how are you doing?

CAPCOM Roger. Fine. Over.

SC Is this Jerry.

CAPCOM This is him.

SC Listen, we show a TV count up here -
let's see - 31 20?

CAPCOM Affirmative.

SC We're about in the right position to try it again, and we wondered if you wanted us to take a trial run to see if it will work. Or do you just want to wait and try it when they're supposed to go on the air with it?

CAPCOM Okay. Stand by a minute.

SC Houston, Apollo 8. Over.

CAPCOM Go ahead, Apollo 8.

SC Roger. Could you ask the GNC to give us an update on our prop quantity, please?

CAPCOM Wilco. You're going to the RCS.

SC Roger.

SC If you'll get Jimmy kind of slow, I'll plot it.

CAPCOM All right, we'll come in, now.

CAPCOM Apollo 8, Houston.

SC Go ahead. This is Apollo 8.

CAPCOM Okay. In reference the early TV, we're loosing the high gain antenna now, and it looks like the only way we would have gotten the early TV pass in anyhow, was to send it to remote and try to look at it there. So we're going to scrub that idea. We'll just pick up with the signal TV. The (garble) remaining are the high-gain dependent type, and we'll put those off until the TV session is completed, and we'll work on the fuel propellant curve for you now.

SC Thank you.

CAPCOM Apollo 8, Houston. Okay, Apollo 8, What we're going to do on the TV is to go ahead and let you crank it up as soon as we get back on the high gain antenna, and it looks like - my guess is that this will be about 31:07, and we'll just use this to - while we have the coverage there. I have an update to your TLI plus 35 test. Now we

APOLLO 8 MISSION COMMENTARY,12/22/68,GET 313900,CST 2:30p,105/4

CAPCOM have to correct the (garble) on there.
So when you get that out let me know and I'll read it to
you.

SC Roger.

CAPCOM Okay. On the TLI plus 35 pass the update
I want to give you is the last three lines in the block.

END OF TAPE.

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 314900 CST 2:40p 106/1

SC Go ahead.

CAPCOM Okay. TLI plus 35 PAD the update I want to give you is the last 3 lines in the block. The EMS range to go 13084 35985 0984217, over.

SC Understand, reading 13084 35985 0984217.

CAPCOM That is affirmative.

CAPCOM Apollo 8, Houston. We are about to have a hand over to Goldstone, and our down link will be through then. I don't know if you will notice any difference in our uplink or not. Apollo 8, Houston. Apollo 8, Houston.

SC Go ahead Houston, you are loud and clear.

CAPCOM Okay. We have switched sites over to Goldstone now. I don't know if you can tell any difference in our uplink. Okay, you have cleared up quite a bit. It sounds a lot better to us.

SC Okay.

CAPCOM Apollo 8, Houston.

SC Go ahead Houston, Apollo 8.

CAPCOM Okay. I have some RCS quantity data for you. We are all set up to receive the TV whenever you get high-gain looking at us.

SC Okay. Let me get turned around here. Go ahead with the quads propellant quantities please.

CAPCOM Okay, Apollo 8. alpha minus 225 pounds 74 percent bravo 240

SC Slower please.

CAPCOM Roger. I will repeat. alpha 225 74 percent, bravo 240 pounds 79 percent, charlie 236 - 78 percent, delta 238 - 79 percent, I would like to remind you on the TV that we need narrow beam width when you get up in high gain. Over.

SC Roger. Understand. Houston, how do you read Apollo 8?

CAPCOM Loud and clear, Apollo 8.

SC Okay. Thank you.

CAPCOM Apollo 8, Houston. Okay. I have a few items for you here I would like to clear up and then leave you alone for a while. The first thing is we would like for you to confirm that your spot meter had an ASA setting of 100.

SC That is confirmed.

CAPCOM Okay. Thank you. That was one of the first questions that came to mind. we are ready for a trial fan cycle at any time. Use your normal procedures.

SC Okay.

CAPCOM All right. You can anticipate a fuel cell purge at 35 hours. We ought to be through with battery A charging somewhere after 34 hours. Looks like you will

CAPCOM have just about a full battery there. We will give you a call on the exact time to cut it off. We would like to get some confirmation from you on the chlorine procedures. Did you get some in last night or not? Just a quick summary of how much sleep you got on Lovell and Anders?

SC Okay. We got the chlorine in and the water has been chlorinated and just a minute I will check with them on their sleep.

CAPCOM I am sorry I didn't copy that sleep.

SC Say again, Ken.

CAPCOM I am sorry I didn't copy your last, Frank.

SC I was asking you to say - say what you said. Jim had about 4 hours sleep, and Bill had about 3 hours sleep.

CAPCOM Okay. Thank you very much.

SC We feel pretty good today. We would like to see in looking over the flight plan, perhaps we ought to put the rest periods a little bit shorter and more frequent. It seems it might work out better. We got all out of kilter on it yesterday. We are sort of trying to get back in a normal cycle.

CAPCOM Okay. We will look into that.

SC You all are doing good work. Keep it up.

CAPCOM Okay. Thank you. Looks like the only other thing we have left over is a COMM check and if we can work that in without interrupting your present schedule we would like to.

SC Okay. Right now we are stopping for a break, but we will go ahead and do that. What does it involve?

CAPCOM Okay. We will need the high-gain antenna, and there should be no comm loss during this mode.

SC Okay, Ken. I think we are going to lose the high gain here shortly. Why don't we pick it up next time it comes around?

CAPCOM Real fine.

SC Remember, the most important part of the trip occurs in two days when we start back. So you all get better rested too.

CAPCOM Will do that.

CAPCOM Affirmative, Apollo 8.

PAO That brings us up to date with the communications with the spacecraft at present. At this time it is quiet. We have had no further communications with the crew. We expect that it will remain quiet for the next hour or two. At the present time, Apollo 8 is at an altitude of 123 768 nautical miles, and our current velocity reading here at Mission Control is 4568 feet per second. I believe

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 314900 CST 2:40p 106/3

PAO this is in conflict with a figure given earlier on the velocity in our previous announcement. I recall is being reported at about 4400 feet per second. I would like to point that the spacecraft is continuing to decelerate and the reference to 4400 feet per second in a previous announcement would be incorrect. The current read-as I said 4568 feet per second on the velocity. At 31 hours 57 minutes into the mission this is Apollo Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 320800 CST 2:59p 107/1

SC Good by from Apollo 8

CAPCOM Thank you.

SC I hope we can get that other lens fixed. Or some reading on it.

CAPCOM Roger. We are going to work on that one. The one that is sensitive to light is lens that you were just using. You want to be careful about pointing that at some bright object.

SC Roger. We are starting PPC again. I believe that lens hasn't been used for quite awhile, Ken.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 321900, CST 3:15 108/1

PAO This is Apollo Control at 32 hours 14 minutes into the flight now. Apollo 8 is currently at an altitude of 124 506 nautical miles, traveling at a speed of 40 546 feet per second. And we are in touch with the spacecraft at this time. We'll pick up communication and follow it along as it develops.

SC Communication check.

CAPCOM Okay, standing by. Apollo 8, Houston.
Apollo 8, Houston.

SC Go ahead Houston, Apollo 8.

CAPCOM Okay Apollo 8, looks like we're going to have to put this com test off because of some tracking requirements. We can do it in about an hour if this will not interfere with your present operations too much. It'll take maybe 15 to 20 minutes, and it will involve some conversation on the part of the people onboard the spacecraft. So if that's going to interfere with your sleeping and all, why go ahead and we'll defer to that and we'll pick these requirements up some other time. Heh, I've got a score here, looks like Baltimore 21 to nothing.

SC Who were they playing?

CAPCOM How about Minnesota.

SC That's from that other league. How did last year's Army - Navy game come out?

PAO This is Apollo Control, we don't appear to have anymore conversation developing with the spacecraft. Check with the Flight Dynamics Officer down here in Mission Control Center indicate that the spacecraft will continue to decelerate until about 55 hours 38 minutes ground elapse time. At that point our estimate is that it will come into the Moon's sphere of influence or perhaps more accurately the Moon's gravitational attraction will become the dominant force acting on the spacecraft, and the spacecraft will begin to accelerate again. At this point it's altitude will be about 176 thousand nautical miles. It will be about 30 thousand nautical miles from the Moon. At 32 hours 20 minutes into the flight this is Apollo Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY,12/22/68,GET 322800,CST 3:20p,109/1

PAO This is Apollo Control at 32 hour 48 minutes. Now we're in communication with the spacecraft at this time, and we'll bring you up to date with a tape recording on the earlier part of the conversation and then pick it up live.

CAPCOM Go ahead, Apollo 8.

SC Roger. We've turned up all the cryos. Could you give me your quantities, please?

CAPCOM Okay. Stand by.

SC We advised the CMP.

CAPCOM Okay. And our guys down here are watching high gain antenna pointing program, so anytime you're not using the DUSKY fan in alpha, they'd like to watch it for a couple of cycles, so if you would leave that noun 51 on the display it will help a lot down here.

SC Okay. Why don't you give us react angles and we'll try that for the next time.

CAPCOM Okay.

CAPCOM Apollo 8, are you ready to copy from ground quantities?

SC I'm ready. How about O2 first.

CAPCOM Okay. O2 tank 1, I show 88.1 percent.

SC Okay. Could you give it to me in pounds, please?

CAPCOM Okay. You'll have to stand by while we convert that.

SC That's okay, Gene, go ahead, I'll take the percent.

CAPCOM Okay. We will try and get the pounds for you, too, though. Tank 1 oxygen 88.1.

SC What time is that for?

CAPCOM This is present.

SC 32:30, okay.

CAPCOM Okay, I've got 32:25. And O2 - okay, O2 tank 1, 88.1, O2 tank 2, 87.37,

SC Is that .37 or .36?

CAPCOM .37.

SC Roger, got it.

CAPCOM H2 tank 1, 75. niner 7. Tank 2, 78.06. Over.

SC Okay, thank you very much. It looks good.

CAPCOM Okay, thank you.

END OF TAPE.

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 324500, CST 3:40 110/1

PAO This is Apollo Control at 40 rather 32 hours 45 minutes. At the present time the spacecraft is at an altitude of 125 723 nautical miles, traveling at a speed now of 459 feet per second. We've been in conversation with the crew for the last couple of minutes. At the present time lunar module pilot, Bill Anders and command module pilot Jim Lovell are attempting to get a little bit of sleep. Anders requested a few moments ago that he be given a go ahead to take a Seconal tablet. This is one of the short acting sleeping pills carried aboard the spacecraft. And the medics have given him the go ahead to take the Seconal tablet. We'll play back that tape for you now and then stand by for further conversation with the crew.

SC Go ahead, Houston, Apollo 8.

CAPCOM Okay, just a couple of things I need from you. I would like to get a battery C voltage. I would like to check a battery manifold pressure.

SC Battery C 37 volts.

CAPCOM Understand 37 volts on battery C, is that affirm?

SC 37.

CAPCOM Okay, thank you. And if you can give the battery manifold pressure, like to read that one.

SC Point 6 volts.

CAPCOM All right understand point 6 volts. The angle you asked for on the high-gain antenna are pitch minus 45, and yaw 90.

SC Okay, this is Apollo 8, I'm just going to go to high-gain antenna, we're about ready to pick you up on the beam that works on react.

CAPCOM Okay, and I have a scanning telescope star visibility item for you to pick up when you're ready to copy that.

SC Roger, we'll get that on high-gain when we get back to you.

CAPCOM Okay, thank you.

SC We'll come back on high gain.

CAPCOM Roger.

SC That's not fair, we're there already.

CAPCOM That's pretty good acrovision.

SC You guys are reading the disk. Go ahead Houston.

CAPCOM Okay, Apollo 8, believe we ought to try that one again next time. And the scanning telescope star visibility is scheduled for a 34 10 in the flight plan. And it'll be star number 31. The angles are roll 184.7, pitch 23.4, yaw 14.3, shaft and trunion zero, over.

SC Star 31, roll 184.7, pitch 23.4, yaw 14.3,

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 324500, CST 3:40 110/2

and start at shaft and trunion at zero.

CAPCOM That's affirm, and that's copy star 31.
SC That's roger, 31.
CAPCOM Okay, thank you.
SC Houston, Apollo 8.
CAPCOM Go ahead.
SC LMP would like to take a Second and hit
the hay.
CAPCOM Okay, that's a go.
SC Okay, thank you.
CAPCOM Telemetry data to data.
SC Normal mode voice to voice; telemetry data
to data.
CAPCOM Okay, up telemetry command to normal.
SC Normal.
CAPCOM High-gain antenna track auto.
SC Roger, on auto.
CAPCOM High-gain antenna beam width to narrow.
SC Beam width narrow.
CAPCOM Okay, this will be our base line data
check. This will be a full uplink voice with ranging and
fold down link.

END OF TAPE

PAO This is Apollo Control at 33 hours 13 minutes. At the present time we are involved in a series of communications checks with the spacecraft. We will pick that up for you at the beginning and continue to monitor live.

CAPCOM Apollo 8, Houston. We are going to have to delay the COMM check again.

SC Houston, Apollo 8. How do you read?

CAPCOM Apollo 8, Houston. You call?

SC Roger. We lost you for a while there.

Are you reading us there now?

CAPCOM Loud and clear now.

SC Okay. Thank you, so are we.

CAPCOM Okay, Apollo 8, do you want to try that AUTO REACT 33 plus 24 looks like a good time and the angles are the same. And the late ball scores are 24 to 14 --

SC (Inaudible)

CAPCOM All right.

SC Say again.

CAPCOM I say a late ball score here is --

SC Do you have the ball scores?

CAPCOM 24 to 14.

SC Baltimore over Vikings?

CAPCOM Affirm.

SC Houston, Apollo 8.

CAPCOM Go ahead, Apollo 8.

SC We have reached the scan limit on the high gain, what do you want us to do about it now?

CAPCOM Apollo 8, what we would like to do with these angles is set it in AUTO REACT over on panel 2, and it is under the tracking for the high-gain antenna, and it will -- the lower position will say REACT. On the position dials we would like to set pitch to minus 45 and the yaw to 90.

SC Pitch minus 45, yaw 90.

CAPCOM Okay. Stand by 1.

SC Roger. We could leave it in REACT if you want to use the high gain to keep from waking us up every rev.

CAPCOM Apollo 8, Houston. I think we may have gotten off on a tangent. These are pitch and yaw angles that we called up to you for the high-gain antenna were in response to Bill's request to know what position we could put on there for a -- for the AUTO REACT position. We can straight -- still remains if we don't want to be on an omni antenna at the same time. We are in the AUTO REACT position we should be in one or the other. So, you can use that information if you want to try it out. Otherwise the procedure he has been using all along will be just fine. Over.

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 331300 CST 4:05p 111/2

CAPCOM Apollo 8, Houston. I am transmitting
in the blind right now. Our downlink isn't working, so --
PAO This is Apollo Control at 33 hours
17 minutes. At the present time the spacecraft is at an
altitude of 126 969 nautical miles from Earth traveling at
a speed of 4471 feet per second. We have no further
communication with the crew at this time. We will take
circuit down and stand by to come up again when next we are
in touch with the spacecraft. This is Apollo Control at
33 hours 18 minutes.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 333800, CST 4:30P, 112/1

PAO This is Apollo Control at 33 hours 38 minutes. Spacecraft, at this time, is 128,179 nautical miles from Earth and our velocity is 4434 feet per second. We're still involved from time to time with the communications checks with the spacecraft. One of those is in progress at this time and we'll pick up the beginning and continue to follow along.

SC Houston, do you read Apollo 8?
CAP COM Right, Apollo 8. Read you weak but clear now.

SC Roger, Thank you.
CAP COM Okay, looks like we had a ground problem there.

SC Roger.
CAP COM Apollo 8, Houston.
SC Go ahead.
CAP COM Okay, looks like we're at a good attitude to try this high gain antenna on the COM check one more time. I believe you're still on an omni. Is that correct?

SC Roger.
CAP COM Okay, if we could try the high gain and maybe we can get started on this COM check. I'd also like to verify that you've got the LMP and the CMP trying to get some sleep here and we could use an oral temp from you too.

SC All right, my temperature is 97.5.
CAP COM Okay, thank you.
SC That's what it was this morning when I felt badly.

CAP COM All right, thank you.
SC Do you want me to go to omni now, Ken?
CAP COM I'd like for you to go to high gain.

SC High gain?
CAP COM Yes sir.
SC High gain.
SC This is Apollo 8 on high gain.
CAP COM Rog. You're kind of weak now but we're taking a look at it.

SC Houston, Apollo 8 on high gain.
CAP COM Okay, I'm reading you loud with just a little background noise.

CAP COM Apollo 8, Houston. We're not getting a good lock. Wonder if we could try making sure that we're in AUTO on the tracks and that we're now beam width?

SC Stand by. How's that, Houston?
CAP COM Okay. That works real good.
CAP COM Apollo 8, this is Houston. What we're doing right now is sending dateline data and we'll be in the

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 333800, CST 4:30P, 112/2

SC . . . mode for another couple of minutes
and then we'll be moving out to a conditional..

CAP COM Apollo 8, Houston. How do you read?

CAP COM Apollo 8, Houston.

SC Houston, Apollo 8, read you five by.

CAP COM Okay, we are receiving some ground
problems and we're reading you weak but clear. We're ready
to start into our test. We're going to be changing our
mode so you'll probably hear a burst of noise as we make the
change. This will be a noise that sounds like an S-band
armlock. However, your AEC leader will lock out. This is
due to the modulation of the uplink. There will be about
2 minutes and during this time, you will hear one burst of
noise.

CAP COM Apollo 8, Houston. Voice check. Over.

CAP COM Apollo 8, Houston. Ready to check.

CAP COM Apollo 8, Houston.

CAP COM Apollo 8, Houston.

SC Go ahead, Houston.

CAP COM Apollo 8, this is Houston. Do you read?

SC That's affirmative.

CAP COM Okay, thank you. Were you reading all
along? This is the first time we've heard you call back.

SC Houston, we're reading you but we're
trying to hold the noise down so we can get some sleep.

CAP COM We'll be through with this in just a
minute, I think.

SC Roger. I will answer you but I'll try
to do it quietly.

CAP COM Okay, Bill.

CAP COM Okay, Apollo 8, next portion of the test
is like we did yesterday. We'll be changing the uplink mode
to uplink command and ranging with no upvoice. We'll be in
this mode for approximately 2 and 1/2 minutes and send two
test messages. During this time, we will not have uplink.
We are going into this mode at time 33:48:30 and we'll be
back in this configuration at 33:50:00. Over.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 334800, CST 4:40 113/1

CAPCOM At time 33 48 30, and we'll be back in
this configuration at 33 50, over.
CAPCOM Apollo 8, Houston, are you clear?
SC Clear Houston.
CAPCOM Okay, fine. How about telemetry input
PCM switch to low please?
SC You're in low, Houston.
CAPCOM Roger. Apollo 8, we've completed third
test; we're going into the final test now. PCM switch to
high please. Apollo 8, Houston, we're going to switch uplink
to the upvoice backup for about 2 minutes, and may take a
few seconds to link the transition. And we'll be back up at
33 56 in our normal mode to place the uptelemetry data switch
to upvoice backup at this time, over.
SC Roger.
CAPCOM Apollo 8, Houston on backup voice.
SC Loud and clear, Houston.
CAPCOM Okay, fine, thank you. Apollo 8, we're
still back up to telemetry data switch to data. Apollo 8,
Houston. Apollo 8, Houston. Stand by, guess we've got
85 foot site voice back now, the noise went away. Apollo 8,
Houston.
SC Go ahead, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 335900 CST 4:51p 114/1

SC Go ahead, Houston.

CAPCOM Okay. Apollo 8 that completes our COMM test. Thanks for your cooperation. I have a change here to a map sighting that will come up 3420. We want to change your star a little bit there. Are you ready to copy?

SC Ready to copy.

CAPCOM Okay Apollo 8. We would like to change and have sighting as follows: we would like to use star 26, that is 2 6, we would like to make it Earth-near horizon for 2 sets, 2 sets. Then we would like to take star 16 Earth far horizon 1 set. If star 26 near Earth horizon is not possible, star 16 Earth far horizon 1 set, and star 22 Earth far horizon, 1 set. Over.

SC Roger, Houston. Be advised the CMP is asleep and whatever you better put those off for awhile.

CAPCOM Okay. Stand by. Apollo 8. We can put this off. What we will probably need from you is some kind of an estimate of when you think somebody will be available to work on it, and we are working on how much lead time we need now.

SC Stand by 1. Houston, why don't you figure the CMP will sleep another couple of hours, then the LMP and then the CDR up to about 43 hours. Over.

CAPCOM Okay.

SC Then we will start off with the CMP again in about 44.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Okay. We can put off this map sighting. It was scheduled apparently for 420. We can put it off. Judging from your comments about sleeping, we would like to get to it as soon as we can. Right now our plans are to sight at 2 hours. We will do the P-52 by sighting it back to the same thing since it is associated with the P-23. So if that is a convenient time for you why we will plan on that.

SC We are doing the P-52 now. Do you want us to continue?

CAPCOM Well, as far as we are concerned that isn't going to help us any. We will have to do it over again anyhow.

SC Okay. What time did you want to do it?

CAPCOM Well, if you think that Jim is going to be up in a couple of hours why that will fly us two hours to 3620.

SC Okay. We will go ahead and make another one there and pick it up there.

CAPCOM Okay. That will be real fine. Thank you.

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 335900 CST 4:51p 114/2

SC What we are going to try to do is get
back on the sleep cycle to those sleep periods just prior
to LOI by taking shorter cycles for each man.

CAPCOM Real fine.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 340900 CST 5:01p 115/1

PAO This is Apollo Control at 34 hours
10 minutes. As you heard in that conversation with
commander Frank Borman we will be rescheduling part of the
flight plan activity in order to allow Jim Lovell to continue
sleeping. That is the mid-course activity scheduled to
occur between 34 and 35 hours in the flight plan. Current
plans are to move that back about 2 hours. Do it after
Lovell has had a chance to get some rest. Borman also advised
that following Lovell's sleep period, Anders would attempt
to get a few hours of rest. That he himself would try and
get some rest. At 34 hours 11 minutes into the flight this
is Apollo Control.

END OF TAPE

PAO This is Apollo Control at 34 hours 23 minutes. And the past few minutes we've been in conversation with the spacecraft. Frank Borman and Lunar Module Pilot Bill Anders and Bill advised that he was preparing to join Jim Lovell in getting a little bit of sleep, and Frank Borman advised that when one of the two wakes up a little later on, he'll try and get a few hours of rest, also. We'll play back the tape with that conversation and then continue to follow on any conversation live.

SC Houston, Apollo 8.

CAPCOM Apollo 8, go ahead.

SC How about giving us some react angles and we'll stay in react.

CAPCOM Say it again please.

SC Okay. Give us some react angles.

CAPCOM Wilco.

SC Say it again.

CAPCOM Apollo 8, Houston. I hadn't said anything at that time. We're digging some angles out for you now. In reference to your earlier question about the sleep cycle juggling et cetera, we agree with your comment. We would like to get back on the flight plan as far as the sleep cycles and so forth are concerned by the time we get into lunar orbit. So we'd like for you to use your own judgment about the most efficient way to accommodate the sleep cycles and proportion it up among yourselves. We would like to have you keep us informed about who's doing what and what your plans are. We have the 1P23 that we slipped 2 hours. We'd like to get the other one in. We can also adjust the time for the other P23 if it's going to conflict - I guess that's two more P23's. We can adjust the time for those if you'll let us know what your forecast is for when Jim will be available to take some sightings. So the big message is that we'd like to work around whatever your desires are. If you'll let us know, we'll pick some stars and some angles and have them ready for you.

SC Okay, Houston. The CMP will be up at 36:36 hours. The LMP is going to sleep now, and he'll sleep through until 40 and then I'll stagger that in and try to go to sleep around 30 to 37 so that by the time we get to day 3 we'll all be back on the same direct sleep cycle.

CAPCOM Okay, real fine. Thank you.

CAPCOM Apollo 8, Houston. React angles look like minus 45 in Pitch, plus 90 in Yaw, and 34 23 for the time.

SC Roger. Copy. This is good users react because it keeps the caution warning from going on.

CAPCOM Rog. I understand that. Are you leaving the high-gain antenna on after it swings over to the recut

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 342300, CST 5:15p, 116/2

CAPCOM position?
SC Do you have any reason for us to use the
high gain antenna?
SC Do you think we need that, really, very
much?
CAPCOM Stand by.
SC Why can we just not use the high gain
antenna for awhile? Getting high bit rate on the omni's
Okay, let's tell them then that we'll just not worry about
the omni for awhile. (Garble)
SC Houston, this is the LMP. Before I hit
the sack, could you give me a rundown on our systems the way
you see them?
CAPCOM Okay, we'll put that together for you
and we were just talking about the redundant ECS components
check and we were going to put that off until everybody's had
a chance to get some sleep. Trying to keep these men from
going to the left hand couch.
SC Oh, that would be nice. I sent Lovell
onto the couch, though. I've got one man sleeping under the
left couch here - right couch and one man sleeping on our
right couch.
CAPCOM Okay. I understand you've got one under
and one on the right couch.
SC Roger, that's affirmed.
CAPCOM Okay, and in reference to the omni versus
the high gain, it looks like we can live with the omni antennas
here for several more hours, if you would like to delete the
use of the high gain.
SC Okay. Good doing Houston.
CAPCOM Okay before you pitch your eyeballs there, we'd
like to terminate the battery charge.
SC I knew you guys would get me.
CAPCOM Got you.
SC Okay the battery charge is terminated at
37.3 volts.
CAPCOM Okay, thank you.
SC Standing by for your systems
status.
CAPCOM Okay, we'll pulling that together now.
SC How are the PU valve and SPS 9/10ths
looking?
CAPCOM Okay, I'll test that.
SC We just had (garble) I understand.
SC Systems look okay, Houston?
CAPCOM Okay, Apollo 8. All the systems look
real fine. You've got an RCS quad update on the quantity,
so you have that information. The SPS oxidizer feed line
temperature and the fuel temperature are both at 73 degrees.

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 342800, CST 5:15p, 116/3

CAPCOM The cryo profile is running right on the line. Battery A - our calculation have 39.63 amp hours, Battery B, 37.94, and Battery Charlie, 38.46. The comm continues to be running ahead of predictions in quality and circuit margins. Everything else looks like it's real fine.

SC Rog. Do you expect to have a low bit rate voice on the PMC of the omni's at Lunar distances?

CAPCOM That's negative on PMC of the omni's. Not looking forward to very much improvement.

SC Roger. We need about a 30-foot dish I figure, for that.

SC On the spacecraft.

CAPCOM It runs up the fuel required for PPC, though, Bill.

SC Rog.

PAO This is Apollo Control. There are no further communications with the spacecraft at this point, so we'll take the circuit down and stand by. At the present time, Apollo 8 is at an altitude of 130 368 nautical miles, and velocity is 4370 feet per second. This is Apollo Control at 34 hours 33 minutes into the mission.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 345700, CST 5:47 117/1

PAO This is Apollo Control at Houston at 34 hours 57 minutes into the flight of Apollo 8. Here in Mission Control Center, Flight Director Milton Windler has just held what he termed a midshift briefing bringing all the flight controllers here in the center up to date on the latest developments as they stand in respect to the overall performance of the spacecraft and the status of the crew. In general, Flight Director Windler noted that the crew feels much better and they have been advised to set their own pace as you probably heard in the air-to-ground commentary between the ground and the crew. Lovell is currently sleeping, and he went to sleep at about 34 hours and plans to sleep through until about 36 hours g.e.t. Bill Anders went to sleep about 20 minutes later, and we expect that he will be sleeping till about 40 hours ground elapse time. Frank Borman advised that he would like to try to get some sleep at about 37 hours ground elapse time about 2 hours from now. And we expect that he will probably sleep 4 or 5 hours. All of the spacecraft systems look good at this time. We've also got a preliminary evaluation of the onboard TV performance this afternoon. And perhaps an explanation on the problems the crew experienced with the telephoto lens. The feeling at this time is that perhaps the automatic light control device on the camera was in effect fooled by the bright disk of the Earth in the dark background overcompensating and washing out the picture. We're running some tests to determine if this information was in fact was the case and it maybe possible to correct this on future TV transmission with the use of proper filters. We do have a bit of brief communication with the spacecraft, with Frank Borman, and we'll play that back for you now and then stand by for any live conversations that develop in the meantime.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Okay, I know you're trying to be quiet so I'll just read up some information to you. One of the things that we just turned up that might give you some confidence, you lose oxygen cryo tank now. You have 80 pounds remaining now at CMSM sub. The limiting factor on single tank operation right now is the hydrogen tank which has a positive margin at CMSM sub, assuming our standard profile gives about 143 hours. So it looks like you over the hill on those. Notice that your flying in the rate 2 position for your B mags which is fine. Only make sure that you still were maintaining a PTC attitude. Looks like your pretty close to it.

SC Roger, we are flying PTC, and I was wondering why it was going out of the deadband, now I know, thank you.

CAPCOM Okay, thank you.

SC That's what happens when you let Anders fly. He's asleep so he can't defend himself.

CAPCOM Roger, but we've got it on tape though.

SC Good. They're both conked out, how about just filling me in on some news, and I'll keep quiet just to give me some words on what's going on in the world.

CAPCOM Okay, give me a few minutes to collect some data, and we'll do that.

SC Houston, Apollo 8, how do you read?

CAPCOM Loud and clear, Apollo 8. Hadn't forgotten you just -

PAO This is Apollo Control, we'll continue to stand by for any conversation with Frank Borman aboard the spacecraft. In the meantime, we would also like to perhaps clarify some figures we gave earlier concerning the point at which the spacecraft comes under the dominant influence of the Moon gravity and begins accelerating toward the Moon. Now that figure we gave you was a time of ground elapse time of 55 hours 38 minutes. At that point the spacecraft velocity, this is inertial velocity, the - with respect to the Earth - is about 3261 feet per second. And this occurs at an attitude from the Earth of 176 271 nautical miles. At this point, the point at which the spacecraft passes into the lunar sphere of influence, gravitational influence, here in Mission Control Center will shift our reference point for measuring spacecraft velocity and will no longer be measuring it with respect to the earth, but will begin measuring it with respect to the Moon. At this point 55 hours 38 minutes ground elapse time, the Earth reference velocity will be 3261 feet per second, and by comparison in reference to the moon it will be 3980 feet per second. To give you some indication of what continues to happen to the velocity then as we progress toward the Moon, the speed of the spacecraft with respect to the Earth will reach a minimum point some 65 hours into the flight when we're about 11 000 nautical miles above the Moon. At this point, the velocity will be 3 083 feet per second with respect to the Earth; with respect to the Moon, and this will be the figure that we'll be using in Mission Control Center, the velocity at that point 65 hours into the flight or 11 000 nautical miles from the Moon, the spacecraft velocity is projected to be about 4353 feet per second, 4350, and it will accelerate rapidly from that point for the next 4 hours until we reach the point of lunar orbit insertion. That nominally is set to occur at this time at about 69 hours 11 minutes. And for that 4 hour period of time, the velocity will increase from 4350 feet per second to about 8420 feet per second. And

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 345700, CST 5:47 117/3

then as we go into orbit about the Moon, that will reduce the velocity by slightly under 3000 feet per second taking it down to about 5300 feet per second. Coming back again the same thing will apply in reverse. We'll follow the spacecraft velocity with respect to the Moon until the Earth becomes the dominant force, gravitational force acting upon the spacecraft. And then at that point we will transfer back to an Earth reference system. At the present time Apollo 8 is at an altitude of 131 843 nautical miles, and we're traveling at a velocity of 4327 feet per second. At 35 hours 5 minutes into the flight, this is Apollo Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 352800, CST 6:20P, 119/1

SC Houston, Apollo 8, are you reading?
CAP COM Loud and clear, Apollo 8. I'm going to
have a maneuver pad and -
SC Houston, Apollo 8, are you reading?
CAP COM I read you loud and clear, Apollo 8.
CAP COM Apollo 8, Houston.
SC Houston, Apollo 8, Houston, Apollo 8,
how do you read?
CAP COM Apollo 8, loud and clear.
SC Hello Houston, Apollo 8, go ahead.
CAP COM Apollo 8, Houston. I'm afraid we've
lost our uplink. I'm transmitting in the blind. Read you
loud and clear.
SC Houston, Apollo 8. Houston, Apollo 8,
how do you read?
CAP COM Apollo 8, Houston, read you loud and
clear. We may have some uplink problems. Transmitting in
the blind, at this time. Over
CAP COM Apollo 8, Houston. Apollo 8, Houston.
Apollo 8, Houston.
HAW Hawaii Network GOSS Conference, how do
you read?
SC Houston, how do you read Apollo 8?
CAP COM Apollo 8, I read you loud and clear.
How me?
SC Houston, Apollo 8. How do you read?
CAP COM Apollo 8, Houston, over.
SC Go ahead, Hawaii, Apollo 8, how do you
read?
CAP COM Apollo 8, Houston. Read you loud and
clear.
SC Okay, thank you, Hawaii. How do you
read?

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 353700, CST 6:30p, 120/1

PAO This is Apollo Control in Houston at 35 hours 37 minutes. We have reestablished our communications from the ground up to the spacecraft directly from Houston, and preliminary assessment one the problems is that it originated at the Goddard Space Flight Center where all of communications are routed through on route to Houston. Apparently we blew a fuse at Goddard and our communications circuit between Goddard and Hawaii was down. We were able to receive the spacecraft communications loud and clear here in Houston, and we were able to relay information through the station at Hawaii through the maintenance and operations people at Hawaii to the spacecraft. The link between Houston and Hawaii was restored after about 20 minutes and we're now in conversation with the spacecraft. We'll pick up that conversation for you and then follow it as it occurs.

CAPCOM Apollo 8, Houston.

SC Go ahead Houston, Apollo 8.

CAPCOM Okay, we got back together again.

You're loud and clear. We've been reading you. We have a problem down here on the ground getting our signal from MCC at remote site.

SC Roger. I understand.

CAPCOM Apollo 8, Houston. I've got a ball score for you. It was Oakland 41-Kansas City 6. That was the final score. It was 41 to 6 Oakland. We're trying to get some news releases over here for you. I suspect we're going to find that the staged TV show was probably the biggest news of the day.

SC Say, that's the greatest. I'm sorry that the TV vamps broke down.

CAPCOM Well, we're working on that some more. I'm not sure that the whole thing is lost yet. It appears that our problem is one where the light intensory which is sensed by our light meter in there is picking up an average field which is much larger than the Earth, and so it's something of a great deal of deep space environment which is dark and we're suspicious of this is probably opening up the lens aperture as wide as it will go, and then when you point the camera at the Earth while the Earth is only filling about 3 degrees of cone angle, whereas lens takes in 9. So it looks like you're probably just saturating the tube. Now we're pondering around now with some -

SC We just lost you again, Houston.

CAPCOM Say again.

SC I just lost your last transmission, you weren't clear (garble)

CAPCOM Okay. Did you get any of my comments about the TV, too.

SC Rog. I got them.

CAPCOM Okay. What I - what we've got in mind

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 353700 CST 6:30p 120/2

here is that we are looking at some of the lenses you have onboard for cameras, and we are going to see if one of them can possibly be used to attenuate some of this light so that you will be able to take one of these pictures. We are running some tests now, and we will let you know about those. I also have a maneuver PAD that I need to read up to you whenever it is convenient.

SC Let me get a pencil, it will be fine right now.

CAPCOM Okay.

SC Go ahead Houston.

CAPCOM Okay. The first one I will give you is a TLI plus 44 maneuver PAD. I will start reading down the left hand column. TLI plus 44, SPS G&N 62970 minus 162 plus 129046560431 plus 00197 plus all zeros, plus 60701180133001 November alpha plus 002036070170460451121375349 far sight star is Earth down 037 right 22 plus 1068 minus 1650012856361180982717. The PDC alignment stars the primary star is Sirius, secondary Rigel 010 294 320 no ullage path return P-37 Delta-V 87 50. This goes to the Indian Ocean and requires a high-speed procedure. That is minus Mike Alpha and that will refer to your check list page November Charlie 1. Over.

SC Okay. How do you read us?

CAPCOM Loud and clear.

SC TLI plus 44 SPS G&N 62970 minus 162 plus 129046560431 plus 00197 plus all zeros plus 60701180133001 plus 00203 plus 6070170460451121375349 Earth down 037 right 2.2 plus 1068 minus 16512856361180982717 Sirius and Regil . Hello Houston, How do you read now?

CAPCOM Loud and clear

SC Sirius and Rigel 010 294 320 no ullage path return P-37 Delta-V 87 50. Indian Ocean

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 354700, CST 6:40P, 121/1

SC Houston, how do you read now?
CAP COM Loud and clear.
SC Sirius and Rigel, 010 294 320, no
ullage. Past return P-37 delta V 8750. Indian Ocean
minus 70, check list in state 1.
CAPCOM That's affirmative, Apollo 8. And I
have a flyby path for you also.
SC Go ahead.
CAPCOM Okay, in this flyby path is an update to
one that we gave you yesterday so you might want to note that
this is the second one. And it will be a flyby SPS G&N.
62970 minus 162 plus 129, 060 59, 4807 plus 00966 plus 00552
minus 02079, Roll, pitch, and yaw are all zeros. November
Alpha, perigee height plus 00202 02358 022 02281 030407 317
013 up 047 right 39 plus 1418 minus 16505, 12904, 36160,
1462912. Primary star Sirius, secondary Rigel, 136 310 340.
No ullage. Requires realignment to preferred REFSMMAT.
This burn will raise perilune to 550 miles. Over.
SC Okay, Houston. The second flyby SPS G&N.
Are you with me?
CAPCOM Yes sir.
SC 62970 minus 162 plus 129 06059 4807 plus
00966 plus 00552 minus 02079. Next three are all zeros.
NA plus 00202 02358 022 02281 03 0407 317 013 up 04.7 right
3.9 plus 1418 minus 16505 plus 12904 plus 36160 1462912.
Sirius, Rigel, 136 310 340. No ullage. Requires realignment
to preferred REFSMATT. Peri lifted to 550 miles.
CAPCOM That's correct, Apollo 8.
SC Thank you.
SC Houston, Apollo 8.
CAPCOM Go ahead, Apollo 8.
SC Okay. The CMP is now up so I will
proceed with the 52 option and turn on the cislunar navigation
CAPCOM Okay, thank you. We'll start looking
for some star data.
SC For the low bit rate.
CAPCOM Apollo 8, Houston.
SC Go ahead, Houston, Apollo 8.
CAPCOM Okay, when you pick up your activities,
I have a preferred alignment here that I want you to be in
when you do your P-52 and I'll have about four items to
change on your timelines so if you'll give me a call when
you're ready for it.
SC We're ready right now. We were doing
the P-52. You want to hold off and go to a particular
alignment, is that right?

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 35:47:00, CST 6:40P, 121/2

CAPCOM Affirmative.

SC All right, I'm ready.

CAPCOM Okay, the attitude is pitch 23.4, roll 184.7, yaw 14.3. And the reason we're doing the alignment in this attitude is the next thing we'll be coming up with is the scanning telescope visibility test and that will be 70 degrees Sun and Arcturus with a shaft and trunnion of zero. And then we can go ahead with the P-52 and then a trunnion bias followed by P-23 with the same stars we read to you before.

SC Okay.

SC Houston, Apollo 8. We're maneuvering to the angles you gave us.

CAPCOM All right. Affirmative.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 360000, CST 6:53 122/1

PAO This is Apollo Control. We don't appear to have anymore communications developing between the ground and the spacecraft at this time. During that previous conversation part of the information that was passed up to the crew from the ground were routine updates to the backup information that is carried onboard the spacecraft to allow the crew to return to Earth at various points in the flight should it become necessary, and should at that point not be able to get updated information from the ground. This includes returns at 25 hours after, rather 35 hours after translunar injection, another point at which we pass up this so called block data. As for 44 hours after translunar injection, and the crew has also been updated with the information they would need if they elected not to go in orbit around the Moon, but rather to do a flyby. This type of information passed up routinely at certain specified periods during flight. At 36 hours 4 minutes into the mission, Apollo 8 is now at an altitude of 134 264 nautical miles from Earth, and the velocity is 4258 feet per second.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 362300, CST 7:15 123/1

PAO This is Apollo Control, Houston, at 36 hours 23 minutes into the flight. Apollo 8 at this time is at a distance from the Earth of 134 rather 135 042 nautical miles, and the current velocity is 4236 feet per second. Jim Lovell who had been asleep for what appears to have been about 2 hours is now up, and we've heard from him aboard the spacecraft. At the present time Lovell is involved in some midcourse navigation using the onboard Guidance and Navigation system. We have some of his comments made during the past few minutes of conversation made with the ground on tape which we'll play back for you now, and then we'll stand by for any live communication with the spacecraft that follows.

SC First control came there 20 seconds, 2 m. Houston, we've reached the perferred attitude, and we're proceeding with the P52.

CAPCOM Okay, real fine, and pass up some advise from your friendly Flight Surgeon, he says you're supposed to take one more Ramtil.

SC Is that everybody or just me?

CAPCOM Just Frank.

SC Houston, P52 is completed, and we're ready for your other data.

CAPCOM Okay, understand that you've done the P52. The next item on the flight plan should be a scanning telescope visibility test, and this is the same one that was one your flight plan previously at 34 hours and about 12 minutes, and we'll be checking that 70 degrees sun Arcturus. Following that we need to make a trunnion bias check, and then we'll go into a P23, and I can read you those star numbers and sets if you don't have them from the last time I read them up.

SC Stand by. Houston, Apollo 8.

CAPCOM Go ahead.

SC With such good visibility, such good communications, we'll just give you a verbal description without using the scanning telescope right now. Your angles for maneuvering for Arcturus were quite good. The guide on Arcturus is better than the scanning telescope. At this sun angle there is a shaft of light directly across the center of the scanning telescope, and it's a band of light. It precludes seeing a lot of stars around us, and although I kept my eye glued to the telescope for some times, it's very difficult to see any star patterns or anything. I couldn't recognize that with Arcturus unless I - the objects just drove me there. Now because I'm near zero shaft and zero trunnion, I'm getting quite a bit of shaft movement. Every-time the shaft moves more particles leave the optics, and

they're just as bright as surrounding stars. And they make appearance of stars, and you can't tell star patterns or constellations. With this particular attitude, the shaft excludes any identification of constellations or individual stars.

CAPCOM Okay, copy that. Can you tell us something about the orientation of this band. You mentioned that last night that you also had a band about 10 degrees wide that ran across. Is there no orientation that we can tie that to.

SC I believe so. This band is parallel to the M-line. And I think it has something to do with the design of the optics where we have that shaft or the rectangular entrance of the optics from the outside. This particular sun angle is runs right across. Now I noticed that both the Earth and the sun do this to the scanning telescope. In the sextant, the same light band is there, although it covers the entire sextant's field of view. However, the magnification brings out the stars quite well, and it is possible to mark on them. But the identification of the stars with the scanning telescope makes it very difficult. Now the attitude that I found the optics are best at, are the attitudes which give the constellations Gienah Major and Orion in the scanning telescope. At this particular attitude of the spacecraft the band is gone; we're at a position where by the sun is behind us, and I can see quite a few stars. Now yesterday I could also after getting dark adapted see quite a few stars around the constellation Capella which at first I couldn't. Right now this band includes what I can see all except Arcturus which of course I know we're aiming at right now.

CAPCOM Okay, thank you very much.

SC What stars did you want to use? Did you want to read them off.

CAPCOM Okay, first star will be 26, and we'll be making two sets of measurements, Earth near horizon using star 26. Then we would like to have one set on star 16, that's 16 using the Earth far horizon. It turns out that star 26 Earth near horizon is not possible, then we'd like to have star 16 on the Earth far horizon one set, and star 22 Earth far horizon one set, over.

SC You want star 26, Earth near horizon, two sets; star 16, Earth far horizon, one set; and star 22, Earth far horizon one set.

CAPCOM Okay, that's star 22 only in the event that 26 is on the Earth's near horizon is not possible, over.

SC We won't even do star 22 then unless we can't get star 26 on the near horizon.

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CAPCOM That's affirmative.

SC Com sure is good all of a sudden, isn't
it?

CAPCOM Yes, this is outstanding.

PAO This is Apollo Control. It appears we will
have no further communication with the crew for the moment
anyway. Shortly we would expect that Frank Borman would
attempt -

END OF TAPE

APOLLO 8 MISSION COMMENTARY,12/22/68,GET 363230,CST 7:25P,124/1

PAO . . . would attempt to get a few hours rest. He indicated earlier that as soon as either Lovell or Anders awoke that he would attempt to get several hours of sleep. At the present time, Apollo 8 is at an altitude of 135,442 nautical miles and our velocity is 4225 feet per second. This is Apollo Control at 36 hours 33 minutes into the flight.

END OF TAPE

PAO This is Apollo Control at 36 hours 55 minutes into the flight of Apollo 8. At present time we are in communication with the spacecraft. Jim Lovell is the only one of the three crewmen who is awake at the present time. Indications at this time are that both Frank Borman and Bill Anders are resting. And here in Mission Control Center as well as onboard the spacecraft, activities have slowed down somewhat and it has become quite quiet here. At the present time, Lovell has just finished a series of star sightings for onboard navigation. And we are in the process of passing up some pad data to the crew. We will pick up with the first part of this conversation recorded and then when we will catch up, we will continue on live.

SC Houston. Apollo 8.
CAP COM Go ahead, Apollo 8.
SC Okay, we have completed two sets on 26 and one set on 16.
CAP COM Roger. Getting pretty speedy there.
SC Jim is getting to know the objects.
SC Are you receiving the data, Houston?
CAP COM Affirmative.
SC Okay.
CAP COM Keeping you on it.
SC That's right.
CAP COM Okay, Apollo 8. We have looked at the data and it looks good and feel like you can go back to PTC attitude anytime you are ready to. And if you can - go ahead.
SC What attitude did you use? The same one?
CAP COM That's affirmative. Okay, if you can reach over Bill there and get to panel 3.1 believe we would like to cycle the oxygen fans. And also like to get the biomed switch over to CMP.
SC Okay.
CAP COM If you have to bother Bill, to do that why we can hold off on the cryo fans.
SC No, he moved. We already chased him under the seat. Okay, now you want just the oxygen fans on?
CAP COM That's affirm. Turn one on for about 2 minutes and when we turn it off, then we will turn the next one on. We don't want to turn them on simultaneously though.
SC I know that. I mean you don't want hydrogen though?

CAP COM That's affirmative. Just the oxygen.
CAP COM Go ahead.
SC Ken, just to be careful, I would like some explanation on your maneuver path, something which I'm really not knowledgeable about, the way it was presented to us, Jim mentioned fast return P37 Delta V of 8750, just briefly clarify that, will you please?
CAP COM Okay, stand by.
SC Can you give us a little report on how our trajectory looks and the tracking is going and things like that?
CAP COM Okay, sure will. I will put a summary together here.
SC The pericynthian sign
CAP COM Rog. We will get all that together for you in just a few minutes.
SC And we never did get the news.
CAP COM You are the news.
SC (garbled)
SC Okay, the fans have been cycled 2 minutes each and they are back off.
CAP COM Okay, thank you very much.
SC Houston, Apollo 8 is back in the PTC attitude, reads MHPTZ.
CAP COM Okay, thank you. And in reference to your question about the P37 Delta V, 8750, that's the number that goes into option at P37 for your minimum time return. That gives you a target for the Indian Ocean. And in this case, we are going to have use the high-speed procedures that we worked out for you to use some minus number for the major axis.
SC Roger. Understand. I'm going to give that a try, Ken, in a run through. I tried it yesterday. I wasn't getting too much in the way of results. I will give it a try today.
CAP COM Okay. And on the - your tracking that we have now, it still looks like the time we gave you last night for time of pericynthian is still good, 59 plus 10 and right now your fly by earth pericythian altitude is 65.8. Looks like the midcourse number 3 is going to be something less than 1 foot per second. and all trajectory parameters are still holding real fine.
SC That's the things we like to hear. We would like to keep those holding very much.
CAP COM Roger.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 371000, CST 8:01P, 126/1

PAO This is Apollo Control. There appears to be no further conversation with the crew, at this time, so we will take the circuit down for the time being. At the present, the mission appears to be going very well. Right on the flight plan, in most cases, and our crewmen reported earlier that they were feeling much better. A short while ago, the medics advised Frank Borman to take one additional lomital tablet. This is a pill to reduce bowel activity. We've heard no word from the crewmen of any physical problems they're having and the feeling here on the ground is that their condition is improving. We're at a quiet period in the flight plan. Frank Borman had indicated earlier that he planned to get some sleep beginning at about 37 hours ground elapsed time. We heard from him at the beginning of the last transmission and deduced from that that he had still not, at that time, gone to sleep. However, it has been quiet now for sometime so perhaps he is getting some rest, at this point. At the present time, Apollo 8 is 137 127 nautical miles from Earth and is traveling at a speed of 4178 feet per second. At 37 hours 14 minutes into the flight, this is Apollo Control.

END OF TAPE

HOUSTON Hawaii, Houston GOSS Conference, How
do you read?
HAW Network voice, Standby okay.
HOUSTON Hawaii, Houston on GOSS Conference.
Hawaii, Houston Network, GOSS Conference.
HAW Houston, Network, Hawaii NET 2.
HOUSTON Hawaii, Houston on GOSS Conference,
How do you read?
HAW Houston Network, Hawaii.
HOUSTON Hawaii, this is Houston, am I on your
GOSS Conference now?
HAW I'm reading you on our NET 2 line.
HOUSTON Okay, that's good. At the present time
NET 2 is being utilized for GOSS Conference.
HOUSTON Hawaii, Houston. GOSS Net 2. Hawaii,
Houston, NET 2.
HAW Houston, Hawaii, NET 2.
HOUSTON Hawaii, take your carrier down.
HAW Roger.
HAW Hawaii, unable to come in. Carrier down.
HOUSTON Hawaii Network.
HAW Network, Hawaii.
HOUSTON Roger, Leave your carrier up.
HAW Roger, we'll have to bring it up again.
HOUSTON Okay.
HAW AOS
HOUSTON Hawaii, go for command, CSM.
HAW Roger.
HOUSTON Hawaii, do you have your NET 2 patched
in to key to ours.
HAW Roger.
HOUSTON Okay.
HAW Hawaii, LOS, unable to find.
CAPCOM Apollo 8, Houston. Apollo 8, Houston.
CAPCOM Hawaii, this is Houston, CAP COM, over.
HAW This is CAP COM, Hawaii, over.
CAPCOM Hawaii, Houston CAP COM. I would like to
have a voice check.
HAW Roger, I read you loud and clear.
CAPCOM Okay, I'm reading you loud and clear.
I understand you have contact with the spacecraft. Is that
affirmative?
HAW I have uplink voice to the spacecraft,
the downlink is too low in the mud.
CAPCOM Okay, understand that you have good up-
link, but your downlink is in the mud. You don't have any
way of copying it either, is that correct?

APOLLO 8 MISSION COMMENTARY, 12/22/68, CST 7:00p 127/2

HAW That is affirmative.
CAPCOM Okay, Hawaii, we can hear Apollo 8 calling
down. Would you answer and tell them that we did copy that.
HAW Roger.
HAW Apollo 8, ... Houston reports they copied
your last.
SC Okay, Thank You.
CAP COM Apollo 8, Houston. Over.
HAW Hawaii, Houston Network, GOSS Conference.
HAW Hawaii, Houston Network, GOSS Conference.
Your NET 2
HOUSTON Houston Network, Hawaii.
HAW Roger. Did you copy the CAP COM?
HOUSTON Affirm. We copied the CAP COM.
HAW Is he keying the transmitters out there?
HOUSTON He did key it one time Network.
HAW Okay. I'm going to ask him to call the
spacecraft again and I would like for you to give me a re-
port if he does not key the transmitters.
HOUSTON Roger, Network is NET 1
HAW Your NET 2 is conference to our GOSS
conference here.
HOUSTON Roger, How about our GOSS conference loop.
HAW Your GOSS conference loop is dead.
HOUSTON Roger, we are Go for command. We were
unable to count that before.
haw Understand.
HOUSTON We transmitted to the spacecraft as per
CAPCOM and they acknowledged our transmission.
CAPCOM Hawaii, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, CET 373200, CST 8:32P, 128/1

PAO This is Apollo Control Houston at 37 hours 42 minutes into the flight of Apollo 8. At this time, the spacecraft is 138,226 nautical miles from the Earth and traveling at a speed of 4148 feet per second. It's continued to be relatively quiet here in Mission Control and the flight plan also shows relatively little activity onboard the spacecraft for the crewmen. Both Frank Borman and Bill Anders are scheduled to be sleeping at this time. The crew is following the ground advice that was passed up earlier from Mission Control Center that they pace themselves and set their own work/sleep cycle to fit in with their own feelings and they appear to be following that advice. We do have some communication with the spacecraft over the past 15 or 20 minutes. We'll play that back for you now and then stand by for any live conversation with the spacecraft.

SC Houston, Apollo 8.

CAPCOM Go ahead.

SC Roger, we're getting near - we're going to need to dump urine overboard here. I wonder if that's going to fire your trajectory up. Or can we go ahead and do it?

CAPCOM No, that's okay. Something that is kind of interesting though is that the last time you had your water dump, they noticed a change in the trajectory tracking at the same time and they got through correlating it, they found some fellow that thought he knew the characteristics of a nozzle and how much water you're dumping and his estimates of the effect on the trajectory seemed to coincide with the tracked results. So I guess you have to stay on to some of those things.

SC Rog. Okay, we'll go ahead and dump it.

CAPCOM Okay.

SC Houston, Apollo 8.

CAPCOM Rog, go ahead.

SC You planning on using our computer any time in the near future, I thought I'd do a little P-37.

CAPCOM Apollo 8, Houston. You can go ahead and run that 37 and we'll going to kind of watch that from the ground, , too, and see how it works out. A couple of items that are just of general interest in the trajectory world. Looks like the uncertainty and position was about 12 miles. Your uncertainty in velocity is about a quarter of a foot per second. And the perigee altitude of uncertainty is 5 miles.

SC Rog. Understand. Just for information, perhaps you read it out on the ground. I ran our perigee altitude determination. First of all, P-21, the star state vector that we navigated with, we have plus 84.7 mile altitude and then we ran out your state vector that you

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 374200, CST 8:32P, 128/2

updated with us the last time. We got 64.2 and then I ran P-30, using our state vector and got 82.6 nautical miles. These are all plus.

CAPCOM That's good.

SC What I'm going to attempt to do on P-37 is to input your delta V on your TMI plus 44 and use that 44 burn time. Notice that the velocity is a little high. We might not be able to do a normal P-37 but we'll give it a try.

SC Houston, one more question then before I start. Did you notice on this last update PAD, this minus MANZ 1. Was that referring to the P-37 fast return or the nominal maneuver which you gave me?

CAPCOM Apollo 8, that's referring to the fast return procedures.

SC Okay.

SC Houston, Apollo 8.

CAPCOM Go ahead.

SC Are you following my procedure?

CAPCOM That's affirmative.

SC Okay, this happened yesterday, too. I'm trying to load the delta V you gave us in the maneuver G alignment 44. It's in P-37, but I keep getting an operator error everytime I try to load zeros for the termination for the middle and corner. Do you know what I'm doing wrong in that position?

CAPCOM Okay, stand by.

CAPCOM Apollo 8, Houston.

SC Okay, go ahead. I can take it.

CAPCOM Okay, looks like the decimal point in R2 under NOUN 60 is on the extreme right-hand side so the proper load will be 06070. Over.

SC Ah, so! Okay, fine. Thank you. I'll update my checklist. Don't know what I want to update it for, I can't read.

END OF TAPE

PAO This is Apollo Control Houston at 38 hours 6 minutes into the flight of Apollo 8. At the present time the spacecraft is 139 151 nautical miles from Earth and traveling at a speed of 4122 feet per second. In the last few minutes we had a conversation with Jim Lovell aboard the spacecraft. Lovell gave us another of the periodic updates that he has been passing down on the optic system used in conjunction with the onboard guidance and navigation equipment. Lovell again noted, as he has in the past, that he is getting a bank of light through the field of view of his scanning telescope. This is a multiple use device. One of the uses that the crew would make of it is to locate and identify a particular constellation that they would be looking at through the sextant which is a 28 power device, giving them much greater magnification. The sextant would be pointing at a particular star in a constellation. The use of the scanning telescope is to identify the constellation that the sextant star is located in and then confirm that they are in fact on the proper star. It has been our observation here on the ground that the crew has been able to carry out the required sighting maneuvers, but Lovell has on occasions remarked that there appears to be some light scattering back into the field of view of the scanning telescope and obscuring part of his visibility. We will play back the tape of his comments on that particular situation and then stand by for any live communication with the spacecraft.

CAPCOM Apollo 8, Houston. We are about to hand over to another site so you may lose lock momentarily.

SC Roger, Houston. Did you receive the results of the P-37?

CAPCOM Sure did. Looks pretty good here.

SC I concur.

CAPCOM Apollo 8, Houston through Honeysuckle. The switch is completed.

SC You are loud and clear.

CAPCOM Roger.

SC Houston, Apollo 8.

CAPCOM Go ahead.

SC I have a comment on the optics we're in PTC right now. We are passing the -- we have the roll of about 182 with about 226 pitch ... I can rotate the shaft all the way around at this particular attitude. I have kept this band of light at about 10 degrees the other side of the M line. It varies in intensity with the shaft position. However it is there with this particular attitude.

CAPCOM Okay. Thank you. Jim we have just been looking at your mark with respect to accuracy and they figure they are within a couple of thousandths of a degree

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 380600 CST 8:57p 129/2

of the theoretical optimum. The integrater seems to bear that out.

SC Well i hope that they are enough to get us home if we have to use them.

CAPCOM Well, I am getting a lot of confidence in your ability to run that mystery show now.

SC Hey, Jim, we have to spend four more days up here with him, will you take it easy. He is already talking about going back to MIT as a professor.

CAPCOM HAHAHAHA.

END OF TAPE

PAO This is Apollo Control Houston. At 38 hours 41 minutes into the flight of Apollo 8. We have had no communications with the crew in the past 20 minutes since our previous announcement. At the present time, Apollo 8 is in an altitude of 140,600 nautical miles, traveling at a speed of 4,083 feet per second. We continue to have a very quiet period, both here in Mission Control Center and on the flight plan. We have gotten a call from the spacecraft and we will pick that up now.

CAP COM You sure do sound wide awake.

SC hello Houston. Apollo 8. How do you read?

CAP COM Apollo 8. Houston. We read you loud and clear. How me?

GOSS COMPASS Honeysuckle network. Goss Compass. How do you read?

SC Houston, this is Apollo 8. How do you read?

CAP COM Loud and clear, Apollo 8.

GOSS COMPASS Go ahead Honeysuckle, how do you read?

GOSS COMPASS Well, I would like to say hello to all of you in Australia. How is everything down there? Pretty good so far. Thank you.

GOSS COMPASS Honeysuckle, Houston Network, on Goss Compass. How do you read?

HONEYSUCKLE Network, this is Honeysuckle reading at 5 5.

GOSS COMPASS Roger.

CAP COM Apollo 8. Houston. Apollo 8. Houston. Apollo 8. Houston. Over.

PAO This is Apollo Control. We are apparently having some problems with direct communication from Houston to the spacecraft. We are reading them loud and clear. But at the present time we are having to relay information through the Honeysuckle maintenance operation personnel to the spacecraft and we are checking into the lines between here and Honeysuckle, Australia to determine just where the problem lays.

SC Hey, if you all start having ground switching problems, how about having some place that has comm come in and tell us about it. Will you please?

CAP COM Roger. Apollo 8. That's what we have been trying to do. Some of our problem seems to be getting from here to that thing.

SC Houston. Apollo 8. How do you read?

CAP COM Apollo 8. Houston, loud and clear. How me?

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 384100, CST 10:33p 130/2

SC Houston. Apollo 8.
CAP COM Apollo 8. Houston. Read you loud and
clear. (pause) Apollo 8. Houston.
SC Roger. Go ahead Houston. Apollo 8.
CAP COM Roger. We read you loud and clear and
copy your remarks about having our remote site talk to you.
Some of our problem has been in going from MCC to the remote
site. We will attempt to do that any time we can.
SC That's right. I just thought you were
having problems.
CAP COM Roger.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 385300, CST 10:45 131/1

PAO This is Apollo Control. Having reestablished two-way communication with the spacecraft, it appears that we won't hear anymore from the crew at least for the time being. We did hear from Frank Borman at the time that indicates that he is no longer resting, at least is not asleep. Frank had indicated earlier that he would attempt to get some rest beginning in about 37 hours ground elapse time, and we heard from here they're at about 38 hours 45 minutes into the flight. We do not have an evaluation as to what the problem was with the uplink. The problem appeared to lie between Houston and the site at Honeysuckle. We were able to relay messages from Honeysuckle to the spacecraft, but we were not able to talk directly with the spacecraft from Houston. That problem as we timed here began 38 hours 42 minutes, and we had calm reestablished at about 38 hours 48 minutes about 6 minutes after the call was first put in. At the present time Apollo 8 is at an altitude of 141 197 nautical miles, and it's velocity is 4067 feet per second. I believe Cap Com Ken Mattingly is preparing to put in another call to the crew. We'll stand by briefly for that.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 391000, CST 10:00 132/1

PAO This is Apollo Control at Houston 39 hours 10 minutes into the flight of Apollo 8. We've had no further communications with the crew since our previous report, and we do have a preliminary report on the cause of our communication problem through Honeysuckle. And it appears that the problem was with a control monitor panel at the Honeysuckle, Australia site. The exact nature of the problem with this piece of electronic equipment is not known at this time. It is associated with the unified S-band system at Honeysuckle. The problem as we said occurred at about 38 hours 42 minutes ground elapse time and was corrected some 6 minutes later. And it's effect was to prevent direct communications from Houston to the spacecraft; it did not effect communications from the spacecraft to Houston. And we were able to relay information to the crew through the maintenance and operation people at Honeysuckle. At the present time here in Mission Control, we are going through a change in shift. Flight Director Glenn Lunney and his black team of flight controllers are coming to replace Milton Windler. Gerald Carr will be the Astronaut Capsule Communicator replacing Astronaut Tom Mattingly. And at the present time the shift going off is briefing the oncoming shift on activities during the shift that is concluding at this time. At the present time Apollo 8 is at an altitude of 141 777 nautical miles, and the velocity continuing to drop down slowly, now down to 4052 feet per second. At 39 hours 12 minutes into the flight this is Apollo Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 394315, CST 10:34 133/1

PAO This is Apollo Control, Houston, 39 hours 43 minutes 15 second now into the flight, Apollo 8. The Apollo 8 spacecraft at the present time is at an altitude of 143 023 nautical miles; our current velocity reading 4019.1 feet per second. As had been previously reported, we were undergoing a change of shift briefing. We have change of shift here in Mission Control, I should say, we have done that. The Glenn Lunney team of black team of controllers is now on duty. Glenn's first action as he took over was to bring up each member of his flight control team with an amber light, and had them give to him a status report on how we look. And at the present time we look very good. The spacecraft systems all look good at this time. Our current spacecraft weight reading is 62 970 pounds. The communications problem briefly that developed toward the later part of the earlier shift of flight controllers had been isolated to be in the control monitor panel in the Honeysuckle tracking station, and was further isolated to be a relay in that panel. We had one brief transmission with the crew since the black team has been aboard, and we'll play that for you now.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET: 395300, CST: 10:45p 134/1

PAO Apollo Control Houston. 39 hours
53 minutes. This is brief clarify - clarifying report on
last transmission. The conversation between the spacecraft
Apollo 8, and Capsule Communicator, Jerry Carr, can perhaps
be best identified by its brevity. Apparently it did not
get recorded on tape, only some 8 seconds in length. However
this transmission was strictly an acknowledgment of communica-
tions between the spacecraft and the ground. We thought you
should know that - that this time since it apparently did
not play with our previous announcement. So at 39 hours
54 minutes, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 401100, CST 11:02, 135/1

PAO This is Apollo Control Houston at 40 hours 11 minutes now into the flight of Apollo 8. The Apollo 8 spacecraft is now 144 094 nautical miles in altitude. Our current velocity is 3991.2 feet per second. Jerry Carr, the capsule communicator here in Mission Control, has just had a rather long chatty conversation with spacecraft commander Frank Borman, in which, among other things, he passed on a bit of news and some ball scores and told Colonel Borman of the release of the 82 crewmen from the Pueblo today. As a matter of fact, they're still talking a bit here and we'll pick up that conversation now.

CAPCOM Right now, on the wires, is that all 82 crewmen of the Pueblo have been returned. They walked across the Bridge of Freedom Monday night.

SC Wonderful!

CAPCOM Said it took about 30 minutes for all 82 men to come across the bridge of no return and that's the one separating North and South Korea. They started across about 11:30 AM and were over by about noon and they brought the body of the crewman that was killed, also.

CAPCOM Okay, Frank, on ball scores, did you get the word on the Baltimore and Minnesota game today?

SC Not the final one.

CAPCOM Okay, final score was the Colts 24, Vikings 14. That gives them the western conference so it looks like for the NFL title, it's gonna be the Browns versus the Colts on the 29th.

SC 29th?

CAPCOM Rog, slow return - you'll get it.

SC Say again.

CAPCOM Roger, come back slow return and we'll get it.

SC I'd rather come back fast and watch it on television.

CAPCOM Atta boy!. Let's see, for the AFL, the big game today was Oakland and Kansas City and Oakland dumped them 41 to 6, so it's looks the AFL title game will be the Raiders and Jets.

SC Righto, that's hard to believe, that score.

CAPCOM Amen! Okay, in yesterday's game, I don't know if you got the score on that. The Cleveland Browns and the Cowboys. The Browns dumped the Cowboys 31 to 20.

SC Now hear that.

CAPCOM The other crying and bellowing. Basketball scores. Houston didn't do so good this weekend. Illinois beat Houston 97 to 84. And North Carolina took the Owls. The score was 85 to 87. We had a couple of words in the paper, Frank on - the Oilers. The Oilers voted George Webster their most valuable player and - although Houston didn't

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 401100, CST 11:02P 135/2

make anybody on the All Offensive team this year, they put Walt Thugs and Hoyle Granger on the second team.

SC Very good.

CAPCOM But although the Oilers didn't do so well out on the field, they did great in the box office. Bud Adams, Don Klausterman and Wally Lemm were all - real played good. By the way they were at the Cape to watch the show. Houston in eleven games - the Oilers attracted 460,628 people.

SC How much for your record? For them? I don't believe...got that many in Rice Stadium.

CAPCOM I think so. Let's see, the regular season Attendance was about half that. This includes all the exhibition games. The paper says they averaged about 40 480 for the league games.

SC Great.

CAPCOM Well, that's about it for now Frank. We got some more news that they promised they would bring over as soon it comes off the wire. The only thing of real interests were - particularly the Pueblo release. I think you've already been told about the - Nixon-Eisenhower wedding. And about the only other thing is the weather which is pretty clear around here. We've got high overcasts. But it is cold, good visibility, and it's beginning to feel like winter again.

SC Good time for Christmas, good weather for Christmas.

CAPCOM Who have you got up now, Frank?

SC The other two guys are pretty sleepy. They sacked out again. So I am holding the fort down for a while.

CAPCOM Okay, thanks.

SC Roger. Thank you.

CAPCOM Frank we had a little egg nog over Charlie Duke's tonight.

SC Say again.

CAPCOM We had a little egg nog at Charlie Duke's tonight. Val Anderson dropped by. She's looking fine. Tell Bill she's doing real fine.

SC Fine. How do you like shift work, Jerry?

CAPCOM It's great Frank. You've got the black watch watching you tonight.

SC Yeah, that's what I figured. Yeah, we're getting along pretty good though now.

CAPCOM Real good. It looks like you're approaching a 150000 miles.

SC Roger.

CAPCOM How does the mode lock Frank?

SC Pretty good.

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 401100, CST 11:02P 135/3

CAPCOM Have you looked at the moon lately?

SC No. I saw it yesterday, but we haven't seen it today.

CAPCOM Frank, you've probably already been told this. But you looked great on TV today. One little homey item though. In the El Lago area you were upstaged by Santa Claus. He came along on a fire engine just about the time you guys came along. So the little critters are all outside.

SC I'll have to get it. I wish we could have got that one lens working. I'd like to share the view here of the earth.

CAPCOM Frank, we've got some guys looking at it. We might be able to find a way to make it work for you. Hopefully, by a couple of hours before TV time tomorrow we'll have an answer.

SC Very good.

CAPCOM John Smith -

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/22/68, GET 402100, CST 1112p 136/1

SC Very good.
CAP COM Ah, Jack Schmitt's working with it too.
SC Very good. That's typhoid Jack.
CAP COM Ha. Ha. Ha.
SC This crew is so good we don't figure
we'll have much to debrief.
CAP COM Roger. Probably the biggest part of the
debrief will be the medical part.
SC Roger. You're sure right. Oh, we're all
in fine shape.
CAP COM Real fine, Frank.
PAO Apollo Control Houston. As you heard
Colonel Frank Borman, he is up at the present time by him-
self minding the store in Apollo 8 while the other two crew
members, Jim Lovell and Bill Anders, are taking a rest per-
iod. As to condition, he described the crew as all in fine
shape acknowledging certainly that the medical debriefing
would be a significant one. As you heard, the conversation
arranged a wide gamut of subjects but I guess when you're
144,548 nautical miles away from home it is perhaps stimulat-
ing to occasionally have what would seem to be at least in
a large measure a fireside chat. So, at 40 hours 23 minutes
18 seconds into the flight of Apollo 8, this is Apollo Control
Houston.

END OF TAPE

PAO This is Apollo Control Houston. 41 hours 52 minutes 35 seconds now into the flight of Apollo 8. Our current altitude on Apollo 8 now 147 956.7 nautical miles. Our current velocity on Apollo 8, 3892 feet per second. We've had a bit of conversation with spacecraft Commander, Frank Borman, and we will pass that along to you now.

CAP COM Apollo 8. This is Houston. We have a handover coming up in 2-1/2 minutes to Guam. Over.

SC Okay Jerry. Thank you. Hey Jerry?

CAP COM Go ahead.

SC Somebody long-range guess what the weather is going to be like Friday.

CAP COM Roger Frank. Apollo 8. Houston, with a weather watch.

SC Go ahead Houston. Apollo 8.

CAP COM Roger Frank. For 7 degrees, 38 minutes north, 155 west landing area, we are showing 2000 scattered, 12 000 broken, high over and 10. The winds from east at 12, 4-foot swells, about an 82 degree temperature. There will be some rain showers in about 10 to 30 percent of the area with ceilings around 2000. If there is - turns out to be a thunderstorm in the area, it will probably have a ceiling around 500 feet. Apollo 8, Houston. Did you copy that weather okay?

SC Roger. I said thank you. Do you read me now?

CAP COM Roger. Reading you much better. We got the voice coming down through Honeysuckle now.

SC Okay.

PAO Apollo Control Houston. As you heard spacecraft Commander, Frank Borman, did request the weather advisory for his time of return to earth and you certainly can't fault the spacecraft Commander for not planning his mission in advance. At the present time, our communications were uplinking from Guam and downlinking voice data through Honeysuckle. At 41 hours 55 minutes 46 seconds into the flight of Apollo 8, this Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 422229, CST 1:13a 139/1

PAO This is Apollo Control Houston. 42 hours 21 minutes 32 seconds into the flight of Apollo 8. At the present time, Apollo 8 now 14 041.4 nautical miles in altitude. Our - meanwhile our spacecraft velocity continuing to slow down. Our current velocity reading 3864.7 feet per second. Since our last announcement, we've had only one conversation with the Apollo 8, and we will pass that along to you now.

CAP COM Apollo 8. Houston.
SC Go ahead Houston. Apollo 8.
CAP COM Roger Frank. Can you cycle the H2 and
O2 cryo fans now for us?
SC Roger. Will turn her now, the H2, leave
on 2 minutes.
CAP COM Roger.
SC You may need to call us now and then.
Everybody is a little drowsy.
CAP COM Okay Frank.
SC That completes it Jerry. All cycles are
up.
CAP COM Roger Frank.
SC Houston. Apollo 8.
CAP COM Apollo 8. Houston. Roger.
SC Did you get my message about the fans.
CAP COM Sure did Frank. Thanks.
PAO And that concludes the conversation.
A procedural one. And at 42 hours 23 minutes 15 seconds
into the flight. this is Apollo Control Houston.

END OF TAPE

CAP COM They are talking about cabin fans. But that sounds like sort of a noisy proposition. Apollo 8. Houston.

SC Go ahead.

CAP COM Apollo 8. This is Houston. I have got two messages for you to warm up the cabin there. The first one is a one-man job, about the best way would be to one or both cabin fans on and go full hot on the cabin heat exchanger. It'll be a fairly slow process of warming up and you won't get a whole lot of heating. Your second method would be to adjust with mixing valve your radiator OP temperatures. This is again a two-man job and you have to be pretty careful.

SC Well, Frank just went to bed and Bill isn't up yet. I'll put on the fans and then we will go high on the cabin temperature and see what that does.

CAP COM Okay Jim. Remember, if you use just one fan, cover the other.

SC Roger.

PAO Apollo Control Houston. As you no doubt surmized, Frank Borman, did take Jerry Carr's advice and decided to grab some shuteye. Jim Lovell, now awake, took the last part of that transmission. In our verbal update on the flight plan, as you had heard, our next set of star sightings we will use the moon horizon as a reference rather than the earth. This being for program 23. Also our Flight Dynamics Officer, who was closely scrutizing midcourse trade-off, looking over 1.1 foot per second Delta V versus something on the order of 3 feet per second is strongly inclined toward recommending a midcourse at 61-hour GET mark rather than 47 hours. Initial factor there, the water dump which would occur after the 47-hour mark could very possibly negate part of a very minimal midcourse anyway. The recommendation that it appears very likely that the crew will go with, with regard to the cabin temperature, is one whereby one of the cabin fans would be turned on and the heat exchanger put to full hot. There is some possibility that there would be an increase in noise level, but, this again becomes a trade-off. At 43 hours 10 minutes 45 seconds into the flight of Apollo 8, continuing to monitor, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 433300, CST 2:34, 141/1

PAO This is Apollo Control, Houston, 43 hours, 33 minutes, 8 seconds now into the flight of Apollo 8. Apollo 8's current altitude - per hours displays 151,686.2 nautical miles. Current velocity, 3700.92 feet per second. Capsule communicator Jerry Carr has just passed along some flight plan update numbers with regard to the program 23 star sightings to command module pilot Jim Lovell. And we'll pick up that conversation.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, GO.

SC Roger. I have used just one fan. You mentioned about covering the other one. Are you sure that's true in this spacecraft?

CAPCOM Roger. That's affirmative.

SC I remember that's the one problem.

CAPCOM Standby, Jim. We'll recheck on that one. Apollo 8, Houston, did you get the word from Frank on the star sighting plans?

SC Roger. I got off the flight plan if you have an update to it now though...now.

CAPCOM Okay. Apollo 8, Houston. Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Roger. Are you ready for that flight plan update?

SC Roger. Go ahead.

CAPCOM Okay. At time 4715, delete the P23 sightings you're showing there. And at 45 minutes correction 45 hours, add one additional set of sightings to each star.

SC Okay. You said at 45 hours add one set of sightings to each of the three stars. Is that correct?

CAPCOM That's affirmative. Everybody's real pleased with the earth horizon work and as far as we're concerned you can knock that off and just add one set to each one of your lunar horizon stars at about 45. At 45 our time also is not hard. You can shift it as you desire.

SC Roger. I see things coming up now, Jerry. We're going to get the block data around 44 and we'll do a lima around 4430 and then we'll go into this lunar navigation.

CAPCOM Okay, fine Jim. Then remember after you do the sightings we'll want you to go back to the TTC mode again. And a little curiosity, how's the water tasting and how did you sleep?

SC Water's tasting okay, no problems. And the sleep is getting better. We find it better to sleep underneath the couch now. I was up here with Frank and I

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 433300, CST 2:34pm 141/2

was chosen off periodically over the last several hours.
Frank's now below and Bill's below too.

CAPCOM Okay, Jim, thanks.

PAO Apollo Control, Houston. As you heard
the star sighting results have been indeed well accepted
on the ground. So we'll have here for the first time the
lunar horizon becoming the prime reference - point for these
navigation exercises. At 43 hours, 37 minutes, 6 seconds
into the flight, this is Apollo Control, Houston.

END OF TAPE

PAO This is Apollo Control Houston at 43 hours 45 minutes 15 seconds now into the flight of Apollo 8. Our current altitude on Apollo 8 152 125.2 nautical miles. Current velocity reads 3788.4 feet per second. We just had an interesting conversation with Jim Lovell who called. With regard to seeing stars in daylight, Glynn Lunney, incidentally, got on the line, Jerry Carr, the Capsule Communicator was out of the room briefly. And we thought we would pass along that conversation now.

CAP COM Apollo 8. Houston.

SC .Go ahead Houston.

CAP COM Apollo 8. We've got a command handover from Guam to Honeysuckle coming up in about 2 and one-half minutes.

SC Roger. Houston. Apollo 8.

CAP COM Go ahead Apollo 8. This is Flight -

SC --at this distance --

CAP COM Say again, Apollo 8.

SC -- this distance there is no problem - there is no problem in seeing stars in the daylight at this distance.

CAP COM Roger. Copy. Apollo 8. Flight.

SC This is eighth class.

CAP COM Jim, are you talking about out the window or out any of the - telescope?

SC I am looking out the window right now. I have the lights out in the spacecraft, the window covered where the sun is. And then I can see the stars very well out the left rendezvous window.

CAP COM Okay, I guess that window is still pretty good for you then.

SC That's right. It is one of the few that is. The center window unfortunately, is all fogged over, it looks like a coating of ice or coating of heavy fog. Bill claims it is something else though.

CAP COM Roger. By the way, I am just getting OJT on this Cap Com job while Jerry is out of the room.

SC Well, we all have to learn sometime.

CAP COM Yes sir.

SC You picked a midnight shift, I see.

CAP COM Yes, it is turning out to be kind of quiet too.

SC We like it that way.

CAP COM Well, things will pick up here by tomorrow night, I think.

SC I believe you are right.

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 434515, CST 2:37a 142/2

CAP COM We think we show cabin temperature as 70, so maybe you are warming up you.

SC Well, we can feel it warm up. I have both fans on and the - our gages indicate about 70.

CAP COM Okay, and I have got a real Cap Com back now.

PAO Apollo Control Houston. Glynn Lunney's reference of course, to tomorrow night dealt with the lunar orbit insertion times. We are just over a day away, as a matter of fact. Approximately an hour from this time tomorrow would be the time that we would traverse over the back side of the moon. At 43 hours 49 minutes into the flight of Apollo 8, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston at 44 hours 11 minutes into the flight of Apollo 8. At this time, Apollo 8 153 100.2 - 153 100.2 nautical miles in altitude. Our current velocity reading 3764.7 feet per second. Capsule Communicator, Jerry Carr, has just passed along a - passed along block data information to Jim Lovell, aboard the spacecraft. These come out as a long stream of numbers meaningful to the onboard computer. The numbers, by the way, are not part of the ongoing flight plan. These are for a contingency situation only. A means of assuring proper return data for the crew should we have a problem with the communications or lose communications. We'll play that rather extensive tape for you now.

SC Go ahead Houston. This is Apollo 8 here.
CAP COM Apollo 8. This is Houston, with a fly by. A PC, pericyynthion plus 2 hours maneuver PAD when you are ready to copy.

SC Roger. Ready to copy.
CAP COM Roger. Your TLI plus 44 maneuver PAD is good - requires no update. Fly by maneuver PAD follows SPS G&N 62954 minus 162 plus 129. Copy?

SC I am copying.
CAP COM Roger. 060 59 4808 plus 00953 plus 00578 minus 02076 000 000 000. Copy?

SC I am copying. Stand by. I am going to switch to omniantenna.

CAP COM Roger. Standing by.
SC Okay. Go ahead.
CAP COM Roger. HA is not applicable plus 00202 02356 022 02280 03 0393 310 013 up 048 right 35 - I repeat right 35. Copy?

SC Copied.
CAP COM Roger. Plus 1418 minus 16505 12904 36160 146 29 11 GDC align with your Sirius Rigel set stars. 137 311 339 no ullage. Copy?

SC We are copying.
CAP COM Roger. I have two comments. Number one. Requires realignment to preferred REFSMMAT. Two. Raises perilune to 554 miles. Over.

SC Roger. I have it. Stand by for read back.

CAP COM Roger. Standing by.
SC Fly by maneuver SPS G&N 62954 minus 162 plus 129 060 59 4808 953 578 those are 00953 and plus 000578 minus 02076 000 000 000 not applicable plus 00202 02356 022 02280 03 0393 310 013 up 048 right 35 plus 1418 minus 165 05 12904 36160 146 2911 Sirius Rigel 137 311 339

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 441100, CST 3:03a 143/2

SC no ullage requires realignment to preferred REFSMMAT. Raises perilune 554 nautical miles.

CAP COM Roger. Jim. That is correct. Let me know when you are ready for your PC plus 2.

SC Okay, let's go on PC plus 2.

CAP COM Roger. Pericyynthion plus 2, south three turns, SPS G&N 61503 minus 158 plus 131 071 36 1244 plus 59578 minus 00086 minus 05287. Copy?

SC I am copying.

CAP COM Roger. 012 080 018 not applicable plus 00203 59813 650 59566 11 2160 332. Copy?

SC Copying.

CAP COM Roger. Earth up 005 right 27 plus 0398 plus 06500 13215 36961 1061911

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 442055, CST 3:14 144/1

CAPCOM 1 zero 6 1911 Sirius Rigel. 137311339
no ullage copy.

SC Copy.

CAPCOM Roger. I have five remarks. Number one, assume execution of flyby maneuver. Number two, use same alinements as for flyby. Number three, time of midcourse number five for GERU determination GET of 8338. Copy.

SC Roger.

CAPCOM Roger. Two remarks to go. Number four, standby. Number four, use T37 MC dash 4. Steps one through ten and MC8, steps 3 and 4. Remark number five, average Z400K for corridor control charge equals 36531. Over.

SC Roger, Houston. MDC plus 2. Maneuver plan as follows. SPS G & N 615 zero 3 minus 158 plus 131 zero 7136 1244. Copy.

CAPCOM Roger, copy.

SC ...59578 minus zero zero zero 86 minus zero 5287 zero 12 zero 8 zero zero 18. Not applicable. Plus zero zero 2 zero 3 59813 65 zero 5956611216 zero 332 earth up zero zero 5 right 27 plus zero 398 plus zero 65 zero zero 13215369611061911. Sirius Rigel 137311399. No ullage. Assume execution of flyby maneuver. Uses stable lim - limen as the flyby. Time of MTZ5 for gay route determination is 83 plus 38. Use D37 MT4 steps one through ten MD8 steps three and four. Average D400K recorded control chart 36531.

CAPCOM Roger, Jim. That's all correct. Apollo 8 Houston, that PC plus two is a fast return.

SC Roger. we'll send a fast return.

PAO Apollo Control, Houston. And that concludes our voice update on block data. For the past several minutes we've been monitoring the bioenvironmental display here in Mission Control and the cabin temperature is holding steady at a comfortable 70 degrees. It would appear that the - ground solution involving the cabin fan and heat exchanger has worked satisfactorily. So at 44 hours, 26 minutes, 43 minutes into the flight this is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 450124, CST 3:53a 145/1

PAO This is Apollo control Houston at 45 hours
1 minute 24 seconds now into the flight. The Apollo 8 space-
craft at this time 154 thousand 847.7 nautical miles in altitude.
Its slowing velocity now reading 37 hundred and 22.7 feet
per second. We've had no conversational contact with Apollo
8 since our last announcement. Command module pilot Jim
Lovell apparently continuing with his navigation task. At
45 hours 2 minutes into the flight of Apollo 8 this is Apollo
control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 452050, CST 412a 146/1

PAO This is Apollo Control Houston 45 hours 20 minutes 40 seconds now into the flight Apollo 8. Apollo 8's current altitude at this time of 155,579.3 nautical miles above the Earth. The velocity of the spacecraft now reading 3705.1 feet-per-second. We've had contact in the past few minutes with both Jim Lovell and Bill Anders who has just awakened. We'll play that conversation now.

SC Houston, Apollo 8.

CAP COM Apollo 8, Houston. Go.

SC Roger. Just ... interesting things on the - just done a nav with the Moon, the Sun is currently right in the way. I managed to get a one fit on that carry and was working on the second fit and the rim of the Moon just disappeared completely. The view through the sextant is a milky white whether your looking at black sky or the Moon. The tint of the Moon is slightly washed out by the brightness of the Sun. I'll try the next star and see what I can do with it.

CAP COM Roger, Jim.

SC Good morning, Houston. How are the systems looking here lately?

CAP COM Mornin' sleepy head. Systems are looking GO.

SC Thank you.

CAP COM How'd you sleep, Bill?

SC Oh, off and on, Jerry. There was quite a bit of noise in here and anytime somebody responds to a transmission, why, it tends to wake you up. But it was a reasonably good rest.

CAP COM Real fine. We got a little work scheduled for you here. We've got an ECS redundant component check to run and some fuel cell purging to do.

SC Okay, how about if we wait until this NAV exercise is over with.

CAP COM Rog. Bill, what we have planned for you right after Jim gets finished is a waste water dump, a cryo fan cycle, redundant component check, and a fuel cell purge.

SC Roger.

CAP COM We'll be wanting an O2 and H2 fuel cell purge; we'll give you a 20 minute hack on the heater.

SC Okay. Want me to turn 'em on now or when you give me a hack?

CAP COM Ah, you better wait about 20 minutes.

SC Okay.

PAO Apollo Control Houston. So you heard how the Sun with it's close relative proximity tended to wash out the last of NAV siting for Jim Lovell. We expect

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 453929, CST 4:30 147/1

PAO This is Apollo Control, Houston, 45 hours, 39 minutes, 25 seconds now into the flight of Apollo 8. Apollo 8's current altitude 156,242.7 nautical miles. Our velocity now reading 3689.4 feet per second. Here on the ground we passed along on a correction to the TLI plus 44 hour pad already with the crew. We'll play back that report.

CAPCOM Apollo 8, Houston. Bill, are you still eating?

SC Doing what?

CAPCOM Are you busy eating?

SC Negative. I'm watching the store while Jim does his maps hunting and recording the data point.

CAPCOM Okay. We have a correction to make to your TLI plus 44 pad. It's a - if you've got a chance there we'd like to fire it on up to you.

SC Standby.

CAPCOM Roger.

SC Okay, ready to copy the correction of TLI plus 44.

CAPCOM Roger. The correction is in the remarks at the end. Delete the reference to per - high speed procedure minus NA.

SC Roger. Delete minus NA flash MC1...

CAPCOM All right, that's affirmative and copy the following. This comment should read UT37 MC4 step 1 through 11. Over.

SC Roger. UT 7 MC4 steps 1 through 11.

CAPCOM Roger. Then proceed to longitude control for no calm procedure page NC7.

SC You got a little fast. Say again please.

CAPCOM Roger. That's page MC7. I'll read that again. Then proceed to longitude control for no calm procedure page NZ7. Average 400K V400K for courdier control charts pages 3, 6, 2, 5, 3. I repeat average V400K for courdier control charts is 36253. Over.

SC Roger. Say again. That's average G as in George.

CAPCOM Negative. Average Victor 400K for courdier control charge is 36253.

SC Roger. Average V400K for courdier control chart is 36253.

CAPCOM Roger. The minus NA procedure is okay after abort when the GERU is left then. Zero 7 niner niner zero.

SC Roger. Minus NA procedure is okay for abort when GERU plus zero 7 niner niner zero.

CAPCOM Roger. I'll read back the entire remarks now just to make sure we got it straight. UT37 MC4

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 453929, CST 4:30 147/2

steps 1 through 11. Then procedure to longitude control for no calm procedure on page MC7. Average Victor 400K for corridor control chart is 36253 minus NA procedure is okay after abort when GERU is less than zero 7 niner niner zero.

SC Roger, copy.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Bill, you can turn on the H2 fan flying heater now.

SC Okay.

PAO Apollo Control, Houston. Taking down all down that navigator talk was Systems Engineer Bill Anders. Here in Mission Control Center our LOS clock now reading 23 hours, 12 minutes, indicating we are now than a day away from that time the Apollo 8 spacecraft passes - starts it pass over the backside of the moon out of communications range with Mission Control Center. It's relatively quiet here in the Mission Control Center now. However, we don't expect this to be representative of what it will be like in this room this time tomorrow. At 45 hours, 45 minutes, 40 seconds into the flight of Apollo 8, this is Apollo Control, Houston.

END OF TAPE

PAO This is Apollo control Houston at 45 hours 58 minutes 20 seconds now into the flight of Apollo 8. We read Apollo 8's altitude at this time at 156,917.4 nautical miles. The velocity reading shows 36,73.5 feet per second. Jim Lovell has completed his program 23 navigation sightings and at this time the Apollo 8's spacecraft is being returned to a passive thermal control attitude. We'll play the report that command module pilot Lovell passed down to our capsule communicator Jerry Carr now.

CAP COM Apollo 8 Houston

SC Go ahead Houston

CAP COM Jim when you get a chance will either you or Bill give us a crews status report on you and Bill?

SC Roger. We're going to pick up this one set of stars for you then well do that.

CAP COM OK.

SC Have you been getting this data down there in Houston?

CAP COM That's affirmative Apollo 8.

CAP COM Jim so far we've only missed one point that we'll ask you to read back a little bit later.

SC Which one do you need?

CAP COM Stand by. Apollo 8 Houston, what we need is the third mark on the first set star 33 trunion only over.

SC Roger. That's the only one we're in doubt of. We think it was 12020.

SC Roger copy.

SC OK incompletance of 33 at this time Houston. Are you satisfied?

CAP COM Roger Jim.

SC Houston for information on the last 2 start 34 and 40 we're shot at the tip of the librium. If you practically have to imagine the rim continued on past where it goes into the darkness.

CAP COM Roger. I understand they were shot at the tip of the librum.

SC That's affirmative and the area around the entire moon now both the sky and the moon itself are milkey white because of the nearness to the sun.

CAP COM Roger copying. Apollo 8 Houston you can re-establish PTC same, same attitude 224 and 220.

SC Roger your still... now.

CAP COM OK. Apollo 8 Houston

SC Go ahead Houston.

CAP COM We'd like to have you start your waste water dump as soon as you can. Dump to 20 percent. We're doing this in order to get 71 percent of their low eye over.

SC Understand. 20 percent.

CAP COM Roger

Apollo 8 Mission Commentary, 12/23/68, GET 455820, CST 4:48am 148/2

PAO Apollo control Houston. We picked up the last transmission as it was going off. The advisory that Apollo 8 should proceed with its waste water dump as soon as possible. So at 46 hours 3 minutes 3 seconds into the flight of Apollo 8 this is Apollo control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 462522, CST 517a 149/1

PAO This is Apollo Control Houston at 46 hours 25 minutes 22 seconds now into the flight of Apollo 8. We now read an altitude of 157,868.9 nautical miles for Apollo 8. Velocity now reading 3651.2 feet-per-second. The waste water dump has been completed by the Apollo 8 crew and here's a conversation regarding that sequence.

CAP COM Apollo 8, Houston.

SC Go ahead, Houston.

CAP COM Roger. We see waste water coming down now. While it's on it's way down, how about a cryo fan cycle?

SC Okay. Cryo fan cycle I'll make a H2 and O2 fan, one at a time, two minutes each.

CAP COM Roger. (pause) Apollo 8, Houston. We're showing you at 20.0 percent now.

SC Roger. We're showing about 25, we'll shut it off now.

CAP COM Roger. Next on deck is the fuel cell H2 O2 purge.

SC Alright.

PAO So, that's it at 46 hours 27 minutes 10 seconds into the flight. This is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston at 46 hours, 40 minutes, 20 seconds now in the flight of Apollo 8. Present altitude 158,396.4 nautical miles. Present velocity 3639 feet per second, 3639 feet per second. As we picked up this conversation we find the crew - undergoing one of the systems procedures that of a fuel cell purge. Let's pick up that conversation.

SC Okay, Houston we're ready to start the purge.

CAPCOM Roger, Bill. While you're purging, can you give us a crew status report?

SC That's going to be O2 and H2. Is that correct?

CAPCOM Affirmative.

SC Roger. H2 first okay?

CAPCOM Roger, that's okay.

SC Okay. We're getting H2 flow, Jerry, but we don't have any of the - any vapor particles anywhere. Sand particles started now.

CAPCOM Roger, we confirm your flow and understand your sand particles now.

SC They're not much though. Okay, now going to number two.

CAPCOM Roger.

SC You know it's too bad the side windows are fogged up because we never see any sun in the rendezvous windows and we can't get very good pictures in the foggy windows.

CAPCOM Roger.

SC Okay. Chart number 302.

CAPCOM Roger, Apollo 8. Apollo 8, this is Houston. Would you accept for P27 update state vector to your limb sides and we'd like you to -

SC Say again.

CAPCOM Roger, Bill. Would you set up to accept a state vector update? We'll be putting it in the limb slot and do not unzap. Over.

SC Roger, roger. NORMAL ACCEPT. We're going to have to put the word zap back in the dictionary.

CAPCOM Roger, Batman.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, GO.

SC It might be interesting to note that after NAV firings we ran out B21 and we get a pair of... 666.8 miles.

CAPCOM Roger, copy.

SC I hope you get it long enough...window was closed. Okay start fuel cell 2.

CAPCOM Roger. Apollo 8, Houston. Your state

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 464020, CST 5:31 150/2

vector update is complete and verified. You can have the computer back in block. Over.

