SSVEO IFA List **Date:02/27/2003**

STS - 51A, OV - 103, Discovery (2) **Time:04:28:PM**

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** -001:00:26	Problem	**FIAR**	**IFA** STS-51A-V-01	APU
	GMT: 312:12:41		**SPR** 19F014	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Auxiliary Power Unit 2 Water Spray Valve System A Failed. (ORB)

Summary: DISCUSSION: After APU (auxiliary power unit) shutdown following ascent, the primary water cooling system "A" for the APU fuel pump and GGVM (gas generator valve module) was activated on all three APU's. However, at 312:12:41:55 G.m.t., the APU 2 water valve system A failed to provide cooling to the fuel pump and GGVM resulting in exceeding the FDA (fault detection annunciator) limit of 180 deg F. A maximum temperature of 191 deg F was present at the fuel pump and 189 deg F at the GGVM. The crew switched over to water cooling system "B" and proper cooling was observed in APU 2.

Flight data confirmed that a command that had been sent to pulse the APU 2 fuel pump and GGVM water cooling system "A" spray valve, however, no cooling occurred. Postflight inspection of the APU 2 water spray valve system "A" revealed a broken wire to the valve. The wire has been repaired and the valve is operational. The broken wire most probably occurred during ground operations. CONCLUSION: The cause of the APU 2 water spray valve system "A" failure was a broken wire. The broken wire most probably occurred during ground operations. CORRECTIVE_ACTION: The APU 2 water spray valve system "A" broken wire has been repaired and the valve is operational. CAR ANALYSIS: On-vehicle troubleshooting verified that the valve ground wire was sheared off at stud point 50E242. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:00:16	Problem	**FIAR**	**IFA** STS-51A-V-02	MPS
	GMT: 313:12:31		**SPR** 19F015	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: SSME 3 Helium Regulator A Outlet Pressure (V41P1354A) Read Low. (ORB)

Summary: DISCUSSION: At 313:12:31 G.m.t., after the MPS (main propulsion system) dump, the SSME 3 helium supply was isolated and the A-side regulator pressure decayed from 757 psia to 0 in about 3 minutes. Previous mission data established that the 750 psia pressure is normally maintained for several hours.

Review of the flight data did not indicate any noticeable increase in helium consumption through MECO after which the A-side of the engine helium system is not used. Since the B-side regulator pressure remained high (over 700 psia) and is used for entry pressure and purge operations, the A-side helium pressure decay posed no problem to the mission. Postflight inspections have revealed a loose transducer (V41P1354A) and associated seal resulting in helium regulator A outlet pressure decay. The transducer seal will be replaced, transducer retorqued and the system reverified. The loose transducer was most probably the result of improper torquing and lockwiring. CONCLUSION: The SSME 3 helium regulator A outlet pressure read low because of a loose transducer and associated seal. The loose transducer most probably resulted from improper torquing and lockwiring. CORRECTIVE_ACTION: The SSME 3 helium regulator outlet pressure transducer seal will be replaced and the transducer retorqued and lockwired. An inspection will be conducted to insure proper lock-wire application to the transducer. CAR ANALYSIS: This appears to be a workmanship and inspection problem. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51A-V-03	INS
	GMT:		**SPR** 19F001, 19F005	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Instrumentation Problems (ORB)

Summary: DISCUSSION: A. SSME 3 GH2 outlet temperature (V41T1361A) failed. The measurement read off scale high 4 seconds after lift-off. The sensor installed in this location was an earlier configuration known to be susceptible to high launch-vibration levels. It has been replaced with an upgraded design sensor which is less susceptible to launch vibration loads. Failure analysis will be tracked on CAR 19F001.

CAR ANALYSIS: Wrong sensor was installed. This CAR is closed. [not included in original problem report] B. APU 1 exhaust gas temperature 2 (V46T0140A) failed. The measurement read low approximately 5 minutes before touchdown. The sensor has been replaced and measurement operation verified. This measurement is not required by launch commit criteria. Failure analysis will be tracked on CAR 19F005. CAR ANALYSIS: (Failure transferred from CAR 14F011 to AC7837-010). RI-Downey L&T analysis revealed that the sensor lead wires were twisted and shorted near the transducer exit area. Insulation in the area was also badly frayed. Cause of twisting and insulation damage was attributed to mishandling of the sensor before, during and after installation into the APU exhaust duct. A sensor redesign was submitted by EDCP but was rejected at PMR between Rockwell and NASA. [not included in original problem report] C. SSME 1 LH2 inlet pressure (V41P1100C) drifted 1.5 psi high from 150 to 200 seconds after lift-off. The minor drift was within the specification limits for the measurement. Measurement operation is acceptable for the

next OV-103 flight. No corrective action is required. D. SSME 2 LH2 inlet pressure (V41P1200C) read about 8 psi high during ascent. The same bias was observed on STS-41G. The sensor for this measurement will be replaced during the current turnaround flow, if time permits. CONCLUSION: See above. CORRECTIVE_ACTION: See above. EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending CAR analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:01:20	Problem	**FIAR**	**IFA** STS-51A-V-04	RCS
	GMT: 313:13:35		**SPR** 19F011	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Right Reaction Control System 3/4/5 Fuel And Oxidizer Crossfeed Valves Did Not Indicate Closed. (ORB)

Summary: DISCUSSION: At about 313:13:35 G.m.t., the right RCS (reaction control system) 3/4/5 fuel and oxidizer crossfeed valve closed position downlink indications were zero (low) after the OMS (orbital maneuverinng system) -2 burn. The onboard valve position indication showed the proper CLOSED position. The control switch was placed in GPC to remove power from the valves.

