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

STS - 5, OV - 102, Columbia (5) **Time:04:31:PM**

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** Prelaunch	Problem	**FIAR**	**IFA** STS-5-V-01		RCS
	GMT: Prelaunch		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: RCS Regulator Leak on Right-Hand Fuel B Leg Helium Regulator. (ORB)

Summary: DISCUSSION: During helium loading for STS-5, the right-hand RCS B leg regulator leaked through the primary and secondary stages. A special test was performed to determine the leak rate at operating pressure. This test indicated a reduced leak rate that would be acceptable for the critical ascent phase of the mission. The regulator was then isolated until T-15 minutes. When it was brought back on line at T-15 minutes, no leakage was observed. The regulator was used during ascent and during the last half of the mission with no further indication of leakage. The regulator, S/N 14, was removed and replaced after STS-5.

Postflight checkout and testing at the vendor indicated leakage in both the primary and the secondary regulator stages. The primary stage exhibited low leakage but the secondary stage had a high leak rate. Silicone oil and fuel decomposition products were found internal to the regulator and around the sealing surfaces of both the primary and secondary stages. This contamination showed up as small brownish red spots and had migrated upstream of the regulator into the 25 micron filter. All forward and aft RCS primary and secondary stage helium regulators on OV-102 were leak checked after STS-5. One FRCS fuel helium secondary stage regulator leaked slightly out of spec. The regulator, S/N 37, was removed and replaced. Failure analysis at the vendor found a small amount of metallic and fiberous contamination together with traces of a clear substance and an orange brown residue. Analysis is continuing. Both regulator stages of all RCS pressurization systems were leak checked on OV-099 prior to STS-6 and the primary stage regulators on the aft RCS have been leak checked for STS-7. The check valve downstream of the right-hand fuel helium regulators on OV-102 was also leak checked after STS-5. The regulators on OV-102 and OV-099 have functioned normally in flight and no leakage failures have occurred during the first six flights. Each RCS pressurization system has series/parallel regulator redundancy with an isolation valve in each parallel leg. CONCLUSION: Silicon oil and fuel decomposition products in the right-hand RCS fuel B leg helium regulator and around the sealing surfaces caused the regulator leak. The source of the silicone oil has not been identified. Fuel decomposition products did not effect RCS fuel helium regulator performance during the first five flights of OV-102 and no leaks were experienced on the OV-099 helium regulators during STS-6. CORRECTIVE_ACTION: The right-hand fuel B leg helium regulator on OV-102 was removed and replaced after STS-5. The primary and secondary stages of the OV-099 helium regulators were leak checked at KSC prior to STS-6. The primary stage regulators on the aft RCS were leak checked for STS-7. Additional corrective action for the program will be tracked on CAR AC4422. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** Prelaunch	Problem	**FIAR**	**IFA** STS-5-V-02		DPS - MDM
	GMT: Prelaunch		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: MDM FF01 Exhibited Transient Bite-Detected Internal Error. (ORB)

Summary: DISCUSSION: On two occasions, during prelaunch operations, a BITE status register (BSR) detected an internal MDM error (Bit 9) on the MDM primary port only. This register is interrogated on approximately 8-hour intervals during prelaunch operations. The incoming MDM commands were reviewed during the failure period and no cause for Bit 9 being set was evident. Further, the status of the I/O module portion of the MDM remained unchanged from the previous monitor interval indicating a failure associated with the MDM internal bite circuitry. Also, had the failure been associated with interval MDM bus traffic, the "validity bit" would have been set, which was not the case. It was concluded that the error was most probably unique to the bite error circuitry within the MDM and the MDM would operate properly during the flight. Postflight interrogation of the BSR showed no bits set. This is the first MDM failure of this type on STS-1 through 6.