SC Roger. ...9 number 102.

CAPCOM Roger, Bill.

SC All Helmut Kuehnel kitchen time is pretty nice.

CAPCOM Roger, Bill. You can turn off your H2 heaters now.

SC Wilco.

PAO Apollo Control, Houston. As you heard we sent a load to the onboard computer to update this state vector. This was sent and verified. Also, that was Jim Lovell along with Bill Anders. Jim indicating that they had narrowed their pericyynthion through additional NAV sightings down to 66.8 nautical miles. Bill Anders in obviously very good spirits as you heard through the course of that conversation. At 46 hours, 45 minutes, 5 seconds into the flight, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston at 46 hours 53 minutes 58 seconds into the flight. Our current altitude of Apollo 8 is 158,873.2 (accurate) nautical miles. The current velocity 3627.9 feet-per-second. We've received a status report from the crew and we'll pass this along now.

CAP COM Bill, we show you 168,000 (note discrepancy) out and we're getting - still getting pretty good high bit rate off the 30 foot ditches.

SC Okay. I'm in narrow beam high gain now. Were you getting that high bit rate on the omni.

CAP COM That's affirmative. We're back on high gain now.

SC Okay number one 02 is off and will you clarify your previous statement, were you getting good high bit rate while we were on the omnis about 10 minutes ago. Over.

CAP COM Apollo 8, Houston. That's affirmative. We were getting fairly good high bit rate with a little bit of noise.

SC Okay. Thank you.

CAP COM Roger. We only got two things left to do now; your crew status report and a redundant component check.

SC Okay, Jim will give you the latter - er former and I'll give you the latter.

CAP COM Okay. Bill, EECOM says thanks for the good job of keeping the omni's moving.

SC Roger. We'll make any sacrifice as long as they keep an eye on the systems.

CAP COM Wilco.

SC Who's on the watch with you?

CAP COM It's just me right now.

SC How about EECOM?

CAP COM Well, we have Clint. The Black Watch is watching.

SC Okay, stay alert.

CAP COM Roger, the Black Watch is watching.

SC Roger, I'll stay alert.

Okay Houston, here comes the status report.

CAP COM Roger, we're ready to copy.

SC Roger. For sleep, each of us has had two sleep periods, Frank's in his third one right now. Bill had six hours the last time, I had four hours the last time. Good to fair, both of us. Frank had five hours the last time, of fair. And Frank, of course, is sleeping now.

CAP COM Roger, Jim. How are the three of you feeling?

SC Wonderful. We're all feeling pretty good now, no problems. We've all had about between 40 and 60 ounces of - or clicks of water so far today.

CAP COM Okay.

SC The food, we're up to - we've eaten day two meal two so far and both of us have eaten three hydratables and the juices and about half of the solids.

CAP COM Roger, copy.

SC The cabin's running slightly cold, we do have one cabin fan on and we're in full heat and it's running just slightly under 70. Might get designed on for future spacecraft.

CAP COM Roger, Jim. That fan pretty noisy?

SC It's not as noisy as most fans when they're running; we cut it down to one fan.

CAP COM Roger. We keep thinking we hear it when your talking to us.

SC I wouldn't be a bit surprised.

Houston, we're showing a glycol evap out temp around 44 and a RAD out temp of about 28, I wonder if we might try some manual mixing it would raise the glycol evap amp temp out a little bit?

CAP COM Roger, Bill. Stand by.

SC Okay, Houston, secondary loop is coming up.

CAP COM Roger, Bill.

SC Okay, we're boiling the secondary evap and the temperatures stabilized and so we're gonna close up the back pressure valve.

CAP COM Roger, copy. Apollo 8, Houston.

SC Go ahead, Houston.

CAP COM Roger, Bill. Before you try the manual mixing, we'd like you to give it a whirl at the manual and increase on the cabin temp. Over.

SC We've done that. We're in full HOT and what is your - what's the lowest RAD out - individual RAD out temp you see there in your PTC?

CAP COM Roger, stand by. Apollo 8, this is Houston. We saw 26 one time.

SC Roger, understand. Plus 26.

CAP COM Affirmative. Apollo 8, Houston. Go ahead with your manual mixing. Suggest you set your evap out at about 55. Over.

SC Okay, we'll give that a try and let us hope the RAD out temps get ...

CAP COM Roger. We're monitoring.

PAO This is Apollo Control Houston. We now read ground elapsed time of 47 hours. Perhaps its good to

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PAO point out again that as we examine the data in the early hours of this morning, we chose not to do the mid-course correction burn at ground elapsed time of 47 hours. The reason we chose not to do this, the data indicated that the burn would be in the magnitude of about one foot-per-second. This would be followed by a water dump which would have some perturbation on the trajectory and it appeared wise to pass this one by. So at 47 hours one minute now, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston at 47 hours 25 minutes now into the flight of Apollo 8. Apollo 8 now showing a velocity of 3603.1 feet per second. Current altitude just under 160 000 nautical miles. 159 968.9 nautical miles. We have a short strip of conversation with the crew and we will play that now.

SC Houston. Apollo 8.

CAP COM Apollo 8. Houston. Go.

SC Roger, we have it stabilized about 53 degrees and we will leave it there, but we will go back AUTO if you start having any concern about the radiators.

CAP COM Roger Bill. We are showing 514 now.

SC Okay.

CAP COM Apollo 8. This is Houston. We are going to have a command changeover to Honeysuckle in about 2 minutes. Over.

SC Roger. Houston. Standing by.

CAP COM Apollo 8. Houston. That was Honeysuckle to Madrid.

SC Si, senior. Good by, you chaps.

SC Houston. Apollo 8.

CAP COM Apollo 8. Houston. Go.

SC Roger, did you delete the cislunar NAV exercise at 4715?

CAP COM That's affirmative and we added the extra star sightings to the 145.

PAO Apollo Control Houston. That concludes our latest conversation with the crew. At the present time in Mission Control Center, some members of the Green Team are beginning to arrive. We will have a change of shift within the next hour. And during the Green Team's time aboard, we will cross that great divide in space. At 55 hours 30 minutes, about 8 hours from now. Where, for the first time, in manned space flight, the earth's sphere of influence will be secondary to another celestial body. Apollo 8 will enter the moon's sphere at about 55 hours 30 minutes. At this time the attraction of the moon becomes greater than the attraction of the earth. Our display references here in Mission Control will also have the capability of following suit. We will probably show such things as altitude and velocity relative to the moon. At 47 hours 28 minutes 25 seconds into the flight, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo control Houston at 47 hours 43 minutes 53 seconds into the flight of Apollo 8. Our current altitude reading 160 thousand 614 nautical miles. Current velocity in feet per second 35 hundred 88 feet per second. We've had additional conversation with the crew and we'll pass that along now.

SC Houston. Apollo 8. Are you reading?
CAP COM Apollo 8 this is Houston. Buenos dias muchachas.

SC Buenos dias. I'm going to be answering your calls pretty quietly for a little while here to let the CDR get to sleep if you can't hear us, why --

CAP COM OK
SC Houston Apollo 8
CAP COM Apollo 8 Houston go.
CAP COM Apollo 8 Houston go.

SC Roger. My two cohorts are going to try and get some sleep here so y'all might keep a good eye on the systems I'm going to be moving over to the other side.

CAP COM Roger. Apollo 8 Houston we're getting low bitrate now, we could do better with a high-gain antenna before you move over to the other side. Over.

SC Houston Apollo 8
CAP COM Apollo 8 Houston go.

SC You might just give me a call every now and then, Jerry. Just let me know you're still there. As we're switching antennas, or play some music, or something.

CAPCOM Say again, Bill, you're kind of garbled.
SC Just give me a call every now and then

as we switch antennas, just to let me know you're still there. Play some music or something, just to make sure we haven't lost contact.

CAPCOM Okay, Bill. Your antennas are looking good now. Hey, Bill, if you want music, I'll have Mike sing.

SC Get him to sing "Anchors Aweigh", will you?

CAPCOM This is Apollo Control, Houston, you no doubt gleaned from that last comment when Jerry Carr offered a musical rendition by the oncoming CAPCOM, Mike Collins, Mike just walked into the room a few moments ago, he will take over duty as capsule communicator shortly. So at 47 hours 46 minutes 50 seconds into the flight of Apollo 8, this is Apollo Control, Houston.

END OF TAPE

PAO This is Apollo Control Houston, 48 hours 30 minutes into the flight. The Green team, the Green launch team has come to work here in the Control Center, and Flight Director Cliff Charlesworth is going around the room, console to console, getting a status report. The only little minor problem we have uncovered here, in this round robin and from discussions from the previous shift, is the suspicion cast that the secondary coolant loop, it may not be closing properly and a procedure was passed to the crew to take a look at that. All else seems to be quite normal. We have some brief conversation backed up and we will play that for you now.

CAPCOM Apollo 8, Houston.

SC Roger.

CAPCOM -- on your secondary coolant loop looks like your backpressure valve might be slightly open. I suggest you go to secondary coolant loop EVAP switch to the reset position for 58 seconds. Over.

SC Roger. I did that again, I'll try it a third time.

CAPCOM Okay.

SC It didn't do any good, Houston.

CAPCOM Roger, Bill.

SC Keep an eye on it, in case it starts dropping. It stabilized there right after I set the evaporator on.

CAPCOM Roger, we will watch it.

SC What might have happened - Jim might have gotten the water control valve off before we completely had the backpressure valve closed.

CAPCOM Roger. Understand Jim turned the water control valve off.

SC Roger. We have the secondary water evap control valve off but he might have gotten it off on that return pump chart check prior to the time the evaporator backpressure valve had completely closed, which might explain its lower than state nominal pressure.

CAPCOM Roger, understand.

CAPCOM Apollo 8, Houston. Over.

SC Go ahead.

CAPCOM Roger, Bill. We see your secondary steam pressure coming back up slowly and we would like to just sit and watch it for a while before doing anything else.

SC Okay.

PAO This is Apollo Control Houston. We are

standing by, or estimating that the press conference from the previous shift should begin, the change of shift briefing, in approximately 8 minutes, shooting for 7:30 Houston time. We want to alert all press people to that fact. While that tape was playing, we did hear an analysis of - from the Surgeon's console, and they said while they felt the crew was doing better with their little medical problems of yesterday, they didn't feel like they were completely out of the woods yet. They note that they are behind on water and they are apparently behind on sleep. They are also don't - not eating as much as they planned. But generally they are pleased that the situation is an improvement over yesterday morning. At 48 hours 33 minutes and 162,320 miles from earth, this is Apollo Control Houston.

END OF TAPE

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PAO This is Apollo control, Houston and at 49 hours 18 minutes, we've just tagged up with the crew and Mike Collins is reading the morning addition of the Interstellar Times. Here's how it's going.

CAPCOM Apollo 8, Houston. Apollo 8, this is Houston, over.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger, I just wanted to let you know we still have voice contact and we have the morning news for you, we can give it to you now or sometime later, your choice.

SC How about right now.

CAPCOM Very good. This is the twenty third edition of the Interstellar Times via Paul Haney. We would like to let you know that there are only two more shopping days until Christmas. He says your TV transmission was a real big hit yesterday, Mickey Herskowitz is doing double duty for the Post, he's has written a couple of columns on your launch in addition to his other sports columns and Jim your mom certainly appreciated that birthday greeting. Twenty-one convicts broke out of a prison in New Orleans yesterday and President Johnson went home last night from the Naval hospital after his bout with the flu. He sends you guys a special message - not what to do for the flu but congratulations on the flight - the midwest, I don't know if you can see that from up there or not and then in Houston as a matter of fact, it's getting pretty chilly about 35 degrees and we would like to know who you like next Sunday, Baltimore or Cleveland. Baltimore defense looked pretty tremendous yesterday, they put on a great pass rush and in fact the capcom like Haney is trying to con you guys into a bet. Over.

SC I like Baltimore. How are the families doing, Mike.

CAPCOM They are doing just great, Bill, just talking to Valerie a few minutes ago.

SC That was Frank.

CAPCOM Oh, well, likewise, with Susan I have not talked to her since last night.

PAO Apollo control here, we got a little low on the conversation that may be resumed, we will take advantage of the lull to give you the altitude which is 163 920 miles and our velocity, 3514 feet per second, if you take three-fourths of that you can get the distance in miles per hour - I'll read that - it's something like 26 - 26 hundred miles per hour, call it. We'll stand by, here is more conversation.

SC Good sleep, yesterday.

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CAPCOM Roger, thank you, Mike, we were wondering about that, about 5 hours of good sleep.

SC Right.

CAPCOM How is everything going up there, Frank, all three of you guys feeling okay this morning.

SC Feel fine, Jim went back to sleep though and I have had breakfast and everything seems fine.

CAPCOM Good, glad to hear it.

PAO This is Apollo control here, apparently we are wrapping up, the crew is now eating and we doubt that we will get any additional conversation for at least the next few minutes, the eat period extends up to 50 hours elapsed. We are in 49 hours 29 minutes. The spacecraft meanwhile has - it's about to complete its second - let's back off that statement and put it this way. The Earth is about to complete its second revolution under the spacecraft. The spacecraft now in relation to the Earth is over Africa and that is its second revolution since the second rev when suddenly the spacecraft left the Earth out over the central Pacific. Our flat map projection follows this trace and it's running at about 10 degrees south latitude very steady and coming back across, if for map purposes it appears that it's coming - going from east to west across the face of the map. Of course, the spacecraft is quite steady and the Earth is turning under it. At 49 hours 30 minutes into the flight this is Apollo control, Houston.

END OF TAPE

PAO This is Apollo Control Houston here, 50 hours, 11 minutes into the flight. We have just established contact with Apollo 8 and here is how the conversation is going.

CAPCOM Apollo 8, Houston, over.

SC Go ahead Houston.

CAPCOM Just checking in with you after about a 45 minute quiet break. Say, we notice on your high-gain antenna, if you like you can get a little bit more use out of it by switching to it from an OMNI when you have a yaw angle of 90 degrees, and a pitch angle of minus 45 degrees. We are noticing that you are staying an extra 10 minutes on the OMNI, which is fine; but you could get more use of high-gain, if you use that procedure, over.

SC Okay, thank you Houston. As long as the OMNI isn't working, we've got it all wrapped up here on the 8 ball with the roll ... pointing to an OMNI number, we just switch it, it makes it alot easier, if it is not bothering you.

CAPCOM Okay, that is fine. We are presently happy with the contact, we are just trying to be helpful.

SC Thank you very much. It's very unusual that Mike Collins is trying to be helpful, but never the less thank you very much.

CAPCOM (Garble)

SC Say hello to Howard Tindall for us will you, his procedure seemed to be working.

CAPCOM Sure will.

SC I hope that you have got everybody looking this thing over very carefully. One thing we want is a perfect spacecraft before we can consider the LOI burn.

CAPCOM Apollo 8, Houston, we concur and we are doing that.

SC Okay. And Houston, Apollo 8, the water is in the process of being chlorinated at this time.

CAPCOM Apollo 8, Houston, over.

SC Go ahead.

CAPCOM At your convenience, we would like the readout of your Service Module SPS propellant quantities. We haven't gotten one of those so far this flight.

SC Standby, we are just about to - need to change the antenna. I'll get it.

CAPCOM Go ahead Apollo 8.

SC Okay, A, Service Module A, you ready.

CAPCOM Ready to copy.

SC The temperature is about 111, the helium pressure - do you just want the quantity or the whole works?

CAPCOM Well, if you are reading, give us the whole works.

SC Okay, the helium pressure is about 37, the manifold is 182, and the quantity is reading 80. B has got the temperature about 112, the helium pressure of 36, the fuel pressure 180, and the quantity about 77. C has got the temperature of 140, incidentally, those other temperatures should have been 120 instead of 110, I was looking at the wrong calibration here. The pressure is 37, the manifold fuel pressure is about 182 and the quantity is 80. Temperature on D is 115, pressure is 137, the manifold pressure is 181, and the quantity is about 83.

CAPCOM Roger, Frank, I read you loud and clear. On the temperatures, quad A and B should both be 120, Roger.

SC Roger.

CAPCOM Thank you.

SC 365 - I will trade all of that good information for a readout of the actual quantity, if you will give us a minute we will go ahead and plot them up, Mike.

CAPCOM Roger, we will standby until we get them for you.

CAPCOM Apollo 8, Houston, I have your Service Module RCS quantities available, over.

SC Roger, we are ready to copy at 50 hours, 16 minutes.

CAPCOM Okay, I have them both in percent and pounds, I'll give you both numbers. The pounds are slightly more accurate for plotting on your chart. Quad A 72 percent, 219 pounds; Quad B, 76 percent, 233 pounds; Quad C, 70 -.

SC Take it a little slower Mike, whoa, whoa, whoa, whoa.

CAPCOM Okay.

SC Slow up, we just got Quad A plotted. They are on separate tracks.

CAPCOM Okay.

SC Okay for Quad B.

CAPCOM Quad B, 76 percent, 233 pounds.

SC Okay, Quad C.

CAPCOM 76 percent, 231 pounds.

SC Quad D.

CAPCOM 76 percent, 229 pounds.

SC Okay. Would you give us the O2 and H2 as long as we are plotting?

CAPCOM Roger, standby for O2 and H2.

CAPCOM Apollo 8, Houston, we have got those numbers in a percent, we are going to switch them over to pounds; and in the meantime, we are going to be changing our ground antenna in about another 2 and 1/2 minutes you can expect a comm glitch, over.

SC Thank you.

CAPCOM Apollo 8, Houston, over.

SC Go ahead Houston, Apollo 8.
CAPCOM Roger, I have your oxygen and hydrogen quantities whenever you are ready to copy.

SC Ready.
CAPCOM Oxygen tank number 1, 270 pounds.
Oxygen tank number 2, 267 pounds. Over.

SC Roger, thank you.
CAPCOM Roger, on the hydrogen, hydrogen tank number 1, 19.7. Hydrogen tank number 2, 20.1, over.

SC Understand 19.7 and 20.1.
CAPCOM Roger, you are a little bit low on the line on your graph, but due to the fact that they started out low.

SC Roger.
PAO This is Apollo Control. We have apparently got a lull in the conversation. We have been listening to the exchange between Mike Collins and Apollo 8 live now, for nearly half an hour. Our present position relation to Earth, is 166 116 miles from Earth. Our velocity in feet per second, 3466. And one-fourth of that would be about 27 - 2725 miles per hour. Velocity will continue to slow down to a value of 2170 miles per hour, not feet per second. And at the point of lunar capture, or the point of lunar sphere influence, which we are rapidly approaching; and infact reach, I believe at 55 hours. We will begin to see a slight acelleration. I think the biggest thing that we will experience today, at least we will be filling in numbers in an unknown but at a predicted area, is the range of temperatures that the spacecraft will be seeing. The Earth - even in Earth orbit, the Earth exerts a temperature factor over spacecraft, even out at 100 or more miles. And the Moon, it's theorized, does the same thing because of its highly reflective quality. The area between the Earth and the Moon has no great reflector available. And, thus, a different temperature regime is experienced. This will be of considerable interest to the spacecraft builders and the spacecraft thermal planners, as we progress through this day. At 50 hours, 27 minutes, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston 50 hours 55 minutes into the flight. Mike Collins just put in a - I take that back. Apollo 8 just gave us a call a few minutes ago, I guess just to check and make sure our antennas are all switched around, which I believe they have been. We can expect some communication very shortly. We have had a number of calls on conversion charts. We would like to pass on to you these conversion tables. Earlier we had estimated that to get a handy grab on statute miles per hour, simply take $3/4$ of feet per second. Of course, the number is somewhere between $3/4$ and $2/3$, so here are some more exacting tables. Before we do that, let's go now live to the communication.

CAPCOM - the block data you have onboard is satisfactory, over.

SC Understand. The block data we have aboard is satisfactory.

CAPCOM Roger. As for the flyby and pericyynthion + 2 hour block update, we would like also to get a current up to date report on all your windows. We are trying to make some alternate plans for using the center hatch window when you are in lunar orbit and we would like to make sure we understand exactly what the condition of all five windows is. Over.

SC Okay. Window number 1 and window number 5 are clouded but may be partially useful. The hatch window is very heavily clouded. Windows number 2 and 4 are good.

CAPCOM Okay. Understand the hatch window is unusable, 1 and 5 are partially usable, and the rendezvous windows are both good.

SC Right.

CAPCOM Okay.

PAO Apollo Control here. We will take advantage here to go ahead and give you these conversion tables that we talked about earlier. If you have feet per second and you want statute miles per hour, you convert by multiplying feet per second times .6818. The resulting number statute miles per hour. If you want knots, you take feet per second, and multiply by .5925, I repeat, feet per second times .5925 gives you knots per hour. If you want kilometers per hour, you take feet per second and multiply by 1.097, 1.097, and you get kilometers per hour. And one other factor to help, particularly our European, well to help all reporters who are other than U.S., if you have statute miles per hour and multiply by 1.609, you can get

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kilometers per hour. So much for the lack of a universal numbering system. We will go back and monitor the circuit now any additional communications.

PAO Apollo Control here. CAPCOM Mike Collins is sitting back in his seat and apparently we will not have any communication unless it is initiated by Apollo 8. So we will take the line down now at 51 hours even into the flight and we are - they are 167,000 miles from earth, moving at a velocity of 3441 feet per second. This is Apollo Control Houston.

END OF TAPE

CAPCOM Fine, fine, Jim. You are sounding good this morning. We would like to give you a little rundown on these stars. As you can see in the flight plan, we've got you scheduled for a number 33, Antares, number 34, Atria, and number 40, old Altair. Now the first of those, Antares, is in plane, the second two are out of plane. As you know, we would like to get a mixture of the in and the out of plane. Antares, number 33, is closer to the sun, and we expect if you are going to have difficulty getting those measurements on number 33, we would like very much for you to try, but if you are unable to do number 33, then we propose that you use number 42, which is Peacock, to the lunar far horizon. We realize Peacock isn't the greatest one available, greatest star in the sky, but it's about the only one available. Over.

SC Roger, understand. I'll - we will go to Antares first and try it. You know, we tried it last time, but I got one set before I lost moon completely in the white haze. I'll give it another try and if it doesn't work out, we will go to Peacock and give it -

CAPCOM That is affirmative, Jim and if neither Antares nor Peacock work, well then, we just - we will be happy to go with Atria and with Altair. We would like them to increase the number of sets and do three on Atria, that is number 34, and two on Altair, number 40. But that is only in the event that you can get neither Antares nor Peacock. Apollo 8, Houston. Did you copy?

SC Roger, this is 8, copied. --- 34 to 3 and the number set of 40 to two if we cannot get 33 or 42.

CAPCOM That is exactly right.

PAO This is Apollo Control Houston. That cleans up our backlog of tape at this point. One item on new conference scene for the next several shifts, we plan a news conference today, or this afternoon, at approximately 3:15 pm Houston time. That will be 15 minutes after the change of shift for this afternoon. We will plan a news conference tonight at 11:15, at that shift break and tomorrow morning at 9:30 am. All times are Central standard, Houston time, 3:15 this afternoon, 11:15 tonight, and 9:30 tomorrow morning. Our distance right now 168,829 miles, we should - we are to pass into the lunar sphere of influence 55 hours 38 minutes, about 4 hours from now. Our velocity has slowed down to 3408 miles. While we were talking, Mike Collins has put in another call. Let's go back to that.

CAPCOM - and on this P-23 where it's rough to get our data, you are going to have to delay the DSKY display about 10 seconds when it comes up with NOUN 87, over.

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SC Roger.
CAPCOM Apollo 8, Houston. We are past that 87
display now. Did you write down what your trunnion bias
was?

SC Negative. Houston, we haven't started
23 yet. Our cal is zero.

CAPCOM Roger, understand. Thank you.

SC We are in the process now to do a - to
go to P-23 auto -

CAPCOM Roger, thank you.

PAO And this is Apollo Control Houston. That
apparently wraps it up for now. We are 51 hours 50 minutes
into the flight.

END OF TAPE

PAO This is Apollo Control, Houston, 52 hours 21 minutes into the flight. We have a little tape backed up from the last twenty minute time period since we talked to you. We will play that for you. Very shortly we expect to query the crew on their medical status. We have had some communication regarding the system status. That is reported to be in excellent shape. Dr. Berry, and his people on the medical console are wondering about the water intake and the food intake which seems to be off. We don't understand the sleep cycle. The crew are grabbing naps or better when they can. We don't have a very good plot of just how much sleep each man has had. So he has prepared a list of questions which I think will be relayed to the crew within the hour. I believe that brings us up to date. Let's play the tape now, and we may, if the conversation resumes, come in with that.

CAPCOM Apollo 8, Houston.
SC Go ahead Houston, Apollo 8.
CAPCOM Roger. Our downlink data shows that on stars 33, Jim is using the lunar far horizon when he should be using the lunar near horizon. Over.
SC Okay. Thank you. 220?
CAPCOM Roger. 220.
SC Let's change it.
CAPCOM Roger.
SC Do you want the far horizon now, Houston?
CAPCOM Roger. Far horizon.
SC We have far horizon in now, Mike on 220.
I will check again though.
CAPCOM Yes. That is right. We are requesting the lunar near horizon as per the flight plan. The lunar near horizon. We show that you are using the lunar far horizon.
SC Okay. Roger. I thought that you had copied up 220 to me. I will move to the near horizon.
CAPCOM Roger.
SC Houston, Apollo 8. Over.
CAPCOM Apollo 8, Houston. Go ahead.
SC ... We're getting a play-back, Mike. It is getting kind of damp in here. It might be a good idea to go back into AUTO on the temp in -- the glycol temp in for awhile to try and get some of this moisture out of the cabin.
capcom Roger. Stand by, Bill.
SC Roger.

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CAPCOM Apollo 8, Houston.
SC Go ahead.
CAPCOM We concur. We would like you to go back to AUTO on the glycol temp inlet valve.
SC Okay. What was our lowest radiator out temp during the last couple of hours while we have had it in MANUAL?
CAPCOM I will get it for you.
SC And we are back in AUTO.
CAPCOM Roger. Back in AUTO. Twenty-nine degrees is as low as we sink.
SC Okay. We are showing a cabin temp of about 75. It is very comfortable, but we are getting a lot of condensation on the walls now.
CAPCOM Roger. Understand.
SC Houston, Apollo 8.
CAPCOM Apollo 8 this is Houston.
SC Roger. Mike, while we are waiting for the spacecraft to maneuver into the moon, I might note that as we get closer to the moon, the light from the sun comes right into the scanning telescope, and it is impossible to use. You have to rely on the sextant alone.
CAPCOM Roger, Jim. Understand that light from the sun is coming into the scanning telescope making it impossible to use, and you have to rely on the sextant alone. Can you attach any angle to that?
SC Well, Mike, I am right now on the substellar plane of 30 degrees. I don't know where the sun is exactly from there, but that is about the angle. We're -- the optics are pointed right at the moon now.
CAPCOM Roger. Understand. Apollo 8, Houston. We are going to be changing our antennas in a couple of minutes. You can expect COMM ...
SC Thank you.
SC Houston, Apollo 8. Over.
CAPCOM Apollo 8, Houston. Over.
SC Roger. The LMP is going to take a little snooze here for a while. I am wondering, can you give me a quick -- your view of the system status here before I depart, and also, give me an idea of when the next cryo stir is due.
CAPCOM Apollo 8, Houston.
SC Go ahead.
CAPCOM Roger. Your systems remain unchanged. They are all looking go. You can go ahead and stir up the cryo starting right now.
SC Okay. Will do.

CAPCOM ...Jim makes his next mark could he call
up verb one noun one. We missed the last trunnion. Over.
SC Roger. The last trunnion was 10660.
CAPCOM 10660. Thank you.
CAPCOM Apollo 8, Houston.
SC Go Ahead.
CAPCOM Roger. Before Bill gets his snooze we would
like him to give us a PRD readout on all three crew members.
Over.

SC Roger. CDR is .06, CMP is ...
SC Okay Houston, We got three sets on 33, we
are going now to 34 lunar far horizon for one set. Don't
you agree?
CAPCOM We agree. Star 34 lunar far horizon for
one set.

PAO Apollo Control here. In the course of that
discussion we are now up to the live action, we have switched
antennas from Ascension where they have a 30 foot dish to
Madrid. That big 80 footer. Let's just leave a line open
and see what results.

SC Houston. The cryos have been stirred and
could you also give me a quick rundown on how the SPS
align temps are doing?

CAPCOM Roger, Bill. Understand you stirred the
cryos last time we checked the SPS align temps were excellent
they were nice and warm. We will give you another number
right now.

SC And ... valve.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger. On your SCS system your oxidizer
is running 75 degrees ...

END OF TAPE

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CAPCOM Apollo 8, Houston.
SC Go ahead.
CAPCOM Roger, on your SPS system, your oxidizer
is running 75 degrees, fuel 74 degrees, and the PU valve
between 78 and 82, depending on where we measure it, over.
SC Real good, everything really is working
fine, isn't it?
CAPCOM Yes, it's moving right along, Bill.
SC Okay, see you later.
CAPCOM Adios.
PAO Okay, Apollo Control Houston, 52 hours,
33 minutes. We will just shut it down to save wear and tear
on the eardrums.

END OF TAPE

PAO This is Apollo Control Houston, 53 hours, 5 minutes into the flight. The spacecraft is 171 360 odd miles from Earth. Its velocity in feet per second, 3356. We have heard from the crew in the last 20 minute time period, a rather complete medical status. They reported that Bill Anders had taken 1 marezine. They say they are all feeling all quite well now as opposed to yesterday. They also explained their sleep and rest cycle. As a general reference, the spacecraft is proceeding on sort of a nose down - in a nose down attitude, if you consider in your mind's eye, the Earth, Moon, and Sun, all on a flat plain and along with the spacecraft of course. The spacecraft is proceeding in a nose down attitude toward an intersection with the Moon and at the same time the spacecraft is rotating about 1 revolution per hour. It has held this attitude for some time and will continue in that attitude. Here is the tape conversation we have.

SC Houston, Apollo 8.
CAPCOM Apollo 8, this is Houston.
SC I understand you want two sets on
number 40, lunar near horizon. Is that right?
CAPCOM That's affirmative. Two sets on number 40,
lunar near horizon.
CAPCOM Apollo 8, Houston.
SC Go ahead Houston.
CAPCOM Caused we missed you last trunion angle,
Frank.
SC 21450.
CAPCOM Roger, 21450, and Paul tells me Valerie
is over here and wishes Bill a happy nap.
SC Okay, thank you. Tell her that he makes
as tired sometimes too, will you.
CAPCOM Roger, I will deliver this modified
version of the message.
SC Thank you.
CAPCOM Apollo 8, Houston.
SC Go ahead Houston.
CAPCOM Roger, on star number 40, which you are
doing now, the flight plan only calls for one set of marks.
You called down two sets and it's really your choice. Only
one is required. We are glad to have the data if you do a
second set, over.
SC We will only do one then, if you want
to. Our flight plan has been updated to request two sets.
That is why I called it down.
CAPCOM Roger, one set is fine.
CAPCOM Apollo 8, Houston, we missed your last
trunion.
SC Very well, I will read it to you. 21455.

CAPCOM 21455, thank you. Just a matter of interest, it is taking your voice about 1.6 seconds to get down to us.

SC (Frank) I'm a little hoarse, that's why. Okay Houston, do you want us to go back to the PTC attitude now, and start the rotisserie again?

CAPCOM That is affirmative Frank. We will have the PTC attitude for you in just a minute here.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger, those PTC attitudes remain pitch 224 degrees, yaw 020 degrees. On the next page, page 239 of your flight plan, those PTC numbers should be changed to (garble).

SC Pitch 224 and yaw 20.

CAPCOM That is affirmative.

CAPCOM Apollo 8, Houston, over.

SC Go ahead Houston, Apollo 8.

CAPCOM If you have a few minutes, we would like to hear the detail crew status report from you.

SC Like what.

CAPCOM Well, like we would like to know, in the last 24 hours has anybody had any symptoms similar to Frank's. We would also like to know - you know we told you the other day to take marezine as you like. We would like to know if anybody had taken any drugs and then we would like to talk over there about sweet breads and water and such.

SC Okay, nobody has taken any other drugs. Nobody took any marezine. Nobody is sick. Bill took one of those pills, a sleep Seconal pill, last night. Everybody had breakfast this morning and ate most of their meal, meal A-day 3. What else do you want?

CAPCOM We would like to tell you to drink plenty of water. We think that your water intake may be down, when we copied your dosimeter readings. The only other thing is we were wondering how you feel, in general. We show you to have about 15 hours sleep total, Frank or Bill about 10 and Jim about the same and we were wondering just how you are feeling in general.

SC We all feel fine, we are going to fix it now so that we all have one more rest period before the LOI.

CAPCOM Roger, thank you.

SC (Frank) Happiness is bacon squares for breakfast.

CAPCOM If you don't eat them all, bring them back and we will finish them off here.

SC Okay, Houston, Apollo 8 here. *I stand corrected, William had 1 marezine. He didn't tell me about it, he snuck it.

CAPCOM Roger, understand Lovell took the
Marezine. Understand.

SC I asked Bill Anders and he took one when
he took the - with the Lomatil, when the doctors told him
to.

CAPCOM Roger, we copy that, thank you.

SC Okay, we are back on the barbeque attitude,
starting PTC.

CAPCOM Roger, Apollo 8, thank you.

SC We ran the latest state vector we have
through the P21 and it shows the pericyynthion at 69.7 miles.

CAPCOM Yes, we were all having a big talk about
that down here. It looks like you are giving us a real good
comparison on our system. Looking extremely good.

SC We've got the navigator, platters and launchers.

CAPCOM I believe it.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM What was the time you used on that P21?

SC 6910 there, Mr. Sliderule.

CAPCOM Thank you.

SC Mike, I wonder if Buz wants us to change
the time.

CAPCOM No, that is fine.

SC Oh, okay, thank you.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston

SC Roger, are you going to give us an update
for a maneuver PC plus 2 that does not assume a flyby maneuver.

CAPCOM Roger, standby.

CAPCOM Apollo 8, Houston.

SC Go ahead Houston, Apollo 8 here.

CAPCOM Roger. Here is a rather brief summary
of the updates that you will be getting. The one that you
have now for PC plus 2, following a LOI minus 8 flyby maneuver,
is still good. That will not be updated. The next update you
will get will be MCC 4. After that, you will get 2 PC plus 2
maneuvers, that assume MCC 4 completed. One will be a minimum
Delta-V and the other will be a fast return. Do you copy?

SC Roger, understand and also I take it for
MCC 4 you are going to give us a new alignment. Is that
correct?

CAPCOM Affirmative.

PAO Apollo Control here. That was Jim Lovell
who came back with that snappy line, "happiness is having
bacon cubes for breakfast." Our present distance 171 699 miles
velocity in feet per second 3349. An update on the passage
into the lunar gravitational field, that event to occur at

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 530500, CST 11:56A 161/4

PAO an elapse time of 55 hours, 38 minutes,
46 seconds. The - our present weight of the spacecraft is
62 915 pounds, Earth pounds. At 53 hours, 16 minutes into
the flight, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston at 53 hours 34 minutes into the flight. Mike Collins is passing on a procedure to the crew, involving the use of that telephoto lens which we couldn't get to work yesterday. It will certainly be of interest to the broadcast media and hopefully, an interest to a lot of other people, too. Let's listen to this conversation.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger, Frank. I have got a lot ^{of} talking to do regarding TV cameras and brackets and whatnot. I would like to start in on it whenever you are ready to talk about it.

SC Let me get a piece of paper out.

CAPCOM Okay.

SC Go ahead.

CAPCOM Okay. First a question. Are you planning to show us TV pictures of the earth today?

SC Well, that is what we wanted to do. It seems that would be the most interesting thing we can show you, but we - you know, we had trouble with the lens.

CAPCOM Well, okay, that's good. All this procedure that I am going to give to you here is relative to what we hope are fixes to the lens and for looking your rendezvous window at the earth, and the gimbal angles and all that good stuff is based toward looking out the window at the earth rather than the moon. Over.

SC Roger.

CAPCOM Okay. First, unstow the red filter, the polarizing filter, the red and blue filter holder, and some tape. Over.

SC Okay, let me read this down.

CAPCOM Roger. I'd suggest that I got a whole page full.

SC Okay.

CAPCOM All right. Tape the red filter to the telephoto lens. That red filter is the 25A red filter, not the one that is in the red and blue filter slider.

SC Roger.

CAPCOM Attach telephoto lens to the camera.

SC Okay, we can figure out to do that, Roger.

CAPCOM Insure that the automatic light control, the ALC switch on the camera is the IN position. Over.

SC ALC IN, roger.

CAPCOM Roger. Attach camera to the adjustable TV bracket and attach the bracket to the TV mounting point

on the commander's side of the hatch to point out rendezvous window number 2.

SC Roger.

CAPCOM Okay. There is a note here that says use dovetail on top of camera, rather than the side dovetail. Use the dovetail on the top of the camera for mounting to bracket and place the rocking nut on the bracket down. And down means toward your -X direction.

SC Roger.

CAPCOM Okay. Say, this step I just got through giving you is somewhat complicated. You might want to get the camera set up early using the instructions I just gave you.

SC We are not ready yet.

CAPCOM Roger. I say again, the instructions that I just gave you should end up having the camera looking out the window and about 30 degrees yawed left from your +X axis, so I suggest you get the camera set up that way early and any problems that come back to us, we will talk them over. These mounting instructions are sort of complicated.

SC Roger.

CAPCOM Okay, the next step. Dim the interior lights, over.

SC Dim interior lights.

CAPCOM Roger. Next stop passive thermal control at gibal angle, pitch 224, yaw 020, roll 270. Over.

SC Pitch 224, yaw 020, roll 270.

CAPCOM Roger. Next acquire on high gain antenna. Switch to auto tracks, now beam upon acquisition. Over.

SC Got it.

CAPCOM Okay. Yaw spacecraft left to get good view of earth and your rendezvous window number 2. You may have to pitch slightly as well, but primarily a left yawing maneuver to get a good view of the earth.

SC Got it.

CAPCOM Okay. This maneuver is going to put you very close to your scan limit for the high gain antenna, so while you are making the maneuver, check your lights. If your scan limit light comes on, you still have got 15 degrees to play with, but the only message is should you break lock, then you are going to back to go back and reacquire and do that maneuver over again, because you are going to be very close to the edge of your high gain antenna capability.

SC Thank you.

CAPCOM Okay. And then finally, now that you have got the spacecraft over there, aim the camera as required

to include the earth and the field of view and do not touch the body of the lens while lens while televising. Apparently, if you put your hand on the lens, it is felt it causes electrical interference. Over.

SC Okay, aim camera and do not touch lens while televising.

CAPCOM Right. And in all this sutff and all these pictures using the ALC, it is important that you let the camera stabilize for at least 10 or 20 seconds, to let the ALC do its thing.

SC Stabilize for 10 or 20 seconds. Thank you.

CAPCOM Right. Now we have some additional instructions in case this does not work. They say a full 20, Frank, on that ALC. It requires a full 20 seconds undisturbed for the ALC to properly do its thing. Now if these procedures that I've given you do not work, then we will be giving you some more and they had to do with other filters and various combinations thereof, so I have the polarizing filter and the red and blue filter holder at hand because we will be attempting to use those in addition to the red filters if this procedure doesn't work.

SC All very well, Mike.

CAPCOM That's all we have right now. We will have a few more remarks on the TV here coming up later. I would suggest that you get set up for this early and if you have any questions on it, shoot them down to us. We have a bunch of experts down here to help out.

SC Thank you, will do.

END OF TAPE

PAO This is Apollo Control, Houston. 54 hours 25 minutes into the flight. We have some conversation that has come in recently from the crew. We will play it for you now.

CAPCOM Apollo 8, This is Houston, over.

SC Go ahead Houston, Apollo 8.

CAPCOM Just a voice check, Frank.

SC Roger, Loud and clear.

CAPCOM Thank You.

CAPCOM Apollo 8, Houston.

SC Go Ahead Houston, Apollo 8.

CAPCOM Good, we would like some high bit rate data when you can get it blocked up on the high gain. We haven't had any of that for a while.

SC Roger, we will do that.

CAPCOM Thank You. How is that camera bracket thing working out?

SC We are doing alright now.

SC This is Apollo 8 transmitting to you on the high gain. How do you read?

CAPCOM Read you loud and clear Frank. Thank you.

SC Apollo 8 transmitting on the high gain antenna.

CAPCOM Apollo 8, Houston. You are loud and clear. Thank you for the high gain.

PAO And this is Apollo Control, Houston back. During the television pass this afternoon we don't know exactly what the crew is going to do, but you know from the earlier discussion that they are going to work with the telephoto lenses again with a filter application which we hope will enhance the image of the earth and it is also entirely possible they will swing it around --swing that camera around and take a picture of the moon if we are successful we should see approximately about a quarter moon. The eastern limb of the moon and in what detail, it is impossible for us to estimate. But those are the general plans to take a long look of the earth and hopefully a quick look at the moon. They will be about 45,000 miles away from the moon at that time. They are presently 174,000 miles from earth, they are moving in a velocity of 3300 feet per second. This is Apollo Control, Houston.

PAO This is Apollo Control Houston at 54 hours 35 minutes into the flight. We have established contact and Frank Borman says, among other things, that they have spectacular view of the earth. He goes into some little detail regarding a jet stream that they are observing. Mike Collins tells him he hopes that will hold up for at least another hour so we can all see it on television. Here is the conversation as it unfolds.

SC Houston, this is Apollo 8. Are you getting high bit rate all right?

CAPCOM That is affirmative, Apollo 8. We are getting good high bit rate.

SC Thank you.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger. I've got some more talking to do about the TV any time it's convenient for you.

SC Go ahead.

CAPCOM Okay. First thing, we've made no provisions in these instructions for taking pictures of the moon and you could get some moon shots after it's all over by looking out a different window or by making some small maneuver, of course, we would be happy to have them. The show as scheduled is just out the window of the earth only. Over.

SC Roger.

CAPCOM The second point is, of course, when you stop your passive thermal control, you are about 90 degrees to the earth line, so when you make that yaw left, you are going to have to yaw left until your middle gimbal angle is in the vicinity of 60 degrees. You will get the additional 30 degrees by offset between where the camera is pointed and your +X axis. But the two together are going to total up around 90. We just wanted to make sure that you understood you were going to be working with a large middle gimbal angle. Over.

SC Roger, we understand that. We are also looking at the earth right now and there is spectacular long thin band of clouds. Looks like it may be a jet stream. It's absolutely spectacular, going almost all the way - half way around the earth.

CAPCOM Roger. Well, you might want to repeat that during the TV narrative and we would like you, if possible, to go into as much of a detailed description as you poets can on the various colors and sizes of those things and how the earth appears to you, in as much detail as you can possibly muster, over.

SC Roger. I figure we will have to do that because I bet you - I won't bet - but I bet the TV doesn't work.

CAPCOM Well, we won't take that bet, but anyway, we are standing by for a nice lurid description and we would suggest that you talk a little bit slower than you did yesterday, over.

SC Okay.

CAPCOM And the only other thing on this TV is that the experts tell us that do not point with the wide angle lens on the camera. Do not point at either the earth or the moon, it comes close to damaging the interior of the instrument due to the fact that is too bright, over.

END OF TAPE

PAO This is Apollo Control, Houston 54 hours 50 -- almost 54 minutes into the flight and the spacecraft presently 174,800 miles from the earth. A word or two here on a change in our charts and a change in our reporting procedure which will come up following the passage of what we call MSI or moon sphere of influence. That event to take place in about a half an hour from now. We've been reading the reporting we have given you on distance and velocity is coming from a chart called the Command Service Module Space Digitals and it presently uses as a reference, the earth. Now at some point shortly after we pass the pass into the sphere of influence of the moon the reference will become the moon and we will have rather sharp and dramatic change of the velocity reference. For instance, the velocity at precisely at the passage in relative to earth terms will be 3261 feet per second. Relative to the moon, that same velocity reading will be 3989 feet per second. And from that point we will be giving you velocities in relation to the moon. which will be exercising the gravitational effect at that point. Our present estimate is that at MSI the moons sphere of influence point, the moon will be 33821 miles from the spacecraft and the spacecraft will be 176275 miles from earth. Both of those are nautical miles. In the last 10 to 15 minutes the crew has put in one call simply to establish communications. We have had nothing more than a "Roger, we read you loud and clear." And at 54 hours 56 minutes into the flight this is Apollo Control, Houston.

END OF TAPE.

SC Houston, This is Apollo 8. We have the television camera pointed directly at the earth.

PAO This is Apollo Control Houston. Frank Borman has come up a little bit earlier -- a little earlier than anticipated, but let's buzz this picture out. It is -- The bright blob on the upper right is the earth.

SC Roger. I got you.

CAPCOM Okay. We are just picking it up at 3 o'clock on our screen.

SC Okay.

CAPCOM It is moving up toward 1 o'clock and in toward the center. Keep it going in that direction.

SC Okay.

CAPCOM You're looking better. You're holding it about 1 or 2 o'clock. Looking better. Give us a little more in that same direction. You're down at 3 o'clock now. We see about half of what you see. Too much. It is disappearing at our 5 o'clock. Now it is coming back. It is half off the screen at our 2 o'clock. It has disappeared off at our 3 o'clock. There, it is coming back in now. It is headed toward the middle of our screen. Mark. It is right in the center of our screen. Just hold her - hold her steady it is really looking good. Okay. we have --

SC What you're seeing Mike is a. Houston, what you are seeing is the Western Hemisphere. Looking, the top is the North Pole. In the center, just lower to the center is South America. All the way down to Cape Horn. I can see Baja, California and the southwestern part of the United States. There is a big cloud bank going northeast, covers a lot of the Gulf of Mexico up to the eastern part of the United States. It appears now that the east coast is cloudy. I can see clouds over parts of Mexico, the parts of Central America are clear. We can also see the white bright spots of the subsolar point on the light side of the earth.

CAPCOM Roger. Could you give me some ideas about the colors, and also, could you try a slight maneuver. It is disappearing, we see about half of it. It is going off to our 12 o'clock. Now it is going off to our 3 o'clock. That is the wrong direction. Yes, that is a good direction. We need another small correction to bring it it to our center screen. If you could maneuver toward the terminator, that is the part of it we are missing. We are getting the lighted portion. There you go, that's fine. Stop it right there.

SC Okay. For colors, waters are all sort of a royal blue, clouds, of course, are bright white, the reflection off the earth is much greater than the moon. The land areas are generally a brownish, sort of dark brownish

to light brown in texture. Many of the -- borders of the clouds can be seen by the various weather cells. A long band of various cirrus clouds that extend from the entrance to the Gulf of Mexico going straight out across the Atlantic. The terminator, of course, cuts right through the Atlantic Ocean right now. Going from north to south. Southern Hemisphere is almost completely clouded over, and up over near the North Pole there is quite a few clouds. Southwestern Texas and southwestern United States is clear. I would say there are some clouds up in the northwest and over in the northeast portion.

CAPCOM Roger. Could you maneuver toward the terminator again, please? A little bit more. Stop her right there and hold it. It keeps slipping up a little bit. Could you maneuver slightly more toward the terminator?

PAO That is the North Pole at the lower left portion of the earth. At about 8 o'clock.

SC How is that, Houston?

CAPCOM We are getting about half of the earth, Frank. The top half, our top half which includes the dark portion in it is obscured.

SC How is the definition on the picture?

CAPCOM Looks pretty good.

SC Can you see the cloud patterns at all?

CAPCOM That is affirmative.

SC Good. How are still seeing, Houston?

CAPCOM Yes, we are seeing it. We are missing the portion of the earth that is over toward the terminator. The dark portion of the earth is what we are not picking up. We are getting about 3 quarters or four fifths of the rest of it.

SC Roger. I will move it. Tell me when I am getting better or worse please.

CAPCOM Good. Stop right there. That is worse, Bill. Go back where you were. You made it disappear to our 3 o'clock. Now it is coming back. Okay. Stop right there. Now you are back where you were. We need a motion that is about 90 degrees to that last one you gave us. That is the wrong 90 degrees. 180 degrees away from that one. Stop right there. Okay. Now we have lost a different half of it. I need a motion 90 degrees to that last one. That is good right there, Bill. That is good right there. Apollo 8, Houston. If you can stick your polarizing filter in front of the camera without

distributing anything else, it might improve the quality slightly.

SC Stand by.

CAPCOM Roger Bill.

SC Okay. The polarizing filter is in front.

How is it now, Mike?

CAPCOM Still looking good. That didn't make much of a change one way or the other, but in general, considering how far away it is, it is looking excellent.

SC Well, I hope that everyone enjoys the picture that we are taking of themselves. How far away from earth now, Jim, about?

CAPCOM We have you about 180 000

SC (Lowell) You are looking at yourselves at 180 000 miles out in space. Frank, what I keep imagining is if I am some lonely traveler from another planet what I would think about the earth at this altitude. Whether I think it would be inhabited or not.

CAPCOM Don't see anybody waving is that what you are saying?

SC I was just kind of curious if I would land on the blue or the brown part of the earth. You better hope that we land on the blue part.

CAPCOM So do we. Babe.

SC (Zornow) Jim is always for land landings.

CAPCOM Frank, this picture is drifting off center again. If you could make another correction to bring it back, I couldn't tell you which direction, but you're going the right way, you're going the right way. A little more, a little more, whoa stop right there. That is the best centering we have had Apollo 8, if you could just hold that it would be perfect.

SC To give you some idea, Mike, of what we can see, I can pick out the southwest coastline of the Gulf and where Houston should be, and also the mouth of the Mississippi, I can see Baja, California, and that particular area I am using a binocular that we have aboard.

capcom Roger. That understand.

SC This is an 8 power instrument that I have.

CAPCOM Right. Well, we are seeing the entire earth now including the terminator. Course we can't see anything past the terminator at all. Are you able with your binoculars to see the dark horizon? Anything past the terminator?

SC Negative, Mike. We can't see anything past

the terminator with the binoculars or with^{not} them. This earth is just too bright to and it cuts down the night adaptation to see anything on the dark side.

CAPCOM Roger, understand.

SC Since this is winter time. Since this is winter time in the northern hemisphere, we can see all of the South Pole and the southern ice cap, and not too much of the North Pole. Hey, you and Jim better get together. Jim just said he saw the North Pole.

CAPCOM He is looking out a different window.

SC That is what makes the difference.

CAPCOM Do you still have the --

SC He has the binoculars upside down.

CAPCOM Do you still have the polarizing filter in front of the camera?

SC Negative.

CAPCOM Okay.

CAPCOM Try putting it back in front of the camera one more time.

SC (Inaudible) Okay?

CAPCOM And once again we need a small attitude correction. Our earth is disappearing up and to the right. Our earth and your earth. The wrong way, wrong way. A little bit more. Okay. That is fine if you can hold it right there. Oops, no it is slipping back off again. Okay. Keep coming a little bit more, a little bit more. Okay. 90 degrees to that direction. That is the wrong 90 the other way. There we go. A little bit more. Nope, wrong way, wrong way, I am sorry. Keep coming in that direction. No, it is gone up at our 12 o'clock. There we go it is coming back down. There we go, it's coming back down, it's coming back down. Bring it down a little bit more. Okay. Stop. Now we need 90 degrees to that direction again.

SC I hope that the next camera has a sight on it.

CAPCOM Roger.

SC How is that.

CAPCOM Well, that has disappeared, just practically. We were wondering if there was any change of your looking out one of the other windows and seeing the moon? Hey, it is coming back in, Bill. Okay. Hold it there. That is just fine for the earth. That is extremely good on the earth if you can just hold that.

SC It has the polarizing filter in front of it now, Mike.

CAPCOM Roger. Thank you and it is centered very well. We get a very slight improve with it but in general it is very good considering the distance.

PAO Our present distance from earth is 175 803 175 803.

SC Mike, I think we will have to save the moon for another time.

CAPCOM Roger. I understand. You are still very well centered with your picture. We noticed a couple of jumps in the apparent intensity. Did you make some filter change?

SC Roger. We tried to put that other red filter in front of it, but it didn't seem to fit.

CAPCOM Roger.

CAPCOM We would -- on a final test when you get down to the end of your allotted time here, we would like you to remove all filters and let us see how it looks with all filters removed, and then we would like to get several spot meter readings at the very end of the test.

SC Okay. We will be removing the red filter now.

CAPCOM Roger.

SC Do you still have us, Mike? The lens is off.

CAPCOM Roger. We have it, and if you could maneuver it toward the terminator slightly you would again center our picture.

PAO The spacecraft is almost directly over dead center South America. This picture is being received simultaneously through our antenna at Madrid and at Goldstone California.

SC Is that the right direction?

CAPCOM That is the right direction. Keep coming. Now that is the wrong direction, Frank. Did you --

SC (Inaudible)

CAPCOM Well, negative. I need another maneuver toward the terminator. It is drifting off the screen to our 11 o'clock. We appear to need a maneuver toward the terminator.

SC Thank you.

CAPCOM No, that is the wrong direction, Frank. We are starting to lose the picture. There you go. That is the correct way.

SC Okay, Houston. How's that for today?

CAPCOM That is just fine, Frank. That's great. We would like to at the conclusion here take 3 spot meter readings. You can do that at any time at you convenience. We would just like to get some after the fact readings on the luminous intensity.

SC Roger. Jim has got the spot meter out now.

CAPCOM Thank you.

SC Is it centered now, Houston?
CAPCOM Now quite, Frank.
CAPCOM That's good right there. Hold that right there. That's perfect.
SC Okay, earth. This is Apollo 8 signing off for today.
CAPCOM Good show, Apollo 8. We appreciate it. See you manana.
SC Roger.
CAPCOM We have Haney down here following your trajectory, so all is well. He says 10 minutes from the moon's sphere of influence.
SC Okay. Good.
PAO This is Apollo Control Houston. We bring that raps up our television viewing for the day. The picture started -- I have to go back and get a hack on it -- I would estimate about 5 minutes of 2. Stand by and we will get an exact start time. We had not anticapted the starting of the pass until about 5 or 6 minutes after the hour. The crew moved in on us a little early as they did yesterday. I guess we should have anticapted it. When we began receiving a signal through Goldstone. Stand by one. We have had word from our station on Goldstone that they suspect that their reception may be even sharper than what we were receiving back here in Houston. We are going to get an early report on that. We are still awaiting a start time our assistant is trying to get it for us. Well, we go with the estimate of 1:58 pm EST and the signal went off at approximately 2:20 pm CST. Both of them are -- The spacecraft now 176 000 miles from earth. Its velocity in relation to the earth is 3265 feet per second. This is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 5538 229a 167/1

PAO This is Apollo control, Houston, at 55 hours 38 minutes into the flight and we have been asked for a reaction here in the control center during that television passage. I think the remark from Lovell got the most reaction was in his description of the blue and brown Earth and not being sure of whether he would land on it. This triggered a tremendous spike of laughter, the likes of which I can't recall, which immediately settled down to business and in general the room the - there was just zero talking going on in the room at the time except for what we all heard from Mike Collins in an exchange which the crew and as we have been talking the Apollo 8 has passed the - into the Moons sphere of influence and quite literally this is a historic landmark in space flight because for the first time a crew is literally out of this world, they are under the influence of another celestial body. The Moon from which the Earth 33 820 straight line nautical miles. We indicated earlier our space digital charge at some point not yet completely clear we'll switch over and start giving us Moon related values. That switch just took place and we immediately have configured, velocity is now 3989 feet per second in relation to the Moon and the last value in relation to the Earth was 3261 feet per second in relation to the Earth. We'll see this number go down off the Moon related figure over the coming period. We have some tape just prior to the start of this transmission, we will play that for you now..

SC Houston, Apollo 8, returning to the PTC in those.

CAPCOM Alright, Houston, understand, returning to PTC. Thank you.

SC Roger.

CAPCOM You can tell Jim he is getting pretty ham handed with that P21, he got a parallel altitude three tenths of a mile off what we are predicting down here.

SC Is that right.

CAPCOM Rog. Apparently you have got 69.7 and the ITC says 70.

SC Are we going to leave it at that or are we going to correct it to make it lower.

CAPCOM We are talking about it, Frank.

SC We have got a lunar reading of about between 1 and 1.25 - 1.25 K.

CAPCOM Roger, understand, between 1 and 1.25 K thank you.

SC Houston, Apollo 8.

CAPCOM Alright, Houston.

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 5538 229a 167/2

SC Roger, if you put your CMT to accept
we will send you our state vector.

CAPCOM Touche'.

PAO And that wraps it up from Apollo 8
and now - and now presently 33681 miles from the Moon and
moving in a Moon related velocity 3989 feet per second at
55 hours 42 minutes into the mission, this is Apollo control,
Houston.

END OF TAPE

PAO Apollo Control, Houston here. 56 hours 3 minutes into the flight and in the last 15 to 20 minutes we have had a most interesting discussion with the crew. Like getting Frank Borman's reactions primarily to the television pass. He was advised by Mike Collins that fortunately today those spectacular views of the earth had no competition had no football games to compete with and Borman allows as how he hopes a football game wasn't stopped to see the view from space. That pretty well sums up Frank Borman's extraordinary interest in the game of football. Here is the conversation.

SC Houston, Apollo 8.
CAPCOM Apollo 8, Houston.
SC How does everything look, Mike. All our systems and everything. See any switches out of place?
CAPCOM Negative, I'll take a check around here but it is looking good, just a second.
SC We are all in the cabin Mike like monkeys and I wanted to make sure we didn't hit anything.
CAPCOM Apollo 8, Houston. Everything is looking good down here all ... and systems are GO.
SC Thank you.
CAPCOM We are reading you loud and clear Frank.
CAPCOM We are having a playback of your TV shows and are all enjoying it down here. It was better than yesterday because they didn't pre-empt the football game.
SC Don't tell me they cut off a football game, didn't they learn from Heidi?
CAPCOM You and Heidi are running neck and neck in the telephone call department.

END OF TAPE

OLLO 8 MISSION COMMENTARY, 12/23/68, GET 550400, CST 1:55p 169/1

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Roger. We will be switching antennas from Madrid to Goldstone in another 3 minutes. You can expect a glitch on your comm.

SC Thank you.

CAPCOM Apollo 8, Houston. We are reading you loud and clear through Goldstone, over.

SC Television on now and we are trying to maneuver to the earth.

CAPCOM Roger, understand.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston. Over.

SC (Lower) Roger. We are maneuvering the position now for the TV. Bill has got it set up in Frank's left rendezvous window and I'm over in Bill's spot looking out the right rendezvous window. The earth is now passing through my window. It's about as big as the end of my thumb.

CAPCOM About as big as the end of your thumb at an arm's length.

SC That's right. I think what we see now is South America down below us.

CAPCOM Roger. Is the TV camera pointed at about 30 degrees yaw level from the +X-axis?

SC Stand by. We're checking it. We think we've got it in the right position, we are going into position now.

CAPCOM Okay.

SC Houston, are you getting any sort of picture?

CAPCOM Apollo 8, Houston. Negative, not yet.

END OF TAPE

PAO This is Apollo Control at 57 hours 11 minutes into the flight. Here in Mission Control Center, we've completed the change of shift and Flight Director Milton Windler has gone through the status of the mission with his flight controllers. Now, at the present time, we are preparing for a midcourse correction. This will be the second performed on this translunar leg of the Apollo 8 flight. That first maneuver was, of course, performed with the service propulsion system engine, Midcourse maneuvers number 2, numbers 2 and 3, now which had been included in the flight plan, were not performed because of the small amount of correction needed and our estimate, at this point, is that midcourse correction number 2 will be for about 3 feet per second and will occur at the nominal time in the flight plan of about 61 hours. We've had two brief conversations with the crew since our last report. We'll play those back for you now.

SC Houston, Apollo 8.

CAPCOM Go ahead, Apollo 8.

SC Hey, Jerry, how much water does this, the water dispenser in the lower equipment bay, the one that puts out hot and cold water, how much comes out of that with each shot?

CAPCOM Stand by. I'll take a check on that. And by the way, welcome to the Moon's sphere.

SC The Moon's fair?

CAPCOM The Moon's sphere - you're in the influence.

SC That's better than being under the influence.

Hey, Jerry?

CAPCOM Go ahead, 8.

SC My handy LMP added schematics out of the drop of a hat and informs me that it's 1 ounce per cycle.

CAPCOM Apollo 8, looks like the flying EECOM and the ground EECOM came to a dead heat on that one.

SC They did?

CAPCOM We got the same answer at the same time.

SC I'll have Bill put it on the tape recorder and send it down.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Okay, 8, we want to run a little exercise on the ground here to make sure that we're able to dump the tape and bring the voice portion back to Houston in a timely manner. So we plan to dump your tape and we're going to exercise the procedures on the ground to get it back here and take a listen to it. We believe that we have something on the tape already unless you have recorded over it after the last dump. Just to make sure, we'd like to have you just say a few words, give us a short count or something on the tape and anything that you

might want to put on there. And we're going to do this in the next 5 minutes before we get away from Madrid. In fact, we want the exercise so we'll go ahead and do that and we'll tell you before we make the dump.

SC Houston, this is Apollo 8, over.

CAPCOM Go ahead, Apollo 8.

SC Okay, kid, we put a few comments on the last of the tape after we heard from you and it's being rewound now and you can have it as soon as we get it back to the beginning.

CAPCOM Okay, we'll have to wait. It looks like you are going out of the attitude to use high gain. We'll catch it next time around and then dump it.

SC Okay, I know this would be better in high bit rate though it will probably take quite awhile.

CAPCOM All right.

PAO And that concludes the conversation that we had with the spacecraft during the press conference. At the present time, Apollo 8's velocity, as it moves toward the Moon now, is 4011 feet per second. So we are beginning to see an increase in velocity as the spacecraft comes under the influence of the Moon's gravity and begins to accelerate toward the Moon. Our height above the Moon is also showing a continued decrease and now reads 30 021 nautical miles. Marilyn Lovell, Apollo 8 Command Module Pilot Jim Lovell's wife was in the viewing room at Mission Control Center for about 30 minutes, viewing activities here in the Control Room and talking with Dr. Robert Gilruth in the viewing room. And she heard the rather brief conversations with the spacecraft during that period of time and she has now left the Control Center. At 57 hours 16 minutes into the flight of Apollo 8, this is Mission Control Houston.

END OF TAPE

PAO This is Apollo Control at 57 hours 32 minutes into the flight of Apollo 8. Now we are in contact with the spacecraft at this time and Bill Anders reports that both Frank Borman and Jim Lovell are sleeping at the present time. And we have passed up some preliminary information to the crew on the mid-course correction that they will be performing at 61 hours in their flight. We will bring you up to date with the tape on every part of that conversation and stand by for any live communication with the spacecraft.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Rog. Do you think we're in a position where we could use the high gain?

SC I believe we could.

CAPCOM Okay.

CAPCOM Apollo 8, Houston. We're dumping at this time.

SC Roger. (garble)

SC We ought to also get a check on it at mid-rate per TSC voice.

CAPCOM Apollo 8, are you saying that everything that's on there now is in high bit?

SC That's where my switch is.

CAPCOM Okay. We'll take a look at it then. It was making - It was previously recorded in low bit. After awhile we'll come back and maybe take a look at that, too.

SC Okay, we might can wait until we get in a little closer to the Moon to put as big of strain on it as we can.

CAPCOM Apollo 8, Houston.

SC Go ahead Houston.

CAPCOM Okay, we've completed the dump and the tape recorder's back to where you can use it any way you want. We may want to dump that thing again, and if we do we'll go ahead and use the same information unless you have something else that you specifically wanted to put on there later. Listening to the voice call to you - it sounds real good. We're coming up on a mid-course four and right now it's - talking about doing it on time and you can anticipate the burn in the neighborhood of 3 foot per second. We're considering and would like for you to think about the possibility of doing this burn using the onboard vector and just have us update the vector in the lens slot, so that you will have the midcourse vector on board. But it looks like it won't have any big effect on the burn result and it might prove interesting. So if you think about that one for a bit, let us know if you have any suggestions or thoughts on the subject.

SC Rog. You say it uses the onboard vectors

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SC and leaves the midcourse vectors on
the lens slot.

CAPCOM That's affirmed, if that's what you would
like to do, right. We considered it and looks like that would
be a reasonable thing.

SC Roger. Frank and Jim are asleep now and
I'll bring this up to them when they wake up.

CAPCOM Okay, real fine.

CAPCOM Apollo 8, Houston. How about turning up
the oxygen?

SC Okay, it's turned up.

PAO This is Apollo Control and it appears that
we have no more communications with Bill Anders during this
period. We would also judge that the crew is following the
advice of the ground given out yesterday that they set their
down pace and sleep when they feel they need it. As you heard
Anders report both Borman and Lovell are sleeping at the present
time. Apollo 8 is continuing now to accelerate toward the
Moon. The current velocity reading is 4018 feet per second
now that's up about 10 feet per second in velocity in the
past 30 minutes. And our current altitude now stands at
29 048 feet or rather 29 048 nautical miles above the Moon.
This is Apollo Control at 57 hours 40 minutes.

END OF TAPE.

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 580000, CST 4:51p 172/1

PAO This is Apollo Control at 58 hours into the flight of Apollo 8. We've had no communications with the spacecraft since our last report, and here in Mission Control it has also been rather quiet. At the present time the spacecraft is at an altitude of 28 225 nautical miles from the moon and velocity reads 4024 feet per second. Coming up in just a little under 3 hours we have a midcourse correction maneuver scheduled. This is listed as midcourse correction number 4 in the flight plan and will actually be the second midcourse correction on route to the moon. Midcourse corrections 2 and 3, which were listed in the flight plan, were such low values that they were not performed and we anticipate that midcourse correction coming up will be for about 3 feet per second, a burn of about 3 feet per second using the spacecraft reaction control system. At 58 hours 1 minute this is Apollo Control.

END OF TAPE

PAO This is Apollo Control at 58 hours
12 minutes. We have just been in touch with the spacecraft
and received a status report from Bill Anders on the condi-
tion of the spacecraft windows at this time. We'll play
back that conversation for you and then stand by briefly,
for any further communications with the spacecraft.

CAP COM Apollo 8, Houston.

SC Go ahead Houston.

CAP COM Okay Bill, I guess I want to belay my
laughs throughout, using the on board state vector 4NCC4.
Now after looking at it somemore on the ground, they've got
to get going on making their paths and doing all their com-
putations. And rather that put it off or do it twice, we're
going to go ahead and go with the procedures we've been using
all along. On the lunar orbit stuff, we've been looking it
over and we got several guys, Jack Smith, accompanying in
the back room, looking at what effect your windows have.
And basically it looks like there's two options that will
make an impact on that REV 2. One of the options, of course,
will be just to have you and Jim change seats and let Jim
look out and get his SAM that way, and another option will
be to roll the bird over and let Jim point the optics as
far forward as he can get them and take his SAM through
the telescope. And I guess we'd like to have any thoughts
that you folks have on what you think you can do with the
windows, if you have anything we'd like to sipher it into
our thinking and go ahead and firm up our plans as early as
we can. We'd like not to put it off so that we have none
of these things to do after midcourse. You folks can prob-
ably tell us more about what you can do with those windows.
So if you have any thoughts, go ahead and sing out with them
and we'll see what we can do about fencing that in.

SC Okay. With reference to the midcourse,
I think that's generally agreed upon. That we do it like
we've always been doing it. Now with respect to the win-
dows, spare windows, essentially, are useful. The 2 side
windows are, may be all right for observation, and the
problem with the rendezvous windows is that they're pretty
small. And I just thought we'd have to play the window
game by ear. Not really sure what capability we're going
to have. And we'll give you somemore thoughts on this
later.

CAP COM Okay, how about exercising the idea of
rolling over and having Jim do his polarization through the
telescope because if we have to change attitudes we'd like
to go ahead and start thinking about what effects that'll
have on such things as antenna orientation and all that.

SC Okay. We'll - I'll mention it to them
when they wake up.

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 581200, CST 5:02p 173/2

PAO And it appears that we'll have no further communication at this time with Bill Anders, aboard the spacecraft. We're continuing to monitor the velocity and altitude as it approaches the moon. At the present time, our velocity reading is 4030 feet per second and we're at an altitude, above the moon, of 27 575 nautical miles. Our predictions, in Mission Control Center, are that the velocity will, of course, continue to accelerate as we approach the moon rather slowly for the next 7 hours or so and we anticipate that by about 65 hours the velocity will be somewhere around 4350 feet per second. That would be an increase of about 300 feet per second over what we're showing now. The dramatic increase in the velocity will come between 65 hours and 69 hours, at the point of lunar orbit incursion, when the velocity will just about double, going from 4350 feet per second up to about 8420 feet per second. At 58 hours 18 minutes into the flight this is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY,12/23/68,GET 583700,CST 5:28 P,174/1

PAO This is Apollo Control at 58 hours 37 minutes. At the present time, our spacecraft velocity is 4037 feet per second and we are at an altitude now of 26 764 nautical miles above the Moon. We had one rather brief conversation with Bill Anders in the past 15 minutes or so and have not heard from the spacecraft since. During that conversation, we passed up to the spacecraft an update to the computer driven clock aboard the spacecraft and that pretty much summarized the content of that communication. We'll play that back for you now and then pick up live with conversations that are going on at the present time.

SC Go ahead, Houston.

CAPCOM Okay, Apollo 8, we'd like to update your CMC clocks. This is not the correct errors which we have now but just to make up for some effects that we're going to have in lunar orbit. And what we'd like to have you do is go to POO and accept and let us update the clock time.

SC Stand by.

SC Okay, in POO and accept.

CAPCOM Rog, thank you.

CAPCOM Apollo 8, Houston.

SC SC Go ahead, Houston.

CAPCOM Okay, we're completed with the clock update and the computer is yours.

SC Thank you. Going to block.

CAPCOM Rog.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 592200, CST 6:13, 175/1

PAO This is Apollo Control at 59 hours 22 minutes into the flight. At the present time Apollo 8 is at an altitude of 25 036 nautical miles above the moon and traveling at a speed of 4053 feet per second. Since our last report, we have only had one very brief conversation with the spacecraft. That was a request from the ground that Bill Anders begin a fuel cell purge, supposedly one of the routine bits of housekeeping that the crew will - is carrying out throughout the flight, at specified time intervals and part of this procedure to remove any contaminants that build up inside the fuel cells and could begin to degrade their performance. We will play back the short bit of tape that we have on that conversation and then stand by for any possible call to the crew.

CAPCOM	Apollo 8, Houston.
SC	Go ahead Houston.
CAPCOM	How about an O2 purge.
SC	Okay.
CAPCOM	Thank you.
SC	There's number 1.
CAPCOM	Roger.

END OF TAPE.

PAO This is Apollo Control at 59 hours 46 minutes. Capsule Communicator Ken Mattingly has just put a call into the crew. We'll catch up with the tape and then follow the conversation live.

CAPCOM Apollo 8, Houston.

SC Houston, Apollo 8, go ahead.

CAPCOM Okay, we'd like to update CMC the order that we'll update will be the LM state vector, the CSM state vector, and then the external DELTA-V and the rest mat. So any time you're free with it, we can have POO in accept we'll go ahead with it.

SC I understand you're going to update LM state vector, CSM state vector, and external DELTA-V and rest mat.

CAPCOM Affirmative. And I'll have one, two, three pass to read to you.

SC Stand by. Okay, you've got POO in accept.

CAPCOM Okay, thank you. And just a minute I'll be with you on the pass. They'll be three minute pass. One of them MCC 4.

SC Houston, Apollo 8, we're ready to copy if you read.

CAPCOM Okay, stand by.

SC Okay, that means we've lost com here for a second.

CAPCOM No, just fine. 012 minus 00 011 plus 00 012 031 008 323 November-Alpha plus 00 618 00 020 011 00 020 17 29 65 308 Alpha-Centauri up 073 left 34. For the stars it will be the primary-Sirius, secondary Rigel, 129, 155 010, over.

SC Roger, MCC4, RCS G&N 6288 NA NA 060 59 5430 minus 00012 minus 00011 plus 00012 031 008 323 NA, are you with me so far?

CAPCOM Keep going.

SC Plus 00618 00020 011 00020 17 29 65 308 Alpha-Centauri, up 073 left 34 primary Sirius secondary Rigel 129 155 010, over.

CAPCOM That's correct Apollo 8.

SC And what else have you got?

CAPCOM Okay, I've got one for pericyynthion plus 2 and it's a minimum DELTA-V solution.

SC Roger, ready to copy.

CAPCOM Okay, that's pericynthion plus 2 RCS G&N 628 71 November-Alpha and stand by one. Okay, we'll pick up with a pitch trim and yaw trim of not applicable. Time 071 07 2216 minus 004 68 plus 00 254 plus 00 181 173 101 027

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 594600, CST 6:37 176/2

November-Alpha plus 00 187 00 563 515 005 63 01 31 69 198
044 down 044 left 45 plus 11 00 minus 025 00 129 67 36198
137 0153 primary Sirius secondary Rigel 129 155 010
4 jets plus X. This assumes execution of midcourse correction
number 4 and uses the same alignment as midcourse correction 4,
over.

SC Roger, pericyynthion plus 2 minimum DELTA-V
RCS G&N 62871 NA NA 071 07 2216 minus 00468 plus 00254 plus 00181
173 101 027 NA plus 00187 00 563 515 00563 013169 198 044
down 044 left 45 plus 1100 minus

END OF TAPE

SPACECRAFT Graft 45 plus 1100 minus 02500 12 niner 67 361 niner 8 1370153 primary Sierra, secondary rogel 12 niner 155010 4 jet plus 6 assumes MCC4 with same alignment over.

CAPCOM That is correct Apollo 8.

SPACECRAFT Houston, Apollo 8, confirm that foresite star and SPA are exactly the same number and not typographical error.

CAPCOM Roger, Apollo 8, they are checking that. Apollo 8, the computer is here if you can take it back

SPACECRAFT Roger, going to Block.

CAPCOM Thank you.

CAPCOM Apollo 8, Houston here. Apollo 8, Houston

SPACECRAFT Houston, this is Apollo 8. Do you copy?

CAPCOM I do now loud and clear. I've got one more pad for you and the confirmation that forsite star number and the pitch angle are correct at 44.

CAPCOM Roger, and we are ready to do our P52 preferred alinement at this time are you ready?

CAPCOM Affirmative.

SPACECRAFT Okay, we are ready to copy.

CAPCOM Okay this is a pericentium plus 2 for a fast return. This will be SPS GNN 628 71 minus 161 plus 12 niner 071 064207 plus 45224 minus 06216 minus 18712 001 287351 November Alfa plus 001874 niner 336 6034 niner 118 112038 2 niner 6 earth up 010 right 37 plus 14 75 plus 06500 1323 niner 36 niner 131060 niner 23 primary star Sirius secondary Rigel 12 niner 155010 no ullage. Assumes execution of midcourse correction 4 and uses the same alignment. The time for MCC5 for GERU determination that's Golf Echo Romeo Uniform. This will be a GET of 8302 us P37 NC4 steps 1 through 10 and NC8 steps 3 and 4. I say again use P37 November Charlie 4 steps 1 through 10 and November Charlie 8 steps 3 and 4. Velocity 400 K for Carter control chart 36507 over

SPACECRAFT Houston, Roger, this is Apollo 8, you copy?

CAPCOM This is Houston

SPACECRAFT Roger Houston, this is Apollo now you read.

CAPCOM Okay, loud and clear Bill.

SPACECRAFT Okay, Ken, pericentium plus 2 fast return SPS GNN 62871 minus 161 plus 12 niner 071064207 plus 45224 minus 06216 minus 18712 001 287 351 NA plus 00187 49336

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 600600, CST 6:57p, 178/1

SC 49336 603 4 niner 118 11 2038 2 niner 6
Earth up, 010 right 37 plus 1475 plus 06400 1323 niner 36
niner 13 1060 niner 23 primary serious secondary roger 12 niner
155 010 no ullage assume MCZ4 same alignment MCZ5 gay rude
determination GED 8302 P-37 MZ4 1 through 10 and copy MZ 8
3 and 4. Velocity at 400K 36507. Over.

CAPCOM Okay, Apollo 8. That's correct with one
exception. In the pad format under longitude noun 61. That
is plus 06500. Over.

SC Roger, that's what I have - plus 06500.

CAPCOM Okay. That's correct Apollo 8.

SC And we're ready to copy whatever else
you have.

CAPCOM Apollo 8, let's go back and confirm on
your minimum Delta V pericyynthion plus 2. That the pitch
column is 101. That's the fifth block down.

SC Roger. Pitch. Roger, Pitch 101.

CAPCOM Okay. Thank you very much. And the item
we have left to go is that we'd like to get with you on how
you want to handle problem with windows on rev 2.

SC Okay, Houston. Stand by on that please.

CAPCOM Roger.

SC Houston, this is Apollo 8. We want you
to come up with a suggested red line for RCS usage during
Lunar orbit, also, please.

CAPCOM Rog, that's in work.

SC And for your information, Houston, when
the Sun is shining on window 5, it's pretty hazy. Window
number 1 is a little bit better.

CAPCOM Okay, thank you.

SC Houston, this is Apollo 8. Houston,
Apollo 8.

CAPCOM Apollo 8, go ahead.

SC Roger. We tried to get this realignment.
We need - Do you have a maneuver to get us some gimbal angles
so we don't get gimballed when we get the preferred alignment?

CAPCOM Stand by on that.

SC Thank you.

SC All right here's the present position
we'll go into gimbal lock because we're doing it in preferred
angle.

CAPCOM Say it again, Apollo 8.

SC In running through program 52, we get a
program alarm 401 which would indicate there'd be continued
if we drive it into gimbal lock.

CAPCOM Rog. I understand.

CAPCOM Apollo 8, Houston. This should be an
option 1 like option 3.

SC Rog Houston, we're doing an option 1

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 600600, CST 6:57p, 178/2

SC like option 3. We keep getting a 401
alarm, which does desired RCTU yield gimbal lock.
CAPCOM Rog. Stand by.

END OF TAPE.

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 601600, CST 7:07 179/1

CAP COM Apollo 8, Houston. It appears that you have maneuvered around the Gimbal LOX system.

SC Roger. Roger.

CAP COM Okay. Sorry we were late on that answer.

SC Thank you. Houston.

PAO This is Apollo Control. During that series of conversations with the spacecraft, among the numbers passed up to the crew and then verified and read back down from the spacecraft, was the information that will be used for the midcourse correction coming up at 61 hours. That maneuver is scheduled to be an RCS maneuver using the 4 reaction control system jets on the service module, each of those having a thrust of about 100 pounds. So we'd have a total of 400 pounds of thrust. The burn duration is scheduled for 11 seconds and with that much burn time and that much thrust acting on the weight of the vehicle which is estimated to be at 62 888 pounds it gives a delta V, a change in velocity, of about 2 feet per second. And that velocity change would be in the retrograde direction. It would slow the spacecraft down slightly, having the effect of lowering the perigee or perilune at the point the spacecraft passes closest to the moon. Our computations on the ground give the low point above the surface of the moon at present, without the maneuver, as 69 nautical miles. The nominal altitude would be 61.5, and this burn is designed to give us that altitude at pericyynthion. The spacecraft will be pitched down and yawed right slightly in the burn, making it retrograde and slightly out of grade. We're now back in conversation with the spacecraft, and we'll pick that conversation up now.

SC Houston, Apollo 8.

CAP COM Go ahead.

SC Well, we stopped and went through course line of P52 and then we got final line, pick a pair, pick Capella. But she drove and didn't get to any place. All right, just pick Capella, I can't recognize anything out there right now. Can I re-cycle here and go back and pick a pair?

CAP COM I'm sorry, Apollo 8.

SC All right, Houston? Apollo 8.

CAP COM Go ahead, Apollo 8.

SC Our plan is to go back into re-enter program 52. It did not drive to Capella and I can't recognize it in the scanning telescope.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 602600, CST 7:17p, 180/1

SC My plan is to go back into re-enter program 52, well it did not drive to cabilla and I can't recognize it in the scary telescope. My plan is to go back into the recoil P-52.

CAPCOM Okay, stand by one.

CAPCOM Apollo 8, can you confirm that you zero the optics where I'm concerned?

SC Roger that's affirmative, we zeroed the objects.

CAPCOM Apollo 8 Houston, you have a go for a second try in P-52 in option 3.

SC Okay. I know how (garble) got in the telescope, I might want to call that one instead of Capella.

CAPCOM Okay.

SC I want to see what it comes up with first, though.

PAO This is Apollo Control. We have just now passed the 30-minute mark in the clock counting down to the mid-course correction maneuver. Now that clock currently reading 28 minutes 35 seconds until the burn, and at the present time Apollo 8 is at an altitude of 22 211 nautical miles above the Moon, traveling at a speed of 4085 feet per second. We'll continue to stand by for any conversation from the spacecraft or the ground to the spacecraft.

SC Houston, Apollo 8. We came up with an unacceptable difference in our stars. We're going to have to recycle.

CAPCOM Roger.

SC If we don't get this mid-course, then what will I do to our pericyynthion?

CAPCOM Stand by, one.

CAPCOM Apollo 8, Houston. In the event that we don't get this mid-course in, we'll still go for an LOI, and let's don't forget that you try a (garble) which is OCTO 10.

SC That's the one we're trying now.

CAPCOM Roger.

END OF TAPE.

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 603600, CST 7:27 181/1

PAO This is Apollo Control at 60 hours 40 minutes into the flight, and we're continuing to countdown to our midcourse correction now 19 minutes 57 seconds from that maneuver. At the present time the crew is somewhat behind in the flight plan, and we suspect they are involved in aligning the inertial measurement unit in the Guidance and Navigation equipment. We just heard from the Guidance Officer that it appeared that that operation was proceeding well at this time. We'll continue to follow activities and monitor for any conversation between the ground and the spacecraft.

PAO This is Apollo Control at 60 hours 46 minutes. Now we're continuing to monitor for conversations between the ground and spacecraft. It's been a very quiet period what with the crew busily involved in getting ready for the midcourse correction maneuver. That burn is scheduled to occur now in 14 minutes and to resummairize that will be using the spacecraft Reaction Control System thrusters. It will be an 11 second burn giving us a change of velocity of 2 feet per second. That velocity change will primarily be retrograde slowing the spacecraft down by about 2 feet per second in order to lower the pericyynthion or point at which the spacecraft passes closest to the Moon. And the burn will also be performed with the spacecraft yawed slightly out of plane. At 60 hours 47 minutes this is Apollo Control.

END OF TAPE

10/195/✓

APOLLO MISSION COMMENTARY, 12/23/68, GET 605400 CST 7:45 p 182/1

PAO This is Apollo Control at 60 hours 54 minutes we just heard from the spacecraft. Jim Lovell advised that they are set and apparently ready to go at this time for their midcourse correction maneuver. We will play back that conversation for you and then stand by for further communications with the spacecraft.

SC Houston, Apollo 8.

CAPCOM Go ahead.

SC We are all set up counting down at 8 minutes.

CAPCOM Roger.

CAPCOM Apollo 8. Our data is down right now, appreciate you making sure you have the tape recorder on.

SC Roger. I am going to go -- I'll have to go COMMAND reset. You've got control.

SC Houston, Apollo 8.

CAPCOM Go ahead.

SC Roger. You have some pitch and yaw angles for our PGC after burn.

CAPCOM Okay Apollo 8. That's pitch 348 yaw 315.

SC Pitch 348, yaw 315.

CAPCOM That's affirmative. Hey, would you give us another hack on your count down time?

SC It's 518 17 16 15 14.

CAPCOM Thank you.

SC Houston, I will give you a mark in 4 minutes.

CAPCOM All right. Thank you.

SC 3 2 1 mark. Four minutes.

PAO We are coming up now on 3 minutes until our midcourse correction maneuver. You will note a slight time delay, from the time when the spacecraft is counting back and we're watching our clocks here. That's about one and one half second delay one way. Here is another call to the crew.

CAPCOM Apollo 8, Houston. How about switching the biased switch over to the left.

SC Roger. 3 2 1 mark switch.

PAO Coming up on 2 minutes now. Still looking good for that maneuver. At the present time, the spacecraft is at an altitude of 21 thousand 144 nautical miles above the moon and traveling at a speed of 4100 feet per second. We're now coming up on 1 minute 30 seconds until that midcourse correction maneuver. This is Apollo Control at 60 hours 59 minutes 41 seconds, and we're counting down now the last 10 seconds to our maneuver. We should have the beginning of that 11 second reaction control system maneuver at this time. We will stand by for confirmation here on the ground. We show the burn completed at this time.

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 605400 CST 7:45p 182/2

We should have some preliminary figures shortly. Power Guidance and Control Officer advises that they clocked the burn at about 12 seconds. We nominally planned it for about 11. That would be a one second differential.

SC Houston, Apollo 8.

CAPCOM Go ahead.

SC Roger. Burn on time, angles nominal, burn time about 12 seconds, .2 feet per second after the Delta-VC, 0 in VGX. We have transferred the results of the burn over to the left slot VERB 66.

CAPCOM Roger. I have a couple of items that I would like to clean up. We will get you an RCS budget. We've got one deadline now we are trying to get some firmer numbers for you, and we will have those in a little bit. But now your PTC usage is right on the flight plan line, so everything looks pretty good there. We want to get a crew status report from you. We would like to firm up the rev 2 flight plan idea, and sometime at your convenience we would like to take a reading of the PRD for the Commander and CMP and then have you swap them. We are trying to isolate the -- what the possible reason is for the discrepancy, or the disparity in the two readings.

SC And we are maneuvering to the PTV attitude,
Houston.

CAPCOM Roger.

END OF TAPE

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CAP COM Apollo 8, Houston. Could you give us the sign of that Z residual?

SC Stand by Houston. All right, Houston, looks like we didn't record just the Z. We recorded delta VC, which is minus 0.2.

CAP COM Okay, understand.

SC Delta V was 0.1 but we didn't get the sign.

CAP COM Roger. Understand that was delta VC was minus 0.2. I copied delta VZ. ZULU is 0.2. Is that incorrect?

SC Roger. It was 0.1 but we did the sign.

CAP COM Okay. Thank you.

SC We can get it. We have it on the tape, Houston, whenever you want to dump it.

CAP COM Rog. Thank you.

SC Give you about the last 5 minutes worth.

CAP COM Roger.

SC Okay, Houston, for the PRD's.

CRD is .07. CMP is .64. LMP is .80. Note that the CMP's haven't changed since we started and the commander's haven't changed much. We have swapped PRD's, commander has LMP, CMP has commanders and LMP has CMP's PRD. Over.

CAP COM Okay. Thank you.

PAO This is Apollo Control. Based on this information passed back from the crew on that midcourse correction and our figures here on the ground, it appears that the maneuver was within about 0.2 of a foot per second of being right on the nominal and that would put us very close to the preplanned pericyynthion of 61-1/2 nautical miles. We, of course, will be tracking the spacecraft following this maneuver to determine just exactly what effect it did have. But that was the preplanned. That maneuver would have had the effect of lowering the pericynthion by about 6 or 7 nautical miles. At 61 hours 10 minutes into the flight, Apollo 8 is currently at an altitude of 28 676 nautical miles and traveling at a speed of 4107 feet per second. This is Apollo Control, Houston.

END OF TAPE

PAO This is Apollo Control at 61 hours 29 minutes. A preliminary figure on the effects of that midcourse correction performed at 61 hours indicates that our height of perigee will be 62.3 nautical miles as a result of that maneuver. Now we have been shooting for something on the order of 61.5. 62.3 is very good, and the flight controllers here in Mission Control Center are quite happy with that figure. The spacecraft also computed height of pericyynthion following the maneuver and we heard from Lovell their onboard computation was that the maneuver would of placed their pericythion at 63 nautical miles. So we have very close agreement between the ground computer figure in that case and the onboard computation. We'll playback that conversation with the spacecraft for you now and then stand by for any communications that should develop afterwards.

SC Houston, Apollo 8.

CAPCOM Go ahead.

SC Roger, understand as follows water, the Commander has about 50 clicks so far today; CMP 43, and the LMP is 44. We've eaten two meals so far today. Today meal A and B; took most of it except for the hard hard bite. No one cares for it. Pudding was outstanding. We're at a gain of pericynthion now of plus 63 miles. Commander and CMP have had a rest period just before the midcourse four of about 2 hours.

CAPCOM Roger.

SC Houston, Apollo 8.

CAPCOM Go ahead.

SC We're at a gain of about 20 500 miles from the Moon at 61 14, how does that agree with what you figure?

CAPCOM Apollo 8, Houston. Looks like your on the secondary loop. We would like to run that for about 5 minutes.

SC Roger. We're doing the EGS redundant component check.

CAPCOM Roger, we'll follow.

SC - data down there Houston, guess you are. Okay, see you stopped my tape then. I've been running for about 3 extra minutes here to record the check.

CAPCOM Roger, we have data now. That was a temporary loss.

SC What's the matter was it chow time down there?

CAPCOM Roger. Didn't know you could smell it that far away.

SC Give me a call when your satisfied with the secondary loop it's stabilized at down here pretty well

CAPCOM Wilco, and you might tell Jim that RTCC is about 4 miles off. We had a 20 496.

SC Fine. Just put compressor Q on ACQ. Houston, Apollo 8, do you show battery B as voltage dropped as not from the post charge value over.

CAPCOM Apollo 8, Houston, confirm that battery B is a little bit lower, and this is attributed to the parasitic loads that are on there.

SC Okay, I just didn't see the same kind of drop for A. So if you think it's okay, it's fine.

CAPCOM That's firm. You don't have the same parasite loads on that. B is actually drawing some.

SC Okay, I guess that's the radiators, uh.

CAPCOM Apollo 8, Houston, we see enough of the secondary evaporator. We would like for you to wait about 2 minutes between the time you go to reset and the time you turn the pump on.

SC I agree, good idea. And we plan to leave the water control in auto.

CAPCOM Roger. Apollo 8, Houston.

SC Go ahead Houston, Apollo 8.

CAPCOM Okay, looking over the - our redundant component check, it appears we have not yet checked the integrity of the secondary loop radiators, and if you haven't done that some time we would like to open up the secondary radiators but not flow through and just measure the accumulator pressure.

SC Standby. Houston, we don't show that in our pre OLI check, but we will go ahead and do it if you want to.

CAPCOM Roger, we just noticed that it isn't there, and yes we would like to. You understand that we are not proposing that you flow, but merely we check out for any pressure indication.

SC Roger, wait till I get my trusty assistant here to help me. Okay, Houston, we're going to blow the secondary, I mean open the secondary rad for 30 seconds now.

CAPCOM Roger.

SC Looks pretty good.

CAPCOM Sure does.

SC Okay, they're closed now.

CAPCOM Okay, thank you, looks good.

SC Roger, no meteroids yet.

PAO This is Apollo Control. During that conversation with the crew, Jim Lovell gave us a status report on the eating and drinking and sleeping that they've done recently. And he said that they have logged 50 clicks of

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water for the Commander, and 33 clicks for the Command Module Pilot, and 44 clicks for the Lunar Module Pilot. That translates into one half ounce per click which would be about 25 ounces for the Commander; about 21 or 22 ounces for the Command Module Pilot and about the same amount of water for the Lunar Module Pilot. Lovell noted that they have all had two meals today. And found the pudding particularly palatable to them, and also you heard Lovell relay the onboard figure for the height pericythion, the closest approach of the spacecraft to the Moon following that midcourse correction maneuver. We'll continue to monitor for any conversations with the crew, and if we don't pick up communications in a minute or so, we'll take the circuit down and standby to come up again when there are further conversations.

CAPCOM Apollo 8, Houston. You take your tape recorder to stop and we'll reset it then and give it back to you.

SC Roger, it's stop.
CAPCOM Thank you.

END OF TAPE

PAO This is Apollo Control at 61 hours 41 minutes and at the present time we show 7 hours 17 minutes until our Lunar Orbit Insertion Maneuver. I will pass along to you information on that maneuver as soon as it is available. In the meantime we anticipate things will be quieting down somewhat both here in Mission Control Center and aboard the spacecraft. The flight plan is relatively quiet for the next several hours. It doesn't begin to pick up activity again until about 3 hours prior to the Lunar Orbit Insertion Maneuver at which time the crew will begin checking out the guidance and navigation equipment and running through their systems checks and preparation for that maneuver and here on the ground they will be passing up the information needed to carry out the maneuver and the crew will be checking this against their onboard figures and against the information that is automatically loaded into the computer from the ground. We'll continue to stand by for any communications that should develop as I said we do expect that the insuing several hours will be quiet. At 61 hours 43 minutes, this is Apollo Control.

END OF TAPE

PAO This is Apollo Control at 61 hours, 58 minutes, and at the present time Apollo 8 is at an altitude of 18 733 nautical miles, traveling at a speed of 4139 feet per second. Since our last report we've had a couple of conversations with the crew in which we've discussed the, some of the methods for working around the fogged windows that the crew has on the spacecraft in order to carry out the planned tasks in lunar orbit, and we'll play those conversations back for you and continue to stand by for live conversations from the spacecraft.

CAP COM Apollo 8, Houston.

SC Go ahead.

CAP COM Okay. We still need to talk about the REV 2 attitudes we're going to use here to work around the fact that you have a fogged center window. Whenever that's convenient, we'd like to go over what you're thoughts are on the subject and make sure we can get our flight plan squared away.

SC My thoughts are to make do with the best with what we have. We are not interested in changing a lot of things right now.

CAP COM Okay. The one proposal that sounds like it has some advantage to it. If we let Jim do his evaluation through the telescope, you do everything exactly the same except you turn and roll over 180 degrees so that your head's up, and let Jim do his tracking through the telescope and you'll still be all right when you go to pick up your TV and that type of thing. And it looks like that probably will cover everything. We can do that or we can just go as is and just have to let some of that tracking evaluation go by. Another alternate would be to have Jim look out the right-hand rendezvous window, and you may have to change your attitude in order to get the same picture there also.