The valves were opened during the prerendezvous OMS/RCS interconnect and both the onboard and downlink valve position indications were proper and the valves functioned properly. Also, the valve position indications were proper when the valves were closed after rendezvous. Valve control was again placed in GPC to prevent the possibility of continuous power being applied to the valves. There was no further mission impact. The problem could not be duplicated during postflight troubleshooting. The valve position indications are derived from limit switches that have a history of internal conductive and non-conductive particle contamination. The valve actuators have been removed, replaced, and returned to the vendor for failure analysis. The replacement units functioned properly. CONCLUSION: The right RCS 3/4/5 fuel and oxidizer crossfeed valve CLOSED downlink discrete failures were most probably caused by position switch internal contamination. CORRECTIVE_ACTION: The 3/4/5 fuel and oxidizer crossfeed valve actuators have been removed, replaced and returned to the vendor for failure analysis. The results of this activity will be tracked via CAR 19F011. EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending the resolution of CAR 19F011. CAR ANALYSIS: This and many other switch problems is attributed to conductive and nonconductive particles floating within the switch containers in zero G. Problem switches are being replaced as replacement switches (without contaminants) become available. [not included in original problem report]

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:21:33	Problem	**FIAR**	**IFA** STS-51A-V-05	DPS
	GMT: 314:09:48		**SPR** 19F006	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Cathode Ray Tube 4 Failed. (ORB)

Summary: DISCUSSION: At about 314:09:48 G.m.t., telemetry indicated that CRT (cathode ray tube) 4 had experienced a DU (display unit) low-voltage power supply bite message. Subsequently, the crew cycled the input power and reported that the screen was cycling on and off about every 2 seconds. CRT 4 was then powered down. Later, at about 317:11:55 G.m.t., CRT 4 was powered up for rendezvous operations and the previously observed conditions repeated. CRT 4 was powered down for the remainder of the flight. There was no mission impact.

CRT 4 was removed, replaced, and returned to the vendor for failure analysis. Failure analysis revealed a shorted capacitor in the CRT 4 vertical deflection circuit. A comparison of the "as built" versus the design documentation revealed that the voltage rating of the failed capacitor was lower than that specified in the design documentation. The capacitor had previously been installed during a refurbishing effort resulting from vibration qualification test data. CONCLUSION: The cause of the CRT 4 anomaly was the failure of a capacitor (with improper voltage rating) in the vertical deflection circuit. CORRECTIVE_ACTION: The failed capacitor will be replaced with a capacitor that has a voltage rating commensurate with the design requirement. The "as built" documentation of all other LRU's (line replaceable units) involved in the qualification test vibration refurbishment effort will be reviewed to insure that capacitors have the proper voltage rating. The results of this activity will be tracked via CAR 19F006. EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending resolution of CAR 19F006. CAR ANALYSIS: Norden refurbishment procedures have been improved and final inspection will correlate the part issued by checking the configuration prints. This CAR is closed. [not included in original problem report]

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** 000:00:40	Problem	**FIAR**	**IFA** STS-51A-V-06		HYD
	GMT: 313:12:55		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Water Spray Boiler 1 Gaseous Nitrogen Regulator Outlet Pressure Drop. (ORB)

Summary: DISCUSSION: At 313:12:55 G.m.t., water spray boiler 1 GN2 (gaseous nitrogen) regulator pressure (V58P0104) decreased from 26.7 psia at APU (auxiliary power unit) shutdown to 22.8 psia. The observed decay rate was 0.1 psi/hr. This occurrence had no impact on the mission. This has been seen on previous missions (OV-099-STS-6 and -8) and was attributed to the GN2 relief valve not properly seating after ascent. The nitrogen pressure tank is isolated by a valve when the water spray boiler is not functioning. This assures retention of the nitrogen source pressure should manifold leaks such as these occur.

CONCLUSION: The water spray boiler 1 regulator pressure most probably decayed because of the relief valve not seating properly after ascent.
CORRECTIVE_ACTION: The water spray boiler 1 relief valve will be leak-tested during turnaround operations. A verification of relief valve out-of-specification leakage will result in the removal and replacement of the valve. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 001:10:03	Problem	**FIAR**	**IFA** STS-51A-V-07	RMS
	GMT: 314:22:18		**SPR** 19F007	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Remote Manipulator System Aft Manipulator Retention Latch System 1 ReadyTo-Latch Indication Was Lost. (RMS)

Summary: DISCUSSION: At approximately 314:22:18 G.m.t., while cradling the RMS (remote manipulator system), the aft MRL (manipulator retention latch) system 1 ready-to-latch indication was lost. The crew used CRT (cathode ray tube) "SPEC 94" for aft MRL status and cradled the arm. At 315:14:00 G.m.t., when cradling the arm after monitoring the second satellite perigee motor burn, the previously lost indication was recovered and continued to operate properly.

CONCLUSION: On the first attempt to cradle the RMS, the arm failed to make contact with the aft MRL system 1 microswitch. This has occurred before and is most probably due to thermally induced structural deflections. Previous rigging checks have verified proper rigging. CORRECTIVE_ACTION: No corrective action is required. There was no indication of any system failure. CAR ANALYSIS: Indication returned and operated satisfactorily on two subsequent arm berthings; other means also exist to verify ready-to-latch positioning. No corrective action is planned. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 002:20:21	Problem	**FIAR**	**IFA** STS-51A-V-08	OMS
	GMT: 316:08:36		**SPR** AC8899	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Left Orbital Maneuvering System Helium Isolation Valve Leak. (ORB)

Summary: DISCUSSION: At G.m.t. following the NC-1 maneuver for rendezvous with the PALAPA, the left OMS (orbital maneuvering system) fuel tank ullage pressure increased 8 psi in about 7 hours (equates to 100,000 scch). The leak rate following subsequent maneuvers varied from 80,000 to 340,000 scch. The increase in fuel-tank ullage pressure indicated that the helium isolation valve or valves were leaking. When the OMS fuel tank ullage pressure reached 259 psi, the primary regulator locked up and no additional leakage was observed. This condition did not impact the mission.

Prior to the STS 51-A mission, the left OMS helium isolation leg B valve was leaking at a rate of 3800 scch. Specification leak is 360 scch for two valves. The leakage was waived for the STS 51-A mission since both the primary and secondary regulators did not show any out-of-specification leakage rates and provided operational redundancy. CONCLUSION: The left OMS helium isolation valve leakage was most probably caused by a deformed valve seat. CORRECTIVE_ACTION: The left OMS helium isolation valves A and B will be leak checked and removed if found to be leaking. Removed units will be returned to the vendor for analysis and tracked by CAR AC8899. CAR ANALYSIS: Valve leakage was determined to be caused by contamination of the pilot valve and seat with particles of 50 micron size or less. Inlet/Outlet screen filters are of 50 micron size. Finer filter sizing has been recommended, but not approved. In the interim, ground equipment operating procedures are being applied with the utmost care for cleanliness. No further corrective action is planned. [not included in original problem report]
EFFECTS_ON_SUBSEQUENT_MISSIONS: none

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 002:02:12	Problem	**FIAR**	**IFA** STS-51A-V-09	RCS
	GMT: 315:14:27		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Forward Reaction Control System Thruster F4R Fuel Leak Indication. (ORB)

Summary: DISCUSSION: At 315:14:27 G.m.t., during the SYNCOM separation maneuver, thruster F4R was fired. Subsequent to this firing, the fuel injector temperature decreased from 84 deg F to 43 deg F over a 2-hour period. The deselect threshold is 25 deg F. It was believed a small leak existed because of contamination in the injector valve seat. The temperature recovered to 58 deg F at 315:21:08 G.m.t.