The MDM was returned to the vendor where extensive environmental testing failed to recreate the problem. The unit has been returned to SAIL where periodic monitoring of the BITE status will continue. CONCLUSION: The problem is most probably unique to the MDM internal bite circuitry. No failures of this type have been experienced on OV-102 or on the MDM's in OV-099. CORRECTIVE_ACTION: Analysis of the SAIL performance will determine the eventual action. This problem will be tracked on CAR 4421. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** Prelaunch	Problem	**FIAR**	**IFA** STS-5-V-03		DPS - GPC
	GMT: Prelaunch		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: GPC 2 Fail-to-Sync Prelaunch. (ORB)

Summary: DISCUSSION: A redundant set computer fail-to-sync (FTS) occurred on the vehicle at approximately T-13 hours during pre-launch preparations. The FTS occurred following an Item 48 entry to the GPC memory page (G9 OPS display) to clear the GPC Error Log. The problem was caused by the use of an unprotected inter-process variable (IPV) in the CRT update program.

A flag used in the software which services the display system was found to be unprotected, such that software executing at two different priority levels can modify the flag and cause it to have a different value in one of the redundant computers. The different value of the flag can then cause different processing in different computers, resulting in a FTS. Analysis determined that only certain keyboard entries which resulted in a demand update of the CRT display could cause a FTS. All other keyboard entries are explicitly protected. It was determined that of the entries which could cause a FTS Item 48 has by far the highest relative probability of occurring due to some special timing related to the processing involved. One FTS was experienced out of 4000 to 5000 attempts using Item 48 during testing conducted in the SAIL (Shuttle Avionics Integration Laboratory) and FSL (Flight Systems Laboratory). None of the affected Item entries have any nominal use during powered ascent, orbital maneuvers, EVA's or following the deorbit burn. Of the usages during other periods, all were at times when the computer could be recovered by normal procedures. There is no conceivable necessity of using Item 48 during any dynamic flight phase. The potential contingency uses, during periods when failed computers cannot be recovered all involve circumstances associated with two or more failures. CONCLUSION: The problem was caused by the use of an unprotected inter-process variable (IPV) in the CRT update program. Because the flight exposures were so limited, and the probability of a FTS so low the overall risk of continuing the mission was judged to be less than the inherent risk of a late patch to the software. CORRECTIVE_ACTION: The problem will be fixed in all subsequent releases of the flight software, including the software release planned for use on the FRF for STS-6. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-5-V-04		DPS
	GMT:		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Display Unit 2 Flickered And Then Failed. (ORB)

Summary: DISCUSSION: The display was shifted to the lower left quadrant. While attempting to call up different formats, DEU memory parity was also encountered. The problem was isolated to DEU 2. DEU 4 was recabled by the crew into the DEU 2 circuit to facilitate entry. The DEU was removed and returned to the vendor for analysis and the problem was duplicated by temperature cycling. The shifted display and the memory parity errors were the result of two separate failures. A potentiometer failure on the Y deflection board caused the display shift and a defective solder connection on the memory parity board caused the memory parity errors. STS-5 was the first flight of the failed DEU.

CONCLUSION: 1. The shifted display was caused by a failure in a potentiomenter on the Y deflection board. 2. The memory parity errors were the result of a defective solder connection on the memory parity board. 3. These failures are the first experienced of this nature and therefore are not considered generic.
CORRECTIVE_ACTION: The boards have been replaced and the DEU returned to the inventory. No corrective action is required for STS-6.
EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-5-V-05		INS
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: STS-5 Operational Instrumentation Failures. (ORB)

Summary: DISCUSSION: A. WSB (Water Spray Boiler) 1 Reg. Out Pres (V58P0104A) failed off scale low after MECO (toggling between 29.1 and 0 in 1 to 2 seconds). The problem has been isolated to the WSB controller and it will be replaced. This measurement is not required for Launch Commit Criteria.