SC I think we'll try to do that, but I don't - this is one of the things that we'll work out when we get there.

CAP COM Okay. The reason we were looking into it in the flight plan is, if you do want to try rolling over and flying heads up or something of that nature, we can help Bill get a little more out of his photography by giving him some new film settings and that type of thing. We'll have something like that available in case you do fly heads up, why we'll have some numbers we can call up for film fittings.

SC Houston, Apollo 8.

CAP COM Go ahead.

SC Roger. We are going to have to dump some urine, here shortly. Will this bother your tracking?

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CAP COM Apollo 8, we're checking on that with the tracking people now.

SC Houston, just give us the time when we can start on it and we'll hold off until you say so.

CAP COM Okay. And you can anticipate hand over between stations here on the hour. And you might get a slight blitz as we go through. I'll give you a call when we get back.

SC Thank you, Ken. What station are we going to be going to, Ken?

CAP COM Four. Okay, we'll be going to Honey-suckle.

SC Thank you.

CAP COM Now, Apollo 8, Houston. You're cleared for a dump at this time and I understand this is the last gas station for a long time.

SC You mean you don't want us to dump after this for a while?

CAP COM That's affirm. Due to the tracking as you approach the LOI, they would like to minimize any of these type of protovations.

END OF TAPE

GET 62:25.00

APOLLO 8 MISSION COMMENTARY, 12/23/68, CST:9:15 pm

187/1

PAO This is Apollo Control at 62 hours 24 minutes and at the present time Apollo 8 is traveling at a speed of 4,159 feet per second or presently at an altitude of 17,657 nautical miles above the Moon. We have some preliminary information on the Lunar Orbit Insertion Maneuver. We anticipate that this information will be refined and updated as we get additional tracking information on the spacecraft. At the present time we anticipate that the maneuver will be performed at about 69 hours 8 minutes ground elapse time and the burn will be a total duration of about 4 minutes 2 seconds and it will slow the spacecraft about 2,990 feet per second. We anticipate that the velocity at the beginning of the burn will be about 8,400 feet per second. This will give us a velocity following the maneuver of about 5400 feet per second. We have had some conversations with the spacecraft since our last report. We are in communication with the crew at the present time. We'll pick up with the tape and follow with whatever live communications are going on when we complete playing back the tapes.

CAPCOM Apollo 8, Houston, through Honeysuckle.

SPACECRAFT Roger, Houston, through Honeysuckle, we read you loud and clear.

CAPCOM Okay, good morning.

SPACECRAFT Good morning

CAPCOM Thought you went to sleep.

SPACECRAFT You got over Australia pretty fast.

CAPCOM Right. Did that gas station call wake you up?

SPACECRAFT Man, I've been all eyeballs and elbows here for the last several hours.

CAPCOM I'll bet. If you've got nothing else to do, I do have two charts in your LOI table I need to give you some update numbers on.

SPACECRAFT Standby. We'll get our LOI tables man on the line here. Okay, Houston, ...

CAPCOM Yes sir, I've got a couple of charts in your chart book under LOI and I have some numbers to fill in. One of them being the chart of LOI Delta V magnitude versus abort Delta V.

SPACECRAFT Okay, standby and I'll get it out.

CAPCOM Roger.

SPACECRAFT I have the chart out. Go ahead.

CAPCOM All right. Mode 1 5 hours. Roll 1.38 pitch 7.8 niner, yaw 357.37. Mode 1 15 minutes, roll 180.73 pitch 2 niner 46, yaw 1.65 over.

SPACECRAFT Roger, the new attitudes for the Mode 1 5 hour Mode 15 minute are as follows: Roll 1.38, pitch 7.89, yaw 357.37. Mode 1 15 minute, roll 180.73 pitch 29.46 yaw 1.65

CAPCOM Okay, that is correct. Now I also have to give you a couple of points to plot on that curve.

CAPCOM The present curve you have drawn is based on a 60 mile perigee or parallel and you right now have a 62 mile pericyynthium and the reason that your target is for 62 miles is to pass over the landing site so I have 5 sets of coordinates for you to copy.

SPACECRAFT Is this to go on the same chart to redraw the curve?

CAPCOM That is affirmative.

SPACECRAFT Okay, go ahead.

CAPCOM Okay, we'll go in on the LOI Delta V Magnitude 1600 abort Delta V 2450.

SPACECRAFT Okay, LOI Delta V Magnitude 1500 Abort Delta V 2450 standby just one. I have it continue

CAPCOM Okay, the next one is the LOI Delta V 2,000 Abort Delta V 3130.

SPACECRAFT Roger, I've got that plotted.

CAPCOM 2400 LOI Delta V, Abort Delta V 3880

SPACECRAFT I've got it plotted.

CAPCOM 2800 LOI Abort Delta V 4700 over.

SPACECRAFT Roger, I have that one plotted too.

CAPCOM All right the last one is LOI Delta V 2990 abort Delta V 5114 that is almost directly into the present curve 5114.

SPACECRAFT Say again the LOI Delta V Magnitude please.

CAPCOM LOI Delta V 2 niner niner 0

SPACECRAFT Roger, 2 and ends in 0. Okay, I have it plotted.

CAPCOM All right and on the next one you should have a chart that number 10 and we have 3 numbers to go in there for a Mode 3 Gimbal angle.

SPACECRAFT Roger, go ahead with the Mode 3 gimbal angle

CAPCOM Roll 180.87 pitch 42.31 yaw 1.65

SPACECRAFT Mode 3 Gimbal Angle are as follows:
Roll 180.87, pitch 42.31, yaw 1.65.

CAPCOM Roger, that is correct.

SPACECRAFT Could you please send up a fetched curve for me?

CAPCOM Roger.

SPACECRAFT Send up a couple.

CAPCOM The only one I have is about 6 foot.

SPACECRAFT Houston, could you give us some Gimbal Angles to point at the Moon. I never have seen it the whole trip and I'm wondering which way it is from us now.

CAPCOM Rog, 180

SPACECRAFT Houston, Apollo 8, radio check.

CAPCOM Rog. Loud and clear.

SPACECRAFT Roger

CAPCOM We are getting ready to give you a run down your systems. We're going over all the final steps

CAPCOM and we will tell you what we see in the way of trajectory and systems information and once again Dr. Joe Kerwin has brought over all the latest news and we can read that up to you a little bit at a time if you don't go to sleep.

SPACECRAFT What's he going to do. Read out of the AMA Journal? Go ahead, we are all ears.

CAPCOM Okay, Here is one. The previously scheduled cease fire by the Viet Cong went into effect today 17 hours before the allied truce was to begin.

SPACECRAFT You lost us on the numbers there. What was that again?

CAPCOM The jest of it was that the VC went into a cease fire earlier than the truce that we had planned on. As a Christmas Holiday type.

SPACECRAFT Roger, good.

SPACECRAFT Houston, Apollo 8.

CAPCOM Roger, Loud and clear, sorry to have stopped on you there. We are going over the summary of the systems data.

CAPCOM Apollo 8, Houston.

SPACECRAFT Go ahead Houston, Apollo 8.

CAPCOM Okay, I have a rundown on your systems here. GMC step

END OF TAPE

CAP COM down on your systems here. A IMC status of, everything looks real - Go ahead.

SC Just a minute. I want to wait until the LMP gets on the head set, Houston.

CAP COM All right.

CAP COM That's looking pretty good. It looks like we got all the things back in that we took out and we're running right along the prediction. We would like to get a battery C voltage from you if you can just reach over there and touch it.

SC Roger. 37 volts on battery C.

CAP COM Rog. 37 volts. Okay. The predicted trial qualities except on oxygen tank one, 170, oxygen tank two, 170, hydrogen one, 9.5, and hydrogen two, 10.0. You sent me a single trial capabilities, all the way at full power now.

SC Fine.

CAP COM The secondary cooler loop really looked good. Looks like you had a nice tight radiator and everything else on there was working right along the performance curves. Your main oxygen regulators fulfilled at 104 psi during our check. Looking at the lunar orbit expect to be doing a water boil of about 1 pound per hour, and this is just an approximation, has quite a variety of estimates as to what the water boiling requirements may be. Might go anywhere from boiling lots to not boiling at all. The next water dump will be coming up after TEI so you don't have to worry about any of that until you get through. Communications predictions looking good. Possibly a little bit better than what we had hoped for and looks like we're going to get high bit rate on OMNIS. We're 210 foot dish at Goldstone and so be looking for us on the first couple of REV's and we'll be switching sights so we'll go back to using OMNIS for a little bit. The voice quality of PSE is good. Your fuel cells have been running above nominal for the entire flight and they really look nice and stable. There's been some deep stratification -

SC Everything's on normal voice, dosen't it?

CAP COM Okay. Looks like may not be able to hac the normal voice. On the cyro tanks, we've had quite a bit of destratification between the oxygen and you know this during the fan cycles and delta V, so we're going to be sure and we're going to remind you again to stir up the oxygen prior to LOI. CMC is running along like clockwork. CMC tells us that the RCS quantities are looking good. You're using the same amount as predicted for your PTC and for your alignment. So we have the way of the redline, we're going to tell you that you can use 30 percent per quad in lunar orbit. Now this is quite a bit fuel to play with, and you can take 30 percent and subtract that from what you have to completion

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 623400, CST 9:25p 188/2

of LOI, and that will be a good number. On the SCS, the oxidizer and fuel feed line temperatures are 75 and holding steady. The service module RCS quad package stamps are cycling and holding between 120 and 140 and looks like we're getting normal heating operations. We plan to have you in a 60 mile circular orbit after LOI 2. And we should have some paths for you on the LOI burn at about 67 hours.

SC Roger. We got all that.

CAP COM Okay. We're still going through the tracking and as you know we're going to hold down on the water dumps so forth during the last couple of hours in and out sort of aid the tracking procedures. Everything's running along the line normally now. Do you have any other specific questions? We are looking for an angle on the moon. I guess that about summarizes the system. Everything looks GO right now.

SC Okay, Ken, thank you. We just completed Day 3, meal C and now are going to break up and each take a rest period before LOI.

CAP COM Okay, real fine. Everybody wanted to ask you if wouldn't try and get some sack time here before we go in. It's going to be a big day.

SC Roger.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 623400, CST 9:25 189/1

SC Okay, Houston, go ahead while E com is
on the line.

CAPCOM Okay, we're just start with E com business
then. I give you a summary of your batteries, battery A we
calculate 38.3 amp-hours, battery B -

SC Stand by for a second, Ken. Let me get
the chart out.

CAPCOM Roger.

SC Go ahead now.

CAPCOM Okay, battery A is 38.3, battery B is 36.9,
battery C 38.5. That's looking pretty good. Looks like we've
got all the things back in that we took and whipping right
along.

END OF TAPE

APOLLO 8 MISSION COMMENTARY,12/23/68,GET 624400,CST 9:35p,190/1

PAO This is Apollo Control. At the present time, the spacecraft is traveling at a speed of 4176 miles - rather, feet per second, and the altitude is 16 814 nautical miles. You heard the crew advise they do hope to get some rest now before activity breaks up leading toward the Lunar orbit insertion maneuver. According to the flight plan, they'll have about 3 hours of relative quiet in which they will be able to get some rest prior to picking up activities leading toward that maneuver. Such things as preparing the guidance and navigation system, checking out the spacecraft systems, and getting set up for that maneuver. We'll continue to monitor for any conversation. We do anticipate that it will be relative quiet, and we'll come back up in the event that we hear anything from the crew, and we'll give you periodic status reports. At 62 hours 46 minutes, this is Apollo Control.

END OF TAPE.

PAO This is Apollo Control at 63 hours 4 minutes. At the present time our spacecraft is at an altitude above the Moon of 100, rather 16 035 nautical miles, and our velocity continuing to increase still increasing rather slowly but steadily. Our speed is now 4 194 feet per second. We would expect this relatively slow velocity build up to continue to about 65 hours. At that point the spacecraft will be some 11 000 nautical miles from the Moon, and from that point on the acceleration will begin to build up quite rapidly so that within about 4 hours from 65 hours at the point where we do the lunar orbit insertion maneuver from that - in that 4 hour period of time the velocity would just about double going from some 4350 feet per second up to about 8400 feet per second. We have some further information on the lunar orbit insertion maneuver as a result of the midcourse correction that was done at 61 hours, and we have the refinement also on the effects of that midcourse correction. Prior to the midcourse maneuver we compared that our perigee or point of closest approach to the Moon would have been about 66.5 nautical miles. As a result of the burn it was lowered to about 61.8 nautical miles. The lunar orbit insertion maneuver using the service propulsion system engine is scheduled to occur at 69 hours 8 minutes ground elapse time. The burn duration would be 4 minutes and 2 seconds. This would give us an orbit about the Moon with a low point of about 60 nautical miles and a high point of about 170 nautical miles. We've had one brief conversation with the spacecraft since our previous report, and we advised the crew that they should be getting a good view of the Moon as they continue through their passive thermal control mode with the spacecraft rolling at the rate of about 1 revolution per hour. At a certain specified degree of roll they should acquire the Moon through one of the windows of the spacecraft. During this period of time the spacecraft will be coming into a much better view of the Moon with a larger part of the lighted surface becoming visible to the crew. We'll play back that short conversation for you and then pick up with the conversation that is developing right now between Cap Com Ken Mattingly and the crew.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Finally found out where the Moon is. In your present TIC attitude if you happen to look out the right window as you go by, roll attitude of 320, it should be there.

SC Thank you. Houston, Apollo 8.

CAPCOM Go ahead.

SC Roger, Bill would like to ask the doctor for permission to take a Secoal.

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 630400, CST 9:55 191/2

CAPCOM Okay, stand by.
SC Houston, this is Apollo 8, did you call
me, I lost track for a minute.
CAPCOM Okay, Apollo 8, you're cleared to go ahead
with that pill. Take, recommends a small one.
SC Small one, Roger.
CAPCOM Apollo 8, Houston, if you can we'd like
to have you stir up the oxygen cyro.
SC Okay, I'll do that right now. Just a
moment, just the oxygen?
CAPCOM Okay, we want to get both the oxygen and
hydrogen.
SC Just the oxygen, then?
CAPCOM No, sir, both the oxygen and the hydrogen.
SC Okay, start - starting with the hydrogen.
CAPCOM Okay.

END OF TAPE

APOLLO 8 MISSION COMMENTARY,12/23/68,GET 634300,CST 10:34p,192/1

PAO This is Apollo Control at 63 hours 43 minutes. At the present time Apollo 8 is traveling at a speed of 4236 feet per second, and their altitude is 14 399 nautical miles above the moon. Since our last report, we had one brief conversation with Frank Borman aboard the spacecraft. It's been relatively quiet on the spacecraft as we would anticipate. The crew indicated that they would attempt to get some rest between the mid-course correction, which was performed at about 61 hours and the starting of activities leading up to the Lunar orbit insertion maneuver at 69 hours and 08 minutes ground elapsed time. There will be a period of a couple of hours before their activity picks up in preparation for that burn. Beginning at about 66 hours in the flight plan they will begin burn preparations of the systems checks and guidance and navigation preparation that they will do for that maneuver, and until the flight plan is relatively quiet, so we, in line with that, do expect that we'll be hearing very little from the crew. In a previous conversation we heard Bill Anders request permission to take a second tablet, one of the short acting sleeping pills that the crew carries onboard, and the flight surgeon recommended that he take a smaller tablet. They carried two different sizes. One a 50 miligram tablet and the other 100 miligram tablet, and the recommendation was that Anders take the 50 milligram tablet. We'll play back that conversation with the spacecraft. A very brief conversation, and then stand by for any further communication from the crew.

SC Okay, Houston, Apollo 8. We've cycled through all of the cryo fans.

CAPCOM Okay, thank you.

PAO It appears that we'll have no further communication with the crew at least for the moment. Here in Mission Control at the present time, activity is beginning to pick up as we near our change of shift. Flight Director, Glynn Lunney and his team of flight controllers are coming on at this time receiving briefings from the previous shift headed by Flight Director, Milton Windler. The activity on the boiler control, sounded as, you would expect, like a beehive at the present time. At 63 hours 48 minutes, this is Apollo Control, Houston.

END OF TAPE.

APOLLO 8 MISSION COMMENTARY, 12/23/68, GET 642224, CST 11:14 193/1

PAO This is Apollo Control, Houston, at 64 hours 22 minutes 24 seconds now into the flight of Apollo 8. The Apollo 8 spacecraft at the present time 12 761.5 nautical miles away from the Moon. Its current velocity relative to the Moon 4288.9 feet per second. Glenn Lunney's team of black - black team of flight controllers is now aboard. He brought the team up with amber lights, and went around the room and discussed our current status. Meanwhile we have about 15 seconds of conversation with the crew. The conversation relative to present trajectory and tracking. We'll play that now.

CAPCOM Loud and clear Apollo 8.

SC Okay, thank you.

CAPCOM Roger, we had a momentary loss there.

SC How is the tracking?

CAPCOM Looking great.

SC How is the tracking data look, Ken.

CAPCOM Looking great.

SC Roger.

PAO So at 64 hours 22 minutes 37 seconds you heard the discussion. Our tracking looks great. This is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 654800, CST 12:39a 194/1

PAO This is Apollo Control Houston at 65 hours 48 minutes now into the flight of the Apollo 8. At the present time our displays show us that we are 9128.8 nautical miles away from the moon. Our velocity reads 4460.3 feet per second. We have only had brief conversations with Apollo 8 since our last announcement. Primarily communication checks and we will play that tape for you now.

SC Houston. Apollo 8. Lunar radio check.

CAP COM Apollo 8. Houston. Loud and clear.

SC Good evening, Jerry.

CAP COM Howdy. The Black Watch is watching.

SC How do you read on this - how do you read on this antenna?

CAP COM Loud and clear on that one, Bill.

SC That's great. Roger.

CAP COM Don't mention it.

SC Houston. Apollo 8. Do you read on omni three?

CAP COM Apollo 8. Houston. Reading you loud with some background noise.

SC Roger. You are loud and clear.

CAP COM Apollo 8. Houston. Comm check.

SC Roger Houston. This is Apollo 8. Loud and clear. How me?

CAP COM Roger. Loud and clear, Jim.

PAO Apollo Control Houston. Meanwhile we have been provided some reassigned numbers for the loss of signal and acquisition of signal as we proceed on our lunar orbit insertion burn number one. We should lose Apollo 8 communications behind the moon at 68 hours 58 minutes 4 seconds ground elapsed time. We are now looking at the time of ignition of 69 hours 8 minutes 5 seconds and we should reacquire at 69 hours 31 minutes 34 seconds. Honeysuckle should be our tracking station to acquire. At 65 hours 15 minutes 18 seconds into the flight, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 661420, CST 1:05a 195/1

PAO This is Apollo Control, Houston, at 66 hours, 14 minutes, 20 seconds now into the flight of Apollo 8. Our current distance away from the moon is 7980.3 nautical miles. Our current velocity continuing to build up 4542.1 feet per second. We've passed along a preliminary LOI maneuver pad to the spacecraft. Jerry Carr conversing with Jim Lovell the command module pilot. And we'll relay that to you now.

CAPCOM Apollo 8, Houston with a preliminary LOI one pad, over. Apollo 8, Houston, over.

SC ...clear, Houston.

CAPCOM Apollo 8, Houston, this is a preliminary LOI one pad, over.

SC Roger, standby one.

CAPCOM Roger, standing by.

SC Houston, Apollo 8. Ready to copy.

CAPCOM Apollo 8, this is Houston. Roger. LOI 1 STS G & N, 62844 minus 161, plus 12 niner zero 6 niner zero 8 1841. Copy.

SC 8 is copying.

CAPCOM Roger, 8. Minus 2 niner 837 plus zero 23 niner zero plus zero zero zero niner niner 4 zero zero zero 2 zero zero zero zero 5 zero 16 niner 3 plus zero zero 6 zero zero 2 niner niner 4 niner 4 zero 2 2 niner 782. Copy.

SC Copy.

CAPCOM Roger, 8. Zero 1 zero 68 niner 26 zero. Perpieye zeta. Down zero 48 left zero 5. The remainder is not applicable. Sirius Rigel set of stars for GDC alliance. 12 niner 155 zero 1 zero negative ullage. We'll pass the horizon data later. Over.

SC Roger. Preliminary LOI one pad as follows: STS G & N, 62844 minus 161, plus 12 niner. Are you copying?

CAPCOM Roger, copying.

SC Zero 69 zero 81841 minus 29837 plus zero 239 zero plus zero zero 994 zero zero zero. 2 zero zero zero zero 5 zero 1693 plus zero zero 6 zero zero 29949 4 zero 2 29782 zero 1 zero 689 26 zero. Perpieye zeta. Down zero 48 left zero 5. The remainder not applicable. Sirius Rigel 129155 zero one zero. No ullage. We'll pass up the remainder up later.

CAPCOM Roger, Jim. One question - we talked about a T40 gimbal check. Would you like to do that during this maneuver to LOI attitude or would you rather hold that off until a little closer to LOI. Over.

SC Let me check on that. We weren't using them.

CAPCOM Roger, standing by.

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 661420, CST 1:05a 195/2

SC Houston, Apollo 8.
CAPCOM Apollo 8, Houston, GO.
SC Roger. We could make this gimbal check
as a maneuver to the LOI attitude.
CAPCOM Roger.
SC I understand that you'll load us up with
the LOI one pad and we'll run through these for you as far
as the gimbal check.
CAPCOM Roger. That's what we heard you were
going to do on it. Are you going to run both the manual
gimbals as well as the automatic, correct?
SC Roger.
PAO This is Apollo Control. That was the
preliminary maneuver pad passed to Apollo 8 for the LOI one
ignition or burn. Some of these numbers represent some
slight changes and we've leaned from the long listing certain
ones that could be considered of interest. We're looking
at time of ignition at 69 hours, 8 minutes, 18 seconds.
The burn a retrograe burn should place us in an orbit around
the moon with an apolune of 169 nautical miles, a perilune
of 60 nautical miles. The DELTA-V for the burn that we're
looking at would be 2994 feet per second, burn time of
4 minutes, 2 seconds. So at 66 hours, 21 minutes, 35 sec-
onds into the flight, this is Apollo Control, Houston.

END OF TAPE

to 213'

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 663952, CST 1:30a 196/1

PAO This is Apollo Control Houston. At 66 hours 39 minutes 52 seconds into the flight of Apollo 8. Apollo 8 drawing closer to the moon at this time we read a distance away of 6848.8 nautical miles. Our present velocity 4643.5 feet per second. We've had only a brief conversation with the crew of Apollo 8 since our last transmission and we will pass that along now.

CAP COM Apollo 8. Houston. Standing by to monitor P52. Over.

SC Roger. Houston. Apollo 8. P52 complete.

CAP COM Apollo 8. Houston. Roger. Copy.

PAO Apollo Control Houston. Although we expect an apilune of 169.3 nautical miles, and a perilune of 60 nautical miles to result from the lunar orbit insertion number one burn, we would anticipate ignition for the 2994 feet per second at an altitude of about 70 nautical miles. Since on our trip out the moon is below our trajectory plane or path and as Apollo 8 approaches the moon, we will see a velocity build up to around 8400 feet per second at the time of LOI ignition. Our approach - on approach the spacecraft sort of dives toward and behind the moon. So at 66 hours 41 minutes 50 seconds, this is Apollo Control Houston.

END OF TAPE

lunar orbital ~~translunar~~ insertion 211/1 211/2 (copy)

PAO This is Apollo Control Houston at 66 hours 57 minutes 14 seconds now into the flight of Apollo 8. Apollo 8 now 6077.3 nautical miles away from the moon. Its current velocity 4729.7 feet per second. We have had considerable conversation over the past few moments with the crew. And we will pass that along now.

SC Houston. How do you read Apollo 8?

CAP Apollo 8. This is Houston. Loud and clear.

SC Okay, Jerry. At 67 we are going over to the LOI one attitude, do a sextant star check and then we will have to go back to PTC. I want to know if you want us to go back to the same attitude we are at now?

CAP COM Apollo 8. Houston. That is affirmative. Break. We are getting ready to ask you to do an erasable dump Verb 47. We are ginning up to get ready for it now and we will call you as soon as we are ready to copy.

SC Understand. Verb 47 when you call.

CAP COM Negative Verb 74.

SC Okay. Verb 74.

CAP COM Apollo 8. This is Houston. We are setting up for the dump now. It will take about 3 minutes and 20 seconds once we start the dump. Over.

SC Understand.

CAP COM Apollo 8. Houston. Go.

SC Roger. Can you point out the position of this Persizeta (?) to us a little better. We don't have it marked on our charts. We have got the bare facts and we know how to go, but which one is Persizeta (?)

CAP COM Roger. Frank. Persizeta (?) is just about exactly between Aldebaran and Mirfak.

CAP COM Apollo 8. This is Houston. We are ready for your C&C erasable dump. PVerb 74 enter. Over.

SC Roger. Verb 74 enter. Did you get it? Houston. Apollo 8. Are you getting the dump?

CAP COM Apollo 8. This is Houston. Indications are that we are getting it. We are checking. You will have to leave the computer on for 3 minutes and 20 seconds. Over.

SC Roger. We are.

CAP COM Apollo 8. Houston. We are getting your dump low bit rate through Honeysuckle.

SC Roger.

CAP COM Apollo 8. Houston. Persizeta (?) is third magnitude star same as Enif. Over.

SC Same magnitude as Enif.

CAP COM Affirmative.
SC Okay. When are you going to send us
the TEI one and the rest of that block data?
CAP COM Apollo 8. Houston. PC plus 2 does not
need an update. So I have your TEI one and two in about
10 minutes. Over.
SC Roger.
CAP COM Apollo 8. Houston.
SC Go ahead Houston. Apollo 8.
CAP COM Apollo 8. Houston. The dump is complete.
You can have your computer back. The reason for the dump was
to investigate further the P52 anomaly you had about 4 hours
ago. We will try to have some words for you in about 20 or
30 minutes. Over.
SC You mean when it wouldn't come up with
the proper star?
CAP COM Affirmative.
SC Okay. We are going to go ahead and start
our maneuver to LOI one attitude.
CAP COM Roger. Standing by to monitor.
SC Houston. Apollo 8.
CAP COM Houston. Go ahead.
SC I ran into a flight - I noticed that the
auto optics look drive to the star pick a pair selected.
Example, we did pick Alphard at one time, went drive there -
drove to a spot that had no star and I went back and re-
selected the program and came back and it worked okay.
CAP COM Roger. Jim. Copy. Jim, is this anomaly
you are talking about, was that 4 hours ago when we did the
REFSMMAT alignment?
SC This happened, I think, yesterday. When
we - we were doing a regular REFSMMAT alignment, Alpheratz
was the first star selected and it didn't drive to Alpheratz.
And I ran and reselected the program again and it worked
okay.
CAP COM Okay, Jim. Thank you.
SC Jerry. This is Apollo 8.
CAP COM Go ahead.
SC Our PAD here is - Roger. I understand
the gimbal angles for LOI one are roll zero pitch 200, and
yaw 5. Is that correct?
CAP COM Affirmative Frank. That is correct.
CAP COM Apollo 8. Houston. With a map update.
Over.
SC Okay, stand by a minute.
CAP COM Roger.

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 665714, CST 1:48a 197/3

SC Go ahead.
CAP COM Apollo 8. This is Houston. Map update
REV 1 splash 2. 685804 690505 693141 701448. Copy?

SC Copy.
CAP COM 705636 710059 711042 713940 722317.

Copy?

SC Copy.
CAP COM Roger. Remark Charlie Poppa 1711457
Charlie Poppa 2 712832 Charlie Poppa 3 714726 Bravo 1 720942
Over.

SC Roger. Stand by. I'll get the antenna.
Map update as follows Houston. 685804 690505 693141 701448
705636 710059 711042 713940 722317 Charlie Poppa 1 711457
Charlie Poppa 2 712832 Charlie Poppa 3 714726 Bravo 1 720942

CAP COM Apollo 8. This is Houston. Read back
is correct. Apollo 8. Houston. Try to lock up an omni
for us. Over.

SC Roger. How do you read now Houston?
CAP COM Apollo 8. Houston. Reading you loud
and clear. No TM.

SC Understand. No TM.
PAO Apollo Control Houston. As you heard
Apollo 8 has begun its maneuver towards the LOI one burn
attitude. Apollo 8 has started this maneuver. Map by the
way does not translate into

END OF TAPE

Apollo 8 Mission Commentary, 12/24/68, 670714, 1:58am, 198/1

PAO has started this maneuver. Map by the way does not translate into message acceptance Paul said it did in earlier manned flights. These numbers that were passed along are times in lunar orbit for acquisition in loss of signal for the manned space flight network. Lunar sunrise and sunset times in crossing of the moons sub-prime radian determined by the lunar sunset terminator longitude. It's almost, in fact it is 2 hours passed midnight now. It's Christmas Eve and as we proceed on the last lap of our flight path toward a position where the moon will be, Apollo 8 is actually coming to a final phase of rendezvous with the moon. The moon too is traveling from the time of lift off the moon will have traveled on the order of 130 nautical miles to make good its meeting for the lunar orbit insertion burn. So at 67 hours 8 minutes 14 seconds into the flight this is Apollo control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY,12/24/68,GET 672700,CST 218a 199/2

SC Roger, understand. LOI-one.
CAP COM That is affirmative, LOI-one FTF D&M,
62844 1 correction minus 161 plus 129 069 08 1952 minus 29840
plus 02390 plus 01053. Copy. (pause) Apollo 8, Houston.
Over.

SC Roger we broke lock, did not get the
Delta VX.

CAP COM Apollo 8, Houston. Roger. Beginning
with Delta VX, minus 29840 plus 02390 plus 01053 000 200
005 01693 plus 00600 29954 402 29788. Copy.

SC Roger.
CAP COM Roger. 01 0688 259 persizeta (?) down
048 left 05, the remainder not applicable, Sirius Rigel
129 155 010, negative all H. Horizon window, ignition
minus two minutes, 40 degrees unlit, ignition 27 degrees
unlit. Over.

SC Roger. LOI-one SPS G&N 62844 minus
161 plus 129 069 08 1952 minus 29840 plus 02390 plus 01053
000 200 005 01693 plus 00600 29954 (cut out)

CAP COM Apollo 8, Houston. Readback is correct.
Ready to copy TEI-one. Over.

SC Roger.
CAP COM Apollo 8, this is Houston. Are you
waiting for us before you start your gimbal check? Over.

SC We're waiting to start the gimbals
check right here.

CAP COM Roger. You wanna copy while your doing
it or stand by on TEI-one?

SC Stand by for a minute.

CAP COM Roger. Standing by. Apollo 8, this is
Houston, shifting command back to Honeysuckle. Over.

SC Roger.

PAO Apollo Control Houston. You heard an
update to our LOI-one maneuver pad being passed along. This
changed only one number and only by one second. The GET,
ground elapsed time, ignition has changed to 69 hours
19 minutes 05 seconds, correction that would be a change of
one minute. So at 67 hours 36 minutes 05 seconds, this is
Apollo Control Houston.

END OF TAPE

Apollo 8 Mission Commentary, 673821, 12/24/68, 2:30am, 200/1

PAO This is Apollo 8 control Houston. 67 hours
38 minutes. We've twisted our tongue on that last announce-
ment the ground elapse time of ignition should read 69 hours
8 minutes 19 seconds. We repeat it should read 69 hours 8
minutes 19 seconds, a change of 1 second. So at 67 hours
38 minutes 40 seconds this is Apollo control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 674615, CST 2:37a 201/1

CAPCOM Apollo 8, Houston, how is that gimbal drive check going?
SC It went fine.
CAPCOM Roger, Frank. We're ready with the TEI 1 and 2 maneuver pads. We've also got two state vectors in a target load to upblank and load if you'll configure for it. Over.
SC Roger, we're trying to get...we're maneuvering to PTT.
CAPCOM Roger.
SC Go ahead with you TEI pads.
CAPCOM Apollo 8, this is Houston. TEI 1 SPS G & N 462, correction 46728 minus zero 53 plus 121 zero 71 25 zero 473 plus 37746 minus zero 32 niner niner...1221 zero 45. Sirius Rigel, 12 niner 155 zero 1 zero, ullage 2 jet 2 zero seconds jet BRAVO DELTA, horizon window X-axis on horizon at ignition minus 3 minutes. Assume LOI 1. Over.
SC Houston, Apollo 8. TE 1 as follows:
SPS G & N 46728 minus zero 53 plus 13 copy.
CAPCOM Roger, copy.
SC Plus zero zero 1763790033637005421279 309. Not applicable three times. Plus 1350 minus 16500 1305036389 1221045. Sirius Rigel. 129155010 ullate, 2 jets, 20 seconds, quad N & D, horizon window X-axis on horizon at ignition minus 3. Assume LOI 1.
CAPCOM Apollo 8, Houston, Roger. Correct.
SC Standing by for TEI 2. Do you have it?
CAPCOM Apollo 8, Houston. Will be ready with the TEI 2 in about 1 minute.
SC Roger.
CAPCOM Apollo 8, Houston, with a TEI 2 maneuver pad.
SC Roger, ready to copy.
CAPCOM Roger. TEI 2 FPF G & N 46728 minus 053 plus 121, copy.
SC Roger, copy.
CAPCOM Roger, 073213024 plus 28466 minus 00350 plus 02406180022002, not applicable. Plus 00188, copy.
SC Roger, copy.
CAPCOM Roger. 28570250284014206412 niner 6, not applicable three times. Plus 0 niner 20 minus 1650012 niner 53361751463216, copy.
SC All right, copy...
CAPCOM Apollo 8, Houston, request you switch your OMNI. It's getting pretty terrible now.
SC Apollo 8, I copied. I question the latitude and the range to go. It appears that you gave me 12 few digits in both cases.
CAPCOM Roger. I repeat latitude plus 0 niner

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 674615, CST 2:37A 201/2

. 20 minus 1650012 niner 53361751463216, copy.

SC I copied.

CAPCOM Roger. You GDC aline is no change,
ullage no change, horizon on the minus 2 degree line at
ignition minus 3 minutes. Assume to LOI 1, over.

SC Roger. TEI 2 maneuver pad SPS G & N
46728 minus 053 plus 121 073

END OF TAPE

Apollo 8 Mission Commentary, 12/24/68, 2:51 am, 202/1

SC Plus one two one, zero seven three, two one, three zero two four, plus two eight four six six, minus zero zero three five zero. I did not get the five zero two four zero six for a double z z. One eight zero, zero two two, zero zero two not applicable. Plus zero zero one eight eight, two eight five seven zero, two five zero, two eight zero zero one, four two zero six four one, two nine six, not applicable three times. Plus zero nine two zero, minus one six five zero zero, one two nine three, three six one seven five, one four six three two one six. No change in these. GDC aline stars no change knowledge a rise on the minus GDC line at T minus 3 assumes LOI-one.

CAP COM Apollo 8 this is Houston. Roger correct. I repeat delta zz plus zero two four zero six over.

SC Roger. Plus 02406.

CAPCOM Roger.

PAO This is Apollo Control Houston. We're going to cut short here for a moment because very shortly we will have our GO-NO/GO decision. Incidentally, this block data that's being passed along is continuancy information only making ground information available to the crew for a transearth injection burn at the end of the first or second lunar orbits plus PC plus 2 which translates into pericyynthion plus 2 hours. The time of closest approach to the moon plus 2 hours. This information is entered into the onboard equipment, but it is used only if an alternate mission becomes necessary. So, at this time we are going to stand by and continue to monitor the loops here in Mission Control for our GO-NO/GO decision

END OF TAPE

PAO This is Apollo Control Houston. 68 hours 32 seconds. We have conversation going back and forth with the crew now. The Apollo 8 spacecraft at this time 3125.7 nautical miles away from the moon. And our velocity 5319.6 feet per second and we are standing by at this point for our decision which appears very likely to be a go for lunar orbit. Standing by. This is Apollo Control Houston, continuing to stand by for that decision point. At 68 hours 1 minutes 49 seconds.

CAP COM Apollo 8. Houston. Over. Apollo 8. Houston.

SC Roger. This is Apollo 8.

CAP COM Roger. That pericyynthion you read out is for ignition. We read that as 75 miles. Your true pericynthion is 64 miles at 691035. Over.

SC Roger.

CAP COM Apollo 8. This is Houston with an addition to your TEI one maneuver PAD. Over.

SC Stand by a minute. Go ahead.

CAP COM Roger. Under Remarks add the following require minus MA procedure. Over.

SC Requires MA procedure.

CAP COM Affirmative 8. Apollo 8. This is Houston at 6804 you are go for LOI.

SC Okay. Apollo 8 is go.

CAP COM Apollo 8. Houston. You are riding the best one we can find around.

SC Say again.

CAP COM You are riding the best bird we can find. Over.

PAO This is Apollo Control Houston at 68 hours 4 minutes 40 seconds. As you just heard, we passed along the go for the lunar orbit insertion burn, with the service propulsion system engine. Flight Control team here in Mission Control has examined the data and it is good. So we have a combined crew/ground decision. We are go. Repeat - go for lunar orbit insertion one. At 68 hours 5 minutes 10 seconds into the flight of Apollo 8, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston at 68 hours 12 minutes 12 seconds into the flight. Apollo 8 draws closer to the moon. Our current distance away 2555.9 nautical miles. Our velocity building up now reading 5527.5 feet per second. We have stored some tape so we could pass that go/no-go decision to you live, so we will turn and play you back that tape now.

CAP COM Houston. If you can go 00 ACCEPT, we will start the NAV load.

SC Roger. Go ahead.

CAP COM Apollo 8. Houston. That CM vector is in working on the LM now. Over.

SC Roger.

CAP COM Apollo 8. Houston. We would like a cryo fan cycle when you can. Over.

SC Roger. We are starting that now.

CAP COM Roger. Apollo 8. Houston. The LM vector is loaded - target load going in now.

SC Roger. Go ahead Houston.

CAP COM Apollo 8. Houston. The update is complete. You can have the computer. TLM to block. Be advised the eraseable dump checks out okay.

SC Roger. Thank you. We have the computer. We are in block.

CAP COM Roger. Apollo 8. This is Houston. We would like to make at this time a down voyage backup comm check. Set the S-band OX tape to down voyage backup. PLN input PCM low. Over.

SC Roger. Houston. We would like to have a check of our DSE on low bit rate for voice.

CAP COM Roger. Understand. You want the DSE check on low bit rate for voice.

SC That's affirmative and we will give you - it about 10 minutes now, for about 5 minutes and then you can check it out.

CAP COM Roger.

SC Houston. Apollo 8.

CAP COM Apollo 8. Houston. Go.

SC As a matter of interest, we have yet to see the moon.

CAP COM Roger. Apollo 8. Houston. What else are you seeing?

SC Nothing. It's like being on the inside of a submarine.

CAP COM Roger.

SC Houston. We just ran our program 21.

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 681212, CST 3:03a 204/2

SC We show a pericyynthion of plus 74.9
miles on the state vector you just uploaded.
CAP COM Roger. Plus 74.9.
SC Roger.
CAP COM Apollo 8. This is Houston. Reading
your downvoice back up loud and clear. I request keep those
switches where they are for the remainder of the pass. Over.
SC Roger. And I am rewinding the tape
recorder for a DSE voice dump check.
CAP COM Roger 8.
SC It's rewound. Are you ready to dump?
We would like to go to S-band OX tape briefly so you can
dump the tape while we are in high gain. We have got about
30 seconds worth.
CAP COM Apollo 8. Houston. We will do that
from the ground. Over.
SC Roger. Switch configuration is downvoice
backup and stop. You got it.
CAP COM Roger. We will dump it.
SC You won't need to dump more than a minute's
worth.
CAP COM Roger.
SC The cryo's have been stirred here.
CAP COM Roger, Bill. Apollo 8. Houston. We
just saw an MC&W light.
SC We just tested the caution and warning.
CAP COM Roger.
SC That's keeping alert.
CAP COM Roger.
PAO This is Apollo Control Houston at
68 hours 16 minutes 42 seconds. We are continuing to
monitor.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 682122, CST 3:12 205/1

PAO This is Apollo Control, Houston at 68 hours, 21 minutes and 22 seconds now into the flight of Apollo 8. Our spacecraft at this time 2100 nautical miles away from the moon, velocity continuing to rise our current reading of 5743.8 feet per second. We had a brief conversation with the Apollo 8 crew moments or minutes back and we're going to pass that conversation on now.

CAPCOM Apollo 8, Houston, we're 42 minutes from LOS and we caught another caution and warning light.

SC It was a high gleem antenna going out of limits.

CAPCOM Roger. Apollo 8, Houston, voice quality on the DSC dumps is very good. The DSC is yours, over.

SC Mighty fine.

PAO This is Apollo Control, Houston. You heard our indication from our capsule communicator to time of loss of signal over the back side of the moon. During this pass over the back side, Apollo 8 will perform its lunar orbit insertion burn number 1 with the service propulsion system engine. Following this burn, the spacecraft weight should be some 16000 pounds lighter with the expenditure of propellants. A slight plane's change of about 2 degrees is combined into this engine firing. The intent of the plane change is to make the Apollo 8 pass over again and heading over the primary Apollo zone. And the desired landing site. To hearken back to Gemini it's an NCC combination correction. At 68 hours, 23 minutes, 20 seconds into the flight, this is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 682800, CST 3:19a 206/1

PAO This is Apollo Control Houston at 68 hours 28 minutes into the flight now of Apollo 8. We are drawing closer to the moon with the Apollo 8 spacecraft. Current reading 1773.1 nautical miles away. Velocity going up the steep curve now. Current reading 5945 feet per second. We had a very brief communications check with the Apollo 8 spacecraft. They acknowledged that communications looked fine. We're some 30 minutes now away from our time of loss of signal. And the time that the Apollo 8 spacecraft goes over the backside of the moon, out of sight from the ground. The LOI one burn by the way, is to be performed retrograde to take energy out so that Apollo 8 can dip into a lunar orbit rather than continue in its free return trajectory. For the burn, the crew will be in a heads down position, giving them a visual reference to the lunar surface. The vehicle should be pitched slightly nose up, perhaps on the order of 8 degrees from the local horizontal. At 68 hours 29 minutes 25 seconds into the flight continuing to monitor this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 683308, CST 3:24a 207/i

PAO This is Apollo Control Houston at 68 hours 33 minutes 8 seconds now into the flight of Apollo 8. Apollo 8 now 1517 nautical miles away from the moon. Current velocity reading 6120.2 feet per second and accelerating. The Apollo 8 is currently going through a series of systems checks. We have had some conversation. Jerry Carr, our Capsule Communicator with Bill Anders aboard the spacecraft and we will pick that up for you now.

CAP COM Apollo 8. Houston. Comm check.

SC Houston. Apollo 8. Over.

CAP COM Apollo 8. Houston. Go.

SC Roger we are ready to activate the primary water boiler.

CAP COM Roger. Copy.

SC We got a go?

CAP COM Roger. Go.

SC Okay, steam pressure going to AUTO. H2 flow going to AUTO.

CAP COM Apollo 8. Houston. We are on low bit rate. We won't see your steam pressure, your rad out is 33 over.

SC Roger. We're below the boiling limit and steam pressure is steady at 21 5.

CAP COM Roger. Apollo 8. This is Houston. We have got our lunar map up and ready to go.

SC Roger.

PAO This is Apollo Control Houston. You heard that last report. Our lunar map - lunar display is up here in Mission Control Center and we are ready to go at 68 hours 34 minutes 48 seconds into the flight of Apollo 8. This is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY,12/24/68,GET 684054,CST 332a 208/1

PAO This is Apollo Control Houston at 68 hours 40 minutes 54 seconds now into the flight. Apollo 8 now 1128 nautical miles away from the Moon. Our current velocity reading 6467 feet-per-second. We've had a brief conversation, Jerry Carr has talked to Bill Anders aboard the Apollo 8 spacecraft regarding service propulsion system tank pressures and we're gonna play that conversation now.

SC Houston, Apollo 8. Over.

CAP COM Apollo 8, Houston. Go.

SC Roger. We're showing a fuel pressure of 167 in oughts of 163. Wondering, do you think there's a possibility of us having a transient pressure warning trip on fuel oughts to pressure at the beginning of the burn that would correct itself anomaly as we had a chance to pressurize. Over.

CAP COM Roger, understand. Will check, stand by.

SC Roger.

CAP COM Apollo 8, Houston.

SC Go ahead.

CAP COM Apollo 8, this is Houston. We've been reading fuel 173 ought 167 holding steady for a long period of time. We expect no caution and warning trip. Over.

SC Roger, understand.

PAO Apollo Control Houston. Meanwhile here in Mission Control Center our LOS clock, loss of signal clock, continues to count down. We now read MARK 15 minutes 26 seconds until that time that the Apollo 8 spacecraft will pass out of communications range over the backside of the Moon. And at 68 hours 42 minutes 50 seconds into the flight, this is Apollo Control Houston.

END OF TAPE

Apollo 8 Mission Commentary, 12/24/68, 684900, 3:40am, 210/1

PAQ This is Apollo control Houston at 68 hours 52 minutes into the flight of Apollo 8. Apollo 8 now 5 hundred and 82 nautical miles away. The velocity reading 71 91 feet per second. We're some 5 minutes 30 seconds away from LOS at this time. At this time Glynn Lunney has gone around the room taking a status check with his flight control team. We look go we continue to stand by and this is Apollo control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 685400, CST 3:45a 211/1

PAO Apollo Control, Houston, 68 hours, 54 minutes now into the flight. Our Apollo 8 spacecraft now 529 nautical miles away. Velocity reading 7286 feet per second. Jerry Carr has spoken with the crew and we're going to pick up that conversation now.

CAPCOM Apollo 8, Houston...LOS all systems GO, over.

SC Thank you you're still...

CAPCOM Roger, Frank. The custard ^{Jim}Gemini oven at 350, over.

SC No comprendo. Roger.

PAO This is Apollo Control, Houston. We're now some 3 minutes, 35 seconds away from LOS and standing by. Apollo Control Houston, 2 minutes, 50 seconds away from time of LOS now. Our distance away from the moon 460 nautical miles, velocity 7417 feet per second. Here in Mission Control - we're standing by as certainly a great deal of anxiety at this moment as in the next 2 and 1/2 minutes we will not talk with the crew for some period of time. Acquire at 36 minutes. So at 68 hours, 55 minutes continuing to monitor this is Apollo Control. Two minutes away now from LOS.

CAPCOM LOS.

SC Roger.

PAO 418 nautical miles away from the moon. Our velocity continuing to build up, 7518 feet per second continuing to climb. One minute, 30 seconds away now from LOS. Our guess is it's away from the moon 401 nautical miles. Velocity reading 7535 as we continue with this flight of Apollo 8. One minute away now from LOS.

CAPCOM One minute to LOS. all systems GO.

SC Roger, going to command reset tapere-corder forward low bit rate.

PAO Current altitude away from the moon 377 nautical miles.

SC (ANDERS) Thanks a lot. ^{Jim}

CAPCOM We'll see you on the other side.

PAO You heard the remark of Jim Lovell. thanks a lot troops so we'll see you on the other side. We have a correction to that voice from the spacecraft. That was Bill Anders. ^{Jim}

SC Roger.

PAO Bill Anders again with that remark, Roger. When to advise to 10 seconds LOS, you're on your way. We've had lost of signal with Apollo 8 at 68 hours, 58 minutes, 45 seconds. We will watch with continuing interest the AOS clock here in Mission Control. This is Apollo Control, Houston. 69 hours now into the flight of Apollo 8. We're going to pick up that transmission when

APOLLO 8 MISSION COMMENTARY. 12/24/68, GET 685400, CST 3:45a 211/2

Jerry Carr advised that we were LOS. Apollo 8, Houston,
2 minutes until LOS.

CAPCOM Apollo 8, Houston, 1 minutes until
LOS. All systems Go. Roger, safe journey, guys.

SC (A 12 00) Thanks a lot, troops. We'll see you
on the other side.

CAPCOM Apollo 8, 10 seconds to GO. You're GO
all the way.

SC Roger.

PAO This is Apollo Control, Houston. They're
traveling over the back side of the moon now. Velocity
reading here 7777 feet per second at the present time we
show an altitude above the moon of 293 nautical miles. So
at 69 hours, 1 minute, this is Apollo Control Houston.

END OF TAPE

PAO COM Apollo Control, Houston, 69 hours, 3 minutes now into the flight of Apollo 8. Apollo 8 now traveling over the backside of the moon. Time of ignition for our service propulsion system engine burn, 69 hours, 8 minutes, 52 seconds. Some - a little over four minutes away from this time Apollo 8 will perform its burn in the guidance and navigation mode using the onboard computer and the DSKY - the display keyboard. To do this, the crew will key into one of their guidance programs on the DSKY. The service propulsion system gimbal is trimmed before the burn. Maneuver-to-burn altitude has already been accomplished. A good deal of data will be flashed on the DSKY; and then in the final thirty seconds, a countdown to time of ignition will come up on its face. And at time of ignition, minus seconds - five seconds - comes what, in effect, is a final GO-NO GO. The computer, in effect, asks the crew, "May I proceed?" To execute the burn, one of the crew, probably Spacecraft Commander Frank Borman, must punch the "proceed" key. So, at 69 hours, 4 minutes, 55 seconds into the flight of Apollo 8, this is Apollo Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY 12/24/68, GET 690800, CST 4:00 a 213/1

PAO This is Apollo Control Houston. 69 hours 8 minutes. Apollo 8 is less than 30 seconds away from the planned time of lunar orbit insertion burn. The crew should now be looking at the count down to ignition on the face of their display and keyboard. Heads down, they should be seeing the feature, the rugged features over the back side of the moon, moving below them at a high rate of speed. Standing by, this is Apollo Control. (pause) ... we will not know until we re-acquire their retrograde burn with the service propulsion system engine should be progressing now. Assuming no last minute complications. We will not know, however, until we acquire. (pause) Apollo Control Houston. Now we are in our period of the longest wait. Thus far in the mission, we are 19 minutes 50 seconds from acquisition at this time. (During Mission Control Simulations, this was a good time for coffee breaks. For the flight controllers. But that is not true today.) Continuing to monitor, this is Apollo Control Houston.

END OF TAPE

70 228

21 21 21-1

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 691445, CST 406a 214/1

PAO This is Apollo Control Houston, 69 hours 15 minutes now into the flight. Our display readings now show an altitude of 86 nautical miles, a velocity reading of 8355: this last reading assuming we did not have a burn. Our AOS at this time 16 minutes 40 seconds. If for any reason the service propulsion system engine did not burn, we would see the spacecraft perhaps 10 minutes before normal acquisition time so here in Mission Control continuing to monitor, this is Apollo Control Houston.

END OF TAPE

? 225-1

1P. initial power 226

"Miller" crater 228/2

"Moon is essentially gray" 218/1

under a small? 228/2

2-step Brown, hill, Auburn 228/2

180° roll to obtain S-band
Contact 214/1

Apollo 8 Mission Commentary, 12/24/68. 692200, 4:19am, 215/1

PAO Houston here in mission control center. Cliff Charlesworth getting our - correction there. - Glynn Lunney, we should say, getting ready to talk to his flight control team. Our time of acquisition clock now reading 9 minutes 45 seconds and were continuing to watch it. Mean while our top clock is counting forward now reading 25 seconds. The top clock was used to denote acquisition time if we had a no burn situation. We will continue to monitor here in mission control center.

END OF TAPE

PAO Apollo Control, Houston, just under four minutes away now from our time of acquisition with Apollo 8. Apollo 8 still out of range, should be rolling now 180 degrees shortly, if not already, to establish S-band high-gain antenna communications with the ground. We're standing by in Mission Control. This is Apollo Control, Houston. Mark. Three minutes from predicted time of acquisition. Standing by. Apollo Control, Houston. Mark, two minutes from predicted time of acquisition. Apollo Control, Houston. Mark one minute from predicted time of acquisition. Apollo Control, Houston. Jerry Carr has placed a call. We are standing by. We've heard nothing yet, but we are standing by. Apollo Control, Houston. We've acquired signal but no voice contact yet. We are standing by. Apollo Control, Houston. (We are looking at engine data, and it looks good, tank pressures look good. We have not talked yet with the crew, but we are standing by. We got it! We've got it! Apollo 8 now in lunar orbit. There is a cheer in this room! This is Apollo Control, Houston switching now to the voice of Jim Lovell.)

SC 560.5. Good to hear your voice.

CAPCOM Apollo 8, this is Houston. Verify your evaporator water control in AUTOMATIC. Over.

PAO This is Apollo Control, Houston. We have a crew report of an orbit of 60.5 nautical miles by 169 nautical miles. Standing by, continuing to monitor. This is Apollo Control.

CAPCOM Apollo 8, Houston. Over.

CAPCOM Apollo 8, Houston. Over.

END OF TAPE

*Edwin G + N
(Mike) as one of the
others say "AOS"
before Lovell announced*

to Bowman?

*See 217-2
Lovell is correct
tape 46 p 5
in to front*

CAP COM Apollo 8. Apollo 8. This is Houston.
Houston. Over.

SC Roger. Houston, we read you loud and clear. How do you read us?

CAP COM Apollo 8. This is Houston. Reading you loud and clear now. And verify your evaporator water control panel switch to the AUTO position. Over.

SC Roger. I am sure it is in AUTO.

CAP COM Roger.

SC Purge status report as follows: burn on time. burn time 4 minutes 6-1/2 seconds, VGX minus 1.4 attitude is nominal, no trim, TGY was zero, TGB was plus .2, Delta VC was minus 20.2, orbit 169.1 by 60.5.

CAP COM Apollo 8. Houston. Roger, the burn on time. burn time of 460.5. VGX was minus 1.4, Apollo 8. Houston. Verify your EVAP water control on panel 382 is AUTO. Your EVAP out temperature is high. Over.

SC Roger. Stand by. Houston. Apollo 8. Roger. Primary EVAP is AUTO, H2 flow AUTO, do you recommend activating the secondary water boiler?

CAP COM Roger. Copy. Stand by.

PAO This is Apollo Control Houston. The conversation taking place is with Bill Anders aboard the spacecraft. *Correct*

CAP COM This is Houston. Re-verify manual valve on panel 382 evaporator water control automatic. Over.

SC Roger. Verified.

CAP COM Apollo 8. This is Houston. Recommend you activate your secondary water evaporator.

SC Secondary EVAP coming on line.

CAP COM Roger.

PAO Apollo Control Houston. Ground data closely coincides with that aboard the spacecraft.

CAP COM ... up your DSE and we will go to high bit rate. Over.

SC Roger.

CAP COM Apollo 8. This is Houston. And I will continue my readback of the burn status report. Copied VGX zero, VGY zero, VGZ 1.2, Delta VCharlie minus 20.2. Over.

SC Stand by while I get my chart out again. ... ZG was .2.

CAP COM Roger. Understand. .2 on VGZ.

SC Houston. This is Apollo 8. We are on malfunction 1 or 6, going through step 1 to step 2. Over.

CAP COM Apollo 8. Houston. Roger. Copy.

SC Correction. That is to step 4.

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 693625. CST 4:28a 217/2

CAP COM Roger. Copy. To step 4.
SC Now to step 13.
CAP COM Roger. Step 13.
PAO Apollo Control Houston. What you are hearing here is checkout procedure of the environmental control system. The voice, principally from the spacecraft, that of Bill Anders. The systems engineer member of the team aboard.
SC Now to step 14.
CAP COM Houston. Roger.
SC Looks like the boiler dried out somewhere along the line.
CAP COM Roger, Bill.
PAO Apollo Control Houston. Our ground readings on this orbit 168 nautical miles and apolune perilune of 60.4 nautical miles.
SC This is Apollo 8. I would like to confirm that burn status report. VGX was minus 1.4. VGY was 0. VGZ .2 minus .2 that is. Delta VC was minus 20.2.
CAP COM Apollo 8 --
SC -- perigee 169.1, perigee 60.5.
CAP COM Apollo 8. This is Houston. I will read back again. The burn was on time, 4 minutes and 6 and 1/2 seconds, VGX minus 1.4, trim nominal, VGY 0, VGZ minus 0.2, Delta V Charlie minus 20.2. Over. ~~2/2~~
SC That's Roger. *Borman*
CAP COM Roger. And we copy your apogee and perigee.
SC Steam pressure is coming up. *(Anders)*
CAP COM Roger Bill.
PAO This is Apollo Control Houston. So you've have the first status report from an Apollo crew in lunar orbit. The unmanned lunar Orbiter spacecraft traversed the moon, perhaps over 10,000 times. but this is the first man aboard, in this case Frank Borman, reported to his compatriots here on earth.

END OF TAPE

See 2176

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 694623, CST 427a 218/1

SC Step 15.
CAP COM Roger, concur.
SC ... coming down.
CAP COM Apollo 8, Houston. Roger, we concur.
SC Okay, Houston, keep a good eye on it.
CAP COM Roger, we're watching.
SC Okay, nice job on the malfunction procedures.
CAP COM Roger, Bill, thanks.
SC You, too. (pause) Give us a call when you think we ought to stop the secondary boiler, Houston.
CAP COM Apollo 8, Houston, wilco.
SC Houston, Apollo 8.
CAP COM Apollo 8, Houston. Go.
SC *Lowell* Roger. For information, we're passing over just to the side of the crater Langrenus at this time going into the Sea of Fertility.
CAP COM Apollo 8, Houston. Roger.
PAO As you heard, Apollo 8 approaching the Sea of Fertility. (pause) Apollo Control Houston. Our first batch of ground tracking data shows agreement in velocity within one foot-per-second with that of the spacecraft.
CAP COM Apollo 8, Houston. What does the 'ole Moon look like from 60 miles? Over.
Lowell SC Okay, Houston. The Moon is essentially gray, no color. Looks like plaster of paris or sort of a grayish deep sand. We can see quite a bit of detail. The Sea of Fertility doesn't stand out as well here as it does back on Earth. There's not as much contrast between that and the surrounding craters. The craters are all rounded off, there's quite a few of 'em, some of them are newer. Many of them look like - especially the round ones look like hit by meteorites or projectos of some sort. Langrenus is quite a huge crater, it's got a central cone to it. The walls of the crater are terraced, about six or seven different terraces on the way down.
CAP COM Roger, understand.
SC And coming up now, the Sea of Fertility are the old friends Messier and Pickering that I looked about so much on Earth.
CAP COM Roger.
SC And I can see the rays coming out of blaze Pickering. We're coming up now near our P-one initial site which I'm going to try and see. Be advised the round window, the hatch window, is completely iced over; we can't use it, Bill and I are sharing the rendezvous window.
CAP COM Apollo 8, Houston. Roger. Got any

Lowell

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 694623, CST 427a 218/2

CAP COM more information on those rays. Over.
SC Roger. The rays out of Pickering are quite faint from here; there are two different groups going to the left, they don't appear to be any depth to them at all, just rays coming out.

CAP COM Roger.
SC They look like just changes in the color of the Mare.

CAP COM Bill, if you can tear yourself away from that window, we'd like you to turn off the secondary evaporator. Over.

SC *Andus* Roger, going OFF.

CAP COM Apollo 8, this is Houston. You can leave that secondary pump on for just a few minutes. Over.

SC *Lowell* Stand by to remind us. Okay over to my right are the Pyrenees Mountains coming up and we're just about over Messier and Pickering right now. Our first initial point is easily seen from our altitude. We're getting quite a bit of contrast as we appear - as we approach the terminator. The view appears to be good, no reflection of the Sun back to our eyes; it appears that visibility at this particular spot is excellent. It's very easy to pick out our first initial point and over this mountain chain we can see the second initial point, the Triangular Mountain.

END OF TAPE

Apollo 8 Mission Commentary, 12/24/68, 695626, 4:59am, 219/1

SC We can see the second additional point of the triangular amount.

SC Now we're coming upon the craters Columbo and Gutenberg. Very good detail visible. We can see the long parallel faults of Gaudibert and they run through the Mare material right into the high land material.

PAO The principal speaker that you've heard during most of this discourse has been Jim Lovell but that last voice was that of Bill Anders.

SC We're directly over our first initial point now for P1. It's almost impossible to miss, very easy to pick out and we can look right over into the second initial point.

CAP COM Roger Jim.

SC I can see very clearly the five crater star formation which we had on our lunar chart.

CAP COM Roger.

SC And right now I'm trying to pick out visually P1.

CAP COM Roger Jim. Bill you can turn off the secondary event prop now.

SC Houston. This is Apollo 8.

CAP COM Apollo 8 Houston go.

SC Roger. How about giving us a system status please.

CAP COM Roger.

SC OK. I've got me one in flight now Houston.

PAO The reference to be one is a land mark a land mark which relates to a projected landing sight.

SC It's very easy to spot. You can see the entire rims of the craters from here with of course the white crescent on the far side where the sun is shining on it. The shadows are quite lengthy now. Maskelyne B has quite a few shadows off of it but it can be recognized. Just west of the Maskelyne B we start going to the terminator. The terminator is actually quite sharp over the pyrenees and its, I can't see anything in earth shine at this present time. Bill says that he can see things out the side window but he's not looking down on the sun shine on the moon.

PAO Apollo control Houston. As a matter of interest space craft commander Frank Borman's heart rate has been ranging between 78 and 80 since we acquire

CAP COM Evaluating the 6th chart on your MTS burn and we'll give you a read out on that shortly. Over.

SC Roger. Thank you. It's seems smooth. Do you need high bit rate any more?

CAP COM Roger. We'd like high bit rate. We have dumped your DFE and we'd like to stick with high bit rate for a while.

SC Roger

Apollo 8 Mission Commentary, 12/24/68, 695626, 4:59am, 219/2

SC Well we're just about over Maskelyne B now and our target is just directly below us.

CAP COM Apollo 8 this is Houston. If you want the recorder now it's yours.

SC Roger. Thank you.

PAO Apollo Control Houston. Our tracking data from the ground still compares very well with the guidance and navigation computer on the spacecraft.

CAP COM Apollo 8 Houston. Mission tracking is comparing very well with your on board nav.

SC Roger

SC Houston, for your information we lost radio contact at the exact second you predicted.

CAP COM Roger. We concur.

PAO The reference there was to loss of signal as they went over the back side of the moon.

SC Did you turn off the transmitters at that time?

CAP COM Honest Injun, we didn't.

SC While these other guys are looking at the moon I want to make sure we have a good SPS. How about giving me that report when you can.

CAP COM Sure will Frank.

SC We want a go for every rev please, otherwise we'll burn in GE11 at your direction.

CAP COM Roger. I understand.

END OF TAPE

CAP COM Apollo 8. This is Houston. Are you eating?

SC Say again.

CAP COM Apollo 8. This is Houston. Are you eating dinner?

SC May eat a bite of breakfast in a little while here.

CAP COM Roger. Apollo 8. This is Houston. When you go into the dark about 7 or 8 minutes I have some words for you on the filters for the wide angle lens, for your TV camera. Over.

SC We are in the dark now.

CAP COM Roger. Let me know when you are ready to copy. Apollo 8. Houston. Any words on earthshine? Over.

SC Earthshine is about as expected, Houston. Not as much detail, of course, as in the sunlight, but you can see the light craters quite distinctly and you can see the albedo contacts quite distinctly. And also, there's a good three dimensional view of the rims of the larger craters.

CAP COM Roger. Bill.

SC I think our high-speed film will be able to pick some of this stuff up quite well.

CAP COM Roger.

PAO Apollo Control Houston. Apollo 8 passes over the night portion of the moon, the guidance and navigation the platform is to be align. This during period of darkness, as the spacecraft remains in an inertially fixed attitude for this procedure. This leaves lunar daylight periods for maneuverability needed for photography and visual observations. At 70 hours 12 minutes continuing to monitor this is Apollo Control Houston.

SC Go ahead with your information on the filter, Houston.

CAP COM Apollo 8. Houston. Roger. We recommend you use a wide angle lens on this particular TV run. You can use a telephoto lens with the same set up as yesterday's TV show. However, we recommend a wide angle lens. Step number 1 take the single red filter to the red filter on the red/blue filter holder, do it so that the filter slide still functions. Over.

SC Go ahead.

CAP COM Roger. Step number 2. Attach the filter holder to the lens with tape on the top and bottom. Do this with the slide forward. Over.

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 700020, CST 4:57a 220/2

SC Go ahead.

CAP COM Roger. Then at the end of your second REV TV pass, or on request from here, we would like you to remove that red filter from the holder and transmit briefly with it that way then slide it over the blue side so your final transmission. Over.

SC We got you.

CAP COM Okay, Frank.

SC Houston. Apollo 8. Standing by to record TEI one and TEI two.

CAP COM Apollo 8. This is Houston. Your TEI one and two (PAD) you received last pass are still good. Using these PAD's your next midcourse will be left and 20 feet per second. Over.

SC Roger. Understand.

CAP COM Apollo 8. Houston. We have all the SPS experts looking at your data now. The preliminary look is very good and we will give you some final words later.

SC Roger. We could

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 701626, CST 5:07 221/1

SC Roger. We could feel the charge when we threw in bank B, but not exactly but we could feel additional thrust.

CAPCOM Roger, copy.

SC Houston, be advised on this red blue filter technique on the TV. You cannot slide the two filters out of the way with them taped onto the TV camera. So I suggest we do red blue and then take them off.

CAPCOM Roger. we concur. But make sure the little red filter is taped over the big one, over.

SC All right, you don't want the red filter - you want the blue by itself. Is that correct?

CAPCOM That's affirmative, Bill. Bill, we'd like you to use the double red filter for the first transmission, over.

SC Roger. It worked.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Apollo 8, this is Houston. If you should decide that you want to roll headsup on REV 2, one thing to remember be sure you're YAW 45 degree right in order to maintain your high gain antenna calm, over.

SC We will not do that, we're going to stick with the flight plan and make the best we can here.

CAPCOM Roger, Frank.

SC As usual, in the real world, the flight plan looks lot fuller than it did in Florida.

CAPCOM Roger, understand.

PAO Apollo Control, Houston, a period of relative quiet, perhaps the crew has decided to start their first meal in lunar orbit.

END OF TAPE

Didn't he order it?

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 702626 CST 5:17a 222/1

PAO Apollo Control, Houston. We're now less than away from our LOS time on this the first revolution in lunar orbit. Continuing to monitor, this is Apollo Control, Houston.

CAPCOM Apollo 8, Houston. We need an O2 purge now.

SC Roger. And we're standing by for a map update.

CAPCOM Roger.

SC Houston, Apollo 8. Just for your information after we completed P-52, I acquired the earth in the sextant. Quite a sight from here.

CAPCOM Roger. Bet it is.

SC How are the systems experts on the SPS coming, Jerry?

CAPCOM They are still working, Frank, another five or ten minutes.

SC Roger.

CAPCOM Apollo 8, Houston. Your SPS data looks real good. It is just a matter of getting it all in from the site and getting it looked at.

SC Thank you.

CAPCOM So far everything looks copacetic.

PAO Apollo Control, Houston. We've just received data from our Flight Surgeon that Frank Borman's peak heart rate at LOI 1 read 130. The same reading he had, as a matter of fact, that he had at lift off. We would pass that along, continuing to monitor. This is Apollo Control.

CAPCOM Apollo 8, Houston. We would like to take about five minutes of high-bit rate. Over.

SC Roger. Five minutes of high-bit rate coming up.

CAPCOM Roger.

SC You've got it.

CAPCOM Apollo 8, Houston. We have a map update.

SC Stand by 1. Go ahead with the map update.

CAPCOM Roger, Frank. Map update. Rev 1/2, no change. The Rev 2/3 follows: 73 04 57 73 09 37 73 19 01 73 48 53 74 24 23. Remarks, Bravo one 74 16 24. Over.

SC Got your copy.

CAPCOM Roger. We show you 23 minutes to LOS.

SC Roger. Are you going to dump the tape?

CAPCOM Apollo 8, this is Houston. You are GO for Rev 2. All systems are GO. SPS evaluation still underway and looking good. Over.

SC Understand GO for Rev 2. Thank you.

CAPCOM Roger, Apollo 8. We're still using the tape recorder. We will dump it in a little bit.

PAO Apollo Control, Houston. You just hear

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 702626 CST 5:17a 222/2

that GO for Rev 2. Flight Director, Glynn Lunney, --
CAPCOM Order is yours. You can go to low-bit
rate.

SC Thank you.
PAO Flight Director, Glynn Lunney, crossed
checked with Z COMM and Flight and Guidance Control Officers,
and told our Capsule Communicator, Jerry Carr, to pass along
that GO for Rev 2.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24,68, GET 703626, CST 5:28A 223/1

PAO Apollo 8, Houston request biomed switch,
over.

SC

3 2 1, mark. (*why laughter here? see notebook*)

CAPCOM

Roger, mark.

PAO Apollo 8, Houston, put your telemetry
input switch to low, over.

SC

Roger, go low. Houston, Apollo 8. We're
in the process of preparing meal four day...formula A.

CAPCOM

Roger, Frank.

END OF TAPE

SC Houston. Apollo 8. Over.
CAP COM Apollo 8. Houston. Go.
SC Are you going to be able to dump that
tape right after LOS?
CAP COM Roger. Bill. They say they have already
dumped the tape and it's almost totally clean.
SC What does that mean?
CAP COM That means you have got about 2 minutes
of low bit rate on there, but the rest is clean. Over.
SC The high bit rate of the burn wasn't
on there?
CAP COM Negative. We've already dumped and got
that.
SC Okay, let me know when you're going to
dump it next time, Jerry. I understand we are go now for
the DSE. Have you got any voice off of it?
CAP COM That's affirmative. We did.
SC Okay, thank you.
CAP COM Apollo 8. Houston. The voice quality
on your tape was just sort of middling. We were able to
monitor your burn and hear most of that pretty well.
SC Roger. Did you get a report of the
photography accomplished or is that on the tape at present?
CAP COM Negative. We haven't heard that.
SC Okay, we will put it on tape now.
CAP COM Roger.
PAO This is Apollo Control Houston, now
less than 5 minutes away from loss of signal on our first
revolution.
CAP COM Apollo 8. Houston. You are 4 minutes
and 40 seconds away from LOS. I would like a reconfirmation
on your S-band off switch and a downvoice backup position.
Over.
SC Negative, it is in normal voice. We
will go downvoice backup.
CAP COM Roger, request you leave it there for
ever. Over.
SC Roger.
CAP COM Apollo 8. This is Houston. All systems
are go. You're still go for rev 2. Over.
SC Thank you.
CAP COM Apollo 8. Houston.
SC Go ahead Houston. This is Apollo 8.
CAP COM Roger. One minute until LOS.
SC Thank you.

*Data
Storage
Equipment*

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 704626, CST 5:38a 224/2

CAP COM Apollo 8. Houston. 10 seconds until
LOS. All systems are go.

END OF TAPE

CAPCOM
all systems GO.

Apollo 8, Houston. Ten seconds LOS

PAO Apollo Control, Houston 70 hours 56 minutes into the flight. We have had LOS with Apollo 8. At this time we would like to play back those historic first words of insertion into lunar orbit as we heard them here at Mission Control.

CAPCOM Apollo 8, Houston. Over.

SC Go ahead, Houston, Apollo 8. Burn complete. Our orbit is 160.9 by 60.5. 169.1 by 60.5.

CAPCOM Apollo 8, this is Houston. Roger. 169.1 by 60.5. Good to hear your voice.

PAO Apollo Control, Houston. Now we will switch back and play-back some of Jim Lovell's descriptions as he viewed the lunar surface from his orbital altitude.

CAPCOM Apollo 8, Houston. What does the ole moon look like from 60 miles? Over.

SC Okay, Houston. The moon is essentially gray. No color. Looks like plaster-of-Paris. Sort of a grayish deep sand. We can see quite a bit of detail. The Sea of Fertility doesn't stand out as well here as it does back on earth. There's not much contrast between that and the surrounding craters. The craters are all rounded off, there's quite a few of them. Some of them are newer. Many of them look like, especially the round ones, look like hit by meteorites or projectiles of some sort. Langrenus is quite a huge crater, it has a central cone to it. The walls of the craters are terraced, about 6 or 7 different terraces on the way down.

CAPCOM Roger. Understand.

SC Coming up now on the Sea of Fertility our old friends Messier and Pickering that I looked about so much on earth.

CAPCOM Roger.

SC I can see the rays coming out of Blaze Pickering. We're coming up now near our Pl initial site which I am going to try and see. Be advised the round window, the hatch window is completely iced over. We can't use it. Bill and I are sharing the rendezvous window.

CAPCOM Apollo 8, Houston. Roger. Got any more information on those rays. Over.

SC Roger. The rays out of Pickering are quite faint from here. There's two different groups coming or going to the west. They don't appear to be -- have any depth to them at all. Just rays coming out.

CAPCOM Roger.

SC They look like just changes in the color of the Mare. Okay. Over to my right are the

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 705627 CST 5:46 a 225/2

Pyrenees Mountains coming up. We're just about over Messier and Pickering right now. Our first initial point is easily seen from our altitude. We're getting quite a bit of contrast as we appear -- approach the terminator. The view appears to be good. No reflection of the sunlight in our eyes. It appears that visibility in this particular spot is excellent. It is very easy to pick out our first initial point. Over this mountain chain we can see the second initial point, the Triangular Mountain. We're coming up on the craters Columbo and Gutenberg. Very good detail visible. We can see the long parallel Faults of Gaudibert and they run through the Mare material right into a highland material. We're directly over our first initial point now for P-one. It's almost impossible to miss, very easy to pick out and we can look right over into the second initial point.

CAP COM Roger, Jim.

SC I can see very clearly the five crater star formation which we had on our lunar chart.

CAP COM Roger.

SC And right now we're trying to pick out visually P-one.

PAO This is Apollo Control Houston. As Apollo 8 passed over the lunar hill, out of communication, we read an apolune of 168.2 nautical miles, a perilune of 60.3 nautical miles. Velocity of the spacecraft at that time descending downward from its apogee was 5224 feet-per-second. Our current digital indications say that the present velocity is 5297 feet-per-second. So at 71 hours 02 minutes 35 seconds into this most historic flight, this is Apollo Control Houston.

END OF TAPE

PAO Apollo Control Houston. 71 hours 22 minutes now into the flight of the Apollo 8. Apollo 8 continuing on its pass over the back side of the moon. We're some 17 minutes away from time of re-acquisition. At this time, Command Module Pilot, Jim Lovell, should be taking a look at three control points, which are evenly distributed across the back side of the moon. These repeated on later orbits with the optics designed primarily as a mapping tool. And increasing data in establishing a point in space. Each control point has two IP, initial points, associated with it. These serve the same homing end purpose to Jim Lovell as an IP does to a bombardier. He literally counts down to his CP, 1 to 3 minutes, depending on which ID he has acquired and all of the ID's, such things as craters, hills, rills, and intersection of rills, are in all cases within about a lunar degree of the ground track. Remember a lunar degree is 16 nautical miles versus 60 nautical miles on earth. The same IP relationship exists on the front side with the landmark BI which is designated to the landing site. So at 71 hours 23 minutes into the flight of Apollo 8, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 713200, CST 6:23A 227/1

PAO Apollo Control Houston, 71 hours,
32 minutes now into the flight of Apollo 8. We're within
8 minutes acquiring the Apollo 8 spacecraft now in its
second revolution around the moon which - the first revolu-
tion began at midpoint in the back side. Apollo 8 should
be yawing about 45 degrees just about now to establish a
proper attitude for TV sighting. We'll continue to monitor
as we draw nearer to that point when we reacquire the space-
craft. So at 71 hours, 32 minutes, this is Apollo Control,
Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 713800 CST 6:29a 228/1

PAO This is Apollo Control, Houston, at 71 hours 38 minutes now into the flight of Apollo 8. We are now within 2 minutes of our predicted time of acquisition of this second pass across the front side of the moon. (During this pass we expect to acquire via television our prime tracking site for the TV is the Madrid site.) Meanwhile, Glynn Lunney here in Mission Control has gone around the room updating all his Flight Controllers on the requirements -- flight plan requirements for this revolution. We will stand by and continue to monitor at 71 hours 38 minutes. Mark 1 minute to predicted time of acquisition. Stand by. Mark, 30 seconds and standing by. 5 seconds.

CAPCOM Apollo 8, Houston. Over.

PAO That's Jerry Carr making a call. No reply yet. Standing by. We're receiving telemetry data now. Standing by.

CAPCOM Apollo 8, Houston. Over.

PAO The picture is coming in now.

SC Houston, this is Apollo 8 with the TV going. Over.

CAPCOM Apollo 8, this is Houston. Reading you loud and clear. We see your TV. It is a little bit clearer.

SC Roger. The moon is very bright and not too distinct in this area. I will give you a shot of the horizon.

CAPCOM Roger.

SC How does that look? Is it on the top of your picture?

CAPCOM Apollo 8, this is Houston. In this picture of the horizon we can't see many terrain features yet.

SC Roger.

CAPCOM Apollo 8, Houston. We are beginning to pick up a few craters very dimly. The whole thing is pretty bright.

SC Roger. There is not much definition up here either out on the horizon. We are now approaching the craters Sea and Bassett.

CAPCOM Roger.

SC I will shift to the rendezvous window.

CAPCOM Roger, Bill. Apollo 8, Houston. We want to take the DSC.

SC Roger. You've got it.

CAPCOM Roger. Looks like we've got a real good picture now.

SC Okay, that's the crater Brand.

CAPCOM Roger.

SC Sorry we missed Carr.

Anders:

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 713800 CST 6:29a 228/2

CAPCOM Me too. Apollo 8, this is Houston. We are going to need a cryo fan cycle sometime during this pass.

SC Roger. Can we wait until sunset?

CAPCOM Roger. We can wait.

SC Okay. I think we are coming up on Miller, right now. There's a very new bright impact crater. Should be in the field of view now. *not on my map*

CAPCOM Roger, Bill.

SC You see it in the upper part of your screen. Say, Bill, how would you describe the color of the moon from here? The color of the moon looks like a very whiteish gray, like dirty beach sand with lots of footprints in it. Some of these craters look like pickaxes striking concrete creating a lot of fine haze dust. There's some interesting features out on the other side of the window. Let me switch windows on you now. *but in my notes*

CAPCOM Roger, Bill.

SC You should see the horizon now in the top of your picture.

CAPCOM Roger. We have the horizon, Bill.

CAPCOM Apollo 8, Houston.

SC I believe these are the craters now Basset and Sea.

CAPCOM Roger, Bill. If you have the polarizing filter handy, try flipping it in front, will you?

SC Roger.

SC Jerry, as a matter of interest, there's a lot of what appears to be very small new craters that have these little white rays radiating from them.

CAPCOM Roger, Jim. Roger. We see the filter going over. Apollo 8, this is Houston. Looks like we have too much light. The polarizing filter doesn't help much. Go ahead and remove it again.

SC Roger. It's removed.

CAPCOM Looks like we just got --

SC Roger. We're just passing over the crater Borman, and there's Anders out there, Lovell is right south of it.

CAPCOM Roger. The TV is breaking up now. Okay. We are back with a good picture. Looks like we just have too much light. Our definition is rather weak.

SC Roger. Also, we're fogging up the window here, Houston, among other problems.

CAPCOM Roger, Bill. The other window is better than that one.

SC Okay.

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 713800 CST 6:29a 228/3

CAPCOM Much better picture, Bill. Much better.
SC All right. The right side of the camera is pointing retrograde. We are now passing abeam of the crater Houston. I will show the camera over there once for the folks in Texas.

CAPCOM Roger.
SC It's a big and sprawly one. It's got those two impact craters, one to the right and one to the left.

END OF TAPE

Mount Marilyn Jones 2 32/1
center room by the window 2 32/1
John Aaron 2 29/2 and 10

To 2 44/2

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 714900, CST 6:40a 229/1

SC ... folks in Texas.
 CAP COM Roger.
 SC It's a big and sprawly one. Its got those two impact craters, one to the right and one to the left.
 CAP COM Roger Bill.
 SC How's your picture?
 CAP COM Still about the same, Bill. The terrain's pretty bright. We are not getting much definition at all. Definition on this side is much much better.
 SC Okay, I think - okay, we are leaving the window. That gives you an idea how bad our window is.
 CAP COM Roger. This picture now is much better. I guess the light levels are decreasing now.
 SC Okay, we are coming up on the crater Collins.
 CAP COM Roger. What crater is that going off.
 SC That's some small impact crater.
 CAP COM Roger.
 SC We will call it John Aaron's.
 CAP COM Okay.
 SC If you will keep looking at the systems anyway.
 CAP COM You just quit looking.
 SC Jerry, a lot of ID feature these small impact craters have dark spots in the center, where it appears that they buried in it and hit some new material down below. It has got a lot of fine white dust around it.
 CAP COM Roger. Understand, Jim. Apollo 8. This is Houston - looks like we could see Collins now.
 SC Roger, there is Collins for you. And Collins is right on the edge of Spice Sea which we are about to pass over.
 CAP COM Roger. Apollo 8. This is --
 SC -- now going across the Smyth II Sea.
 Go ahead.
 CAP COM Roger. We just saw a Stellenword (SIC) go by.
 SC Roger. He was really in a hurry.
 CAP COM Roger. Picture is much improved now. Getting better all the time.
 SC Roger. The terrain here is, as you can see, not well defined. We are going to start a roll to the left, in order to come across the target area, with the television.

Borman's prayer
was supposed to say read tonight
and I couldn't quite make it.

2 42/3 and 43/1

CAP COM Roger. Roger Bill.
SC How is that crater in - right in the
middle look now?
CAP COM Roger, that's a very good one. That
must be O'Neal.
SC Roger.
CAP COM Roger Bill, we see O'Neal real well.
Also the smaller crater off to the side of it.
SC That's Dennis.
CAP COM Roger.
SC Houston. This is Apollo 8. We are
going to terminate our program for this pass and get on
with the preparations for LOI two, if you say we are go.
CAP COM Apollo 8. This is Houston. Roger.
SC Okay, signing off until 9th rev. Apollo 8.
CAP COM Apollo 8. Houston. Roger. Apollo 8
Houston. Thank you for the look.
SC Roger.
PAO Apollo Control Houston. Most of those
craters identified in the conversation, largely over the
east part of this front side pass are actually unnamed.
They have been coded for purposes of this flight. Perhaps
you recognized some of the names, names like Bassett, See
and by the John Aaron, John is ECOM on the Green Shift.
So at 71 hours 54 minutes we continue to monitor.
CAP COM Apollo 8. This is Houston. You have
the DSE.
SC Thank you Houston.
CAP COM Roger. Apollo 8, on your backside
data, it's pretty much unintelligible, we suggest Bill that
you recheck the position of your mike for your backside
pass and try to speak a little bit louder and more distinctly.
The last one we listened to was pretty much unintelligible.
Over.
SC Roger. As soon as we get squared away,
we will give you a real quick real-time summary.
CAP COM Roger.
SC And Houston, you might let us know,
can we do the red/blue filter exercise with both these
filters - red filters on. Over.
CAP COM Stand by. Apollo 8. This is Houston -
Apollo 8, Houston. Negative. Apollo 8, this is Houston
with an LOI two maneuver PAD. Ready to copy?
SC Stand by.
CAP COM Roger. Standing by.
SC Okay, Houston, go ahead.

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 714900, CST 6:40 a 229/3

CAPCOM Apollo 8, this is Houston. OIL 2,
SPS G&N, 46427 - 053 + 141073350570 - 0 --

END OF TAPE

CAPCOM minus 01350 plus all 0's plus all 0's,
copy.

SC Roger.

CAPCOM Roger. 00017535800607 plus 00606
0135000 niner 012650231121 niner 7, copy.

SC Roger.

CAPCOM Roger. Taurus, Aida. I repeat Taurus
Aida. Up 162 left 01, the remainder not applicable. ZBC
aline Sirius Rigel, 12 niner, 155010, negative ullage.
Horizon window ignition minus 327 degrees, horizon left.
At ignition 18 degrees, horizon left. Before readback,
configure for receiving any update, over.

SC Roger, understand. Configure for re-
ceiving an update. Okay, we're in pull and accept, go
ahead.

CAPCOM Roger. I'm ready for your readback.

SC LOI 2 SDS G & S 46427 minus 053 plus
141073350570 minus 01350 plus 0000 plus 000000017535800607
plus 006060135000901265023112197 Taurus Aida up 1622 left
point 1, the remainder not applicable. Sirius Rigel 129155
010 no ullage. Ignition minus 327 degrees, ignition 18 de-
grees.

CAPCOM Apollo 8, Houston, readback is correct.
Apollo 8, this is Houston. Your map update for REV 2/3,
no change, over.

SC Understand, no change, REV 2/3.

CAPCOM Roger, Frank. You can expect GO/
NO/GO for the next REV at 20 minutes before LOS, over.

SC Roger.

CAPCOM Apollo 8, this is Houston. We'll try
to make that call 20 minutes before every LOS, over.

SC Fine.

CAPCOM Apollo 8, Houston. We have the CSN
vector starting on the LV over.

SC Thank you. Houston, this is Apollo 8.

CAPCOM Apollo 8, Houston, GO.

SC Roger. Just an interesting feature
on my center window which has ice on it is now beginning
to melt. I'm beginning to see through it.

CAPCOM Roger, that's good news.

SC And again we're directly over our
favorite Messier and Pickering. The view at this altitude,
Houston, is tremendous. There is no trouble picking out
features that we learned on the map.

CAPCOM Roger, Jim, that's good news. What do
you think of the lighting situation as far as the range
of lighting for good visibility?

SC The range from here is outstanding. I
wish we had the TV still going because the brown area now is

draker. We have just passed over the Sea of Fertility and the mare is darker. The bomb range has got more contrast, has more contrast because of the sun angle. Bill has got the 16 mm going for us.

CAPCOM Roger.

SC There is a crater Taruntius, I believe, over there. We will try to get TV on this at a later time, when we are not getting ready for a burn.

CAPCOM Roger, Jim.

SC I can see the old second bishop right now, Mount Marilyn.

CAPCOM Roger.

SC Houston, at these sun angles, everything is quite distinct, shadows are good, the ground doesn't have any sunlight returned, it appears very good visibility at these sun angles.

CAPCOM Roger.

SC As a matter of fact, Bill just mentioned that the visibility seems to be excellent just about up to the terminator. It's something which I didn't expect. I thought there would be a little bit more gradual shift to darkness, but it's very sharp and distinct.

CAPCOM Roger, Jim.

SC Of course, we are in a very high phase angle now.

CAPCOM Apollo 8, Houston. All of your updates are in, the computer is yours, over.

SC Thank you.

SC ... block.

CAPCOM Roger. Break.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 720743, CST 659a 231/1

CAP COM Roger. Break. Apollo 8, Houston. Your TEI-2 pad is good, stand by to copy your TEI-3. Over.

SC Ready for TEI-3.

CAP COM Roger, TEI-3. FPS G&N 46427 minus 053 plus 141 075 31 2995 plus 28960 minus 00456 plus 00720. Copy.

SC Roger.

CAP COM Roger. 180 021 002 not applicable plus 00188 28972 251 28793 40 2769 396. Copy.

SC Roger.

CAP COM Roger. 033 0000 left 17 plus 0883 minus 16500 12955 36185 146 35 07. Sirius Rigel 129 155 010 ullage 2 jets, 20 seconds, quads Bravo and Delta. Horizon on the two degree line at ignition minus three minutes. Assume there's no LOI-2. Over.

SC Roger. SPS G&N, this is for TEI-3 46427 minus 053 plus 141 075 31 2995 plus 28960 minus 00456 plus 00720 180021 002 NA plus 00188 28972 251 28793 40 2769 396 033 0000 left 17 plus 00883 minus 16500 12955 36185 146 35 07, Sirius Rigel 129 155 01 two jet 20 seconds, B and D, horizon two degrees at ignition minus three minutes, assumes no LOI-2.

CAP COM Apollo 8, Houston. Readback is correct. Apollo 8, this is Houston with a TEI-3 with an LOI-2. Over.

SC Go ahead.

CAP COM Roger, TEI-3. SPS G&N 45810 minus 053 plus 141 075 21 2846 plus 30128 minus 00540 plus 01911 180 019 001. Copy.

SC Roger, go ahead.

CAP COM Roger. Not applicable plus 00188 30193 355 30008 40 2742 396 033 down 021 left 18. Copy.

SC Roger.

CAP COM Roger. Plus 0888 minus 16500 12955 36185 146 34 50 GDC aline no change, ullage no change, horizon one degree at ignition minus three. Assume LOI-2. Over.

SC Go ahead - er Houston this is Apollo 8. TEI-3 with LOI-2. SPS G&N 45810 minus 053 plus 141 075 21 2846 plus 30138 minus 00540 plus 01911 180 019 001 NA plus 00188 30193 255 30008 40 2742 396 033 down 021 left 18 plus 0888 minus 16500 --

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 721743, CST 7:09am, 232/1

SC One zero eight eight, one six five zero zero, one two nine five five, three six one eight five, one four six three four five O. No change, no change one degree in the rise of ignition minus three. Assumes LOY2.

CAP COM Apollo 8 Houston. Roger I made one mistake, horizon window is minus one degree. Over.

SC Minus one degree.

CAP COM Roger. Readback is correct. - Apollo 8 this is Houston, you are GO across the board for LOI2 would like to take the DSE for a dump, over.

SC Roger, you guys - I can understand we are GO for LOI2.

CAPCOM That's affirmative.

SC Before you take the DSE for a dump, let me give you a quick run down on that DSE before you dump it, if you will.

CAPCOM Roger, standing by.

SC Roger.

PAO This is Apollo control, Houston, our GET for ignition of LOI2 is 73 hours 35 minutes and 5 seconds aphelion resulting from this burn 60.7 nautical miles perilune 60.6 nautical miles just about as close to circular as you can get. The burn duration expected 9 seconds delta V for this burn 135 feet per second. On this pass over the front of the Moon our spacecraft was at 115 nautical miles altitude. At the time of acquisition 115 nautical miles in altitude. Our aphelion which also occurs on this - over this side of the Moon 168.5 nautical miles - 168.5. Turning back, continuing to monitor now this is Apollo control, Houston.

SC Okay, Houston, you've got the tape.

CAPCOM Apollo 8, Houston, Roger.

CAPCOM Apollo 8, Houston. Would you believe that Taurus Aida is Pleiades? Over.

SC Thank you.

PAO This is Apollo Control Houston, 72 hours 24 minutes into this mission. In this lull, perhaps we can clarify some of the names you heard being given to craters during that recent television pass. Our geology groups here had to apply some names to certain key landmarks instead of using just number and code, they decided to give them real life names. These are in no way officially named craters. In some cases, I think in most cases, the names aren't even - have not even been submitted to the International body which must pass on those kinds of official names, but to clarify this we thought we would run through some of them that are in use in an area that couldn't be too well observed by telescopes from earth. WE have some pictures to work from, and you distinctly heard Lovell - Anders and Loveil talk about craters named for themselves. Incidentally,

PAO this is perhaps a pardonable bit of geologist personality creeping into it. Historically they have been named for discovering geologists or observers. One was got a real time name of John Aaron because he is the electrical environmental and communications console operator who spotted the need for cutting in the need for cutting in the secondary water boiler as we started to circle the moon, that is he noticed the water level was down and he suggested we go to the secondary loop, apparently when all the others were at the window. In future passes, you may hear names like Schmitt, named for Jack Schmitt, Gilruth, the director of this center, Debus the director of the Kennedy Space Center, Kurt Debus. There is an unofficial one, Joe Shea, the former manager of the Apollo Spacecraft program; Ted Freeman, first astronaut killed in an airplane crash in October of 1964. There is a crater bearing the name of George Low, Sam Phillips, Alan Shepard, Mercury, Washington, Apollo, and on either side of the track there is one named for Jim Webb and for Tom Paine, past and present administrators of NASA. Moving along the line we see craters named for Grissom, Gus Grissom, Ed White, Roger Chaffee, clustered three craters fairly close together and just south of the ground track we just heard about. Coming along that same track we see one bearing the name of Chris Kraft, Don Slayton, Jerry Carr, and on along. I'm sure we'll hear more of these. You did hear today about the crater Bassett, so named for Charlie Bassett, the late Charlie N. Bassett, and Elliot See.

END OF TAPE

No Mueller

PAO ... Charlie M Bassett and Eliot See, crater right beside it. Two men killed in an airplane crash in St. Louis, in Feb. 1966. At 72 hours, 27 minutes into the flight, this is Apollo Control Houston standing by.

SC We are about to lose it Houston. How far are you on the tape dump?

CAPCOM Apollo 8, this is Houston. It looks like we have lost it, they weren't quite done. We are standing by for a countdown to bio-med switch left, over.

SC Roger. We would like to get it dumped if we could, stand by a second.

SC Did you get it stopped?

CAPCOM Bill, you can go ahead and cut it off.

SC Okay, we are not going to have high-gain now, until the next time around. Can you give me some idea of how much of that dump you got.

CAPCOM Apollo 8, this is Houston. We are negative. We can't tell, you can go ahead and turn it off.

SC Well, how long did you dump it?

CAPCOM Roger, standby, they are checking.

CAPCOM Apollo 8, Houston. Apollo 8, this is Houston reading you with a great deal of noise in the background. Go ahead and rewind your tape and start it in low-bit rate, and we will try and catch that dump at the end of the next Rev.

SC Roger, I would like to have an idea on how much you dumped, in order to know (garble).

CAPCOM Roger, standby.

CAPCOM Apollo 8, Houston, we are working on that time. We will be able to tell you before LOS, over.

CAPCOM Apollo 8, Houston, over.

SC Go ahead.

CAPCOM Roger, did you read my last?

SC That is affirmative. You will give us a rundown when you figure out how much tape you dumped.

CAPCOM Roger. They feel reasonably sure, however, that if you rewind and start low-bit rate, we will be able to get all of the burn and still not run into what needs to be (garble).