The F4R thruster was reprioritized to last priority since firing it could cause the leak to recur. The impact of F4R deselection is loss of redundancy in -Y translation. At 320:08:33 G.m.t., the F4R thruster was reprioritized to number 1 priority. The thruster fired once during the FCS (flight control system) checkout and did not leak. CONCLUSION: The forward RCS (reaction control system) thruster F4R fuel leak indication was most probably caused by contamination in the injector valve seat that subsequently cleared. CORRECTIVE_ACTION: Monitor RCS thruster F4R for leakage. Fly RCS as is, if leakage does not recur
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 002:03:25	Problem	**FIAR** ILC-H-0071 and -	**IFA** STS-51A-V-10	GFE
	GMT: 315:15:40		0072	**UA**	**Manager:**
			SPR	**PR**	
			IPR		**Engineer:**

Title: Both Left-Side EMU Helmet Lights Inoperative. (GFE)

Summary: DISCUSSION: Both left-side EMU helmet lights did not operate during EMU checkout at about 315:15:40 G.m.t. Onboard troubleshooting determined that the voltage was low on 7 of 8 left logic circuit batteries. Crew in-flight maintenance (IFM) restored left light operation.

Post-flight evaluation determined that the left logic circuits were activated prior to EMU checkout. Dust plugs will be installed for the logic circuits on both sides of the EMU helmets to prevent inadvertent circuit activation. CONCLUSION: Early activation of both left logic circuits on the EMU helmet lights caused low voltage on 7 of the 8 left logic circuit batteries. CORRECTIVE_ACTION: Dust plugs will be installed to prevent inadvertent logic circuit activation. CAR ANALYSIS: The problem has been duplicated and is understood. A detailed discussion of the problem/analysis and corrective action is documented in the NASA failure reporting system under FIAR ILC-H-0071 and -0072. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 002:03:01	Problem	**FIAR** JSC EE-0595F	**IFA** STS-51A-V-11	C&T
	GMT: 315:15:16		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Payload Bay Television Cameras A and D Have Spots In Field Of View. (GFE)

Summary: DISCUSSION: At about 315:15:16 G.m.t., both payload bay camera A and D were observed to have a white spot near the center of the picture. In addition, camera D had a dark spot near the center of the picture. None of the spots were very large and thus did not effect television operations.

Postflight, the crew reported that both cameras were difficult to focus. The focusing problem could not be duplicated during post-mission ground testing by the camera vendor at KSC. Mission video tapes were reviewed with no focus abnormalities being observed. The white spots are ion spots which occur when the SIT (silicon intensified target) tube is inactive for long periods of time. During manufacture, a coating is applied internally to the tube to trap the residual gas after evacuation. When the SIT tube is inactive, this gas escapes and creates an ion cloud which is visible upon subsequent camera use. The gas can be baked out with about one week of continuous SIT tube operation. The black spot on camera D has not been reproduced during post-mission ground testing. Both cameras will be operated, monitored, and a more detailed investigation will follow, if unexplainable conditions occur. Both cameras (A and D) have been replaced with cameras that do not have ion spots. CONCLUSION: The white spots on cameras A and D were caused by ion spots that occur because of SIT tube inactivity. The cause of the black spot on camera D is unknown pending failure investigation. CORRECTIVE_ACTION: Cameras A and D have been removed and replaced with cameras that have no white or black spots. Both cameras are being operated and monitored as the first phase in the failure investigation. The results of this activity will be tracked via FIAR JSC EE-0595F. EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending the resolution of FIAR JSC EE-0595F. FIAR ANALYSIS: The anomaly is reported to be "ion spotting" of

the TV cameras (A and D in this case) and is not an uncommon occurrance. A description of the "spotting" phenomena and the proposed corrective action is contained in the NASA failure reporting system under FIAR EE-0595. [not included in original problem report]

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 002:06:38	Problem	**FIAR**	**IFA** STS-51A-V-12	C&T - S-Band
	GMT: 315:18:53		**SPR** 19F002	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: S-Band Antenna Switch Units 1 And 2 And Beam Switch Electronics Units 1 And 2 Showed Simultaneous On Indications. (ORB)

Summary: DISCUSSION: At approximately 315:18:53 G.m.t., telemetry showed both antenna electronics units were intermittently powered on simultaneously. This condition continued to occur throughout the remainder of the mission. The GCIL (ground command interface logic) was in the uplink command control position for the antenna functions. No impact to the antenna switching system occurred since the switching system is completely redundant throughout the logic and switch coils. When electronics units 1 and 2 are powered, both electronics respond identically to the switching commands and no stress occurs. The telemetry indicates that the problem resides in the GCIL drivers that control power application to the redundant units.

CONCLUSION: A defective GCIL hybrid driver was sending an intermittent erroneous output to the antenna switch unit. CORRECTIVE_ACTION: The GCIL was removed and replaced. Detailed failure analysis of the unit will be tracked under CAR 19F002. CAR ANALYSIS: Failure analysis revealed the failure to be Hybrid Driver #8 on Decoder/Driver Board (A11) in the Ground Command Interface Logic (GCIL) Controller. Exact cause of failure is undetermined, but the device exhibited twice the acceptable leakage (atmospheric) rate and the most probable cause was thought to be moisture. This is only the second failure of this type device and no corrective action is planned. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending results of CAR 19F002.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 003:02:10	Problem	**FIAR**	**IFA** STS-51A-V-13	EPD
	GMT: 316:14:25		**SPR** 19F003	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: The Airlock Dual Function Power Source No. 1 Failed To Regulate Under No-Load Conditions. (ISS)

Summary: DISCUSSION: At about 316:14:25 G.m.t., the airlock dual function power source no. 1 output voltage went from 18.5 volts to 26.5 volts when EMU (extravehicular maneuvering unit) no. 1 was switched to its internal battery. The voltage returned to the proper value of 18.5 volts when the EMU was switched back to th

airlock supply for power. The battery charger mode (alternate function) performed nominally. There was no mission impact.