B. ET LH2 Ullage temperature (T41T1705A) - The measurement failed high during ascent. A new sensor will be supplied with the external tank. KSC troubleshooting will verify measurement wiring and conditioning in the Orbiter vehicle. The measurement is not required for Launch Commit Criteria. C. APU 3 turbine exhaust temperature 2 (V46T0340A) - The measurement failed during descent. The measurement is monitored by GLS for launch [1 of 2 measurements (T1 & T2) mandatory]. V46T0342A APU 3 turbine exhaust temperature 1 is the redundant measurement. This is the first APU turbine exhaust temperature failure in either OFT or operational flight. Troubleshooting will be done at KSC and the measurement repaired. D. OMS-R POD OX tank level low (V43X5233X) - This is the first failure of this measurement. Troubleshooting will be done at KSC. The measurement is not required for Launch Commit Criteria. A decision to repair the measurement will be based on the fix being incorporated in a spare totalizer. There has been no problem with these measurements on OV-099. 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-5-V-06		PYLD
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: GAS Encoder Cable Connector Was Plugged Into The Inboard Switch Panel (SSP) L-11 and GAS Could Not Be Activated. (ORB)

Summary: DISCUSSION: The GAS hand controller was plugged into the auxiliary input/output connector on the Standard Switch Panel located in the aft flightdeck panel L-11 and the GAS payload could not be activated. The crew then disconnected the controller from panel L-11 and plugged the controller into L-12 and the GAS payload was activated. Review of the hardware and documentation indicated the following.

a. OV-102 was wired correctly to panel L-12. b. The "GAS" decal was on the wrong panel (L-11). c. The JSC manifest drawings are correct. (Wiring to L-12 on the decal on L-12.) d. The KSC work authorization documents are correct and installation was verified correct by two QC stamps and a technician stamp. (Checkout through L-12 and "GAS" decall installed on L-12.) e. The JSC simulator was wired incorrectly (to L-11) and the "GAS" decal was installed on the wrong panel (L-11). f. Flight procedure was correct. "Plug into outboard SSP" this would be L-12. CONCLUSION: The GAS decal was installed on panel L-11 even though the documentation showed installation on panel L-12. CORRECTIVE_ACTION: 1) Close out photo's of the standard switch panels will be taken and compared to installation drawings and to the simulator configuration. 2) Flight prcedures will specify the panel number. 3) Periodic reviews will be accomplished to verify simulator configuration. 4) Simulator configuration personnel will participate in integrated Hardware/Software reviews. 5) Simulator configuration control procedures are being reassessed. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification		Documentation	Subsystem
MER - 0	**MET:** 000:16:00	Problem	**FIAR**	**IFA** STS-5-V-07	RCS
	GMT: 315:28:19		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: OV-102 Primary Thruster R4D Heater Controller Failure. (ORB)

Summary: DISCUSSION: Approximately 16 hours into the mission, data showed that the leak detectors on primary thruster R4D had dropped below the minimum heater set point of 66? F and could be indicating a failed-off heater. Further data substantiated this and a decision was made to keep the thruster from deselecting itself on the 30? F leak detector threshold by occasionally firing it, which in turn raised the leak detector temperature with soak-back heat. This was done for about half the mission after which the heater apparently began functioning again and stuck-on. The remainder of the mission was spent with a heater in a failed-on status and the temperatures reached thermal equilibrium. The injector equilibrium temperature of 156?F did not exceed the thruster valve temperature limits.

The thruster and controller were removed. Failure analysis has shown the problem to be within the controller. CONCLUSION: A failure in the heater controller is most probable since the heater apparently failed "off" and later during the mission failed "on". CORRECTIVE_ACTION: Failure analysis is continuing. No corrective action is required for OV-099. No other controller failures have occurred during STS-1 through STS-6. Should the problem occur on STS-7, operational procedures similar to STS-5 can be implemented to control the thruster temperature. EFFECTS_ON_SUBSEQUENT_MISSIONS: None expected.