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, go.

SC Roger, what ref matter are we using for this LOI 2 burn?

CAPCOM Standby Frank, we are talking.

SC Okay, I have an LOI 2 ref matter, but if, I don't understand why the pitch is 175.

END OF TAPE

CAPCOM Apollo 8, Houston.
SC Go ahead.
CAPCOM Apollo 8, this is Houston, you are right the ref mat is LOI 2, the ref mat was determined out there before the last midcourse correction and since that time there has been a slight changing of trajectory and the point at which you are burning LOI 2 now is just a shade different than where it was originally planned for.
SC Okay, thank you.
CAPCOM Apollo 8, Houston. Apollo 8, Houston, over.
SC Roger, go ahead, Houston, Apollo 8.
CAPCOM Apollo 8, this is Houston, DSE is rewind and it's yours available for use in about one hour of low bit rate and two minutes of high bit rate for your burn without running over your good data, over.
SC Roger, do you read us now, Houston.
CAPCOM Roger, reading you loud and clear now.
SC Okay.
CAPCOM Apollo 8, this is Houston, you are GO for LOI 2 on the next rev, over.
SC I can understand GO for LOI 2 on the next rev. How do you read, Houston?
CAPCOM Apollo 8, this is Houston, reading you loud and clear, how me?
SC Loud and clear.
CAPCOM Roger, Frank did you get my message on the DSE.
SC Roger. Roger.
CAPCOM Okay.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 724826, CST 7:39a 235/1

CAPCOM Apollo 8, Houston. Verify the telemetry
input switch LOW, over.
SC Roger. Understand telemetry input LOW.
CAPCOM Affirmative.
SC Done.
CAPCOM Roger.

END OF TAPE

CAPCOM Apollo 8, Houston, 5 minutes to LOS,
over.

SC Thank you, Houston.

CAPCOM Apollo 8, this Houston, 1 minutes to
LOS. All systems GO, over.

SC Roger.

PAO This is Apollo Control Houston at 73
hour 04 minutes into the flight of Apollo 8. We are at
8 seconds away from time of loss of signal. Okay, they
said goodbye to the ground as they passed over at - on the
next pass over the back side of the moon. This is pass over
the back side where we will have our lunar orbit insertion
burn number 2. To quickly go over those numbers again, we
have a ground elapsed time of ignition at 73 hours 35 minutes
05 seconds, apolune 60.7 nautical miles, perilune 60.6
nautical miles or expected to result from the burn. The
burn one of very short duration, 9 seconds, delta V 135 feet
per second. We will be looking for them when we next ac-
quire at 43 minutes 30 seconds from this time. At 73 hours
05 minutes into the flight of Apollo 8, this is Apollo Con-
trol Houston.

END OF TAPE

PAO This is Apollo control, Houston at 73 hours 40 minutes into the flight, our present orbital data, at the last time I gave you still carries a perigee of 60.8 nautical miles, that perigee occurring at 8 degrees north by 89 degrees west. An apogee, an estimated apogee - this would be, of 60.4, this would be after circularization. The flight plan at this point is very busy, all three pilots have considerable tasks to do, as opposed to the last several days when their columns were virtual blanks, for instance at 73 hours 40 minutes, right along about now, Frank Borman is busy doing a platform alignment to a specific number, then he is called upon to roll right 180 degrees into a 2 second degree pitch down and so forth. At the same time, Jim Lovell is doing a number of vectors, he is working on the RCS monitors in sharing the values in the tank there and then shortly he is to start a rest period in about 10 minutes, a 2 hour rest period and at the same time Bill Anders is busy with a battery charger, he is doing a SPS monitor check and he is to put a program to acquire the high gain antenna via the manned spaceflight network at a specific time, during all this he will be - the biomedical switch will be on him - so we will be following his heart action. All in all a very busy period onboard, we are due to acquire the spacecraft in about 6 minutes. At 73 hours 43 minutes into the flight, this is Houston.

END OF TAPE

PAO This is Apollo Control Houston. We expect to acquire momentarily. The first call has gone out. We have acquired; we are reading good tank pressures, and here goes the first call.

CAPCOM Apollo 8, Houston. Over.

CAPCOM Apollo 8, Houston. Over.

SC Apollo 8, over.

CAPCOM Apollo 8, Houston. Loud and clear.

How me?

SC Houston, Apollo 8. Over.

CAPCOM Apollo 8, Houston. Loud and clear.

How me?

SC Roger. Reading you loud and clear and ready for the burn status report.

CAPCOM Roger. Ready to copy.

SC Roger. The burn was on time, 11 seconds .2 with a DGX, 1.8 DGY, that's minus 1.8, minus .2 DGZ, delta VC was minus 9.4, VERB 82 gave us an apogee 62 and a perigee of 60.8.

CAPCOM Apollo 8, this is Houston. Roger. Your burn was on time, 11 seconds, DGX was + .2, DGY was - 1.8, DGZ - .2, delta VC - 9.4, apogee 62, perigee 60.8. Over.

SC Roger.

PAO Apollo Control here. That circuit is noisier than we caught on the last two passes, but we have heard the crewmember, I think Borman, confirm an apogee of 62 miles, a perigee of 60.8, a virtually perfect second burn, giving us a circular orbit. We will continue to leave the line open.

PAO Apollo Control again. Apogee on this, the third revolution around the moon will occur at 80 degrees west longitude, 9 degrees 30 minutes north latitude, those are lunar coordinates of course. The perigee on this rev will occur at 9 degrees 29 minutes south latitude and 99 degrees 28 minutes east longitude. That will be on the back side of the moon. And our numbers now show an apogee of 60.9 versus of perigee of 60.5, compared to 62 mile apogee and a 60.8 mile apogee from the crew. Excellent agreement.

PAO The Press Corp should be advised that we are planning a press conference to begin in about 45 minutes in the MSC auditorium, 9:30 Houston time.

SC How do you read? This is Apollo 8.

CAPCOM Apollo 8, Houston. Weak but clear.

SC You are loud and clear.

END OF TAPE

*Summary, "Boy, how slow that?"
(my notes)*

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 7359 850a 239/1

SC Houston, Apollo 8, we are on high gain now if you want to get the high speed data to look at that burn.

CAPCOM Apollo 8, this is Houston, Roger. Apollo 8, this is Houston we are taking the DSE.

SC Thank you. Can you hold it for about 5 seconds or about 1 minute.

CAPCOM Roger, holding.

SC Okay. Okay, you can dump the data now.

CAPCOM Apollo 8, Houston, Roger, we are taking the DSE for dump.

SC Thank you. We have stated the updated the LM state vector of the burn 66, Houston.

CAPCOM Houston, Roger.

PAO An exceptionally quiet pass across here, we are reading a pitch 192 degrees, it's down and yaw 356 degrees, a 177 degree roll degree attitude, a very steady attitude and I believe they are in orbital rate, that is a read calculated to hold their windows in a specific position and move them in - as they move across the face of the Moon. Lovell should be in a rest period, 2 hours duration now. Perhaps that is why they are keeping quiet. Bill Anders is extremely busy taking pictures. 70 millimeter and 16 millimeters - 70 millimeter stills - 16 millimeter movies.

PAO This is Apollo control, Houston, we are 52 minutes from loss of signal on this pass and let us look over our ECS, Environmental Control Summary Table. The cabin pressure 4.9 and holding very nicely. The cabin temperature 77 degrees, I think that's up a few degrees from yesterday, I don't recall exactly. In general we can expect to see, we should be seeing a slight rise in temperature, this was predicted by the thermo people, a rise particularly in the outside temperature, the outside skin temperature of the spacecraft, a rise of something like 10 to 12 degrees. This was based on an estimates from the 102, the Apollo 7 flight and the experience to date in deep space. The point to be made is that it's - the spacecraft is slightly colder as it reverses from Earth to Moon, that is while in orbit about either body, slightly colder on the outside, inside remains relatively stable. A very quite period and so we will just take the line down, if something occurs we will come back up immediately. At 74 hours 10 minutes into the flight this is Apollo control, Houston.

END OF TAPE

PAO Apollo Control here, 74 hours, 12 minutes. After a long quiet period there, Mike Collins put in a call and he is getting some conversation from Frank Borman, be it ever so brief. Let's hear it now, and we will catch up and go into the live situation.

CAPCOM Apollo 8, this is Houston, over.

SC Hello Michael.

CAPCOM Hey, good morning Frank, we've been tracking you for about 18 minutes now, and we show your orbit 61 by 61-1/2, over.

SC Thank you.

CAPCOM Apollo 8, Houston, your SPS engine looked good on LOI number 2 burn.

SC Thank you.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Bill has got the tape recorder now, we are evaluating the dump. The data is good and we are evaluating the voice quality here shortly.

SC Thank you.

CAPCOM Apollo 8, this is Houston, over.

SC Go ahead Houston, Apollo 8.

CAPCOM I've got a few jolly updates for you, whenever you are ready to copy.

SC Standby.

PAO This is Apollo Control Houston over all of this noise. We will take the line down at this point, and try and figure out where the source of all of our noise is. Fortunately it is an extremely quiet pass; but if there is any further conversation, we will come back up and play it for you. It's 74 hours, 21 minutes into the flight, this is Apollo Control Houston.

END OF TAPE

How much can dump at once?

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET: 743500, CST 9:26A 241/1

PAO This is Apollo Control Houston, 74 hours 35 minutes into the flight. And in the last 10 or 15 minutes we've had a couple of brief exchanges with the crew, who still seem to be in a rather resting mode, but here are those exchanges, primarily numbers updates. We have the tapes.

CAPCOM Roger, Apollo 8, Houston. I have a TEI 3, TEI 4 and map update for REV 3 and 4 to read to you. Actually, the TEI 3 update which you have onboard is still valid, but we will not update that one. Which do you want first, the TEI 4 or the map update?

SC TEI 4.

CAPCOM Alright. This is the TEI 4 update. SPS plus G&N 45695 minus 053 plus 141. Are you with me so far, over?

SC So far.

CAPCOM Very good. 077212758 plus 30627 minus 00625 plus 00577 130 018 001 not applicable. Plus 00188 30639 256 30452. Are you with me so far? Over.

SC So far. Who puts the hole in it, though, Ed?

PAO Apollo Control here. We'll break it off at this point so the news conference can be picked up. One other pertinent comment that did not play out in that tape exchange. Frank Borman said - we had noted that his - the voice quality of Bill Anders was not quite what it should be on the data record system and which is being dumped here each rev back to Houston. This was noted and Bill said they were all so busy right now he would do what he could, make notes on the flight plan and that sort of thing, but he - we would just have to understand. So at this time let's break over to the auditorium and pick up the news conference.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 743800 CST 9:30A 242/1

SC Okay, go ahead.
CAPCOM Okay, the last number I gave was
DELTA-VC picking up at the sextant star, 402730 396 033
Down 030 left 19. Are you with me, over?
SC Roger.
CAPCOM Okay. plus 0858 minus 16500 12960
36195 146 3721 Comment, north set of stars Sirius and Rigel,
roll 129, pitch 155, yaw 010, ullage 2 quad 20 seconds from
quads Bravo and Delta. Horizon on 2 degree line at time of
ignition minus 3 minutes. Over.
SC Roger, Houston, we got a TEI 4 SPS/G&N
45695 minus 053 plus 141 077212758 plus 30627 minus 00625
plus 00577 180 018 001 NA plus 00188 30639 256 30452 40
2730 396 033 Down 030 left 19, plus 0858 minus 16500 plus
12960 plus 36195 146372! 3 is Rigel, 129155010, 2 quads
20 seconds B and D. Horizon 2 degrees at 6 minus 3.
CAPCOM That's about the size of it, Frank,
and a map update for revs 3/4 when you are ready.
SC Ready.
CAPCOM Revs 3/4, LOS 750123. Sunrise 751016.
Prime meridian 751716. AOS 754718. Sunset 762311. Remarks
Subsolar point 754655. IT 1 acquisition 761117. IT 2
acquisition 761230 for IT 1 and 2 those acq times are for
the shaft and trunnion angles equals zero. Over.
SC Roger, thank you. 750123, 751016,
751716, 754718, 762311, Subsolar 754655, IT 1 761117,
IT 2 761230, and the shaft and trunnion at 0.
CAPCOM Affirmative.
SC Okay, Houston, we're getting so busy
that we are having a hard time trying to do a neat job of
logging. I'll try to do it on the flight plan, and if I
make any visual observations we'll put them on the DSE and
I'll try to scribble some notes here and there.
CAPCOM Roger understand. Now high bit rate is
working great.
SC Roger.
SC Hey, Houston, Apollo 8.
CAPCOM Alright, Houston, over.
SC How about giving us the TV times for
tonight's rev, will you please?
CAPCOM Yes, we sure will Frank, stand by.
SC Okay.
CAPCOM Apollo 8 Houston.
SC Go ahead.
CAPCOM Roger, we were checking in to precise
start and stop time for TV and you are GO for the next
rev. Over.
SC I understand, go for the next rev.
Mike, we'd like to if, we could, time the TV to a passing over

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 743800, CST 9:30A 242/2

SC the terminator. WE would like to track the terminator with the TV. Think that's the most impressive thing we've seen and that might be the best thing rather than trying to acquire the earth.

CAPCOM Okay Frank, that's one of the things we are looking at right now. We have you ending at about 86 hours and we're looking at extending that few minutes to include that terminator view. Over.

SC Okay, I don't want us to run into rev 10 (garbled)

CAPCOM Roger, understand.

SC Houston, Apollo 8.

CAPCOM Go ahead Apollo 8.

CAPCOM Apollo 8 Houston.

SC (garbled) the DSE qual is not so good.

How do you read, Mike?

CAPCOM I read you loud and clear. You were cut out about the DSE, say again.

SC Roger. Since the qual - let me give you a quick run down of the status of photo targets. You ready to copy?

CAPCOM Ready to copy.

SC Okay, at REV 1 we got photo target 90 and terminator photography south for near sight terminator. Starting on REV 2 we've got target 12 and target 10, 14, 16, 19, 20, 21, and 23. Unfortunately we got into a - I got into the high speed film there somewhere, and I think those 250mm targets were on high speed. We did change film and starting out in Crater Texas with target 28, 31, 40, 36, was several targets of opportunity that were recorded on the DSE, but apparently lost. Have you been able to copy?

CAPCOM Yes, I'm with you Bill, keep going.

SC Okay, I might be calling up too fast.

Okay, on the third REV we got target 58 and 63 and 65. The training photography was accomplished and it was done on magazine D, which now has, correction that's magazine E which now has 95 exposures. Magazine D is fresh. Magazine K was also used for training photography and it's showing 25.1.

CAPCOM Roger, we copy all that, Bill.

CAPCOM Apollo 8 Houston.

SC Mike this is Frank again.

CAPCOM Go ahead, Frank.

SC Go ahead.

CAPCOM Roger for Bill

SC (Garbled)

CAPCOM Apollo 8 Houston standing by.

SC Alright, I said is Ron Rose around?

CAPCOM Stand by one Frank, we'll look for him and

CAPCOM while we're doing that, for Bill the DSE voice quality on high bit rate is very good, so if he wants to use the DSE in high bit rate for limited amount of time to record important things we suggest that he do that. We would like him to wait 20 seconds after turning it on prior to talking. Over.

SC Roger, copy.

CAPCOM Thank you, Bill.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Ron Rose is sitting up in the viewing room. He can hear what you say.

SC I wonder if he he ready for experiment P1?

CAPCOM He says thumbs up on P1.

SC (garbled) with reference to the DSE on high bit rate, what I would like to do then is if you got the last pass I'd like to play it - run it back and start at AOS on low bit rate and then go to high when we need it. How would that be?

CAPCOM John Aaron buys it.

SC Okay. Mike this is Frank again.

CAPCOM Go.

SC Roger. Rod and I got together and I was going to record a little - say a little prayer for our church service tonight. And I wonder - I guess that's what we are ready on?

CAPCOM Stand by one, Frank.

SC Alright.

SC Houston, Apollo 8, are you still there?

CAPCOM You are still loud and clear, Frank.

CAPCOM Apollo 8, Houston, go ahead Frank with your message.

SC Okay. This is to Rod Rose and the people at St. Christopher's, actually to people everywhere. Give us, O God, the vision which can see thy love in the world in spite of human failure. Give us the faith, the trust, the goodness in spite of our ignorance and weakness. Give us the knowledge that we may continue to pray with understanding hearts, and show us what each one of us can do to set forth the coming of the day of universal peace. Amen.

CAPCOM Amen.

SC I was supposed to lay read tonight, and I couldn't quite make it.

CAPCOM Roger, I think they understand.

CAPCOM Apollo 8 Houston, over.

SC Roger. Go ahead.

CAPCOM Roger, Frank, we'd like to know about the water chlorination. Have you - when was the last time

*certainly
a change
7 subject*

CAPCOM you chlorinated the water? over.

SC (garbled).

CAPCOM Roger, we stopped you an hour and a
half ago. Affirmative?

SC Roger, you know we wouldn't forget that.

CAPCOM Roger.

SC ~~Jim stole a little and it smelled like
a bucket of Chlorox about an hour ago.~~

CAPCOM Apollo 8 Houston, say again.

SC I said Jim (garbled) of that chlorine
and it smelled like a bucket of Chlorox in here a little
while.

CAPCOM Roger, understand.

CAPCOM Apollo 8 Houston, over.

SC (garbled)

CAPCOM Roger. We have 2 and a half minutes
to LOS and all systems are looking good. Everything is
looking just fine down here, Frank.

SC Thank you.

CAPCOM We'll have some more information on
this TV on the next rev. We're not planning any big
change in the time, just to extend them a little bit I
think, closer to the terminator.

SC Just give us the time, will you, because
we just want to know when it is. I'd like to get the
terminator if we could, and we've got a little message and
that's it.

CAPCOM Roger, we'll do that the next time you
come around.

SC Thank you. Okay, and have the E Comm
guys keep a sharp watch on our systems. Anders is so busy
fooling around with these pictures that not much else gets
done.

CAPCOM Roger, the E Comms are doing it.

*Spilled
Air to
ground
TAM 50
12-8*

END OF TAPE

APOLLO 8 COL. BORMAN'S PRAYER, 12/24/68, GET 753700, CST 10:28a 243/1

PAO This is Apollo Control Houston, 75 hours 37 minutes into the flight. Before we lost signal with the spacecraft, some one-half hour ago, I suppose, 20 minutes ago, Frank Borman came up on the line and said he would like to dedicate a prayer to the people of St. Christopher's church, his church here in Seabrook and he added to all the people of the world. Here is that prayer.

CAPCOM Apollo 8, Houston. Go ahead, Frank, with your message.

SC Okay. This is to Rod Rose and the people of St. Christopher, actually to people everywhere. Give us, oh God, the vision which can see thy love in the world in spite of human failure. Give us the faith to trust the goodness in spite of our ignorance and weakness. Give us the knowledge that we may continue to pray with understanding hearts, and show us what each one of us can do to set forward the coming of the day of universal peace. Amen.

repeats

CAPCOM Amen.

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET7547, 1038a, 244/1

PAO This is Apollo control, Houston, 75 hours 47 minutes and we are due to acquire just any second. A whole host of stations, Acension, Bermuda, Mila, Grand Bahama and Madrid and well and the Canaries. This is the fourth revolution around the Moon, by a manned spacecraft, our orbit is 60.4 nautical miles by 61.7. We've had no attempted comm yet you can hear a little keying going on the background, but just any moment we should get an establishing call. A period of acquisition this time is estimated at an hour and 11 minutes. Let's see if we can get charge C of a receiving telemetry yet. It is on this pass where - in which Bill Anders will do an extensive four rev tracking task. He will do a vertical stereo photography and in considerable detail to chart all the approaches to several landing sites in near the center line - in the center of 20 degrees - I'm sorry -- on the face of the Moon, front face. And here goes up the first call from Mike Collins, let's see what we can catch. - And we are advised that we are having antenna problems at our prime site, we have handed it to another site, Goldstone, I believe. You will notice, on some of these transmissions, a lot of background noise, that is being done on the smaller powered antennas from the spacecraft around the high gain antenna, the one which transmits the television pictures and other data, the reception is much clearer. Another call has gone out, here is the conversation.

CAPCOM Roger, we have been having a little antenna problem on the ground here, we are reading you now, with a lot of noise in the back ground, how read?

SC Inaudible.

CAPCOM Roger, Frank, we are still trying to get a little bit better com here, stand by.

CAPCOM Apollo 8, this is Houston, over.

SC Yea, I can hear you.

CAPCOM I understand you are reading us loud and clear, we are barely reading you, would you go to 2 in ACCEPT please, we are going to send you a P27 update.

SC Roger. - We are going to accept, Houston.

CAPCOM Apollo 8, Houston, you are not readable. We are going to delay the P27 until we get a little bit better lock on you.

PAO This is Apollo control, Houston, we are having antenna difficulties. We are going to try some more. standby let's continue to monitor.

CAPCOM Going to the LM slot and we would like you as per planned to transfer that to the CSM slot by a VERB 47 ENTER and we would like to just remind you that prior to doing your VERB 47 ENTER manually select POO and wait for the computer activity lights to go out, did you

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET7547, 1038a, 244/2

CAPCOM copy, over?
SC Roger, we copy.
CAPCOM Okay, Frank, are you still reading me
loud and clear, over.
SC Roger, loud and clear.
CAPCOM Okay, I'll go ahead with a map update.
Ready to copy.
SC Hold on a minute.
CAPCOM Apollo 8, this is Houston, how are you
reading now?
SC Go ahead, Houston, this is Apollo 8.
CAPCOM Apollo 8, this is Houston, with a map up-
date coming.
SC Inaudible.
CAPCOM Roger, Apollo 8, Houston, your map update
for rev 425 LOS 765959 770906 prime meridian 77 15 47 AOS
77 45 50 78 22 03, IP 1 position time for control .2 77 29 42,
IP 1 time closest approach for target B1 78 10 25, over.
SC Roger, inaudible.
CAPCOM We will try it again later.
PAO Apollo control here, I want to correct
something I apparently said, Frank Borman dedicated that
prayer to St. Johns Episcopal church, he is a member of
St. Christophers, the confusion is due to the fact that
Jim Lovell is a member of St. Johns, so we have two
Episcopalians going to two different churches. I apologize
the correct name of the church is St. Christopher, we have
the correct town. Now let's get back and monitor. - We will
take the line down due to the noise and recording any thing
back up to you with anything significant. At 76 hours into
the flight, this is Apollo control, Houston.

END OF TAPE

no. OK on
243/1
(but probably
corrected
in the
typing)

Who?

to 257/2
~~working 1/6/74~~

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 760900, CST 11:00a 245/1

PAO Apollo Control here, 76 hours 09 minutes into the flight. In the past few minutes, we've established a much cleaner communication with Apollo 8. Here is a sample.

CAPCOM Apollo 8, this is Houston, over.

CAPCOM Apollo 8, this is Houston, over.

SC Roger, Houston. How do you read?

CAPCOM Reading you a lot better, Bill. How

are you reading me?

SC I'm reading you loud and clear and you

copying our low bit data to record this - these tracking passes. Over.

CAPCOM That is affirmative. We are getting low bit data now.

SC Okay. I've played - run the tape recorder back to the beginning. We have quite a bit of high bit, so all you will have to do is record when you are ready.

CAPCOM Roger, stand by one, Bill.

CAPCOM Apollo 8, Houston. Stand by one on the tape recorder dump. We would like you to look at your steam pressure. We think that the primary evaporator may have dried out and if the steam pressure shows off scale low, would you please close the back pressure valve, and re-service the evaporator? Over.

SC Roger.

CAPCOM Apollo 8, Houston. We are ready to send you the P-27 LM state vector update when you are ready over.

SC You will have to wait until this tracking exercise is over, Mike.

CAPCOM Roger, thank you.

END OF TAPE

Sig will read numbers -

RCS 251/1

LM state 252/1

*tribute to Jack Schmitt 257/1
"play" the music " 257/2*

*Sig
check in C.M. when in LM. And use
part of computer to action C.M. still
vector.*

What's T.E.I.? 246/1

PAD 246/2

←-quit village 246/3

*TV in Moscow and
E. Berlin 247/2*

long dry shell 248/1

Good hi-fi in living room 248/1

Temp. variation 249/1

possible landing sites 250/1, 257/1

PAO Apollo Control Houston here, 76 hours, 24 minutes. Communication much improved now as we move out on the front side of the Moon, here is how it is going.

SC Houston, Apollo 8.

CAPCOM Apollo 8, this is Houston, are you calling?

SC Roger, you can go ahead now and give the computer the updates and let's get going on the pad messages.

CAPCOM Roger.

SC It is in POO and ACCEPT. Okay Houston, are you ready to talk about the water boil problem?

CAPCOM Roger, we copy you in POO and ACCEPT, and we are sending you a P27 lens stake vector. On the water boiler, it looks like to us the evaporator has been reserviced. How does it look to you, over.

SC Roger, I reserviced it, put it to AUTO, H2O flow to AUTO and the steam pressure went to zero again. So, I tried reservicing it the second time for 1 minute and again no results. I'm in the present process of closing the backpressure valve manually, over.

CAPCOM Roger, understand you tried to reservice it twice, both times steam pressure has gone to zero, and now you are closing the back-pressure valve manually.

SC Roger. Each time I have reserviced it, the steam pressure came up to about .07 to .1 but as soon as the steam and water were put to AUTO the steam pressure went right back down again.

CAPCOM Roger, we copy and we are reading you loud and clear now, Bill. On your map update, did you copy that that I gave you previously?

SC Negative, we have not copied it yet.

CAPCOM Okay, I have it for you again when you are ready to copy.

SC Ready to copy.

CAPCOM This is a map update for revs 4/5.

LOS 765959, Sun rise 770906, prime radian 771547, AOS 774550, Sun set 782203, remarks IP1, acquisition time for CP2 is 772942, IP1 time closest approach for target B1, 781025, over.

SC Roger, LOS 765959, Sun rise 770906, 774547, 774550, 782203, IP1, CP2, 772942, IP1 TCA for P1 781025.

CAPCOM That is right and the prime radian time is 771547 and you got your computer back, we've got a good P27 update.

SC Okay, we will go to POO and TRANSFER.

CAPCOM Roger.

SC Houston, do you have a TEI5 for us?

CAPCOM We are working on it now Frank. We will have it for momentarily.

CAPCOM Apollo 8, Houston.

SC Go.

My
we at all stages of flight provide
for S/C crew info. on the burn that should be
made to get back to earth. This would make TEI more
5th orbit.
TEI Trans Earth
impaction?

CAPCOM Roger, on your back-pressure valve, we would like to know how long after you closed the back-pressure valve the first time - how long was it from the time you closed it until the time you started the reserVICing. We would like for you to wait about 15 minutes. That is to prevent any ice from forming due to flash freezing, over.

SC Okay, I started immediately to reservice it.

CAPCOM Apollo 8, Houston. We showed that you closed it this last time about 4 minutes ago, so we would like you to wait another 15 minutes and then try to reservice it again at that time and then go to AUTO, over.

SC Roger.

CAPCOM Roger, thank you. The TEI 4 pad which you have is still valid. We will have a TEI 5 pad for you shortly.

SC Roger. Be advised we are presently in steam pressure MANUAL, and were in H2O flow AUTO, and are now in H2O flow OFF, as of about 5 seconds ago.

CAPCOM Roger, we copy that. We confirm that is a good configuration.

SC Right now, I've got the H2O flow OFF, do we stay that way?

CAPCOM Affirmative. Apollo 8, Houston. On your television update, we propose that you start the TV at the flight plan time of 85 hours, 37 minutes and simply extend the stop time a few minutes. You are currently scheduled to stop at 86 hours and we would like to keep it going until the terminator, which should be approximately 8614, over.

SC Roger.

CAPCOM Frank, I know you are busy up there. We've got the daily news for you when ever and if ever you would like to hear it.

SC We will give you a call.

CAPCOM Apollo 8, this is Houston.

SC Go ahead.

CAPCOM I have the TEI 5 pad for you whenever you are ready to copy.

SC Okay, go ahead.

CAPCOM Okay, TEI 5, SPS/G and N, 45701 minus 043 plus 11607 niner 212603. Are you with me so far?

SC Roger.

CAPCOM Plus 31171 minus 00767 minus 00214180017001, not applicable plus 001883118125 niner 31003. Are you with me, over.

SC Roger.

CAPCOM Roger, 4027113 niner 8033, down 043,

*PAD ?
the form
of info
on it
say by
the means
in h
a)*

CAPCOM left 23 plus 0832 minus 1650012 niner 56362081463 niner 44. North set of stars remain Sirius and Rigel; roll, pitch, and yaw remain same angles 12 niner 155010. Ullage remains 2 quads for 20 seconds, quads B and D. Horizon on 4 degree line at TIG minus 3 minutes, over.

SC Roger, here we go. TEI 5, SPS/G and N 45701 minus 043 plus 116 079212603 plus 31171 minus 00767 minus 00214 180 017 001 NA plus 00188 31181 259 31003 40 2711 398 033 Down 043 left 23 plus 0832 minus 16500 plus 12956 36208 1463944. Set stars are the same. Ullage - we'd like, do you have any objection to using 4 quads for 15 seconds?

CAPCOM No objection to 4 quad ullage ...

SC Okay, we'd like to just go ahead and use 4 quads all times unless we get a lot shorter on fuel than we are now.

CAPCOM Understand.

SC And is that 15 seconds?

CAPCOM Affirmative, 15 seconds, 4 quads.

CAPCOM Apollo 8 -

SC (garbled) horizon is 4 degrees at minus -

CAPCOM That readback is correct, Frank, and we'd like to advise that the voice quality on that high bit rate is excellent. Over.

SC Thank you. Mike, it's 4 quads for 15 seconds. Is that right?

CAPCOM That is affirmative Apollo 8, 4 quads for 15 seconds.

SC Thank you.

PAO This is Apollo Control Houston here with 24 minutes left to run in this period of acquisition. We might make note of our velocity in this revolutions, it is approximately 3560 statute miles per hour, and here goes another call from Mike Collins.

SC Go ahead Houston, Apollo 8.

CAPCOM Roger for Bill. He can go ahead and do a standard reservice on the water now. It's looking good.

SC Okay, you want us to reservice it now?

CAPCOM That's affirmative, and on completion go back to auto.

SC Roger.

PAO During this - Apollo Control here - during this lull we have been looking at the biomedical data and the harness is switched over to Bill Anders. We're looking at a mean heart rate of 68. His high during this particular reporting period is 69, a low of 67. Mean respiration rate 10, activity mode is listed as normal. Cabin pressure 4.9 cabin temperature 79, that's a 2 degree rise from what we saw about an hour or so ago - 77. A little more than 21 minutes

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 762417, CST 11:16A 246/4

PAO
the line open.

before loss of signal. We'll just leave

END OF TAPE

PAO This is Apollo Control Houston. Our time 76 hours and 40 minutes, and I think Mike Collins is about to advise the crew that they have a GO for rev 5. Stand by.

SC Go ahead, Houston.

CAPCOM Roger. We are still dumping your tapes. The voice quality on high bit is coming through superb, and you are GO for next rev and we would like to get a brief status on your rest between 60 hours and LOI 1, just to fill in some information for us.

SC We only got a couple of hours rest.

CAPCOM Okay.

SC We're tired right now, but we will have to wait until TEI before we get back to .

CAPCOM All right, you're right.

SC Okay, Houston. The water boiler has been reserviced, backpressure valve closed for 1 minute, water on for 2, and it's now steam pressure auto, H2O flow auto.

CAPCOM Roger, we copy, Bill.

SC If we have a problem - a similar problem again on the back side in the sunlight, might be a good idea to crank the secondary loop until we have AOS. What do you think about that?

CAPCOM Stand by one, Bill.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger, Jim. In regard to your evaporator, we feel that if you do have a similar problem next time on the back side in the sunlight, check the evaporator outlet temperature, and if it gets above 60, we concur that it would be a good idea to bring up the secondary loop. Over.

SC Roger.

CAPCOM Apollo 8, Houston. When we say bring up the secondary loop, we mean bring up the evaporator only on the secondary loop, copy.

SC Roger.

SC Houston, Apollo 8. We got time for a little news?

CAPCOM Apollo 8, this is Houston, over.

SC I say how about a little bit of that news you promised?

CAPCOM Roger. We got the Interstellar Times here, the December 24 edition. Your TV program was a big success. It was viewed this morning by most of the nations of

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 763904, CST 11:30a 247/2

your neighboring planet, the earth. It was carried live all over Europe, including even Moscow and East Berlin. Also in Japan and all of North and Central America, and parts of South America. We don't know yet how extensive the coverage was in Africa. Are you copying me all right, over?

SC You are loud and clear.

CAPCOM Good. San Diego welcomed home today the Pueblo crew in a big ceremony. They had a pretty rough time of it in the Korean prison. Christmas cease-fire is in effect in Viet Nam, with only sporadic outbreaks of fighting. And if you haven't done your Christmas shopping by now, you better forget it.

SC Thank you.

CAPCOM A couple of Oilers made the All Star team, Webster and Farr.

SC Roger.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET765130, 1152a, 248/1

CAPCOM And that's about all our news, how about your news.

SC well, we're looking forward to a big burn here shortly.

CAPCOM Rog.

SC Mike, I think I can say it without contradiction it's been a mighty long dry spell up here.

CAPCOM I guess you can say anything you like without contradiction.

SC When do we dump water, Houston.

CAPCOM Say again, Frank.

SC When do we dump water.

CAPCOM Stand by. - Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM We will get you the number after a while on your water dump. Looks like the quantity isn't increasing very slightly and we're considering not only the quantity in regard to the dump, but also its effects on the trajectory relative to TEI and so forth, but we will have a good answer for you shortly.

SC We are not just thinking about the waste water tank, we're thinking about some other kind of water that has to get dumped out of the spacecraft. Slightly used water.

CAPCOM Rog. We understand. - Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger, we have about three and a half minutes to LOS, we give you back the DSE for your control and in regard to your water dump, we are tentatively predicting a waste water tank dump at about 80 GET and any other dumps are your discretion, any time you would like to make them.

SC Thank you.

CAPCOM People listening to the high bit rate down here, say it's like sitting in your living room listening to good hi-fi.

SC Sounds like a good idea.

CAPCOM Apollo 8, Houston, coming up on two minutes to LOS, we got a good reserve on the primary evaporator and everything is still looking very good down here.

SC Okay, thank you.

PAO This is Apollo control, Houston, 76 hours 58 minutes the spacecraft will lose lock with Earth in about one minute and start its fifth - actually its sixth trip behind the Moon and it will be the start of its sixth rev and when it gets to zero, Mike Collins has reminded the crew one minute to LOS and Frank says loud and clear, "loud and clear", they will say their good-byes on, you heard nothing much from Bill Anders on this pass and you are not likely

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET765130, 1152a, 248/2

PAO to for several more, he is an extremely busy photography. His column in the flight plan is almost solid with instructions, he is moving from one couch to another, he is using several kinds of cameras, changing lens, and he is as busy as one man - one astronaut could be. Jim Lovell is working down at the G and N station, getting pointing data and the command pilot in addition to flying the spacecraft, having lunch, is been carrying on a running conversation with his compatriot, Mike Collins down here on the Earth. We have lost lock, we should be back with the crew in 44 minutes. This is Apollo control at 77 hours into the flight.

END OF TAPE

PAO This is Apollo Control Houston, 77 hours 32 minutes into the flight. All quiet for approximately 20 minutes. We are due to acquire again in about 13 minutes. One of the more interesting system phenomena, I guess we could call it, to come out of these early revolutions around the moon is the temperature variance we are seeing within the environmental control system. The system is proving capable to the task, but it seeing much wider excursions that it sees in earth orbital flight. I'm talking about temperatures on the variances - excursions, I guess is the proper word, of 40 to 50 degrees within the system. That is not in the cabin, of 40 to 50 degrees, whereas at the same point in earth orbital flight between the light and dark side, might see an excursion on the order of 10 to 15 degrees. Again, the environmental control system is handling the cabin very nicely, it's been purposely set up somewhat than warmer than yesterday and previous days the crew prefers the cabin up in the higher 70's and that is where it has been on consistently today, 77 to 79. but again and again, we hear action on the water boiler as we come around from the dark side into the sun side. This phenomena I'm sure, will be examined at more length at the change of shift briefing, and as the flight progresses. No new conversation report, all is well at 77 hours 34 minutes into the flight.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 7749, 1250^a, 250/1

PAO This is Apollo control, Houston, 77 hours 49 minutes into the flight and just three minutes ago we acquired Apollo 8 as it came around the corner on this fifth revolution around the Moon, here is the conversation as it progresses.

CAPCOM Apollo 8 this is Houston, over.

SC Apollo 8, go ahead.

CAPCOM Roger, read you loud and clear. Welcome back.

SC Roger. Looks like the evaporator - looks like the evaporator is holding okay or at least it is trying to. It dropped the temperature down to about 32 and now it's come back up again and stabilized at about 42 degrees.

CAPCOM Roger, copy, Bill.

SC Roger, Houston, Apollo 8.

CAPCOM Apollo 8, Houston.

SC Roger, Houston, this is Apollo 8, what we are doing - the control point tracking I managed to look for a CP1 at the same time we were trying to do a CP2 on this rev. I picked two marks which are just as small, but more easily recognizable, than the ones that were given to me. I know that I can repeat the process and pick the same small point on the next rev. Now I can try to look for the control points that are written down, but I think that I have better control over the ones that we have.

CAPCOM Roger, Jim understand, we accept that way.

SC Roger, one more point, the control point times which you have given me are a little bit off and I can notice by comparing these maps that these maps are not too well aligned either.

CAPCOM Roger, these two small points that you can repeat the marks on will you be able to identify those precisely on a map, over.

SC That's affirmative, that is why I picked them, they are both - they are both very prominent features and they are both very small craters about the same size as the one we are looking for, but I can pin point them on a map.

CAPCOM Roger.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, over.

SC Roger, one more comment, this is over a lot of controversy of data priority meanings, it looks like 10 degrees pitch up is the best attitude to obtain a rise so that you can follow the land mark down through the scanning telescope. If you pitch down any more full up trudging will not get the horizon and the horizon is a great help in leading yourself into the control plan.

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CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Jim we concur with your use of the two small craters which you can repeatably mark on and find on the map and also if you will give us your new latitudes and longitudes we can compute for you a time of closest approach to those points with the spacecraft 10 degrees pitched up, over.

SC Roger, Houston, CP1 latitude minus 6062 69 longitude over 2 minus 78954 altitude plus 00152; for CP2 latitude minus 09638 longitude over 2 plus 81691 altitude minus 00007. I tried to get these things read at this last pass, but I let it go by to get set up for this first track of the landing site.

CAPCOM Roger, on CP1 would you say again the latitude and on CP2 say again the longitude on the two please.

SC Roger, CP1 latitude minus 06269, that is the latitude and for longitude over 2 for CP2 plus 81691.

CAPCOM Okay, we copied them, thank you.

SC And it appears that the resolve medium is a very good combination to track.

CAPCOM Roger, I understand, resolve medium.

SC And it appears so far, Houston, that no spacecraft motion is required to get 5 marks on the target in plenty of time.

CAPCOM Roger, I understand you require no spacecraft motion to get 5 marks.

PAO And that brings us up to this point, we have had no additional comments now, for a half a minute or so, that is excellent data to have, precisely the kind of data that we had hoped to get. The navigational side of lunar orbit which will be flown by both the command - future command module and LM flights around the Moon. Lovell will continue to - his navigational work and dear old Bill Anders sitting off in one corner there squeezing off pictures that the most professional photographers wouldn't believe. Frank Borman is entering a rest period here, which is to extend of three hours. It is doubtful that he will really go to sleep, but he has been excellent about following flight plan today, he probably needs rest. At 77 hours 57 minutes into the flight this is Apollo control, Houston.

END OF TAPE

PAO Apollo Control in Houston here, 78 hours 19 minutes into the flight. We've had a few sporadic conversations with two very hard working pilots, actually I guess all the conversation has been with one, Jim Lovell, in the last few minutes. Here is a collection of those conversations.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger. I am about 15 minutes early with the TEI fix update and the map update. I will have them here whenever it's convenient for you to copy.

SC Okay, just a minute, Mike.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger. We would like to ask you to stop using auto optics on the pseudo-landing site. It's necessary that we send you up a P-27 to update the RLS values stored in the computer, over.

SC Roger. I found -- list of ... objects, D-1.

CAPCOM Roger, understand.

CAPCOM Apollo 8, Houston, over.

SC Go ahead, Houston.

CAPCOM Roger. If you would go to P00 in ACCEPT please, we are going to send you a P-27 load which will update an RLS value which will be followed by a procedural change, Jim, we will give you later and auto optics should be working shortly.

SC Roger. All right, just use no landmark auto optics instead of the code.

CAPCOM Apollo 8, Houston. We are also sending you a state vector update at the same time.

SC Okay, we will be expecting that.

CAPCOM Apollo 8, Houston. We taking the DSE for a dump. Over.

CAPCOM Apollo 8, Houston, over.

SC Go ahead, Houston.

CAPCOM Roger. We would like to take Bill's DSE for a dump. Over.

SC Roger, go ahead.

CAPCOM Thank you.

PAO And that brings us up to snuff with all the tape of this pass. I think we are going to go back to live action, let's cut up there.

PAO Our orbit this rev 60 - shows a 62 mile apogee and a 60.1 mile perigee, perigee occurring at 10 degrees

south by 101 degrees east and apogee occurring at 10 degrees north by 78 west. Here goes a call.

CAPCOM Apollo 8, Houston. Roger. I have updates, a map update for rev 5/6, and TEI fix update. Which would you like first?

SC Okay, I've got the map update page now, why don't you give me that one.

CAPCOM Okay, map update for rev 5/6. LOS 785849, sunrise 790807, prime meridian 791430, AOS 794436, sunset 802105, IP 1, time of closest approach to target B1 800908. Now your two new control points that Jim gave us, control point number 1, acquisition 791032, control point number 2 acquisition 792314, over.

SC Roger, copy. Ready for the TEI.

CAPCOM Okay, Bill. Before we read the big TEI update here, I'd like to give Jim briefly a procedure for P-22. When he comes to NOUN 89, we request that he do a VERB 34 enter, do not proceed, and by so doing that, he will not incorporate the lat and longitude from his mark and he will not change the reference value of the landing site, and we will solve auto optics problem, over.

SC Let me see if I have this correct, Mike. When flashing 0689 comes up with the latitude and longitude information, I will not proceed but will go to VERB 34 and terminate, is that correct?

CAPCOM Yes, that is affirmative. Do a VERB 34, enter instead of proceed. And that will -

SC All right, is this technique true?

SC Houston, is this technique true for both the node control point auto optics on G-25?

CAPCOM Stand by one, Jim.

SC And the --

CAPCOM That is affirmative, Apollo 8, that is always true.

SC Okay, roger. True for the code auto optics and no landmark. I'll see that it goes on - or I'll use 34 instead procedural

CAPCOM Roger, thank you, Jim and I have the TEI 6 hour, when you are ready, TEI number 6.

SC Go ahead.

SC Ready to copy.

CAPCOM Roger. I'm glad you are ready to copy TEI number 6. I've got one last comment for Jim before you do so. The VERB 89, correction, the NOUN 89 we are talking about is the one that he gets after marking it. There are two NOUN 89's, one prior to marking and one after and our

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procedure references NOUN 89 after marking, over.

SC Roger, understand.

CAPCOM Thank you, and Bill, are you still ready to copy?

SC Ready to copy, Mike.

CAPCOM TEI 6, SPS/G&N, 45701 - 040 + 157. Are you with me so far?

SC Roger.

CAPCOM 081 21 24 43 + 31776 - 00823 - 01365 180
016001 not applicable + 00188. Are you still with me? Over.

SC Roger.

CAPCOM Good. 31816302 31624 40 2699 396033
down 054 left 21 + 0810 - 1650 --

END OF TAPE

CAPCOM plus 0810 minus 1650012 niner 68362221464204.
GDC align remains the same, Sirius and Rigel. Roll 12 niner,
pitch 155, yaw 010, ullage 4 quads for 15 seconds. Horizon
on 6 degree line at TIG minus 3 minutes, over.

SC Roger, Houston, TEI 6 SPS/G and N, 45701
minus 040 plus 157018212443 plus 31776 minus 00823 minus
01365180016001 NA plus 0018831816302316244026 niner, niner.
Are you with me?

CAPCOM Yes, I'm with you.

SC 3 niner 6033, down 054, left 21 plus 0810
minus 1650012 niner 68362221464204. Same GDC align Sirius
and Rigel 12 niner 155010, 4 jet, 15 seconds. Horizon 6 degrees,
TIG minus 3, over.

CAPCOM Roger, Bill. On your ignition time,
GETI is 81 hours, 081 over.

SC Roger, got it, 081.

CAPCOM Thank you sir.

SC Thank you. As a matter of interest, these
side windows are so hazy, that when the sun shines on them,
they just about - they are real poor for any visual observation
or photography heads up.

CAPCOM Roger, understand.

CAPCOM Apollo 8, Houston, over.

SC Go ahead, Houston.

CAPCOM Roger, these last state vector updates
we sent you, Jim, was to the LM slots and you will have to
transfer that over to the CSM slots using (garble) 47 enter, over.

SC Roger, will do.

CAPCOM Thank you.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Roger, Bill has got his tape recorder
back and we noticed that during that last dump, it was all
in low-bit rate and we wondered if that was intentional or
not? Over.

SC Roger, we didn't have much to say, we
couldn't see out of the windows very well, Mike.

CAPCOM Roger, understand. Thank you Bill.

SC It was really too bad.

PAO This is Apollo Control Houston here, and
that is a pretty tired Jim Lovell we're hearing, I take it,
from somebody who has listened to him now for some 18 - 14 and
4 and 3 - 21 days. Here is somemore conversation, I think
he is just about to get a GO for Rev 6.

CAPCOM Roger, Bill. This next time around into
the sunlight, we don't expect problem with the primary
evaporator. If it does start drying out, we think it is best
just to close the back-pressure valve and there is no need
to activate the secondary boiler, over.

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SC Okay, I guess the 60 degree limit will
still hold then.

CAPCOM Standby.

END OF TAPE

CAPCOM Apollo 8, Houston. We are suggesting you disregard the 60 degree limit and let it go ahead and rise up above 60. There is no need to activate the secondary, over.

SC Okay. We just don't want to boil our

....

CAPCOM (laughter) Roger, understand. Apollo 8, you are GO for the next lunar orbit rev.

SC Roger, Houston.

SC Roger, Houston. I'll read the book this time.

CAPCOM All right.

PAO This is Apollo Control here. We are 15 minutes to loss of signal, we will take the line down and bring you any additional comments that may occur between now and loss of signal. This is Apollo Control Houston at 78 hours 43 minutes.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 790000, CST 1:50P 254/1

PAO This is Apollo Control Houston, 79 hours even into the flight of Apollo 8. We have a few straineous comments coming up - as we went over the hill on this fifth rev, and we will play those for you now, right through loss of signal.

CAPCOM Apollo 8, Houston, over.

SC Go ahead.

CAPCOM Roger, we have about 4-1/2 minutes left before we have LOS, and we would like your last PRD readout. Over.

SC Standby. The commander is asleep, we'll get his when he wakes up. The LMP is still pitch, pardon the expression, quite safe onboard. C is 9, C and D is .09.

CAPCOM Roger, copy .64, .09, thank you.

CAPCOM Apollo 8, Houston, about 40 seconds to LOS and everything is looking good down here.

SC Roger, Houston. We will give it another try here.

CAPCOM Roger.

END OF TAPE

PAO This is Apollo control, Houston, 79 hours 46 minutes into the flight. Mike Collins has sent up two calls and has gotten no response, we think we have some key action, but that's all. To date we've, on the basis of earlier revs, we've gotten used to now, turning to our E-com and asking the first question as we come around the corner - how is the evaporator and the answer is this time it is working great. They apparently have the right handle on it. As I mentioned earlier, it is seeing large temperature excursions, apparently no larger than people within the project office and at North American and, I'm sure at the air corporation, had felt they might see. And I know many people in those positions who are very much relieved to see these excursions and all - excursions of only 40 to 50 degrees. It still no answer, no additional calls or anything. Mike Collins tries again. And we might have a ground antenna problem. Checking our ground stations now. In this temperature area the evaporator, of course, isn't the only area seeing the same order of temperature excursions I am looking at a command service module RCS summary here, which shows - prevents temperature readings at four or five points, on various tanks surfaces in the service module and see one valve in the temperature here which is a specific max digit identified point which marries the low and the high over any given rev and they happen to range from 50 degree fahrenheit to 100 degrees fahrenheit, there are four other readings in the service module, which range from 50 to 90 degrees fahrenheit. It's been nearly six minutes now since we acquired and just getting a general back ground noise in orbit. No additional attempts to raise the spacecraft. So based on what E-comm says, we may wait a few minutes before trying additional calls, we will be back up then. It is 79 hours 51 minutes into the flight, this is Apollo control, Houston.

END OF TAPE

PAO Apollo Control Houston here. We are locked up and Jim Lovell is giving us some interesting description of his use of the auto optics in his tracking tasks on the back side of the moon. Here it is.

CAPCOM Apollo 8, this is Houston, over.

SC Houston, Apollo 8, over.

CAPCOM Reading you very weak but - a lot of background noise. Welcome back around. How do you read now?

SC ...

CAPCOM Okay.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston. Go ahead.

SC Roger, Houston. A few words about our optics tracking system. I used auto optics for control points 1 and 2 on the back side and they worked beautifully. Frank pulled the target for me and I went to the control point 3 as designated in our orbital control book, just using the latitude and longitude given to me and used auto optics to track that particular coordinate system but it was very close to the actual tracking spot. I think the mark there where I did my final marking gives us important latitude and longitude. I'm now about to come up on the landing site and using auto optics --

PAO Apollo Control here. In this lull, we perhaps should take advantage at least to point to the people in the news rooms, who may not - have not noticed it yet. Our latest data display on one of our walls, there's the words Merry Christmas Apollo 8. The Merry is in red letters, the Christmas is in white letters, and the Apollo 8 is in blue letters. That display went up about an hour ago. I guess it technically should be called data. The consensus here is of course, that the crew is and remains quite busy and we are going to have some updates in the course of this pass, the sixth rev. Here it is.

SC Go ahead.

CAPCOM Roger. We know you're busy so we are not going to bother you. We are watching your progress on the DSKY. You are looking good, all your systems are looking good and we have maneuver pads for you any time at your convenience.

SC Roger, we will take them when we are doing the P-52, if that's okay.

CAPCOM That is just fine.

PAO And this is Apollo Control Houston at

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80 hours 1 minute into the flight. We apparently are not going to have very much communication at this point. We will come back up when we do. This is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston, 80 hours 15 minutes into the flight. In the last few minutes we recorded some most enthusiastic comments from Jim Lovell on his assignment. Comments from Lovell and from Anders on their tracking assignment during these middle revs around the moon. <Lovell pays astronaut Jack Schmidt, Harrison Schmidt, actually, a PHD in Geology, a great compliment with the work that he and other members of the Lunar Mapping Science Laboratory here in MSC has done.> In picking various Moon marks or land marks leading to the sights we've picked out as probable landing sights for subsequent Lunar missions. Jim, as I say, is most enthusiastic about the cloudy of the ridges and rills that he was given to work with, and Anders chimes in that he thinks it's all great, too, except he wishes the windows were more easily seen through. Here is the conversation we have - that's been going on in the last few minutes.

SC Mike, Apollo 8.

CAPCOM Apollo 8, go ahead.

SC Mike, there are an awful lot of objects down on the landing sight. It's just as formidable Jack Schmidt marked. All of the objects are tracking perfectly on the target, and if you'd like we can get it out beautifully. I have a beautiful view of it. The first I've seen just barely beneath the vertical now, and the second one coming up - just a grand view.

CAPCOM Roger, go ahead, Jim, Jack's listening.

SC Jack, the information - the triangles that we see now are from the first IV, second IV and the C1 are just right, I think, for landing conditions. The shadows aren't too deep for you to get confused, the land has texture to it and enough shadows there should make everything stand out.

SC If Jack's listening, tell him that the optical may be doing all right, but the eyeball is having a little trouble looking through all this smear on the windows.

SC Doing better than the eyeballs, how about the cameras?

SC We have the smme smear to look through. The Rendezvous windows are okay, but there's some (garble) in all directions here so far.

CAPCOM Roger.

SC I think the vertical stereo will be okay.

SC It certainly looks like we picked a more interesting place on the moon to land in. The back side looks like a sand pile my kids have been playing in for a long time. It's all beat up, no definition. Just a lot of bumps and holes.

SC I'm looking 2P2 right now, Houston, and

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*Sig
transcribed
as is as sig.
by number*

SC it's a great spot.
SC The area we're over right now gives some hint possible volcanic though I can't eyeball it at the moment to pin that down. There are some craters and build-ups that just definitely suggest volcanic activity.
CAPCOM Rog. I understand Bill, and I understand Jim thinks the old 2P2 is the winner.
SC Yeah, that's right the (garble).
CAPCOM Roger.
SC That's relatively speaking, of course.
CAPCOM That's right.
CAPCOM Apollo 8, Houston.
SC This is Apollo 8.
CAPCOM Roger, Jim, we have you on the high gain antenna, we'd like to take the DSC and dump it over.
SC Roger. Houston, are you going to use our computer to update our state vector?
CAPCOM That's affirmative, Jim, we'd like to stand by one and I'll tell you when to do it, put it in ACCEPT.
SC Roger. Then, I'll work my (garble) -
SC Roger. Then, I'll work my P52 around here, Houston.
CAPCOM Jim would you please put it in ACCEPT and we'll send you a P-27 and run a state vector update.
SC Roger, will do. ACCEPT.
CAPCOM Thank you.
SC Houston, this is Apollo 8, we have a little piece of useful information if you're interested in deliberating over it.
CAPCOM Go ahead.
SC Roger. Our first control point is very near the terminator, and as the objects we're tracking, I had an occasion to watch the Sun come up, and at about 2 minutes before sunrise you get the limb begins to brighten up into sort of a fine white haze, a faint glow completely over the space just behind the limb.
CAPCOM Roger, Jim -
CAPCOM Rog. I understand. About 2 minutes before the sun comes up, you get a fine white haze radiating out from behind the limb. How far out does it extend?
SC It goes up quite a ways. It takes a fan shape, unlike the sunrise on Earth where the atmosphere affects it. This is just sort of a complete haze all over the local area. It's concentrated at the exact time the sun comes up at ignition and then goes away from the sun spots. Very interesting.
CAPCOM (garble)
CAPCOM Can we go back to block with the computer.

to 273/1

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SC Roger. Roger.

SC Okay, Mike, we're ready for the map update and then the TEI.

CAPCOM Okay, when you get your - before you get your map book out, the Houston Complex has got a little word for an old ex CAPCOM. They say they consider you in NON REMOTE. Over.

SC Not terminating me, I hope.

CAPCOM Okay, your map update. For rev 6 by 7, LOS 805724, sunrise 810657, prime meridian 811302. Are you with me?

SC You cut out after the prime meridian. I got it, but not AOS.

CAPCOM AOS 814305, sunset 821954, remarks IP1 PCA for B1 820739, and now I've got four more times for you which acquisition times for when various things come over the horizon. Over.

SC Roger. Go ahead.

CAPCOM Okay. Control point 1, acquisition time 810905, Control point 2, acquisition time 812148, Control point 3, acquisition time 814317, B1 acquisition time 820354. I'll say it again all those acq times are when they first come over the horizon. Over.

SC Roger. Copy Houston. In about 2 seconds I'll be ready for the TEI.

CAPCOM All right.

SC I'm ready.

CAPCOM CEI 7 SPS rising, G&N - stand by one, Bill.

SC Just a matter of general interest, Houston, everybody is feeling good and the CDR is taking a snooze.

CAPCOM All right, glad to hear it. We were just talking about a water dump down here. We've got one coming up and it looks like that on this rev prior to the time around LOS or just prior to LOS would be a convenient time to do it, do you think so?

SC Okay, we will. Down to 25 percent again?

CAPCOM That's affirmative and we'd also be interested in any comments, about what these various dumps have done to your optics if anything and how long the effects last after a dump.

SC Don't seem to have done anything to any optics, but it definitely got in some of the windows. There are a few little chunks of ice on window number 1, which is nearest the vent, and also on window number 5 a little bit, windows 2 and 4 remain amazingly clear.

CAPCOM Roger. Thank you Bill and I'm ready to resume the PAD when you are.

SC Okay, press all the way.

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CAPCOM All right, weight 45701 minus 040 plus
157 083 18 2080 plus 32346 minus 01168 plus 05730. Are you
with me so far on this?

CAPCOM Apollo 8, Houston, over.

SC Go ahead, Mike.

CAPCOM Rog. I got down through Delta V X, Y, and Z.
Did you copy those? Over.

SC No I didn't read a word. I'm still waiting
for the weight.

CAPCOM Roger. Let's go back to the weight.
45701 minus 040 plus 157. Are you with me? Over.

SC Sounds good.

CAPCOM Okay, GETI 083 18.

END OF TAPE.

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CAPCOM Okay, GETI 083182080 plus 32346 minus 01168 plus 4 correction plus 05730 are you with me, over.

SPACECRAFT Roger

CAPCOM Thank you. 17 niner 00 niner 001 not applicable plus 0018732870 30732676 420880 253033 down 121 left 27 plus 07 niner 0 minus 16500 12 niner 7336238146 44 14 same North set Sirius and Rigel row 12 niner, pitch 155, yaw 010 4 quads for 15 seconds rising on the 2 degree mark at P ignition, over.

SPACECRAFT Roger. GETI 7 SPS/G&N 45701 minus 040 plus 157083182080 plus 32346 minus 01168 plus 05730 17 niner 9 correction 00 niner 001 NA, are you with me.

CAPCOM Yeah, I'm with you, Bill.

SPACECRAFT Plus 00187 32870 307 32676 32 correction 420880 253033 down 121 left 27 plus 07 niner 0 minus 16500 12 niner 73 36238 146 44 14 same North Set Sirius, Rigel 12 niner 155010 4 jet 15 seconds 2 degrees now horizon and peak.

CAPCOM That's all correct.

PAO Apollo Control Houston here 80 hours 36 minutes into the flight and I think we are going to have a little pause here perhaps for another 10 to 15 minutes before we come upon a final conversation then the spacecraft goes over the hill on this 6th rev around the Moon at orbits apogee 62.3 perigee 59.8 velocity 5,338 feet per second. At 80 hours 36 minutes this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control, Houston, at 80 hours 57 minutes. We're - we've just lost signal with the spacecraft. We have several minutes of conversation to play out for you, but before we get to that I want to mention one or two things I don't think we've made mention of the fact today that we have finally after 6 revolutions gotten used to watching the spacecraft go from the right side of your front wall map to the left. Just as it is proceeding around the Moon in a retrograde orbit, this after all these years of watching spacecraft move from the left side of the wall map to the right, it's quite a transformation in just one brief day. Another point regarding the windows, obviously that this has to be the worst system we've turned up with on this flight, and we've been talking to several experts about it here. This particular condition that we're seeing, the fogging on the hatch window and on - to a considerable degree - and on windows one and five is similar to a condition that existed on Spacecraft 101 commonly known as Apollo 7. The situation has within very recent days been if not duplicated very closely approximated in test within the Spacecraft Industrial Government Complex. The test has shown that the material used in the window calking if you will, substance around the window that provides the trough in which the three pane windows ride. It has been demonstrated that some outgassing occurs, that the particular kind of rubbery material being used in these windows joints, that is the window joints in windows 1, 3, and 5. In the rendezvous windows 2 and 4, a different material treated under different conditions is being used and apparently it is quite successful. Some changes will be made on the next spacecraft. And that represents about all the information we have on that particular area. One other announcement, we presently plan no Press Conference this afternoon. I repeat no Press Conference at our change of shift because we really see no new information to offer. You've heard the bulk of the conversation today, and I think it's all been very straight forward. In view of the extraordinarily long hours that many of us have been in the Control Center, we would like to bypass the afternoon Press Conference which would have occurred about 6 o'clock. And continue to observe the activities through the evening hours and top off the evening with a Transearth Injection sometime around midnight, Houston time. So I say again, we presently plan no Press Conference at the change of this shift which will - would have occur about 6 p.m. tonight. We'll continue right ahead with as full a coverage as we can provide you, and will take care of any questions you might want to relay to our News Center. Here now is the tape that finished up the sixth rev.

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CAPCOM Apollo 8, Houston, over.
SC Go ahead Houston.
CAPCOM Roger, you got your DSC back and you are
GO for the next lunar orbit, over.
SC Roger, how far did you want us to dump
that water?
CAPCOM 25 percent, please dump.
SC Roger, 25 percent. Houston, Apollo 8.
CAPCOM Apollo 8, this is Houston, over.
SC Are you receiving our tracking data?
CAPCOM That's affirmative, Jim. We are receiving.
SC Okay, thank you.
CAPCOM And also Jim, we are - that last P27 we
sent was for the LM state vector only, and it will require a
rev 47 enter to transfer to the CSM slot, over.
SC Roger, will do.
CAPCOM Thank you.
SC Okay, we're dumping the waste tank now,
Houston.
CAPCOM Roger, Bill. Apollo 8, Houston, over.
SC Go ahead, Houston.
CAPCOM Roger, we've got four minutes till LOS, and
everything is looking good down here.
SC Roger. How much longer do you think we
have to go into battery charge there Mike.
CAPCOM I'll find out for you.
SC If you can wake up the E com, why don't
you have ask the back room?
CAPCOM Oh, you really know how to hurt a guy.
Apollo 8, Houston, we estimate the charge will be complete in
another 45 minutes, over.
SC Okay, thank you very much.
CAPCOM Apollo 8, Houston, 1 minute til LOS, and
standing by.
SC Okay, see you on the other side, Mike.
CAPCOM Looking forward to it.
SC Me too.

END OF TAPE

PAO Apollo Control Houston here 81 hours 43 minutes. We have not yet acquired nor have we put in a call but since it is about that time we thought we had better come up and let everyone know we are here. We have acquisition now and we are getting telemetry data. And apparently my call is going to wait a few minutes before he initiates the conversation. Here we go with the call. Let's bring it up.

SPACECRAFT Houston, Apollo 8.

CAPCOM Roger, Frank, good morning, you're loud and clear, how about me?

SPACECRAFT Loud and clear.

CAPCOM Welcome back.

SPACECRAFT Thank you

PAO This is Apollo Control. Let's see our cabin temperature, cabin pressure is 4.9. Cabin temperature 77 degrees and we apparently have the biomed switch on none of the pilots at this point. We're getting no data there. Here goes our call.

SPACECRAFT Go ahead, Houston.

CAPCOM Roger, we have a request that Jim space his marks, his 5 marks a bit more slowly if possible we would like to get a couple of them past the zenith. We're getting 5 of them with rather rapid spacing and from the geometry view point it would be better if you'd slow them down a little bit and lengthen them out so as to put a couple of them past the zenith, over.

SPACECRAFT ... Houston, Apollo 8, that last bit of marks are invalid. Disregard what Jim drew the last time.

CAPCOM Roger, understand the last bit of marks are invalid, over.

SPACECRAFT Roger, if you would correlate the last set.

CAPCOM We have an awful lot of background noise, Jim, could you say again please.

SPACECRAFT By just giving up on control voice 3 I tried to stick another control voice in between 2 and 3. It didn't do it so I just marked it down on the program.

CAPCOM All right, understand that you are coming up on 3.

PAO This is Apollo Control Houston. It sounds like another long quiet very much of a working pass. The 81 hours 51 minutes with Frank Borman up as you heard. He'll be very busy flying the spacecraft. Lovell continues doing program 222 Auto Optic Exercises. He has just a solid block one after another to do through this entire rev. Bill Anders is literally sandwiching in an eat period between additional land marks and more photography. Here is more conversation.

CAPCOM of approximately 330 seconds between each mark. The last ones we are copying roughly 15 seconds between marks and we would like to stretch it out even further if that is okay with you.

SPACECRAFT All right.

PAO Ground Elapse Time 82 hours to 83 hours
10 minutes and hour and 10 minutes. Bill Anders will get
a rest, a well deserved one. with all his lunch. At 81 hours
53 minutes this is Apollo Control Houston. We'll be back up
with more action when it occurs.

END OF TAPE

PAO Apollo Control, Houston, 82 hours 13 minutes into the flight. And we are in the midst of one of our quieter passes today. We've had very little conversation. Here is what we've had in the last 10 or 15 minutes.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, over.

SC Roger, Mike. I find that tracking is much easier using the sextant than the scanning telescope. You have finer control and with this medium and resolve the best combination.

CAPCOM Roger, Jim. I copy that it's easier for you to use the sextant than the scanning telescope. It gives you finer control and say again after that. Apollo 8, Houston, do you read?

SC Roger, that you copy.

CAPCOM Roger, I copy that it's - tracking is easier using the sextant than the scanning telescope because it gives you finer control and say again after that, over.

SC It has a combination of resolve and medium is perhaps the best combination of - combination of speed mode is too low, we can't catch up with the target.

CAPCOM Roger, understand that the best combination is resolve and medium. Low is just too low.

SC Roger. Houston, Apollo 8.

CAPCOM Apollo 8, Houston, over.

SC Roger, I'm not too sure what happened that time, Mike. I was marking on the landing sites, using the code, and I kept here in a large trunnion for auto optics. And I could see the target, or landing site was coming up, so I just went manually and marked and get the - the latitude and longitude were quite different from the nominal.

CAPCOM Roger, we copy that Jim.

PAO Apollo Control here. That brings us up to the live action. I can't really tell if this conversation will be extended or not. Mike Collins is doing a lot of note taking. Let's hold on for a minute or two and see. Each revolution around the Moon today, the crew has been given a GO approximately about 20 minutes before loss of signal. Right now we stand 38 minutes from loss of signal on this particular rev. About to pass the navigational updates to the crew. And here it goes.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger, we're checking into Jim's remarks on his P22, and in the mean time I have your maneuver pass and map updates at your convenience, over.

SC Roger. Go ahead with your data, Mike.

CAPCOM Okay, and before that we'd like to take the DSC away from you, please for a while.

SC All yours.

CAPCOM Thank you, and we'd like you to go to P00 in accept. We have a P27 state vector update for you.

SC There's P00, and I'm going to accept.

CAPCOM Thank you.

SC All yours.

CAPCOM Which would you like first, the map update or the TEI8?

SC The map would be fine.

CAPCOM Okay, map update. LOS 82 55 54, sunrise 83 05 49, prime meridian 83 11 38, AOS 83 -

PAO Apollo Control here while Mike is passing this update up, we're looking at biomedical data on Jim Lovell. And his mean heart rate is registering 66; his high heart rate over the recent sample period has been 76; his low is - we'll now we have a new data point here so his low is now 70; his mean rate is 74. He must be moving around a little bit. His respiration rate is up some what 20 to 21 and shows an activity mode as normal. Could be that he just went from the couch down to his G&N station removed in the opposite direction. Cabin pressure 4.9; cabin temp 77 degrees where it's been most of the day. Get back now to the update.

CAPCOM Understand.

SC For the TEI pass.

CAPCOM Roger, the TEI8 pass, SPS, G&N 45701 minus 040 plus 157 085 18 19'er04, are you with me so far, over?

SC Roger.

CAPCOM Okay, plus 3 -

PAO Apollo Control here, the crew now is directly opposite the Earth. They're just west the Sea of Tranquility, just south of the Imbrium Sea, southeast of the big crater Aristarchus, and directly east of the enormous Ocean Procellarum. They're only just a few miles north of a cluster of landing sites which are right along the Lunar Equator. They're about 8 degrees, 8 lunar degrees North of the sites, four of them that we consider prime sites in that central Apollo zone which is boxed in by an area of about 45 degrees west by 45 degrees east and running 5 degrees north and south of the Lunar Equator. And that's the area, of course, that the crew concentrated today on their optics check just as well as they're photographic efforts.

CAPCOM 060 left 42 plus 0773 minus 16500 129 82 36256

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 822400, CST 5:14p, 262/1

CAPCOM 823 6256 146 4618 north set star remains Sirius, Roger, Roll 129 6155, Yaw 010. For quad Elliott 15 seconds, horizon on a 4-degree line at PGS and requesting you zero the optics. Over.

SC Roger. Went to zero optics.

SC Are you through with the computer, now, Mike?

CAPCOM With your computer P-27 on state vector and then verify it.

SC Roger, we're going to put the GS in quad.

CAPCOM Roger, that's fine.

SC Okay, GEIA, SPS G&N 45701 minus 040 plus 157 085 18 1904 quad 3, 3195 minus 01267 plus 04716 179 08 001, NA plus 00187 33552 311 333 55 42 09090 252, Schuba down 060 rev 4.2 plus 0773 minus 16500 12982 3656 14646 18 3 is rising 129 155 010 4 quad 15 seconds horizon 4 degrees

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Roger. Some time back we noted evidence of a restart in the computer and wondered if you had any remarks about it. Over.

SC I know it. Jim got screwed up on one of those programs. He got kind of tired here and we got a restart and a couple of program alarms. I don't know what he did.

CAPCOM Roger, Frank, the main point is the computer is looking fine to us now.

SC That's good.

SC Houston don't believe all you hear up here.

CAPCOM No, we have a filter Jim, for that.

SC Thank you.

CAPCOM Apollo 8, Houston.

SC Go.

CAPCOM Rog. In some of Jim's previous comments about the limb brightness as the sun was about to come up has sparked a lot of interest down here. And we'd like to ask him if he gets a chance to notice again or perhaps he can recall, were there any changes in the appearances of the stars, such as did he notice any twinkling while this was taking place, and did he notice any narrow limb brightening within 10 to 20 seconds prior to the sun's rising. Over.

SC He'll be with you - he's doing a P-52 now.

CAPCOM Okay.

SC Houston, my comments concerning the sunrise was the comment above the terrain. There appeared what might be called diagonal light or light to the haze or something like that. As the sun came above or before the sun came

SC above the limb, Definite rays can be seen coming from the other side. It was a uniform haze apparently from the center spot where the sun was going to rise. And this was something which I couldn't explain.

CAPCOM Roger, Jim. I believe we copied that and just curious, and if you see it again and if you notice any stars twinkling or any additional information.

SC Will do. Won't have a chance until 20.1.

SC Naturally he doesn't want to pass out too much of that information. He wants to save it and write a paper when he gets back, Mike.

CAPCOM Right then. In German probably, huh.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston.

SC Okay, what time is that TV, Mike, 85 by

37?

CAPCOM 85 37 to terminator, which is probably like 86 14.

SC Okay. Well, I don't know if we can go that long with it and I'm going to scrub all the other experiments that converts into stereo or other photography and we are a little bit tired, I want to use that last bit to really make sure we're right for TEI.

CAPCOM Roger. I understand, Frank.

CAPCOM A couple of miscellaneous items for you. We'd like for you to discontinue charging Battery B at this time. We'd also like to get a cryo stir 2 minutes on all four, and your up telemetry IU switch, put to block please and you are go for the next Lunar orbit.

SC Thank you.

CAPCOM Rog.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, go ahead Frank.

SC Rog. I want to scrub these control point sightings on this next rev, so we can let Jim take a rest.

CAPCOM Rog. I understand.

CAPCOM I understand you want to scrub control points 1, 2, and 3 on the next rev and the converging stereo on the following rev.

SC That's right. We're getting too tired.

CAPCOM Okay, Frank.

END OF TAPE.

APOLLO 8 MISSION COMMENTARY, 12/24/68, CST: 5:10 pm 263/1

CAPCOM Take 41845 remarks control point 1 acquisition 83073 niner. Control point 2 acquisition 832021. Control point acq. 834151. B1 acquisition 840228, over.

SPACECRAFT Roger. A2 5554 A3 0549 A3 1138 834143 841845. CP1 830739, CP2 832021, CP3 834151, B1 840228

CAPCOM That is affirmative.

END OF TAPE

CAPCOM Apollo 8, Houston.

SPACECRAFT Go ahead.

CAPCOM This rev coming up we would like to clarify whether you intend to scrub Control Point 1, 2, and 3 only and do the psuedo landing site or whether you also intend to scrub the psuedo landing site mark, over.

SPACECRAFT We're scrubbing everything. I'll stay up and try and keep the spacecraft vertical and take some automatic pictures but I want Jim and Bill to get some rest.

CAPCOM Roger, I understand.

PAO This is Apollo Control Houston. You heard the last transmission from Frank Borman wherein he indicated that he planned a drastic reduction in activities in the next 4 revs. We've been noting and suggested earlier we had a tired crew. Certainly indicated in Lovell's voice. We heard very little crack from Bill Anders who is presently in a sleep period. It just could be that that will wind up our activities in lunar orbit. There is a conference going on now around the Flight Director's console and it will be from that the ground will make up its mind on what if anything is needed or if anything we might suggest to Borman and that will be the subject of a further conference if anything more was needed. Sounded to me like Frank was very definite that he wanted to wrap it up at this point and certainly let Lovell get some rest before transearth injection burn. The transearth injection burn is planned for 89 hours 15 minutes. The major question in our minds on this particular console is whether the spouting off of activities will include the television transmission on the 9th rev. We don't have the answer to this yet. We should have the answer shortly. At 82 hours 46 minutes into the flight this is Apollo Control Houston.

END OF TAPE

GST 92:58:00

APOLLO 8 MISSION COMMENTARY, 12/24/68, CST: 5:48 pm

265/1

PAO Apollo Control Houston here 82 hours 56 minutes into the flight. We have just lost signal with the spacecraft and I believe you heard earlier Frank Borman declare that he had a tired crew. Jim Lovell was very tired you could tell it from his voice as the afternoon wore on. He said he was relieving him of all further flight plan responsibilities 5 minutes after he said that he came back on the line and said Lovell is snoring already. Here is the last few conversational items with the crew before they went over the hill. Let's have the tape.

CAPCOM Apollo 8 Houston 4 minutes to LOS you have control of the DSE now and all your systems are looking good.

SPACECRAFT Thank you very much, Mike.

CAPCOM You bet.

SPACECRAFT Lovell is snoring already.

CAPCOM Yeah, we can hear him down here.

CAPCOM Apollo 8 Houston.

SPACECRAFT Go ahead.

CAPCOM We have 1 minute to LOS, Frank, you can terminate stirring up your cryos any time and we agree with all your flight plan changes. Have a beautiful backside and we will see you next time out.

SPACECRAFT Thank you.

PAO This is Apollo Control Houston here. You heard Borman and since that camera station the project manager George Low has come over to our console and he said that he urged me to make it very clear that Apollo Spacecraft Program Office is altogether happy with the data they have gotten today and they feel like they have gotten as nearly 100 percent of the data as they could possibly get. He is quite pleased with it and he is ready to give the crew a well earned little extra bonus rest. According to the last information we have from the Flight Director, Cliff Charlesworth and from the incoming Flight Director, we are going through a change of shifts here, we will still have the television pass as scheduled at about 8:25 or 8:27 in Houston time to last approximately 45 minutes. We'll refine more as we get to it. Let me check my log here. We show it scheduled for 85 hours 37 minutes delineated earlier in the day. It used to run to 86 hours 14 minutes. That's elapse time and this is Apollo Control Houston at 82 hours 59 minutes.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 831100, CST 6:02 266/1

PAO This is Apollo Control at 83 hours 11 minutes
At the present time Apollo 8 is nearing the end of it's seventh
revolution. We've had loss of signal now for about 16 minutes.
Our displays here in Mission Control Center show that we should
reacquire the spacecraft again in about 30 minutes. At the
present time here in Mission Control Center, Flight Director
Milton Windler is in the process of relieving Clifford Charlesworth,
and our Capsule Communicator will be Ken Mattingly replacing
Mike Collins in that position. Windler at present is going
over the status of the spacecraft and the mission with his
team of flight controllers. And as I said we will be reacquiring
the spacecraft again in about 30 minutes. At the present time
all systems aboard the spacecraft look good, and as you heard
in previous conversation shortly before we had loss of signal,
Lovell is sleeping at the present time, and the crew is modifying
the flight plan to allow both Lovell and Anders to get some
sleep or rest at least before the Transearth Injection Maneuver
scheduled to occur at 89 hours 15 minutes into the flight.
At 83 hours 12 minutes this is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 834100, CST 6:32 267/1

PAO This is Apollo Control, Houston, at 83 hours 41 minutes into the mission. We're standing by at this time to reacquire the spacecraft as it comes over the Lunar horizon on it's eightth revolution. Here in Mission Control Center, Flight Director Milton Windler and his team of flight controllers are becoming busily involved in becoming prepared for the Transearth Injection burn scheduled to occur at 89 hours 15 minutes. Particularly the flight dynamics people down in the front of the Control Center. They are of course the gentlemen who will be coming up with the information needed by the crew for the maneuver, and they are very heavily involved in that at the present time. We'll stand by for Capsule Communicator Ken Mattingly to put in a call to the crew as we reacquire at the signal now at about 1 or 2 seconds.

SC Houston, Apollo 8,
CAPCOM Apollo 8, loud and clear.

SC Roger.

PAO This is Apollo Control. During this pass on the eighth revolution across the front side of the Moon, we expect to begin passing up some information to the crew relevant to that Transearth Injection maneuver. We do anticipate that both Lovell and Anders will be resting at this time, shortly before we lost to the spacecraft - lost signal from the spacecraft. On the previous revolution, Borman advised us that Lovell was sleeping, and he said that he had removed a number of items from the flight plan in order that both Jim Lovel and Bill Anders would be able to get some rest before this Transearth Injection maneuver. We'll continue to monitor here and anticipate that we will be having some conversation with Borman shortly.

END OF TAPE

SEP 1968

PAO This is Apollo Control at 83 hours 54 minutes. We just put in a call to the spacecraft. Conversation with them at this time and we will pick that up for you at this time.

SPACECRAFT ...

CAPCOM All right Apollo 8. Couple of notes for you. On the P52 you are coming up to on this rev. We've looked at your state vectors and all your information. The platform looks good and feel it is your op if you would like to bypass this P52 your platform will still be good at the following PEI pass and we would like to have your PRD reading and I guess we are behind the sleep summary, over.

SPACECRAFT ... about 3 hours or 4 hours today.

CAPCOM Roger.

SPACECRAFT PRD ... 144.

CAPCOM Copy 144 and we have dump tape ready to go into your computer for the state vector if you want to go to P00 and accept.

SPACECRAFT We'll accept.

CAPCOM Thank you.

PAO This is Houston. We're continuing to stand by here for further conversation. At the present time the Spacecraft is transmitting back to us with their omni antennas and there will be about 12 or 13 minutes before we bring on the high gain at that point we would expect that the noise level would drop off somewhat. We are also here in Mission Control going ahead with the TV circuits. Calling up those circuits and maintaining on the assumption that we will have TV transmission at the scheduled time and that is 85 hours 40 minutes ground elapsed time at the beginning we have not had confirmation of that from the crew and as you heard earlier, Borman indicated that he would be deleting some items from the flight plan. However, the feeling at the present time here in the mission control center is that the television transmission will occur on schedule unless we are advised otherwise by the crew. We'll continue to monitor here for a short while. If we don't pick up some conversation, we'll take the circuit down and pick up again when we are in contact with the crew.

SPACECRAFT ... PEI 9 Pad..

CAPCOM Okay, Apollo 8, we have completed with the computer. You can use the vert 47 to transfer and I have the PEI 9 pad.

SPACECRAFT That's ... isn't it. Just a minute and I'll take care of it.

CAPCOM Roger

SPACECRAFT Okay, I went to P00 and then vert 47 and I'm ready to copy.

CAPCOM Okay, do you have it in Block?

SPACECRAFT Say again.

CAPCOM I say, do you have the up telemetry in Block?

SPACECRAFT Roger

CAPCOM Okay. This Pad is a PEI 9 SPS G&N 455
niner 7 minus 040 plus 157 087 1 niner 1820 plus 34188 minus
013 53 plus 00780 180 008 001 November Alfa plus 00187 34223
313 34021 4208 niner 8253 033 down 131 left 28 plus 0758
minus 165 00 12 niner 87 362 77 14648 16 Primary Sirius.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 840400, CST 6:55 269/1

CAPCOM 16, primary star Sirius, secondary Rigel, 129 155 010 4 quads 15 seconds ullage, horizons on 1.2 degree window line at T minus 3, use high speed procedure with minus Mike-Alfa. After looking at the burn information from your previous SPS burns, it appears that the engine performance should give us a 3. second burn time, longer than what you have on the pad. The pad number should correspond with what you get out of the computer. So we have not factored this into the past data, however you can anticipate the engine for a normal DELTA-V to give you a 3. second - 3.7 second burn in excess of the computed time, over.

SC Roger, thank you. TEI 9 SPS G&N 45597 minus 040 plus 157 087 19 1820 plus 34188 minus 01353 plus 00780 18008 001 NA plus 00187 34223 313 34021 42 0898 253 033 down 131 left 28 plus 0758 minus 16500 12987 plus, or 36277 1464816 and that's Sirius and Rigel 129155010 4 quads 15 seconds, 1.2 degree on the window at T minus 3, high speed minus MA engine 3.7 seconds longer than the other.

CAPCOM That's affirmative, Apollo 8. And when you get around to it, if you would like for us to dump your tape we can do that when you get on high-gain.

SC Roger. Okay, should have it on the high gain now, Houston.

CAPCOM Roger, and we're going to go ahead and dump the tape.

SC Roger. Ken, will we get the real TEI pad the next time around now?

CAPCOM Apollo 8, we'll have one for you the next time around, and we'll update it if necessary on the following rev.

SC Okay.

PAO At present time the spacecraft is crossing over the Sea of Tranquility, and it's approaching the terminator the point at which it will go into darkness, actually not total darkness. That would be the area of the Moon that would be lighted by Earth shine, and from previous reports - stand by we have a call from the crew.

SC Do you have any idea why quad B seems so much lower in quantity than the other three quads?

CAPCOM Stand by.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 841400, CST 7:05p, 270/1

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Okay. It looks to us like, although we're reading out the same thing you are on the quad quantity, using the computer program and all of the correction factors that are in there, it looks like all four of your quads are very close. In pounds, it looks like you have, for example, 193 pounds in quad A and 189 in B, 200 in C and 190 in Delta and the difference that you read on the gage is attributed to the fact that you don't have all of the correction factors in there. This ground calculations has an accuracy of about plus or minus 6 percent and the best you can do onboard - even using your chart as plus or minus 10 percent. Over.

SC Thank you.

PAO This is Apollo Control at 84 hours 18 minutes. At this point, we have passed all of the information that Flight Director, Milton Windler, wanted to get to the crew on this pass on the 8th revolution and we anticipate that any further conversation with the spacecraft before we lose signal in about 36 minutes, will be initiated by the crew. We'll continue to monitor and pick up the conversation as it develops. At the present time, it appears that Frank Borman is the active crewman. Lovell and Anders, we expect, are getting some rest at this time in preparation for the busy schedule they're going to have during the Trans-earth injection maneuver.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 842600, CST 7:17p, 271/1

PAO This is Apollo Control, Houston. We've had one very brief conversation with the crew since our previous report, and we'll pick that up and come up live with conversation that is developing at this time.

CAPCOM Apollo 8, Houston, the tape recorder is back to you.

SC Thank you.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Okay, we've just finished looking at all your systems and all the trajectory information and you have the go for another rev.

SC I understand we're go for rev 9.

CAPCOM That's affirmative, 8.

SC How's the weather down there, Ken?

CAPCOM It's really beautiful. Loud and clear and just right - the temperature.

SC How about the recovery area?

CAPCOM That's looking real good.

SC Very good.

CAPCOM Yeah. They told us that there is a beautiful moon out there.

SC Now we were just saying that there's a beautiful Earth out there.

CAPCOM It depends on your point of view.

SC Yeah.

CAPCOM If you're looking for things to do up there, Frank, you might look and switch that biomed switch over to the left position.

SC Okay.

SC Are you ready?

CAPCOM All set.

SC 543 - Say it again.

CAPCOM We've got the computer waiting.

SC Ken are you ready - 5 4 3 2 1 mark.

PAO Based on that count from Frank Borman aboard the spacecraft, we've concluded here in Mission Control, we have about a 3-second delay from the time the signal is sent until we receive it here.

SC Houston, Apollo 8.

CAPCOM I'm reading you weak, but clear, Frank.

SC How about this (garble) here, is that any better?

CAPCOM It's a little louder.

PAO This is Apollo Control. At the present time, we seem to be getting a fair amount of noise on the circuit. We'll stand by to pick up conversations again should they develop and take the circuit down at this time.

END OF TAPE.

*To be included (A to G)
Tape 57 page 2*

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 844700, CST 7:38 272/1

PAO This is Apollo Control, Houston, at 84 hours 47 minutes into the flight. We've just reviewed with Frank Borman the procedures and plans we have for our television pass coming up on the next revolution, and we'll play back that conversation for you and then continue to follow for any live communications with the spacecraft.

SC Ken, how did you fellows pull duty on Christmas Eve, it happens every time doesn't it.

CAPCOM I wouldn't be anywhere else tonight.

SC Roger. Just finished tracking on this lunar orbit right now.

CAPCOM Okay, Frank, it's looking like it's coming right down the pike, it's doing just what it is supposed to and apparently all our computer programs have got the right numbers in them because they're predicting where you're going.

SC Have they copied any of these anomalies due to high spots?

CAPCOM Roger, detectable but they're not changing things enough to see anything more of interest.

SC Fine, hope they are as good with the starter as they were with the LOI, that was beautiful.

CAPCOM It sure was, that's a text book all the way. Apollo 8, Houston.

SC Go ahead.

CAPCOM Okay, we're about 10 minutes till LOS. We'll be picking you up again at 85 40, and we'll have all of the TV pass information standing by. In the event that the situation develops again for pointing accuracies, if anything that looks like a terminator or anything of that nature, I'm going to call the dark side of it 12 o'clock and use that as a reference system. And we'll try that. If that doesn't dope out any problems with camera pointing, why I may try - call for a plus pitch and then I'll just correct what I see to account for it.

SC Roger, we're not going to use the telephoto lens. I don't believe we'll be able to get a picture of the Earth. It's going to have to be the terminator, the lunar surface. I'm looking at the Earth right now; we won't see it again during that period.

CAPCOM Okay, real fine then. And next time around why we'll take an extra special look at all of the parameters; we'll have our TEI pad for you. And we'll use the last rev for a real good check on all systems. I'll give you a run down by system of all things we see, and where they stand.

SC Okay, fine.

CAPCOM Apollo 8, Houston. We're approaching 4 minutes till LOS. All systems are GO.

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 844700, CST 7:38 272/2

PAO Part of the transmission on that last conversation was a little bit difficult to copy. We were able to copy Borman saying that he would not be able to get pictures of the Earth on this TV pass coming up on our next revolution. And he indicated that he did not plan to attempt to use the telephoto lens. The estimation here in Mission Control Center is that he will not be in a proper attitude to get a shot out the window of Earth, and therefore would not be using the telephoto lens. We're now 2 minutes 35 seconds away from loss of signal from spacecraft. We'll reacquire again about 46 minutes after we lose contact. At 84 hours 52 minutes into the flight, this is Apollo Control.

END OF TAPE

PAO This is Apollo Control Houston 85 hours 21 minutes into the flight. A little more than 20 minutes since we have been in touch with Apollo 8. We should reacquire in about 18 minutes. To recap a bit the crew was given a few hours extra rest, particular Jim Lovell. On the 7th rev Bill Anders, we presume is also getting some nap time prior to the transearth burn a little later tonight. One or two things might be pointed up from today's revolutions around the earth, we have noted the temperature excursions that have occurred. They weren't entirely unpredicted but the variance interested people here on the console. Excursions over a 50 degree range. Another point that is proving interesting here with the passage of each rev is the fact that our apogee tends to grow ever so slightly and our perigee tends to shrink. This has not been the experience in earth orbital flight. The apogee tends to shrink ever so slightly and the perigee usually remains stable coming down somewhat but in the earth orbital experience is explained by the ever so slight amount of drag exercised on the spacecraft at perigee which tends to cool down the apogee to slow the spacecraft somewhat at perigee and the effect of it comes in at the high point of the orbit then tends to drop it down somewhat. Somewhat the opposite effect seems to be taking place in these revolutions around the Moon. We have plots here on the first rev of 60.5 miles for apogee versus 60.9 perigee. The next rev 60.4 apogee versus 61.7 perigee and a 62 versus 60.1 and a 62.3 apogee versus a 59.8 and the curve continues in that way. It is slight but it is interesting and it does not conform to the earth orbiting experience. Again another reason for wanting to fly this navigational-operational Apollo 8 mission. At 85 hours 24 minutes into the flight this is Apollo Control in Houston.

END OF TAPE

277-74

Ames prayer 277/1

(Hard to distinguish between Anders & Borman voices)

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 853900, CST 8:31p, 274/1

PAO Apollo Control, Houston, here. 85 hours 39 minutes and we're very nearly at the acquisition point. Only 10 seconds away. And we should, if we're on plan, move right into a television transmission. The time of 85 hours 45 minutes has been passed to the crew. The prime sight for this picture will be the Goldstone Station from California. We're getting telemetry now via Honeysuckle Creek the dish in Australia. No word yet on Goldstone. Getting a carrier nice, now it should be indicative of transmission coming.

to 290/1

PAO There are still no calls. We are a minute and a half into acquisition. The capsule communicator has been advised to pass to the crew, when we acquire, that all of the systems look good. Ten minutes now since we did acquire the spacecraft. Rather noisy data. The data of the 9th revolution around the moon, we are doing an apogee of 63 miles of a perigee of 58.9 miles, velocity 5352 feet per second. We've got a picture here, but - we've got a voice to go with it. Bill Anders.

SC How does the picture look, Houston.
CAPCOM Loud and clear.
SC Does everything look okay?
CAPCOM Rog. Very good.
SC Welcome to the moon, Houston.
CAPCOM Thank you.
CAPCOM We're theorizing here that that bright spot in the top left side of your picture is the earth. That's not very clear.

see A to G type 57 p. 4

SC Take a look at the Lunar horizon. We're going to follow a track or to a terminator where we will turn the spacecraft and give you a view of the long shadowed terrain at the terminator which should come in quite well in the TV.

CAPCOM Roger.
SC We don't know whether you can see it from the TV screen, but the road is nothing but a Milky Way. Completely void. We're changing the cameras to the other window now.

SC This is Apollo 8 coming to you live from the moon. We've had to switch the TV cameras now. We showed you first a view of Earth as we've been watching it for the past 16 hours. Now we're switching so that we can show you the moon that we've been flying over at 60 miles altitude for the last 16 hours. Bill Anders, Jim Lovell, and myself have spent the day before Christmas up here doing experiments, taking pictures, and firing our spacecraft engines to maneuver around. What we will do now is follow the trail that we've been following all day and take you on through to the Lunar sunset. The moon is a different thing to each one of us. I think that each one of us - each one carries his own impression

*use 13,000 w/ procedure at TEL 284/1
Winkler was paper controller 289/1
"Thomas a South Class" 280/1*

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 853900, CST 8:31p, 274/2

SC of what he's seen today. I know my own impression is that it's a vast, lonely forbidding type existence, great expanse of nothing, that looks rather like clouds and clouds of pumice stone, and it certainly would not appear to be a very inviting place to live or work. Jim what have you thought most about.

SC Well, Frank, my thoughts are very similar. The vast loneliness up here of the moon is awe inspiring and it makes you realize just what you have back there on Earth. The Earth from here is a grand ovation to the big vastness of space.

SC Bill, what do you think?

SC I think the thing that impressed me the most was the Lunar's sunrises and sunsets. These in particular bring out the stark nature of the terrain and the long shadows really bring out the relief that is here and hard to see and is very bright -

END OF TAPE.

SC It is here, and hard to see, at this very bright surface that we're going over right now. Now describe, that's not color, Bill, describe some of the physical features of what you're showing.

CAPCOM Apollo 8, Houston, we're not receiving a picture now, over.

SC We're now coming on to Smyth's Sea, a small mare region covered with a dark level material. There is a fresh bright impact crater region on the edge towards us and a mountain range on the other side. These mountains are the Pyrenees.

CAPCOM Apollo 8, we're not receiving modulation on the signal; we do have sound.

SC Are you reading us Apollo, Houston.

CAPCOM Apollo 8, we're reading you loud and clear, but no picture. We ~~have no modulation.~~ *do have sync*

SC Roger, we understand. Take a look now. How about now, Apollo.

CAPCOM Loud and clear. Good picture.

SC *Lowell* - What you're seeing has been crossed by sea of the Craters Castner and Gilbert, and what we've noticed especially that you cannot see from the Earth are the small bright impact craters that dominate the lunar surface. *unders* The horizon here is very, very stark. The sky is pitch black in the Earth or the Moon rather, excuse me, is quite light. And the contrast between the sky and the Moon is a vivid dark line. Coming into the view of the camera now are some interesting old-double ring craters. Some interesting features, they are quite common in the mare region and have been filled by some material. The same consistency of the other maria and the same color. There are three or four of these interesting features. Further on the horizon you see the Messier. The mountains coming up now are heavily impacted with numerous craters whose central peaks you can see and many of the larger ones. Actually I think the best way to describe this area is a vastness of black and white, absolutely no color. The sky up here is also rather forbidding, foreboding extents of blackness with no stars visible when we're flying over the Moon in daylight. You can see by the numerous craters that this planet has been bombarded through the eons with numerous small asteroids and meteoroids pock marking the surface every square inch. And one of the amazing features of the surface is the roundness that most of the craters - seems that most of them have a round mound type of appearance instead of sharp, jagged rocks. All, only the newest of features have any sharp definitions to them, and eventually they get eroded down by the constant

*Turn 57
p. 6*

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 854600, CST 8:38 275/2

bombardment of small meteoroids. How is the picture now, Houston?
Houston, are you reading us?