In the power-supply mode of operation, the airlock power source uses two reference voltage circuits which control a voltage regulator in series with the output voltage. For no-load conditions, one circuit senses the output voltage internally near the output power connector and maintains the voltage at 18.5 volts. When the airlock source provides power to an external load, the reference voltage is sensed at the load which, in this case, was EMU no. 1. The output voltage is also maintained at 18.5 volts. Analysis of the no-load reference voltage sense circuit revealed that a failure of one of several electrical components could have caused the noted anomaly. The airlock power source will be removed, replaced, and returned to the vendor for failure analysis. CONCLUSION: The failure of the airlock dual function power source no. 1 to regulate at no load conditions was most probably caused by an electrical component failure in the no-load reference voltage sense circuit. CORRECTIVE_ACTION: Airlock power source no. 1 will be removed, replaced and returned to the vendor for failure analysis. The results of this activity will be tracked via CAR 19F003. CAR ANALYSIS: Investigation verified the reported failure. However, the condition is not a failure because "open circuit voltage" is not a parameter of the procurement spec. The charger is designed to shut down when the sense lines are open. The reported problem occurred when the EMU's were switched to INTERNAL POWER, thus leaving the power supply open circuited. Since this condition is not controlled by the spec and is not harmful to the unit, no corrective action will be taken. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR** JSC-EE-0594F,	**IFA** STS-51A-V-14	CREW
	GMT:		ILC-H-0073F,	**UA**	**Manager:**
			SPR 19F019	**PR**	
			IPR		**Engineer:**

Title: Crew Interface Equipment Problems. (GFE)

Summary: DISCUSSION: A. Wireless crew communications unit "A" had a hot mike. A hybrid component on the interface board had shorted. The component, U2 (P/N 86022A), was replaced. Failure analysis will be tracked on FIAR JSC-EE-0594F.

FIAR ANALYSIS: The WCCU is GFE to the Orbiter. Failure analysis is tracked in the NASA failure reporting system under FIAR EE-0594F. [not included in original problemm report] B. EVA torque wrench separated from tether. Tether attachment unscrewed from wrench. Redesign will hold retainer nut in place. Failure analysis will be tracked on FIAR ILC-H-0073F. FIAR ANALYSIS: Torque wrench/tether separation failure analysis and corrective action is documented in the NASA failure reporting system under FIAR ILC-H-0073F. [not included in original problem report] C. EVA portable foot restraint stowage socket jammed and universal joint loosened. Thermal tolerances will be checked during acceptance tests. Universal joint manufacturing will be changed to prevent loosening. D. Arriflex 16mm camera failed. A defective microswitch was found in the standby circuit. The microswitch was replaced. E. Wrist tether hook stuck open. A wrench bounced out of the open hook when EV-2 attached the tether to a "D" ring. WIF procedure will be revised to account for viscous effects. F. Multi-use brackets broke at the elbow. The clutch mechanism broke on 3

of 6 brackets. Grease had contaminated the Loctite on the elbow bolt. Will use Vibratite. G. Headset interface unit had low output and did not operate in VOX. Unit was removed and replaced. Failure analysis will be tracked by CAR 19F019. CAR ANALYSIS: Vendor failure analysis disclosed a broken wire in cable W1-J3 near a shrink sleeve cable marker. There have been six similar occurrances near the cable marker. As a result, EDCP 105 has been issued to eliminate the shrink sleeving (and resultant stiffness) and provide marking on the boot. The EDCP is to be implemented when the HIU III is returned for repair. [not included in original problem report] CONCLUSION: See above. CORRECTIVE_ACTION: See above. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51A-V-15	OMS, RCS, HYD
	GMT:		**SPR** 14F005, 13 f001, 14F015, AC8418F, 19F013, 13F001	**UA** **PR**	**Manager:** **Engineer:**
			IPR		

Title: STS-41D Carryover Items. ()

Summary: DISCUSSION: The following failures were tracked on STS-41D and recurred on STS-51A. Corrective actions were defined for STS-51A because of turnaround impact or unavailability of replacement parts.

A. Left OMS (orbital maneuvering system) fuel total quantity failed (See STS 41D-8). CAR ANALYSIS: Vendor failure analysis isolated the failure to tolerance build-up on the 1550314-002 circuit card in the totalizer. More stringent acceptance testing is planned. Design changes are not planned. [not included in original problem report] B. Forward RCS (reaction control system) manifold 2 fuel isolation valve close indication failed (see STS 41D-13). CAR ANALYSIS: This and many other switch problems is attributed to conductive and nonconductive particles floating within the switch containers in zero G. Problem switches are being replaced as replacement switches (without contaminants) become available.[not included in original problem report] C. Right OMS fuel tank isolation valve A open indication failed (see STS 41D-25). Reference Flight Anomaly 51A15B CAR ANALYSIS.[not included in original problem report] D. Flash evaporator system topping duct heater B zone H failed (see STS 41D-1). CAR ANALYSIS: Repairs deferred from 41D-1. This anomaly is rewritten for the record and repairs are deferred to STS-51C for lack of replacment parts and/or turnaround impact.[not included in original problem report] E. Right OMS fuel total quantity failed (see STS-41D-8). Reference Flight Anomaly 51A-15A CAR ANALYSIS.[not included in original problem report] F. Right OMS crossfeed B fuel and oxidizer valves closed indication failed (STS 41D-24). Reference Flight Anomaly 51A-15B CAR ANALYSIS.[not included in original problem report] G. Right OMS oxidizer total and aft scale factor change (failure occurred on the ground prior to STS-41D). CONCLUSION: Item A - The suspect forward probe electronics were replaced for STS-51C. Item B - The valve actuator containing the suspect microswitches has been replaced with a unit from OV-102 and its operation verified. The failure was most probably due to contamination in the valve actuator microswitches. Items C through G - Deferred for STS-51C because of turnaround impact or unavailable replacement parts. Operational workarounds approved for STS-51A will be used for STS-51C, should these problems recur. CORRECTIVE_ACTION: Item A - Troublehsooting isolated the most probable cause of the problem to the forward probe electronics. Failure analysis will be tracked on CAR 14F005. Item B - The valve actuator has been replaced with a unit from OV-102. Failure analysis at

the vendor will be tracked on CAR 14F009. Items C through G - Fly as is. EFFECTS_ON_SUBSEQUENT_MISSIONS: none