Tracking No	Time	Classification		Documentation	Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-5-V-08	MPS
	GMT:		**SPR**	**UA**	**Manager:**
			IPR	**PR**	

Engineer:

Title: Partial Failure of the Orbiter GO2 Engine 3 Flow Control Valve. (ORB)

Summary: DISCUSSION: The flow control valve failed to fully open from T+2 seconds to T+40 seconds when commanded. The valve is solenoid-powered closed and spring-loaded open. The closed flow rate is 1.2 lb/sec and the open flow rate is 2.4 lb/sec at 100 percent engine power level. The flow rate at T+10 sec was approximately 1.6 lb/sec. This flow rate resulted from the internal mechanism not going full open. The problem failed to reappear during the remaining mainstage operation. This failure did not affect the external tank ullage pressure performance since the valves on the other engines opened fully.

The internal mechanism has two forces acting on it during the close-open cycle. They are the opening spring force and closing pressure force. The pressure force is created by the high velocities around the internal mechanism while opening. The high velocities cause a pressure drop on the poppet-seal assembly which results in a net closing force. The effect of the pressure force varies from valve to valve. On STS-5, the pressure force apparently rose above the opening force and stalled the internal mechanism during its stroke and temporarily produced a partial flow rate. During STS-1, the engine 1 valve had the same problem which remained throughout the entire mainstage operation. Prior to STS-1, the valves on OV-102 had undergone an acceptance test using qualification size orifices (9 percent lower flow than the present flight orifices) and were tested at 109 percent power level inlet pressures to the valve. Prior to the STS-1, flight sized orifices were installed in the valves. After STS-1, the engine 1 valve was replaced by the same configuration valve with a flight orifice; the replacement valve was acceptance tested, but with the flight orifice. The valves on OV-099 are the same as OV-102 valves except the valve body and orifice material was changed from stainless to inconel 718. The material doesn't affect the pneumatic unbalance problem. The OV-099 valves went through an acceptance test with flight orifices. The use of flight orifices makes the acceptance test a more realistic test for proving the valve will operate properly for STS-6. The flight readiness firings for OV-099 demonstrated the flow control valve functions for OV-099. The OV-102 engine 3 flow control valve was disassembled at the vendor and the internal mechanism showed the expected pattern of wear. CONCLUSION: Pneumatic unbalance is the most likely cause of the STS-5 engine 3 flow control valve problem. The OV-099 valves have been acceptance tested with flight orifices and inlet pressures at 109 percent engine power level. The valves performed properly during both flight readiness firings. CORRECTIVE_ACTION: An inconel 718 redesigned valve is currently in acceptance test. The all-inconel 718 redesign internal geometry has been modified to resolve the force balance problem. Also, a preassembly check will be performed on the internal mechanism to find the susceptibility of the mechanism to the pneumatics unbalance problem. The acceptance test procedure in the future will include a valve cycle test using at least 130 percent engine power level inlet pressures. No action is required on OV-099 for STS-6 based on valve acceptance test data and FRF performance. It is planned to replace the three flow control valves on OV-099 after STS-7. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-5-V-09		EPD
	GMT:		**SPR**	**UA**		**Manager:**
			IPR	**PR**		

Engineer:

Title: ESS 1BC "Audio Left" Circuit Breaker on Panel R15 (CB4) Found Open. (ORB)

Summary: DISCUSSION: During STS-5 the ESS (Essential Power Bus) 1BC "Audio Left" circuit breaker on panel R15 (CB4) was found tripped twice on orbit and a third time after landing. At the conclusion of extensive testing, no anomaly was found. Tests included measurement of DC resistances, current measurements using dummy loads, and operation under load. A two day continuous operation test at representative load was complete without repeating or identifying the problem.