CAPCOM Loud and clear, and the picture looks real fine.

SC Can you see the two large craters just to the right of our track, Houston?

CAPCOM That's affirmative.

SC The very bright features you see are the new impact craters, and the longer a crater has been on the surface of the Moon why the more mottled and subdued it becomes. Some of the -

CAPCOM Apollo 8, we've apparently lost your voice. The picture is still good.

SC Roger. Houston, we're passing over an area that's just east of the Smyth's Sea now in checking our charts. Smyth's Sea is coming up in a few minutes.

CAPCOM Roger. Apollo 8, if you go to POO in accept, we'll uplink some information.

SC We are now coming up towards the terminator, and I hope soon that we'll be able to show you the varying contrast of white as we go into the darkness. Houston, we're POO and you have the computer.

CAPCOM Thank you.

SC We're now approaching a series of small impact craters. There is a dark area between us and them which could possibly be a lava flow. You can see the large mountains on the horizon now ahead of the spacecraft to the north of our track.

PAO We estimated about 325 miles to the horizon just to help your reference.

SC The intensity of the sun's reflection in this area makes it difficult for us to distinguish the features we see on the surface and I suppose even harder on the television. But as we approach the terminator and the shadows become longer you'll see a marked change.

END OF TAPE

correct
 SPACECRAFT There is a very dark crater in the filling material that is narrowly in front of us now. It is rather unusual in that it is sharply defined yet it is dark all over its interior walls whereas most new looking craters are of very bright interior. Small impact crater in front of us now in a little ray well defined quite new and another one approaching. The spacecraft is facing North from our track we are going sideways to our left. You are now seeing the Sea of Crises coming over the horizon. We believe the Crater, the large dark crater between the spacecraft and the Sea of Crises is a condorcet crater. The Sea of Crises is amazingly smooth as far as the horizon and pass this rather rough mountainous region in front of the spacecraft.

CAPCOM Apollo 8, we are through with the computer you can go back to Block and it looks like we are getting a lot of reflection off your window now.

SPACECRAFT We'll switch windows. How is that now, Ken?

Nothing
 CAPCOM That is real fine.

CAPCOM Apollo 8 can you tell us which window you are looking out there. There is a large crater looks like it is sticking up in the upper right hand corner of our picture Can you identify that one?

SPACECRAFT Rog, you were just about to loose our lock that is why we are slowing up. We see the Sea of Crises in front of us now. You are looking out the left hand rendezvous window. Houston are you reading us now.

CAPCOM Loud and Clear.

SPACECRAFT The crater you see on the horizon is the Sea of Crises. Are you reading us, Houston?

CAPCOM Loud and clear Apollo 8 and we have a picture that is good.

SPACECRAFT Roger. We are getting a lot of static. The Sea of Crises is in front of us on the horizon and the dark crater Picard can be seen in the middle. We are now ~~breaking the Moon's sun rise or the spacecraft's sunset.~~ This is an area that the sun has just recently come up on the moon. Mare we are over now has a mottled look about it but is not very heavily cratered so it must be relatively new. This is the Sea of Fertility and we're coming upon a large crater the delta rim variety. Has a strange circular cracks patterned around the middle of it. The crater that you see now is about 30 or 40 miles across. How is your picture quality, Houston?

CAPCOM This is phenomenal.

SPACECRAFT There is an interesting rill directly in front of the spacecraft now running along the edge of a small mountain. Rather sinuous shape with right angle turns. This area just to the west of the Sea of Crises is called the Marsh of Sleep and to the west of that the Sea of Tranquility. Can you see the fracture pattern going across the mare in front of us now, Houston?

...

*Frame 58
 P. 1
 58/2*

OK

CAPCOM That doesn't quite stand out.
SPACECRAFT Roger. The series of cracks or faults across the middle of the Mare they drop down in about 3 steps to the South. The parallel faults pattern to the North and drop down in the center. I hope all of you back down on earth can see what we mean when we say that it is a very forboding horizon, a very rather dark and unappetizing looking place. We are now going over approaching one of our future landing sites selected in this Moon region called the Sea of Tranquility smooth in order to make it easy for the initial landing attempts in order to preclude the having to dodge mountains. Now you can see the long shadows of the lunar sunrise. We are now approaching the lunar sunrise and for all the people back on earth the crew of apollo 8 has a message that we would like to send to you.

END OF TAPE

ANDERS In the beginning, God created the Heaven and the Earth. And the Earth was without form and void and darkness was upon the face of the deep. And the spirit of God moved upon the face of the waters and God said, let there be light. And there was light. And God saw the light and that it was good and God divided the light from the darkness.

LOVELL And God called the light day, and the darkness he called night. And the evening and the morning were the first day. And God said, let there be a firmament in the midst of the waters. And let it divide the waters from the waters. And God made the firmament. And divided the waters which were above the firmament. And it was so. And God called the firmament Heaven. And evening and morning were the second day.

BORMAN And God said let the waters under the Heaven be gathered together in one place. And the dry land appear. And it was so. And God called the dry land Earth. And the gathering together of the waters called He seas. And God saw that it was good. And from the crew of Apollo 8, we pause with good night, good luck, a Merry Christmas and God bless all of you - all of you on the good Earth.

PAO This is Apollo Control Houston. The speakers in the order that they read from what we believe to be chapters from Genesis, were Bill Anders and Jim Lovell and close out with Frank Borman. That's both Biblical and a geological lesson that none of us will for get. At 86 hours and 9 minutes into the flight, this is Apollo Control Houston.

END OF TAPE

12/26/68
see
frank
says "his
was
the
end
in
bram)

for

7
Luther

circled text: "and
was to"

"believe to be"
- Paul Honey

which were under
the firmament from
the waters

↑
connections from
frank's Bible
study
Houston
5 Jan 68

See Take 58, p. 4
(So CC did make
a "good show" comment)

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 861800, CST 9:09p 278/1

PAO This is Apollo Control Houston at 86 hours 18 minutes into the flight. Just a word or two on where the crew is looking. They are - they particularly they identified the tracking extremely well as they moved along. But some of the areas were not so well identified because of the reading which concluded their pass. The reading came while they were moving across Tranquility in a generally westerly direction. The look angle is to the northwest and to a series of mountains, rimming the northwest edge of the Sea of Tranquility. Earlier we, you recall, pointed out the Sea of Crises, concluding that the Picard Craters. And immediately after we lost the picture lock, we went back to work with this update on - with this tape.

CC said "Thank you for a real good show"

SC Well, Ken. We would like to get all squared away for TEI here. Can you give us some good words like you promised?

CAP COM Yes, sir. I have a maneuver PAD. I think we would like to start by dumping the tapes. If we can have that, I have your TEI 10 maneuver PAD and then we will run through a systems briefing.

Lines were omitted

SC I understand this is a maneuver PAD that we will use for TEI. Is that correct? And you got the tape Houston.

CAP COM Thank you.

SC Ready to copy, Ken.

CAP COM Roger. TEI 10. SPS G&N 45597 minus 040 plus 157089191564 plus 35189 minus 01513 minus 00346 180007000 November Alpha plus 001863522331835019420928253 boresight star Scorpi Delta another name for it is Deshuba down 071 left 45 plus 0748 minus 1650012995363001465005 primary star, Sirius. Secondary Rigel 129155010 four quads 15 seconds ullage. Horizon on the 2.9 window line at T minus 3. Use high-speed procedure with minus Mike Alpha. Over.

SC Okay, TEI PAD as follows: SPS G&N 45597 minus 040 plus 157089191564 plus 35189 minus 01513 minus 00346 180007000 not applicable plus 001863522331835019 420928253 Scorpi Delta Deshuba down 071 left 45 plus 0748 minus 1650012995363001465005 Sirius Rigel 129155010 four quads 15 seconds 2.9 degrees window line at T minus 3. High-speed procedure minus MA.

CAP COM That's correct Apollo 8.

SC Ken, this is Frank. I want to make one thing certain. This the load that we are to use to burn with? Right? This is not just a PAD data for 10 abort?

CAP COM Okay, Apollo 8. We will update this PAD prior to the burn.

SC Oh you will. Okay.

CAP COM Yes sir.
SC Say again.
CAP COM Apollo 8. Houston. Roger. I am reading you with a lot of background noise. Can you read me clearly?
CAP COM Okay, I am going to give you a quick summary of systems basically, all systems are good. In respect here, return trajectory, we can still get to the mid-Pacific line at 146 hours by waiting as late as the 13th rev. After 138 seconds of the burn, you are on your way home. The weather in the recovery area looks good. Apollo 8, did you call? Apollo 8. Houston. Could we have the high-gain for a little bit longer?
SC We broke scan on it Ken.
CAP COM Okay, you are coming in loud and clear now. Did you copy my trajectory information?
SC We are on omni though.
CAP COM Roger. That is fine.
SC Say again, please. Go ahead. We are 130 - will you say it again please?
CAP COM Wilco. Apollo 8. First - if you can spare, we would like to have the high-gain to complete the dump.
SC Stand by. We will try to get it for you.
CAP COM Roger.
SC In a couple of minutes there, Houston.
CAP COM Roger. Thank you. Okay Apollo 8, while we are - Apollo 8 - while we are waiting for the high-gain I will continue the trajectory summary. We can still get back to the mid-Pacific line in 146 hours from the 13th rev. And you are on your way after 138 seconds of the burn. That's 138 seconds, gets you clear of the butterfly region. We recommend not trying pre-ignition for restart after 20 seconds. If you go beyond 20 seconds, this may get the trajectory beyond the correction - RCS correction capability to the free return. The weather in recovery area is good. We have an AOS following TEI of 89 plus 28 plus 39 and an AOS without TEI of 89 plus 37 plus 24. During the burn

END OF TAPE

APOLLO 8 MISSION CONTROL, 12/24/68, GET 862800, CST 9:19p, 279/1

CAPCOM * during the burn you may notice a slight change in chamber pressure and tank pressures due to the fuel adjust in the storage tank and going to the sump tank. This may occur somewhere around 2 to 5 seconds into the burn. It will be a small change in pressures in both systems. Going down the systems - all systems are go. In ECS we want to stop water boiling after TEI for trajectory purposes. Your water dump situation looks good. You should be good to greater than 105 hours. We'll try to hold off the water dump until after MCC-5. In the EPS we'd like to stir the cryos prior to TLI - correction TEI. The next purge on the fuel cells will occur at approximately 92 hours and that will be both hydrogen and oxygen. Your battery status - battery A 34.9, Battery B 39.1, and Charlie 38.5. We had - we have single fan cryo capability, SCS - looking at the performance of the previous burns you can anticipate a normal burn taking approximately 3.7 seconds of excessory computed value. Engine performance looks nominal, and all primaries have been setting. RCS looks good; all four quads going to the computer programs have approximately the same capacity. You have a good rev map to take you through TEI. You'll have a post TEI PTC edited for you in a few minutes and that just about wraps up what we have on systems. Over.

SC Roger, thank you, Houston. We appreciate the summary. We're trying to get high gain.

CAPCOM Rog.

SC I think we have it. We have the high gain antenna. As I understand it, if it shuts down after 20 seconds of burn, you don't want us to try to realign it, is that what you said?

CAPCOM Stand by. Apollo 8, the intent was do not delay ignitions beyond 20 seconds. Over.

SC Oh, do not delay ignition beyond 20 seconds. Roger.

CAPCOM That's affirmed.

SC Do you want me to start it on Bank A and then switch to C again, as we did on our LOI, right?

CAPCOM That's affirmative.

SC Okay. Did you put in this PAD for us should the P-30 and 40 be in our computer now?

CAPCOM Apollo 8, that's negative. We had not up-linked the SIS Pad. We'll put this one in on the next pass.

SC Okay. Roger.

PAO This is Apollo Control at 86 hours 33 minutes. Part of the information passed up to the crew during that last series of conversations was the information they will use for their trans-earth injection maneuver. This is preliminary information, we do anticipate that it will be

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 862800, CST 9:19p, 279/2

PAO updated probably on the next revolution. These figures as they were read up to the crew are as follows: the time of ignition is 89 hours 19 minutes and 16 seconds, the burn duration will be 3 minutes 17.8 seconds, that will give us a nominal change in velocity of 3522.3 feet per second, and the maneuver will occur at 174 degrees east longitude and 9 degrees 17 minutes south latitude over the moon. This would give us a nominal return time to earth of 146 hours 49 seconds and we do anticipate to update the burn information prior to the maneuver. At 86 hours 34 minutes into the flight, this is Apollo Control.

END OF TAPE.

PAO This is Apollo Control at 86 hours 48 minutes into the flight. At the present time we have just about 5 minutes before loss of signal and we have had about a minute and a half of conversation with the crew since our last report. We'll play that back for you and then stand by for any parting conversation from the crew before they go over the lunar horizon on this revolution.

CAPCOM Apollo 8, Houston. You have a go for this rev.

SPACECRAFT Roger, Houston.

CAPCOM Apollo 8, Houston, we have completed the tape dump and the recorder is yours.

SPACECRAFT Thank you. Houston how do you read Apollo 8 on OMNIC?

CAPCOM Loud and clear

SPACECRAFT Thank you

CAPCOM Apollo 8, Houston. We're 5 minutes to LOS. We'll have AOS Honeysuckle at 873842.

PAO This is Apollo Control. I would like to clarify one aspect of the figures we gave you concerning that transearth injection maneuver. The return time that was listed ground elapse time of 146 hours 49 minutes 37 seconds was the time in which the spacecraft would nominally reach 400,000 feet altitude. The splash time would be about 14 minutes 10 seconds beyond that and these numbers are close so we will be updated both prior to the transearth injection maneuver and also on route back to earth so we would expect some change in those, some update. We're now less than 2 minutes from loss of signal and we will pick up the spacecraft again at a ground elapse time of 87 hours 38 minutes 43 seconds. At 86 hours 50 minutes this is Apollo Control.

END OF TAPE

PAO This is Apollo Control at 86 hours
54 minutes as the spacecraft went over the horizon and we
lost the signal. Capsule Communicator Ken Mattingly passed
up to the crew a all systems go report. We'll play that
back for you now.

CAPCOM Apollo 8, everything looks good going
over the hill.

SPACECRAFT Roger, Ken. Thanks a lot. We'll see
you around the next pass. Have our TEI update ready for us.

CAPCOM Okay

PAO We expect to reacquire Apollo 8 in
43 minutes 52 seconds. this is Apollo Control at 86 hours
55 minutes into the flight.

END OF TAPE

PAO This is Apollo Control at 87 hours 18 minutes into the flight. Our spacecraft is currently nearing the end of its ninth revolution and the beginning of the 10th. We'll have about 21 minutes before we acquire I would like to pass along some preliminary figures on the acquisition of signal and loss of signal times that we'll have on either side of that transearth injection maneuver. These were passed up to the crew previously. The loss of signal time on the 10th revolution will be about 88 hours 51 minutes and this will be about 28 minutes 5 seconds prior to the transearth injection maneuver. Following the maneuver the signal will be reacquired at 89 hours 28 minutes 39 seconds. This will be about 9 minutes 24 seconds after the maneuver. At this time we have 19 minutes 42 seconds prior to reacquisition of Apollo 8 at 87 hours 29 minutes into the flight this is Apollo Control, Houston.

END OF TAPE

PAO This is Apollo Control at 87 hours 38 minutes into the flight. At the present time our spacecraft is in its 10th revolution and we are standing by for acquisition of signal as Apollo 8 comes over the horizon. That should be in about 15 seconds. The current velocity is 5352 feet per second. And at this point we are at the time when we should be acquiring the spacecraft. We will stand by for a call to the crew or for a message from the spacecraft.

SC Houston. Apollo 8.

CAP COM Loud and clear, Apollo 8.

SC Okay, you want the computer?

CAP COM Apollo 8. We would like to have the high gain and when we get that, well, we will start a dump and we will start your update.

SC Okay, how about reading us the PAD and we will try to get you to high gain. Ken, read us off the PAD in case you can't get the dump in. We can still do it.

CAP COM Roger. I have got them right here. Okay, Apollo 8. The first PAD I have is TEI 10.

SC Go ahead.

CAP COM All right. TEI 10, SPS G&N 455 97 minus 040 plus 157 089 19 1567 plus 351 86 minus 01512 minus 005 20 180 007 000 November Alpha plus 001 86 352 23 318 350 18 42 0924 253 Scorpi Delta down 069 left 45 plus 07 48 minus 16500 12994 363 00 1465005 primary star Sirius, secondary Rigel 129155010 four quads 15 seconds ullage. Horizon on 3.2 degree window line at T minus 3. Use high-speed procedure with minus Mike Alpha. Over.

SC Stand by 1 second. You got the high gain now, Ken.

CAP COM Roger.

SC Houston. Apollo 8. How do you read?

CAP COM Loud and clear.

CAP COM Apollo 8. We would like to --

SC -- TEI 10.

CAP COM Apollo 8. We would like to have you go to POO and ACCEPT and we would like to take the recorder at this time. Then I will copy your PAD.

SC You have got PU and mix up. And you have the recorder.

CAP COM Thank you then.

SC All set for the maneuver.

CAP COM Go ahead.

SC TEI 10. SPS G&N 45597 minus 040 plus 157 089 19 1567 plus 35186 minus 01512 minus 00520 180 007 000 not applicable plus 00186 35223 318 35018 42 0924 253

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 873800, CST 10:29p 283/2

SC Scorpi Delta down 069 left 45 plus
0748 minus 16500 12994 36300 146 50 05 Sirius Rigel 129
155 010 four quad ullage 15 seconds horizon on the 3.2 degrees
mark is T minus 3. High-speed procedure minus MA.

CAP COM That is correct, Apollo 8. Would like
to confirm the hours on GEDI 089.

SC Roger. 089.

CAP COM All right, Apollo 8. I have TEI 11 PAD.

SC We are ready, go ahead.

CAP COM Roger. TEI 11. SPS G&N 45597 0 - cor-
rection - that's minus 040 plus 157091 18 1224 plus 36325
minus 01727 plus 01428180003 000 November Alpha plus 001
86 363 94 323 361 86 42 09 95 254 Scorpi Delta down 103
left 48 plus 0742 minus 16500 130 05 363 27 146 51 44
Sirius and Rigel 129 155

END OF TAPE

CAPCOM 4651 44 Sirius and Rigel, 129 155 010
4 quads 15 seconds, horizon on 2.9 degree line at T minus 2
high speed procedure with minus Mike-Alfa, over.

SC Roger, Houston. TEI minus 11, SPS G&N
45597 minus 040 plus 157 091 18 1224 plus 36325 minus 01727
plus 01428 180 003 000 not applicable, plus 00186 36394 323
36186 42 0995 254 R cope by DELTA, down 103 left 48 plus 0742
minus 16500 13005 36327 14651 44 Sirius, Rigel, 129 155 010
4 quad 15 seconds, 2.9 degree with the mark at T minus 2,
high speed procedure minus MA.

CAPCOM That's correct Apollo 8.

SC Houston, could you give me the SPS helium
tank temperature at about 87 20, please.

CAPCOM Okay, stand by one.

SC Roger.

PAO At the present time here in Mission Control,
Flight Director Milton Windler has just checked with his key
flight controllers and we got the report that we look very
good at this time as the pace begins to quicken moving toward
this Transearth Injection maneuver. Included in the list of
numbers read up to the spacecraft and read back down for
verification was the information the crew would use for the
maneuver, the updated information. And checking over it,
we see very few modifications to the preliminary figures we
gave you. One minor change is in the longitude and latitude
at ignition. The previous longitude was 174 degrees east.
That is now updated to 173 degrees 51 minutes east, and our
latitude was 9 degrees 17 minutes south and that has changed
to 9 degrees 20 minutes south. All the other figures appear
to have remained the same. We have a weight at the time of
ignition. That would be 450, rather 45 597 pounds prior to
the maneuver. Following the maneuver predicted weight is
32 124 pounds. The difference there is 13 473 pounds, and
most of that would represent SPS propellant.

CAPCOM Apollo 8, Houston. Our loads are in and
verified. The computer is yours.

SC Roger, Houston, Apollo 8.

CAPCOM Apollo 8, Houston. At 87 48, we're reading
84 degrees, and at LOS we had 80. We'll take a look at the
tape and see if we can find out what we had on the back side.

SC Roger.

CAPCOM We loaded your CSM and LM nav and external
DELTA-V in that order.

SC Roger. Okay, I would kind of like to
know what I might expect at ignition here at TEI.

CAPCOM Roger, we'll take that off the tape.

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 874900, CST 10:40 284/2

SC Houston, this is 8. I take it you have loaded both state vectors, is that correct?

CAPCOM That's affirmative,

SC Roger.

CAPCOM We loaded you CSM and LM nav and external DELTA-V, in that order.

SC Roger.

PAO This is Apollo Control. Currently our spacecraft velocity is 5 354 feet per second, and our orbit measures 58.8 nautical miles at it's low point. We've got a high point of 63.2 nautical miles above the Moon's surface. At 87 hours 59 minutes this is Apollo Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, CST: 10:56 pm 285/1

PAO This is Apollo Control at 88 hours
5 minutes. The crew has just been given a GO for the
transearth injection on this revolution. here is how that
sounded.

CAPCOM Apollo 8, Houston.

SPACECRAFT Go ahead Houston, Apollo 8.

CAPCOM Okay, Apollo 8 we've reviewed all your
systems you have a go for TEI. One of the things we would
like to do as soon as you come out on the other side is a
P23. We are checking into your helium pressures now. We're
going to correlate not only the last rev but the previous
rev for the same location and we will have that number for
you in a little bit.

END OF TAPE

PAO This is Apollo Control at 88 hours 20 minutes. At the present time, we are about 31 minutes 15 seconds from loss of signal. And the crew, at this time, is involved in aligning the platform on their guidance and navigation system. Here in Mission Control Center, Flight Director, Milton Windler, has just gone around the room again, pulsing all the flight controllers and in every case the word was go. We have gotten all the necessary information up to the crew at this point that they will need for the maneuver. And at the present time, the mood here in Mission Control Center could best be described, I believe, as one of relaxed confidence. Flight controllers are continuing to over their displays, looking at the systems, getting last minute look at all systems before we lose contact with the spacecraft. And we are again, going back over the figures that have been passed up to the crew, verifying every aspect of this maneuver. And aboard the spacecraft, following the platform alignment, the crew will be pretty much up to date on all the things they need to do for the maneuver. At about 88 hours 48 minutes into the flight, they are scheduled to transfer the Command Module Pilot, Jim Lovell, is scheduled to transfer from the lower equipment bay where he has been doing the guidance and navigation checkout and preparation to transfer from there to his couch. We have had very little communication with the crew since our last report. We have about a minute and a half on tape and we will play that back for you now.

CAP COM Apollo 8. Houston. The tape recorder is yours. I have your PTC attitude.

SC Roger. Go ahead.

CAP COM Okay, PTC attitude will be pitch, 10 yaw 45. This begins at 92 hours. Over.

SC Is that pitch 10 and yaw 45?

CAP COM Affirmative. And looks like that will go with the entry REFSMMAT. Begins at 92 hours. Apollo 8. Would you put your up telemetry to block, please?

SC In block.

CAP COM Apollo 8, Houston.

SC Go ahead.

CAP COM Okay, on the helium temp tanks, that's not recorded on low bit rate, and looking over our tape dumps, most of this stuff we have on the back side there is low bit rate. So we won't be able to get you an exact number but looking at what we have every time we go out of sight and come back over the hill, it looks like you can expect about 82 to 84 degrees as a nominal temperature.

SC Thank you.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 883700, CST 11:28P 287/1

PAO This is Apollo Control at 88 hours, 37 minutes. We're now some 13 minutes, 55 seconds from loss of signal. The Guidance Officer has confirmed that the spacecraft at this time is in the proper orientation for the transearth injection maneuver. That - maneuver scheduled to occur at 89 hours, 19 minutes. 16 seconds into the flight. There have been a very few brief comments that has passed back and forth from the ground to the spacecraft. Since our last report, we'll play those back. We'll play those back for you now and then standby for a live conversation with the crew.

CAPCOM Apollo 8, Houston, we'd like to have the tape recorder for about 5 minutes for one last look.

SC Roger, Houston, you're getting it.

CAPCOM Thank you. And I guess we still have a cryo stir ahead of us and we've checked your triple bins and there's no change.

SC Roger. And we're stirring cryos right now.

CAPCOM Thank you.

SC Jim, are you through with the tape recorder?

CAPCOM Standby 1.

SC We're on a maneuver to burn attitude and it's going to make us lose the high gain.

CAPCOM Apollo 8, the tape recorder is yours. We have your double umber update. 890715.87.

SC Roger, copy.

CAPCOM All right. And no change on your AOS time.

SC Say that again, will you Ken?

CAPCOM There's no change on your AOS time.

SC Now what was it?

CAPCOM Okay, with TEI 8 niner 283 niner.

SC Thank you.

CAPCOM Thank you.

PAO At this point, Flight Director Milton Windler has just advised his flight controllers that we are just about 10 minutes now from loss of signal. And recommend that they take a last look at all their displays before there is communication with the crew. We're coming upon that transearth injection maneuver. Currently, the spacecraft is traveling at a speed of 5331 feet per second. Our current altitude is 63 nautical miles and the orbital parameters are 63.2 nautical miles for apocynthion, 58.6 nautical miles for pericynthian. At 88 hours, 42 minutes into the flight of Apollo 8, this is Mission Control Houston.

END OF TAPE

PAO This is Apollo Control at 88 hours 46 minutes. We are now just under 5 minutes from loss of signal. We will stand by for any communications with the crew. As we - as the spacecraft goes over the lunar horizon and we lose touch with them. At the present time, Jim Lovell should be finishing a sextant star check. This will be a verification of the spacecraft attitude for the maneuver. And he will then be transferring to his couch, joining Commander Frank Borman and the Lunar Module Pilot, Bill Anders, who are in their couches at the present time. We will stand by now for any parting communications with the crew.

CAP COM Apollo 8, Houston. We have 3 minutes until LOS. All systems are go. Apollo 8. Apollo 8. This is Houston. Three minutes LOS, all systems are go. Over.

SC Roger. Thank you. This is Apollo 8.

CAP COM All systems are go, Apollo 8.

SC Thank you.

PAO At 88 hours 51 minutes, we show loss of signal with the spacecraft. Our next communications with Apollo 8 should come in about 37 minutes. We are now about 28 minutes prior to our transearth injection maneuver. As the spacecraft went over the horizon, Capsule Communicator Ken Mattingly passed along for the second time the word that all systems are go. And we got a very terse Roger back from the spacecraft. At 88 hours 52 minutes into the flight, this Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston at 89 hours 19 minutes into the flight. We are now less than 30 seconds to the scheduled time of ignition, for the maneuver to start Apollo 8 on its course back to earth. In the last 15 seconds, prior to ignition, the crew will be burning their service propulsion system - rather their reaction control system engines to settle propellants. And here in Mission Control Center, we have just counted down to the burn. We should have ignition at this time. That will be a 3 minute and 18 second burn nominally. It will increase the spacecraft velocity by about 3522 feet per second or some 2395 miles per hour. Following the maneuver, the spacecraft should have a velocity of about 8800 feet per second, some 6000 miles per hour. And here in Mission Control, it is relatively quiet. As it has been since we lost communications with the spacecraft as they went over the moon's horizon. At this point, flight controllers here in Mission Control, as with the rest of the world, now they are waiting. (Pause) Coming up in just a few seconds now, we should have shutdown of the service propulsion system engine on the spacecraft. That should have occurred at 89 hours - or rather will be occurring at 89 hours 22 minutes 34 seconds. Actually, we are just a little less than a minute from that event. And the clock here in Mission Control Center that is counting down to the time when we will re-acquire the spacecraft shows that we have 6 minutes 30 seconds until re-acquisition. At this point, the SPS engine should be shut down and we will now be waiting for the spacecraft to come over the lunar horizon and give us a report on their status. We now show 5 minutes 45 seconds until re-acquisition. (Pause) This is Apollo Control Houston at 89 hours 26 minutes. Flight Director Milton Windler has just advised his flight control team here in Mission Control Center that we have less than 3 minutes now until re-acquisition of the spacecraft and he requested that they monitor their console, get prepared to re-acquire and to get a status from the crew. (Pause) This is Apollo Control Houston. We now show less than 30 seconds until re-acquisition. We will stand by for the first words from the Apollo 8 crew as they come over the lunar horizon. And into acquisition.

END OF TAPE

A

PAO We have AOS signal, there is a little bit of a cheer going up among the flight controllers here. We should be hearing from the crew shortly.

PAO Our station at Honeysuckle reports that we do have a radio signal from the spacecraft. Having a bit of trouble locking up at this point, to the point where we can get voice communications from the crew.

CAP COMM Apollo 8, Houston. Apollo 8, Houston. Apollo 8, Houston. Apollo 8, Houston.

SC Houston, Apollo 8, over.

CAP COMM Hello Apollo 8. Loud and clear.

SC Roger. Please be informed there is a

Santa Claus.

CAP COMM That's affirmative. You are the best ones to know.

SC Burn status report. It burned on time. Burn time 2 minutes 23 seconds 7/10 plus BGX. Attitude Nominal, residuals minus 5/10, BGX plus 4/10 minus 5/10 BGX plus 4/10 BGY plus 0 VGC Delta VC minus 26.4.

CAP COMM Roger. Apollo flight has -- Apollo 8 reconfirm your burn time please.

SC Roger, we had 2 minutes 23 seconds our -- wait one. Change that to read 3 minutes 23 seconds.

CAP COMM That's it.

PAO This is Mission Control, Houston. Flight Dynamics Officers says that burn is good.

CAP COMM Say again Apollo 8.

SC I say that at this position you are climbing.

CAP COMM Roger.

SC What's next on the docket?

CAP COMM High gain antenna.

CAP COMM Apollo 8 at the first convenient moment we'd like to have high gain antenna.

SC You've got it. You're on the high gain.

CAP COMM Rog.

END OF TAPE

PAO This is Apollo Control at 89 hours, 51 minutes. And in here Mission Control Center we're continuing to assess the effects of that maneuver and we're just in the process now of playing back the tape data of the burn. Of course that maneuver occurring on the back side of the moon, we were unable to monitor as it occurred. We're now looking at the results we would have seen had we been able to receive communications from the spacecraft as the burn occurred. We just put in a call to the crew. Here is that conversation.

CAPCOM The POO and ACCEPT will update the REF map and I have some backup GDC angles for the new entry REF map.

SC Roger, understand. POO and ACCEPT and you'll give us the new REF maps.

CAPCOM Roger.

SC Okay, Houston, you have the ACCEPT.

CAPCOM Roger. Your backup GDC alignment ROLL 308, PITCH 20 niner, YAW 357. Over.

SC Roger, all right what set of stars?

CAPCOM That's on Sirius and Rigel.

SC Understand ROLL 308 PITCH 209, YAW 357.

CAPCOM That's affirmative, Apollo 8. Good morning Apollo 8, Deke here. I just would like to wish you all a very Merry Christmas on behalf of everyone in the Control Center and I'm sure everyone around the world. None of us ever expected a better Christmas than this one. Hope you get a good night's sleep from here on and enjoy your Christmas dinner tomorrow and look forward to seeing you in Hawaii on the 28th.

SC Okay, leader, we'll see you there. That was a very very nice ride that last one. This engine is the smoothest one.

CAPCOM Yeah, we gathered that, an outstanding job all the way around.

SC Thank everybody on the ground for us. It's pretty clear we wouldn't be anywhere if we didn't have them doing it or helping us out here.

CAPCOM We concur that.

SC I concur too. Even Mr. ^K Craft does something right every once in a while.

CAPCOM He got tired of waiting for you to talk and went home.

SC Okay.

PAO This is Houston. Our capsule communicator in that last exchange was astronaut Donald K. Slayton, Chief of Flight Crew Operations here at the Manned Spacecraft Center. Shortly after we acquired the spacecraft and established communications with the crew. Here in the

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Control Center our big display up in the front changed
from a lunar map to an earth map and the colors on it are
red and green. We also had a Christmas tree brought in
and it's now standing down in front of the Control Center.
It looks like it stands about 6 feet tall and it's decorated
with lights and ~~tinsel~~ and with a big blue ornament on top.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Okay, the computer is yours. And I
guess we have an IMU alignment and a P23 on the sch-
edule.

SC Okay, thank you. Do an IMU align-
ment coming up. CM in black.

CAPCOM Roger.

END OF TAPE

CAP COM Apollo 8. Houston. We would like to have your zero optic switch prior to beginning P52.

SC Roger. We are going to see if we can find some stars here before we do this P52.

CAP COM Roger. And got a couple of words for you. Jack's been watching you since LOI and he has a few words he wants to give you.

SC Go ahead.

CAP COM Typhoid Jack here and we have got some good words here that originated at the Cape with a bunch of friends of yours and it's sort of in a paraphrase of a poem that you are probably familiar with. Do you read me Apollo 8?

SC You are loud and clear Jack.

CAP COM Okay, 'Twas the night before Christmas and way out in space, the Apollo 8 crew had just won the moon race. The head sets were hung by the consoles with care in hopes that Chris Kraft soon would be there. Frank Borman was nestled all snug in his bed, while visions of REFSMAT danced in his head and Jim Lovell, in his couch and Anders in the bay, were racking their brains over a computer display. When out of the DSKY, there arose such a clatter, Frank sprang from his bed to see what was the matter. Away to the sextant he flew like a flash to make sure they weren't going to crash. The light on the breast of the moon and jagged crust gave a luster of green cheese to the gray lunar dust. When what to his wondering eyes should appear, but a Burma Shave sign saying "Kilroy was here". But Frank was no fool, he knew pretty quick that they had been first, this must be a trick. More rapid than rockets, his curses they came. He turned to his crewmen and called them a name. Now Lovell, now Anders, now don't think I'd fall for that old joke you've written up on the wall. They spoke not a word, but grinning like elves, and laughed at their joke in spite of themselves. Frank sprang to his couch, to the ship gave a thrust and away they all flew past the gray lunar dust. But we heard them explain ere they flew around the moon, Merry Christmas to earth, we will be back there real soon. Great job gang.

SC Thank you very much. That was a very good poem. But in order to win the race, you have got to end up on the carriers.

CAP COM We will see you there.

SC Hey, Jack. You really got Bill trained. Okay.

CAF COM I certainly hope so. You did pretty

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 895900, CST 12:50a 293/2

CAP COM well Jim. You must have talked on the
way out there.

PAO That rendition of the Night Before Christ-
mas was read up to the crew by Astronaut Harrison Schmidt.
Jack Schmidt, who worked with Lovell quite extensively prior
to the mission and going over the lunar sightings and photog-
raphy that he would do at lunar orbit. At 90 hours

END OF TAPE

ok, Schmidt says?

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 900310, CST 12:54a 294/1

PAO At 90 hours 3 minutes into the flight,
this is Apollo Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 901800, CST 1:09a 295/1

PAO This is Apollo Control Houston at 90 hours 18 minutes. Our displays here in Mission Control are now beginning to show the effects of that transearth injection maneuver. We show an altitude above the moon at this time of 2802 nautical miles. Our spacecraft velocity is 6050 feet per second. And slowing. And our weight following that maneuver is now 32,180 pounds. Onboard the spacecraft at the present time, the crew is finishing up some last minute activities connected with onboard navigation and then they plan to get a little bit of rest. Frank Borman is scheduled to be in a sleep period at this time. And we have had some indications from the crew that Lovell and Anders also hope to get a little bit of rest as soon as possible. We have some brief conversations with the crew that we recorded since our previous report. We will play those back for you now and then stand by briefly for any live communications with the spacecraft.

SC Houston. This is Apollo 8.

CAP COM Go ahead.

SC Roger. We got an alignment with with your new REFSMMAT now. It's on the program here. You want us in P23 and then what?

CAP COM Looks like sleep is coming up.

SC That's what I wanted you to say. We used up the gimbal angles of 10 and 45 with the - this REFSMMAT, right?

CAP COM Affirmative.

SC Okay.

CAP COM Apollo 8. Houston.

SC Go ahead Houston. Apollo 8.

CAP COM Roger. Notice that you are starting on your P23 which is the last scheduled activity. Initial tracking looks like the initial midcourse may be less than 4 foot per second on the first guess. And we have looked at your burn data and it's all just as smooth as you said. Everything on there looks real nominal. Systems now look good. Looks like in PTC attitude, we should be able to switch omni's for you if you would like to do that. We were having good success with predicting on the way out where to switch the antenna. And if it will help you any, we can do that on the way back in.

SC That would be nice if you could do it because we will keep one man in the shop to watch the gimbal angles, but if took - switched the omni's, it should save us a lot of problems.

CAP COM Okay, we will do that. When you get in

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CAP COM the PTC attitude, we will let you know
when we take the command on the antenna switching.

SC Okay. Just be careful what you do with
the tape recorder. ~~Bill's a little sensitive about that.~~

CAP COM Roger. We were listening to the tape
dumps and looks like Bill gets a happy new year after all.

SC A happy ~~new year.~~ How come, Jack - an
in joke?

CAP COM No we got that off of his tape dump. He
and Jim were discussing that one.

SC Oh yes, that is right.

END OF TAPE

PAO This is Apollo Control at 90 hours, 50 minutes into the flight of Apollo 8. At the present time our spacecraft is at an altitude above the moon of 4504 nautical miles and traveling at a speed of 5645 feet per second. We've heard very little from the crew since our last report. We do have a couple of brief fix changes on tape. We'll play those back to you and standby for a conversation.

SC Houston, are you getting all this data from P23? Houston Apollo 8.

CAPCOM Go ahead, Apollo 8.

SC I wanted to know if you getting the data for P23?

CAPCOM That's affirmative.

SC Okay.

CAPCOM Ureka.

PAO This is Apollo Control. We're expecting Capsule Communicator Ken Mattingly to put in a call to the crew shortly. While we wait for that, we'll pass along some information that we have been requested to gather, also some additional information on the results of transearth injection maneuver. The transearth injection burn occurred on time. It lasted for 3 minutes and 23 seconds. We had originally estimated that it would last about 3 minutes, 18 seconds. We obtained almost precisely the amount of velocity change from that burn that had been planned. The figure that we have at this point is a velocity change of 3522.8 feet per second. We've been shooting for 3522.3 feet per second. So we would have only have been off about 5/10 of a foot per second. As a result of that maneuver, our current figure is that splash will occur in the mid Pacific at 147 hours, 4 minutes, 59 seconds. That's a very precise figure and I doubt if it will continue to hold true through the post phase and trajectory analysis that will be done on route back to earth. We do anticipate that figure will change. Coming up at 100 hours, 47 minutes, 47 seconds GET, we will be going through the change in the sphere of influence. This will be the point where the moon's gravity ceases to be the dominant influence on the spacecraft. It will also be the point at which the spacecraft will reach its minimum and earth velocity and then start to accelerate toward earth. This will occur at an altitude above the moon of 33821 nautical miles and at that point will be 175528 miles from earth. The velocity at that point will be 4839 feet per second with respect to the moon. And it will be 4106 feet per second with respect to earth. We're also requested to pass along some figures on altitude and velocity at the beginning of the transearth injection maneuver and at the end of that maneuver. At the beginning of

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the maneuver, our velocity was about 5350 feet per second and following the maneuver our velocity was 8841 feet per second. Our altitude at the beginning of the transearth injection maneuver was 60 nautical miles above the surface of the moon. And at the conclusion of that maneuver, 3 minutes and 23 seconds later it was 66.5 nautical miles. At the present time our altitude above the moon is 4876 nautical miles and our velocity is 5587 feet per second and continuing to decrease very gradually. We are still anticipating sometime in the near future a call to the crew and we will pick back up again when that call comes through. This is Apollo Control at 90 hours, 58 minutes into the flight of Apollo 8.

END OF TAPE

PAO This is Apollo Control at 91 hours 22 minutes. Since our last report, we've had a couple of brief conversations with the crew. They indicated that they were very tired and they had perhaps gotten about 2 hours of sleep prior to the transearth injections maneuver. Frank Borman advised that he and Jim Lovell were going to attempt to get some sleep shortly and that Bill Anders would stand watch while they were getting some sleep and then when one of them awoke, Bill would get some sleep. We'll play back that tape for you and then stand by as our capsule communicator puts in a call to the crew.

SC Houston, Apollo 8.

CAPCOM Go ahead, Apollo 8.

SC Houston, Apollo 8.

CAPCOM Go ahead, Apollo 8.

SC Ken, we've about run out of gas here on this next set of stars. Would you ~~ask your people to~~ be especially alert there watching the systems tonight?

CAPCOM Sure will, Frank.

SC Okay, it's maneuvered to pitch 10 and yaw 45.

CAPCOM Roger. I have - let's see we've got a hydrogen purge right here that ought to come out about 9140 and an oxygen-hydrogen fuel cell purge for 92 hours.

SC Okay, will you call us about those please?

CAPCOM I sure will. And let's see, we just wanted to let you know we've got a real good battery charge going here this time. Looks like - it looks just like the ones in the book and I'd like to get a battery C voltage before you shut down and a sleep report on what you did in lunar orbit and your plans for the next couple of hours.

SC Okay. 37 volts on battery C.

CAPCOM Roger. 37 volts.

SC That looks good.

SC We only got about 2 hours sleep today max, Ken. We're going now - Bill's going to stay up awhile and Jim and I are going to sack out and we're going to try to rotate a short sleep's cycle so we get back to the normal one.

CAPCOM Roger, sounds like a good idea. And EECOM on the ground tells flying EECOM to go ahead and put his hydrogen purge line heater on and we'll get ready for a fuel cell.

SC Thank you. He can't turn on his - there he goes.

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SC I hope we won't disappoint anybody too much if we knock off those last two stars but Jim is just in a haze and so am I.

CAPCOM Roger, no sweat.

SC Thank you.

CAPCOM Apollo 8, one of the things we'd like to have before you get down also is VRB 64 so we can watch the pointing angles.

SC Roger.

CAPCOM Hey, Frank you might be interested they are having some trouble with the medics (P-2).

SC What?

CAPCOM The medics can't clear out their P-2.

SC Oh, is that right - it's been so busy.

CAPCOM Oh yeah it's worn the thing out at the bearings.

SC Hey Ken, tell the people if you see anything getting close to the gimbal lock to be sure and whistle too, will you.

CAPCOM We sure will, Frank. I want to make sure one of you keeps your comm carrier on too.

SC That's right. We'll keep one man with a comm carrier on.

CAPCOM Apollo 8. You have got some big yawing on there.

CAPCOM Apollo 8 Houston. Apollo 8 Houston. Apollo 8, Apollo 8, Houston. Apollo 8, Apollo 8, Houston. Apollo 8 Houston. Apollo 8 Houston. Copy that you are now in PTC attitude and we're watching your gimbal angle. We apparently do not have a down link voice but the data is good.

SC Houston Apollo 8. Over.

CAPCOM Loud and clear 8.

SC Okay, we're establishing PTC. We took one last look at the burn on our way back.

CAPCOM Roger.

PAO This is Mission Control Houston at 91 hours 31 minutes. Our spacecraft is at an altitude of 6673 nautical miles above the moon and we're traveling at a speed of 5375 feet per second. Appears that we're going to have no further communications with the spacecraft at this time and we'll take the circuit down and come back up when next we reestablish contact or with a periodic status report.

END OF TAPE

PAO This is Apollo Control at 92 hours, 8 minutes into the flight of Apollo 8. And at the present time our spacecraft is at an altitude of 8545 nautical miles above the moon, traveling at a speed of 5238 feet per second. It's been some time before we have heard from the crewmen. At about 91 hours, 25 minutes, we had a report from the spacecraft that commander Frank Borman and Jim Lovell command module pilot would be attempting to get some sleep. And Bill Anders was to stand watch. But we do have a small amount of tape of previous conversations that we have had since our last report. We'll play that back for you now.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Okay. In order for us to handle the antenna slipping I guess we'd like to have the OFF switch switched to OFF and the tape forward switch OFF. And we'll be switching between OMNIS BRAVO and DELTA.

SC Between what and what?

CAPCOM Okay, we are going to be switching between OMNIS BRAVO and DELTA.

SC Okay.

CAPCOM All right. And I'm gonna - you bug me when you get over 50 degrees of YAW. So I'll probably be watching that number pretty closely. We'd like to have the biomed switched to the right position. Okay, and for your own information - the fuel we show in the different costs I have here if you would like to copy them.

SC Okay, ready to copy.

CAPCOM Okay. I'll give you the percentage on ALFA 60 BRAVO 57 CHARLIE

SC At the present time I can't copy that fast, Jim.

CAPCOM All right, I'm sorry. ALFA is 60.

SC For what time?

CAPCOM 9136.

SC Okay, standby. Okay, what's BRAVO?

CAPCOM Okay, that's 57.

SC Okay.

CAPCOM CHARLIE 62.

SC Okay.

CAPCOM And DELTA 57.33842

SC That's a coincidence. That's just what I would have got on Lovell's slide rule. How are we doing on the cryos?

CAPCOM Oh, you got some pretty good numbers on that today. Start off yesterday and you had about a hundred sixty hours. Well, I'll check that out, but you were fat on cryo. I've got some SPS DELTA-V. You've got 3320. You saw the service module RCS -

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through the DAP. You had 142 and through SPS 121.

SC Roger.

CAPCOM Apollo 8, Houston, we can't monitor on low bit rate whether you started your fuel cell purge. If you haven't we can still go ahead and start now and if you can keep us posted as you go through it.

SC Roger. You want an O2 and a H2 purge again?

CAPCOM That's affirmative.

SC You shall have it.

CAPCOM Thank you. Apollo 8, Houston -

SC Go ahead.

CAPCOM It looks like you may be in OMNI ALFA. Can you confirm that we're set up to switch between BRAVO and DELTA?

SC You are now.

CAPCOM Okay, thank you very much. And you are in the fuel cell purge?

SC It's complete.

CAPCOM Okay, understand the purge is complete. Thank you. And in reference to your cryo - it looks like we'll have a 180 pounds in each oxygen tank ACCEPT and 11 pounds in each hydrogen tank. And you're well above the single tank capability.

SC Okay, thank you.

PAO This is Apollo Control. At the present time here in Mission Control, we're involved in a change of shifts. ~~Flight Director Glen Lunney is coming on to replace Milton Windler and his team of flight controllers. And Lunney, at present, is consulting with the~~ his team of flight controllers, getting status report - getting up to date on the status of spacecraft and mission. At 92 hours, 14 minutes into the flight of Apollo 8, this is Mission Control, Houston.

END OF TAPE

PAO This is Apollo Control Houston at 93 hours 2 minutes now in the flight of Apollo 8. Apollo 8 is now 11 290 nautical miles away from the moon. Current velocity 5 110 feet per second. We placed several calls in the blind to Apollo 8 and it took a while before we got a response from Bill Anders and we're going to play that sequence for you now.

CAPCOM Apollo 8, Houston. In the blind, select OMNI Charlie, over.

CAPCOM Apollo 8, Houston. Apollo 8, Houston. In the blind. We've lost all data on you and request you select a good OMNI antenna by Charlie. Over.

CAPCOM Apollo 8, Houston. In the blind. Your yaw is 42 degrees - recommend you set yaw to ATTITUDE HOLD for PPC. Over.

CAPCOM Apollo 8, Apollo 8, This is Houston in the blind with due antenna alpha. Over. Antenna alpha. Apollo 8, Apollo 8, Houston in the blind select antenna alpha, antenna alpha. Over. Apollo 8, Houston. Over. Apollo 8, Apollo 8, this is Houston, Houston. Over. Apollo 8, Apollo 8, this is Houston. Over. Apollo 8, Apollo 8, Houston, Over. Apollo 8, Houston. Over. Apollo 8, Houston, Over. Apollo 8, Apollo 8, this is Houston, Houston. Over. Apollo 8, Apollo 8, this is Houston, Houston, over. Apollo 8, Apollo 8, this is Houston, Houston, over. Apollo 8, this is Houston, how do you read?

SC I read you like a book.

CAPCOM Ah, Roger, Bill. We lost data on you for 15 minutes and voice COMM for about 45 and were beginning to get a little itchy. Is your PTC set up for rate command attitude hold?

SC Roger.

CAPCOM Apollo 8, Houston. Set up on the Charlie. Over.

SC Roger.

CAPCOM Apollo 8, Houston. We're showing yaw 54.5. Over.

SC (Garble)

CAPCOM Apollo 8, Apollo 8, Houston, say again. Apollo 8, Apollo 8, Houston, say again.

SC You might as well go on Command. The crew alert officer might have to use it again.

CAPCOM Roger, Bill.

PAO Apollo Control Houston. This sequence, somewhat dramatic sounding, was more a matter of curiosity than concern here in Mission Control since we were and are

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getting in good to the spacecraft with commands and receiving solid telemetry. The curiosity, quite frankly, we didn't know for sure if Bill Anders had dozed briefly or if he had gone to the lower equipment bay, or just what. The solution, as Bill himself explained, he had a loose connector. So, at 93 hours 6 minutes into the flight of Apollo 8, continuing to monitor, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 934900, CST 4:40A, 300/1

PAO This is Apollo Control Houston at 93 hours 49 minutes into the flight of Apollo 8. Apollo 8 now 13 635 nautical miles out from the Moon on its trip home. Current velocity 5037.4 feet per second. We've had brief conversations with Bill Anders aboard the Apollo 8 spacecraft and we're going to play those for you now.

CAPCOM Apollo 8, Apollo 8, Houston. Over.

SC Go ahead, Houston.

CAPCOM Apollo 8, this is Houston.

SC Go ahead.

CAPCOM Switch to OMNI Bravo and we'll try the Bravo Delta switching again. Over.

SC You got it.

SC We're on OMNI A now, Houston.

CAPCOM Roger, Bill.

SC Looks like B couldn't quite hack it, I'll put it back there in a minute.

CAPCOM Roger.

SC Houston, if your EECOMs need any more help, just tell them to give me a call.

CAPCOM Roger.

SC We're going on OMNI Bravo now, Houston.

CAPCOM Apollo 8, Houston. Say again.

SC Omni Bravo,

CAPCOM Roger. Omni Bravo,

CAPCOM Apollo 8, Houston. Looks like we're getting pretty far off in both pitch and yaw. Showing about 50 degrees in pitch and about 25 in yaw.

SC Roger, I get that.

PAO Apollo Control Houston, as you heard, the conversations dealt primarily with communications procedural matters. At the present time, our Apollo 8, by the way, considerably lighter than on the trip out, current weight reading 31 739 pounds, this reflecting the two major service propulsion engine burns on this day of lunar orbit. I should say yesterday's day of lunar orbit, this is Christmas Day and we are past midnight. So, at 93 hours 52 minutes into the flight of Apollo 8, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 942900 CST 5:20 am 301/1

PAO This is Apollo control, Houston at 94 hours 29 minutes now into the flight of Apollo 8. Apollo 8 now 19 662 nautical miles away from the moon, and it's heading back towards earth. Current velocity stands at 4056 feet per second. Since our last report we've only had a very brief exchange with the crew. I believe some 7 seconds in duration. A systems check. We are going to play that back for you now.

SC Apollo 8, Roger.

PAO This is Apollo Control, Houston. The acknowledgement from Bill Anders was in response to a statement that all systems looked good. Perhaps we should qualify our last remark about two major SPS burns around the moon. Since the Service Propulsion System Engine was certainly fired 3 times. LOI 2 was indeed a major burn as a mission event but expended considerable less Delta V than the lunar orbit insertion number 1 and the TEI burns did. So at 94 hours 30 minutes, it's quite peaceful is perhaps the best terminology, calm in Mission Control Center on this early Christmas morning. We will continue to monitor any future conversations. At this time we will sign off. This is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 950700, CST 5:58A, 302/1

PAO This is Apollo Control Houston at 95 hours 7 minutes into the flight of Apollo 8. Although the Apollo 8 spacecraft won't enter the Earth's sphere of influence until it's at an altitude of 175 528 nautical miles above the Earth, our displays here in Mission Control have now switched to an Earth reference system. At the present time, relative to the Earth, we read an altitude of 189 133 nautical miles. Our velocity reading, irrelative to the Earth, currently reads 4055.9 feet per second. As we picked up conversation with the crew, we find that spacecraft Commander Borman and Command Module Pilot Jim Lovell are just waking up and Bill Anders is tucking in for the night or we should say early morning. And we'll pick up that conversation now.

CAPCOM Apollo 8, Houston. Apollo 8, Houston. Over.

SC Go ahead, Houston.

CAPCOM Apollo 8, this is Houston. Your systems are all looking good. Got a flight plan update for you. At timeline 96, you can delete P-52. Your drift rates are real small.

SC Roger. It looks like you'll do the coordination at about 9530 vector.

CAPCOM Roger, understand. Coordination 9530.

SC Houston, we're on omni C and going to Bravo now. Correction (garble).

CAPCOM Roger, understand going Delta.

SC We're on Charlie now.

CAPCOM Roger, understand you're on Charlie. Break. Verify your upkeel end switches. Command reset it at normal. Over.

SC Roger. In set normal. I've had the command reset since we broke lock there and I have to get back and control the omnis so why don't you go COMMAND over to talk, then give it back and I'll send the other one on BRAVO.

CAPCOM Roger.

CAPCOM Apollo 8, Houston. We have you on DELTA. You can go to BRAVO, break, give us a call when you've finished your coordination. Over.

SC Okay, everybody seems to be stirring around now, so we'll probably get to it on time.

CAPCOM Okay.

SC (indistinct) Houston, the other two space aces are up now and the LMP would like to hit the pad and he'd like to take a Seconal prior.

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET950700, CST 5:58a 302/2

CAP COM Apollo 8, Houston. Roger. Permission granted, Bill. Have a good sleep.
LMP Thank you.
CAP COM Apollo 8, Houston. Looks like you need about three more hours on that Battery A charging. Over.
SC Okay. Well, my co-workers can handle it.
CAP COM Roger.
CAP COM Apollo 8, Houston. Can we get a crew status report on Bill before he goes to sleep?
SC He's doing fine. A little sleepy.
CAP COM Roger.
SC And had a meal about - had a meal about two hours ago. Drinking lots of water.
CAP COM Roger, Bill. Thanks.
SC Okay.
CAP COM Good night.
SC Godd night. Wish everybody a Merry Christmas for me.
CAP COM Sure will, Bill. Same to you.
SC Thanks.
CAP COM Make sure Bill hangs up his stocking before he goes to bed.
SC I've got it right next to my Teddy bear.
SC Houston, Apollo 8.
CAP COM Apollo 8, Houston. Go.
SC Roger. We're up on all the jobs; Bill's going to sleep.
CAP COM Roger, Frank. Good morning.
CDR Good morning.
CAP COM Apollo 8, this is Houston. I have a little "feature" news and sports news for you if you'd like to hear it.
CAP COM Apollo 8, Houston.
SC Go ahead, Houston. Apollo 8.
CAP COM Roger, Frank. I have some feature page and sports page news if you'd like it.
SC Roger.
CAP COM Roger. First of all, Frank, the guys down here on the control who want to spread their appreciation for a beautiful television job done.
SC Thank you.
CAP COM Roger. We'll start out with the sports news. Los Angeles Dodger pitcher, Sandy Kofax, and Ann Widmark, 23-year-old daughter of actor, Richard Widmark, plan to marry some time in the near future. Kofax said Tuesday that no date for the wedding was set; but he and Miss Widmark have been dating for some time. Springfield -

Tape

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p. 3

Carr

APOLLO 8 MISSION COMMENTARY, 12/25/68, CST:5:58am GET950700 302/3

SC (garbled)
CAP COM Say again.
SC Morning, ...
CAP COM Good morning, Jim.
CAP COM Let's see. In Springfield, Missouri,

Mickey Owen, the old-time catcher for the Brooklyn Dodgers, who made the record books by dropping a third strike that led the New York Yankees to a victory over the Dodgers in the '41 World Series, decided that he would be remembered by more than just his sports record. Forty-five boys and girls have been the recipients of ponies that he offered. These youngsters were requested to send letters in telling him how they would care for a pony. When the letters poured in, he added five ponies to the twenty he already offered; and other donors pitched in twenty more; and said Mickey Owen, "I thought I'd have about forty-five letters, but I ended up with about nine hundred." Now on the feature page, Wellington, New Zealand. About fifty men sat down to the traditional turkey and cranberry sauce at the South Pole today. And the Christmas and Oriental flavor, as well. It included Kiaki, fixed by members of a Japanese party, who are crossing the Antarctic Continent and stopped for the day with the U. S. Navy. In San Diego, California, the crewmen of the captured intelligence ship Pueblo donated their first paychecks to the workers at San Diego and Balboa Naval Hospitals. They had all been given \$20.00 each and when they landed in San Diego and they felt that this was a good demonstration of their feelings for those who had done so much to make their welcome here.

SC We just now changed antennas, or you must have.

CAPCOM Okay.

SC Garble.

CAPCOM In Reno, Nevada. Oh, that's affirmative, Frank. We changed the antennas from here. In Reno, Nevada, because there is no fireplace in his home, a little boy wrote Santa Claus in care of the local newspaper . . .

END OF TAPE

Antarctic?
Yes
Page 6's
p. 5

CAP COM ... home a little boy wrote Santa Clause in care of the local newspaper, and suggested would you please use the front door. You will have to kick the bottom a little bit because it sticks. And Little Rock, Arkansas, babies born at St. Vincent Infirmary during the week before Christmas and through Christmas Day are being released to their mothers at discharge time in huge red Christmas stockings. Here is one ecumenical cooperation. Andeo, California, the Chief of Police was armed Christmas Day with a prayer book. Rabbi Phillip H. Wienburg has taken over as Chief for a day so the real Police Chief, Homer Hunt, a Methodist could spend the holiday with his family. This is the third straight Christmas the Rabbi has filled in for Hunt. The previous 6 years, Rabbi Weinburg did the same for the Roman Catholic Police Chief of Reno, Nevada. From the associated Press, Americans watch Pope Paul celebrate Christmas Mass in Italy and Europeans viewed a Christmas greeting from Apollo 8 via the most powerful communications satellite yet sent aloft. The news of Pope Paul and the Apollo 8 crew Tuesday night were the first to be relayed across the Atlantic commercially by Intelsat III, which was launched from Cape Kennedy last Wednesday. That's the one we saw go.

SC Roger. I remember that.

CAP COM Intelsat is a 63 nation international communication consortium, provides a chart on the first global communications network. The new satellite is scheduled to begin full commercial service on January 2, initially serving North and South America, and Europe. Further coverage of the Apollo 8 mission is to be relayed to Europe this week. From Washington. This Christmas the world is brightened with the hope of peace. When it comes, when hope turns to substance and the guns are quiet once again, it will come because you have pursued it with courage and skill. This was a message from President Johnson to the Armed Forces on Christmas. Here is a feature by Harry Rosenthal of Associated Press. It says: from Houston. Two Santas brighten the Christmas Eve for 2 year old Jeffery Lovell. The first one knocked on his front door and brought presents. The second started his daddy home from the moon. The first wore a red suit and a white beard and ho, ho'd loud enough to be heard down the block. The second was a huge engine sending flame behind the moon and thousands of people were awaiting word that it had fired. "Please be informed that there is a Santa Claus" were the first words from Apollo 8 as it emerged from radio silence to inform an anxious world fifteen minutes after the fact that the engine had performed

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its critical burn. None of us ever expect to have a better Christmas present than this one, said Ken Mattingly of Mission Control. Thank everyone on the ground for us. You know we couldn't have done it without you, came the reply from Col. Frank Borman, the spacecraft Commander. At this point a Christmas Tree came aglow in front of the consoles in Mission Control and Astronaut Harrison Schmitt read a space version of "A visit from Saint Nicholas." to the crew. "Twas the night before Christmas and way out in space, the Apollo 8 crew had just won the moon race", it began. The Mission Control Crew had delayed the celebration until Jeffery's daddy, Navy Captain James Lovell, along with Air Force Major William A. Anders and Col. Borman were safely on their way home. Any other Christmas Eve The families of the astronauts would have been in church for Christmas services, but this year they were all glued to their television sets. The homes all near the Manned Spacecraft Center were decorated. The lawn around the Lovell home and throughout his community of Timber Cove were lined with Mexican style luminario, and the four Lovell children came out to light them about 7:30. They were just in time. At 8:00 a car drove up carrying a tall Santa Claus with a large sack on his back. He ho ho'd up to the door and knocked loudly. It opened, and there stood Jeffery Lovell who will be 3 on January 14. Jeffery recoiled at the sight. His mother held him up and Jeffery clung to her still shying away. Last year he ran away crying said his 15 year old sister Barbara. Earlier she had to run after him to prevent his blowing out all the lumenarios. The other Lovell children, 13 year old James, 10 year old Susan watched with great amusement. Finally, the Santa and the children disappeared into the home and put the presents under the tree not to be opened until today. Mrs. Lovell prepared egg nog and cookies for the guests and they watched a 25 minute televised tour of the moon conducted by the three astronauts. Later friends took Mrs. Lovell, Barbara, and Jeffery on a tour of the neighborhood brightly lighted for Christmas. Above them in a clear sky, a quarter moon shone brightly, and the three astronauts, more than any other men have seen the fruits of creation, pause in their scientific exploration there to beam to the earth the majestic words from Genesis. "And God created the firmament heavens, and God called the dry land earth, and God saw that it was good."

SC Thank you Jerry.

CAPCOM *Lovell* We have a newspaper coming in after while, we will give you a little more news later.

SC Thank you, Jerry, that's nice. *Borman* we have chlorinated the water and we're changing the canister now.

switch!

↑ Lines omitted to p. 63 p. 10

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 951700 CST 6;08 a 303/3

CAPCOM Roger, Frank. Copy. Would you put the biomed switch to the left. We would like to get a crew status report on Jim and Frank when you get a chance.

SC Both Frank and myself had a meal before bed last night, and I believe that we had about 20 clicks of water, and a good night's rest. We're just getting up.

PAO Apollo Control, Houston. As you heard, Bill Anders, just before retiring, requested and received permission to take a short acting sleeping pill. Borman and Lovell now up, listened to their early morning deep space newscast. After Jerry Carr completed his newscast to the crew, Flight Director Glynn Lunney grinned and said quote there's a new item on the wire Jerry, they want you to take a job in New York as a newscaster. And so at 95 hours 27 minutes into the flight of Apollo 8, this is Apollo Control, Houston.

END OF TAPE

316-328 missing
to 316/1

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 960000, CST 6:51a 304/1

PAO This is Apollo Control Houston at 96 hours into the flight of Apollo 8. The Apollo 8 spacecraft at this time is 187 043 nautical miles away from earth. Its velocity is relative to earth now reads 4063 feet per second. During the past 20 some odd minutes, we have had a couple of conversations with the Apollo 8 crew and we are going to pass those on to you now.

SC Jerry, this is Frank. Do you have any further word on our trajectory and how the charging looks?

CAPCOM Roger. Stand by Frank. We will give you an update. Apollo 8. Houston. We are looking at a midcourse correction some 104 hours of about 5 feet per second. Your tracking is real good. We got you in the center of the corridor and on target.

SC Understand. 5 feet per second at 104 hours.

CAPCOM That's affirm. Frank, did you get the word that we deleted the P52 at 96?

SC Roger. Do you mind if we go ahead and do it now?

CAPCOM Negative. We've deleted it. Your drift rates are small that you don't even need to unless you want to do it.

SC Okay, we won't.

CAPCOM Roger. Apollo 8. Houston.

SC Go ahead. Houston.

CAPCOM Roger Frank. In 3 minutes we are handing the control from Honeysuckle over to Madrid. Over.

SC Thank you.

CAPCOM Roger.

SC You are loud and clear now.

SC Roger. This is Frank. Do you read me?

CAPCOM Roger Frank.

SC Okay, I wasn't sure we were in wide enough ...

CAPCOM Apollo 8. Houston. If you don't need the computer, we would like to have you call out Verb 64 ENTER so that we can do the BD antenna switching from the ground. Over.

CAPCOM Apollo 8. Houston.

SC Go ahead.

CAPCOM Jim, if you don't need the computer, would you call out Verb 64 ENTER and we will take care of the antenna BD switching down here. Over.

SC Roger. Do you read us in an automatic maneuver and then get on back to PTC attitude.

*Radio Havana rebroadcast VOA 305/1
funny 305/1
Neil is laughing? 305/2
~~missed EVA?~~ 311/1 see 311/1, funny*

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 960000, CST 6:51a 304/2

CAPCOM

Roger.

PAO

This is Apollo Control Houston. This 5 feet per second midcourse correction at 104 hours is performed perpendicular to the radius vector or roughly this would be perpendicular to the flight path. So at 96 hours 4 minutes into the flight of Apollo 8, this is Apollo Control Houston.

END OF TAPE

Besaranov

Tape 64, p. 3

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 963436, CST 7:24am 305/1

PAU . . . 180 675 nautical miles away from earth. Its velocity relative to earth now reading 4 thousand 71 feet per second. During the past several minutes Jerry Carr has been passing along the second edition of the deep space news roundup and that along with some early conversation we will play to you now.

CAP COM Apollo 8 this is Houston. All your systems looking good.

SC Apollo 8.

CAP COM Roger, Frank I got some more news paper if you would like to hear it.

SC I would enjoy it.

CAP COM Roger. We will start out with the world news. On page one of the Houston Post. Praise for Apollo 8 Astronauts and hopes for international cooperation in space exploration with the world wide Christmas Eve messages as the tiny spaceship orbited the moon. Even in the Communist world there was enthusiasm for mans first voyage to the moon. In Moscow Soviet Scientist Anatoly Blagouravov recall his country and the United States shared space knowledge before and predicted the Apollo 8 flight would lead to more cooperation. In Cuba, Radio Havana re-broadcast the voice of America program to tell the listeners of the Apollo 8 speech. Voice officials said it was the first time that any of the U. S. agency's programs had been carried by Havana Radio. Czechoslovakia saw the moon flight through extensive a television coverage and in Budapest, Hungary, people talked of little else on the trains and busses. In a non-communist world office

workers and Christmas shoppers held their breath as the spacecraft was readied for the blast toward earth. Frenchman in the street praised American knowhow and the space feat and some viewers watch television lunar photos cheered magnifiqu. In London swarms of Christmas shoppers crowded into shops and pubs to watch the photographs of the moons crater's. Britian's foremost space astronomer Bernard Lovell, who until a few weeks ago criticized the Apollo 8 project on the grounds that instruments could do the job without risking the lives of the astronauts. made it clear that he was deeply impressed by the moon flight. Pope Paul the forth said honor to those pioneers of the extension of man inlect and activity. There were only a few scrooges that Phoo Phoo the Christmas voyage however, the most notable was Samual Shenton sectary of London's Flat Earth Society. He said, the public is being balihooded, taken for a ride. How does that grab you, Frank?

SC It doesnt look to flat from here, but I don't know but maybe something is wrong with our vision.

CAPCOM Roger. Where else in the world news the

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 963436, CST 7:24 am 305/2

Pueblo crew landed at NAS Miramar yesterday afternoon at 1400 and they will spend a few days there in Balboa hospital with their families celebrating Christmas. On the local scene here the retail merchants association has announced that Christmas gift exchange policy is going to be the same as this year as it was last year, that is, very liberal. Ah, fellows we will be glad to replace any broken items that you might bring back too, but ah, sorry there won't be any cash refunds.

SC Thank you. *Takes!*

CAP COM Another little bit of local news the County Court House at Huntsville burnt down before dawn yesterday so it looks like they will go in the construction business there again. On the feature page, got a little bit about the waiting families. This one is by Ann James, post reporter. We rest on the back side of the moon said Valarie Anders, Christmas Eve, as she and her family waited for Apollo 8 to get out of moon orbit and head back toward home. Mrs. Anders had been up since 2 am Tuesday and neighbors just collected all the youngsters so the family could get some rest while the spacecraft was behind the moon and out of communication. Col. Frank Borman's home was decorated with four big evergreen wreaths outdoors and sprinkled with powdery snow and decorated with red bows. A tree in the den awaits his safe return and his pretty blond wife sue and husky son Frederick, and Edwin, plan to stay home for the midnight blast out of moon orbit. Ordinarily they would attend midnight services at St. Christopher's Episcopal Church. Their plans were for the family to go to Christmas day Services at 7:00 am. Since there are no young children in the Borman home, family Christmas gift giving will simply wait until Col. Borman comes back with his fantastic holiday gift of the flight to the moon and back. Marylyn Lovell's four youngsters will have an absolutely normal Christmas as far as the kids are concerned as the wife of Capt. Lovell reported. But talking about presents was out the because two of them ^{was} sitting right there next to her. I haven't even had time to change my clothes that I wore last night, Mrs. Lovell said. I adult to adult gifts, however, and the tree will still be right there when Lovell comes home. Here is a good one on the action line. There is a little letter to the action editor. We intended to pay you earthlings a surprise visit by flying saucer last night. We got scared off by some crazy antics of a fat man and a sleigh and three guys in a rocket powered bucket drag racing around the moon. Is that any way to run a planet. Signed, the boys from mars. Frank, it looks like the only people around here unimpressed by the Apollo 8 is the stock market. Its 30 industrials are down 1 point 43.

SC Neil will be crying

Cap Com Laughter, yea you bet. On the sports age not to much activity, ; UCLA is tops in both

amusing

asth

yes - says John McLean

basketball polls. Have you got any particular one you want to ask about? Let me know and I'll tell you if they are in the top ten on either poll. As far the North the college all Stars game that is going to be played tomorrow is concerned the North is a slight favorite over the south. Ara Parsegian is the coach of the North's team and he's got six of Nortre Dame troupes working for him, so they ought to be pretty tough. The coach of the South team is Frank Howard of Clemson. He say's it ain't easy, he quips, to build a team in four days to play Notre Dame. Another little item of interest in the Sports page is Woody Hayes of Ohio State was named head coach of the year by the football's writers association. Well that's about it. Any questions?

SC No thank you very much Jerry.
CAP COM Okay Frank..
SC Jerry you can do this every Sunday.
CAP COM ~~Do you want me to read you the funnies.~~
SC No, Thanks.
CAP COM Did you get the word that Fred made all district football team? *Borman?*
SC Yeah thank you, I heard about that before lift off..
CAP COM Yeah, I thought you heard about that.
Now back to the work, today we need a cryo fan cycle from you.
SC We're starting right now
CAP COM Roger
SC Houston, Apollo 8
CAP COM Apollo 8, Houston, Go
SC Jerry in a little while I would like to try out little P37 excerise based on minus MA just work one through and maybe we can a get a solution from the ground and then we can compare them.
CAP COM Okay Jim. Retro says they are ready to copy.
SC Tragic (?)
That performance at LOI was abosolutely fantastic, you all really came in on the money I just couldn't believe it.
CAP COM Roger, That kinda surprised us too.
SC Oh OH Hope you're not getting that close to the earth. We got another quarter in here you know.
CAP COM We havent cleared yet.

End of TAPe

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET964436mCST 7:34 AM,306/1

CAPCOMM We haven't quit yet.
SC Okay. Houston, Apollo 8.
CAPCOM Apollo 8, Houston. Go.
SC We'd like to (garble) *use the computer now*
CAPCOMM Roger Jim, it's yours.
SC If you can switch them down there without
(garble) well go ahead and do it.
CAPCOMM We'll give it a whirl, Frank.
SC Okay. (Garble)
PAO This is Apollo Control, Houston at
96 hours, 45 minutes into the flight of Apollo 8.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET972000, CST 8:10 AM, 307/1

PAO This is Apollo Control, Houston at 97 hours, 20 minutes into the flight of Apollo 8. The Apollo 8 spacecraft is now 183,882 nautical miles away from earth. At the present time, the velocity of Apollo 8, relative to earth reads 4085 feet per second. Although Apollo 8 won't reach the earth's sphere of influence until it's ~~175,528~~ nautical miles away, our displays here in the Mission Control Center and this includes the world map, are referenced to the earth. The velocity, for example, while decreasing relative to the moon, is shown on our display as increasing relative to the earth, but it's a creeping increase, we must admit - at this point about 1 nautical mile every 3 minutes. At present aboard Apollo 8, Jim Lovell has been exercising the G&N computer and Program 37, this being the return to earth onboard program, and what he has been doing here is working with the onboard system and figuring mid-courses for return home. The Manned Spaceflight Network, of course, is the prime and the actual numbers used. We've had some conversation with Apollo 8 over the past 20 minutes or so, and we'll play that back.

SC Roger, thank you Frank.

CAPCOMM Apollo 8, this is Houston with battery status report.

SC Roger.

CAPCOMM At 96 hours EEP, battery A has 38.95 amp hours, battery B has 36.35 amp hours, Battery C has 38.46 amp hours. Your total 113.76 amp hours. At 97 plus 50 Battery A will be fully charged and will have 40 amp hours and you can terminate charge at that time. Over.

SC At 97 50.

CAPCOMM Roger.

SC We'll give you back Verb 64 Houston.

CAPCOMM Apollo 8, Houston, say again.

SC We gave you back Verb 64, now why don't you guys in guidance figure out corridor correction at 114 hours for us with a minus 648 cabin.

CAPCOMM Okay Jim, we copy and now let's see, we have the Verb 64 back. We'll be back with you in a minute.

PAO Apollo Control, Houston. Right now aboard Apollo 8 cabin temperature reads 78 degrees which is a bit warmer than on the trip out to the moon. Also, we've just been handed our first weather advisory for the prime recovery area, and this reads as follows: that the space-flight meteorology group advises that weather conditions in the planned landing areas are expected to be satisfactory for

APOLLO 8 MISSION COMMENTARY, 12/25/68,GET972000,CST 8:10 AM, 307/2

the next 3 days. Both ocean areas should have partly cloudy skies, moderate winds, seas 3 to 4 feet and the temperature from 78 to 82 degrees, scattered showers are forecast for the Pacific area. So at 97 hours, 24 minutes into the flight of Apollo 8, this is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 980000, CST 8:51A, 308/1

PAO This is Apollo Control Houston at 98 hours into the flight of Apollo 8. Apollo 8, at the present time, is 182 270 nautical miles away from Earth. Current velocity relative to Earth now reads 4100 feet per second. We've had some conversation with the Apollo 8 spacecraft, specifically with Jim Lovell. We'll pass that along now.

CAPCOM Apollo 8, Houston. Over.

CAPCOM Roger, we have a comparison now on your P-37.

SC Roger.

CAPCOM Okay, based on your vector, the TMC vector, the ground computes 15.3 feet per second on a mid-course. VEI at 36 221, a gamma EI of minus 6.51 so it looks like your P-37 program is pretty good. Applying your P-37 solution to our vector, however, we get a gamma EI of minus 10.32. We expect these two solutions converge with a little more tracking and after you get some Earth horizon sightings. Over.

SC Roger. How valuable do you think that the lunar space (garble)

CAPCOM Apollo 8, Houston. Repeat your question please.

SC Roger. I was getting curious of the value of onboard tracking in the big P-23 course to the Moon, in regard to the distance tracking that close to the Moon. I think there might be a trail-off for onboard navigation and I think it might be better than distance tracking.

CAPCOM Roger. Stand by.

CAPCOM Apollo 8, Houston. Roger. I guess the experts would say that the ...data was probably best based on the number of sightings that you have taken. However, that's going to be the subject of quite a bit evaluation, I think, after the mission. Over.

SC (Garble)

CAPCOM Roger, Jim. Be advised that we are beginning to read you very weak and with a rather loud background noise.

SC Understand (too weak)

CAPCOM Apollo 8, Houston, How do you read now?

SC I'm reading you loud and clear.

CAPCOM Roger. Still reading you weak but clearer.

CAPCOM Apollo 8, Houston. You can turn off the battery charger. Over.

SC Roger. Will do.

PAO This is Apollo Control Houston. What you've heard was the ground via Jerry Carr talking to Jim Lovell aboard the spacecraft Apollo 8 critiquing the P-37

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 980000, CST 8:51A, 308/2

return-to-Earth onboard computer program. Meanwhile, here in Mission Control, we have switched our space digitals display to reference the Moon again. Relative to the Moon, our altitude shows that we are 26 049 nautical miles away from the Moon, at the present time. And our velocity - this is velocity relative to the Moon - reads 4871.6 feet per second and 98 hours 5 minutes into the flight of Apollo 8, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control, Houston at 98 hours, 21 minutes now into the flight of Apollo 8. Our space digital displays now again referenced to the earth. Our distance away for Apollo 8, distance away from the earth at this time 181,428 nautical miles. Current velocity relative to the earth 4108.5 feet per second. Capsule Communicator Jerry Carr has just passed along family Christmas messages to two of the Apollo 8 crew members, Jim Lovell and Frank Borman, and we'll let you listen.

CAPCOM Apollo 8, Houston. Roger, is this Jim? Roger Jim. Christmas morning around your house was kinda quite, says Marilyn. She says they are all thankful the mission has gone so great. They missed having you around the tree this morning but they wanted to reassure you that your presents are waiting. The roast beef and yorkshire pudding will be on the table when you get home.

SC Oh, roast beef and yorkshire pudding.

CAPCOM Yeah, man. Is Frank listening?

SC Frank's not on the line yet. He will be shortly.

CAPCOM Okay. How about Bill, is he still asleep?

SC Bill is still asleep.

CAPCOM Okay, have Frank give me a call when he is ready. I have a message for him too.

SC Okay. Sounds good. How is your Christmas, Jerry?

CAPCOM Real good, Jim. Santa Claus struck last night before I came in here on the shift and I guess we will finish off the unwrapping this morning when I get back.

SC He was looking for a chimney on 103 here but he didn't see any.

CAPCOM You could have left the hatch unlocked for him.

SC *I'll think about that.*
I didn't think about that.

CAPCOM Think real hard, Jim. EECOM says he could have slid down the steam duct.

SC Sounds good, about that time Bill was boiling water.

SC Hey, Jerry, this is Frank. What's up?

CAPCOM Hi Frank. Christmas morning was calm at the Borman house. And the boys and Susan, and your Mom and Dad all send their love. They say for you to stay in there and pitch. Over.

SC Okay, thank you. Please reciprocate for me.

CAPCOM Sure will Frank.

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APOLLO 8 MISSION COMMENTARY, 12/25/68, GET982100, CST9:12 AM, 309/2

CAPCOM Frank, when Bill wakes up, give me a
holler. I've got a message for him too.
SC Houston, Apollo 8.
CAPCOM Apollo 8, Houston, go.
SC Roger. Are the guidance boys busy this
morning?
CAPCOM They say they are.
SC I just worked outa NAV ... to move my
landing logitude 6 degrees. east. I just want to compare
with what they've got based on the same burn time (garble)
14 hours, based on the bias impact longitude determined from
the P37 which is wrong. I'm indicating that I'de get a
600 foot per second Delta VC burn plus and my Delta VX changes
to a minus 11.6 feet per second. I'd like to have that
verified if I could.
CAPCOM Roger Jim. Stand by and I'll see if they
copied all that.
CAPCOM Apollo 8, Houston
SC Go ahead.
CAPCOM The voice isn't too great right now and
the guidance troops didn't get all that. How about waiting
about 2 or 3 minutes, we'll flop on the antennas and we
should get good voice transmission from you and then repeat
it would you please.
SC Roger.
CAPCOM Okay.
CAPCOM Apollo 8, Houston. How do you read? Over.
SC Loud and clear.
CAPCOM Roger. We're reading you much better now.
Jim can go ahead with his transmission to the guidance troops.
They have one question before he starts. They would like to
know what his view (garble) was at 114 hours. Over.
SC Roger. Wait one. The ... at ... was
plus 07972.
CAP Roger. Plus 07972. Apollo 8, this is
Houston. We are ready to copy your data when you are ready.
Over.

APOLLO 8 MISSION COMMENTARY, 12/25/68,GET982100,CST9:12 AM,309/3

SC Okay Houston. Based on the P37 with
minus.. solution, I got an impact longitude of minus 160.95.
I biased it to get an impact latitude - longitude of 163.75.
I wanted to change my impact point 30 degrees to the east
and I tried to determine what my ... burn primers would be
to do this and I got a Delta VX burn of minus 11.6 and a
Delta VC of plus 600. Delta VY is zero. So that changed
my previous Delta VX burn from minus 50.2. I just want to
know if that meets with their approval.

CAPCOM Roger Jim. We copy and will run it
through the mill and give you an answer.

PAO Apollo Control, Houston, at 98 hours,
28 minutes into the flight of Apollo 8.

APOLLO 8, MISSION COMMENTARY, 12/25/68, GET 985700 CST 9:48am 310/1

CAP COM This is Apollo Houston at 98 hours 57 minutes into the flight of Apollo 8. The Apollo 8 spacecraft now 179 989 nautical miles away from earth. Current velocity relative to earth 4124.3 feet per second. Capsule Communicator, Jerry Carr has passed along some flight plan update information to Apollo 8 and we will listen to that now.

CAP COM Apollo 8, Houston

SC Go ahead, Houston, Apollo 8

CAP COM Apollo 8, This is Houston with a flight plan update.

SC Go ahead.

CapCOM Roger. At 100 hours 30 minutes change star number 02 from one set to two set. Over.

SC Roger. ~~Stars 02 from one set to two set~~

CAP COM Roger. Also set number 2 change star number 11 to star number 7. Over

SC Roger. 11 to 7.

CAP COM Roger Then after star set number 3 initiate PTP again Pitch 10 Yaw 45. Over

SC Pitch 10 Yaw 45

CAP COM Roger. At 101 hours 30 minutes delete the earth horizons settings. Over

SC 101 30 delete the earth horizons settings.

CAP COM That's affirmative. The folks here are evaluating the thermal situation looks like you will be out of PTC rather at an extended period of time. That's the reason we have you initiating PTC again there around 101 as soon as you finish those three star sightings. We are still working on the buff about the next ten hours. after 100 hours we are looking at the thermal situation and the star sighting situation and we will be giving you more update later on. Over.

SC Roger. We really don't have a thermal problem at all now. All indications here are normal.

CAP COM Roger. Everything looks okay, just trying to look down the track away.

SC I've often look down that way too.

CAP COM Roger.

SC ...

CAP COM Okay. Apollo 8, Houston.

SC Go ahead, Houston.

CAP COM Roger. Frank would like to talk to you a minute or two about the auto funny you have been seeing throughout the nation. Over.

SC Go Ahead, Houston

CAP COM Roger. The problems you have run into so

Opine's

tape 66 / p 2

APOLLO 8 MISSION COMMENTARY , 12/25/68, GET 985700 CST 9:48am 310/2

CAP COM far are due to some unknown source, probably EMI alike loading your T and C trunion cell it's now 91, So it really doesn't represent your true training angle. Now this loading problem we don't feel implies any decrease in the realibility in your C and C at all. We think that the best way circumvent the problem is to cycle the optic zero switch to off and then on prior to using the optic switch to any purpose. And with that procedure I think you probably went have any more problems. Over

SC Roger. Jerry I notice one difference in REFS band and first we have trouble with and we got..... Notice in the first ... anomal option that was the very same procedure that ...

SC Roger. JCopy.

PAO Apollo Control Houston, Apollo 8 is a bit over 4000 thousand nautical miles away from that point in the flight pad. Will be recaptured by the earths ... influence. So at 99 hours 1 minute into the flight this is Apollo Control Houston.

End of tape

APOLLO 8 MISSION COMMENTARY, 12/25/68,GET993500,CST 10:25AM,311/1

PAO This is Apollo Control, Houston, at 99 hours, 33 minutes into the flight of Apollo 8. Apollo 8 now 178,529 nautical miles away from earth. It's current velocity relative to earth is now reading 4141 feet per second. We've had some conversation with Apollo 8, since our last report, and we'll play that now.

CAPCOM Apollo 8, this is Houston. We are to come back on your entry navigation calculations. Over.

SC Go ahead.

CAPCOM Roger. We went through the charts and got exactly the same answer as you got. Looks like your procedure is very good. Looks like .. a real good head, you remembered to average out the velocity. We also went ahead and computed the problem to verify the chart and got a good solution. Over.

SC Roger. Thank you very much.

CAPCOM You're welcome.

SC Now if we can get our state pictures to agree, we'll be in business.

CAPCOM No sweat.

CAPCOM Apollo 8, Houston. Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger, Frank. Is Jim listening?

SC Listening.

CAPCOM Roger. On your question about the option. Program 40 fits the preferred flag,...the next P52 will come up option 1, subsequent alignments after that come up option 2. Over.

SC All right. We understand. So 40 will have to come up with a (garble) burn with an option (garble)

CAPCOM Roger. Now concerning your restart that happened in Lunar orbit, for the peace of mind of the computer people, and the MIC folks, we have a question. Did Verb 34 enter to a flashing Verb 51 and P22 caused a restart. Over.

SC That sounds like it was it.

CAPCOM Roger. Thank you Jim.

SC That must be a "no no".

CAPCOM Yes Yes, that is a No No.

SC That almost caused an unscheduled EVA too.

CAPCOM Apollo 8, Houston. Biomed switch center.

Over.

SC 3,2, 1, MARK.

CAPCOM Roger, Your MARK.

PAO Apollo Control, Houston. You heard conversation exchanges between Jerry Carr here at the Mission Control Center and both Jim Lovell and the spacecraft commander, Frank Borman. Bill Anders apparently must still be in a rest period. So at 99 hours, 36 minutes into the flight of Apollo 8, this is Apollo Control, Houston.

66/4

APOLLO 8 MISSION COMMENTARY, GET 100:12:00, GET 11:03 AM, 312/1

PAO This is Apollo Control, Houston, at 100 hours, 12 minutes into the flight of Apollo 8. Apollo 8 is now 176,166 nautical miles away from earth. Our current velocity reading relative to earth is 4161 feet per second. Let's hark .. back to one of our earlier air to ground discussions, an earlier reference to restart and unscheduled EVA involved a bit of banter on the part of spacecraft commander, Frank Borman. Apparently yesterday in Lunar orbit, Jim Lovell working with his computer, got one of his verbs or nouns a bit twisted. The computer reacted predictably by giving a restart. This came as unexpected event to the crew. Frank's reference in a jesting manner indicated that they felt a moment or two about tossing jim out. We've had additional conversation with the crew since the last report and we'll play that now.

CAPCOM Apollo 8, this is Houston. It is about time for us to start keeping track of some command module RCS temperatures, so when you get a chance, we'd like the reading now, and we'll try to repeat it about every 8 hours or so.

SC Okay, we'll get them for you right now.

CAPCOM Roger.

SC You want the motor off the test meter, right?

CAPCOM That's affirmative.

SC The 5C is (garble) high.

CAP Roger, 5C (garble) high.

SC D high.

CAPCOM Roger, D high.

SC (garble) 5D, 6A is high, 6B is high, 6C is 5 volts, 6D is (garble) high.

CAPCOM Apollo 8, Houston. Roger, Understand 5C and 5D are pegged high, 6A and 6D are pegged high, 6 Charlie is 5 volts, and 6 Delta is pegged high. Over.

SC That's roger.

CAPCOM Apollo 8, Houston.

SC Roger, go ahead.

CAPCOM Apollo 8, Houston. We're showing quad A running a little bit warmer than the other quads. If you remember, I mentioned before we were coming into a period of time here where we were going to spend a lot of time with no PIC going. We'd like for you to try to favor quad A if you can, in the shade and do whatever you can to keep that temperature from getting out of hand. Over.

SC Roger, I'm only reading 121 on quad A.

CAPCOM Roger.
SC Quad C is the highest temperature we have. 122.
CAP Roger, Frank. We are more interested in the tank temperatures than the quad temperatures. Over.
SC Roger, I understand and listen, if you think it is that important, will just keep PTCing it and not do anything.
CAPCOM Negative. It no sweat right now. We're watching it and we just wanted to let you know that this thing is being looked at. If we get anywhere near a situation where we feel we ought to change, we'll go back to PTC or cool it.
SC Roger, thank you. We'll do our best but it is kind of hard though, you are sort of subject of ... geometry. Where ever the stars and the moon happens to be, that's where you point.
CAPCOM Roger. We understand. We're going to keep an eye on it down here and we'll keep you appraised.
SC Thank you.
CAPCOM Apollo Houston.
SC Houston, this is Apollo 8.
CAPCOM Roger, pass the word to jim that on these MARKS that are coming up, it is pretty important that he remember to record his Delta R and Delta V and trunnion. We are working low bit rate down here, so we're not going to be able to record that data from here. Over.
SC We are recording them all.
SC Houston, Apollo 8. Did you read that we are recording all the Delta R and Delta V and trunnion.
CAPCOM Roger. (garble)
SC Jerry, this is Apollo 8.
CAPCOM Roger, go ahead.
SC It looks like we have directly ahead on top of us.
CAPCOM Roger, we understand but tank temperature is holding steady, so we are alright.
PAO This is Apollo Control, Houston. The reference to quads that dealt with the reaction control subsystem engine quads. From the ground we had a reading, or have a reading, from quad A which indicates that it is a bit above the temperature level of the other quads, some 7 degrees. We will be watching this and taking steps to balance the temperatures. So at 100 hours 17 minutes into the flight of Apollo 8, this is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1010400 CST 11:51 313/1

PAO This is Apollo Control. Houston at 100 hours 54 minutes into the flight of Apollo 8. The Apollo 8 spacecraft at this time is 175 220 nautical miles away from earth. At 100 hours 47 minutes 47 seconds the Apollo 8 spacecraft with its crew passed back into the earth's sphere of influence. It's current velocity relative to the earth currently reads 4184 feet per second. At this time we are in the process of undergoing a change of shift. Clif Charlesworth and his team now coming aboard. Since our last report we have had several transmissions from the crew and we are going to play those for you now.

CAPCOM Apollo 8, Houston. Over.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger, Frank. The helium tank temperature that we are watching on quad A has only gone up 1 degree in all this work that you are doing. So, we don't consider it to be to terribly serious. What we would like to do, as soon as you finish this P23 work, is rather than go back into PTC let's just roll her over 180 degrees and put quad A on the cool side, and hold it that way until your next activity comes up which is around 102 30. Over.

SC Okay. Fine.

SC it should be getting cool now, Jerry.

CAPCOM Roger, Frank. So far we haven't seen the temperature curve back down again. We expect to see it though.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston. Go.

SC Roger. Give us the word when you want us to maneuver back here before that time that you (garble).

CAPCOM Wilco.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Roger, Frank. We have some data that was missed on your P23. We'd like you to read it down to us if you have time.

SC Roger, we will in just a minute.

CAPCOM Roger.

SC Go ahead. What do you want?

CAPCOM Roger. On star number 2, the sixth mark, we missed delta R and delta V.

SC Sixth mark, that's - did Lovell pay you to do this? Come on Carr, come clean. Did he ask you to ask for this?

CAPCOM Who?

SC Jim Lovell.

CAPCOM Negative. We really missed it.

SC It's all zeros and all zeros.

CAPCOM Roger. All zeros, all zeros. Okay,

67/2

on star number 7, we lift the trunnion on marks 1, 2, and 3.

SC On 1, trunnion was 03235. On 2, it was 03240. On 3, 03241.

CAPCOM Okay, Frank, and then the last one is on star number 1. We missed the trunnion on mark 5.

SC 04064.

CAPCOM Roger. 04064.

SC Righto.

CAPCOM Thank you, Frank.

SC You're welcome, Jerry.

CAPCOM That Lovell is getting pretty proficient. ✓

SC Not bad.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Was that last number you read down to me mark 2 on star number 1?

SC That's right, star number 1, mark 2.

CAPCOM Roger. Thank you. Now that one got you on guidance.

SC Okay.

PAO Now this is Apollo Control Houston.

Since the black shift is shortly leaving duty, we thought at this time that we would summarize the activities that we saw during this 9-hour period. When Glynn Lunney's black watch came aboard, we were very pleased to see a Christmas tree, a lighted Christmas tree here in the Mission Control Center which we understood was placed up sometime following the transearth injection burn. The shift itself was one of relative quiet. When the black team of controllers took over, Bill Anders was awake. During most of the period, the spacecraft was flying in passive thermal control attitudes. Shortly after taking over, we placed several calls in the blind to the spacecraft. This was not a matter of concern. In fact, it was more a matter of curiosity since we were receiving telemetry solid in getting to the spacecraft very easily with commands. The solution came when the ground reached Bill Anders and it turned out that the situation was probably one of a loose connector. Shortly thereafter, spacecraft Commander Frank Borman and Jim Lovell awoke. And Anders took a short-acting sleeping pill and retired. We passed along a flight plan update to the crew that put the first midcourse correction at 104 hours with a delta V of 5 feet per second. This burn of a very short delta, a very small delta V, we should say, is formed perpendicular to the radius factor and this would make it roughly perpendicular to the flight path itself. A little later, Jerry Carr, our Capsule Communicator, tried his hand

APOLLO 8 MISSION COMMENTARY,12/25/68,GET 1010400,CST 11:51A,313/3

again as a newscaster and, in fact, passed up a couple of newscasts during the period of little activity. One based on wire service copy, the other based on a copy of the Houston Post. Then Command Module Pilot Jim Lovell, exercised a computer program. Computer program number 37, the return-to-earth program onboard to practice onboard computations for midcourses. There was considerable conversation played back and forth between the Mission Center and the spacecraft regarding this activity. A little later, Jerry Carr relayed the family Christmas messages to Frank Borman and Jim Lovell who were awake at the time. Bill Anders undoubtedly will receive one later when it's established that he is awake. As we mentioned earlier, we reached the Earth's sphere of influence at 100 hours 47 minutes 47 seconds, only a short while ago. Although this event took place only a short while ago, most of the morning as we viewed our space digitals display, we were reading them in terms of Earth reference. And the latter part of our shift, Jim Lovell worked again with the computer. On the onboard guidance and navigation system, we should say rather. In program 23, the cislunar navigation program. As you heard toward the latter part of the shift, we started looking at temperatures on quad A of the reaction control system. And the temperatures in the service module reaction control system quad A have been running about 10 plus degrees warmer than in the other three quads. In order to maintain balance temperatures between quads and to avoid reaching any thermal limits in the propellant tanks, propellants the spacecraft just shortly before our flight control team went off duty . . .