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 001:05:59	Problem	**FIAR**	**IFA** STS-51A-V-16	Water and Waste
	GMT: 314:18:14		**SPR**	**UA**	Management System
			IPR	**PR**	**Manager:**
					Engineer:

Title: AC 1 Phase "A" And "B" Current Low On WCS Fan Separator 1. (ORB)

Summary: DISCUSSION: Beginning at about 314:18:14 g.m.t., the WCS (Waste Collection System) fan separator 1 phase "A" current, as measured by the current signature on the ac 1 bus phase "A" total current measurement, was periodically less than normal. The fan separator 1 startup amperage on phase "A" was 2.0 amps while the other two phases read 2.9 ampos. The phase "A" run amperage was 0.5 amp while phases "B" and "C" read 0.9 amp.

At about 314:22:11 g.m.t., a lower than normal (0.2 amp) rise in the ac 1 bus phase "A" current was noted during the initial RMS (remote manipulator system) unlatching operations. The other two phases read the expected 0.4 ampo. The ac 1 phase "A" current signature for all subsequent RMS latching operations was normal. Postflight troubleshooting could not repeat the problem and the fan separator 1 performance was normal. Ground tests have shown that if the fan separator has a decreasing current in a single phase, the current increases in the other two phases. Also, the startup time for the fan separator increases. Postflight data analysis shows that these conditions did not occur when fan separator 1 phase "A" was indicating low. Therefore, it is concluded that the noted anomaly was caused by an intermittent condition in the ac 1 bus phase "A" current montiroing loop, but the cause is unknown. CONCLUSIONS: Periodic low current readings on ac 1 phase "A" for WCS fan separator 1 were probably caused by an intermittent condition in the current measurement loop. Operation of the WCS fan separator was normal. CORRECTIVE ACTION: Ac 1 phase "A" on OV-103 will be closely monitored for intermittent low current readings during future flights. EFFECTS ON SUBSEQUENT MISSIONS: NONE [the following was not the original problem report, but was included in the computer database - see STS-51C-6] [DISCUSSION: On flight day 2, the WCS (waste collection system) fan separator 1 phases "A" and "B" indicated low current as measured by the total current measurements for each phase on the AC 1 bus. A similar current signature had been observed on AC 1 phase "A" during WCS fan separator 1 operation on the previous flight. See problem STS-51A-16. Inflight troubleshooting showed that the low motor currents were experienced when the WCS fan separator 1 operations were associated with use of the panel lights. The low current on phase "A" was duplicated by placing the left center panel lights on full bright. The same low current condition was experienced on phase "B" when the right panel lights were on full bright. When the panel lights were turned off, the motor currents were equal on all three phases. CONCLUSION: Low currents on AC 1 phases "A" and "B" were caused by the operation of the WCS fan separator 1 together with the panel lights. Operation of the panel lights changed the power factor and the phase current readings. CORRECTIVE_ACTION: None required. Current measurements were normal due to the change in power factor caused by operation of the panel light. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE]

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 005:20:45	Problem	**FIAR**	**IFA** STS-51A-V-17	EPD
	GMT: 319:09:00		**SPR** 19F017	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Aft Payload Bay Port And Starboard Floodlights Failed. (ORB)

Summary: DISCUSSION: At about 319:09:00 G.m.t., both the aft PLB (payload bay) port and starboard floodlights were turned on for 7 minutes, but did not illuminate. The lights were turned off and declared failed. There was no impact to the mission.

During postflight troubleshooting the problem was isolated to the lamp assembly in each floodlight. The lamp assemblies were removed and replaced. The failed lamp assemblies have been returned to the vendor for failure analysis. CONCLUSION: The cause for the aft PLB port and starboard floodlight lamp assembly failure is unknown pending failure analysis. CORRECTIVE_ACTION: The failed aft PLB floodlight lamp assemblies have been removed, replaced and returned to the vendor for failure analysis. The results of this activity will be tracked via CAR 19F017. CAR ANALYSIS: Lamps failed because of thermally induced cracks. Heating was aggravated by an unauthorized titanium dioxide pigmented paint on the radiation surfaces. Lamps will be replaced with modified assemblies on an attrition basis. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending resolution of CAR 19F017.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 005:22:50	Problem	**FIAR**	**IFA** STS-51A-V-18	RCS
	GMT: 319:11:05		**SPR** 19F012	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Forward Reaction Control System Manifold 3 Fuel And Oxidizer Isolation Valves Lost Open Indication. (ORB)

Summary: DISCUSSION: At about 319:11:05 G.m.t., during the second rendezvous maneuver phase, the forward RCS (reaction control system) manifold 3 fuel-valve open downlink discrete read zero (low) when the valve was open. About 2 seconds later, the oxidizer valve open discrete also read zero. As both of these discretes read zero, the RCS RM (redundancy management) system declared the F3 manifold closed and the F3 thrusters not available. The failure cleared before the crew was required to take action to recover the thrusters.

The control switch on panel O8 was subseqsuently placed in GPC to prevent power from being applied to the valves should the failure repeat. There was no further impact to the mission. The anomalous valve position discretes are derived from limit switches that have a history of internal conductive and non-conductive particle contamination. If during ascent or during an RTLS (return to landing site) abort, the observed valve position indication failures occur and the RCS RM deselects the forward manifold 3 thrusters, there is no way to recover these thrusters even though they could be fully operational. The loss of the other left-hand forward RCS down-firing thruster (F1D) could result in ET (external tank) recontact during ET separation. Postflight, the limit switch failures could not be duplicated at KSC. The valve actuators, however, have been removed and replaced with OV-102 actuator that have been flown on six previous flights without limit switch failures. The failed actuators have been returned to the vendor for failure analysis. CONCLUSION: The RCS manifold 3 fuel and oxidizer valve open-position indication failures were most probably caused by limit-switch internal contamination. CORRECTIVE_ACTION: The valve actuators have been removed, replaced and returned to the vendor for failure analysis. The results of this activity will be tracked via CAR 19F012. EFFECTS_ON_SUBSEQUENT_MISSIONS: Pending the resolution of the limit switch contamination problem, the potential exists for the deselection of an RCS manifold. CAR ANALYSIS: This and many other switch problems is attributed to conductive and nonconductive particles floating within the switch containers in zero G. Problem switches are being replaced as replacement switches (without contaminants) become available. [not included in original problem report]

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 006:17:27	Problem	**FIAR**	**IFA** STS-51A-V-19	Windows
	GMT: 320:05:42		**SPR** 19F008	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Starboard Overhead Window (W7) Has 1/32-Inch Diameter Damaged Area. (ORB)

Summary: DISCUSSION: On day 7, the crew reported a small damaged area of approximately 1/32-inch in diameter on the X-axis centerline of window W7. Evaluation indicated an ample structural margin existed and the damage was of no concern for the flight.