Potential sources include: 1) Vibration due to entry, RCS firing, and/or physical contact. 2) Heat induced tripping due to a faulty breaker and/or ADS component. 3) Defective Wireless Crew Communications Unit (WCCU) and/or cables. This tripping circuit breaker is an intermittent, difficult to repeat problem that is probably unique to the ESS 1BC "Audio Left" components on OV-102. CONCLUSION: The ESS 1BS "Audio Left" CB4 tripped twice on orbit and a third time after landing. Potential sources of the anomaly include vibration, heating or a defective WCCU and/or cables. The cause of this intermittent CB tripping is unknown at this time. CORRECTIVE_ACTION: There is no known effect on OV-099. Fly as is for OV-099. Testing will continue, and if the breaker is found defective, it will be replaced on OV-102. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-5-V-10	ECLSS
	GMT:		**SPR** 05F018	**UA**	**Manager:**
			IPR	**PR**	

Engineer:

Title: Free Water Through Middeck Floor. (ORB)

Summary: DISCUSSION: During the STS-5 mission, the crew reported free water coming up through the middeck floor around the LiOH stowage access door. Additional inspection by the crew revealed the presence of water that had collected on the outside of some uninsulated interface sections of the cabin heat exchanger outlet air ducting. The crew also reported approximately 2 to 3 ounces of water inside the ducting downstream of the cabin heat exchanger. The water collection rate in the waste water tank was less than predicted when operating on separator B from launch to day three. Simultaneous operation of separators A and B resulted in a significant increase in subsequent waste water collection rate. Separator B was turned off and separator A remained on for the remainder of the mission. Waste water collection with separator A operating was close to predicted during the fourth sleep period, but was significantly lower during the fifth sleep cycle, suggesting possible degradation in separator A performance.

Degraded performance of the water separator package or cabin heat exchanger slurper is suspected. Postflight air flow checks were conducted on the water separator at KSC. The air flow rates were approximately 22 to 23 lbs/hr for separators A and B, indicating a restriction in either the cabin heat exchanger or water separator package. Specification flow rates are 37 lbs/hr minimum and preflight flow rates were about 51 lbs/hr for each separator. CONCLUSION: The water discovered in the cabin and ducting during STS-5 was probably cause by a partially plugged slurper section in the cabin heat exchanger or a restriction in the water separator package. Condensation may have also occurred on the uninsulated duct surfaces. CORRECTIVE_ACTION: The water separator package was removed from OV-102 and sent to the vendor for evaluation. Contamination (lint and debris) was found in both separators. Separator B contained a greater degree of contamination than Separator A. An air flow test of the slurper was performed on OV-099 prior to STS-6, and will be repeated prior to STS-7 and 8 to verify proper air flow. Final corrective action for the program will be tracked on CAR 05F018. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-5-V-11		C&T
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: Wireless Crew Communications Units (WCCU's) A and B Inoperative. (ORB)
<u>Summary:</U> DISCUSSION: The commander's set failed completely and was confirmed as a hard short circuit in the leg unit which blew battery fuses. The short was traced to a commercial transceiver board but the short cleared before a specific failed component or conductive debris was found. All components likely to exhibit this problem were replaced. Complete ATP was run successfully.

The pilot's set got progressively noisier and new batteries did not correct the problem. Postflight troubleshooting configured the set as used in flight and the comm quality was evaluated. No abnormal noise was heard even with the units in two separate rooms one floor apart. Complete ATP was run with no failure. The leg unit receiver squelch point showed a slight change downward. The units were powered up and operated on 18 hour cycles. One instance of low modulation occurred on the wall unit transmitter. This is the same unit that operated intermittently on STS-4 and postflight testing could not identify the problem. A thermal cycle test is being set up to induce a recurrence of the failure. CONCLUSION: Commander's Set - A hard short of undetermined source occurred on the transceiver board in the leg unit. Pilot's Set - A possible intermittent occurred in wall unit transmitter. CORRECTIVE_ACTION: Commander's Set - Since the source of the failure was off-the-shelf commercial hardware on the transceiver board and the failed component was not identified, all components likely to exhibit the problem were replaced. Pilot's Set - Tests of STS-5 units will continue; the backup pilot's set will fly for STS-6. A spare unit will fly again on STS-6. Each unit will operate on a different frequency and units will be color coded with matching antennas. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-5-V-12	CREW
	GMT:		SPR	UA	Manager:
			IPR	PR	
					Engineer:

Title: Erratic Operation of Fan Motor In Allen's EV-2 Suit. (ORB)
<u>Summary:</U> DISCUSSION: The motor in mission specialist Joe Allen's extravehicular mobility unit (EMU) ran erratically. The problem was first noted during the preparation for the scheduled extravehicular activity (EVA), after the donning sequence and prior to initiating the three and a half hour prebreathe. The motor would start up, but never achieve normal operating speed. During operation the motor "labored" at low speed with some "surging". It appeared the fan would sometimes shut down by itself and other times run until the crew turned it off. Attempts to operate the motor with the power switch in the battery position were also unsuccessful. Post-landing tests at Dryden Flight Research Facility (DFRF) and at Johnson Space Center (JSC) confirmed the problem.

Troubleshooting at JSC isolated the problem within the motor assembly; and at the contractor's facility, more specifically to sensor no. 1 of the two Hall-effect sensors. The Hall-effect dc brushless motor used these two stationary sensors to sense the six magnetic poles of the rotor, as they pass by, to determine the rotor's orientation and then provide signals to a decoder that sequentially directs solid state switches to apply power to the windings of the motor's stator. In addition, sensor no. 1 provides the input signal to the speed control circuitry. Failure analysis showed the voltage null point had shifted on sensor no. 1, with the result that the stator windings were receiving signals at the wrong time and for the wrong duration. Moisture, in sufficient quantity to form an electrolyte on the sensor's active element (an indium arsenide chip) and in the presence of an electric current, had resulted in copper from the sensor lead wires being plated on the indium arsenide, and some arsenic depletion, causing the device to become electrically unsymetrical, and thus shifting the voltage null point. The actual moisture intrusion path has not been determined. Although the most credible time of intrusion would be during motor operation in the moist oxygen environment, the sensor manufacturing and assembly processes should prevent moisture inclusion. Better sealing methods should provide protection against moisture intrusion during use. Flight unit selection will include consideration of time history of operation, standby, and storage in moist and dry environments. The fan motors selected for flight on STS-6 operated without a problem during the extensive EVA operations conducted by the two STS-6 mission specialists. CONCLUSION: 1. Problem was caused by a change in the electrical characteristics of Hall-effect sensor no. 1 which resulted in erratic operation of the motor. 2. The change within the Hall-effect sensor was cuased by the presence of moisture, which when combined with electrical potential and copper leads, resulted in small copper deposits on the indium arsenide sensor element and some depletion of the arsenic. 3. The exact method of how moisture enters the sensor has not been determined but the sensor sealing method requires improvement. CORRECTIVE_ACTION: 1. Testing of motors with low exposure to moisture is included with the normal flow sequence for the STS-6 EMU's. 2. An improved sealing technique is being evaluated for the Hall-effect sensors. 3. A more positive "in-motor" means of determining proper motor operation and sensor degradation is being developed. 4. EMU checkout including motor operation was performed the day before the scheduled EVA's on STS-6. 5. Testing is being performed in relation to how moisture gets to the sensor. 6. Possible motor circuit modification to be more tolerant of sensor shifts is being evaluated. EFFECTS_ON_SUBSEQUENT_MISSIONS: Flight motors for STS-7 and subsequent missions will be selected on the basis of time

history of operations, standby and storage in moist and dry environments similar to the STS-6 selection until test results and design improvements provide a better method for selection.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA	STS-5-V-13	C&T
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: EVA UHF Comm Not Keying On Uplink Audio. (ORB)

Summary: DISCUSSION: During EVA preparation, the ground audio uplink did not key the orbiter UHF transceiver. When the UHF transceiver is in the EVA mode, a vox circuit is enabled to allow relay of voice from the NSP (network signal processor) to the EVA crewmen. Signal strength measurements indicated the vox was not keying reliably when the ground was talking to the spacecraft. The crewmen were not aware of this anomaly because the SCU's were still connected providing them with a second path for uplink voice.