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1005400, CST 11:41A, 314/1

it was maneuvered to place quad A on the shady side. When it will be maintained in this attitude until our next period of work activity emerges. So, at this point, with no news conference or change of shift schedule, change of shift briefing scheduled, Flight Director Glynn Lunney would like to extend to all visiting newsmen from all parts of the country a very merry Christmas. And at 101 hours 5 minutes 2 seconds into the flight of Apollo 8, this is Apollo Control Houston.

END OF TAPE

*Who said newsmen
don't like funny?
Mark Bloom?*

APPOLO 8 MISSION COMMENTARY, 12/25/68, GET 1011700 CST 12:08PM 315/1

PAO This is Apollo control Houston at 101 hours 17 minutes into the flight. and the Green team has taken over here at the control center. In the last few minutes we have noted down here on the ground temperature QUAD A are reaction control system 4-way motor on the Service Module called Quad A is showing a slight rise in temperature it's about 10 degrees above where it should be. The other Quads are running 70 to 75 degrees quad A is presently reading 86 degrees F. So we ask Frank to roll the spacecraft around and put Quad A in the shade for a while. Trying to bring that temperature down. We are going to watch it, as yet it has not dropped. Here is some conversation that we had with the crewman.

CAP COM Apollo 8, Houston you are back under our influence again. Over

SC Very good. Things started speeding up now uh.

CAP COM Roger. You have been in for about 20 minutes.

SC Very good. Jerry this is Jim.

CAP COM Go ahead, Jim.

SC Find out if the guidance group of a midcourse maneuver of minus 4.8 dextant daugher (?) 14 hours would be better than the 15 we're doing capable of first.

CAP COM Okay minus 4.8

SC Right

CAP COM We have already started checking on it Jim. I bet you think that P37 passed us.

SC Big brother is watching.

CAP COM Affirm

SC Houston, Apollo 8

CAP COM Apollo 8, Houston

CAP COM Apollo 8, Houston Go

SC I just wondered how Jim is doing.

CAP COM We have seen no improvement as yet Frank.

SC Alright here is a

CAP COM 86 degrees

CAP COM Apollo 8 Houston

SC Go ahead.

CAP COM Ah roger, Frank we are going to arrange a range sequence now? We would like to keep com on the net for about 3 minutes.

CAP COM Over

SC Very well

PAO This is Apollo control Houston, here at 101 hours 19 minutes into the flight and that brings us up to date.

End of TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1014000, CSI 12:31 PM 316/1

PAO This is Apollo Control Houston at 101 hours 40 minutes. The next television transmission is scheduled for 104 hours 15 minutes. In about 2 1/2 hours from now. Should make it about 3 o'clock Houston time. That's pretty close we will refine that a little later. The rise in quad A is that we noted earlier is not, is no panic situation at all. It's about 10 degrees above where we plot that it should be. We have rotated the spacecraft around held it on the dark side for awhile. And now the crewmen have been advised to go back to passive thermal control, that gently rolling, barbequeing kink of motion, to see what effect that has on the, Uh, Quad A still running about 85 to 86 degrees. Here is the conversation which as developed over the last few minutes.

CAP COM Apollo 8, Houston range sequence complete.
Over.

SC Thank you

SC Hello Houston, Apollo 8. How do you read?

CAP COM Apollo 8, Houston, loud and clear.

SC Houston, are you reading Apollo 8?

CAP COM Apollo 8, Houston loud and clear by me.

SC I wasn't reading you for a while, but I read you loud and clear now.

CAP COM Roger, Frank

SC I want to know what a range sequence desk ... was, Jerry.

CAP COM I was afraid you was going to ask that.

Stand by.

CAP COM Apollo 8 Houston,

SC Go ahead

CAP COM Roger, this range sequence is phenomena we get on down voice backup. In this mode the ranging and the voice share the same channels so we have to periodically check and make sure that they are not interfering with each other. Over.

SC Thank you. That's a very education.

CAP COM Roger. We are learning a little bit down here too.

SC I hope you are studying reentry.

CAP COM No we're fat on those Frank.

SC Roger.

CAP COM Apollo 8, Houston.

SC Go ahead, Houston

CAP COM Roger, Frank

We would like for you to go back into PTC now. Your helium tank temperature is still holding about the same. and

to 328/1

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1014000, CST 12:31PM 316/2

CAP COM We are going to try to PTC to you and things out. Over.

SC Okay

CAP COM Apollo 8, Houston

SC Go ahead Houston.

CAP COM Is Jim listening?

SC He's not here right now.

CAP COM Roger. Trying to let him know that we repaired his latest P37. And these vectors have converged to they are very, very close now.

SC Your saying that your state vector and our state vector are very close.

SC That's affirmative, Frank

SC Is that right Jerry?

Okay I'll start a thank you (?)

CAP COM Roger

CAP COM But don't let his head get big.

SC Don't worry, it would be impossible to live with. He always was pretty sharp.

PAO And this is Apollo Control Houston again we got a little quiet period here, so lets run through some of the charts this morning for this afternoon. The cabin temperature of the cabin pressure is 4.9 pounds per square inch. We are looking at a cabin temperature of 78 degrees and yesterday I think we ran between 79 and 77. Showing presently 29 pounds of waste water aboard. Have 37 pounds of drinking water which means a full tank. In our oxygen quantities well up there, oxygen tank one is 68 percent oxygen quantities in two is 68 percent. Hydrogen quantities is 52 percent in tank one and remaining 54 percent in tank two. Great shape there. Temperatures on the cryogenic oxygen is minus 174 for tank one and minus 187 tank two. and hydrogen tank one temperature is minus 413 degrees F Tank two minus 414 degrees. In the weight department, Apollo 8 continues to lose weight at a very dramatic pace. Cause before we went into Lunar Orbit just prior to our Lunar Orbiting insertion burn, we had something on the order of 63 000 pounds While orbiting yesterday, we were down to 45 000 pounds Today after our transer injection burn we were down to 31 739 pounds. And we will continue to see that reduce as we get closer to home and particularly when we drop that service module. just prior to reentry. So all in all in 101 hours 47 minutes this is that's our status this is Apollo Control Houston.

END OF TAPE

unseen: "Isaac Newton driving" 317/1
 Buzz's eye patch? 318/2
 fix these windows 318/3

were for the night 319/2
 funny 322/2
 quality of food 324/2 1/3

PAO This is Apollo Control, Houston at 102 hours 12 minutes into the flight. Frank Borman's family, his parents his wife, his two boys are in the Control Center and they just got a Christmas nod relayed to them from Apollo 8 by Mike Collins. Here's how the conversation went.

CAPCOM Apollo 8, Houston, say again.
SC Mike, we lost lock and Bill hit command reset to get the lock back on again, but you're welcome to the antenna.

CAPCOM Okay, Frank, thank you.
SC Houston, Apollo 8, over.
CAPCOM Apollo 8, this is Houston, go ahead.
SC Good morning, Michael.
CAPCOM Good morning.

SC (garbled)
CAPCOM Apollo 8, Houston, you've got a lot of back ground noise and about unreadable. We're trying to get a better OMNI. Apollo 8, Houston, how do you read, over.
SC Loud and clear.

CAPCOM Okay, you're loud and clear. Is this Bill?
SC Non other.

CAPCOM I got a message for you while you were asleep. Valarie said to tell you that she and the kids are leaving for church about 11:30 and eagerly awaiting your return. She said presents are magically starting to appear under the Christmas tree again so it looks like a double barrel Christmas, over.

SC You can't beat a deal like that. How was Christmas at your house today?

CAPCOM Early and busy as usual. I told Michael you guys are up there, and he said who's driving?

SC That's a good question. I think Isaac Newton is doing most of the driving right now.

CAPCOM Say again.
SC I think Isaac Newton is doing most of the driving right now.

CAPCOM Roger, we copy.

SC Give Valarie and the kids a Merry Christmas for me, Mike, and tell them I'll see them here in a while.

CAPCOM I sure will, and you might tell Frank that if he's got any messages his people are about 10 feet away.

SC He said bah hum bug. Howdy, how are you'll?
CAPCOM You've got a whole row of smiling faces in the back room, Frank.

SC Very good. Will they be proud of me, I'm using the . . . right now.

*Michael Borman Collins
Page 5
Free Mike Jr
Gaining the
Line
308*

*I thought
Borman
said this
No. 2
68/2*

Scrooge?

Ever-Jemie

APOLLO 8 MISSION COMMENTARY, 12/2⁵/68, GET 1021200, CST 1:03 317/2

CAPCOM
SC

Don't over do it.
I won't.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68. GET 1023000 CST 1:21PM 318/1

PAO Apollo Control Houston, here. 102 hours 29 minutes in the flight. couple of points we should mention for one Quad A the temperature that we reported earlier to peak up to 86 degrees now it's way down. Drop one degree it is now 85. And that drop has taken place in the past 15 minutes About 15 minutes ago into passive thermal control of a gentle slow roll did distribute the sun's heat evenly. Quad B is reading 71 degrees, Quad C 76 And Quad D like dog is 70. This temperature measurement comes from the helium tank which pressurizes the particular quad. We are planning a midcourse at last time 104 hours, 104 hours even. It will be burn of 5 feet per second. 5 feet per second. We're also planning a television acquisition at 104 hours 15 minutes which in relation to Houston time should be 3:06 pm central standard time. duration of the television pass is planned for 10 to 12 minutes. We do not know the content of the show and we have no schedule plans for it. Mrs. Frank Borman, who with Frank's parents and Frank and Susan's two sons just left the control center, forwarded a message this morning to Mrs. ^{Bucher} to Commander and his wife ~~Bucher~~ at the San Diego hospital, San Diego, California. The message is as follows: You have been in our thoughts and prayers. Your reunion has brought great joy to our hearts this Christmas. Our best to you personally to all the families under your command. Signed the families of the crew of Apollo 8. The message was composed and suggested by Mrs. Frank borman. It was forward by NASA Facilites this morning. We have some conversation with the crew and we will play it for you now.

CAP COM Apollo 8, Houston, Over.
SC Go ahead, Houston, Apollo 8.
CAP COM Roger. Quad Able helium tank temperature has dropped very slightly and it looks pretty good to us now.
SC Thank you, Michael.

I've got a procedure for Jim I would like to read up and it involves bringing the LM and the CMS state vectors to the earth servant ...

SC Alright, standby
CAP COM Okay
SC Getting his arrow now.
Whose procedure is this Michael?
CAP COM Oh its the agent of the opinions of our experts down here. I got it from Mr. Colossusdown at the MC.

SC Very good
I want make sure it was'nt an Aldrin special.

CAP COM I'm sorry you're broken up.

68/3

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1023000 CST 1:21PM 318/2

CAP COM " No sig say again.
SC Merry Christmas Bud.
CAP COM Yeah, Merry Christmas up there Jim.
I've got a procedure when your are ready to copy.
SC Okay. I just got a minute to set, just
let me get a pencil and paper and I will copy it.
CAP COM Okay
SC Okay Mike
CAP COM Okay, the purpose is to bring the Lm
and the CSM state vectors to earth trail of inflight.
Step one: Verb 37 enter 23 enter . Step two: At noun
70, at noun 70, load and register 1 and 2 3 and the following
numbers. 51, 0 0 0 0 2 register 2 5 .. register 3 0 0 2 1 0
Step 3: proceed on noun 70 coming up. Step 4: proceed
on noun 25 to 25. Step 5: Do not proceed on noun 18.
Wait for 30 seconds then do do verb 37 and enter zero, zero
enter, end of procedure. Over
SC Okay, As I understand that the reason
for this procedure is to bring the LM and CSM state vectors
back to the earth ... is that correct.
CAP COM That's correct.
SC Okay, to do it we convert 37 enter and
23 enter and noun 70 load and register one. 4 balls two
register 2 all balls and register 3 2 balls 210 Will proceed
on that 70 and proceed on 25 and will not proceed on 18
wait 30 seconds and we will do a convert zero zero enter ...
CAP COM That's affirmative.
SC I'm just kinda curious I thought this
was done for us. The computer took care of it so problem
CAP COM Roger, you're normally it is done automatically
Jim. Have you 23's exactly as schedule it would have been
but it's in doubt that P23 was stopped at 7 minutes (?)...
prior to the transition point and just had to be absolutely
sure that completely over.
SC Okay. Tell Buzz, I sure could use his
eye patch.
cap com Roger. I understand
.. ...
Sc ... end of the procedure now.
CAP COM That's affirmative Jim. Now at your
convience. Did you see guidance. Is the flag set? We set
it that's right.
CAP COM Apollo 8, Houston.
SC Go Ahead.
CAP COM Thank you Jimmie, Copy your DSKY work
there and its looking just fine to us now.
SC Okay
cap com Apollo 8, Houston

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1023000 CST 1:21PM 318/3

SC You might try to work on that that way.

CAP COM Can you stand by Apollo 8?

CAP COM Apollo 8, Can you standby? Try to get you a better antenna. You're unreadable.

SC Alright.

CAP COM Apollo 8, Houston we are right in between antennas can you wait 5 minutes so we can hear better comments.

SC Roger.

CAP COM Apollo 8 Houston, Over

SC Go ahead Houston, Apollo 8.

CAP COM Okay you're loud and clear now Frank, Go head and say what you were going to say about program on it.

SC ~~They ought get some moving out on some way to fix these windows cause the 3 windows the hatch window and the 2 side windows really its a shame in fact it's almost completely unusable because they got so gumped up.~~

CAP COM Roger I sure agree. We copy so far in the windows 2 and 4 are in excellent shape and one and 5 are sort of mediocre and 3 is just about totally unusable.

SC 3 is totally unusable 1 and 5 or unusable for any kind of photography.

CAP COM Got that

SC And Mike sure puts a ... that puts a bad light on cant see where you are going.

CAP COM ~~Yeah, and you're setting between two guys that wont tell you too.~~

SC That's right. You think they will share a window no sir. Also know the optics are very good visibility down to good visibility too so far, no coating at all. *che*

CAP COM Glad to hear that Jim.

PAO That was Jim Lovell who tag that one with the statement. Sure is a shame when the CMP the commander command module pilot can't see where he is going. It's a reference to the old navigator joke. I am a navigator and I have a right to know. Please tell me. So, we are all and all in good shape. 102 hours, 40 minutes into the flight This is Apollo Control Houston.

END OF TAPE

68/4

PAO This is Apollo Control, Houston, 103 hours 7 minutes into the flight. Apollo 8 is 169 750 miles from home. It's moving in a velocity of 4264 feet per second. You multiply by a .68, you get miles per hour. In the last 15 minutes we've had a good deal of conversation with the crew. And in the course of it, Frank Borman makes a comment, a reference about the windows. He says they are really a shame. We discussed them yesterday, and the message was immediately relayed to George Lowé. And in the course of the ensuing discussion, Mike Collins suggest that perhaps the crew should have had Spacecraft 104 which is the next one down the line. And Borman insists no, no. He had the right spacecraft. And it's a most interesting conversation, here's how it goes.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger, we copy Jim doing a P52, and I'm standing by with a maneuver pad for midcourse 5 anytime at your convenience.

SC Okay, ready to copy, Mike.

CAPCOM Roger, Jim. This is midcourse maneuver number 5, and it's a RCS/G&N, and it's 317 00, not applicable, not applicable. Are you with me?

SC With you.

CAPCOM Good. 103 59'er 5286 minus 00050 plus all zero's plus 00001 000 334 001, five zero's 00000 plus 0019'ero 00050 014 00050, are you still with me, over.

SC Still with you.

CAPCOM Good. 413020 183 charla down 064 left 06 plus 0747 minus 16410 129'er88 36301 146 4640 north set of stars, Sirius and Rigel, roll 308 pitch 209'er yaw 357. Remarks use high speed procedure with minus MA, over.

SC Roger, Houston. MCC 5 RCS G&N, are you with me?

CAPCOM I'm with you, Jim.

SC 31700 NA NA 103 59 5286 minus 00050 plus all zero's plus 00001 000 334 001, all zero's plus 00190 00050 014 00050 413020 183 charla down 064 left 06 plus 0747 minus 16410 12988 36301 146 4640 Sirius Rigel 308 209 357, use high speed procedure with minus MA.

CAPCOM Roger, and could you go to accept please and we're going to send you a P27 load consisting of a LM state vector and a target load for MCC 5.

SC Roger.

CAPCOM Apollo 8, Houston, over.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger, we'd like to dump your waste water tank down to 25 percent. We'd like to do it before the midcourse for tracking reasons. So if it is convenient with you, if you'll

start right now, we'll dump on down to 25.

SC Roger, we'll get right with it.

CAPCOM Thank you. Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger, we got those loads in and verified.

~~You can go back block at your computer. And George Low says he's working on that window problem at 6, or Spacecraft 104.~~

~~You just happen to have the wrong spacecraft.~~

SC ~~That's the wrong statement, we've got the right spacecraft. I'll clue you if it keeps going this way for 2 more days, we've got not only the right spacecraft, but we've got the best spacecraft.~~

CAPCOM It'll keep going.

SC Apollo 8, we're starting the dump now, Houston.

CAPCOM Apollo 8, Houston, over.

SC Okay, we're starting the waste water dump now.

CAPCOM Okay, Bill, thank you.

SC That's a blizzard.

CAPCOM Roger, understand. Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Roger, I need a Pop-Romeo-Dog on all three and a status report on the LMP.

SC Roger, the LMP's PRD hasn't moved an inch since we took off. And that's the one the CMP used to have, still .64. And I just had about 5 and a half hours sleep, and I'm in the process of scarfing up a meal, and I've been drinking lots of water, feeling good, and that's about it.

CAPCOM Okay, and you got a PRD on the other two.

SC Yes, the PRD is ready to report. The CMP is reading 1.2 rem. And the CDR, I got stuck with somebody else, but my reads now, my new one reads 2.02 rems. I don't know if there is a message there or not. He's starting to glow in the dark.

CAPCOM Yeah, you should have hung on to the one you had. It sounded a little bit better. I copy left to right 2.02, .12, and .64, over.

SC Roger.

CAPCOM Thank you, sir.

SC What have they measured in our - what have they measured on that, I guess you would call it the PABABR, or PABD.

CAPCOM We're sending the boy to the back room to find out.

SC Find out what it is, or what it's reading?

CAPCOM First one, and then the other.

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APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1030700, CST 1:58 319/3

SC We'll need both answers up here, too.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1021700 CST 2:08p 320/1

SC We'll need both of the ... up here too.
CAPCOM Apollo 8, Houston.
SC Go ahead.
CAPCOM Bill's VA and VR reading that he requested
is .13. Over.
SC Roger. Look's like you've got a little
discrepancy here.
CAPCOM Yes, I agree.
SC You ought to give those guys a chance
to ... and calibrate those things.
CAPCOM Apollo 8, Houston. We've just had
25 percent. You can terminate your waste water now, please.
SC Okay. Will do. Believe it or not, our
gauge is 5 percent behind yours.
CAPCOM Yes, John said that he has been noticing
that.
CAPCOM Apollo 8, Houston.
SC Go ahead, Houston, Apollo 8.
CAPCOM Yes, we are going to switch antennas
from Madrid to Goldstone in about 3 minutes. You should
hear the glitch.
SC Thank you. Houston, Apollo 8.
CAPCOM Apollo 8, Houston. Over.
SC Rog. Just for information would the
perigee reading and noun 42 be such a big minus number
for such a small burn? We are reading minus 03137 now.
CAPCOM Roger. Understand noun 42 perigee reads
minus 03137. Over.
SC Roger. We are going to program 30 after
you gave us the target load, and I didn't think there would
be that much of a change for such a small burn.
CAPCOM Roger. Stand by, checking.
CAPCOM Apollo 8, Houston.
SC Go ahead, Houston, Apollo 8.
CAPCOM Roger, Frank we don't think theres's
any problem or any funnies in this perigee prediction of
minus 03137. It if ... prediction and it's not very accurate.
Now we have taken your vector from the downlink and run it
through a make believe Delta V maneuver down here, and we
get precisely the correct answer. Over.
SC Roger. Understand that you figure just
because ... it comes up.
CAPCOM That's affirmative. The Kepler solution
is just pretty gross
SC Okay. I was just kind of curious. I
could see differences when we were talking about LOI burns.
This being such a short one, I thought it wouldn't be that
much difference. I understand. Mike, this is Frank.

CAPCOM Go ahead.
SC Tell our monitoring -- see if we get any inadvertent engine firing for the time ...
CAPCOM Well, we can't when you're in low bit rate. We're in high bit rate right now.
SC Okay. Can we crank up high bit rate and just have you take a checkout look at it?
CAPCOM Okay.
CAPCOM Apollo 8, Houston.
SC Go ahead.
CAPCOM Roger. Since you're on OMNI D dog it this time, we're sort of 180 out of phase for the high-gain antennas. We can get high gain lock then with the high bit rate we can be looking at those or looking for any justifiers, but we can't do it until ...
SC Okay. We will take the antennas and get on the high gain as soon as we can.
CAPCOM Thank you.
PAO This is Apollo Control, Houston. And that catches us up to 103 hours 21 minutes. We're now about 45 minutes away from a -- 40 minutes away from the burn. A midcourse correction of 5 feet per second. The spacecraft will have had its nose pointed at Scorpio. I do not know exactly what angle that will be in along its path of flight. It will apparently not be in the direct line of flight. It will be a slight adjustment kind of burn to have the effect to move the spacecraft more to the center of a 35 mile corridor key hole through which the spacecraft will enter the atmosphere that's -- in it's final splashdown maneuver. At 103 hours 23 minutes into the flight, this is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1034500, CST 2:36PM 321/1

PAO This is Apollo Control, Houston, at 103 hours 45 minutes into the flight. In the last few minutes we have been looking at the Biomed data, the harness is switched to Jim Lovell and his mean heart rate is 57. The high during this sample period is 59, the low is 54. His respiration rate is 13. Jim and Bill Anders are shortly to have Christmas dinner, just after this midcourse correction which is to come at 104 hours into the flight. The 5 foot per second burn that will have the effect of insuring the spacecraft hits more nearly the center of our entry corridor, rather than the high side of it. We have some taped conversation backed up here. We'll play it now.

CAPCOM Roger, Frank. We've done some more checking and we confirm that that is the correct keplerarian prediction on noun 42 minus 03137, just like you said.

SC Thank you.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger, we are going to be doing a ranging sequence, if we can eliminate voice for a couple of minutes, we would appreciate it.

SC Roger, We will.

CAPCOM (Garbie)

CAPCOM Apollo 8, Houston. Over

SC Go ahead Houston.

CAPCOM Roger, our ranging is complete and we have been monitoring your thruster firings and they show what appears to be very normal damp activities. Over.

SC Thank you. I guess it was associated with the water vent.

CAPCOM Roger, Understand.

PAO This is Apollo Control, Houston. 103 hours and 47 minutes into the flight. We will be back after the burn in about 12 minutes.

END OF TAPE

PAO This is Apollo Control Houston at 103 hours 59 minutes into the flight and Mike Collins has given the crew a standby for their midcourse. 20 seconds to ignition for a burn that - in which the nose will be pointed at a 90 degree angle away, 90 degrees away from a radius vector running out from the center of the Earth. And we will try to describe the position of the spacecraft a bit more at the change of shift briefing. It's just a very difficult thing to visualize with the cerebral bodies. Present weight is 31 678 pounds, we're 167 548 miles from home. By the way, that quad A's temperature we reported earlier up to 86 is now down to 82. Pitch attitude is 334 degrees, his yaw 1.1 degrees, he's got .7 degrees in roll. Apparently, he's all set up now and got the angles he wants. Jim Lovell now is reporting that the burn went off on time and the duration of the burn was 14 seconds and we're trying to check now and find out exactly how many feet per second we got. Mike Collins is now filling in his post-burn report. Let's pick up this - go back from the start of the burn and pick up the conversation up til now.

CAPCOM Apollo 8, Houston. Over.

SC Go ahead, Houston, Apollo 8.

CAPCOM Frank, we've got about 2 and 1/2 minutes to ignition and why don't you chart some of your SPS switches. Not set up as per checklist specifically, rate low, deadband minimum and your BMAG mode at attitude one rate too.

SC Can't make it.

CAPCOM Can you manualize these switches in rate command?

SC Right.

CAPCOM Apollo 8, Houston. Mark 1 minute to ignition. Over.

SC Roger. We concur.

CAPCOM Apollo 8, Houston. Mark 20 seconds to ignition.

SC Roger.

SC Houston, Apollo 8.

CAPCOM Go ahead, Jim.

SC Rog. We burned on time, 14 seconds, attitude nominal. Our residuals were plus 2 in BGX, minus 1 in BGY, nothing in BGZ. Our EMS stopped about 6.2 and still counting after the burn.

CAPCOM Rog. Understand 14 seconds, burn on time, nominal attitude, two-tenths X, one-tenth Y, and nothing minus one-tenth Y, and nothing Z, and you put 6.2 on the EMS and it continued to count after the burn. Is that affirmative?

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1035900, CST 2:50P, 322/2

SC No, we put the burn delta V in the EMS and after the burn, it was still counting.
CAPCOM Rog. Understand.
SC Okay, here's to be transferred the state vector to one spot.

CAPCOM Roger, Jim, thank you, and I still don't understand you on this EMS. Count it down from 5 to 0 normally and then continued through zero in a negative way and now it's reading minus 6.2. Is that affirmative?

SC Rog. That's right, it was counting up when we shut it off. Last time I saw it, it was 6.9. Now Frank just put it on AUTO again with the delta V function switch in delta V and it jumped six-tenths. Then he tried the second time and it stayed at zero so we really don't know what the story is.

CAPCOM Rog. Understand now.
PAO And that brings us up to live - up to the present. 104 hours 5 minutes. 10 minutes from now should start our television acquisition. Let's go back now.

SC I guess you want us to resume PTC - right?

CAPCOM Stand by.
PAO Reminder to the Press, in building 1 auditorium area, the big ediphor will be available for the television pass.

SC Go ahead.
CAPCOM We'd like you to resume the PTC attitude pitch 010 yaw 045 and then come out of it again for your P23 that you're scheduled in about another hour and 10 minutes. In another hour and 10 minutes.

SC Roger.
SC Mike, this is Frank. Is this TV still scheduled for 1:04?

CAPCOM That's affirmative, Frank, if you can manage it.

SC Okay.
CAPCOM How's it going with the TV, Frank? Are we - can the network count on having it on schedule? Over.

SC Yeah, we can have it on schedule. We don't have much to do but we'll perform for you.

CAPCOM Okay, we have a bunch of filter experts standing by if you need any of that.

SC Well, we're going to have to just do it inside today because there are no good shots of the Moon in the afternoon.

SC I think it's raining out there.
CAPCOM Yeah, we figured that.

*Spoke
Ediphor
2 scenes on left
or more right on
large TV
projections
and called
Ediphor
center on net
to it are
striking
it.*

69/4

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET1035900,CST 2:50PM,322/3

PAO Well, till we get acquisition or until we get closer to the time, 6 or 7 minutes away, we just get off the line right now and come back up then. Our present distance 167,187, velocity in relation to the earth 4304 feet per second. Our weight is now 31,679 pounds. At 104 hours and 9 minutes into the flight, this is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET10414,CST 3:05PM,323/1

PAO This is Apollo Control, Houston 104 hours 14 minutes. We do not have a picture as yet. We are not particularly trying hard but we do expect it within 45 seconds. Earlier Frank Borman said only that he would have to keep the camera inside today and made some offhanded reference to the fact that it is raining outside. The Flight Plans shows two crew members, Jim Lovell and Bill Anders would be in a eating period, eating their Christmas dinner. Perhaps we'll see them performing that little chore and also Frank Borman is to be having Christmas dinner. Immediately after dinner, Frank will, like so many other people after their Christmas dinners down here on earth, will take a long nap. Frank's should extend for about 7 hours. We are hearing noise from our Goldstone station. They are having a little trouble acquiring the spacecraft today, a momentary delay we hope. 104 hours and 15 minutes in elapsed time. It's all quiet. We haven't heard from the spacecraft in about 4 or 5 minutes. Our EECOM, the communications officer here on the console advises we are not yet locked up on the high gain antenna and we certainly will have to do that in order to receive the television signal. In relation to the earth, the spacecraft is directly above the heart of South America. Over 60 degrees west longitude and about 5 degrees south latitude. Flight Director advises it will be several more minutes before we get the high gain antenna locked up. We have some small amount of tape backed up at this point. Suppose we move that now. This was recorded about 5 to 7 minutes ago. Could we have that tape please.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, go ahead.

SC ROGER, on this EMS, when I put in Delta V, it was reading zero, then I switched to AUTO. Sometimes it will count to 19 to 20 feet per second. I guess that is what happened.

CAPCOM Roger, understand when you put it to AUTO, it maybe will keep counting up to as much as 19 to 20 feet per second.

SC Just when you put it to AUTO, it will start counting on some occasions, by itself.

CAPCOM I understand.

PAO And that concludes our recorded conversation. We are back now to live waiting.

END OF TAPE

PAO Present velocity is, our present distance from Earth is 166 743 miles, moving at a velocity of 4311 feet per second. It's a constantly increasing value. Present weight of the spacecraft is 31 679 pounds. We're standing by waiting for the high gain antenna to lock up with our Goldstone antenna. And hopefully the antenna has a big antenna in Madrid as well. And our Communications Officer advises the spacecraft is about 3 degrees from establishing lock, and we ought to get a picture just any second now. For the newsmen who may be monitoring a picture of the Control Center, perhaps they can observe the Christmas tree down in front of the consoles between what we call the front trench and the wall displays. Now Borman says Mike, we're ready when you are, and we're certainly ready.

SC Say again.

CAPCOM Yeah, we're ready, Frank. We're all squared away and eagerly standing by. You got your make-up on?

SC Yeah, have we got a picture?

CAPCOM Negative, Frank.

SC How about now, Houston.

CAPCOM Negative, Frank.

SC We don't seem to have much luck today, but don't call for a repairman yet. It may be our camera here.

PAO We're understanding that the onboard camera takes a minute and a half, two minutes to warm up. At least that's the word of the Communications Officer, here we go back now.

CAPCOM It hasn't warmed up properly.

SC Okay, we had it on for awhile. Are you getting our FM okay?

CAPCOM Okay, Frank, there we got it. It's coming in loud and clear. We look like we're looking at your hat and now the MDC.

SC Okay, well, good-afternoon. This is the Apollo 8 crew. And how does it look now, Houston.

CAPCOM It's looking good. If you can hold the thing still, it's sort of a time delay. Any motion at all ruins our picture.

SC Tell me if there is any difference in it now.

CAPCOM It's looking good now.

SC Okay, fine.

CAPCOM It looks like your okay, but somebody else is upside down.

SC Okay, that's right, that's Jim Lovell. What we thought we'd do today was just show you a little bit about life inside Apollo 8. We've shown you the scenes of the Moon, the scenes of the Earth, and we thought we'd invite you

69/7

into our home. It's been our home at least for 4 days as you can see on the instrument panel. We park off each day on the instrument panel. We're four down, and we're working on the fifth day. Of course we're all looking forward to the landing on Friday. Down here in the part of the spacecraft we call the Lower Equipment Bay, we have the President's adviser on physical fitness, Captain Jim Lovell. About to undergo an exercise program that we do everyday. You notice that he floats around very freely. He just bumped his head on the optics, used for our navigating. He's working with an exercise device that's designed to keep the muscles in shape. Now another very important function of our spacecraft is the computer and I thought you might be interested in seeing what we have here, the displays that gives us all the information about our burn, about navigating, and about the velocity that we use during entry and retrofire on Earth orbital missions. It's controlled by a DSKY, or similar to a typewriter keyboard. And the things that go in and out of that are absolutely miraculous. It's done a fantastic job for us, and Jim Lovell has done an excellent job operating it. Now another very important thing whether you're in space or the ground is eating. And I've asked Bill Anders to show you how we eat up here in the flight. Pardon the picture while we move around here and change cameras. The food that we use is all dehydrated; it comes prepackaged in vacuum sealed bags. You notice that all Bill has to do to keep it in one place is let go of it, except for the air currents in the spacecraft it would stay perfectly still. He gets out his handy, dandy scissors and cuts the bag. The food is varied, generally pretty good. If that doesn't sound like a rousing endorsement, it isn't. But nevertheless pretty good food. You can see that Bill is very clever. He does things swiftly. Actually, those food bags are stuck together because they've been vacuumed packed.

in debriefing he said it was superb

69/8

CAPCOM What do you have today, Bill, for dinner?
 SC Well, here we have some cocoa, should be good. I'll be adding about 5 ounces of hot water to that. These are little sugar cookies, some orange juice, corn chowder, chicken and gravy, and a little napkin to wipe your hands when you're done. I'll prepare some orange juice here. Okay, you can see that he's taking the scissors and cutting the plastic end off a little nozzle that he's going to insert the water gun into. Water gun dispenses a half ounce burst of water per click. Here we go; Bill has it in now. And the water is going in. I hope that you'll have better Christmas dinners today than this, but nevertheless we thought you might

be interested in how we eat.

CAPCOM Roger, I haven't heard any complaints down here, Frank. We're going to bring up ~~the~~ speed on your food when you get back.

SC Very good.

CAPCOM Looks like a happy home you've got up there.

SC Ordinarily we let these drinks settle for 5 or 10 minutes, but Bill going to drink it right now, then, to get on with the program. He cuts open another flap, and you'll see a little tube comes out. This is not a commercial. And he drinks his delicious orange drink, maybe I should say he drinks his orange drink. He's usually not that fast. Bill is really in a hurry today. Well that's what we eat. Now another very important part of the spacecraft is the navigation station or the optics panel. And we - just a minute Bill wants to say something. That's good, but not quite as good as the old California orange juice. Bill's from Florida. Okay, now if you'll let me have the camera Jim, I'll show the people where you do most of your work. Okay. Can you explain it? If I can clean up some of Bill's food around here, and have some delay. Down in this area is called the LEB or the lower equipment bay. And we have our optics positioning equipment right here. We do all our navigation down here by sitting on stars and on horizons of either the Moon or the Earth. And this is where we find out exactly where we are in space, what direction, and how fast we are traveling. And our computer, as Frank has mentioned it, takes information and tells us how to maneuver to get home safely. I work with the scanning telescope and the sextant and occasionally if I get too busy, I just sort of float out of site and go up into the tunnel which is the tunnel to the hatch of the lunar module which we don't have onboard, of course. Now, that's about all we have for today. I - each and everyone of us wish each and everyone you a very Merry Christmas. And, I guess we'll see you tomorrow, and we'll be landing early Friday.

PAO And at - this is Apollo Control. We started receiving pictures at 104 hours 24 minutes. And we saw the wind up at 104 hours 33 minutes 55 seconds. This is Apollo Control, Houston.

END OF TAPE

69/9

Tony ?

Should be
broken up
- all
called
here

APOLLO 8 MISSION COMMENTARY 12/25/68 GET 104:59:00 CST 3:50p 325/1

CAP COM Apollo 8, Houston here. 104 hours 59 minutes into the flight, and in between courses of the Christmas dinner, we have recorded this conversation.

CAP COM Apollo 8, Houston.

SC Come in, Mike.

CAP COM We're suggesting attitude deadband max and rate high.

SC You're right, thank you.

SC Houston, Apollo 8.

CAP COM Go ahead, Frank.

SC How soon will they tell us what effect the midcourse will have on our trajectory, Mike?

CAP COM Oh, the longer we track, the smarter we'll get, but stand by one, for a pertinent answer.

CAP COM Apollo 8, Houston.

SC Go ahead.

CAP COM Tentatively midcourse correction at 122 hours is zero and in about an hour and a half we'll have some track data to confirm that.

SC Okay, thank you. We're going to have something to eat here, Mike, just taking it easy.

CAP COM Roger, understand.

SC Get another shotgun for Christmas?

CAP COM No, I'm missing enough with the one I have.

SC That's what Edwin told me, I thought maybe you might want to try another one.

CAP COM Well

SC What was it, 40 shots at four birds?

CAP COM Oh negative, Frank, I'm 100 per cent. One bird per box.

SC Then you and I are in the same fix.

SC Houston, Apollo 8.

CAP COM Apollo 8, Houston, go ahead.

SC It appears that we did a great injustice to the food people. Just after our TV show, Santa Claus brought us a TV dinner each, it was delicious. Turkey and gravy, cranberry sauce, grape punch, outstanding.

CAP COM Roger, Jim. Glad to hear it. Now we're down here eating cold coffee and baloney sandwiches.

END OF TAPE

APOLLO 8 MISSION COMMENTARY 12/25/68 GET 105:26:00 CST 4:17p 326/1

CAP COM This is Apollo Control, Houston, 105 hours 26 minutes into the flight. A few minutes ago, Frank Borman told us that they had a number of navigational checks to make and their attitude might consequently put certain quads in the sun for an overlong time. As a result, he asked us to keep an eye on temperatures. Here's how the conversation went.

SC Houston, Apollo 8.

CAP COM Apollo 8, Houston. Apollo 8, this is Houston, over.

SC Roger. We've got an awful lot of these stars to mark on now, Mike, and they were having some concern about the PPC, will you let us know if we stay in one position too long, or if we have to knock off and do some PTC?

CAP COM Will do, Frank.

SC Thank you.

CAP COM Apollo 8, Houston. We are monitoring your temperature. The quads all look good. We will continue to do so and we expect no difficulty with them during the P23 work.

SC Thank you.

SC Our highest tank temperature now is C.

CAP COM Understand. C is ...

CAP COM And our present distance from earth is 163,838 nautical miles, velocity 4,360 feet per second, current weight 31,679 pounds. At 105 hours 28 minutes into the flight, that's our status.

END OF TAPE

PAO Apollo Control, Houston, here 106 hours 10 minutes into the flight. And here is what's been going on.

CAPCOM Apollo 8, Houston, over. Apollo 8, this is Houston, over.

SC Go ahead, Houston.

CAPCOM Roger, Bill, we would like to talk about your high gain antenna sometime when you get a minute.

SC Okay, just a second, Mike. About 5 minutes Mike, we'll be done here. Houston, Apollo 8, about the high gain antenna.

CAPCOM Okay, Bill, ... can be an extremely worthwhile thing to find out how it operates in the auto, react mode, and we propose running a test on it in that mode from 109 to 110 hours g.e.t., over.

SC Okay, we'll do that.

CAPCOM Okay, I have about a -

SC We'll try it on the way out, okay.

CAPCOM We have a detail procedure which we can read up to you anytime you're ready.

SC Go ahead.

CAPCOM Okay, we suggest to start time 109 hours g.e.t., stop time 110 hours. And you'll be in a PTC, we're requesting a left roll rate which we notice that you've been perfering. A left roll rate of 1 revolution per hour, and this is in your present PTC attitude, IE pitch to 10 degrees 010 degrees and yaw 45 degrees. The procedure is at step one. Stop at roll angle 150 degrees; acquire is a step two. Acquire in manual mode. Three switch to auto now beam. Four, make sure tracking auto mode then switch to auto react mode. Five. position the high gain antenna -

SC Whoa, whoa, whoa.

CAPCOM Okay, whoa, whoa, standing by.

SC I'm still starting. Okay, make sure tracking in auto and then what?

CAPCOM Make sure tracking in auto, and then switch to auto react mode, over.

SC Okay, will do.

CAPCOM Okay, step 5, position high gain antenna pitch and yaw control to predicted Earth's rise angles. And those angles are yaw 50 degrees, pitch minus 40 degrees, over.

SC Okay.

CAPCOM Okay, two more upsteps. Step 6, remain on high gain antenna in this mode for 2 revs. Do not switch to OMNI anytime during these 2 revs, and maintain mode configuration of voice and data. We expect loss of track should be no more than 15 minutes per rev, over.

SC Roger.

CAPCOM And the final step 7, is any problem arises go back to your initial gimbal angles of 10 degrees pitch 45 degrees yaw, and 150 degrees roll. Reacquire and go to auto mode, over.

SC Yes, I guess, there ought to be a 10 4A which says start roll again, right.

CAPCOM That's affirmative. Excuse me there, that's affirmative.

SC Okay, if - let's see if we - I don't understand your last comment. If we get into a problem, you want us to go back to 150 degrees roll.

CAPCOM Well, all we want you to do is go ahead and reacquire in the auto mode, Bill. And it looks like that would be one way of doing it, but all we're saying is the, you know, if you want to talk to us about something or you have any other problems or you don't like the way it looks, anything at all, just go ahead and reacquire in the auto mode.

SC Yeah, why don't we just say that if we do have problems, it doesn't pick up when it's supposed to, give it a good try and then call you up on the (garbled) we talk about it and try for another 2 revs.

CAPCOM That's just fine, Bill.

SC Okay, it's worked. We tried it once or twice on the way out, but the one modification when it did break lock and go to its' manual position with that special OMNI inbetween. That sound fine.

CAPCOM Bill, could you run through that again. We're not reading you too loud and would you say again what you tried on the way out, please.

SC On the way out, they gave us some react angles which we used and once it broke lock and repositioned itself, why it went over to the OMNI. And waited till we got to near breaking lock again and switched back and snapped right in there.

CAPCOM Roger, thank you, we copy.

SC We have a few more stars to get, and then we'll give it a try.

CAPCOM Roger.

END OF TAPE

PAO This is Apollo Control, Houston 106 hours 52 minutes into the light -- into the flight. We've had a long quiet period this afternoon. The ground -- on the ground here we are working with Jim Lovell. Checking out his computer programs and comparing them against our, sending him some programs so they can be put in and compared. All in all sort of a feeling of relaxed vigilance, I would say. No major activities going on. Frank Borman should be sleeping but he's not. He hasn't turned in yet. Before too much longer goes by we plan to play the crew a little music. Perhaps some Christmas Carols. We have some conversation backed up here we will play it for you now.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston. Go ahead.

SC Roger, for some reason, we suddenly got a program 01 and no attitude light on our computer.

CAPCOM We confirm that. Stand by one, Jim. We're working on a procedure for getting you cranked back up again.

SC Okay.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Okay, Jim, while we're working on this procedure, we'd like to know did you select 01, did you get above 37 ... on enter.

SC Let's see, I'm not too sure, Mike. I might have done that, yeah. We have star 01 coming up, now that might have been the reason.

CAPCOM Okay, we understand. Why don't you just hold what you've got on your DSKY, and we'll be with you shortly.

SC Okay.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger, could you or Bill give us a better OMNI antenna, please.

SC Roger, stand by.

CAPCOM Apollo 8, Houston, over.

SC Go ahead, Houston, Apollo 8.

CAPCOM Okay, Frank, our procedure is to select P00 and from P00 go to P51, and get a platform alignment. After you've done that we will send you up a P27, a REFSMMAT, and then you can do P52 REFSMMAT options. Then you'll be back in business, over.

SC Okay, Mike, thank you. Roger. Houston, this is Apollo 8. Houston, Apollo 8.

CAPCOM Apollo 8, this is Houston, go ahead. Apollo 8, this is Houston, say again, over.

SC Okay, we've completed a P51 now, you want us to try a P52, or do you want us to wait till we can put a REFSMMAT in.

reference
matrix, hardware to
alignments of the platform
CM have to align the thing
the computer
339/2

~~_____~~
332/1
Jimmy

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1065200, CST 5:43 328/2

CAPCOM Stand by one, will you, please, Frank.
SC Roger.
CAPCOM We're putting together a P27 load for you
now, Frank. That's the reason for the delay, we just want
to make sure we don't overlook anything before we send it up
to you.
SC Okay, we'll just sit back then. We've
got a good P51. We'll just wait till you put in a REFSMMAT
and then of course we'll fine line over to that, right.
CAPCOM That's right, that's exactly right, just
stand by.
SC Mike, this is Frank, again.
CAPCOM Go ahead.
SC I suggest that we go ahead while you're
doing that do a P52 here, and let it do an automatic and just
keep this up. Jim had to use Rigel and Sirius, and they're
pretty close together. And although we got a zero difference
for the star angle, that might not be a bad idea just to try
a P52 here.
CAPCOM We'd rather not do that, Frank. Stand by
one.
SC All right, we won't do a thing.
CAPCOM Frank, we feel that procedure that you're
talking about is really not required, and it's sort of wasting
your time. You'd still have to upon completion of that, we'd
have to send you a new REFSMMAT, and you'd have to go ahead
and do a P52 to that REFSMMAT in addition, over.
SC We understand that, go ahead. We'll
wait for your REFSMMAT.
CAPCOM Okay, thank you. Apollo 8, Houston, if
you'd go P00 in accept we have our P27 ready. We'll send you
up a REFSMMAT, over.
SC Roger, P00 in accept.
CAPCOM Roger. Apollo 8, Houston. Frank, we'd
like to make sure you understand that when you do your P52
you want to select option 1, the preferred option because
those are the registers we're blinking on with this P27.
SC Roger, option 1, thank you.
CAPCOM Apollo 8, Houston. We got the load in,
and it's your computer. Go to block.
SC Okay, roger, stand by.
CAPCOM And you can go ahead with your P52 at your
convenience.
SC We're going ahead right now.

END OF TAPE

file on handwriting 334/1
handwritten on page top page 334/1
handwritten 335/2

CAP COM Apollo Control here at 107 hours, 19 minutes into the flight. And the long quiet afternoon continues with Jim Lovell looking at his computer programs and us looking at his computer program, and essentially nothing new to report. Here's the conversation that's ensued since our last report.

CAP COM Apollo 8, Houston.

SC Go ahead, Houston. Apollo 8.

CAP COM Roger. When Jim gets to the end of P52, he's got a flashing 37, we'd like him to not proceed to hold at that point, we'd like to read some bits and pieces out of the computer at that time. Over.

SC Roger.

CAP COM Apollo 8, if Anders has got time to give us a countdown, could we get the biomed switch from center to left?

SC Do one point.

CAP COM Did you take that one point seven second time to end the count?

SC Sorry about that. Okay, Houston, you have it.

CAP COM Thank you, Jim. And I'll give you an estimate here on how long we want to hold it at this point, it won't be too much longer.

SC Roger. It was my goof, I must have put in 3701 instead of 3723 and 501.

CAP COM Roger. Apollo 8, Houston, we have got a flight plan suggestion for you.

SC Go ahead.

CAP COM Go ahead and delete the remainder of the P23's that you're working on now, go back to PTC attitude and then pick up where it says 108 hours into the flight plan to pick up again there with P23, or if you prefer to switch that time a couple of hours if you want to get some rest inbetween.

SC I think that's a good idea, we'll do that.

CAP COM Okay.

SC What does this do to our state vector?

CAP COM Not a thing, we've looked at your state vector and it's good.

SC So we didn't lose all that we had just accomplished, right?

CAP COM Stand by one on that Jim, I don't know, I'm checking.

CAP COM Apollo 8, Houston.

SC Go ahead.

CAP COM Roger. I say again, your state vector is just fine, it's still ticky-poo and the reason we're

APOLLO 8 MISSION COMMENTARY 12/15/68 GET 107:19:00 CST 6:10p 329/2

holding here is that we're checking to see if any P23 information was lost, that's reason one, and the second reason is that your W matrix shares some computer memory cells with PO1 and we are getting a clarification on the status of your W matrix before we proceed. Over.

SC Roger, Michael. We'll go ahead and start heading over to the PTC attitude.

CAP COM Very good.

SC Do you need that high gain any more, Mike?

CAP COM Negative, we don't need it any more.

CAP COM Apollo 8, Houston.

SC Go ahead.

CAP COM Roger, Frank. We're coming up on time for an oxygen purge on all three fuel cells, it might be a good time to do it while we are waiting here.

SC All right. All right, Mike, we are going to purge the three fuel cells of oxygen only.

CAP COM That's good. Thank you. That's enough on fuel cell number 1, if you'd start on 2 please.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 107440, CST 6:35 330/1

PAO Apollo Control, Houston, here 107 hours 44 minutes into the flight. And the exhaustive business of checking the onboard computer continues. We're 157,989 miles from home moving at a velocity 4464 feet per second. Our weight is down to 31,679 pounds. Here's how the conversation has been running.

CAPCOM Apollo 8, Houston. We're in low bit rate now. Last time we saw you, you were still purging, over.

SC Roger, (garbled)

CAPCOM You're unreadable, but request that you end your purge.

SC Roger, we end the purge.

CAPCOM Thank you. Apollo 8, Houston, over.

SC Go ahead, Houston.

CAPCOM Roger, Jim. I've got a short procedure I would like to read up to you on your DSKY, and I'd like to explain what it is. Your W matrix shared some memory locations with P01, therefore the W matrix that you have right now is not a good one. And we would not want you to continue your P23 sighyings with that matrix. So the procedure I'm going to give you is going to cause the matrix to reinitialize itself prior to your next P23 when you go into P23. And this will put you back with the value of the W matrix which you loaded after TEI. You remember that 33 hundred and 3 thing. And if this has any further effects on the flight plan, we're in the process of sorting that out and if need be we'll send you up a revised sighting schedule later, both with the com and loss of com case, over.

SC Okay, stand by and I'll get something to copy with.

CAPCOM Okay.

SC Okay, go ahead.

CAPCOM Okay, and search without releasing the flashing verb 37. The following: the verb 25 down 07 enter 77 enter 40 enter enter verb 37 enter 00 enter, over.

SC Understand, we insert verb 37 without releasing, is that correct?

CAPCOM Roger, you should have flashing 37 on your DSKY now, and without releasing that flashing 37 go ahead with the verb 25, et cetera.

SC Roger, okay, I see what you mean. Okay we'll insert verb 25 down 07 enter, 77 enter 40 enter enter reinsert verb 37 enter 00 enter.

CAPCOM That's all correct. Say if you've got any questions about that, we would be happy to answer them.

SC Roger, are we cleared to do that now?

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1074400, CST 6:35 330/2

CAPCOM That affirmative, Jim.

SC Roger. Hey, Mike, this is Frank.

CAPCOM Go ahead, Frank.

SC Is there any danger that this might have
screwed up any other part of memory that would be involved with
entry or anything like that?

CAPCOM Frank, all indications are that there is
absolutely no problem with anything in the computer memory
other than the W matrix, however, we are continuing to look at
it, and if there is any doubt in our mind we will ask you to
dump the memory locations for us later, over.

SC Okay, fine.

END OF TAPE

PAO This is Apollo Control, Houston at 108 hours 12 minutes into this flight. Frank Borman is now retired for a night's sleep. Jim Lovell is still going through his computer check with the ground, and Bill Anders is up and about, refers to himself as the JOD which I believe means Junior Officer of the Day. Here's some conversation.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Roger, Jim, we thought you might be interested in knowing based on 2 and a half hours worth of track after your last midcourse and looking ahead, we're predicting the midcourse correction at 122 hours will be less than 1 foot per second. And keep it on going to entry enterphase minus 2 hours. We're predicting 2 foot per second midcourse at that time. Now those numbers will be refined. We'll get about another 8 hours of track on you before we amend them. over.

SC Sounds like we're on pretty good trajectory.

CAPCOM ~~Can't hardly beat it.~~

SC After we do these next P23, I'll see what our P37 gives us. What's that midcourse 122 hours that has practically zero?

CAPCOM Yeah, it's looking to be less than 1 foot per second about 4 tenths of a foot per second right now. And then the one before entry at 2 hours before Entry Enterphase is looking to be about 2 feet per second.

SC Roger, well, okay. I'll run a P37, and we can just compare the difference. Houston, Apollo 8, over. Houston, Apollo 8, over.

CAPCOM Apollo 8, Houston, over.

SC Roger, got the JOD back on watch again. We want to make sure we don't overdo the star sightings at the expense of thermal control, so you might keep a eye on us and give us a no-go if we start getting too hot on one side.

CAPCOM Roger, we'll do that. Has Jim gone to bed?

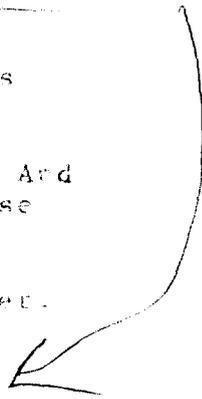
SC No, I'm right here. We're going to start doing assist to nav right now, and Bill's up in the left-hand seat.

CAPCOM Roger, understand, you're going to do some P23's now. We thought you were going to take a rest, and do them later.

SC No, Frank, is asleep now. We'll get these out of the way. So I'm coming over to do a trunion alignment at this time, and then we'll go into the P.

CAPCOM Okay, Jim. There's one thing before you get started on the P23. What we told you before, we still think is absolutely correct. The only thing in the computer

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memory that is changed by that P02 is the W matrix. However, as an additional precaution, we'd like to dump the computer memory and go through it and check it bit by bit and make sure everything is exactly copathetical.

SC Okay, do you want to do that now?

CAPCOM Affirmative, we're getting Goldstone configured for it; it'll be just a minute. And while we're doing that I can read you this procedure, if you're ready to copy.

SC Okay, stand by one, and I'll be ready to copy pretty soon.

CAPCOM Thank you.

SC Go ahead.

CAPCOM Okay, we'd like a verb 01 noun 01 enter 333 enter and then we'd like for you to read us register 1. Register 1 we expect will be a 10 000, and if register 1 is equal to that then what that means is that the computer will dump it's eraseable memory twice. That's 10 000 numbers - twice number for the eraseable memory dump. If it's not reading 10 000, then we'll ask you to make it read 10 000 by going verb 21 noun 01 enter 333 enter 10 000 enter. After you've done that the dump verb is verb 74 enter, and that will automatically dump the total eraseable memory twice, and return you to the proper configuration.

SC Okay, the procedure will be verb 01 noun 01 enter 333 enter and read out register 1. And then 10 000 the memory - the computer will then dump the memory twice as properly configured. If not, we have to load in 10 000 and we do that by going verb 21 noun 01 enter 333 enter 10 000 enter and verb 74 enter. Now if register 1 does read 10 000, then we'll still have to the verb 74 enter, is that correct?

CAPCOM That affirmative. That 74 enter is what starts the dump, then we just, prior to that one make sure we got 10 000 erase on. And just hang loose one here on Goldstone down here, we're getting it configured.

SC Roger, you need the high gain link.

CAPCOM Negative, we won't need the high gain. Apollo 8, Houston. Goldstone is all ready and you can go ahead with that procedure Jim.

SC Roger. Okay, register 1 reads 10 000.

CAPCOM Okay, thank you.

SC And do you want verb 74 now.

CAPCOM That's fine. Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger, have you done the verb 74 enter, yet.

SC No, I'm waiting for your command.

CAPCOM Okay, I'm sorry, you must have missed me.

You can go ahead right now, Jim, we're all set.

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APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1081200, CST 7:03p 331/3

SC Roger, verb 74. On it's way down.
CAPCOM Thank you.
PAO Apollo Control here. Spacecraft's a
156 460 miles from Earth, moving at a speed of 4493 feet
per second. At 108 hours 19 minutes, that's our status.

END OF TAPE

*about 10 lines
omitted here
72/4*

PAO
APOLLO 8 MISSION COMMENTARY, 12/25/68 GET 108:29:00 CST 7:24pm 332/1

CAP COM This is Apollo Control, Houston, 108 hours, 29 minutes. The crew has asked for some music to pass away the hours on this Christmas evening. Here's how the conversation is going and here's what we are piping up.

CAP COM Apollo 8, Houston.

SC Go ahead.

CAP COM With the computer, we sort of got behind in our promise of music. Do you still want it?

SC Go ahead.

CAP COM Okay.

SC Just so Neal doesn't accompany it.

CAP COM - choir. (Music of Joy to the World and a choir singing another song)

CAP COM Must be the wrong speed.

(More singing)

SC Houston, Apollo 8.

CAP COM (Music) Apollo 8, Houston, over.

SC Roger, Mike. That's real nice but if you don't mind, hold it off until we get this tracking test done.

CAP COM (Music) Roger, Bill. We concur.

SC Sounds like it has been running at the wrong speed.

CAP COM It doesn't sound very good down here either.

SC You sound better though, Mike. You're coming through nicely, Mike, maybe you could just sing a little bit.

CAP COM Yeah, I'll get my harmonica.

CAP COM This is Apollo Control here. Apparently the music didn't sound at just the right speed to Bill Anders, or it may have somehow interrupted the other activities on board. Whatever the reason, he gave us a call and asked us to stop it with the music, so we have. At 108 hours, 34 minutes into the flight, this is Apollo Control, Houston.

END OF TAPE

Armstrong?
and Mike
talks
to
8

72
5

APOLLO 8 MISSION COMMENTARY, 12,25,68, GET 108:54:00, CST: 6:45p 333/1

PAO Apollo Control Houston, here at 108 hours 54 minutes into the flight. Since our last report we have had no communications with the crew, very, very quiet. These hours this afternoon, as you might have assumed, might be contrasted with the last several revs, perhaps earlier than that. Maybe the last 10 or 12 hours of a long-duration mission. The crew feels - senses that it is all down hill. Which of course, it is. The only thing that is different here is, that we still have 37 hours to go before splashdown. But subjectively, it is very much like the end, the last revs of an earth orbital mission and a fairly extensive one. We are 154 900 miles from earth. Speed - velocity building to 4523 feet per second. And at 108 hours 55 minutes, that's our status. By the way, we are planning a press conference this evening - press briefing, if reporter interest warrants it. Shortly after 9 p.m. Houston time in the auditorium. This is Apollo Control Houston.

END OF TAPE

PAC Apollo Control Houston here. 109 hours 17 minutes into the flight. And we have had a little chatter with the crew, Bill Anders primarily sitting over in the driver's seat. Here is how that is going.

SC Houston, Apollo 8.

CAP COM Apollo 8, Houston. Over.

SC Roger, Mike. Tell how our temperature is looking across the service module. Are we going to be GO here for a shoot in another couple sets on this next start?

CAP COM Yes, I mind them, they look real good to me Bill. Just a second and I will check with the experts. Yes, you are just fine, Bill, on your cryo fans.

SC And SPS is okay.

CAP COM Affirmative, SPS is looking good all the time. Apollo 8. Houston.

SC Go ahead, Mike.

CAP COM Roger, Bill. Because of this W matrix thing, we would like to add some more star sightings when Jim gets through with the series that he is currently on. And I have the information routed to them when you are ready to copy.

SC Stand by. Go ahead.

CAP COM Okay, this is - we would like him to do them as I say whenever he is through this area he is on now and they are the same ones that are printed on your flight plan page 2-88.

SC Houston, Apollo 8.

CAP COM Go ahead, Jim.

SC I would like - I have got the entry checklist right now. You want to give me a little bit?

CAP COM Okay, Bill. Thank you. The first one is on page E-7.

SC Okay, Mike. Ready to go. Now I know why the fuel was low.

CAP COM No. You can't blame it on him. Page is E-7 under CM RCS preheat. Halfway down where it says up telemetry block. Are you with me?

SC I am with you.

CAP COM Okay, after telemetry block, insert RCS CM heaters circuit breakers two close.

SC Okay.

CAP COM All we are doing there is just making sure you get your heater circuit breakers closed. The next one is on page E-9.

SC Ready to copy.

CAP COM I need 9 up near the top under terminate CM RCS preheat and the middle there, after CM RCS heaters off, L&P confirm, insert RCS CM heaters circuit breakers to OPEN. Got this opening those two breakers back up.

SC Roger.

CAP COM And the last change is update page 14.

SC Okay.

CAP COM Yes, this should be in favor of the earth. Very top where it says tape recorder, record forward, are you with me?

SC Roger.

CAP COM Insert between tape recorder and record forward, insert command reset high bit rate, over.

SC Okay, we got them.

CAP COM Thank you, Bill. That's all.

SC Okay, Michael.

CAP COM How is it going? Do you want any systems OP?

SC Yes, they are hanging together. I haven't even looked at them for the last half hour. I have been over here in the sack.

CAP COM Yes, they sure are Bill. They can get you any specific numbers, what not, if interested.

SC Well, I hate to say I wasn't interested, but I don't need any specific numbers right now.

CAP COM Okay, very good. We concur. That's an outer space first.

SC On second thought, how's the evaporator outlet temp doing?

CAP COM 46 degrees, Bill. *outer*

SC Cancel that ~~aerospace~~ first.

CAP COM Right. ~~How's Magellan coming along?~~

SC I am getting a crossed eye looking into space. Hey, Mike, just as a matter of interest, I have been looking into space the last hour and a half and two tremendous storms down there. I am not sure just where they are but the vortex are huge.

CAP COM Roger. Understand.

SC That's your first space weather report at the manned weather forecast from space and I am not so sure where it's raining, but it is raining somewhere.

CAP COM Roger --

SC --point out that Magellan is not a good analogy. I would also like to point out that Magellan is not a good analogy. I don't think he made it around.

12/16

CAP COM Very good.
SC How about Alford Chitister?
CAP COM Roger. Alf. I don't know how much detail you can see Jim, but your subspacecraft pointed out in the middle of the Pacific Ocean about half way between Australia and South America.
SC Roger, the next time I take a look, I'll see what I - maneuver to the moon now. We see if we can see our shadow. Seriously, has anyone been able to see the spacecraft from earth? Optically?
CAP COM We don't think so, Bill. We haven't been able to confirm that they have.
SC Okay.
CAP COM You are coming right down the center line of the airways. You see the airliners going the other way, you better move over.
SC That's the first time old Lovell's been on track for a long time.
CAP COM Roger.
SC Mike. An interesting viewpoint of the NAV sightings, maneuvering with the minimum impulse controller on the way home is a lot more difficult than going out because of all the fuel we don't have now. Every little pulse really moves the spacecraft around.
CAP COM Roger. Understand you have too much control.
SC Yes. Let Bruce beware.
CAP COM Apollo 8. Houston.
SC Go ahead.
CAP COM Howdy, Jim. Dick Underwood is over here getting their film processing all prepared for your film when you get back and tentatively, can you give them some idea of how much you exposed?
SC Let me -- let me introduce you to the great film man. He will tell you all about it.
CAP COM Go ahead.
SC Tell him I hope he can account for haze through the window. We - on our departure from the moon, we tried to burn up as much as what we had left over which was quite a bit and tell him I hope he can develop the high speed film taken at normal film percentage.
CAP COM Roger. Understand you used just about everything and a lot of the high speed, you used it to normal setting.
SC Roger. Got in the wrong bucket there a couple of times.
CAP COM Okay.
SC We never did have a chance to do anything

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1091700, CST 8:08p 334/4

with that earthshine stuff.

CAP COM Say again about the earthshine, Bill.
SC We never did have a chance to do any
earthshine photography.

CAP COM Roger. Got that.

PAO And so we get a good something of a wrapup
on our film situation. Which we have been wondering about
now for about a 24-hour period. And at 109 hours 26 minutes
the spacecraft 153 504 miles from home, this is Apollo Control
Houston.

END OF TAPE

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APOLLO 8 MISSION COMMENTARY 12/25/68 GET 110:05:00 CST 8:56 pm 335/1

CAP COM This is Apollo Control at 110 hours, five minutes into the flight. At the present time here in Mission Control Center, we have just completed a shift change and our flight director at this time is Milton Wendler and our capsule communicator is astronaut Ken Mattingly, Apollo 8 at this time is at an altitude of 151,789 nautical miles from earth and it's traveling at a speed of 4,584 feet per second. Since our last report, we have had something under a minute of conversation with the crew, and we'll play that back for you now.

CAP COM Apollo 8, Houston. How are you coming along with your P23 mods.

SC Five balls, they are getting square. What we have been doing most of the day, Ken, have you received the data down below?

CAP COM Roger. Looks like you are getting some pretty good marks. We have a pretty good hack on the vector and the matrix, and looks like if you wanted to terminate at this point, that we do have good data.

SC - try to do stars at one -

CAP COM All right.

SC Did you have a nice Christmas?

CAP COM Apollo 8, Houston. Did you call?

PAO This is Mission Control. At the present time, I understand Bill Anders is flying the spacecraft, occupying the commander's couch, the left-hand couch, and Frank Borman is getting some sleep. The medic advises that he has been sleeping now for about two hours. We expect that shortly Jim Lovell will also begin a sleep period and we would also expect that Frank Borman would be waking up. At 110 hours, 10 minutes into the flight, this is Apollo Control.

END OF TAPE

PAO This is Apollo Control at 111 hours 6 minutes. Since our previous report, we have had about 8 or 9 minutes of conversation with Bill Anders aboard the spacecraft. It appears that both Frank Borman and Jim Lovell are getting some rest at this time. We will bring you up to date on the conversations that have developed and then stand by briefly for any live conversations with the crew.

SC Houston, Apollo 8. Over.
CAP COM Go ahead, Apollo 8.
SC Who is this? Kenny, or Jerry?
CAP COM Say again, please.
CAP COM This Ken, go ahead.
SC Okay Ken. We are getting back to the
PTC attitude. Would you like us to do the test?
CAP COM Affirmative.
SC ... just went to ...
CAP COM EECOM.
CAP COM Okay, Apollo 8. That is fine. That's
right, Bill. That was just an ... acquire.
SC Man, we get acquire on the run here.
CAP COM Hey, you are getting good at that.
SC (garbled)
SC Okay, we will keep it here for two revs,
Ken. Mike and uh - Mike and Jim are asleep and I'll just
keep it going here for two rolls.
CAP COM Okay, real fine.
SC Houston, Apollo 8. Over.
CAP COM Go ahead 8. Go ahead 8.
SC Well, the react didn't work as advertised.
We get - went on by the scan limit and into the mechanical
limit and followed - this meant around - Looking out of
the corner of its eye on wide beam and when Menkent came
back underneath the spacecraft, why it snapped back on it
to narrow beam. Apparently never broke lock, or if it did
it was only instantaneous.
CAP COM Roger. It looked like we did break lock
there for about 8 minutes.
SC Two-way lock, but I was still -
CAP COM Roger.
SC Under the scan limit, why I'll go ahead
and go the manual and auto lock on sequence and switch over
to react and see what it does next time around.
CAP COM Roger.
SC Houston. Were you able to get high bit
rate from the omni's now, by the way?

CAP COM Apollo 8. Houston. The omni high bit rate capability is noisy, but usable.

SC Okay. I think what we'll do here is if I see the high gain definitely going past the scan limit before it gets to the mechanical limit, I'll go ahead and ask - you could ask if the react feature hasn't taken over I'll just go ahead and shut it down stops.

CAP COM We are talking about it now, Bill.

SC Okay. But my understanding is that the scan warning of this thing is supposed stop tracking and it uh break of lock, for example, not very big.

CAP COM Roger. That's my understanding, but we are talking about it right now. I'll let you know in just a second.

SC Probably, Ken, we are not ever losing the earth's present signal.

CAP COM That's correct. Hey, Bill. Can you tell us what angles this went through. The curves that we have plotted is apparently the RF limit rather than the mechanical limit and discussing the function of the AUTO react mode, it looks like it is supposed to shift when it hits the RF limit, which is your - should be your inner set of numbers as opposed to the scan warning limit and if it went inside of that number, could you tell us about what kind of numbers it did go into.

SC Roger. It went past the caution warning limit to RF limit.

CAP COM Okay. Say for it me so I can copy it.

SC The antenna went to about 330 to 270 yaw plus 60 80 pitch.

CAP COM Roger.

SC Okay. The HEC dropped off to what I call our noise level that was the voltage integrated when the noise broke in. It was about 11 o'clock ... beam switch and a couple of times dropped to ... very briefly.

CAP COM Okay, you got some larks on that AGC that should register in volts, I believe. Do you have an indication other than 11 o'clock?

SC Unfortunately, the numbers never got on here. If you will look on that chart that Fred Hayes has, it ... 11 o'clock position. I might have it on my systems --

CAP COM Bill, --

SC -- when the antenna - when the antenna did snap back in, it went into yaw 80, pitch minus 5. With Verb 64 reading plus 67 for yaw and minus 10 for pitch.

CAP COM Okay. Yes, copy all that. I think you would have 4 or 5 marks on that power meter, don't you. From what you are saying, I take it, it's between Marks 2 and 4.

SC yes. Stand by a second.

SC Stand by Ken. I'll tell you what that mode is.

CAP COM Thank you.

SC Okay, it went to about hovering around 2.4 to 3.

CAP COM Okay, thank you. Roger. Apollo 8, Houston.

SC Go ahead.

CAP COM Okay. It's not real clear that it did in fact, get to the mechanical stop and if it does, the back room people say we can stay up against that stop for a maximum of 15 minutes without doing any damage. And we would kind of like to track it through one more time as is. We do have the high bit rate capability on omni. So we would like to follow through that same configuration for one more rev.

SC Well, since we are not sure that it did get up against the mechanical stop last time for 10 minutes or so, I don't think it would be too smart to ... position.

CAP COM I am sorry, Bill. You didn't come through. Say again, please.

SC Since we are not - it is not clear to me that we went up against the mechanical stop for a while on the last time around, that might account for 10 minutes of that 15 minutes and it would be pushing our luck - dropping it back where it belongs. We are still a long ways from home and if that antenna switch fails, it's going to fail the high-gain position and that's all we got.

CAP COM Roger, Bill. And we will be making a handoff on stations at 5 5.

SC Ken, we are going to switch COMM carriers here a second.

CAP COM Okay, thank you. Okay. Apollo 8, Houston. Through Honeysuckle.

SC Roger. Read you 5 by.

CAP COM Thank you.

SC It did the same thing that time, Ken. This time the voltage AGC did drop to full scale low for several seconds, but the antenna does seem to indicate it can look right through the spacecraft and on your D the earth went where the antenna was not supposed to be able

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1110600, CST 9:57p 336/4

SC to go.
CAP COM Okay. I would just like to confirm
with you that it never did go back to the preset numbers.

SC No, it apparently never lost earth
presence signal. It sounds like it was trying to pick up
one-way lines all the time and we usually hovered around
2 volts AGC except for brief periods.

CAP COM Okay. Thank you very much.

SC It looks like if they had - should have
not had the ... switch into wide beam until after it had
gone to those preset limits. We are back in AUTO on the
omni.

CAP COM Okay. Thank you.

SC - CDR is up and manning the helms. We
are going to switch COMM carriers. That will be all up
here for a little bit.

CAP COM Okay. Thank you.

END OF TAPE

*Borman
11/25/68*

73/8

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 11:16:00 CST: 10:07 337/1

SC Hey, Ken this is Frank.
CAP COM Good morning, sir.
SC Houston, Apollo 8.
CAP COM Go ahead Apollo 8, loud and clear.
SC How far are we from home, Ken?
CAP COM Oh, about 152 it looks like. That is
pretty gross, I will get you a real number in just one
minute.

SC 152?
CAP COM 148,550. That is a good number.
SC Pretty good.
CAP COM A velocity of about 4650.
SC Increasing it.
CAP COM That is affirm.

Pause
PAO This is Apollo Control at 122 - rather
111 hours 22 minutes and at the present time we are standing
by for a status report - a crew status report which we antici-
pate to be coming up from the crew shortly. In that past
conversation we heard from Frank Borman for the first time
in about three hours and we should be getting a report in
that crew status summary from Frank on just how much sleep
he did get. We will continue to stand by for that call to
the crew from capsule communicator, Ken Mattingly.

Pause
PAO This is Apollo Control and we have been
advised that, that the crew status report will probably be
a little bit delayed in coming. At the present time Borman
is scheduled to be eating and we plan to wait until sometime
after he has had a change to complete his eat period before
requesting that status report. At the present time Apollo 8
is traveling at a speed of 4,657 feet per second and our
current altitude reading is 148,210 nautical miles. This is
Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY 12/25/68 GET 111:35:00 CST 10:26pm 338/1

CAP COM This is Apollo Control at 111 hours, 35 minutes. At the present time, we are in communication with Frank Borman aboard the spacecraft. Frank has just advised us that he is the only one up at the present time. A short time before that, Bill Anders came on and said that he planned to get a little bit of sleep and requested permission to take a Seconal tablet, one of the short-acting sleeping pills ~~carried aboard the spacecraft~~, and was given a go-ahead to take a tablet. And we also received a crew status report from Borman and he reported that all three crewmen had eaten three meals today, said they had been drinking a lot of water, and had used the exerciser, and in general summed up their condition as being quite good at this time. We will pick up that conversation and play back what tape we have accumulated, and then follow whatever live conversation is going on when the tape is through.

SC Houston, Apollo 8.

CAP COM Go ahead, Apollo 8.

SC We tried to get back on our normal sleep cycle, and I just woke up here a little while ago, so I'm going to try to hit the hay again, probably be a good idea to try another Seconal to try to get with it. What do you think down there?

CAP COM Okay, sounds like a good idea. And if we can get Frank to tell us how much sack time he got, that will go in the log too.

SC I was in bed for seven hours, Ken, and I probably slept for about four and a half to five hours of it anyway.

CAP COM You're getting better. Good.

SC If you're interested in further reports, we've all had three meals today, and we have drunk a lot of water, and Jim is asleep now, he worked pretty hard this afternoon, but I think we are all in pretty good shape now.

CAP COM Real fine. Thank you.

SC We used the exerciser. Well, Ken, that just leaves you or I, how about you and I, anything exciting happen today?

CAP COM I think you know about all the things that are exciting up on your end of it, real quiet down here. Everybody is smiling, Santa was good to most of the folks in the world, and everything is pretty calm, like it should be on Christmas.

SC Very good.

CAP COM Milt there is in a period of relaxed vigilance.

SC Very good. We relax, you be vigilant.

CAP COM That's a fair trade.

SC Hey, Ken, has anybody got any good idea

74
2

why that quad A tank is running hot, hotter than the rest of the quads?

CAP COM Okay, I didn't have an answer when I came on, just a second and I'll check again.

CAP COM Apollo 8, Houston.

SC Come in, Houston.

CAP COM Okay, Apollo 8. Let me tell you what subject matter we're going over down here; number one, we're making a review of all the entry procedures and that type of information, I mean we're actually going through and reviewing the entry check list. We have people that are still working on verification of your erasable memory, and we are looking at the EMS problem, and we're discussing the quad temperature, so I'll feed up some of these pieces of information as they come along, and right now we are just sort of having a status review.

SC I don't think the EMS is much of a problem, it just jumps when you go into auto. I don't believe it will bother us on entry. I don't remember the EMS doing the same thing - I am just going over my check list - one of the first things I see here is a coldsoak, and I don't think we want to evaporate between the last midcourse and entry, do we?

CAP COM This is Apollo Control. In that previous conversation with Frank Borman, we heard Cap Com Ken Mattingly review activities here in Mission Control Center, including a comment on the quad temperatures, these are the temperatures in the reaction control system, the engine quads, of which there are four in the spacecraft service module, and we have been observing the temperature of quad A for several hours now. That quad is running about 83 degrees compared with 60 or 70 degrees for the other three. The assessment here in Mission Control Center is that that is not a problem. There is no explanation as to why that one quad is somewhat higher than the other three, but we don't consider it any problem. At the present time, the spacecraft velocity is 4,675 feet per second as we continue to watch the gradual buildup in velocity and a gradual decrease in altitude. Our altitude reading at this time is 147,321 nautical miles. At 111 hours, 45 minutes into the mission, this is Apollo Control.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1121600, CST 11:10P 339/1

PAO This is Apollo Control, Houston, at 112 hours, 19 minutes. Apollo 8 is at an altitude of - 145 758 nautical miles and traveling at a speed of 4709 feet per second. Since our previous report we have about 6 or 7 minutes conversation with Frank Borman aboard the spacecraft. He reported that his cabin temperature was running a little bit higher than normal, about 80 degrees at the present time and indicated that apparently the higher temperature is due to the fact that current spacecraft attitude allowed more sunlight into the windows. We'll play back the tape of that conversation for you. We're expecting a call through the crew shortly from CAPCOM Ken...and we'll standby after we catch up to pick up any live conversation.

CAPCOM Apollo 8, Houston. Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger. Looking at the flight plan you have a P52 coming up at a 115 hours and we'll have to do another one at 11945 preparation for the P23. And it's acceptable with the ground procedures if you would like to delay about 115 hour alignment and do it just once at 11945 or you can do it there in flight plan location. If you want to skip the 115 hour alignment, we could go ahead and start in on the 15 YAW free PTC load at this time.

SC What does that mean, Ken?

CAPCOM Okay, we have a DPO that requires that we do a PTC and go ahead and do it in minimum impulse load so that we're not putting any attitude corrections in. And we're going to be tracking the attitude excursions. And they want this something like 6 hours or until we reach 11.

SC Roger. The temperature is running a little bit warmer than normal.

CAPCOM I'm sorry, say again.

SC I say the cabin is running a little bit hotter than it has been. It looks like this particular PTC alignment gets more sun in the cabin.

CAPCOM All right, what kind of temperature are you recording right now?

SC I just put the window shades up that will cool you off.

CAPCOM Okay.

SC You won't be there to take the pitch YAW out of - brake fan, right?

CAPCOM That's affirmative. You just put it minimum impulse and then we'll watch it.

SC There you are.

CAPCOM Okay, thank you.

SC Have fun.

CAPCOM Roger. And I'm at quad temperature. The upper limit of that thing is 105 degrees on the bottle.

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1121900, CST 11:10P 339/2

You are well below that. We have been watching it and it is tracking although it is tracking very slowly as you pull the spacecraft the temperature seems to be a little sluggish. But it isn't a frozen censor. And talking a little bit more about that one right now - You might tell Jim the next time he goes to work with the optics...when you work with the trunnion if you'll go ahead and recycle the zero switch you can avoid the problem we had prior to midcourse correction four. And the midcourse correction - the midcourse correction number six right now looks like zero. And midcourse correction seven is approximately 2 feet per second.

SC Okay, Jim, now we've got an inject list to initiate cabin cold flow. This involves evaporating and I don't think we want to do that.

CAPCOM Okay, now we talked that over with... and at 12 hours out everyone seems to think that we don't need to do it there. But in close it doesn't seem to have any effect on the trajectory and what's been suggested if you'd like we can go over the entry checklist and just kind of walk through it on the air with all the people on the console. Right now you have the team that will be performing the entry session with you so we can go over the checklist and run down any corrections that you might have. It's left up to you.

SC That's fine, let's do that. I've got one right here...

CAPCOM All right, give us a few minutes to pull ourselves together and get on the air.

SC Go ahead.

CAPCOM Okay, we've drifted off now about 25 degrees in PITCH. I'd like to have you take it back and set up the PTC plane again at PITCH of 10 and YAW 45 and set up the PTC under control and turn your ship back to minimum impulse and give us a mark when you have done that. And we'll time the drift rates down here.

SC Okay. Okay, Ken, I've got them all stamped out about as low as I can get them.

CAPCOM Okay, fine.

SC I'll put in a ROLL right now.

CAPCOM Thank you.

SC I'll put in a ROLL right now.

CAPCOM Thank you.

SC Takes actuations to get about a degree and a half or a tenth - one - . 15 degrees per second.

CAPCOM All right. And giving a mark when you release the break command and pitching out.

SC I haven't even got them on.

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APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1121900, CST 11:10P 339/3

CAPCOM Oh, okay, fine.

SC When I gave you - when I gave you that
mark that was it.

CAPCOM Real fine, thank you.

SC Ken, be sure and call me if you see
any gimbal angles start to get near arc or anything
gimbal ... I'm a little drowsy still. I don't want
to end up with another no attitude like one is enough.

CAPCOM Roger, will do.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1122900, CST 11:20p 340/1

PAO This is Mission Control. There doesn't appear to be any further conversation developing at this time. We do have some figures for you. On the half way point in the spacecraft's return to earth, we anticipate that that will be reached at a time of 126 hours 3 minutes 9 seconds in the flight. At that point Apollo 8 would be 103 002 nautical miles from earth and would be traveling at a speed of 5870.6 feet per second. At 112 hours 31 minutes into the flight, our velocity is 4720 feet per second and the spacecraft at this time weighs 31 649 pounds. Current altitude reading is 145 208 nautical miles. This is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1125800 CST 1149p 341/1

PAO This is Apollo Control Houston at 112 hours, 58 minutes. At the present time both here in Mission Control Center and aboard the spacecraft it's a relatively a quite period. Frank Borman continues to be the one of the three crewmen who is awake at the present time and he's reported on a couple of occasions that he is getting sleepy. Eariler, Frank reported, that he had gotten about four and a half to five hours of sleep and had been in the sleep station for about seven hours. Since our previous report we've accumulated about five minutes of tape conversation. We play that back and continue to stand by for any live comments from Borman aboard the spacecraft.

CC Apollo 8 Houston

SC Okay, would you reinitialize the PTC attitude and try it one more time?

CC Okay.

SC Okay.

CC Roger. Say that again, please.

SC Say, that's getting pretty good now.

CC I think it's getting freezing up there, huh?

SC Okay, would you believe that the north beat the south three to nothing, and they did that all with a first quarter field goal.

SC How about that, Eddie.

CC Yes, sir. And Frank we're going over a check list right now and I'll get back with you on the entry check list in a few more minutes.

SC Roger. We're flying a train very badly.

CC Okay, I noticed that on PV.

SC I'll tell you one thing we are going to do on these suits, we're going to stow them, one under each seat the way North American suggested.

CC Roger. And you'll be putting the helmets in the food storage.

SC Yes, I think we'll put the helmets in the food storage and any stuff we have to take out of there, we'll just stick in a suit.

CC Okay.

SC Is the weather still good our there?

CC Its not quite as clear as it was yesterday, it sure is nice and balmy.

SC (garbled) 165 west.

CC Okay, Frank, we've got a weather picture here. The forecast shows 2000 scattered and 4000 broken with a high overcast, you might see that as you come down to it and way height four feet when by 070 at 12 with 10 miles visibility and perhaps some scattered showers in the

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1123800 CST 1149a 341/2

miles visibility and perhaps some scattered showers in the area and this is forecast for 27th and 16 other Zulu.

SC Very good, we'll be there.
CC Yes, I'm sure you will
SC (static) about 45 minutes
CC Okay, we'll put in a kit for some

small waves.

SC Tell Jerry Hammack if the waves get high its his fault.

PAO This is Mission Control, apparently a small segment of Borman's remarks during that past conversation was at a low enough level that they did not trip the recording mechanism for a release circuits. We will have those on a backup tape that will be included in the transcript. Generally, those remarks consisted of brief comments on anomalies encountered. Borman summarized about four or five items that constituted minor problems and I'll run through those for you now. He mentioned that the inflight coverall booties that the crew was wearing had become frayed and that they had removed them, he also mentioned that one of the Y adapters associated with their electrical umbilicals had developed an open circuit and he said the light weight head sets that they carry onboard had not proved very useful but that the snoopy hats of the helmet type arrangement with the communications equipment inside the headset was quite comfortable and that the crew was wearing those all the time. The following remarks, I believe, did appear in the tape release was concerning the plan to store these suits and but - helmets, storing the suits under each seat at reentry and the helmets in the food storage area. At 113 hours, six minutes into the flight our displays in Mission Control Center show that the spacecraft has an altitude of 145 319 nautical miles and its velocity 4718 feet per second. This is Apollo Control Houston.

END OF TAPE

CAP COM Apollo 8, Houston.
SC Go ahead, Ken.
CAP COM Okay, would you re-initialize the PTC
attitude and let's try that one more time.
SC Okay. Are you ready.
CAP COM Okay.
SC Okay, three blips.
CAP COM Thank you.
SC There she goes.
CAP COM Roger.
SC Is it sleepy out down there too?
CAP COM Say again, please.
SC I say, is it sleepy out down there.
CAP COM No, it's getting pretty good now.
I figured it's getting sleepy there - not not -
SC yes.
CAP COM Okay, well would you believe that the North
beat the South 3 to 0. And they did that all with a first
quarter field goal.
SC Very good and when was the East West
game?
CAP COM Oh, about Saturday.
SC Next Saturday?
CAP COM Yes sir. And Frank we are going over
the check list right now and we will get back with you on
the entry checklist in a few more minutes.
SC Okay, Jim. I think it is pretty good
one, but that is one thing we have practiced a lot. Why
don't you let everybody know what we are doing.
CAP COM Roger.
SC Ken, while we are just killing time
here, there are a couple of anomalies we noticed on the
booties, you know, for the inflight coveralls. Mine have
frayed very, very badly and I have taken them off. Also
we had one Y adapter with an open end and the lightweight
headsets were kind of useless.
CAP COM Roger.
SC I take that back. I really didn't mean
to say that. The lightweight headset - what I really meant
to say was, the lightweight headsets are useless.
CAP COM Okay.
SC But these snoopy hats are pretty comfortable.
We have worn them the whole time.
CAP COM yes, I noticed that on TV. Ken, one
thing we are going to do on the suits, we are going to stow
them, one under each seat, the way North American suggested.

APOLLO 8 MISSION COMMENTARY, 12/25/68, GET 1125800, CST 1149p 341A/2

CAP COM Roger. And you don't be putting the helmets in food storage.

SC Yes, I think we will put the helmets in the food stowage and any stuff we have to take out of there, we will just stick in the suit.

CAP COM Okay.

SC Is the weather still good out there.

CAP COM Oh, it is not quite as clear as it was yesterday, but it sure is nice and balmy.

SC no, I mean out at 165 west.

CAP COM Okay Frank, we have got a weather picture here. The forecast shows 2000 scattered and 12 000 broken with a high overcast. You might see that as you come down through it and wave height, 4 feet, wind about 070 at 12 with a 10 mile visibility. And perhaps some scattered showers in the area and this is forecast for the 27th and 1600 zulu.

SC Very good. We will be there.

CAP COM Yes, I am sure you will.

SC i will make those waves ... We are going to sit in this thing for about 45 minutes.

CAP COM Okay, we will put in a kit for some small waves.

SC Tell Jerry Hammack, if the waves get high, it's his fault.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1134000, CST 12:31A 342/1

PAO This is Apollo Control, Houston at 115 hours, 40 minutes. We've had a very quiet period here in Mission Control since our previous report. One very brief exchange between the ground and Frank Borman. We show virtually nothing in the flight plan for the next two hours as both Anders and Lovell are continuing to sleep. They have now been sleeping or resting for about 3 hours and Lovell perhaps maybe an hour longer than that. He indicated that he was beginning his rest period about an hour before Bill Anders came up and indicated that he would also try to get some sleep. Here is the conversation that went on a short while ago. We'll play that back to you now.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Okay, why don't you drive it back over to the PTC attitude and put it back into attitude hold for the ROLL. And we're going back in and review the DTO requirement. You have about the same results it looks like on a cursery analysis all three times. So we're going to take another look and see if there is any reason to do it again. If so, we'll call you. You can go ahead and put it back in attitude for now.

SC Okay, Jim, thank you.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1140600, CST 12:57a 343/1

PAO This is Apollo Control at 114 hours
6 minutes. At the present time, our spacecraft is traveling
at a speed of 4817 feet per second and our altitude now
above the earth is 140 780 nautical miles. We have had
very small amount of communications with the crew since our
last report. We will pick that up for you now and then
stand by for any further conversations that develop.

SC Houston, Apollo 8. Radio check.

CAP COM Loud and clear, Apollo 8.

SC Okay Ken. Thank you.

CAP COM Roger. It is taking us a little longer
to go through and rehash all of the entry tickler than I
thought and we are just about to wrap it up now.

SC No problem. Just watch my gimbal
angles for me and give me a call if they get too close.

CAP COM All right. We will watch them.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1142100, CST 112a 344/1

PAO This is Apollo Control at 114 hours,
21 minutes. CAPCOM Ken Mattingly has just put in a call
to the crew. We'll pick that up for you at the beginning.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Say, we would like to look at a couple
more DELTA-V tests on the EMS and the general consensus
is that we don't think there is any particular problem.
We'd like to go ahead and take a look at what you get by run-
ning four or five more DELTA-V tests in private. We'd like
to run one of these null bias tests and since we don't have any way
of monitoring any of this stuff on the downlink, I'd like to
have you tell us each step when you turn the switch and
different orders and things like that.

SC All right, I'll run a test.

CAPCOM Okay, the first thing we want is this
null bias a hundred seconds. Affirmed.

SC DELTA-V.

CAPCOM Roger.

SC I took some minus 4, 24 that is.

CAPCOM Roger.

SC Minus 25.

CAPCOM Roger.

SC Minus 26. Minus 27, and there is a 106,
minus 27 and 106.

CAPCOM Roger.

SC Now what do you want?

CAPCOM Okay, if we go back and both switch to
standby and function switch OFF.

SC Roger.

CAPCOM Okay, now we'd like to do a couple of
DELTA-V soft tests.

SC Okay, 7 to 1586.A.

CAPCOM Roger.

SC Have you gone to automatic?

CAPCOM Roger.

SC Want a DELTA-V test? Now, counting
down.

CAPCOM Apollo 8, Houston. Apollo 8, Houston.

SC You back, Ken.

CAPCOM Apollo 8, Houston.

SC Roger, read you.

CAPCOM Okay, we got caught in a space and hand'
over there. This copy may be empty, you said you were put-
ting it to DELTA-V test.

SC I ran three tests during that hand over.
I over minus 19.6 2R minus 19.8 one of them minus 19.6.

CAPCOM Okay, that sounds real fine.

SC Roger.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1142100, CST 112A 344/2

CAPCOM Okay, the other thing that sometime prior to entry and we're going to be looking at it is the normal entry test pattern and it's called out certainly in the checklist as something we do around an hour and we'd like to check if you can read the number on the scoll that is up now so we can see where we are in the test pattern sequence. We're considering taking a look at these test patterns before we get into an R so we can have more time to think about it in the event that there should be something anomalous in it.

SC Why don't we do it right now? We're on number 8.

CAPCOM Okay, understand that's number 8, right?

SC Roger. It takes an awful long time to run them over there anyway. It won't hurt to do one.

CAPCOM Okay, if you'll standby here for just a second. We're checking to see where we stand in the sequence of events for pattern 8.

END OF TAPE

SC Hey, Ken.
CAP COM yes sir.
SC Another little thing about this EMS.
You know, we had it set up when we separated from the booster -
CAP COM Roger -
SC - and the shock of the separation -
the shock of the pyro's blowing in separation knocked it
up to 100 and something.
CAP COM Understand, knocked it up to 100.
SC Roger.
CAP COM Was the pyro separation enough that
the - you felt a sensible G in the bird?
SC Roger. Let's just say there wasn't
any question ...
CAP COM Roger. Understand.
SC While you are checking the scroll ... find
out which drifting pattern I should be using on this bird.
CAP COM Okay, will do.
PAO This is Apollo Control. During the
past few minutes the conversation has concerned the ENTRY
monitoring system. We have been running some tests on
this system to - stand by here is a call to the crew.
SC Go ahead.
CAP COM Okay, we are verifying that scroll
position. They are talking it over in the back room about
that now. I would like to go ahead and run down the
checklist with you for entry.
SC Go ahead.
CAP COM Okay, look in on entry 1, the second
item there is 12 hour Kevin cold soak and in discussions
here and preflight, I think it is agreed that we don't want
to do the cold soak there. So we are going to delete that
step 2. And what it amounts to is, I think we do want to
do a cold soak and we certainly want to exercise the water
boilers prior to entry in order to insure that we don't
have one that is dried out, in the same manner that we
had one dried out prior to LOI. And we are working on
some procedures for that and wanted to come back to you
with those a little bit later and we will try to do it
sometime when Bill is on the line. So that everybody can
get in on the loop at the same time. We would like to add
a step between 8 and 9, or as part of step 8. This is all
on page D-1 where we turn the VHF to SIMPLEX A at minus
4 hours and 35 minutes. Now, this will be beyond two-
way VHF range, but it will make sure that we do have it on
at the time when we pick it up. We were able to get out to
20 000 miles with it downlink and we are checking on the

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1143100, CST 1:22a 345/2

CAP COM uplink signal. So if we put it on at this point, we know we have it on well in advance of any time we might be able to get into VHF.

END OF TAPE

CC If we put it on at this point we know we have it on well in advance of any time that we might be able to get into the VHF.

SC Okay.

CC Okay, I guess maybe I have that backwards - they copy - you folks copied the VHF out to 20 KM, we're checking on the - on the downlink, end of that now, but in any event this four hours and 35 minutes will get it well in advance for that.

SC Roger

CC Okay, 8, we just had an answer back on the test patterns, we thought it was - we had 25 test patterns that you're allocated at the ground test and these are the ones we've been looking at. Then there is five more than is allocated to flight and the only difference in these patterns is that the flight patterns have instructions actually written on them so if we are looking at test pattern eight that means that we're still working on the ones that you were allocated on the ground test, so there was no problem there and I'll get you a number for which pattern we will be using for entry, we're working on that one right now. So we would like to go ahead and run through these.

SC

CC Say again, Frank.

SC I don't mean the test pattern, I don't mean the test pattern, we ask them to put the supercircular on the number - the first place on the scroll and I'm sure they did, I'm sure its the first pattern but I just wanted to make sure that's right.

CC Roger, that's why we are trying to verify it - so -

SC You want me to run through a test pattern.

CC Yes, sir, do it please. And if you'd tell us each step as you go through it.

SC Okay, going through step one, EMS step one, wait five seconds, five seconds going auto, okay, indicator lights are all off, the range is zero, zero. I'm gonna slew the hairline over the notch. Okay, and now we go EMS test two.

CC Roger.

SC Got the 05 G light, all others are out.

CC Roger.

SC On test three, far side lower light on ten seconds, going to set your range counter to 58. Okay set at 58, going test four.

CC Roger

SC Beautiful, its perfect, its right in

the corridor, it comes down and stops at zero, zero.

CC Very good.

SC Going test five. Perfect, again. Okay,
now I'm going to range set.

CC Okay.

SC Stand by.

CC Okay.

SC Okay, that was perfect.

CC Real fine. Okay, Apollo 8, I'd like to
run one more null bias and looks like we will have exercised
everything that we can get to.