Postflight inspection of the damaged area showed two small craters that were characteristic of metorite impacts. One crater, 0.001-inch deep, was located 2 inches from the forward TPS (thermal protection system) tile on the X-axis centerline, and the other 0.0018-inch deep, was located 1 inch from the rear TPS and also on the X centerline. CONCLUSION: The damaged areas were most probably the result of metorite impacts. The window visibility is unaffected, and analysis has verified that the structural integrity of the window is acceptable for additional flights. CORRECTIVE_ACTION: A structural analysis of the window with the measured flaw depths has been conducted. No further action is necessary. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 006:19:35	Problem	**FIAR**	**IFA** STS-51A-V-20	GN&C

	GMT: 320:07:50	**SPR** 20F007	**UA**	**Manager:**
		IPR	**PR**	
				Engineer:

Title: Forward Digital Autopilot Panel (C3) Pitch And Roll Rotation Pulse Buttons Failed. (ORB)

Summary: DISCUSSION: At approximately 320:07:50 G.m.t., the crew reported that, during OPS 8, the forward pitch pulse DAP (digital autopilot) PBI (push button indicator) had failed. Data showed that contact A of the two-contact momentary switch was failed off. The crew exchanged the forward-pitch PBI with the aft-yaw ACCEL PBI and both PBI's worked in their new locations. Extensive ground tests have failed to duplicate the problem.

At approximately 320:08:56 G.m.t., telemetry indicated that the forward-roll pulse DAP PBI was exhibiting failures. The indication was that one contact was opening at least 0.48 second before the second contact. Additional data review showed that the two contacts were not opening or closing simultaneously. This indication appeared only in the downlink data and was transparent to the crew. Extensive ground tests show that PBI contacts can open at slightly different times. CONCLUSION: A large number of switch acutations have been performed during ground testing and the pitch-PBI fault has not been duplicated. The fault was most probably caused by a particle which has since cleared and is no longer present. The roll-PBI signature is that of a switch that has been actuated very slowly. Most switches, if operated very slowly, will show contacts opening or closing at slightly different times. This does not affect the operation of the switch. CORRECTIVE_ACTION: Leave the PBI's as they are now. Should the problem recur, it is not a time-critical operation. There are other means available to initiate the action. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	**Time**	**Classification**	**Documentation**		**Subsystem**
MER - 0	**MET:** 003:22:05	Problem	**FIAR**	**IFA** STS-51A-V-21	Star Tracker
	GMT: 317:10:20		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: -Z Star Tracker Target Suppression Shutter Latchups With Anomalous Bright Object Sensor Operation. (ORB)

Summary: DISCUSSION: During PALAPA and Westar rendezvous operations at 317:10:20:52.75 G.m.t., 317:11:51:42.75 G.m.t., and between 319:08:07:29.15 to 319:08:13:04.75 G.m.t. the -Z star tracker shutter was closed by the target suppression circuit because of excessive light within the 10-deg field-of-view where the BOS (bright object sensor) should have closed the shutter first. The target suppression occurrences were associated with momentary BOS signals at sun angles of 30 degrees or less. Crew action was required to reopen the shutters, after which the star tracker operated nominally for tracking of the PALAPA and Westar rendezvous targets.

At 319:08:13:04.75 G.m.t., an occurrence was caused by the Westar target (being tracked at 40 nmi. range) becoming bright enough to exceed the target suppression circuit threshold. The sun was not a factor in this instance. The moon and sunlit earth were not associated with the target suppression BOA (bright object alert) anomalies because of the illumination geometries existing at the occurence times. CONCLUSION: On at least two occasions, the star tracker shutter failed to close as required by BOA action and the known lighting geometry. The BOA signal was anomalous in that it was momentary vs. the expected change from a high-to-low state as the star tracker line-of-sight approached the sun to an angle of less than 30 deg. These conditions can only exist if there is a hardware failure in the chain of components which includes the BOS, BOA signal processing, and shutter actuation circuitry. The shutter and its motor appear to be functioning normally since the target suppression function did cause it to close and the crew was able to reopen it successfully. The target suppression shutter closure caused by the overly bright Westar target is not considered an anomaly, although it was not expected that the target would reach the target-suppression threshold brightness at a range of 40 nmi. The low probability of the combination of another failure in the star tracker and the sun being in the field-of-view at the same time should preclude any damage to the star tracker on STS-51C. CORRECTIVE_ACTION: Fly as is for the 51-C mission with careful monitoring of BOA/shutter action when the line-of-sight to the sun is expected to approach or be less than 30 deg. Flight control plans to monitor for this occurrence during STS-51C to have sufficient time to make a corrective action call. The -Z Star Tracker (SN 009) and its Light Shade/BOA Assembly (SN-001) will be removed following the STS 51-C flight, and returned to Ball Aerospace for troubleshooting and repairs. EFFECTS_ON_SUBSEQUENT_MISSIONS: None except as noted under Corrective Action.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 007:05:40	Problem	**FIAR**	**IFA** STS-51A-V-22	RCS
	GMT: 320:17:55		**SPR** 19F010	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: The Left Reaction Control System B Fuel Tank Isolation Valve Manifold 3/4/5 Open Indication Was Lost. (ORB)

Summary: DISCUSSION: At about 320:17:55 G.m.t., while reconfiguring to RCS (reaction control system) straight line feed following an OMS (orbital maneuvering system)-to-RCS interconnection, the left RCS system B fuel tank isolation valve manifold 3/4/5 failed to indicate open on downlink telemetry. The onboard indication was barberpole which indicates a miscompare. The AMCA (aft motor control assembly) status 1 indicated that continuous power was being applied to the valve. The control switch on panel O7 was thus placed in GPC position after reconfiguration to prevent continuous power from being applied to the valve. There was no mission impact.