SC Okay. Delta V, auto, All zeros. Minus two.

CC Roger, understand minus two. All right,
is minus two or minus two tenths?

SC Two tenths, three tenths now.

CC Okay, real good, it looks like we -

SC It looks like we had a lot of noise on
the circuit for awhile there, Jim.

CC Yes, we did, too. Electronic glitches
I guess.

SC Okay, 100 seconds plus minus four tenths.

CC Okay, real fine. That looks like that's
about all the functions that we can check and looks like
everything is just down the line.

SC Roger.

CC Okay, we still owe you confirmation that
you can expect you high speed goal to be a first pattern
you come to and I'll let you know as soon as they come in
with an answer on it. I'd like to go ahead and finish going
through the entry book if you're ready?

SC Roger.

CC Okay, we've reviewed most of the book up
here and we will have to come back in and pick up the way
that we can pick up the water boiler prior to getting reentry
area. We've reviewed all the last minutes changes that were
put in pen and ink type things and they're all looking good.
on page E7 like to add a couple of items.

SC What's that?

CC Okay, on step 34 under final stowage
which is for the catch all area there's a step that says
secondary glycol to radiator that says bypass verifying.
while we are down in this area we would like to go to
panel 382, the water control panel, and set up the evaporator
water control valve both primary and secondary to auto. Now
this is something we would have done had we done the cold
soak at minus 12 hours, but since we were not doing it there
we would like to go ahead and make sure we have these in
auto, this will enable automatic controls from the panel.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET: 14:41:30 CST 1:32a 346/3

SC Shall we just make this part of the procedure when we test out the water boilers beforehand?

CC Yes, sir, if we get that checked out earlier we can just leave them in auto.

SC I'd rather do that.

CC Okay, I'm just going to make a note here and we can do it the other way, too. Another item we'd better mention -

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1145130, CST 1:42A 347/1

CAPCOM You may already have this down as step 35. It says up telemetry to block, verify, and there's a step right after that that says RCS command module heaters' two circuit breakers closed.

SC Roger.

CAPCOM Okay, okay I guess that one was the one sent up to you this afternoon. And when you turn the page over to E8, it shows the EMS entry check being run at an minus hour. And you know that it is a short test. There is really no reason to wait for an hour. We might as well and go ahead and do that as soon as you get through with step 35 on page E7 because we're coming upon a pretty busy period.

SC I say that's fine, we'll do that. Houston, are you still there?

CAPCOM Right, we got a discussion going. Be right back. Okay Apollo 8, page E9.

SC Okay.

CAPCOM At the top of the page you have step 38 and right underneath that prior to step 39, we want to have a primary glycol loop activation. What we are going is to get the glycol evaporator water switched to auto and the glycol evaporator steam pressure switched to auto. This will get your primary water boiler on the line prior to entry. Or at least it will enable it.

SC Okay, tell me what to write in, Jim.

CAPCOM Okay. It's glycol evaporator water to AUTO. Apollo 8, Houston ...

SC Glycol evaporator water switched to AUTO.

CAPCOM Okay, and the second switch is the glycol evaporator steam pressure to AUTO.

SC Okay.

CAPCOM Okay, that takes care of getting the primary water boiler enabled and it is to my understanding that we were going to make the actual entry with both the primary and the secondary water boilers on the line.

SC Am not reading you now Houston.

CAPCOM All right, how now?

SC Loud and clear.

CAPCOM Okay, there's some question from reading the checklist. It is my understanding that both the primary and the secondary water boilers would be on for the actual entry and don't find a place in the checklist where it's actually turned ON. So we'd like to get confirmation of that and want to make sure that we have all the proper switching to put in the checklist.

SC Okay.

CAPCOM All right, still on page E9 and under step 39 at the bottom of the pyro circuit check there's a

step that says panel 8 all circuit breakers closed except and then it lists five that are printed, one that was printed in ink before launch. It says EDS power circuit breakers 3 open and to be complete we should ought to add the RCS heater circuit breakers. There's two of those and they should also be open.

SC Okay.

CAPCOM All right, the rest of these figures look good. I'm coming over through the graphs. And on page E11 -

SC Roger, I'm with you.

CAPCOM Okay, on step 5 on E11 there's - the first subtitle there is helmets and gloves and the items that follow beneath that are affected by whether you wear suits or come in shirt sleeves. But they do have to be accomplished. And the suit return air valves would actually be open for a shirt sleeve entry. And you should have a line penciled in of optics power to OFF between an emergency cabin pressure valve and the time when the CMP moves to the couch.

SC Right.

CAPCOM Okay. And the steps shows the recorder to rewind at minus 30. That's an onboard step rather than a ground step. Just to verify that.

SC Okay.

CAPCOM Okay. Under step 6 almost at the bottom in fact it's three lines from the bottom of the step 6, there's a section that says secondary coolant loop evaporator to RESET and should be a note that that's 58 seconds if you hold it in reset prior to moving the pump off.

SC That's it; I've seen it.

CAPCOM Okay. Okay, the next comment is on page E13.

SC Okay, I'm there.

CAPCOM All right, this is a general comment that refers to any time you're working around P62 or when you're going between P62 and P63. And you should be careful not to call an extended VERB during this time. This is during the program notes and it is just a reminder. Now what will happen if we get into an extended VERB such as an 83 or an 82? We may get hung up in P62 and have to recycle through it in order to get to 63. And neither of these displays are normally used, just a good practice. And we're just trying to remind you that we don't want a call an extended VERB while we're in P62.

SC Okay...that's right.

CAPCOM Out. Okay.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1150130, CST 1:52a 348/1

CAP COM Okay, and going through the rest of it, we didn't find any other things to make comments on. You have all the latest corrections in your checklist.

SC Roger. The main thing that is to come up is with a way to determine that the boiler - water boiler is not dry and make sure that Bill gets it activated at TMSM 7.

CAP COM That is correct. And we will talk to you some more about that the next time we catch both you and Bill up.

SC Righto.

SC Ken, this is Frank. I am going to be off the headset for about 5 minutes.

CAP COM Okay, fine. When you come back, I will have systems rundown for you.

SC Fine.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1151130, CST 2:02a 349/1

No comments recorded on this tape

END OF TAPE

Apollo 8 Mission Commentary, 12/26/68, GET 1151900, CST 2:09am, 350/1

PAO This is Apollo control at one hundred fifteen hours and 19 minutes. At the present time our space craft is at an altitude of 137 thousand 374 nautical miles from earth and traveling at a speed of 4 thousand 895 feet per second. Capsule communicator Ken Maddingly has just received the call from Frank Borman, we'll pick up that conversation now.

CAP COM OK, loud and clear.

SC Back with you.

CAP COM OK. I've got a few good words for you. The erasable memory has been taken completely apart and looked at and it looks like it's all OK. Your POI didn't have any effect. The one thing that might be questionable is if you used a VERB 67 when you get to the noun 99 display you may find that one to be unreliable and what your going to get there is the - that's an error display for the W matrix and it's something you probably won't be using again anyhow and if the occasion arises we can update that one but its not a normal used display and everything else, all the operational functions are good.

SC Very good.

CAP COM OK. As of a hundred and 14 hours, your battery: you had battery with A 39.32 amp hours, battery B had 35.21 and battery C 38.46. Your cryo quantities remaining at set were the same when we gave you the last time 180 pounds of oxygen per tank and 11 pounds of hydrogen per tank. At present the service module RCS, using the computer values for the quantities, you have quad A with 55% Bravo with 50, Charlie with 58 and Delta at 48. What we plan to do with the secondary tanks is to go ahead and turn them on at 37% actual and in the event of lost com or something like that recommend that you use 50% on board gaging as being the time to turn the secondary prepelt on. However as long as we can use our own calculations well we might as well leave them tied up. We probably won't get into the secondary propellants prior to entry anyhow.

CAP COM OK. A couple of items on the, check up on. I'd like to confirm that the hatch dogs will be taken off while your on the shoots if you can if not your going to do that in the water.

CAP COM OK. Now we've got a little better signal. Like to confirm that the hatch clamps on the side hatch will be taken off either on the shoots or in the water which ever you can get to. Is that affirmed?

SC Roger. That's affirmed. As a matter of fact we didn't even put them on.

CAP COM OK. Do you plan to put them on for an entry?

SC I don't think so. It's held pretty well so far.

Apollo 8 Mission Commentary, 12/26/68, GET 1151900, CST 2:09am 350/2

CAP COM OK. And we realize we never did find
out what happened to the mae west. Did you leave it blown
up or did you dump it?

SC We dumped it.

CAP COM OK. Who is the lucky guy?

SC The same guy that tried to launch it
this afternoon.

CAP COM OK and just as a gee wiz item your now
a 137 915 out and you only accelerated the 4883 you might check
to make sure you don't have a speed brake hanging. Those
are nominal values.

SC 137 thousand miles out?

CAP COM Confirmed

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1152900, CST 2:19 351/1

NO COMMENTS RECORDED ON THIS TAPE.

END OF TAPE

Apollo 8 Mission Commentary, 12/26/68, GET 1154600, CST 2:37 am, 352/1

PAO This is Apollo control at 115 hours 46 minutes and just about 10 minutes ago we had a change of watch aboard the spacecraft. Bill Anders who had been sleeping for about 4 hours awoke and came on the circuit to advise that Frank Borman was now attempting to get a better rest. Now we're in conversation with Anders at the present time, we'll pick that up for you now.

CAP COM Loud and clear

SC Good morning or good afternoon what ever it is JOB backup.

CAP COM OK

CAP COM Looks like all the senior guys have the mid watch.

SC I know what you mean. It'd be a good time to try out your ...

CAP COM OK. We'll try it out a little later.

Apollo 8 Houston, Apollo 8 Houston.

CAP COM OK. I guess we should start off with a little dialogue about sleep. How much do you have.

CAP COM Ok. I guess we can figure that out for our selves can't we? OK it's now 142 hours. Just try to find out how soundly you slept. I guess your not that sleepy.

SC ...

CAP COM OK. That's really about 4 hours.

SC OK, good.

CAP COM Apollo 8 Houston. Have you got somebody under the left couch or can you get down to the water control panel? What we were thinking about doing is blowing a little out of the secondary evaporator to check it out, just as a component check something we need to do but if there's somebody down there we can do that some other time.

SC Yeah, that'd be fine. That's a kind of tedious process and I figured we'd kind of keep our eyes out so we'll have some idea of prior entry if we plan on having two loops or one. We start our lead to center another question we're trying to pin down. Two questions infact. Number 1 we'd like to verify that you do plan to use both primary and secondary boilers during the actual entry and we're also looking for a way of checking the primary boiler to make sure it isn't dried out prior entry and that's turning to a little more of a challenge than you might suspect Do you have any thoughts so we can go over that?

SC We do plan to use both. Before we get into water boiling problem I figure I'd like to take a second also to make sure I get off to sleep here.

CAP COM OK. That's a go.

SC OK. On the water boilers. It's interesting that I can get my own, I was going to say that any time you have your mike I can hear myself talking with about a 2 second time delay. Lets stick to the primary and secondary

To 365/1

Apollo 8 Mission Commentary, 12/26/68, GET 1154600, CST 2:37am, 352/2

SC Boilers check. I think it would be a good idea to make sure we've got them both prior to entry and have the reserVICing procedures handy.

CAP COM You know the secondary, in fact both reserVICing procedures are available on the malfunction book. And some of the problem with checking out the primary boiler is finding a way to make it boil on the way in.

SC Yeah. Just a second Jim. I've got another little chore going here. It looks like the only way we're going to be able to do would be to shut off the radiators.

CAP COM We were looking for a little more doubtful way to do that.

SC Roger. That would be agreeable to me. A little more doubtful way but it shouldn't freeze up if we get it quickly.

CAP COM We're talking over several things like putting the ten pin valves in manual or partially closing it or some of these different ideas. Something you can think about while you're laying there with nothing else to do

SC Yeah. We've noticed that it's gotten warmer in this cockpit, coming back than it was going out. I remember going out we manually positioned the ten pin valve, but we had pretty good control over the glycol evap outlet temperature. So approximately that'd be the thing to try first rather than the radiators.

CAP COM OK. We've got backroom boys looking at it too.

SC I guess that if we just pick a time we ought to pick a time so if something did go haywire we could afford to boil in full the rest of the way in but still leave us enough time to make sure we've got the evap service if it didn't work.

CAP COM Confirm. We're factoring in things like that. Forget reconsiderations and all that sort of thing.

SC Right. Maybe the second Derivative of the water boiler versus time clock will give it the optimum time to do it.

CAP COM There's also speculation you have a code on board that gives that information.

SC Well if I don't I'm sure those guys can gin one up, they've done some other pretty good ones.

CAP COM It's also been suggested that if you don't have the chart it's on the tape recorder.

SC Well if I don't have a chart I'll put it on the tape recorder.

SC I think, unless you guys have some more comments along those lines maby we ought to give these guys a chance to get some sleep and I'll reply here for a while unless you've got something to brief me on go ahead but I keep my

Apollo 8 Mission Commentary, 12/26/68, GET 1154600, CST 2:37am, 352/3

SC answers to yeses and no and what ever else you think you really need.

CAP COM OK. Fine Bill and I'll check with you like every 30 minutes just to make sure we have a word of contact.

SC OK. I've got some writing to do and what not so keep an eye on the distance and angles and well be all right.

CAP COM AOK

SC And Ken if your decon man wants to play the object of which game, we're on Bravo at this time - but also configured for D's, of course D is also configured for Bravo, if you want to switch, go ahead.

CAPCOM Okay. We are cranking up some background music for you. - We can use your humming for a back up ranging in case everything else fails.

SC Rog.

CAPCOM Apollo 8, Houston, you don't need to answer this transmission, but doctors observe that it looks like some of your sensors may be working loose, so you might just kind of push on them and see if they are in place.

SC Did that do any good.

CAPCOM No, it looks like it is one of your sternals, Bill. - Apollo 8, we can't handle the OMNI switching for about thirty minutes, til we get back to an 85 foot disk, so you will have to watch the antenna store for a few more minutes.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1154600, CST 2:37a 352A/1

SC Houston, Apollo 8. Over.
CAP COM Loud and clear.
SC Good morning, or afternoon, or what
ever it is. The JOD is back at the COMM. CDR went back
to bed.
CAP COM Okay.
CAP COM Looks like all the junior guys have
the midwatches.
SC I know what you mean. I had a little
sleep earlier, so I am pretty well rested and want to make
sure Jim gets a good snooze here prior to entry. This
might be a good time to try out your background music, and
see if you have any better luck.
CAP COM Okay, we will try that a little later.
CAP COM Apollo 8, Houston.
CAP COM Apollo 8, Houston.
SC Go ahead, Houston.
CAP COM Okay, I guess we should start off with
a little dialogue about sleep. How much did you have?
SC Well, let's see. Whenever it was I
told you I went to bed last night until now. Just a second
and let me check the flight plan. Have you got it logged
in whenever I asked for that last Secondal?
CAP COM Okay, I guess we can figure that out
for ourselves, can't we?
SC Yes, why don't you let me know. I have
kind of lost track of time it was when I went to bed, but
I went to sleep about 15 minutes after that and woke up
about 10 minutes ago. Good sleep.
CAP COM Okay, so I see it is now 142 hours
SC What do you think I am, Rip van Winkle?
CAP COM Just trying to find out how soundly
you really slept. I guess you are not that sleepy.
SC (echo)
CAP COM Okay, it is really about 4 hours.
SC Okay, good.
CAP COM Apollo 8, Houston. Have you got some-
body under the left couch, or can you get down to the
water control panel?
SC I can get down there. Frank hadn't
quite gone to sleep yet.
CAP COM Well, what we were thinking about doing
was, boil a little out of the secondary evaporator, check
it out, just for a component check, something we need to
do, but if there's somebody down there, why we can do that
some other time.

SC Well, if it boils we are going to know it before - it won't take long to find out if won't boil down, a heck of a lot we can do about it, so why don't we wait until someone else wakes up here, Mike wakes up again.

CAP COM Yes, that would be fine. There is something you can do. You can reservice this and it is kind of a tedious process, and that's the reason why we just want to kind of keep our eyes on it so we will have some idea prior to entry we can count on having two loops or one. Which kind of leads us into another question, we are trying to pin down. Two questions, in fact. Number one - we would like to verify that you do plan to use both primary and secondary boilers during the actual entry and we are also looking for a way of checking the primary boiler to make sure it isn't dried out prior to entry. And plus turning the interim a little more of a challenge than you might suspect. If you have any thoughts on that subject we will go with that.

SC The answer to the question is yes. We do plan to use both. Before we get into the water boiler pump though, I would like to take a Seconal also. Make sure I can get off to sleep here.

CAP COM Okay, that's go.

SC Okay, on the water boilers, - interesting that I get - I was going to say anytime you have your mike keyed, I can hear myself talk with about a 2-second time delay. With respect to the primary and secondary boiler checks, I think that is a good idea to make sure we got them both. Prior to entry and have the reserve procedures handy.

CAP COM Roger. You know the secondary - well, in fact, both reservicing procedures are available in a malfunction book and sort of the problem with checking out the primary boiler is finding a way to make it boil, on the way in.

SC Yes, just a second, I got another little chore going here. Roger. It looks like the only way I will be able to do it would be to shut off the radiators.

CAP COM We were looking for a little more docile way to do that.

SC Roger. That way would be agreeable to me too, more docile way. But, shouldn't freeze up if we did it quickly.

CAP COM Roger. We are talking over several things, you know, like, putting the ... valve to manual or partially closing it or some of these different ideas. And something

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1154600, CST 2:37a 352A/3

CAP COM you can think about while you are laying
there with nothing else to do.

SC Yes, we noticed that it had gotten
warmer in here, cockpit, coming back than it was going out.
And I remember going out when we manually positioned the
10-pin valve, but we had pretty good control over the
glycol evap outlet temperature. So possibly that would be
the thing to attack first rather than the radiators.

CAP COM Okay, we have got the back room boys
looking at it.

SC I guess if we didn't pick a time though

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1155600, CST 2:47a 353/1

CAP COM ... omni switching for about 30 more minutes, until we get back to an 85-foot dish. So you will have to watch the antenna store for a few more minutes.

SC Okay, I don't see any loose sensor - the upper - upper - are you trying to call us?

CAP COM No, I didn't. It sounded like you were getting an echo and I checked and I hadn't held the key down at the time either.

SC Okay. I don't see any loose sensors, but the upper sternal is beginning to irritate a little bit, but not badly. And possibly there is something going on there.

CAP COM Okay, and did you copy about the antenna?

SC They really disappoint me, but I'll keep that in mind.

PAO This is Apollo Control. That appears to be all the conversation for now. We will stand by to come back up when next we hear from the spacecraft. At 115 hours 59 minutes into the flight of Apollo 8, our velocity is 4940 feet per second and our altitude 135 462 nautical miles. This is Mission Control Houston.

END OF TAPE

PAO This is Apollo Control. 116 hours 21 minutes. At the present time, we are talking with Bill Anders aboard the spacecraft. A short while ago we attempted to play up some background music, as requested by the crew and met with marginal success. On that we will pick up the conversation ensuing - following that attempt.

CAP COM Apollo 8, Houston. Radio check.

CAP COM Apollo 8, Houston. In the blind. We are not receiving downvoice, we have data and it appears that it is probably a ground problem. Apollo 8, Houston.

SC Roger, Houston. Read you loud and clear.

CAP COM Okay. I got you that time. I take it you were able to copy with the music? Is that affirm?

SC I was able to copy you all the time, Ken, but I could only hear the music when you were trying to transmit and I wondered if you noticed cycling on my suit power switch when you - when you called me. I am hearing an echo now.

CAP COM By time you copy your echo. And what switch were you cycling?

SC I was cycling the suit power which turns off the BIOMED periodically. I figured that would wake the doctors up.

CAP COM It appears that we have more than one communications problem.

SC Roger.

SC We need the high gain, Houston. Will omni be okay?

CAP COM 8, Houston. That's negative. --

SC Be advised that my - I am hearing these echos quite a bit of the time and if you are trying to play music, I am not hearing it.

CAP COM Roger. We understand and we are not trying to play music right now.

SC Okay, who is this? Comm Tech?

CAP COM Ken is only human. This is his substitute. This is Flight Director.

SC Oh, I didn't recognize your voice there.

CAP COM I don't get to talk often.

SC Who is substituting for you now, Flight - Director?

CAP COM DFD.

SC Okay. Looking pretty good from here. How about down there?

CAP COM It couldn't be better.

SC You guys are doing a great job. I appreciate it.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1162100, CST 3:12A 354/2

CAP COM Apollo 8, Houston. Going to be handing over sites at 25. I will make a voice check with you when we come up on the new site and the ground says thank you for your kind words.

SC Okay, we will be standing by.

CAP COM Apollo 8, Houston. Through Honeysuckle.

SC Roger, Houston. Loud and clear.

CAP COM Okay, Bill and our BIOMED data still looks a little bit squirrely. How about checking the blue signal conditioner on your BIOMED harness. You have one connector. It should be the center package; has a blue patch on it. You kind of check that and I wonder if you have changed the BIOMED harness recently. If you have, this might have caused some problems.

SC Roger, I was just cracking open some acorns here for breakfast. Let me put them down and I will check my BIOMED leads.

CAP COM There is no rush on it.

SC Everything is in ship shape.

END OF TAPE

APOLLO MISSION COMMENTARY, 12/26/68, GET 1163100, CST 3:22A 355/1

NO COMMENTS ON THIS TAPE.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1164500, CST 3:36 356/1

PAO This is Apollo Control at 116 hours, 45 minutes. At the present time Apollo 8 is traveling at a speed of 4993 feet per second. And our altitude is 133 267 nautical miles above earth. We've had no further contact with the spacecraft since our last report. We are anticipating another attempt shortly to play up some music to the crew. And at this time aboard the spacecraft Bill Anders is standing watch. Both Frank Borman and Jim Lovell are in sleep periods at the present time. We will continue to standby for any call to Anders and for that next attempt to play up some music.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1165000, CST 3:41A 357/1

PAO This is Apollo Control, 116 hours, 52 minutes. CAPCOM Ken Mattingly has just put a call to the crew. We'll pick up that conversation now.

CAPCOM Apollo 8, Houston. Apollo 8, Houston.

SC Go Houston.

CAPCOM Okay, Bill. We're ready to try this music on a different kind of lash up this time. What I'd like to do in order to make sure that we maintain voice comm is when you get it if you would give us a call and tell us you have the music and any comment about its relative volume or anything like that. And if I get your call, then I'll call you back and tell you and what will happen is when I go to talk to you we'll talk the music link. And we can go ahead and take over the switching of the antennas if you like.

SC Okay, I'm in BRAVO DOG switch configuration and go ahead with the music. Be advised last time the fidelity was low and the volume was too high.

CAPCOM Okay. And if you'll give us the same kind of comment hopefully, not the same comment but the same type of evaluation, pick it up this time.

SC Play it a little bit and we'll talk about it.

CAPCOM I can barely barely hear it.

SC Need to get the hear louder. That's good.

CAPCOM Playing music. (Herb Albert and Brass)

SC ...

CAPCOM Apollo 8, Houston, how was that?

SC That's real good for background level type, Jim. Maybe you can do some logging in here so that's real nice...a little bit louder but that's good for now.

CAPCOM Okay. That's about the max flying we can take down here so if you want to talk with us you may have to call once or twice. You're just barely phonetic.

SC Okay, try again and - Okay, try again and I'll give you a little louder call and try to keep it quiet.

CAPCOM Oh yeah, listen I was aware you were calling, I just didn't make out what you said. And from now on any time you call, hold off the music and I'll talk to you.

SC Roger, don't hesitate to inhibit.

CAPCOM Jim and Bill we're going to have to wait until we get around to BRAVO before we start switching. Our margin is still a little bit long.

SC Okay, I'll just go ahead and switch it

...

CAPCOM Okay, thank you. Our midnight DVA goes

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1165000, CST 3:41A 357/2

back on the air.

SC	Right.
CAPCOM	Playing music.
SC	Very clear now.

END OF TAPE

Apollo 8 Mission Commentary, 12/26/68, GET 1170000, CST 3:51am, 358/1

CAP COM Music
APO This is Apollo control Houston at 117
hours 5 minutes. We'll take the circuit down for the time
being and come back up the next time we reestablish communica-
tions with the spacecraft. At 117 hours 5 minutes, this is
Apollo control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1171900, CST 4:10A 359/1

PAO This is Apollo Control at 117 hours, 19 minutes. At the present time the spacecraft is at an altitude of 131548 nautical miles and our velocity continuing to increase now up to 5035 feet per second. We're in communication with the spacecraft. At this time here is how that conversation is going.

CAPCOM Apollo 8, Houston, check your YAW gimbal angle.

SC You must have been reading my mind.

CAPCOM No, the...

SC Oh, okay.

CAPCOM Playing music.

SC Houston, Apollo 8.

CAPCOM Go ahead, Apollo 8.

SC Jim, do you want me to use the high gain when we come around or is the object suspicioned? It doesn't matter to me.

CAPCOM Okay, the OMNI is doing fine. I was just watching your middle gimbal angle there and was getting a little far out.

SC Oh, okay. I thought you - I was too. I thought you said check the disk and I thought you were talking about the high gain that time.

CAPCOM No, I'm sorry. I was just watching umbilical gimbal.

SC This thing really slops around bit dead pan. It's really nice flying otherwise.

CAPCOM Glad to hear that.

SC I have flat used the whole trip as pulse.

CAPCOM You just woke the Doctor up. You said pulse and he came alive. And he'd like to know if you did in fact check out the biomed harness.

SC Yes, I tightened down all the plugs and checked all the lead and everything looked in order. When the other fellows wake up, why don't you remind me and I'll give it a more thorough going over.

CAPCOM Okay, Bill. ...has suggested that they would like to see you try switching the two leads you have a yellow and a blue one and just go ahead and switch them and they'll sacrifice their numograph because they'd rather have the EKG.

SC Do they need it now or can they wait until somebody else wakes up?

CAPCOM I guess we can wait though. Is that a hard thing to get to?

SC You have to take your pants off and about everything else - standby. How's that Houston?

CAPCOM ...take a look at it.

SC Houston, Apollo 8.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1171900, CST 4:10A 359/2

CAPCOM All right. Read you. We're looking
at data now.

SC My heart has been beating.

CAPCOM We couldn't argue with you. That
doesn't help at all. That's pretty bad.

SC We've got problems - we can't use that
DSC low bit rate. So that's real good.

CAPCOM Yeah, it's coming in loud and clear.
Pretty interesting.

SC Let me tell you it was a hectic revolu-
tion.

CAPCOM Playing music.

SC You got the music going? I'm not hear-
ing it.

CAPCOM No, I was waiting to see what we did
on that before I started it up again.

SC Okay. If they get home...for a couple
of hours and if they have anything at all just tell them
I'm alive. Well, I'll get my real good going over here.
I might even make a statement to the world that I haven't
noticed that the amplifiers got hot.

CAPCOM You say it did get hot?

END OF TAPE

Apollo 8 Mission Commentary, 12/26/68, GET 1172900, CST 4:20am, 360/1

SC No I hadn't noticed it until until I
started changing the lead.

CAP COM OK. I'm going to crank the music up
again.

SC OK. Have they got anything at all down
there?

CAP COM No. We're on low bit rate right now
so it'll be a few minutes before we get another chance to
look at it. We'll let you know if he gets any.

CAP COM Music

SC I can't hear it but it sounds like
something I'd rather not hear anyway.

END OF TAPE

PAO This is Apollo Control at 118 hours 43 minutes - rather 118 hours 18 minutes and after almost 45 minutes of relatively quiet we've received a call from the spacecraft. We are in communications right now with Bill Anders aboard Apollo 8. We will pick that up from the beginning.

CAP COM Hello Apollo 8. I interrupt this of music to bring you the late evening status report.

SC Good. Wake up.

CAP COM Okay, we are getting ready to have a shift turnover and I wanted to go over a few items before I do. On the midcourse correction number 6, right now that looks like it is at most .3 a foot per second, so there will be no burn for midcourse number 6. Midcourse number 7 is a little larger and will make a decision on that later. Your weather in landing site still reported as being good and the forecast to be about 2000 scattered and 12 000 broken. But the same numbers they gave Frank earlier. Visibility will be about 10 miles, wave height about 4 feet. And I guess there is some scattered thundershowers, like less than 5 percent, you should worry about, 10 to 30 percent maybe at 2000 broken as opposed to scattered. So it looks pretty fair. We have got a -

SC Just my kind of weather.

CAP COM Roger. Got a couple of flight plans things to consider. Now, number 1 at 119 30 minutes. We have got a P52 IMU realignment, which we need to slip in ahead of the P23 sightings. And that will be an option 3 REFSMMAT.

SC Roger.

CAP COM Okay, some of the folks sitting back and looking at the TV business, have some ideas about things they would like to see tried with the filters. And I would like to review what they have here and see what you think about it... next 10 hours you can decide whether or not you think it is worth the effort. Basically they would like to try using a whole different series of filters.

SC ... Hey Ken, got something to write on. Wasn't that P52 at 18:30 or 19:30?

CAP COM 19:30.

SC Ready to copy on TV.

CAP COM Okay, before you copy let me read it all through to you here so you will get the feel for what it is we are talking about. The title of this little epistle is "TV ... and what they want to do is mount the TV camera with the telephoto lens on a bracket in the

CAP COM rendezvous window and take a TV picture of the earth through the red and blue filter, 1 minute per filter. That means red and blue filters individually. Then they would like to take TV picture of the earth through through the red, in that case the 25 alpha filter combined with the polarizing filter. Rotate the polarizing filter through a 360 degree increment, again 1 minute per position. (skip) ... and to go with this, we would like to have Hasselblad pictures - okay, I am standing by.

SC When you were talking about pictures through the polarizing filter, is that the TV pictures through the polarizing filter?

CAP COM That's affirmative. All above were TV.

SC Okay, now the only thing - the only problem here is it is darn near impossible to aim that television camera (skip) ... that he took three men and a boy up here to get the thing pointed in the right direction. And we tried using chewing gum for a sight and everything else and let me tell you that the odds of getting that thing in the earth is pretty small.

CAP COM Okay, I think we weren't too clever in our ground callout as to how to point the spacecraft. For the thing, I think we can do that a lot better next time now that we have stumbled through it once. I agree with you -

SC It's not the spacecraft, it's not the spacecraft that's hard to point, it's the camera. The bracket has sufficient slump in it that it can take the camera out of field of view when configured through the window. And it took a lot of microadjustments with a lot of coaching from the ground to get the thing in. It was a real tough job, so I think you ought to take all this in mind, if you could possibly use the wide angle, you might be better off.

CAP COM Okay, I understand what you are saying now. I'll run that by the TV guys and see what they have to say about that. In conjunction with the involved, they wanted to take some Hasselblad pictures of the earth through the rendezvous window with the red (skip) window with the red and blue filter and black and white film and then again through the polarizing filter and this is all going to be used as - in order to try and correlate the TV and the regular film photography. So if you think it is a worthwhile thing, you would like to give it a try, I'll run this by Jack and the TV cats and see if they would like to get

CAP COM something out of it with the wide angle.
And we can talk about it a little later.

SC Okay. Another thing to keep in mind
is that we haven't seen the moon - we didn't see all the
way out and we rarely see it going back. We haven't seen
it once since we left. But we have maneuvered the wrong
way from a (skip)

CAP COM Okay. I wanted you to be aware of this
and think about it and what its implications to the flight
plan might be and I'll run this wide angle and comment about
the moon back by and see which subject they think would be
most appropriate. Okay, on the EM scroll, Frank wanted us
to verify the order that they could expect to see the entry
profile and the first profile that comes up is labelled
"nonexit number two" and that is the short range high speed
entry. The second thing that will come up, is entitled
"The 3500 mile" which is also high speed reentry, but it is
the one you would use in event we go to the longer entry
ranges. (skip) it is probably nice to know that we are not
throwing away at the most important time that it is a function
of the computer program rather than a so much a function
your trajectory being changed.

SC Let me ask you one thing. That's, do
you want a cold soak sometime prior to the midcourse cor-
rection for 1 hour. Is that what you told me?

CAP COM not really. I think we are looking at
that prior to the midcourse correction. It being the time
when we would like to check out the water boilers. Now, the
cold soak does involve some water boiling too, but that's
going to be done right before entry when these things are
not going to be very sensitive and if we don't do it in
12 hours, it is not real clear where the cold soak takes
place. Or where you turn on the secondary

END OF TAPE

CAPCOM ... The way you turn on the secondary water boiler and looking through the entry checklist tonight we didn't find a place for that.

SC Okay. Is it really clear that you need the cold soak? We kind of figured on sometime prior to sep, bringing up to secondary evap and also after the primary of that point sometime prior to that date on your suggestion.

CAPCOM Okay we thought about doing that like an hour prior to sep but in the presep check while the things we powered down were in the secondary loop. And they won't need to turn - Right. We're doing that to keep our power profile where we want it. And then we're going to be turning it back on sometime prior to entry. And the time to turn it on in entry, of course this is specified. You turn it on as the voltages show they can hack it.

SC Preferably right after separation.

CAPCOM That sounds like a real good place. Okay, I'm sure we're going to discuss that one a little bit more, Bill. But right now those are the kind of things we're talking about doing. And on the high gain there is still a lot of discussion about as to what exactly what we saw and what it means. And I think it is a little too early to say anything about that one.

SC Roger, I think it's got X-ray eyes.

CAPCOM That's as good a...explanation.

SC Yeah, I think that's what they hashed out on the ground, Ken.

CAPCOM Okay, I think we all agree that we all want to try experimenting with it if we - really don't know what we're looking at.

SC I jotted down some numbers here that I hope will be helpful.

CAPCOM Okay, fine.

SC You know...in the debriefing.

CAPCOM Real fine.

SC I don't like to make it a real big deal because the antenna switching is not hard at all and the (static) ...is required to work if it doesn't work... (static)

CAPCOM Okay, and we're looking at 120 hours, for the next ordered gimbal.

SC Is it my imagination, or do you have the music run?

CAPCOM I'm sorry, say again.

SC Is it my imagination, or do you have the music running?

CAPCOM I think it's your imagination.

SC Oh, don't let the doctors hear that.

CAPCOM It's too late, he already heard you.

SC I must be getting that detached feeling.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1185300, CST 5:44 A 363/1

PAO This is Apollo Control at 118 hours, 53 minutes. And at the present time our spacecraft is traveling at a speed of 5152 feet per second, at an altitude of 126944 nautical miles. Here in Mission Control we're in the midst of a change of shift. Flight Director Glynn Lunney is coming on to replace Milton Windler. At the present time Bill Anders is the only crewman aboard the spacecraft who is awake at the present time. And he has had the watch for several hours now as Frank Borman and Jim Lovell have apparently been getting some well earned rest. We had a very quiet evening. We did play up some music to the crew, about an hour's worth. And we have - I had a few brief comments from Anders since our last report - will bring you up to date on those. And then standby for any live communication with the spacecraft.

SC Apollo 8.

CAPCOM Go ahead 8.

SC Roger. Just to make sure the urge to get red blue filter shots of the moon haven't crept into this TV test. We had got red blue filter shots of the moon so you need not worry about that.

CAPCOM Okay. I don't think that would throw it away. I think we're trying to come up with something definitive so that post flight will have some real data to compare with - what we do on the ground for future work. I would like to have you go over and take a look at the battery CHARLIE please.

SC I'm on my way. Okay, battery CHARLIE, that's about 36.8.

CAPCOM Okay, 36.8. Thank you

SC Roger. Also with respect to the TV tests I would think that we could probably get a pretty good handle on the operations just by taking red/blue colorizing shots of the earth independent of the TV. But within the same time range, or at about the same range of the TV test time.

CAPCOM Okay, that's what the second portion of this really is asking that we do this with the hasselblad and again we won't be using the red/blue filters so we have our base line.

SC Taking a picture of the earth with the hasselblad is no big deal because it does swing by the earth now and then. But trying to get the TV and the hasselblad all pointed to the earth at the same time would really be tough.

CAPCOM Roger. I don't that it's that time critical but I'll ask.

PAO And this is Apollo Control. We anticipate that our change of shift press briefing will come at about 6:30 this morning. And that briefing will include Flight Director Milton Windler. At 118 hours, 57 minutes, this is Apollo Control.

END OF TAPE

PAO This is Apollo Control Houston at 119 hours 30 minutes into the flight of Apollo 8. The Apollo 8 spacecraft at this time 125 043 nautical miles away from earth. Our current velocity reading 5202 feet per second. Flight Director Glynn Lunney has brought his Black Team aboard and brought them up with amber lights and gone around the room discussing systems and operational aspects of our mission at this point in time. At present, all systems look good. We've talked with LM Pilot, Bill Anders some since our last report and here is that conversation.

SC This is Apollo 8.

CAP COM Go ahead, 8.

SC ... hold up on the LiOH change about a half an hour. The PCO2 reading is low and we don't want to wake up the CDR. It's right by his feet.

CAP COM ... Apollo 8, Houston.

SC Go Houston.

CAP COM Okay, Bill. We are coming up on the P52 and then the P23 sightings and there is some concern that if we just go directly to P23 attitude that we are liable to overheat quad Charlie. So, we would like to have you maneuver to place the minus X-axis toward the sun now. And I have got some gimbal angles here for you. And if we take it over there and point the minus X at the sun between now and the time we have to start into the alignment, then - the P23 business, we will tend to cold soak Charlie and then we will be able to go through the P23 operations without worrying about the temperatures.

SC Okay, ...

CAP COM Okay. Roll 183.3, pitch 136, decimal 7 yaw 13.5.

SC Right. 183 roll, 137 pitch, 14 yaw.

CAP COM Okay.

SC We worked out up here on Lovell's slide rule and got 183.25 roll. Houston, you wanted to go to this cold soak attitude prior to the P52, did you not.

CAP COM We would like to go to the cold soak attitude now.

SC That was to keep from heating up quad D, was it?

CAP COM Negative. Quad Charlie.

SC Okay.

PAO Apollo Control Houston. As you heard we passed up a cold soak attitude to Bill Anders. As Apollo 8 gets ready to start IMU alignments and cislunar navigation activities, this is to put quad Charlie on the

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1193000, CST 6:21a 364/2

PAO shady side for a while. It is the same conservative type of approach followed yesterday on quad Alpha. Current quad temperature readings on these are reaction control system quads on the spacecraft, current quad temperature readings on quad A 83 degrees, quad B 70 degrees, quad C 78 degrees and quad D is 74 degrees. And so we continue to monitor at 119 hours 34 minutes and this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET12018, 710a, 365/1

PAO This is Apollo control, Houston, at 120 hours 18 minutes into the flight of Apollo 8. Apollo 8 at the present time 122 637 nautical miles away from Earth. Our current velocity now, 5267 feet per second on Apollo 8 as it returns to Earth. We have had conversation with Apollo 8 and we are going to pick up that conversation now.

CAPCOM Apollo 8, Houston.

SC Hi, Houston, Apollo 8.

CAPCOM Roger, the P23 that is coming up next, we will want to do a water dump as soon as we are through with that P23, but dump down to 30 percent and this ought to be the last dump of the mission. Over.

SC Okay, you think that we will end up generating enough water to fill her up prior to entry.

CAPCOM Affirmative.

SC Okay, we are at that attitude you gave us, so we stopped the roll a little bit short, it was more like 150 degrees roll right now.

CAPCOM Okay, Bill, on that water dump, we expect to have 90 percent.

SC Okay. Houston, Apollo 8, over.

CAPCOM Apollo 8, Houston, over. Apollo 8, Houston, GO.

SC Roger, we are done with the P52 and arranged for the P23, was there any constraint you wanted - for length of time you wanted to stay in that attitude.

CAPCOM Negative, Bill, when you are finished with P23 we will go back into PPC.

SC Okay, we are going to maneuver for P23 now.

CAPCOM Roger, we are watching your tank pressures.

SC Okay, thank you, we will do an optical first and then do the P23.

CAPCOM Okay. Apollo 8, Houston, we are handing over to Madrid in about 15 seconds. Over.

SC Roger, and good morning Jerry or good afternoon or whatever it is.

CAPCOM Good morning, Jim. About 6:30 in the morning. Apollo 8, Houston, how do you read.

SC Loud and clear, how us.

CAPCOM Roger, the same. Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Morning, Frank. Looks like we have lost the transducer on the primary radiator OUT temperature we are showing an off scale high, the rest of the loop looks real fine though, when you get a chance would you take a look at it and see if you're in the same position, over.

70 378 / ✓

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET12018, 710a, 365/2

SC Which one is it?
CAPCOM Primer A, radiator OUT temperature.
SC Ours is showing 100 off scale, also.
CAPCOM Roger.

PAO Apollo control, Houston, as you heard, all three crewmen, Borman, Lovell, and Anders now awake and ready for business. Apollo 8 has completed its platform alignment and as you heard the cislunar star sighting operation has begun, this matching the stars with, now at this phase of the mission, the Earths horizon. Jim Lovell now awake handles these activies, following P23 the cislunar navigation exercise, Apollo 8, will return to its passive thermo control attitude. A bit earlier we performed - just prior to the G and N exercises, put one of our reaction control system quads into a cold soak briefly, the radiator OUT temperature transducer, reference transducer of course, being a piece of instrumentation equipment and we wanted to cross check with the crew, as to readings. As part of todays activities, there is a period of television, this scheduled in our prior flight plan at 128 hours ground elapsed time. We have just received a further weather update for our landing area. The weather conditions in the planned landing area, this about 900 miles southwest of Honolulu, are expected to be satisfactory at landing time Friday morning, weather conditions expected are partly cloudy to cloudy skies moderate winds, seas about 4 feet and the temperature near 82 degrees. Scattered showers are also forecast for this area, which may lower ceilings to near 2000 feet and visibility 25 miles. We've had, while we where talking here, a brief further conversation with Apollo 8 and we are going to pick up on that.

SC Houston, Apollo 8, over.
CAPCOM Apollo 8, Houston, GO. Apollo 8,

Houston, GO.
SC Roger, about this radiator OUT temperature does your telemetry show that it happened all of a sudden.
CAPCOM That is affirmative.

SC Okay, I'm on malfuction 23, step 2, it looks to me like there is a small possibility we might be boiling, but I doubt it, so, you just want to hop over to step 4 and consider that a closed case.

CAPCOM Roger, we consider it closed.

PAO That was our final exchange with Apollo 8, the conversation with Bill Anders and at 120 hours 24 minutes, we will continue to monitor. This is Apollo control, Houston

END OF TAPE

PAO This is Apollo Control Houston at 120 hours 43 minutes into the flight of Apollo 8. Apollo 8, at the present time, 121,351 nautical miles away from earth. Current velocity of the spacecraft is 5302 feet per second and accelerating. As we pick up the Apollo 8 crew, we find during the conversation that spacecraft commander Frank Borman is interested in Apollo 8 final television appearance scheduled for this afternoon, the final appearance prior to return to earth. We will pick up the conversation now.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Roger. Frank, all of your primary loop temperature readings look just fine. Your evap in temperatures are normal and indicate you are getting normal mixing.

SC Okay, thank you.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger. For the P-23 attitude that you are in right now, your quad tank temperatures are better than we expected, but we are still monitoring and it's looking good.

SC Thank you. After we complete this, do you want us to return to the PPCS2, is that correct?

CAPCOM That is affirmative, Frank.

SC Would you have someone get up the gimbal angles for us to point the X-axis at the earth at the TV time, please.

CAPCOM Willco.

SC Also, Jerry, I would like to know our range and velocity at that time.

CAPCOM Roger, Frank. You want the range and velocity at TV time.

SC Right.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger. At 128 hours your altitude is 97,413, your velocity is --

SC Stand by just a minute.

CAPCOM Okay.

SC AT 128 hours you say?

CAPCOM Roger, that's TV time. Your altitude is 97,413, velocity is 6,072. Roll is 1 degree, pitch is 58, yaw 0.

SC Thank you.

CAPCOM You are welcome.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1214300, CST 7:31a 366/2

CAPCOM I just got a newspaper, Frank. I will go through it and pick out the news items for you.

SC Good, that will be great. We are just eating breakfast.

CAPCOM How are you having your eggs this morning?

SC Bacon, all except Lovell. He is having eggs Benedict.

CAPCOM It figures.

SC That Timbercove crew, you know they -

CAPCOM That's the gourmet crowd.

SC Jerry, I'm doing these P-23's, we were just about over Africa most of the time, at least it was in view. Nice weather over there this time of year.

CAPCOM Roger. You want to go down there?

SC Too hot.

SC Jerry, Jim Lovell just checked the P-30, rather the P-21 and you are right, 97, --

CAPCOM Roger, thank you, Jim. We ought to have these computers flight qualified in another couple of missions.

SC Yeah.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, go.

SC Roger. Was FCC 6 determined for exactly 122 hours, when you came up with that 6/10ths of a foot per second?

CAPCOM Roger. Jim, at exactly 122 we were figuring .5.

SC Roger. I'll try it again now at the same time using the P-37 with MA. The last time we did it before the last sightings, I got 2 feet per second. I'll see what I come up with this time.

CAPCOM Roger.

PAO This is Apollo Control Houston. We repeat those altitude and velocity numbers, at 128 hours ground elapsed time, that time for the final television transmission for Apollo 8 prior to return. At that time, the altitude is to be 97,413 nautical miles, velocity 6,072 feet per second. As you heard, we do expect some news items to be passed on to the crew shortly. At 121 hours 48 minutes into the flight of Apollo 8, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston, at 120 hours, 3 minutes into the flight of Apollo 8. The Apollo 8 spacecraft, at present 120 309 nautical miles away from Earth. Its present velocity is 5331 feet per second. We received a status report from the crew and Capsule Communicator, Jerry Carr, a sometimes newscaster here in Mission Control, passed along the news to Apollo 8. We will pick up at this point.

CAPCOM Apollo 8, Houston.

CAPCOM Apollo 8, Houston, over.

SC Go ahead Houston, Apollo 8.

CAPCOM Apollo 8, this is Houston. We are ready for you to start your waste water dump anytime now. Could we have a crew status report?

SC You may, we had a good night sleep. Everyone slept at least 7 hours yesterday, and we have just finished breakfast, drunk a lot of water, and I think we are in very good shape. Just used the exerciser.

CAPCOM Roger, Frank. Are you ready for some morning news?

SC Yes.

CAPCOM Okay, there is really not a whole lot in the news this morning, things are kind of quiet. I guess the biggest news is the accident rate, the Holiday deaths, which is certainly not very pleasant news; but we had 233 people killed nationally and 9 of them were in Houston on Christmas Eve, and Christmas. In the world news, the families made the news again. This is Associated Press, "The families of Apollo 8 crew sent a Christmas message to Navy Commander Lloyd Bucher, Captain of the USS PUELBO crew, released this week by North Korea. The message, addressed to Commander and Mrs. Bucher, at San Diego Navy hospital read 'You are in our thoughts and in our prayers. Your reunion has brought great joy into our heart this Christmas day. Our best to you personally and to all of the families under your command'. And it was signed "Families of the crew of Apollo 8." Space official said that the message had been suggested and written by Mrs. Frank Borman.

SC Thank you.

CAPCOM Let me see, elsewhere in the National News, the newly weds, David and Julie Eisenhower, came away from their secret honeymoon hideaway to have Christmas dinner with President-elect Nixon and the family. In New York city, the world's busiest harbor was reduced to almost complete inactivity Christmas Day, due to a 5-day old longshoremen strike and a rare quietus in shipping schedule. No ships arrived or left the harbor. Ferrys running on reduced Holiday schedule, provided the only marine activity. Here is an interesting little feature item that is kind of good to here. It seems that up in Ann Arbor, Michigan, they have

CAPCOM a new youth gang. It's called the Gilnet gang, that roams the streets of Ann Arbor, acting in secret and sometimes bypassing the law. They call themselves the gorillas for good. Some of the things they have done is, painted a bridge that was covered with obscenities. They painted it one night. A condemned house with - it's popular with neighborhood children, but dangerous, was boarded up. Downtown planters ... because of a debate over which group was responsible, business or government, were filled with flowers. A hedge thought to be hampering vision, at a busy intersection was trimmed and the owner was angered. Trash along a portion of the Uron River was picked up. Members of the gang are anonymous teenagers who ask for no individual recognition. Their aim is to slice red tape, to get good things in their opinion done. The organization has a faint religious overtone, it's sort of an ecumenical group, said an assistant professor at the University of Michigan who acts as an informal sounding board for the gang's ideas. The name is from St. Peter, the Fishermans Net. And it is remote enough not to be identified with any particular church. There is a threat of Robin Hood running through this thing, said their teacher, who also prefers to remain anonymous. A lot of their activities are extra legal. When the system bogs down, they directly administer good, rather than go through the red tape channel. The gang is made up of about 55 high-school kids, boys and girls, and there's another 40 or 50 who belonged to the gang before they graduated. The idea for the gang evolved from a trip to Detroit slum area, where a church group - youth group noted the way the street gangs operate. They were impressed with the methods of operation and decided to organize for somewhat different reasons, "with the chance to do things for the pure sake of giving," said the gang's advisor. That is about it as far as the world and national news and the features are concerned. On the sport page, Hank Stram of the Kansas City Chiefs was named as the AFL coach of the year. This is the second time for him in three seasons. The voting was done by an Associated Press panel of 30 sports writers and 30 sportscasters, three from each city. The nearest one to him was Weeb Ewbank. Other coach's that received votes were Sid Gilman of San Diego, and Lou Sabin of Denver. As for the Shriners College All Star game yesterday, the North cooled the South 3 to 0. Michigan State's Dick Berlinsky booted a 23 yard field goal in the first quarter and it was all the North needed to beat the South Wednesday, in the Shriners College All Star football game. Let's see, I guess the interesting things about this are first downs, North 19, South 16; rushing, North 214, South 169; passing was North 96, South 109. So, all in all, it looks like they were evenly matched. Looks like Parseghian

CAPCOM and his Notre Damers weren't as strong as ole Howard was worrying about.

SC Roger, and we are dumping the water now, Jerry.

CAPCOM Okay, Frank.

CAPCOM For the big Astro Blue Bonnet game, the big basketball classic followed by the Astro Blue Bonnet Bowl in the Dome. SMU and Oklahoma have arrived. They are getting ready for the big game. It doesn't say here which are favored. I will look that up and let you know later, if one is favored. The Davis Cup is underway now, down in Australia, and the US is bidding to recapture that again, and were favored to recapture the supremacy today. Another item in the news, is O. J. Simpson, he was named player of the year in college football for the second consecutive season by the Walter Camp football foundation. Woody Hayes, as I told you yesterday, was named coach of the year.

SC Roger.

CAPCOM Well, I guess that is about it Frank.

SC Thank you Jerry, I appreciate that.

Jerry, this is Jim, we detour on that midcourse section two-tenths of a foot per second, is what we get.

CAPCOM Real fine, Jim. Do you just want to turn off your radios and come back without them.

SC No, we can't readout the (garble) erasable memory if we have to go into program one again.

SC I'd tried to get us back on the launch pad a little bit earlier.

CAPCOM Frank, one other little item in the news here, I thought might be interesting, standby.

CAPCOM Apollo 8, Houston.

SC Go ahead, you are loud and clear.

CAPCOM Okay, I got interrupted there for a minute. Bob Hope is back out in Viet Nam again with his troupes, doing a great job as usual. One little name in the news story here is from the USS NEW JERSEY. Bob Hope joked from atop of the hugh gun turret yesterday, or Wednesday, to delight the 1500 men aboard the battle ship NEW JERSEY on its 20th Christmas entertaining US troops abroad. Hope and his 27 member troop entertained the NEW JERSEY seamen after attending a Christmas mass aboard the carrier HANCOCK, both off Viet Nam. This must be the biggest Chris Craft in the world, Hope told the seamen. It looks like Wake Island with a rudder. I think it was nice of them to take the ship out of mothballs just to give me a 21 gun salute, he said. Hope joked while standing on one of the ships 16 inch gun turrets. The sailors were particular impressed.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1211300, CST 8:02A 368/1

CAPCOM The sailors were particularly impressed by a squad of long legged girls who came aboard with Hope including Actress Ann-Margaret and Miss World.

SC Did you say that was his 20th trip over there at Christmas time, or overseas at Christmas time?

CAPCOM That's right, it's the 20th time he has been overseas for Christmas with the troops.

SC He's as old as Jack Benny.

CAPCOM Roger. Hey, you can turn off the water now.

SC We're in the process, or as we say in the aerospace business, that's in work.

CAPCOM Roger, you do good work. That other aviator that's going around the world, Max Conrad with his light plane, he spent Christmas Day in the antarctics at Puento Aranes in Chili. He's waiting for good weather so he can coninue his flight down to the South Pole. He hopes to get around the world. He is going around both Poles, and he's going to fly from Palmer to Byrd, from Byrd to the South Pole, and then return home to the United States by way of New Zealand, Australia, and Hawaii.

SC Brother, he had better take some no doze with him.

SC I tried to talk Frank into the same trip.

SC You can give him a weather report from Apollo 8. The South Pole was really clobbered, at least it was the other day.

CAPCOM Roger. I don't imagine there are many alternates down there.

SC No, I don't think so.

SC WE have some pretty clear weather up here.

CAPCOM No fog, huh?

SC Not outside.

SC Actually, it's snowing outside right now with that waste water dump that Bill just did.

CAPCOM Roger. Does it look a little bit like Christmas?

SC Right. Jerry, do you have a decision about what we are going to do about this next mid-course?

CAPCOM No Frank, we don't need it.

SC Okay, I just wanted to make sure of the first wave fuel, you will Scrub MCC 6?

CAPCOM Affirmative.

SC I guess - Jim said that was already official. I was sleeping at the time, I didn't hear it.

CAPCOM Okay. Frank, by the way, how do you feel about your EMF now? You feel like you've got all the

CAPCOM answers to the little funnies you saw earlier?

SC Yes, the answer is don't turn it into AUTO fast. It seems to be very sensitive to jerks, or separation.

CAPCOM Okay, you, you figure it's all pretty much just a switch throwing anomalies in it? If you play it by the numbers and slow and deliberate you will be okay?

SC Yes, I'm getting razzed up here because I said it was sensitive to jerks.

CAPCOM We thought of that, too, down here.

SC Yes, I figured you did. I told Ken last night at separation after TLI, when we separated from the S-IVB, we got a nice bang out of the pyros and the EMS jumped over 100 feet per second. Jerry, do you want to - I've got it in the flight plan to start charging our battery B. Do you want that started at 100 now also?

CAPCOM Affirmative, Frank.

SC Okay.

CAPCOM Frank, we expect it will take about 3 or 4 hours.

SC We're starting it.

CAPCOM Okay.

SC And we're happy to report the Earth is getting larger.

CAPCOM Roger, that's comforting. Looks like you are going to make Earth instead of Venus, huh?

SC Right.

CAPCOM Apollo 8, Houston. Your friendly guidance officer has got a LM vector update for you and a CMC time update. Over.

SC Okay, we'll go to 02. 02 in ACCEPT.

CAPCOM Roger.

PAO Apollo Control Houston. You heard Apollo 8 crew in extremely good spirits this morning. We have a well rested Apollo 8 crew. The status report indicated that each crewmember had about 7 hours sleep, breakfast complete, the water dump in progress while you listened, and then completed. Jim Lovell confirmed that onboard numbers for midcourse corrections coincided very closely with those on the ground, and at 121 hours 18 minutes into the flight of Apollo 8, continuing to monitor, this is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET12140, 836a, 369/1

PAO This is Apollo control, Houston, at 121 hours 41 minutes into the flight of Apollo 8. Apollo 8 altitude above Earth, at this time 118 346 nautical miles. Present velocity reads 5387 feet per second. We have had only a brief conversational exchange with Apollo 8, since our last report, but we will play that for you now.

CAPCOM Apollo 8, this is Houston, the update is complete, the computer is yours, you can go to Mark.

SC Houston, we won't transfer that state vector, since we are not going to do that MCC, is that all right.

CAPCOM Okay, real fine, Frank.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, GO.

SC We are proceeding with the chlorination.

CAPCOM Roger.

PAO This is Apollo control, Houston, the MCC referred to was on the course correction, number 6 and we will reaffirm again that this midcourse correction is no longer required for the flight plan and at 121 hours 42 minutes, continuing to monitor, this is Apollo control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET12212, 903a, 370/1

PAO Apoll18, altitude at the present time
116 650 nautical miles above the Earth. Present velocity
reads 5436 feet per second. We have had only an abbreviated
contact with Apollo 8 since our last report. This request-
ing a biomedical switch and we will play that now.

CAPCOM Apollo 8, Houston, biomed switch to
center please.

SC 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, MARK.

CAPCOM Roger.

PAO Apollo control, Houston, that is it and
so at 122 hours 14 minutes into the flight, continuing to
monitor.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET12247, 937a, 371/1

PAO This is Apollo control, Houston, at 122 hours 47 minutes into the flight of Apollo 8. Apollo 8 altitude above the Earth at the present time 114 904 nautical miles. Its present velocity as it is coming back to Earth, 5487 feet per second. Here is a replay of the last conversation that we have had with the Apollo 8.

SC Houston, Apollo 8, how do you read?

CAPCOM Apollo 8, Houston, loud and clear.

SC Okay, thank you, we are starting the

P23.

CAPCOM Roger, thank you, Frank. Apollo 8, Houston.

SC Go ahead.

CAPCOM Apollo 8, this is Houston, we have lost all C and C data on you. The last data we had showed a high and middle gimbal line in the lower.

SC That is fine, how come you lost those C and C data.

CAPCOM I think maybe it was just your movement - movement out of PPC.

SC I see, Mike. Thank you, It was high, I was watching it though.

CAPCOM Okay, we have data now.

PAO Apollo control, Houston, and as you heard, this reading on the middle gimbal angle explained by maneuvering from the spacecraft from a passive thermal control attitude to an attitude for the star sighting that navigation the program 23 and so at 122 hours 48 minutes into the flight, this is Apollo control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET12320, 1011a, 372/1

PAO This is Apollo control, Houston, at 123 hours 20 minutes into the flight of Apollo 8. Apollo 8 now 113 087 nautical miles away from Earth, continuing on its trip home. Its present velocity 5542 feet per second. We have had some conversation with Apollo 8 which we will play now.

CAPCOM Apollo 8, Houston.

SC We are noticing our Quad A helium tank is starting to go up again. You got any ideas on that.

CAPCOM Yea, we are watching it too, Frank, so far it is still okay and we are talking about it.

SC Okay.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger, Frank, this helium tank in Quad A it looks like we may have flattered you up unnecessarily on this think, it appears to be no problem as best we can tell. We got a few of the minds together talking about it and it has been down rated quite a bit. Also there - the folks down here monitoring the P23 suspect that Jim is shooting on star number 22 rather 02, so he may be having some problems.

SC I know, we have changed, we are on star 02 on the Moon.

CAPCOM Okay. Frank, I may have to add some names to my chicken list.

SC About what?

CAPCOM Helium tank A, Quad A.

SC Rog, I just don't want to be the one that proves the Fasher mechanics people are right.

CAPCOM Roger, Frank.

SC This attitude is going to have a slight burr under the hood too.

CAPCOM Roger.

PAO This is Apollo control, Houston, Jerry Carrs reference to the chicken list - this reference brought about on the Quad A temperature, it appears now that our tolerances are even better than we had previously thought. Since our last report we have talked with our retro fire officer here in mission control. Jerry Bostic who has passed along some preliminary entry numbers to us both assuming no midcourse correction at entry interface minus 2 hours or correction - midcourse correction at entry interface at minus 2 hours. We will pass along both sets of numbers and emphasis that they are preliminary, they are updated about every hour or so. Assuming no midcourse, we would be looking at a ground elapsed time of entry interface at 146 hours 46 minutes 18 seconds into the flight of

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET12320, 1011a, 372/2

PAO Apollo 8, a velocity at time of entry interface 36221 feet per second, an entry angle of minus 6.31 degrees. Assuming a midcourse correction at entry interface minus 2 hours of about 2 feet per second Delta V we would look at a ground elapsed time of entry interface of 146 hours 46 minutes 14 seconds, with a velocity at the time of entry interface of 36221 feet per second, our entry angle for this mod would be minus 6.51 degrees, so at 123 hours 25 minutes into the flight of Apollo 8, this is Apollo control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET:1233300, CST: 10:24A 373/1

PAO This is Apollo Control Houston at 123 hours 33 minutes into the flight of Apollo 8. Apollo 8's altitude at this time above the earth 112 413 nautical miles. Our current velocity 5563 feet per second. Through Capsule Communicator Jerry Carr we've had a rather healthy exchange with Apollo 8 crew, and we'll play that now.

CAPCOM Apollo 8 Houston, we are going to need some data from your past P23 marks. We missed some items, so don't put it away and when you finish this next P23 we'll get it all together.

SC Okay.

CAPCOM Roger, got some information for you on this PTC that we'll be going to right after this next P23 exercise. We will like you this time to try the nose north attitude at pitch of 180, and a yaw of 315, and also we'd like to give another look at this load free type of PTC and we think maybe we'll get a little bit of ... stabilization if we try it at .3 degrees per second on the roll rate rather than .1, so if you figure on doing that at 12430 we'll see what kind of information we get out of it.

SC Okay, you know what I think of that, don't you? I'll be happy to do it, but I think it's playing games.

CAPCOM Roger Frank, you're burning right now 1.4 pounds per hour with attitude hold in Pitch and Yaw. We're kind of interested to see if .3 degrees per second will reduce your RCS usage due to ... stabilization.

SC Yes, I know, I predict that it will not.

CAPCOM Okay.

SC Jerry, I'm a little concerned about the temperature. We're getting kind of warm in here and also the evaporator outlet temperature is up around 45 degrees. Do you have any transits for getting less efficient operation of the radiators?

CAPCOM Frank, E Comm says everything looks nominal down here. You might try a change in your cabin temperature heat exchanger, huh?

SC No, we don't have the fans on, but what we have done is put up a window shade. That seems to help it. We've been getting a lot more sun in the cabin this morning.

CAPCOM Roger, We'll keep a sharp eye on things and keep you posted.

SC Roger. I don't mind playing games cause you guys have been very nice in the 5 and a half days. If you want to play games in the next half hour we'll play.

CAPCOM Roger Frank.

SC Jim is trying this ... with the ...

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1233300, CST 10:24 373/2

SC optics so we can give you a transmission on that.

CAPCOM Okay.

SC I think it would be very difficult to extrapolate anything that you are getting out of this bit business to a LM command module combination, because the spacecraft handles quite a bit different just with the change of fuel load, including the difference in drifting off and roll.

CAPCOM Roger, Frank, we just got finished discussing that, too. We agree with your point of view on that one. I think this is more of a curiosity thing than anything at all.

SC I think it's fine, no sweat. We don't have anything else to do here for about another 10 hours.

CAPCOM Okay.

SC Jerry, what I'm kind of curious about is the fuel usage now with P23 and what we were doing we have a lot more fuel.

CAPCOM Jim, we'll take a look at that fuel usage bit. Right now the trend looks like it is getting better as we would expect with a lighter weight. We'll try to get a little more definitive for you.

SC We really - we shouldn't complain about the fuel usage on that SPS engine though, cause we're sure getting a lot of miles per gallon on it.

CAPCOM Roger Frank. Frank, we'll enter you in the Shell Road Test on that.

SC Yes, we don't have any TCP in it, or what is that, TCP? Yes. That's the problem, if we'd had that we would have probably used only half the fuel.

CAPCOM Oh, you mean Platformate?

SC That's right, platformate. If you will get the people to spread out one of those banners around the target area we'll try to break it, you know, and coast through it.

CAPCOM Okay, we'll call some of the paper companies and see if they can find a roll big enough.

SC It won't take a big roll, just about 30 feet.

CAPCOM Roger.

SC Onboard Nav.

SC Tell the doctors that we put William to sleep.

CAPCOM Roger. You won't leave any scars will you?

SC No, he's got his tape recorder with him. Bill said to call Valarie and have her to rewind the tape recorder - the tape recorder at home.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1233300, CST 10:24A 373/3

CAPCOM Apollo 8, Houston.
SC Go ahead.
CAPCOM I hate to tell you this Frank, because Jim probably won't even be able to wear his comm carrier anymore, but that last set of marks put your state vector right on top of the News Center state vector.
SC Come off that, Jerry, come on, you promised.
SC I'll get you that bottle of Brandy when I get home, Jerry.
SC Maybe we can get him to go to program 01 again today, too.
CAPCOM Roger, that sounds good.
CAPCOM Apollo 8, Houston. Also on the flight plan for 12430 we would like for you to run an 02 purge on the fuel cells.
SC Okay.
SC Hey, Jerry, we were going over the checklist on entry here, you know?
CAPCOM Roger, Frank.
SC I've got a question. Is John Harpold around?
CAPCOM Roger, he is listening.
SC John, I can't remember, is the list vector up end now, or -
SC Jerry, I'm beginning to worry up here.
CAPCOM Roger, it depends on which way your nose is pointing.
SC I appreciate. You might note for the people at MIT that the next series of stars will be shot by the master navigator with a space helmet on, and long eye remains ...
CAPCOM Roger. That ought to cut his speed down a little bit.
SC Right.
CAPCOM Frank, while you are talking about the entry checklist, this cold soak. Have you decided exactly where you want to do it there prior to entry?
SC Well, I understood that E Comm talked that over with Bill, and we do it 1 hour prior to entry. We'll do it where ever you say is the best.
CAPCOM Okay, 1 hour is fine, it's just a matter of finding time in the time line to do it.
SC I think we can initiate it 1 hour before that.
CAPCOM Okay, fine, sounds like a winner.
SC Really got a 11 zeroes with that helmet on.
CAPCOM Roger, we had noticed that.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1233300, CST 10:24A 373/4

SC Jim's going to leave the helmet off now for the rest I think. It's getting a little anoxic in there. These helmets don't have face plates, and we have a difficult time breathing with that on.

PAO This is Apollo Control Houston. The ground readings do show that the cabin temperature is a bit on the high side. We read 79 degrees F, a little warmer than normal. You heard the crew make a remark about miles per gallon for the service propulsion system engine. The reference here, obviously to the trans earth injection burn, which put them on their path back to earth after orbiting the moon. We haven't had a chance to check our numbers to see what the mile-per-gallon figure might be, but we rather suspect it is a world record. So at 123 hours 42 minutes into the flight of Apollo 8 this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control at 124 hours 19 minutes into the flight of Apollo 8. Apollo 8's current altitude reads 109,929 nautical miles above the earth. Our current velocity reading is 5,641 feet per second. Since our last report we've talked to the Apollo 8 spacecraft, spacecraft Frank Borman and Jim Lovell, on a range of subjects and we will pass those along.

CAPCOM - okay, Jerry, that completes the P-23. Did you have something else you want us to do now? You wanted to check on something from the last sep.

CAPCOM Roger, Frank. We need to get some numbers that we weren't able to copy down here. Stand by just one. Frank, on your first P-23, we missed three marks on star number 2. We missed mark number 3, trunnion.

SC Okay, Three trunnion is 05650.

CAPCOM Okay, 05650. Then star number 1, mark two. We need the trunnion on that one too.

SC 04216.

CAPCOM And on star number 1, mark three, the delta R and delta V.

SC Delta R is 00006, delta V 00001.

CAPCOM Roger, 4 balls 6 and 4 balls 1. Okay, Frank, your PTC attitude is pitch 180, yaw 315, and roll rate .3 degrees per second. The reason for wanting to point it north is not because we are concerned at all about any changes due to venting, in-as-far as we can tell, no affects on your trajectory by venting, we just want to try out that direction on it.

SC That's fine. We are going to stay in for about 2 more seconds while Jim takes the pictures for the sextant for the optics people.

CAPCOM Okay, Frank, and then also, we are looking for a fuel cell O2 purge, when you get a chance.

SC That's right. I've got the word now it's supposed to be at 12430.

CAPCOM Right.

SC Okay, we will do it.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger. For your P-37 that's coming up that you are going to run, use a midcourse 7 time of 14446, also just a little note here, the trajectory is looking so good, it looks like you can make the corridor without even making a midcourse 7.

SC Roger. 14446 for the P-37.

CAPCOM Affirmative.

SC Thank you.

SC Jerry, this is Jim.
CAPCOM Go ahead, Jim.
SC We are going to set this up for the normal PTC mode for a few minutes until Frank gets through with the - another step of the call.
CAPCOM Roger, Jim. When the time is auspicious would you shift the biomed switch over to left side?
SC I think we ought to shift it over right now.
CAPCOM Okay. No, they say hold it up for a little while.
SC - so you can see, it's the same data that Dr. Berry has got on me in Gemini 7, and also good for Frank on Apollo 8.
CAPCOM Roger, he heard that.
CAPCOM Apollo 8, Houston.
SC Do you see that program alarm we got when we went through P-37, 1302.
CAPCOM Affirmative.
SC Let's do it again and see what happens here.
CAPCOM Roger. We are monitoring.
CAPCOM Apollo 8, Houston.
SC Go ahead.
CAPCOM Looks like you loaded the wrong time in P-37, you should load 14446 for your midcourse time. Look like you loaded 14646.
SC Okay. I'm sorry. Yes, I have it here. I loaded 14646, okay.
CAPCOM Roger.
SC I guess the best way to terminate this is by going back to 2, is that right?
CAPCOM Affirmative.
FAO This is Apollo Control Houston. The midcourse correction number 7 referred to in the conversation exchange is that if the entry interface minus 2 hours, or 2 hours before the spacecraft is due to reenter the earth's atmosphere. And this would - consistent with an entry interface time of 14646 minutes would read 14446 minutes, so the reference to P00 is program 00 aboard the computer, the onboard computer. So at 124 hours 24 minutes into the flight of Apollo 8, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston, at 124 hours, 47 minutes into the flight of Apollo 8. The altitude of Apollo 8, at this time, 108 386 nautical miles above Earth. Present velocity, 5690 feet per second. The Apollo 8 spacecraft, now returning to a passive thermal control attitude, this one of three-tenths of a degree per second. We will play conversation with Apollo 8 now.

SC Houston, Apollo 8. It looks like a plus .8 per second correction at midcourse 7.

CAPCOM Roger, Jim.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, GO.

SC Started the fuel cell purge and I'm going to 18350 and I'll start that three-tenths of a degree per second roll and stabilization test for you.

CAPCOM Roger, thank you.

SC Okay, there we are and we are going to start rolling now.

CAPCOM Roger. Frank, on this free pitch and yaw, if either one of them gets outside of 15 degrees from the nominal values, we'll call it off.

SC Okay.

CAPCOM Apollo 8, Houston. I would like to have the bio-med switch left now, if you can.

SC Roger, it's left. The fuel cell purge, wait - 02.

CAPCOM Say again, Apollo 8.

SC 02 fuel cell purge complete.

CAPCOM Roger, thanks.

PAO This is Apollo Control Houston. As you heard the purge of the fuel cells, part of our nominal time lines in the flight plan has been completed. The latest roll in the passive thermal control, a bit above the nominal mission plan, but is being done more to acquire additional data in this mode. The nominal mission plan being one-tenth of a degree per second, this some variance from that roll rate. Apollo 8 has passed that point in the mission incidentally for possibilities of an Atlantic Ocean splash or for an Indian Ocean splash. Therefore, recovery in Mission Control Center is now passing along the official word that recovery forces in those areas may be withdrawn. So at 124 hours, 50 minutes into the flight of Apollo 8, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1251900, CST 12:10a 376/1

FAO This is Apollo Control Houston 125 hours and 19 minutes into the flight of Apollo 8. Apollo 8 continuing its descent, its trip back to earth. The altitude is now registering 106,615 nautical miles away, velocity now reads 5748 feet per second. We have had some discussions with Apollo 8 which we will play now.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Looks like you've exceeded your 15 degrees offset PTC attitude, so you can go to attitude hold and pitch and yaw.

SC Okay, I'll go back to that. We didn't even get around once, did we?

CAPCOM Doesn't look like it. So much for spin stabilization.

SC Well, we tried that several times last night, 1 then the half, then 2 -- I think there is the phenomena known as inertial coupling that has something to do with that.

CAPCOM Roger, that could be.

SC Put a bigger rudder on it.

CAPCOM Need some feathers, Frank.

SC Yeah.

CAPCOM Apollo 8, Houston. On the P-37 comparison, using the midcen vectors, we get a minus 1.4 on that midcourse, compared to your 2.8. We ran your solution through our computer and we also get a 2.8, so your P-37 looks good. We are busy still fiddling with the vectors and comparing them and we will keep an eye on the difference.

SC Roger. Looks like we came up with plus 2.8 though, and you said you came up with a minus something.

CAPCOM Affirmative. Jim, that 4 feet per second difference is worth 28 degrees on the flight plan angle.

SC Roger, thank you.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Roger, Frank. How is your cabin temperature looking now?

SC It's getting cooler, thank you. We put those shades up and that really helped.

CAPCOM Okay. The primary loop down here still looks real good, so it looks like you are in fine shape. Your battery B charge ought to be done by about 127 hours and we think you shouldn't even try to charge battery A, since it looks like at entry interface it is going to have 38 amp hours on it.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1251900, CST 12:10a 376/2

SC I'll tell Bill that.

CAPCOM Okay.

SC How is the weather down there, Jerry?

CAPCOM That's loud and clear.

SC Cold?

CAPCOM No, it's pretty balmy around here today.

Yes, the temperature is about in the 70s here. It's a real nice day.

SC Fine. Say, Jerry, last night Jim was saying something about turning on VHF display about 20 000 miles out. I wrote it down, but I can't seem - I don't know where I put it. (garbled)

CAPCOM roger, Frank. we've got it in the checklist here as right around 4 hours before EI, right after your nominal P23 P37 onboard comparisons, AB-1.

PAO Apollo Control Houston, so there we have it. That was Capsule Communicator Jerry Carr carrying on conversations both with Spacecraft Commander Frank Borman and Command Module Pilot Jim Lovell. The passive thermal control test referred to, this at .3 of a degree per second roll showed perhaps greater deviation in pitch and yaw than the slower rate did. We did the exercise at .3 versus the nominal .1 to see if we would get spin spabilization out of it. We did not. We terminated the test within 10 minutes after it started. As you heard Frank Borman reported that he had tried a slightly higher spin rate yesterday evening. The P37 referred to is the onboard computer program or return to earth program. There you heard Jim Lovell comparing notes with the ground, so at 125 hours 24 minutes into the flight of Apollo 8 this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1255100, CST 12:42P 377/1

PAO This is Apollo Control Houston at 125 hours 51 minutes into the flight of Apollo 8. Apollo 8 now 104 816 nautical miles above the earth, current velocity 5808 feet per second. We've only had brief contact with Apollo 8 since our last report and we will play that for you now.

CAPCOM Apollo 8 Houston.

SC Go ahead.

CAPCOM Roger, we're showing some garbage on your computer. If you will hit error reset we can clear that program alarm so the next one can be identified. Over.

SC We don't have any program alarm.

CAPCOM I think this is a carry over from your last program alarm there, on that P37.

SC Okay. Error reset. Thank you.

SC Did that do it?

CAPCOM Stand by. Okay, thank you Frank, that did it.

SC Roger.

PAO Apollo Control Houston, as means of clarification in our conversation with Commander - Spacecraft Commander Frank Borman just prior to this contact he did indicate that the cabin temperature was much cooler, much more comfortable than they had seen a bit earlier today, and at 125 hours 53 minutes into the flight this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET12622, 113p, 378/1

PAO This is Apollo control, Houston, at
126 hours 22 minutes, now into the flight of Apollo 8. At
the present time the Apollo 8 spacecraft 103 065 nautical
miles away from Earth, current velocity reads 5868 feet per
second. Since our last report we have had only one brief
contact with Apollo 8, this being a communications test,
but since some 20 plus minutes have elapsed since that time,
we thought we would play that tape for you.

CAPCOM Apollo 8, Houston, comcap.

SC You are loud and clear, Houston.

CAPCOM Roger.

PAO And that is the end of the tape at
126 hours 23 minutes into the flight, this is Apollo control
Houston.

END of TAPE

20 391/2

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET12652, 144p, 379/1

PAO This is Apollo control, Houston, at 126 hours 52 minutes now into the flight of Apollo 8. The current altitude above the Earth of Apollo 8 reads 101 319 nautical miles, present velocity now 5929 feet per second. We have had some conversation with Apollo 8, which we are going to punch up now.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger, your battery is full, you can terminate charging, you've got 40 AMP hours on it now and we've got a couple of requests for data here.

SC Okay, we were just talking about that, I told Bill stop - what are your requests?

CAPCOM The first one is - the first time somebody is down in the equipment bay we would like to get another reading on your RCS temperature, those six temp meter readings and one of the boys in the back -

SC Want me to read them again?

CAPCOM Beg your pardon?

SC We just read the RCS thruster temperatures again and they are all pegged high.

CAPCOM Okay, good deal, Frank. The other one is, the boys in the back room would like some time when everybody is awake, if you would fire up both cabin fans for about five minutes, they would like to see what the Delta temperature is on the telemetry when you get the stagnation broken down and get some flow going over it, so if you can see your way clear to do that we would like to see it some time when everybody is up.

SC We had that running before the flight, did they check it then?

CAPCOM You mean early in the game, when you were cool.

SC Yes, when we were cool, right.

CAPCOM Yea, they got that data and they were kind of interested in seeing what it looks like when the cabin is nice and warm and the temperature indicator is reading on the high side, to see how the Delta works in the other direction.

SC Okay, coming on.

CAPCOM Okay, thank you.

SC What else, Jerry?

CAPCOM That's it, Frank. Another thing, Frank, is we just want to remind you that there is no charge needed on A battery.

SC Hey, listen these cabin fans - one of them sounds like it's got a bad bearing, we are going to turn it off, it's got a real squeal to it.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET12652, 144p, 379/2

CAPCOM Okay, Frank.
SC Sounds like it's got something in it.
CAPCOM That must be Bill's teddy bear.
SC Say again.
CAPCOM That must be Bill's teddy bear.
SC I don't know, but there is something
in there. We will try them again, one at a time, and see
if we can determine which ones got the noise.
CAPCOM Roger.
SC Number 2 is really bad. It's got a
bad bearing and it whines like mad, so we are not going to
turn it on.
CAPCOM Roger, thank you.
SC We are not going to try number 1 either,
there may have something, might have got in both of them.
CAPCOM Okay, Frank, that's fine.
SC Sounds like that MG starter of yours.
CAPCOM I'm afraid to turn my starter on now,
it's been so long.
PAO Apollo control, Houston, so Frank
Borman reports a noisy cabin fan. Incidentally on the
ground, we are not necessarily suprised by this report,
noisy fans have shown up in some of the earlier spacecraft
and at 126 hours 56 minutes into the flight, this is
Apollo control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1271842, CST 2:11p 380/2

SC will be a little harder to focus, but it might end up better, picture.

CAPCOM Roger, Frank. If you want to use the telephoto lens, you ought to use the same combination you used going out, 25A.

SC Okay.

PAO This is Apollo Control Houston. We are switching over to conversation now in progress.

SC (garble)

PAO It appears that the discussion at present is going a little slow. That was Frank Borman, reconfirming by the way, our television time at ground elapse time of 128 hours.

COMM TECH Houston, we will be handing over to Goldstone in 2 minutes, over.

PAO Goldstone will acquire in 2 minutes. That is a prime site for this television period. We are about 37 minutes away, from our time, for television. Standing by continuing the monitor, this is Apollo Control Houston.

END OF TAPE

PAO Apollo Control Houston 127 hours 29 minutes now into the flight of Apollo 8. The spacecraft is presently 99,211 miles above the earth, its velocity 6,005 feet per second. We are not exceeding the 6,000 feet per second mark. We've have had further discussions with Apollo 8, Capsule Communicator Jerry Carr talking with both Frank Borman and Jim Lovell. Let's pick up some of those conversations.

CAPCOM Frank, the doctors say they are not getting anything on Bill yet. He is apparently not plugged up.

SC He is out underneath the couch getting some stuff out, he doesn't have his umbilical on.

CAPCOM Okay.

SC Look at the stuff they got yesterday. He hasn't changed at all. Houston, do you read?

CAPCOM Roger.

CAPCOM Hey, Frank, this simulation has really been great. What do you say after these photos we recycle back to TLI again?

SC That's fine. Bring on the vacuum.

SC Hey, Jerry, yesterday (garble)

CAPCOM Jim, we missed that. Say again when you get a better antenna.

SC (garble)

CAPCOM Apollo 8, Houston. We are not reading you. Stand by one.

SC Houston, do you read now?

CAPCOM Roger, loud and clear.

SC I say, Bill will be ready in a minute, he is cycling back and forth under the couch trying to get the TV stuff out.

CAPCOM Okay.

CAPCOM Backup crew says they are ready to go.

SC Great. A most fantastic voyage.

CAPCOM Sure was.

SC We're not through yet. We've still got a 100,000 miles to go. You know, we kind of feel like is not all over with until you get out of it, it's still a long way.

SC ~~Low~~ Jerry, what I was saying before, I tried to hurry up the voyage home by calling up program 01 to get us back on the path, but it didn't work.

CAPCOM Well, that's the best excuse I've heard so far, Jim.

SC The best of many.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 127/27/29, CST 2:12 381/2

PAO Apollo Control Houston. Bill Anders apparently now unstowing the television gear for the upcoming period of TV. I have some of the earlier communications on that discussion - were a bit noisy and you may have missed an earlier made by Capsule Communicator Jerry Carr when he said, "Gee, the simulation is really great, why not recycle back to TLI" referring of course to the reignition of the S-IVB which sent the Apollo 8 spacecraft to lunar distance. Apollo 8 retorted, "Send the backup crew." A later report indicated that the backup crew was indeed ready, so at 127 hours 33 minutes into the flight of Apollo 8, continuing, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo control, Houston, at 127 hours 44 minutes into the flight of Apollo 8. The Apollo 8 spacecraft at this time 98,361 nautical miles above Earth, its velocity exceeding 6000 feet per second. We have had some conversations with - further conversations with both Frank Borman and Jim Lovell, Bill Anders apparently still out of his seat, getting ready for television and we are going to pass those on now.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger, Frank, on TEI, you burned 1480 gallons.

SC Thank you.

CAPCOM Frank, you going to need Jim's slide rule for that calculation.

SC I got 162. - Houston, Apollo 8.

CAPCOM Apollo 8, Houston, GO.

SC Rog, this is one of those rare occasions where Bill left his seat and I am now sitting in it and - for the first time I can see the Earth. I'm looking through his binoculars, it's pretty nice.

CAPCOM Roger.

SC You had a little weather today it appears.

CAPCOM Last word from the weather guys here said it was clear.

SC Well, we could see South America and Florida and the lower part of the U.S. Looks like there is a weather front going over into the central part of the United States, low and clouds over the northwest area. Florida is clear, it looks like the east coast is pretty clear.

CAPCOM Roger, clear, but cold.

SC Lot of clouds up in Canada.

CAPCOM Maybe the geese will go home.

SC Jerry, we are going to turn around and see how the picture is.

CAPCOM Roger. - Nothing yet, Frank.

PAO This is Apollo control, Houston, we're -

SC Any luck yet, Jerry. How's it look. \

CAPCOM We are seeing about half of it. You moved in the wrong direction. Okay it's coming back, a little more. Good, now a shade toward the terminator. A little bit more toward the terminator and the same direction you were moving it before. - Right, you have got it centered right in the middle. - Now move it away from the terminator just a bit. Good picture.

SC Okay, you want us to wait until 128, right.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET1274344, 235p, 382/2

CAPCOM Affirmative, Frank, move your camera to the right, I want to see which way the Earth moves on my screen. Okay, moving your camera to the right, moves the Earth to the left on my screen. On our screen the terminator is almost parallel to the horizontal direction and the dark part is on the top.

SC Okay, we will turn it back on at 128.

CAPCOM Okay, Frank.

PAO This is Apollo control, Houston, we have just picked up a final dress rehearsal for the actual television scheduled at 128 hours ground elapsed time. We will be back in about 12 minutes with that picture.

END OF TAPE

PAO Apollo Control Houston 127 hours 57 minutes. We've had some updated conversations with the crew which we are going to put on before we pick up the next television.

CAPCOM Apollo 8, Houston. You are in the scan limit right now on the high gain antenna although you may have narrow beamwidth selected, you are in wide. To improve the situation would take a pitch down and a yaw left and we will have FAO check it and give you some angles if we need to change it.

SC We just got out of the scan limit by pitching up and yawing right.

CAPCOM Roger, you are right, Frank.

SC Are we still in wideband or are we in narrowband now?

CAPCOM We are checking.

CAPCOM Apollo 8, Houston. The comm says you are in good shape now.

SC Okay.

CAPCOM Apollo 8, Houston. Comm check.

SC Loud and clear.

CAPCOM Roger.

PAO This is Apollo Control Houston. Our current altitude reading 97,507 nautical miles above earth. Current velocity 6,068 feet per second. This coincides very closely with the numbers we passed up earlier to Frank Borman this morning when he asked about the television pass. It was indicated at that time at an altitude of 97,413 nautical miles should be our time, should be our distance at time of acquisition, and a velocity of 6,072 feet per second. We are very close to reaching both of those marks. We are less than a minute away from our anticipated time for television. Goldstone will be our station acquiring. You had a preliminary dress rehearsal glance at what we should see. It could be described as a promo to this the sixth television pass mission during Apollo 8. So we will stand by at this time and look very closely at our television monitors to see when we will acquire a picture. We should be some 15 seconds away. No picture yet, but we are waiting with some anticipation. The earlier glimpse we had indicated a very beautiful view of the earth, one that Jim Lovell had described a few minutes earlier as he looked out Bill Anders window. No picture yet, but we are standing by watching. Okay, we will switch over for any conversation that might come up with the crew and standing by at this time. A bit overdue at this time on our TV transmission, but we have not placed a

call yet to the spacecraft. Capsule Communicator Jerry Carr down at his console, just as we are doing, viewing the screen. Picture coming through.

SC Roger, how's the picture?

CAPCOM Roger, the picture is on the lower right hand of our screen.

CAPCOM Camera should go down away from the terminator and to the right.

CAPCOM Still down, and about the same place. A little worse. Now it's coming in.

SC Are you getting it now, Jerry?

CAPCOM Roger. We've got most of it, keep moving off to the right. Good, you have it centered right now.

SC Well, the earth looks a little bigger to us today, not much, but it's somewhat bigger. I'm sitting over the right hand seat now, Bill has got the TV camera, Frank helping him out aiming it at the earth. I hope we have a good picture. Can you see the clouds?

CAPCOM Affirmative, we sure can. Move it up toward the terminator, correction, away from the terminator just a shade.

SC At the tip of South America, there is a great swirl of clouds down there. It looks like a great storm. I wonder if you can see it.

CAPCOM Roger. We see a large swirl just south of the terminator.

SC Roger. And then up to the left hand side, or towards the north, we can see the light waters around the West Indies, and we can actually see Florida. I'm looking through Bill's binoculars and I can the various land masses, South America, and the central part, and southern part of the United States.

CAPCOM Roger. Move a little bit away from the terminator now. A little left with the camera and a little

SC Say it again, Jerry.

CAPCOM Okay, You're moving it toward the center of the screen now and the earth is off on the left side of our screen. Real fine. That's good. Hold it right there.

SC What we're thinking about right now, Jerry, is getting a wedge angle, about 2 degrees their limit. As we come back the earth looks pretty small from here.

CAPCOM Roger. This view from earth, with the telephoto lens at some 97 000 nautical miles.

SC Ken, on the earth here you're a little far out in space. I think I must have the feeling that the travelers in the old sailing ships used to have. Going on

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1275700, CST 2:48a 384/3

a very long voyage away from home and now we're headed back and I have that feeling of being proud of the trip, but still still happy to be going back home and back to our home fort. And that's, that's richer than being right here.

CAPCOM Roger, Bill. We'll sure be glad to get you back, too.

SC This is Frank Borman. We've enjoyed the television shows and we'd like you stay tuned in in the future because there'll be flights and rendezvous and earth orbit, and then, of course, there'll be television from the lunar surface itself, in the not too far distant future. So, until then, I guess this is the Apollo 8 crew signing off and we'll see you back on that good earth very soon.

CAPCOM Roger, Frank, adios.

PAO So that, our last television transmission before the Apollo 8 crew returns to earth at 128 hours, 5 minutes at the present time. And right now we show an altitude above earth of 97 073 nautical miles. The velocity as the spacecraft, Apollo 8, now on its return trip, a velocity of 6084 feet per second. So at 128 hours, 6 minutes into the flight of Apollo 8, this is Apollo Control, Houston.

END OF TAPE

FAO This is Apollo Control Houston, at 128 hours, 21 minutes, now into the flight of Apollo 8. The Apollo 8 spacecraft, now 96 149 nautical miles above Earth. Its velocity now reading 6119 feet per second and accelerating as it returns at an increasing velocity towards the Earth. Among those interested viewers in Mission Control Center watching the television pass, or perhaps we should say passes, was Mrs. Marilyn Lovell, along with two children, Jay and Barbara. We've had discussion with Apollo 8 since that time, since the time of the television transmission and we'll pass along those conversations now.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM We'd like you to go back to PPC. Pick either attitude that's easiest to fly to.

SC Roger. It's in work.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger. Your PTC attitude ought to be either a 1045 or a 18315. We'd recommend 18315. That will keep your windows out of the sun.

SC 180, that's right. I got them mixed up, didn't I? It's 18315.

CAPCOM Roger.

SC (Too much static to be understood).

CAPCOM Apollo 8, this is Houston. You're unreadable due to background noise. Over.

SC How, now, Jerry?

CAPCOM Loud and clear.

SC I say we're starting to stow the spacecraft and get all squared away and then be sleeping and eating we'll be all thinking about entry from now on.

CAPCOM Roger, Frank. And now that Bill's up we'd like to get a redundant components check.

SC All right. He's putting helmets in the food boxes, just a minute, I'll get him to do it for you.

CAPCOM Roger.

CAPCOM There is no great hurry, Frank, we're -

SC (interrupted)

CAPCOM We're mostly interested in looking at the secondary loops.

SC That's what I was going to say. I can't see any reason to check anything other than the secondary loop, can you?

CAPCOM That's affirmative.

SC Now in our cabin, the cold soak equipment, we won't have any cabin fans.

CAPCOM Roger. I understand.

SC Jerry, this is Apollo 8.
CAPCOM Apollo 8, go.
SC Rog. I just got on the sextant and now
looking at Texas and the weather man is right, it looks like
a pretty good day. Full of clouds down there, but not bad.
CAPCOM Real fine, Jim.
CAPCOM Can you see the kids out in the yard
waving?
SC Would you tell Pete Conrad to get his
kids off my roof?
CAPCOM Wilco.
CAPCOM Jim, do you see the bright spot out in
the Pacific Ocean through the sextant?
SC I'll try. We saw it, of course, through
the windows and through the binoculars. I'll see if I can
spot it.
CAPCOM Roger.
SC Yes, Jerry, I can see the bright spot.
It's - I guess it's the sub solar point. It's off of South
America. It appears to be - it is a grayish spot compared
to the blue waters surrounding it. It's undefined in diameter,
though, I mean, it's not a clear round spot at all, it's just
a raggedy one.
CAPCOM Roger. That showed up real well on the
TV's picture.
CAPCOM Apollo 8, Houston. We'd like to delay
that request for a secondary loop check to a little better
point as far as drifting is concerned.
SC Fine. We can wait for a long time on
that.
CAPCOM Okay.
CAPCOM Apollo 8, Houston.
SC Go ahead, Houston.
CAPCOM Roger. Jim, we've got some bird watchers
in the viewing room.
SC Bird watchers, huh?
CAPCOM Roger.
SC Sounds good. Who are they?
CAPCOM Marilyn.
SC Oh, well good. Say hello to her for me.
CAPCOM Yes, and she's got a few troops with her
too.
SC Did she see the TV, I'm wondering?
CAPCOM Affirmative. Barbara and Jay are with
her.
SC Good.
PAO This is Apollo Control, Houston, at
128 hours and 27 minutes and standing by continuing to monitor.

END OF TAPE.

PAO This is Apollo Control, Houston at 128 hours 46 minutes into the flight of Apollo 8. The Apollo 8 spacecraft at this time is 94 676 nautical miles above the Earth, velocity at this time 6176 feet per second. We have a couple of minutes conversation with the crew that we'd like to play to you now.

CAPCOM Apollo 8, Houston. We're replaying your television pictures now. We can see the Chilean coast and Florida.

SC Very good. That's a pretty good little television camera, isn't it?

CAPCOM It sure is. With the right filters on it, it's great. That was a shock input.

SC He must be a Jack of all trades.

CAPCOM Beautiful.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, go.

SC Bill would like to ask the friendly Flight Surgeon's permission to take a Seconal so he can sleep.

CAPCOM Roger, copy. Apollo 8, Houston, that's a yes. Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger, before Bill falls asleep, we'd like to have him go ahead and do that secondary evap check now at anytime at his convenience, and if we don't happen to be - we'll monitor it with high bit rate, just let us know when you did it.

SC Roger, I'll tell him that evaporator check at any time.

CAPCOM Roger. Apollo 8, Houston. Biomed switch to the GDR, over.

SC Roger, in works.

PAO This is Apollo Control, Houston at 128 hours 49 minutes into the flight. We're coming up on a change of shift here very shortly. The black team of change of shift briefing now scheduled for 4:15 p.m. in the big auditorium. Our participants for this news conference will include Flight Director, Glen Lunney, his Retrofire Officer, Jerry Bostick, Major General Vincent G. Houston, DOD manager for Manned Spaceflight Support Operations, and Mr. Jerome Hammack, Chief of the Landing and Recovery Division of the Manned Spacecraft Center. And this is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1290500, CST 3:56a 387/1

PAO This is Apollo Control, Houston, at 129 hours, 5 minutes now into the flight Apollo 8. Here in the Mission Control Center the green flight control team coming aboard very shortly. The previous shift, or our shift I should say, the members of the black team currently briefing their counter parts on what our status is as of this time. At the present time the Apollo 8 spacecraft a 93 527 nautical miles away from earth. Current velocity reads 6221 feet per second and accelerating. We'll switch now to some conversations between our capsule communicator, Jerry Carr, and the Apollo 8 spacecraft.