The valve open downlink indication is derived from a type of limit switch that has a history of conductive and non-conductive particle contamination. The anomalous valve open position indication could not be duplicated during postflight troubleshooting. The valve actuator, which also contains the limit switches, was removed, replaced, and returned to the vendor for failure analysis. CONCLUSION: The loss of the left RCS system B fuel tank isolation valve manifold 3/4/5 open indication was most probably caused by particle contamination internal to the position limit switch. CORRECTIVE_ACTION: The valve actuator has been removed, replaced and returned to the vendor for failure analysis. The results of this activity will be tracked via CAR 19F010. EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending the resolution of CAR 19F010. CAR ANALYSIS: Reference Flight Anomaly 51A-18 CAR ANALYSIS. [not included in original problem report]

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-51A-V-23	STR
	GMT:		SPR	UA	Manager:
			IPR	PR	
					Engineer:

Title: Payload Bay Blankets And Paint Discolored. (ORB)

Summary: DISCUSSION: Postflight inspection found about 60 percent of the payload bay had turned to a light amber color.

It appears that UV radiation is degrading the beta cloth and the paint exposed to the side sun in the payload bay. Further analysis determined that the optical properties and function of the blankets and the paint are still satisfactory. Testing for the outgassing characteristics of the teflon coated beta cloth to be used for the payload bay liner on the next flight of OV-103 indicates there is no contamination problem since the volatile condensable material is less than 0.02 percent and the total mass loss is less than 0.25 percent. CONCLUSION: Discoloration of the blankets and paint in the payload bay was most probably caused by UV radiation degrading the exposed beta cloth and paint. The optical properties and function of the blankets and paint is still satisfactory. CORRECTIVE_ACTION: None required.
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-51A-V-24	C&T - S-Band
	GMT: 320:23:06		SPR 19F016	UA	Manager:
			IPR	PR	
					Engineer:

Title: S-Band Receiver Lost Lock Several Times While On The Lower Left Antenna. (ORB)

Summary: DISCUSSION: At approximately 320:23:06 G.m.t., the line-of-sight to the TDRS (Tracking and Data Relay Satellite) moved through the lower left S-band antenna. Downlink communications were established, but uplink lock was not obtained until 7 minutes later. Coincident with uplink lock, the radio frequency reflected power dropped from 2.5 to 1.7. No antenna switching occurred during this time. Similar signatures were observed on several other TDRS passes when on the lower left antenna. This antenna did not have the interim sealed switch, and data review indicates the same type of signature that was on the previous flight when the same type switch in the upper left antenna experienced arcing.

CONCLUSION: The reflected-power variation indicates a possible arcing and breakdown condition in the antenna beam switch. CORRECTIVE_ACTION: The antenna was removed and returned to the vendor for replacement of the switch. The repaired antenna has been reinstalled on the vehicle. Analysis of the switch will be tracked under CAR 19F016. EFFECTS_ON_SUBSEQUENT_MISSIONS: None. It should be noted that the lower right and the upper right antennas do not have the interim sealed beam switches and are subject to breakdown condition. CAR ANALYSIS: Investigation revealed that a combination of arcing, gas discharging and multipacting deteriorated the switches and caused the malfunctions. These conditions are believed brought about by the unsealed condition of the switch. The switch procurement spec has been revised to specify RTV sealed switches. [not included in original problem report]

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-51A-V-25	Landing/Decel Systems
	GMT: Postlanding		**SPR** 19F018	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Radar Altimeter 2 Jumped From 60 Feet To 24 Feet On Final Approach To Landing. (ORB)

Summary: DISCUSSION: The crew reported that during landing, the pilot's RA (radar altimeter) tape on the right AVVI (altitude vertical velocity indicator) hung up at about 50 feet, then jumped down to 15 feet and worked properly thereafter. Review of postflight data shows that both radar altimeters were tracking within a few feet of each other until 60 feet, at which point RA 2 readout jumped to 24 feet while RA 1 decreased normally. RA 2 remained in the 20 to 30 feet range until RA 1 tracked down to the same range, after which both worked normally.

Tests of RA 2 at KSC showed the unit to be properly calibrated at the normal 2500-foot test point, but to be low when checked at 100 feet. The unit has been removed and returned to the vendor for analysis. CONCLUSION: Radar altimeter 2 was defective. CORRECTIVE_ACTION: The radar altimeter has been removed and replaced. Detailed failure analysis will be performed under CAR 19F018. EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending results of CAR 19F018. CAR ANALYSIS: Problem was traced to a faulty coaxial cable. Cable was replaced. No further problems noted. This CAR is closed. [not included in original problem report]

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 007:23:27	Problem	**FIAR**	**IFA** STS-51A-V-26	MECH
	GMT: 321:11:42		**SPR** 19F020	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Brake Hydraulic Pressure Increased During Entry. (ORB)

Summary: DISCUSSION: During the entry phase, prior to landing gear deployment, all four brake pressures (left inboard and outboard, right inboard and outboard)

increased to approximately 900 psi. This occurred after landing gear isolation valve 3 opening at 321:11:42:25:33 G.m.t. and before landing gear isolation valve 2 opening at 321:11:49:02:49 G.m.t. The brake pressures increased from less than 100 psi (which is normal) to approximately 200 psi which indicated compression of the brake return springs, then up to 900 psi indicating compression of the brake. The brake pressure returned to normal when landing gear isolation valve 2 was opened. The data did not indicate that brake pressure had been applied on hydraulic system 1.