SC Houston, Apollo 8 over.

CAPCOM Apollo 8, Houston go.

SC Good afternoon, Jerry.

CAPCOM Howdy.

SC Okay, somebody said something about checking out the evaporator, evaporators. What do you want to do?

CAPCOM Roger. Before we get too far along, we'd like to see essentially with the secondary evaporator check that we got any redundant components to check.

SC Okay, standby.

CAPCOM Roger. E Com says to be sure and let it go for at least 5 minutes.

SC Roger. Now you want to check out the primary evaporator also or did you decide it's not necessary?

CAPCOM I guess it's not necessary, Bill.

SC Okay, secondary glycol loops coming on the line.

CAPCOM Roger, Bill.

SC And the secondary vaps coming on the line.

CAPCOM Roger.

SC And it's stabilized the leg, oh, for about 5 minutes.

CAPCOM Roger.

SC Now Houston, Apollo 8.

CAPCOM Apollo 8, Houston go.

CAPCOM Apollo 8, Houston go.

SC Anders All right, what do you have in mind here in the way of activating the secondary loop prior to separation. It looks like if we do have a cabin fan problem we won't be able to do, full blowing cold smoke. Is there anything that we can do that'll do any good?

CAPCOM Well right now, Bill, in the check list we're showing this activation of about minus 1 hour. Let me check with ECOM for a minute and see if they got any more words considering the cabin fan situation.

SC Roger.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1290500, CST 3:56a 387/2

CAPCOM Apollo 8, Houston. Looks like a good time, one hour before entry interface would be fine.

SC Okay, it won't do any good (GARBLE)

CAPCOM Bill, standby. We've got alot of back ground noise. Go ahead now, Bill.

SC Read me now, Jerry?

CAPCOM Loud and clear.

SC Okay, this cold soak is built around the premise that you've got a cabin heat exchanger in my view, and if you haven't got a cabin heat exchanger I'm wondering just what you can do?

CAPCOM He's thinking. Apollo 8, Houston. We think it will still do a little bit of good so we just as soon go through with it.

SC Okay. Even bypassing the suit heat exchanger and that part of it too, huh?

CAPCOM That's affirmative.

SC Okay.

CAPCOM Also, Bill you're secondary loop is looking good.

SC Okay, this jets 5 minutes, I'll deactivate it now.

CAPCOM Roger.

SC Houston, Apollo 8, over.

CAPCOM Apollo 8, Houston.

CAPCOM Apollo 8, Houston, go.

SC Hey, Jerry, when do you want to crank up the VHF anyway?

CAPCOM Roger. VHF simplex, well we had that on the check list for about minus 4 hours.

SC Okay, we wanted to put it out prior to Max Raines, don't you think? Get an idea when we're picking it up?

CAPCOM Roger. Standby Bill, we'll talk about it.

PAO This is Apollo Control, Houston. Well that's the first we've heard from Lunar Module Pilot, Bill Anders for a while. He was, obviously, pre-occupied during the television pass. And at 20, uh, 129 hours, 11 minutes into the flight of Apollo 8, this is Apollo Control, Houston.

APOLLO 8 MISSION COMMENTARY, CST: 4:03 pm, 12/26/68

388/1

PAO This is Apollo Control Houston. We are breaking shift at this time. Flight Director, Clifford Charlesworth and his green team are now aboard. We do want to announce again that the change of shift briefing for Glen Lunney, Flight Director, is scheduled for 4:15 pm and at 129 hours 12 minutes into the flight of Apollo 8 this is Apollo Control at Houston.

END OF TAPE

PAO This is Apollo Control at 130 hours 24 minutes during our change of shift press briefing now, the crew has been primary involved in some guidance and navigation activities onboard the spacecraft. Frank Borman reported that Bill Anders is sleeping at the present time and at the present time our spacecraft is traveling at a speed of 6,417 feet per second our current altitude is 83,706 nautical miles and this is how the conversation has been going up to now.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Roger, entry interface minus 4 hours is just about right for the VHF. That is about 1:42 GET.

SC Roger, thank you.

CAPCOM The next voice you hear will be that of the smiling Irish Man.

SC Outstanding.

CAPCOM Apollo 8, Houston. Over.

SC Go ahead.

CAPCOM Good morning, James.

SC Oh, it's Michael McCollums is it. Good morning to you.

CAPCOM Righto and we're looking at your pitch FDU readout down here and looks to us like you are about 25 degrees off the 180 for your PTC and we were just wondering how come?

SC We've been looking at that too. It keeps wiring off in pitch for some reason just before the yaw. I was just about ready to go back to it again. I had to go back one time and I was just seeing how far she would drift. I thought it would drift out a ways and come back by itself but it is not doing it. We'll get back there

SC Houston, Apollo 8, we are in the process of doing the Trunion Bias check then we will go to P23.

CAPCOM Okay, thank you, Frank.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, GO.

SC We like to have the PTC Attitude to comply with P23 requirements.

CAPCOM Roger, Frank, standby. Apollo 8, Houston.

SC Go ahead.

CAPCOM Any time you want to start on those P23's is just fine.

SC Okay, I was just checking. I just wanted to know how our thermal control was going before we left.

CAPCOM Apollo 8, Houston, over.

SC Go ahead Houston, Apollo 8.

CAPCOM Say, your temperatures are looking good Frank. There is still a differential temperature between quads but nothing that would cause us in this weather to

CAPCOM worry about just a plain thing.
SC Roger, understand.
CAPCOM Apollo 8, Houston, over.
SC Go ahead.
CAPCOM Thank you, Jim. We've been looking at these stars that we gave you this time for P23. It looks like the second star number 11 has a trunnion angle right out to the limit about 49.7 degrees and we're thinking it might be a good idea to switch to star 1 which has a much smaller Trunnion angle. What do you think star 1 is Alpheratz.
SC Fine with me. I would just as soon take star 1.
CAPCOM Okay, that will be then in place of star 11, star 1 and in place of lunar far horizon, lunar near horizon and it remains 2 sets over.
SC Roger, star 1, lunar near horizon 2 sets
CAPCOM Thank you. Apollo 8, Houston, over.
Apollo 8, Houston, over.
SC Read you, Apollo 8.
CAPCOM Roger, fine. Golden fingers there is getting so swift we missed some marks on the down link. I wonder if you hand recorded them could you read us your 3 marks Trunnion angles, your 3 Trunnion angles on star 2 and the last 4 Trunnion angles on star 1, over.
SC ... angles
CAPCOM Standby, we're not reading you good enough so we will wait until you get better omni.
SC That ought to be a good one.
CAPCOM That is a good one. Loud and clear.
SC Okay, star 2 Trunnion angle first one
05245, second one 05243, next one 05241, last 4 Trunnion angles
04133, 04133, 04132, 04132.
CAPCOM Thank you kindly.
SC Can you give me some idea on the updates from the midcourse that we might need and all that good stuff.
CAPCOM Yeah, sure can, Frank, standby. Apollo 8, Houston, over.
SC Go ahead, Mike.
CAPCOM Okay, we're predicting at the nominal time of your next midcourse which is entry interface minus 2 hours, we're predicting 1.4 foot per second burn which changes your gamma at entry interface by a tenth of a degree. Right now with no further maneuvers your gamma is minus 6.39 degrees and we're going to steepen it up very slightly to hit the center of the target line and it will be after the maneuver minus 6.51 over.
SC Very good.
CAPCOM Anything else you want like that?
SC No I just wondered we hadn't heard whether we were going to do it or not.

SC Let me get the pad data and we'll get it all out here.

CAPCOM Yeah, we'll be sending the pad data up to you in about another 2 hours, Frank. About 132 hours GET.

SC Okay, We, this will be the last set of star sightings we do now nominally and even if we loose COMM, we'll just come on in with we got.

CAPCOM Okay, Frank.

SC Incidentally that COMM has been fantastic. I don't know how you've heard us but boy, it's just like you are next door even in lunar distance.

CAPCOM Yeah, it has really been great with rare exceptions when you are on a bad OMNI right before you switch and we get an awful lot of background noise, but in general it has been excellent and boy, we are really thankful for it because reading all these updates would be bad news with bad COMM as you know.

SC Right. Say, Mike, have you noticed the confidence the Captain has in his navigator?

CAPCOM He hasn't called you Gold Finger yet.

SC No, he is disregarding anything I can do. We're coming in anyway.

CAPCOM I expect he is right on that point.

SC Well, back to the drawing board. As usual, we are all pooped. I've got Bill sleeping now and then Jim and I will go off just as soon as we get through with these stars.

CAPCOM Well, you're sounding real good and you are doing good work.

SC Thank you.

PAO This is Apollo Control. That brings us up with the conversation as they developed during the press conference. We'll continue to stand by briefly for any life communications that develop with the crew.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1311900 CST 6:10p, 390/1

PAO This is Apollo Control at 131 hours 19 minutes: Our current spacecraft velocity at this time is 6567 feet per second, and we're at an altitude of 85 284 nautical miles. Since our previous report, it's been very quiet here in the Mission Control Center. Most of the activity has involved checking, double checking figures, and beginning preparation to pass up the information to the crew that they will need for their final mid-course correction, at 2 hours prior to entry. We've had one or two very brief conversations with the spacecraft. We'll pick those up and then stand by for any live conversation that develops.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston, Apollo 8.

CAPCOM Roger, Frank. If you get a chance to, we'd like for you to read us down your trunnion calibration number. We missed that one on the down link and we have an update for your passive thermal control attitude.

SC The trunnion calibration are all zeros.

CAPCOM Roger. Thank you and on page 2104 the PTC attitudes should read 0 Pitch and 45 degrees Yaw. Over.

SC 0 Pitch and 45 degrees that's 2104.

CAPCOM Roger, and we'd like some PRD readings for those (garble) up and around.

CAPCOM Let that slip.

SC 0 Pitch 45 Yaw, it is.

CAPCOM Roger. Thank you.

SC I'm asking (garbled)

CAPCOM That's affirmative Frank. 0 Pitch 45 degrees Yaw.

SC My PRD now reads 2.85.

CAPCOM 2.85

END OF TAPE.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1320800, CST 6:59p 391/1

PAO This is Apollo Control, Houston at 132 hours, 9 minutes. Apollo 8 is at an altitude 1, or rather, 82 111 nautical miles and our current velocity is 6712 feet per second. It continues to be very quiet here in Mission Control and aboard the spacecraft. We've had one or two very brief conversations with the crew and we're anticipating a call up to the spacecraft, shortly, from Mike Collins, so we'll pick that up and then stay tuned.

CAPCOM Apollo 8, Houston. Radio check, over.

SC This is 8, loud and clear, hello.

CAPCOM Well, you're loud and clear, Jim. I'd like to get your PRD reading where we can dock you up and a flight plan change we're suggesting on page 2-107 when you're ready to copy.

SC Roger. Standby. I'm the only person up and my PRD is reading .15.

CAPCOM Roger, I understand, .15.

SC And I'll bet that -

CAPCOM That's okay, don't bother them right now if he's asleep.

SC Houston, Apollo 8. Go ahead with your flight plan change.

CAPCOM Okay, Jim. On page 2-107 we're recommending that you delete that P-52 and just stay in PTC attitude. Your platform is real good and we don't feel that alignment is necessary. One is coming up again at 139 hours anyway. And also, on that same page we'd like to delete the begin cabin cold soak. Over.

SC Righto! Will delete the begin cabin cold soak and will delete the P-52.

CAPCOM Okay, thank you.

CAPCOM Roger, Apollo 8. This is Houston. Over.

SC Roger, Mike. Are you still planning to send up these updates at 132 hours?

CAPCOM Yes, affirmative, Jim. We're getting them together now.

SC Roger.

CAPCOM Apollo 8, this is Houston. Would you please go to P00 and accept, Jim, and we'll send you a P-27.

SC We're ready for you.

CAPCOM Okay. Sending up a state vector to LM slant.

CAPCOM Apollo 8, this is Houston. Over.

SC Go ahead, Houston.

CAPCOM Roger, Jim. You can go back to block. We got the P-27 in and verified. It was a state vector update to the LM clock, and I'm standing by for the mid-course correction number 7 and the entry pass at your convenience, over.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1320800, CST 6:59p 391/2

SC Roger, standby. Go ahead with midcourse number 7.

CAPCOM Okay, midcourse correction number 7 RCS for S, D, and N. It's 3, 1, 6, 0, 0, not applicable. not applicable. 1 4 4 4 5 5 7 9 9 minus 0 0 0 1 4 plus five 0's plus 0 0 0 0 1, are you with me so far, over.

SC Roger, with you.

CAPCOM Good. 0 0 0 3 0 4 0 0 0 not applicable. 0 0 0 1 9 1 0 0 0 1 4 0 0 4 0 0 0 1 4 4 5 0 -

SC Hey, Mike, hold it, hold it, Mike.

CAPCOM Okay, holding.

SC You said not applicable for AJ and HB I started to copy it down and then I didn't get the right number sequence. Did you skip down to what? BG?

CAPCOM No, let's go back to apogee is not applicable and then I just start reading the numbers again from there I've got a perigee and then a delta V and then a burn time and so forth. Over.

SC Okay. I didn't hear a plus or minus on the HP and I only got four numbers off of it so could you start with HP again.

CAPCOM Okay. Going back to apogee not applicable. Perigee plus 0 0 1 9 1. And you weren't hearing anything. That was my mistake, over.

SC Roger.

CAPCOM Okay, picking up with DELTA-V. 0 0 0 1 4 0 remarks: perigee in P-30 equals plus 22.2 nautical miles, over.

SC Roger. Midcourse number 7 RCS, GNM, 31600 not applicable, not applicable, 144455799, are you with me?

CAPCOM I'm with you.

SC Minus 00014, plus all zeros, plus 00001 000304000, not applicable, plus 001910001400400014450459225 Charla, up 236000, plus 0813, minus 1650312202363011464641 (Garbled) 308209357, HP and P-30 are the 22.2 nautical miles.

CAPCOM That's all correct, Jim, and I have the entry pad at your convenience.

SC Okay, Roger, Standby a minute. Ready to copy, Mike.

CAPCOM Okay. Entry pad. Area is mid-Pacific 3571523591462913268 plus 0813 minus 165030683622165112202363 0114646130028, not applicable four times, in other words, DL Max, D1 Min, VL Max, and VL Min, and all not applicable. starting with B040002070025033.

END OF TAPE

to 411/1

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1321800 CST 7:09p 392/1

CAPCOM 00265 0333 0816 16 0590 312 and your vortex star is Zetapersa, which is half way between Mirfak and Aldebaran, up 165 right 34 up remarks is non exit EMS pattern. Over.

SC (Garble) entry as follows mid Pacific. 357 152 359 146 2913 268 plus 0813 minus 16503 068 36221 651 12202 36301 146 4613 0028 NA 4 times, stereo 400 0207 0025 0333 0816 16 0590 312 Zetapersa up 165 right 34 up and remarks use non exit and EMS pattern. And Zetapersa is between Mirfak and Aldebaran, and (garble)

CAPCOM Okay, that's real good.

SC We certainly don't waste much time in getting down to throat deploy, do we?

CAPCOM Roger. That's true.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1323800 CST 7:29p, 393/1

PAO This is Apollo Control at 132 hours 38 minutes. At the present time, we're in touch with the spacecraft. We'll pick up that conversation for you and then stand by to follow it as it develops.

CAPCOM Apollo 8, Houston. Over.

SC Go ahead, Houston.

CAPCOM Roger, Jim. In your computer, we'd like to do an erasable memory dump again, like we did the other day, and the reason we'd like to do it is when you did that P-57 about 8 hours ago, and remember you put that EI time into the tig and got that koodo thing. We'd like to - we don't think there's anything in the world wrong with it. We think everything is just perfect inside the computer, but we'd like to do an erasable dump as we did the other day, go through it bit by bit. Give us something to do down here. Over.

SC Okay. Any time.

CAPCOM And I have the procedures for you when you're ready to copy.

SC Go ahead.

CAPCOM Okay. Verb 01 Noun 01 Enter 333 Enter, and then read out register 1 and that register 1 should be 10 000 - 1 0 0 0 0, and then if it's not, I can give you procedures for getting it to 10 000. If it is 10 000 as we expect, then Verb 74 Enter and that will do the dump. Over.

SC Roger. When do you want it?

CAPCOM Apollo 8, you can do the first part of that now at your convenience to verify that register 1 is reading 10 000 but would you hold up on the dump, itself, until we get our ground stations configured, please. Over.

SC Will do - wait.

CAPCOM Jim, we're getting noisy down here. Could you switch on the antenna, please?

CAPCOM Thank you, sir.

CAPCOM That works pretty well, doesn't it?

SC Not bad. I was amazed at such good communication at the Moon, too.

CAPCOM Apollo 8, Houston. We're configured for the dump. Verb 74 enter at your convenience.

SC Roger.

CAPCOM Apollo 8, Houston the dump is complete and it's your computer. Thank you.

SC Roger.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1331200, CST 8:03 394/1

PAO This is Apollo Control, Houston, at 133 hours 12 minutes. At this point Apollo 8 is traveling at a velocity of 6914 feet per second, and our current altitude reading is 77 946 nautical miles. We've just heard from Bill Anders for the first time in about 3 hours. Bill has been getting some rest and we anticipate at this time both Borman and Lovell are resting while Bill is on watch. We'll pick up that conversation for you now.

SC Houston, Apollo 8, over.

CAPCOM Apollo 8, Houston. Apollo 8, this is Houston, over.

SC Good morning, Mike. We had a little change of the guard here.

CAPCOM You sound real bright eyed and bushy tailed. How's it going up there?

SC Real great.

CAPCOM Apollo 8, Houston, how about giving us a countdown to PRD reading, over?

SC Fine.

CAPCOM Just on you, Bill. We got the other two while you were sacked out.

SC The one that I have now and the one that Jim took off with is obviously broken, it's still at .64.

CAPCOM Okay, thank you. Apollo 8, Houston, over. Roger, Bill on your PTC attitude, we're requesting a pitch angle 0, and we're showing you about 27 degrees pitch and increasing, over.

SC Roger, I've been trying to work it down though.

CAPCOM Now run your drive, that's all.

SC I have to every now and then just to square this thing away. Mike, I'll just give you my status here before the rest of them go to asleep. Had about 3 hours sleep, another meal, and everybody's doing fine.

CAPCOM Roger, Bill, thank you.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1341100, CST 9:02, 395/1

PAO This is Apollo Control, Houston, at 134 hours, 11 minutes and at the present time our spacecraft velocity is 7123 feet per second. Our current altitude reading is 73 952 nautical miles. Since our last report we've had virtually no conversations with the spacecraft with the exception of a short communications check put in by Mike Collins a few minutes ago and a terse "Roger" back from Bill Anders. There is nothing showing on the flight plan at this time. No scheduled activities. And both, Frank Borman and Jim Lovell are scheduled to be getting some rest at this time. We'd like to at this point, repeat some of the figures that were passed out earlier today at our change of shift briefing on the sequence of events at re-entry. We at the present time show 12 hours 33 minutes 55 seconds until entry interface. That event will occur at a ground elapse time of 146 hours 46 minutes 13 seconds approximately, and we anticipate there could be some change in that number following our final midcourse correction which is to come about 2 hours prior to entry interface. Blackout would nominally begin with the current trajectory at 146 hours 46 minutes 38 seconds, and it would last about 3 minutes. They would come out of blackout at 146 hours 49 minutes 41 seconds. Our drogue chutes, the 2 16-1/2 foot diameter conical ribbon chutes, that give the spacecraft its initial stabilization and slow it down prior to main chute deploy. And that event would come at 146 hours 54 minutes 27 seconds. We would be on the drogue chutes for about 47 seconds and then the main chutes would deploy at 146 hours 55 minutes 14 seconds. Our nominal splash time would be 147 hours 0 minutes and 11 seconds. At 134 hours 14 minutes into the flight of Apollo 8, this is Mission Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 1345400, CST 9:45 396/1

PAO This is Apollo Control, 134 hours 54 minutes into the mission. At the present time we are some 11 hours 52 minutes from the time of reentry. Apollo 8 is traveling at a speed of 7289 feet per second and the current altitude of the spacecraft is 70 989 nautical miles. Since our last report, we've had very little communication with the spacecraft. We'll play back for you what communication we have had and then stand by for any calls to the spacecraft or any calls down from the spacecraft.

CAPCOM Apollo 8, Houston. Apollo 8, Houston, over. Apollo 8, this is Houston, over. Apollo 8, this is Houston, over.

SC Roger, Mike, how do you read?

CAPCOM I read you loud and clear now, Bill. I wasn't hearing here for a couple of calls. How do you read me?

SC I had my hands full; I was putting something down. I read you fine.

CAPCOM Okay, understand. If it'll be any help to you in your PTC driving we've computed that as you look out plus X in the COAS or just out the window, you should be pointed right at Acrux when you're in a perfect PTC attitude. We don't know if that's a help to you or not, but we thought you might enjoy trying an alternate mode of keeping the attitude under control.

SC Okay, from my present position we're going to have to move Acrux a little bit.

CAPCOM Well, what ever you think. We just thought you might appreciate knowing.

SC I'll give it a try, Mike.

CAPCOM Can you see it all right?

SC Yeah, I think so. There's a star out there anyway. Houston, Apollo 8, do you read?

CAPCOM Go ahead, Bill.

SC Actually Mike, it's so easy to do it with the 8-Ball with a reasonable sloppy limit that it's hardly worth the trouble to scoot way up in the seat to look out the COAS and it's enough light in the cockpit where the star really isn't too easy to see. So I'm kind of inclined to use the IFR technique here where you can see the rest of the instrument panel.

CAPCOM Okay.

SC I thought you were an all weather pilot.

CAPCOM Well now, you just caused "flight" down here to get a "Gotsya" on Cap Com and FAO.

SC Give you a little warning next time.

PAO This is Apollo Control. It appears that we will have no further conversations at this point. Now we'll take the circuit down at 134 hours 58 minutes.

END OF TAPE

PAO This is Apollo Control at 135 hours 39 minutes and it continues to be very quiet here in Mission Control and aboard the spacecraft. There are no scheduled flight plan activities at this time. Two of our Three crew men are continuing in a sleepful rest period. Bill Anders is awake and minding the duties aboard the spacecraft while Frank Borman and Jim Lovell catch up on their sleep. At the present time Apollo 8 is traveling at a speed of 7,480 feet per second and current altitude is 67,744 nautical miles. The clock here in Mission Control has been counting toward reentry now shows 11 hours 6 minutes prior to that event. This is the ~~communications we have had with Anders in the~~ past 45 minutes or so then we will stand by for any live conversation.

CAPCOM Apollo 8, Houston. We will be changing the antennas in 3 minutes. You can expect a COMM ...

SC Okay, Mike.

CAPCOM Apollo 8, Houston. Can you switch us to OMNI ... please. Thank you sir.

PAO That brings us up to date with the conversations with Anders over the last 45 minutes or so since our previous announcement. At the present time here in the Mission Control Center the large center display map of the world with the spacecraft ground track on it we're beginning to see a gradual effect of the increase in earth's gravitation influence on the spacecraft. That ground track now beginning to swing slowly northward and we'll see it between now and reentry swing even more northward and it will actually reverse its direction as the spacecraft plunges back toward Earth. It doesn't appear that we are going to have any further conversation with the spacecraft at this point. We'll continue to monitor and come back up periodically with status reports and in the event that we have any significant communications from the crew. This is Apollo Control at 135 hours 43 minutes

END OF TAPE

PAO This is Apollo Control 136 hours 04 minutes into the flight of Apollo 8. At the present time, we're in conversation with the crew. Frank Borman just came on the line and indicated that he had gotten some sleep and was now joining Anders. Apparently Jim Lovell is still sleeping at this time. We'll pick up that conversation and stand by to follow it.

SC Houston, Apollo 8. Are you still there?

CAPCOM Apollo 8, this is Houston. Go ahead.

Over.

SC I was just seeing if you were still there,

Mike. The Old Grey Eagle is taking over show here.

CAPCOM Which one of them?

SC We'll settle for chief.

CAPCOM Apollo 8, Houston. Over.

SC Go ahead, Houston.

CAPCOM Roger, Bill. We had an erasable memory dump a few hours back. I think it was while you were asleep, but anyway we've checked the computers and erasable memory bit by bit and everything agrees 100 percent. Over.

SC Mighty fine. Glad to hear it Mike.

Thank you.

CAPCOM Rog. Are you going to brief Frank on your tape recorder before you go to sleep?

SC He can't handle it. It's too complicated.

CAPCOM Roger.

PAO This is Mission Control. At the present time, our spacecraft velocity is 7598 feet per second, and we're traveling now at an altitude of 65 851 nautical miles. Noting that the velocity is beginning to increase more rapidly now and our altitude decrease. At the present time we show 10 hours 39 minutes 25 seconds until entry interface. We'll continue to stand by briefly for any more conversation from the crew.

END OF TAPE.

PAO This is Apollo Control at 136 hours 52 minutes. Since our past report activity here in Mission Control and on the spacecraft has been minimal. We have had a few communications checks with the spacecraft and some routine housekeeping chores being done by the crew. Very little flight plan activity scheduled at this time. At the present time, Apollo 8 is at an altitude of 62 413 nautical miles and our velocity reads 7825 feet per second. We have one bit of interesting information from our flight dynamics officer, which illustrates the rapid velocity increase we will see as the spacecraft nears earth in its final hour of flight. Beginning at 145 hours 41 minutes, or about 1 hour prior to entry interface, we will have a velocity of 18 013 feet per second. During the next hour as the spacecraft closes on earth from an altitude of some 10 445 nautical miles, our velocity will just about double reaching 36220 feet per second. We saw much the same sort of thing happen as our spacecraft neared the moon. Where in the final hour or so of flight, we saw the dramatic increase in velocity and now returning to earth, we are seeing the same sort of thing. A gradual buildup until just about the last hour of flight and then that dramatic increase in velocity from 18 013 feet per second to 36 220. We have a brief bit of conversation on tape from the past 45 minutes or so. We will play that back for you now and will stand by briefly for any live conversation.

CAPCOM Apollo 8, Houston. Give us a different omni, please.

CAPCOM Thank you sir.

CAPCOM Apollo 8, Houston. Over. Apollo 8, this is Houston. Over.

SC Go ahead, Michael.

CAPCOM Roger we are going to switch to ground antennas in about a minute and a half. You can expect a comm break then.

SC Thank you.

CAPCOM Apollo 8, this is Houston through Carnarvon. Were you calling a minute ago, Frank.

CAPCOM Yes, we are reading you loud and clear now.

SC Carnarvon, how do you read Apollo 8?

CAPCOM Apollo 8, this is Houston. Reading you loud and clear through Carnarvon.

SC Hello Houston.

CAPCOM Go ahead, Frank.

SC We are just listening to all the guys around the Net.

APOLLO 8 MISSION COMMENTARY, 12/26/68, GET 2365200, CST 11:43p 399/2

CAPCOM Can you hear them?

SC I could that time, all the way from
Carnarvon to Texas. How did they ever get an old maintenance
officer on the midnight shift?

CAPCOM Frank, you are on GOSS conference, if you
would like to be brave about it.

SC Okay.

CAPCOM Apollo 8, Houston. Omni Bravo, please.

CAPCOM Thank you sir.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 137:32:00, CST 12:23A 400/1

PAO This is Apollo Control Houston at 137 hours, 32 minutes. We continue to have a minimum of conversation with the crew of Apollo 8. At this time the spacecraft is traveling at a speed of 8029 feet per second and our altitude reading has just now dropped below 60 000 nautical miles, now reading 59 517 nautical miles. We do have a small amount of conversation which we will play back for you now and stand by to pick up live anything that follows.

SC Houston, Apollo 8

CAPCOM Apollo 8, this is Houston, over.
Apollo 8, this is Houston, over.

SC Have you noticed how long I've stayed locked in this PTC mode?

CAPCOM Just about an hour and a quarter looks like, Frank.

SC I haven't even touched the hand control here for about 20 minutes, the test just moved outside that zero, I've never seen it like this before. Be sure and have your troop give me a call if it gets close to gimbal like Williams, I'm snoozing a little bit now and then up here.

CAPCOM Yes, we sure will, Frank.

SC Thank you. And if you'd switch the antennas you'd really be good guys.

END OF TAPE

APOLLO 8 MISSION COMMENTARY GET 138:17:00 CST 1:08 pm 401/1

CAP COM This is Apollo Control, Houston, at 138 hours, 18 minutes. Since our last report some 40 minutes ago, we've had no conversations with the spacecraft. Our flight plan shows no activities at this time. We expect that both Jim Lovell and Bill Anders are getting some sleep. Frank Borman is on the watch at the present. And our spacecraft vital statistics, here comes the velocity and altitude are now 8,309 feet per second for velocity and 55,817 nautical miles is our current altitude. At 138 hours, 19 minutes, this is Apollo Control.

END OF TAPE

CAP COM This is Apollo Control, Houston, at 138 hours 57 minutes, and at the present time our spacecraft is at an altitude of 52,745 nautical miles, traveling at a speed of 8,563 feet per second. We heard from Bill Anders aboard the spacecraft a short while ago, and Bill informed us that there had been a change of watch, that he had relieved Frank Borman. We will play that conversation back for you, and then stand by for any further communications from the spacecraft.

CAP COM Apollo 8, Houston. Over.

SC Houston, Apollo 8.

CAP COM Roger. Just a check on the radio and if its practical, biomed switch left, please.

SC Okay, Mike. We had a crew change in the watch again.

CAP COM Well, that was quick. Did you decide you didn't want to sleep after all?

SC Well, it was my decision.

CAP COM Yeah, that's what I figured.

CAP COM Apollo 8, Houston, we will be changing manned antennas in about two and a half minutes, do you expect a com glitch?

SC Roger. We are going to change it too.

CAP COM We're switching from Carnarvon to Honeysuckle, Bill.

SC Roger.

CAP COM Here in Mission Control Center at the present time, we are involved in a change of shift. Our flight director Milton Windler and his team of flight controllers are coming on, getting updated on the status of the spacecraft, crew, and preparations for the re-entry. This is the team coming on that will be handling the re-entry, and that event now scheduled to occur some seven hours and 47 minutes from now. Simultaneously with the change of shift down here in the Control Center, we also began to pick up activity in the flight plan related to the final midcourse correction and re-entry. Now we are scheduled to have a platform alignment in about 15 minutes aboard the spacecraft, and that will be followed by an eat period for the commander. The flight plan shows the command module pilot to continue sleeping until about 141 hours and at the present time, it appears that Frank Borman and Jim Lovell are resting or sleeping. We will continue to stand by for a short while for any further communications from Bill Anders, and then we'll take the circuit down if we don't hear any.

CAP COM This is Mission Control, Houston. It appears that things are going to continue along quietly, at least for the moment. We would like to advise that we will have a change of shift briefing scheduled following this shift, and we anticipate this will occur between 2:15 and 2:30. This is Apollo Control at 139 hours 2 minutes.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 1391500, CST 2:06a 403/1

PAO This is Apollo Control at 139 hours
15 minutes. At the present time, Apollo 8 is at an altitude
of 51 198 nautical miles and our velocity is 8 698 feet per
second. A short while ago we had this conversation with
Bill Anders.

CAPCOM Apollo 8, Houston. Over.

SC Go ahead, Houston.

CAPCOM Roger. Apollo 8. Your Green Team will
be signing off in a few minutes and before we do, Charlesworth
and the rest of us would like to say we have enjoyed it, and
look forward to seeing you back in Houston. Over.

SC We have sure enjoyed it too, Houston.
You guys are really doing a good job. We appreciate it.

CAPCOM (garbled) We will be seeing you Bill.

SC Okay, Mike. We will see you Buddy. Tell
old Cliff adios for me.

CAPCOM Sure will.

END OF TAPE

APOLLO 8 MISSION COMMENTARY GET 139:52:00 CST 2:43 a 404/1

CAP COM Apollo Control here at 139 hours 52 minutes, and a good, good morning from the maroon team. We're 48,000 miles from home, moving at nearly 9,000 feet per second. And in the last half hour we have had these bits and pieces of conversation with the crew. Among other items of interest, Jim Lovell awakened, which you may already know. He awakened a little bit earlier than his planned seven hour sleep period, he was awake at least a half an hour ago. Here's our recorded conversation.

CAP COM Apollo 8, Houston.

SC Go ahead, Houston.

CAP COM Apollo 8, we'd like to have you, before you get a P52 going here, we'd like to have you review all the optics and read us the mechanical CTU, we're trying to collect a little data for troubleshooting.

SC Roger. Stand by.

CAP COM I got you.

SC What questions are you trying to troubleshoot?

CAP COM This goes back to some of the problems we had prior to LOI. Might see if the softwear readouts we're getting down here compare with the mechanical readouts. Not a current problem as far as we know.

SC Okay.

CAP COM Apollo 8, Houston.

SC Go ahead, Houston.

CAP COM Okay. Why don't you just read me the mechanical CTU's there now, and then it looks from the ground like you're ready to go ahead with the P52.

SC Okay, we'll get squared away here in just a minute.

SC Good morning, captain.

CAP COM Good morning, sir.

SC This will be a piece of stew out of a deep sleep. Stand by one. Trunion mechanical CQ looks about like 1 100.

CAP COM Roger.

SC And the shaft mechanical OCU looks like it is reading about 400 below zero, which is about 364.

CAP COM Understand, Jim. That is 400 below zero on that shaft, is that affirm?

SC Yes. Stand by one. About 35996 on the shaft.

CAP COM Okay. You can go ahead with P52 now.

SC Okay.

SC I always said you did better in your sleep.

CAP COM Apollo 8, Houston.

APOLLO 8 MISSION COMMENTARY GET 139:52:00 CST 2:43 a 404/2

SC Go ahead, Houston.
CAP COM Okay. It looks like we're getting down on the service module RCS to the place where we ought to go ahead and activate the secondary service module RCS propellant.
SC Okay. Stand by.
CAP COM Apollo 8, Houston.
SC Go ahead.
CAP COM Okay. We've got a new PPC attitude. For the pitch, 180, for the yaw, 315.
SC Roger. Yaw, 315.
CAP COM Roger. And pitch 180.
SC Okay. Can't you pick one a little further away?
CAP COM Not in our normal sphere.
SC Ken, this is Jim.
CAP COM Go ahead.
SC Aren't we still a little high on the cloudy side to activate the secondary?
CAP COM Negative. We have quad Bravo and quad Delta which are getting right down, according to the calculatrf numbers, next to where we will be activating them. The numbers you are reading are going to be a little bit high, but the computer data on the ground shows that you have about 134 pounds in Bravo and Delta, and about 130 pounds is where you ought to be on the secondary.
SC Okay, Roger. We will activate the secondary and turn off the primary.
CAP COM Okay. It's just to keep you from running one of them hot.
SC Roger. Secondary activation.
CAP COM Roger.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET1404000, CST 3:31A, 405/1

PAO This is Apollo Control Houston, 140 hours 40 minutes into the flight and we just had a chat with the crew which was significant in two respects. They were advised that we would not have another midcourse. None was necessary. And we heard from Frank Borman that the crew was up now, alert and awake, and Frank said they had a real good night's rest. And they are all set for the reentry. Here's the conversation.

SC Houston, Apollo 8.

CAPCOM Go ahead.

SC Ken, on this maneuver, MCC-7, are you going to - are we going to burn the PAD data that we got some time ago or is there a new maneuver coming up or what's going on in that regard?

CAPCOM Okay, Apollo 8. If required, we'll give you a new one. Right now we are looking at not making a maneuver burn at all.

SC You say we may not even have another one now?

CAPCOM That's right.

SC Okay, you're the boss.

CAPCOM Apollo 8, Houston. Apollo 8, Houston. Apollo 8, Houston. Could you try another omni? Apollo 8, Houston. Try another OMNI please. Apollo 8, Houston. Apollo 8, Houston.

SC Go ahead, Houston. Apollo 8.

CAPCOM Okay. Read you loud and clear now. Just wanted to remind you that in the event of a loss of COMM, we don't want you to burn MCC-7. Your present entry PAD is good. We'll be updating your landing points at the same time that you would have gotten MCC-7 and I'd like to have a crew status report from you when it's convenient.

SC If we do lose COMM, you do not want us to burn MCC-7, just go ahead and use the entry PAD you've given us?

CAPCOM That's affirmative. You'll be within .06 degrees of your entry angle target line.

SC All right. The crew status is: everybody has gotten real good rest last night and everybody is in good shape. Jim is just waking up and Bill is starting the initial stowage and we all feel very well.

CAPCOM Okay. Okay and we'd like to - guess we need a PRD reading from you. And we'll be needing one in the neighborhood of 145-hour period, somewhere when it's convenient in there again.

PAO And that wraps up the position of the crew at 140 hours 44 minutes into the flight. This is Apollo Control Houston.

END OF TAPE

PAO Apollo Control, Houston at 140 hours, 55 minutes into the flight. And before we get all wrapped up in the entry process, why don't we take a final look at our onboard system quantity readings? Our cabin pressure remains, as it has now for some days, at 4.9 pounds per square inch; cabin temperature, 78 degrees. The amount of waste water on board right now is 69.5 percent of the tank capacity or 38.9 pounds. The potable drinking water quantity remains as it has throughout most of the mission at slightly over 100 percent, it is constantly being refilled from the fuel cell production. The potable quantity in pounds is 37.3 pounds. And the temperature of the water dump nozzle is 65 degrees Fahrenheit. Now in the oxygen area, tank 1 has 59 percent of its oxygen supply remaining, and tank 2 has 59.5 percent, and the hydrogen area, the number on tank 1 is 40.4 percent, tank 2, 42.5 percent. As we dial up further displays, we will give you that information. And pilot biomed harnesses, we are not taking information right now apparently, have turned that system down for the duration of the mission. And we are still searching here, stand by one. For your information, we are 42,293 miles away from earth now, and velocity has built up to 9600 feet per second. To convert that to statute miles per hour, you multiply by .68. The oxygen flow is running at .3 pounds per hour. Point 3 pounds per hour. The fuel cell status still load sharing very nicely. Fuel cell 1 carrying 33.1 percent, fuel cell 2, 32.2, fuel cell 3, about 34 percent, all very steady values, no problems at all on our fuel cells during the flight. And we have some conversation recorded from the crew, why don't we play that now?

SC Houston, Apollo 8.

CAP COM Go ahead, 8. Apollo 8, Apollo 8, Houston, go ahead.

SC Roger! Could you give us our range and our correction in our velocity and range from the earth now?

CAP COM Stand by. Apollo 8, Apollo 8, Houston. At time prime one, your velocity will be 9526, altitude 42946. Over.

SC Thank you.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 1412900, CST 4:20A, 407/1

PAO This is Apollo Control Houston here at 141 hours 29 minutes. It's been at least a half an hour since we've heard from the crew but no concern here. Things are very quiet obviously in the spacecraft. They're very quiet here in the Control Center. I suppose the two most active areas are the recovery forces. They're working very hard to make sure the adequacy of their communications circuits. They're running almost constant checks. And the retro people, who work very hard over this final entry into atmosphere maneuver. And all the members associated with it - they're working and comparing and talking to each other at a brisk pace. Other than that, it is all quiet at 141 hours and 30 minutes.

END OF TAPE

CAP COM This is Apollo Control, Houston, and everything seems to be proceeding very nicely. Ken Maddingley has been running through entry, pre-entry checklists with Frank Borman. We're content, so are they. At the news conference a little while ago, numbers were passed to the press based on a final maneuver of something on the order of one or two feet per second. As you know, we scrubbed it, there is no need for such a maneuver, and it has been terminated, but the fact that we are not going to have the maneuver matters almost not at all on the numbers. For instance, it changes the splash time by one second, so if you recorded numbers earlier, well, stick with those. And we have recorded the checklist and the conversation with Apollo 8 and we'll play it for you now.

CAP COM Apollo 8, Houston, you call?

CAP COM Apollo 8, Apollo 8. Did you call?

SC Negative, Apollo 8. We did not call you.

CAP COM Okay, thank you.

SC Roger.

CAP COM Apollo 8, Houston.

SC Go ahead, Houston. Apollo 8.

CAP COM Okay, I've got some weather and recovery force status, and a couple of last minute items to run down any time it is convenient for you.

SC All right. It's convenient right now. Any time.

CAP COM Okay. For the mid-Pacific, the general condition is good. You can expect cloud bases 2000 foot, scattered; visibility, 10 miles; wind 070 and 12; wave heights, four feet; altimeter 2974. Sunrise will be 1710 Zulu, and first light 1649 Zulu. The recovery forces, ship will be Yorktown; the aircraft will be Airboss number 1 and 2, and recoveries 1, 2, and 3. The estimated time to a target point: the ship is, Yorktown is, on the target point, Airboss aircraft 15 minutes and will be on scene commander, recoveries 1, 2, and 3 are SH3 Alphas, and they go with the Yorktown, so they are on the target point, all of them have swimmers aboard. If the recovery aircraft do not hear from the spacecraft, they will go ahead and put swimmers in the water, and if you are in good shape and give them a call, then they will hold off on dropping swimmers until sunrise.

SC Roger. Say again, the sunrise and first light time for me, would you please?

CAP COM I say again. Apollo 8, Houston, notice the large middle gimble angle, over.

SC Thank you. Would you say again the daylight time, please, sunlight and first light.

CAP COM Okay. Sunrise is 1710 Zulu and first light is 1649 Zulu.

SC Thank you.

CAP COM Okay. Looking over the weather I gave you was the 2000 foot scattered at the target point, may have a 6000 foot broken layer above that. At the max lift point, you will have about the same thing, and altimeter is the same down the range. As you go further to the east, the weather should improve slightly, there is no problem with thunderstorms or rain showers in any of your recovery area.

SC Very good, thank you.

CAP COM The items that we still need will be a PRD reading as late as you can do it conveniently prior to Apollo stowage. And we don't have any numbers on the last crew sleep period. I'd like to verify that the secondary RCS was activated on all four quads. We're going to have about five comments on the entry checklist procedures to verify.

SC It was activated on all four quads, that's correct. Our final stowage is completed, we'll read out the PRD's for you now.

CAP COM All right, thank you.

SC The LMP's reads .64, I believe it's been that way throughout the flight. The CMP's reads .11 - that's 1.11.

CAP COM Roger.

SC Stand by a minute. Let me look at it closely. That's point 11.

CAP COM Roger. Zero point one one.

SC And the one I ended up with reads 3.10.

CAP COM Okay, thank you.

SC Okay, go ahead, Ken, what else do you want to talk about?

CAP COM Okay, to make everybody happy, we can use an estimate of the number of hours sleep that people got.

SC Just a minute, I'll give you that, I forgot. Anders got about 5 hours, and Jim Lovell got about 5, and I got about 5 and a half or 6.

CAP COM Sounds good. Okay. We went through an exercise with the mockup on the preentry preparations, and we noticed that in the LMP's checklist on page S12, when you go to top off the repress bottles, I believe it is a misprint, it should read the PLSS fill valve rather than the repress valve, and we should be going to the fill position as opposed to going to on.

SC Roger, that's what we do.

CAP COM Okay. And on - go ahead.

SC Go ahead. We agree, that's what we do.

CAP COM Okay. On page E7 of the entry checklist, and under step 34, as long as you have panel 382 open, that's a convenient time to go ahead and have the evaporator water controls, both primary and secondary, to AUTO and the suit heat exchanger for the secondary glycol to FLOW.

SC Those items are already accomplished.

CAP COM Very good. On page E9, when you are getting ready to transfer the RCS to the command module position, could you also avoid having the engines fire as a result of attitude correction, you might want to take the manual attitude switches to accel command ON or minimal impulse, and again on E9 Alpha, it's step 41 Bravo if you want to go back to attitude 0, bring your manual attitude switches back to RATE.

SC What was that last step?

CAP COM Step 41 Bravo on page E9 Alpha. It's if you decide to use either minimal impulse or accel command Step 41 Bravo would be a good place to go back to rate command.

SC Okay, we do a purge or -

CAP COM Okay, fine. Then on -

SC I didn't put all those control configurations Cchanges on the checklist but that's exactly what we did, on minimal impulse.

CAP COM Okay, real fine.

SC Houston, Apollo 8.

CAP COM Go ahead, '8. Apollo 8, Apollo 8, go ahead.

SC I'd like to confirm one item on the pad message, please.

CAP COM Roger.

SC Time to retrodrouges, reference you have to drogues, please.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 1420300, CST 4:54a 409/1

CAPCOM Okay, I'll check that one out.
SC And also, Ken. We are going to turn
on our VHF now. About 4 hours before entry.
CAPCOM Real fine. Thank you. I'll let you
know when we pick it up.
SC ... (garbled)
CAPCOM Affirm.
PAO This is Apollo Control Houston. 142 hours
3 minutes into the mission. A word or two on some of the
congratulatory message traffic that we have experienced
during this mission. I would call it unusually high. Probably
associated with the general interest in the mission. The fact
that it is the holiday season and more people have more time
to express themselves. In general, far and away, the comments
have been extremely laudatory, praiseworthy, and of course,
there has been - as there always is, a very small but an
extremely vocal minority who thinks we shouldn't have done
the mission or if we should have, we shouldn't have done it
over religious holidays. Still others have criticized any
religious overtones that have crept into the mission. But
perhaps, typical of the happier kinds of messages is one that
was received here just a few hours ago simply from an anonymous
well-wisher in Hornsby, New South Wales, Australia. It reads,
"Happy landing Apollo 8 astronauts." At 142 hours 4 minutes
into the flight, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET1423400, CST 5:25A, 410/1

PAO This is Apollo Control Houston at 142 hours 34 minutes. In the last few minutes, we've recorded this conversation.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Okay. We have checked into your drougue time and the number of 0816 on your entry PAD is correct. We'll be giving you an updated entry PAD on the scheduled time of 14330. At the same time, we'll be giving you an update of your state vectors for the LM and CSM. The midcourse number 7 was less than seven-tenths foot per second and we will not execute it. You have a P52 scheduled at 14330 which is not required. It's your option. However, if you decide to delete the P52, the CMC cell check in this DSKY condition light test are still requirements. Over.

SC Give us the CMC cell check. What about DSKY check?

CAPCOM Apollo 8, Houston. That's my mistake on CMC cell check in DSKY condition light. That's an optional test. Over.

SC That's what we thought, Ken. Gosh, if it's been working perfectly for 6 days, I don't see any reason to test it.

CAPCOM I agree.

SC Morning, Ken. How's Houston this morning?

CAPCOM Just fine. Nice and balmy.

SC Good.

PAO And that was Jim Lovell you heard chime in at the end. He's up and sounding perky this morning. At 142 hours 37 minutes, that's our status.

END OF TAPE

PAO This is Apollo Control Houston here 142 hours 59 minutes into the flight. And the velocity increase we are seeing is now becoming dramatic. We are up to 11 298 feet per second and it is really building. We are 30 424 miles from home. Here is the conversation with the crew.

SC Houston, Apollo 8. Over.

CAPCOM Go ahead, Apollo 8.

CAPCOM Apollo 8, go ahead.

SC I am just - it is my understanding that you are bring up the secondary loop in 1 hour prior to SEP maneuver.

CAPCOM That is affirmative. About E Echo 9.

SC Okay.

CAPCOM And Bill, ... guesses if we have the water boiler going on the primary loop, that you - you might wait about 5 minutes or so before you initiate the secondary loop.

SC Wait 5 minutes from what? From the time the primary loop starts or from 1 hour?

CAPCOM From the time the primary loop starts. This will give you chance to see if it had a chance to dry out or not.

SC Oh, I am with you. Okay.

CAPCOM And for your own information, we already have a VHF downlink. Is poor quality, but we do have contact.

SC Okay, we haven't turned anything over to VHF yet.

CAPCOM Okay.

SC We tried to call you on the VHF though Ken.

CAPCOM Roger. Say the quality is pretty poor. They may not be able to understand you.

SC Roger. Houston. Apollo 8. Over.

CAPCOM Go ahead, Apollo 8. Apollo 8, Houston. Go ahead.

SC Ken, we got two things going here which make this suit heat exchanger pull a little different. One of them is, we are not doing a cold soak and the other one is we are powering down the secondary loop prior to SEP. And I wonder if it is a good idea to have the suit heat exchanger only on secondary loop like this. And plus the fact that we haven't got any cabin heat exchanger.

CAPCOM I don't think that was the intent though. What they had in mind, we have the suit heat exchanger on both loops and if they got too cold, you could use the panel switching to shut down the primary loop through the heat

to 428

~~END~~

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 1425900, CST 5:50a 411/2

CAPCOM exchanger, but in any event you would always have something going through the suit heat exchanger. I recognize that we are going to be shutting down the secondary heat exchanger pre-SEP and then turning it back on prior to entry, but the idea was to have both primary and secondary loops on the suit heat exchanger simultaneously.

SC Yes, my checklist doesn't reflect that. I think that's a good idea, because we are a little suspect of our cabin fans and don't plan to use them.

CAPCOM Roger.

SC Houston, Apollo 8. Over.

CAPCOM Go ahead, 8. Apollo 8, Apollo 8. Go ahead.

SC Roger, what's our adjustment of our post-separation main bus voltage?

PAO This is Apollo Control Houston. That brings us up to date. And to amplify one remark I think you heard Bill Anders say, he would try to call on VHF and - if it was received, it was badly garbled. If I recall correctly, on the way out and they were quite a way from the earth, we - they heard us broadcasting on VHF out to about 22 000 miles. Just about the reverse situation here, where it is slightly more than 29 000 miles out. At 143 hours 4 minutes into the flight, this is Apollo Control Houston.

END OF TAPE

Splash Down

- What happens to SM 419/1
- all 8's landed in Pacific 421/1
- route over Peking, Tokyo "
- schedule of reentry 421/2

PAO Apollo Control Houston at 143 hours
36 minutes into the flight. And we have been chatting more
with Bill Anders primarily on how things look. The spacecraft
is now 26 458 miles from earth, moving in a velocity of
12 075 feet per second. The weight of the spacecraft is
31 600 pounds. Now that weight will change dramatically
15 minutes before we reach the 400 000 foot mark when the
service module leaves us and it will go from 31 600 down to
about 12 000 pounds and will hold close to that on in.
Here is the conversation.

CAPCOM Apollo 8, Houston. We will be making a
handover from Carnarvon to Honeysuckle at 15.

SC Roger. Houston, Apollo 8. Over.

CAPCOM Apollo 8, go ahead.

SC I am still a little bit confused on that
- on this activating the secondary loop. You indicated in-
activating it at one hour or five minutes after the primary
evaporator comes on the line. My judgement shows that the
primary evaporator probably won't come on the line until we
by-pass the radiators. Have you got something else in mind
I don't know about?

CAPCOM Okay, Bill. We passed up an update some
time back on page E-9 step 38 right at the beginning. And
you have got a final GET drift check. And between there and
the step 39 where it says terminate CM RCS pre-heat, that was
the place we wanted to activate the primary loop by putting
the primary glycol/water switch to AUTO and the glycol evap-
orator steam pressure to AUTO.

SC Roger. I don't expect it to boil, though.
Do you?

CAPCOM Okay, Bill. We are hoping that it will
there. It looks like we will have had a stable attitude for
sometime and we anticipate that it will be warm enough to
make it boil. That is the reason ... if it is boiling, that
you wait. If it isn't go ahead and turn on the secondary
loop.

SC Okay, well that's where I was confused.
I am waking up. Thank you.

CAPCOM Yes sir. Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Okay, Apollo 8. We would like to update
your LM state vector, CSM state vector, and target point
and if it is convenient now, why we will go ahead and do that
if you will go to PU and ACCEPT.

SC Roger. FU and ACCEPT.

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston. Apollo 8.
 CAPCOM Okay, the loads are in and verified and the computer is yours. You can take it back to block and for Bill's information, weight has skipped from the main bus postset voltage to 27.5.
 SC Guess. You mean the EECOM's are guessing. At least they are honest for a change.
 CAPCOM That is more than you can say for the computers.
 SC Or the crew.
 CAPCOM Apollo 8, Houston. Apollo 8, Houston.
 SC Go ahead, Houston. Apollo 8.
 CAPCOM Okay, 8. We have an entry PAD for you.
 SC Good, just a minute. Ready to copy, Houston.

CAPCOM Okay, this will be the mid-Pacific.
 357 152 359 146 29 00 268 plus 0813 minus 16503 065 36 221
 645 121 22 36301 146 46 14 00 28. The next block is November Alpha. D sub zero 400 02 12 0025 0334 08 14 16 0590 312
 Zedia persi up 165 right 34 up. Use non exist E&S pattern. GDC align, primary star Sirius, secondary Rigel, roll 308, pitch 209, yaw 357. This entry will not involve P65. Over.

SC Houston. Apollo 8. Entry PAD as follows:
 mid-Pacific 357 152 359 146 2900 268 plus 0813 minus 16503
 065 36221 645 12122 36301 1464614 0028. Next block not applicable 400 0212 0025 0334 0814 1659 312. Zedia persi up
 165 right 35 up. Use non exit G&S pattern. Backup alignment
 Sirius Rigel roll 308, pitch 209, yaw 357, and we won't need P65.

CAPCOM Okay, Apollo 8. Would like to verify sextant star shaft 0590. And the boresight star - the last one is right 34. Over.

SC Roger. Boresight star is right 34. And I have the sextant shaft. That's 0590.

CAPCOM That's correct, Apollo 8.

PAO Apollo Control here, and that brings us up to the point where we are now. For those newsmen watching the projection on monitors in our MSC Auditorium news area you'll be able to see very shortly the spacecraft do a long loop the loop kind of maneuver against a flat map such as we are viewing. The maneuver will be quite similiar to that that we saw the other day after the TLI burn when we did a big loop before we started tracing a steady flight path away from the earth. Of course, we are going to see this morning the mirror image of that maneuver, only in this case it will be performed almost directly over India. The spacecraft is now looking down on the southern tip of India.

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 1433600, CST 6:27A 412/3

PAO It is directly over Ceylon, and it will
for earth mapping purposes seem to proceed in a northwesterly
direction.

END OF TAPE

APOLLO 8 MISSION COMMENTARY 12/27/68 GET 143:46:00 CST 6:37am 413/1

CAP COM And it will, for earth-mapping purposes, seem to proceed in a northwesterly direction as it prepares to make its entry, lines up for its entry PAD back to earth and the Pacific Ocean. We are 25,309 miles away from the spacecraft and it is moving at 12,328 feet per second. At 143 hours 47 minutes, this is Apollo Control, Houston.

END OF TAPE

PAO This is Apollo Control Houston, at 144 hours 8 minutes into the flight. And things are continuing to rock along. In the last few minutes, we had a little surprise here with a not yet completely explained water dump. We chatted with the crew about it and, apparently, Bill Anders had dumped some waste matter, some urine overboard earlier, which he had collected for awhile. We still don't completely understand it. We're talking a little about this and here's how the conversation how goes.

CAPCOM Apollo 8, Houston. Apollo 8, Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Okay, Apollo 8, can you tell us if you've done anything with your potable water. We've noticed our readout has gone from 100 percent down to 56 in the last couple of minutes.

SC We're reading about 50 percent right now.

CAPCOM Roger. That correlates with what we see. Have you done anything to change configuration? Over.

SC Yeah, we noticed the venting here, too, Houston.

CAPCOM Jim, did you mean you could visually see it?

SC *Low!* Yeah, we're - oh, stand by - Bill just dumped urine so that might have been urine we were seeing. Bill just shut the potable inlet, Ken.

CAPCOM Okay, thank you.

SC Houston, Apollo 8.

CAPCOM Go ahead, 8. Apollo 8, Apollo 8, go ahead.

SC Roger, Houston. We're still showing about 52 percent and we had our switch on waste so we don't know whether it dropped from a higher value or not. Is yours stabilized now?

CAPCOM That's affirmative. Ours has stabilized now. It was reading full just a few minutes ago.

SC Roger. I don't think - we can't account for any sudden drop in water.

CAPCOM Okay, we looked in the malfunction procedures and number 28 doesn't reveal anything very suddenly.

SC Bill is looking there now.

SC Houston, Apollo 8, over.

CAPCOM Go ahead, 8.

SC Okay, I'm looking at malfunction 28 and it takes you to box 6 but I don't really think that's the problem because the waste tank quantity hasn't changed any. Over.

CAPCOM Okay, I concur. We're watching the same thing.

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 1440800, CST 6:59A, 414/2

SC But we don't care about the potable tank but we do about the waste tank so just in case there is a problem somewhere, I'm going to shut the potable tank OFF and leave the waste tank inlet valve OPEN. How does that sound to you?

CAPCOM Stand by. Okay, 8, we concur.

SC If I see any water floating around, I'll give you another call.

CAPCOM All right. Thank you.

PAO So much for our water situation. That's apparently been laid to rest now. As Anders said, it's not really a problem. Just not immediately explainable so he turned off the potable tank. There are two tanks here, the potable tank, the drinking water, and the waste water tank. He had vented the waste water tank to some degree but apparently had not - they saw some kind of action on the potable meters. In any case, it's been adjusted. Our present distance is 22 276 nautical miles from Earth. This puts the spacecraft at the synchronous orbital altitude and it will now begin to sink its direction in relation to our lunar map. In other words, it will start flying in the direction of the turn of the Earth. Or, at least, it will appear to us down here on Earth to do that. The spacecraft, in fact, is a fixed point in inertial space, just as the Earth is. For mapping purposes, it will appear to turn from approximately this point forward. Our velocity is 13 102 feet per second. At 144 hours 13 minutes, this is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY 12/27/68 GET 144:38:00 CST 7:29 am 415/1

CAP COM Apollo Control, Houston, at 144 hours 38 minutes into the flight. Apollo 8 is 19,000 miles from the earth, it's moving at 14,029 feet per second. Present combined weight of the command module and service module is 31,600 miles. We have some conversation, we have had some conversation, let's hear it now.

CAP COM Apollo 8, Houston.

SC Houston, Apollo 8. Did you call?

CAP COM Apollo 8, Houston. You are loud and clear. We've taken a look at this water -

SC Apollo 8.

CAP COM Apollo 8, Appollo 8, Houston. Read you loud and clear. We have taken a look at your potable water quantity problem and it appears to be a transistor problem. Suggest that you leave the potable tank isolated. You have sufficient water in the waste tank to continue to entry. Over.

SC Roger. Thank you, Houston. Is that go for entry?

SC Houston, Apollo 8.

CAP COM Apollo 8, Apollo 8, go ahead.

SC Roger. Is our thermal stability good enough we can leave the PPC attitude and go to gimbal angles now? Houston, how do you read, Apollo 8.

CAP COM Read you loud and clear, Apollo 8, and we're checking on the PPC problem now. Apollo 8, Houston, you are cleared with entry attitude at this time.

SC Okay, fine, thank you.

CAP COM Apollo Control, Houston, that brings us up to date. We look good all across the board. People at the Control Center are beginning to fill up now with official observers, officials of the program. The 70-seat viewing room immediately behind this Control Center is about half filled right now, and within the next hour, I imagine we will see it filled to overflowing, which it has been during every critical event of this mission. At 144 hours, 41 minutes, this is Apollo Control, Houston.

END OF TAPE

120, I think

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET14505, 756a, 416/1

PAO Apollo control, Houston, here 145 hours 05 minutes into the flight. Some brief conversation with the crew since we last talked, here it is.

SC Houston, Apollo 8, over.

CAPCOM Apollo 8, loud and clear, GO. Apollo 8, Apollo 8, go ahead.

SC Roger, we have completed the check list down to the one auto point and we will stand by for one hour.

CAPCOM Roger. Apollo 8, Apollo 8, Houston.

SC Go ahead, Houston. Just for information did you folks end up having to use any command module RCS heaters.

SC Negative, all our indicators are pegged either high or high volt.

CAPCOM Okay, thank you.

HOU Carnarvon, network GOSS conference voice check, how do you read.

CRO Network, Carnarvon, read you weak, but clear.

HOU Roger, Carnarvon, I read you loud and clear.

CRO You are loud and clear now.

CAPCOM Apollo 8, Houston, standing by for hand over to Carnarvon.

SC Roger.

CAPCOM Apollo 8, Houston.

SC Go ahead, go ahead, Houston.

CAPCOM Okay, Apollo 8, if you will go to PU and accept, we would like to update your LEM and CSM state vectors, over.

SC Roger.

CAPCOM Apollo 8, Houston. State vector load is complete, verify the computer is yours. Apollo 8, Apollo 8, Houston. State vector load is complete, the computer is yours.

SC Roger, Houston, we are going to block.

CAPCOM Roger.

PAO Apollo control, Houston, here and the spacecraft is now a mere 15 256 miles from the face of the Earth, its velocity is almost a match in feet per second 15 459 feet per second. Its weight 31 600 pounds. The service module of approximately 20 000 pounds will be jettisoned abruptly at 15 minutes before we reach the 80 mile high, the 400 K the 400 000 foot mark. At - one other mention, the viewing room as we said earlier is beginning to fill with vistors and among is Dr. Kurt Devis, director of the Kennedy Space Center and his number one deputy for launch operations, Rocco Petrone, the gentleman who had so much to do with the departure of Apollo 8 from the - six - more than

Poo
95
2

betrus

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET14505, 756a, 416/2

PAO six days ago, they are here to watch it
come back to Earth this morning. At 125 hours 09 minutes
into the flight, this is Apollo control, Houston.

END OF TAPE

CAPCOM Apollo 8, Houston.
SC Go ahead, Houston.
CAPCOM Okay, two fast items. Number one, it has been suggested that since Marezine takes some time to take effect, you might consider whether you would be interested in taking some now. And I have an entry pad which has some very small updates to go on it if you would like to copy that.
SC Okay, stand by. Let me get out the entry pad.
SC Okay, go ahead with the entry pad, Houston.
CAPCOM Okay. We are still going to the mid-Pacific, 357 152 359 146 2913 267 + 08 13 - 16503 066 36221 647 12166 36301 1464613 0028. The next block in November Alpha, z sub 0400 0210 0025 0335 0816 160590 312, zeta persei, up 165, right 34, up nonexit MES pattern, Sirius and Rigel, roll 308, pitch 209, yaw 357, no P-65 involved, over.
SC Roger, Houston. Rentry pad as follows: mid-Pacific, 3571523591462913267 + 0813 - 16503 06636221647 12166 36301 14646130028, NA, 400 0210002503350816160590312 zeta persei, up 165, right 34, up use nonexit MES pattern, Sirius, Rigel, 308, 209, 357, no P-65.
CAPCOM That is correct, Apollo 8.
CAPCOM Apollo 8, Houston. You are clear to initiate cabin cold soak at your discretion, over.
SC Roger.

END OF TAPE

PAO Apollo Control Houston here at 145 hours 32 minutes into the flight, and the trajectory of Apollo 8 is programmed against the - our flat wall map here - is carrying it on a path up the west coast of India. It will proceed northerly - northeasterly in a very few moments, and curve, and start in an easterly direction carrying it across China, perhaps before then it will see a little of the southern extremities of the Soviet Union, the Himalayas China and then down across Guam. Present velocity is 17 272 feet per second, the spacecraft is only 11 626 miles from the face of the earth. A few minutes ago Frank Borman called us and suggested he might entertain doing the pyro arm check a little early. It was considered here, we quite agree with him and we're all set to go on it. Here's how the conversation went.

CAPCOM Go ahead 8.
SC Okay, it doesn't appear that we are going to be able to trigger the primary evaps, so I'm going to start up the secondary loop.
CAPCOM Okay, Apollo 8, we concur.
SC Houston, Apollo 8.
CAPCOM Go ahead 8.
CAPCOM Apollo 8, Apollo 8, go ahead.
SC Roger. Since we're going as smooth as we are here and we've got good comm let's start this pyro circuit check about 10 minutes early. What do you say?
CAPCOM Apollo 8, Apollo 8, we can conduct the pyro check just any time.
SC All right, why don't we do it here just momentarily then?
CAPCOM Roger.
SC WE'll give you a call when we're ready.
CAPCOM Roger.
SC Houston, we are ready to proceed with the pyro circuit check.
CAPCOM Roger, go ahead.
SC MSFN are you monitoring the sequential test now? Houston Apollo 8.
CAPCOM Apollo 8, Apollo 8, that's affirmative.
SC Hello Houston, Apollo 8.
CAPCOM Apollo 8, Apollo 8, loud and clear.
Affirmative we are monitoring.
SC Okay.
SC Standing by for GO for pyro arm.
CAPCOM Apollo 8, Apollo 8, you have a GO.
SC Roger.

END OF TAPE

APOLLO 8 MISSION CONTROL, 12/27/68, GET 1454500, CST 8:36A 419/1

PAO Apollo Control Houston, here at 145 hours, 45 minutes into the flight. All is continuing to operate quite satisfactorily. We tried a VHF check with the spacecraft a few minutes ago, and it didn't work out so well. Neither Carnarvon nor Guam picked up on VHF, that from about 10 000 miles out. We are now 96 000 miles from Earth. The velocity is up to 18 532 feet per second. We have a little conversation backed up on us, let's hear it now.

About 11,000 m.p.h.

SC Houston, this is Apollo 8. How is your tracking looking?

CAPCOM Looking great.

SC Okay, everything went fine with the check. We are all armed and ready to go here.

CAPCOM Okay, if you have done everything else, let's make a VHF check.

SC Okay, I'll turn off my S-band. The other two will be on S-band.

CAPCOM Okay, (Harry) will give you a count in just a second. Apollo 8, Houston. Simultaneous VHF and S-band, over.

9-5

SC Roger, I'm not reading you on VHF.

CAPCOM Roger, stand by one.

CAPCOM Apollo 8, Houston. Simultaneous VHF and S-band. Do you verify that you are on the left-hand VHF antenna, over.

SC We can verify the antenna, but we can't verify reading you on S-band or VHF.

CAPCOM Okay, we are receiving some down link, although it is considered to be poor quality.

PAO Apollo Control here. Some may be wondering what happens to the service module. Well, it is jettisoned as 15 minutes before we reach our entry interface or entry point. There is a precept burn of 90 feet per second cranked into the service module and it departs from the command module at that rate. The burn continues for some period of time, exactly which period, I don't have in front of me; but at any case, the new trajectory of the service module carries it about 100 miles or more south of the track of the command module. It is not known exactly what will happen to the service module, some people think it will come on down to an altitude of perhaps 300 000 or 400 000 feet, hit the thicker atmosphere and then bounce out into a sun circling orbit. Others think it will be captured and will certainly burn up before any of its pieces reach the Pacific Ocean. We just can't predict at this point. We are certain it will be safely out of the way of Apollo 8. At 145 hours, 48 minutes, this is Apollo Control Houston.

Some say they know it burned up

END OF TAPE

*Big thing
ETR ALOT
too bit of the
reentry - new patch
from both SM + CM
& about SM breaking
up (set pix)*

PAO This is Apollo Control Houston, at 146 hours, 12 minutes into the flight. I think all of the consoles here have been reconfigured for this reentry effort now. Probably the most noticeable item, leaving the consoles are the lunar maps. They are being replaced by maps, which rested right under the lunar maps, which were simply projections of good ole Earth. A few minutes ago, the crew checked some of the events that will take place in the reentry process and here is what we passed them.

CAPCOM Apollo 8, Houston. I would like to try the right VHF antenna if you have time.

SC We're on right.

CAPCOM Okay, this is a simultaneous VHF and S-band transmission, 1, 2, 3, 4, 5. How do you read on VHF, over?

SC Read you loud and clear.

CAPCOM Understand that is on VHF, is that affirm?

SC Houston, this is Apollo 8. I answered your call on VHF. Did you receive?

CAPCOM Okay, it is not piped back here (garble). I'll have to check and see if they have another ground station.

SC You were loud and clear, Jim.

CAPCOM Roger, thank you.

CAPCOM Okay, Apollo 8, we receive you loud and clear on VHF, through Carnarvon.

SC Roger.

CAPCOM Apollo 8, Houston, standby for handover from Carnarvon to Guam, on the hour. We should have continuous contact, except for the black-out period beginning at 14651.

SC Roger.

PAO Apollo Control here. Now the velocity acceleration pickup is quite dramatic. Our display here intergrates a new value every 12 seconds, I believe. Let me give you a sample of how it is building, 23 303 feet per second, now; altitude 4950 miles. Still reading 23 353, 23 403. It has been stepping up here in these last few minutes in increments of 50 to 60 feet per second. For reference purposes, the peak velocity previously reached prior to this mission by a manned vehicle was the Gemini 11 spacecraft, at perigee after its high altitude burn, which was the other two caltitude record as well, 740 odd miles. That velocity was 26 352 feet per second. Today, we should, at the point of entry enterphase or the 80 mile mark, as we come back into the Earth, we should see a velocity on the order of 36 220 feet per second. Converted to miles per hour, that is 24 530 miles per hour. And at 146 hours, 16 minutes, that is our status and this is Apollo Control Houston.

END OF TAPE

18,000
mph
25,000
mph

21,000
25,000

PAO Apollo Control Houston here, 146 hours 26 minutes. We have had no additional conversation since our last report from the crew, apparently they are all settled down in their couches waiting for the reentry. The next major event will be the command service module separation which should occur about 5 minutes from now. The Capsule Communicator has just been advised to tell the crew that we are GO for that event. This, by the way, will be the fourth, this is the fourth manned flight to be returned to the Pacific area. And coincidentally, all of the 8 series, Mercury 8, Gemini 8, and now Apollo 8 were brought back to the Pacific area. In addition, Mercury 9 landed off Hawaii. Here is some conversation, Ken Mattingly, our CAPCOM is talking to Bill Anders.

SC Houston, Apollo 8. Confirm GO for pyro arm.

CAPCOM Apollo 8, Apollo 8, you are go for pyro arm.

CAPCOM Apollo 8, Apollo 8, you are GO for pyro arm. Everything is looking good.

SC Roger. Everything is looking good here, Ken.

PAO Recovery is advising the Flight Director of their good status and has good weather out there. They are on station. The route of flight, in case you are not looking at a map, will be over northeast China, Peking, and over Tokyo, then we start a southeasterly slant, the ship Redstone is parked at 24 degrees north 169 degrees east. The next listening point will be the ship Huntsville, tracking the ship 172 west 12 degrees north, and the landing point just a few hundred miles southeast of there at 165 west approximately 8 north. That point, by the way, is 600 miles northwest of Christmas Island, which I'm sure has been noted.

SC - going to try to reservice, over.

PAO The crew has been advised that their primary evaporator has dried out, a fact that they couldn't care less about. They are about to say goodbye to that entire system and the service module in another 2 minutes.

PAO And the spacecraft is now, we see our systems here show that they have gone to ring 2. The reaction control system, the system looks quite good, it's operational at 200 pounds of propellant available in that system. It is a redundant system. A few of the events, as we plan to clock them here, the 400,000 foot point which is that point when many of our events begin to happen, we call

it the area of reaching some little small amount of atmosphere is to occur at 146 hours 46 minutes. That blackout period should begin about 25 seconds later. The maximum heating point would be 146 hours 47 minutes, and which occur at roughly 200,000 feet. And at this point, the roller coaster type ride that the spacecraft will take will bend slightly upward for approximately 40,000, 50,000 feet and then level off and begin its last plunge back. But as it hits the first breaking point at 180,000 feet, the max g force will be felt by the crew, of 6.8 g's. A second g spike of 4.2 will be noted about 4 or 5 minutes later. The total blackout we are predicting this morning is on the order of 3 minutes. Since we have very little experience reentering at these velocities, we must caution you that those are only estimates.

CAPCOM Apollo 8, Apollo 8, your secondary loop looks good.

SC Roger, Ken.

PAO The Flight Director has confirmed the separation, separation of the command module and the service module. We have been looking at data on the command module alone and all the values look quite good. This is Apollo Control Houston.

PAO Apollo Control Houston here. We continue to look good on all sources. We - in 11 minutes from now, we will be at the 400,000 foot mark and the velocity of the crew at this point will be 36,220 feet per second, we estimate. That converts to 24,530 miles per hour, which is nearly, is more than 500 miles per hour faster than the crew was moving only 2-1/2 days ago at translunar injection. Their burnout speed at that point 180 miles above the earth was 35,556 feet per second or 24,080 miles per hour. Today as we come back to than point after all the maneuvering and all of the burning at 180 miles above the earth, we will see a velocity of 35,644 feet per second and still building up down to this value at 400,000 feet.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 1463610, CST 9:27A 422/1

PAO 400 000 feet. These are estimates and will be refined based on post-flight data, but they are good estimates at this point. All in all a very quiet reentry up to this point. This is Apollo Control Houston. We will continue to monitor.

CAPCOM Apollo 8 Houston. Looking good both primary and secondary loops look good.

CAPCOM Apollo 8 through the Redstone. You're looking good, both primary and secondary loops are holding good.

CAPCOM Apollo 8, Apollo 8, through Redstone, over.

PAO This is Apollo Control here. We have put in a call through the Redstone.

Sc Roger.

PAO And they were advised by Ken Mattingly that they were looking good. They certainly are. The cabin pressure is 4.9 pounds per square inch, the cabin temperature is down a little bit, purposely, so it's down to 61. Most of the flight it ran between 77 and 78 degrees. We're estimating that the crew is still head down and tracking the horizon visually out their rendezvous - out the windows, any handy window, and letting the G&N system do its work. At 146 hours 41 minutes this is Apollo Control Houston.

END OF TAPE

PAO the com control will be handed over from the Redstone to the Huntsville and we have lost signal, our network controller says we lost signal at 146 46 minutes and with very nearly 46 seconds. And our estimate is that this black out period will continue - oh, let's see, three minutes and right about now the crew should be getting the spike, the G spike that they will see just under 7 G's. We would estimate they are down to the 180 000 foot point, flattening out and actually beginning to ascend slightly. They should be - their heat rate will dramatically recede but they will still maintain a large heat load, nearly 5000 degrees out on the leading edge of the heat shield. Flight director notes that he hears a keying coming, as in Morse code keying and he is wondering as to the source of it. 146 hours 48 minutes. And our curves put the spacecraft down about 35 to 36 miles above the Earth and elevating it slightly perhaps up to 40. Ken Madingly just put in a call and just frankly labeled it a radio check. He has gotten no response as yet. And Ken tries a second call through the Huntsville. Our estimates say that the crew, along about now should be emerging, the Huntsville advises they have not established contact with the spacecraft at this time. About three and a half minutes since we went into the blacked out area. And now the Huntsville is handing over communication checks - communications authority to one of the range aircraft, they called in AIRA. And the Huntsville - the Huntsville says they have acquired an S-band signal, at 51 minutes 04 seconds and they immediately called back and said no contact they negate that first announcement. One of the recovery helicopters reported seeing something, but those kind of reports at these critical moments are not unusual. Ken Madingly puts in another call and there is Jim Lovell. He says, "we are looking good", I can't tell whether it's Borman or Lovell, let's try to cut it in.

SC We are in real good shape, Houston.

CAPCOM Real fine.

PAO Now one of the range ships is reporting a radar contact. The first communication was extremely broken up, but the two words that did come through were "looking good". Another one of the flight controllers here in the control center heard the crew mention, something like "a real fire ball". We estimate here we are about 1 minute to drogue deploy. Drogue shoots out at 23000 feet, and the time plot says 146 hours 54 minutes. The Yorktown is reporting and confirming a radar contact, the baring is being passed to the recovery room, here in Houston.

CAPCOM Your DSKY readings before drogue.

SC Roger, DSKY reading, 1457 812 516522.

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET1464610, 937a, 423/2

PAO That's Jim Lovell. Apollo control, Houston, here at 146 hours 55 minutes, according to our numbers we should have main chute deploy, we should have had it within the last minute. We have heard nothing but a lot of noise on the circuit for the last minute or so. It is understandable at these low level relays, everyone is passing it. And here comes something from Apollo 8, "over," he said. No answer to the Apollo 8 transmission, the transmisssion from Apollo 8, no follow up. In a simulation yesterday we had extremely good communication from the recovery area and we see - we are hopeful that that situation will be duplicated today.

END OF TAPE

PAO 146 hours, 57 minutes, and according to our estimates, they should be hitting the water just about 147 even. If and when we get some intelligible comm, we will come back up on the line. This is Apollo Control Houston, standing by.

PAO This is Apollo Control Houston, 146 hours, 58 minutes. Recovery II within the last minute, has reported they have a flashing light in site, and they followed that with, we have voice contact with the crew. I repeat, they said, we have voice contact with the crew. At 146 hours, 58 minutes. We are going to try and patch that conversation into our consoles here, right now, we have not heard it. The lookout on the YORKTOWN reports a visual siting. They must be close at hand. The helicopter nearest them is piloted by Lt. Kenneth Owen of Pensacola, Florida. There are three swimmers in that helicopter. And our Flight Director has advised us to bring up a special circuit, which I hope will bring up any communication that develops out there. We've an estimate now, that the splashpoint may be as close as 5000 yards from the YORKTOWN. I repeat, 5000 yards from the YORKTOWN. That is a very rough estimate. Now, we have got a second estimate of 5000 yards from the YORKTOWN.

PAO This is Apollo Control. If you have been listening to that circuit, you can tell why we can't be too sure of these events. It's a little ragged, but I have talked to the Public Affairs Officer on the carrier, and he assures me the spacecraft is 5000 yards away. The general plan was to wait for a little more daylight, before attempting a pickup. Intermittently we have been able to pick Bormans voice out of the noise and he seems to be carrying on the routine kinds of conversation that pilots use when they talk to each other in these kinds of situations. We have no word yet upon the attitude of the spacecraft, whether it is nose down, as was the case in Apollo 7, or up. Nearly everyone agrees it is only 5000 yards away from the YORKTOWN, which we will settle for right now at 147 hours, 5 minutes.

*Ben
James*

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 1470630, CST 9:58A 425/1

PAO Apollo Control Houston here 147 hours 8 minutes, we have had several things confirmed or reverified in the last few minutes. The crew condition number 1 is okay, and that came through loud and clear just as I was talking, crew condition okay. We have thought we monitored several conversations between the crew and helicopters, airplanes, and what not. We do have it back now, crew condition okay. The estimate from the Yorktown is the swimmers will wait approximately 20 to 25 minutes before deploying, this as per planned that as long as the crew is in satisfactory condition and in fact now we know they are floating quite nicely in a stable 1 condition. I'm sure the chatting will continue over the next 20 to 25 minutes, but we are assured that everything is alright out there. This is Apollo Control Houston.

PAO Apollo Control Houston here at 147 hours 13 minutes. We have been advised by the recovery forces that recovery helicopter 3 is hovering over the spacecraft, 50 feet above it, and they estimate they are 6000 yards away from the Yorktown. The helicopter pilot is Commander Donald S. Jones of Madison, Wisconsin. When the swimmers get the signal to deploy, the first man in the water will be a Sonar Technician from Columbia, South Carolina, named Chester Coogin. Two other swimmers will follow him: LTJG Richard Flanagan of Oklahoma City, and Donald L. Schwab of Imperial Beach, California. And at 147 hours 14 minutes that's all the new information we have.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 1471630, CST 10:05a 426/1

PAO Apollo Control Houston here. Two new reports. The inflation bags around the spacecraft are inflated and there have been reports, visual reports of course, of the flashing light seen from the Yorktown. Now illuminating area is a helicopter with a big floodlight. So the entire area should be visible from the Yorktown. This is Apollo Control Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 1472100, CST 10:13A. 427/1

PAO This is Apollo Control Houston. From
the YORKTOWN, we have learned they are proceeding toward
the spacecraft. They are now 4500 yards away. And that is
our situation at 147 hours, 21 minutes.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 1472500, CST 10:17a 428/1

PAO And this is Apollo Control Houston at 147 hours 25 minutes. Apparently Frank Borman is making small talk with the crew of that helicopter out there. It was just relayed to us that he had, in chatting with the pilot, he had asked him if anyone had seen the spacecraft on main chute. And of course, there were several reports and this has become the subject of a continuing chat, the pilot of that helicopter is Commander Donald S. Jones. That is all the new information we have right now. At 147 hours 26 minutes, this is Apollo Control Houston.

END OF TAPE

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APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 1472600, CST 10:20A 429/1

PAO Apollo Control Houston here, and Ken Madinally, our Capsule Communicator here has just tried to call through ARIA aircraft. While we try to establish the communication on that shot, we have been advised that the ship is now 3800 yards away, and it is off the port side of the ship. The YORKTOWN has also advised us that in about in 14 minutes, they expect to deploy their first swimmers, about 14 minutes from now. This is Apollo Control Houston.

END OF TAPE

Recovery Ratingly

*Summary
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APOLLO 8 MISSION COMMENTARY, 12/27/68, GET14730, 1023a, 430/1

PAO And this is Apollo control, Houston, Ken Madinglys call just worked and we were kind of frightened at the volume and at the level the answer came back. Borman responded enthusiastically, "Hello, there, Houston, how are you doing?" Here is the tape.

HTV Primary rotoer, over. - This is primary rotoer, Apollo 8 has been advised to expect a call on 2968 AIRA aircraft, over. - Apollo 8 (garble). (garble) that is affirmative, over. Have you heard Apollo 8 (garble) over.

PAO This is Apollo control, Houston, that begins to make you understand the size of our communication program, it isn't a matter of just understanding every other word, it's a case of trying to understand a piece of every other conversation, but we are cheered up and we feel good, we know the crew is feeling fine and with in a very few minutes swimmers will be in the water and we should start the movement of the crew into the helicopters and over onto the Yorktown. This is Apollo control, Houston.

PAO And this is Apollo control, Houston, 147 hours 34 minutes, if anybody had any doubts about the condition of the crew, this little conversation which has been relayed to us, should clear up those doubts. In conversation with the helicopter commander, the crew commander of the helicopter asked the crew what the Moon was made out of, where upon ~~Borman~~^{Ansco} responded that it's not made out of green cheese at all, it's made out of American cheese and well, I think the crew is in pretty good shape. This is Apollo control, Houston.

PAO This is Apollo control, Houston. The report to us from the scene is that the first light of dawn is beginning to show in the east, they are seeing streaks of light, the capsule is riding very nicely in relatively calm waters and just any minute from now we expect to hear a report, the swimmers are in the water. The conversations that have come back to us, except for an intermittent, occasionally hearing from the crew directly have been relayed from the water to aircraft at approximately 25 or 30 thousand feet. There it is being repeated to another man in Honolulu at Hickam Airforce Base and at that point it is being relayed again, back here to Houston, at which point I am trying to relay the content of them to you. And now we get an estimate that the swimmers will be in the water in five minutes. He is preparing to put swimmers in the water in four to five minutes. This is Apollo control, Houston.

END OF TAPE

PAO This is Apollo Control Houston. We have a report from one of the onscene helicopters that the spacecraft is still riding very nicely in the water and rotating at about 1 revolution per minute. I say again, spacecraft rotating at about 1 revolution per minute, which would be a little unusual. I don't know that we have ever seen that. This is Apollo Control Houston.

PAO This is Apollo Control Houston 147 hours 42 minutes since we lifted off. From the communications out there, which are perhaps understandably bad at this time of day, this time of year, and under the circumstances we have plucked a breakfast order and we managed to record it and we would like to play it for you.

YORKTOWN This is the Yorktown and what would you prefer for your menu this morning, sir? Over.

SC Biscuit, steak, and eggs.

YORKTOWN Roger out.

PAO In case you missed it the order came back we'll have steak and eggs, the same as we had before we left. Now the helicopter is maneuvering in a position to drop swimmers and we expect that drop to start just any moment. Recovery 3 helo will deploy the swimmers. The helicopters continue to hover between 75 to 100 feet, as low as 50 feet, for certain inspection type passes. And Air Boss Lt. Glen Byers of Evansville, Indiana, reports the first swimmer is in the water. And now we are advised that the swimmer has attached a sea anchor, and now the helicopter is moving to deploy his two swimming colleagues. And then immediately one of the swimmers will plug in a phone and have a quick conversation with the crew.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 1474500, CST 10:38a 432/1

PAO This is Apollo Control Houston. We are advised that the sea anchor has been attached. The swimmers and the helicopter report they can see a light glowing through the windows from the spacecraft. The hatch, appearantly not yet open. The last measured distance we have between the YORKTOWN and the spacecraft is 2900 yards. This is Apollo Control Houston.

PAO Apollo Control Houston here at 147 hours, 49 minutes since lift-off. Now all three swimmers from helicopter III are in the water and they are clearly visible to the helicopter. They are working afix the flotation collar still an added measure of flotation insurance, around the blunt end of the spacecraft. Immediately they will inflate the May West type device, and that is our situation.

END OF TAPE

PAO Apollo Control Houston here. In the last few minutes, we've deciphered from one relay communication from Jim Lovell that he can see the swimmers working around the spacecraft. We have had confirmation that the inflation collar is fully inflated and secured. We have had some queries regarding our splash point. Our best estimate is the aiming point, we have no reason to - to know that it was 5,000 yards away from the Yorktown, the Yorktown is very, very close to the aiming point which was 165 degrees north, I say again 165 degrees north, correction 165 degrees west and 8 degrees 8 minutes north. The collar fully inflated. We still have no word as to when we might expect the crew open that hatch and come out and take a breath of earth air. This is Apollo Control Houston.

PAO And this is Apollo Control Houston. We have just been advised that the swimmers are standing on the inflation collar, awaiting the crew's pleasure. We still have no estimate as to when the crew will emerge, but it's our guess that that will come at just any minute right now. Now the swimmers are going through additional precautions to insure that the inflation collar is very securely fastened to the spacecraft. Our elapsed time clock shows 148 hours, with the line open for some word on that hatch opening.

PAO Apollo Control here. We have just been advised that the Recovery 3 is preparing to drop a large liferaft. The collar has been inspected and just any moment we expect to see - two liferafts have been dropped. Two liferafts and this probably signals a hatch opening just any moment.

END OF TAPE

PAO This is Apollo Control Houston. Our extraordinary communication coincidences continue. The swimmers advise that they can not talk to the crew via interphone, which is a hard line interphone connection, but they can talk with the crew by little hand radios. Still no word as to when that hatch is going to open, but we are getting our first look at it here in this Control Center in color television which is an addition for this first flight. Both the color camera and color monitors. There has been some discussion that if that ship doesn't stop pitching and rolling we may have some seasickness here. This is Apollo Control Houston.

PAO This is Apollo Control Houston. Now we have been advised that the recovery plan will be thusly: the crew will exit the spacecraft, get into a life raft, and then the hatch will be secured before we begin any spacecraft pickup or any pilot pickup. I thought I copied - stand by just one moment. Yes, I'm sorry, no time estimate just yet as to when we can expect these events but with the light situation out there we may be able to see them. They are estimating 1500 yards now from the spacecraft. We will continue to monitor here. This is Apollo Control Houston.

PAO This is Apollo Control Houston. We have just been advised the hatch of Apollo 8, the hatch is now open. Just any moment we should have some report on exiting crew members. At 11:04 Houston time we received the report the hatch was open. And even though our - and now we're getting the first astronaut, who is not identified by any thing other than "the first astronaut", is now exiting the spacecraft. He's now getting in a life raft. And now a second astronaut is leaving the spacecraft, and if we're following military tradition, the next astronaut should be Frank Borman, although since he is Air Force he may not follow the Navy tradition of the captain of the ship leaving last. Now a second astronaut is sitting in the life raft. And now recovery advised the third astronaut, the final and of course the usual jokes about "And now the fourth astronaut", but we've succeeded in supressing the recovery room advising us of any additional astronauts. All three astronauts are in the lift raft, the swimmers are positioned on the collar around the spacecraft. They are preparing to close seal the hatch for the pickup which will come perhaps an hour from now. And the order of the pilot's leaving the command module was exactly opposite that that I intimated. Borman left first, the second - let's check it. Lovell went second, and the junior member of the crew, Bill Anders, was the last to leave.

END OF TAPE

PAO - I believe, let's check it. Lovell second, Lovell went second and the junior member of the crew, Bill Anders, was last to leave.

PAO And now we have had a third change on it. Jim Lovell may have been the first to leave the spacecraft. ~~That makes good sense.~~ Since he was in the center couch, it's entirely possible that he would leave first in order to let the other out.

PAO And this is Apollo Control Houston. We have learned within the last couple of minutes that the crew has transferred to a new liferaft, for what reason we don't know, but we do know that they are in a second liferaft now and the recovery helicopter is maneuvering to begin the pickup operation. On our recovery board here we see a message from Admiral McMannes, which reads please convey to our NASA friends my congratulations on this magnificent achievement, this reflected glory, has permitted all of us to stand taller in today's world, epic, historic, amazing, fantastic, heartwarming, and the next word I can't make out, unbelievable until it happened - magnificent. It's signed Admiral McMannes and staff, who is the commander of the task force charged with this recovery effort. We are advised that the first astronaut is in the helicopter, no more identification than that. Just first astronaut in helicopter. Now the line is going down for the second astronaut. And the line is dangling and awaiting the pickup of the second man. The second astronaut in the sling and on his way.

PAO And now we have had it confirmed, the second astronaut is in the recovery helicopter. And the line is going down for the third astronaut. Earlier we had given a position of the helicopter - of the carrier only 1500 yards from the scene. That was incorrect, it should be corrected. The position at that time was 3500 yards from the scene and the carrier is making its ~~swing~~ now, preparatory to spacecraft pickup. Alright, the third astronaut is in the sling and is being brought up into the helicopter. And the third astronaut steps into the helo at 11:14 Houston time. The helicopter pilot confirms that the helo door has been secured, all three men are aboard and they are preparing to embark on a short flight to the Yorktown. And as we can see on our television monitors, the helicopter is now proceeding toward the Yorktown.

END OF TAPE

PAO And it is blowing at 20 knots.

PAO And this is Apollo Control here.

Recovery III has permission to land first. Recovery III is bearing the pilots, we believe. We hear Recovery II being instructed to return to the helo at this time. Brisk, windy, situation out there. Navy helicopter number 66 prepares to touch down on the deck of the YORKTOWN. And touchdown at 20 minutes after the hour, 11:20 CST. For those reporters not looking at a television monitor, the engines are being shut down now and two crew members have moved out to block the wheels. And the television camera shifts to the door.

PAO Apollo Control Houston here. We had it confirmed through recovery, that apparently at the request of Frank Borman, there was electric razor aboard the helicopter, and Frank Borman used it on the way in. Very clean shaven, in contrast to the rather rather scraggle conrads with him. Apollo Control Houston here.

PAO And this is Apollo Control Houston, if you are listening to this loop you probably hear applause in the background as demonstration going on here in the Control Center, that we haven't seen ever in our history. If you are in front of a television monitor, you can see an American flag, approximately 15 feet long, and about 10 feet from top to bottom. It was rigged in the Control Center earlier this morning. It has been pulled - .

END OF TAPE

PAO ... in the Control Center earlier this morning. It's been pulled into place. Every console operator is displaying a flag at his desk, very similar to what we saw immediately after the rendezvous in Gemini VI. That's the only other time that we've seen such a display of flags in the Control Center. The earlier display didn't begin to touch this one. Huge flag. It completely blocks out the wall map that we've looked at so intensely for the last six and one half days. Everyone applauded, and in one of the loops we could hear the Star Spangled Banner.

We're absolutely jammed with people here. All three Flight Controllers shifts are in the room. All the program officials.

PAO Apollo Control here if you can hear me above all these voices. It is a veritable roar in here. The North American people are in, the room is awash with cigar smoke. A number of congratulatory messages are coming across this console. We've seen several, we've read several. Here's one from I think it will describe itself. The world's greatest tracking station sends its heartfelt congratulations to the Apollo 8 crew, its beautiful spacecraft and all those who have shared in this magnificent accomplishment. And it's signed, of course, from the tracking station in Madrid, Spain. Courtesy of Dan Hunter, former MSC man before he moved to Madrid. We might return the compliment to Madrid which made possible so many of those beautiful television shots. This is Apollo Control, Houston.

PAO Again this is Apollo Control. I'm not sure how well our voice is getting out. There is tremendous roar, an undercurrent and roar in the background. I have never seen a degree of this emotional outpouring in any previous mission, including Alan Shepard's. I guess one of the big differences there between that one and this one is Alan is here standing right in the middle of this one puffing on a long black cigar. I've seen rallies in locker rooms after championship games, happy politicians after elections, but never -- none of them do justice to the spirit prevailing in this room. For the benefit of reporters listening I have been advised that we estimate the center director's and other officials will be available in our auditorium in 30 minutes for a press conference. This is Apollo Control, Houston.

PAO This is Apollo Control here. Again I think that many of you can see this tumult. Someone suggested that we have set the American Cancer Society's antismoking campaign back several light years. I take it from one who quit smoking a year and a half ago that this is a strong cigar. I don't know how the room can hold anymore people, but they keep coming in. Someone is standing on a console next to mine. It's a photographer. I can't even

APOLLO 8 MISSION COMMENTARY, 12/27/68, GET 1483500 CST 11:25 437/2

make out who is in front of the flight directors desk, but he's produced box after box of cigars. Al Shepard just threw one back here it ricocheted off the wall. That's our status.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/27/68, CST 12:00pm, 439/1

PAO This is Apollo control, we have been asked to pass along the figures that we have here in mission control center on the time of splash, that figure is 147 hours 00 minutes and 11 seconds. Almost precisely as planned, ~~and to repeat again our landing coordinates~~, 165 degrees west, 8 degrees 8 minutes north, also right on target. This is Apollo control, Houston, out.

END OF TAPE