The landing gear isolation valves are two-way spool/sleeve valves which always have a slight downstream leakage. The brake module switching valves are four-way valves with ball detent in either of two positions. When landing gear isolation valve 3 was opened, the switching valves encountered a hydraulic lock in system 2. The pressure generated in both systems (1500 psi in system 3, 1045 psi in system 2) was sufficient to close both thermal circulation valves in the brake module. This resulted in all paths to the return hydraulic lines being closed except through the brake module servo valves. Leakage through landing gear isolation valve 2 drove the switching valves back toward the primary position until the leakage passed through the servo valves. The design of the switching valves is for nominally simultaneous cutoff of the pressure and return flow slots. Tolerance build-up during manufacture could cause the return slots to close before the pressure slots. Therefore, restriction of the hydraulic return path at the switching valve, and leakage through landing gear isolation valve 2, caused a pressure build-up on the brake system. CONCLUSION: The increase in brake hydraulic pressure during entry was most probably caused when leakage through landing gear isolation valve 2 caused a hydraulic system lock which prevented the brake module switching valve from moving to the standby position. A tolerance build-up in the brake module switching valve caused the hydraulic return to cut off first. This return line restriction resulted in an increase in brake pressure. CORRECTIVE_ACTION: For the STS-51C mission, the software controlling the landing gear isolation valve 3 opening will be altered to keep the valve closed during entry and provide an opening command only after nose gear touchdown. This will provide full brake redundancy during vehicle rollout. The opening sequence for landing gear isolation valves 2 and 1 will not be altered. The landing gear isolation valve 3 software change will prevent a hydraulic lock and resulting uncommanded brake pressures similar to that which occurred on the STS-51A mission. For missions subsequent to the STS-51C mission, an investigation of the increased brake hydraulic pressure experienced on the STS-51A mission is being conducted. Upon the conclusion of this investigation, a design change will be established and implemented into the program to prevent future occurrences of the increased brake pressure anomaly. To aid in the brake pressure investigation, a switching valve laboratory test unit will be tested at the vendor to establish the differential pressure and flow performance characteristics of the switching valve. In addition, the Orbiter 104 brake hydraulic switching valves will be removed and returned to the vendor for analysis. CAR ANALYSIS: Tolerance build-up in the return path to the switching valve and leakage through #2 landing gear isolation valve caused pressure build-up in the brake system. Failure of the landing gear isolation valve to open could cause catastrophic failure of the brakes and tires. Corrective action in the near term is a software change to open #3 landing gear isolation valve at touchdown. Permanent fix will be accomplished on OV-104 per MCR 11393; other vehicles will be fixed by mod kit. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation	Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR** **IFA** STS-51A-V-27	MECH

GMT: Postlanding	**SPR**	**UA**	**Manager:**
	IPR	**PR**	
			Engineer:

Title: Left Main Landing Gear Strut Low. (ORB)

Summary: DISCUSSION: Postflight inspection found the left main landing gear strut 3/4 inch lower than the right strut.

Postflight troubleshootiong indicated that the left strut was 1/2 inch lower than the right strut prior to launch. Further analysis determined that a 3/4 inch strut differential is within specification and acceptable for flight. The additional 1/4 inch differential could have been cause by incremental stroking of the strut. CONCLUSION: The strut on the left main landing gear was low prior to launch and the additional differential postflight was probably due to normal operating conditions. A 3/4 inch strut differential is within specification and acceptable for flight. CORRECTIVE_ACTION: None required. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-51A-V-28	STR
	GMT: Postlanding		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: The Right Hand Nose Landing Gear Door Was Bent. (ORB)

Summary: DISCUSSION: Postflight inspection found the lip edge on the hinge side of the nose landing gear door mid section deformed over an area of approximately 24 inches long and the honey comb face sheet lifted approximately 1/2 inch maximum. Inspection indicated that when the door was closed the face sheet was forced tightly against the thermal barrier insulation on the mating structure. As the door opened the face sheet caught on the thermal barrier insulation and was pushed inward.

CONCLUSION: The landing gear door damage was caused by an improper fit between the door structure and the mating seal, causing the door structure to catch on the seal when the door opened. The damage has been repaired and the seal spacing corrected. Successful tile pull tests indicate that no significant honeycomb to face sheet debonding has occurred. Analysis has verified the structure is accpetable for STS-51C. CORRECTIVE_ACTION: The nose gear door has been removed, the door/seal spacing has been adjusted for the proper fit, and the bent face sheet has been riveted to the door "Z" section structure. Dye testing revealed a scratch which has been removed by polishing and ultra-sonic test of the closeout member found no cracks. Tile pull tests have been conducted. As a precaution an ultra sonic test of the face sheet to honeycomb bond will be performed after STS-51C to assure that no minor honeycomb to face sheet debonding voids exist.
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Prelaunch	Problem	**FIAR**	**IFA** STS-51A-V-29	C&T
	GMT: Prelaunch		**SPR** 19F022	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Modular Auxiliary Data System Frequency Modulated Data Was Noisy And Data During Snapshots Was Intermittent. (ORB)

Summary: DISCUSSION: Noise spikes and short noise bursts were observed on all of the FM (frequency modulated) data recorded through the MADS (modular auxiliary data system). Noise was present on both the ascent and entry data. Although the data were degraded, it was usable. Troubleshooting at KSC has determined that the noise was present after each time the STS-51A data were erased and new data were recorded on the MADS tape recorder.

The MADS, when operating in the snapshot mode, records 10 seconds of data at intervals of 10 minutes. After landing, with the MADS in this mode, the snapshot routine was normal in that the tape recorder turned on and off as designed; however, the PCM (pulse code modulation) data were intermittently missing during the snapshot intervals. Orbiter data indicate that the MADS PCM electronics was receiving power during the missing PCM data intervals. Extensive troubleshooting, including long periods of proper MADS operation at KSC, has been unable to repeat the problem. CONCLUSION: The FM data noise is most probably due to a degradation of the MADS data tape. The MADS recorder has been replaced with a recorder from OV-099. The MADS snapshot malfunction is most probably the result of an intermittent failure in the MADS PCM electronics. Two successful flights with the OV-103 MADS instrumentation configuration have been completed. The impact of the unlikely loss of MADS PCM data for one flight does not warrant the replacement of the suspect unit during the current turnaround for STS-51C. CORRECTIVE_ACTION: The MADS PCM tape recorder has been replaced with a recorder from OV-099 and its operation has been verified. The tape recorder failure analysis will be tracked on CAR 19F022. Troubleshooting has not reproduced the problem with the MADS snapshot data. The suspect MADS PCM electronics will be replaced during the next turnaround flow for OV-103. EFFECTS_ON_SUBSEQUENT_MISSIONS: None, pending failure analysis of tape recorder. Possible, but unlikely, loss of MADS PCM data for one flight. CAR ANALYSIS: Tape inspection revealed scratches and contamination due to mishandling. Field personnel have been reminded to use extreme care when handling tapes. [not included in original problem report]