A test was performed at Dryden via Buckhorn S-band to repeat the on-orbit configuration. The results were that the on-board crewman could vox the transmitter but that the S-band uplink would not. All redundant on-board LRU's in this path were tried with the same results. Testing in the ESTL to determine the actual interface levels presented to the UHF transceiver indicated that the S-band was 5 DB lower than voice from on-board stations. CONCLUSION: The voice level from the S-band was below the vox threshold of the UHF transceiver, resulting in unreliable vox operation. The low level was due to operating the delta modulators below the maximum level to enhance voice quality. CORRECTIVE_ACTION: The sensitivity of the vox circuit will be increased to accept a wider range of input signal levels. A spec change for the UHF transceiver has been authorized to modify all flight units. A modified unit will be installed for STS-6. This unit will be delivered to KSC prior to 01/01/83. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA	STS-5-V-14	DPS - MMU
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: EMU (Extravehicular Mobility Unit) No. 1 suit pressure regulator at 3.8 psig instead of planned 4.3 psig. (ORB)

Summary: DISCUSSION: The EMU problem was first observed while pressurizing the unit for a leakage check. The crew reported that the EMU pressure stabilized at

approximately 3.8 psig compared with the desired 4.3 +- 0.1 psig. There is a dual mode regulator providing 0.5 psig in the intra-vehicular (IV) mode used during prebreathe and other airlock operations, and the full 4.3 psig in the extravehicular (EVA) mode. In-flight investigation included cycling the regulator between these two operating modes and fully stroking the regulator mechanism during the depressurization of the airlock to 9 psia. None of these steps had any effect on the 3.8 psig extravehicular operating procedure.

After verifying the problem at Dryden, the EMU was returned to JSC where troubleshooting isolated the problem to the dual mode regulator. A series of troubleshooting steps was then performed which resulted in isolation of the failure condition. The regulator was returned to the vendor where it was determined that the threaded lower spring adjusting ring within the regulator housing had "backed off" its preflight factory adjustment. This "backing off" occurred because two Kel-F locking inserts, which are designed to prevent rotation of the lower spring adjusting ring, were ommitted during assembly of the regulator prior to STS-5. The upper spring adjusting ring was properly secured. The regulator, S/N 110, was acceptance tested at the vendor in July of 1982; it was assembled into PLSS S/N 1006 in August 1982 and acceptance tested as part of the PLSS in September of 1982 at the Johnson Space Center. It went through two manned vacuum chamber runs and preflight testing prior to the STS-5 mission. Checks of the regulato made prior to launch indicated proper adjustment and operation of the regulator. Postflight evaluation indicated that assembly and test procedures did not assure proper regulator spring adjustment for flight. The unrestrained adjusting ring most probably "backed off" during launch vibration, resulting in stable regulation at 3.8 psig. CONCLUSION: The regulator shift was caused by improper assembly and the "backing off" of the regulator lower adjusting ring due to the omission of the Kel-F lock inserts. "Backing off" of the lower adjuusting ring most likely occured during launch vibration. CORRECTIVE ACTION: Correct assembly drawings, correct and clarify assembly and assembly inspection procedures, including dimensional analyses for proper assembly and adjustment. Some in-process tests are expected to be added to the procedure, including the addition of a torque test to assure maintenance of adjustment, a load stroke test to insure springs are working as desired, and a documented pressure test at KSC prior to launch for regulator IV and PRESS/EVA pressures. JSC will send quality personnel to the vendor facility to witness the assembly and acceptance testing of the regulators to be used on STS-6. Rework existing regulators as required. EFFECT ON SUBSEQUENT MISSIONS: none

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Tracking No	**Time**	**Classification**		**Documentation**		**Subsystem**
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-5-V-15		D&C
	GMT:		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Aft Mission and Event Timers Inoperative. (ORB)

Summary: DISCUSSION: During STS-5, the crew reported that the aft mission and event timers were inoperative. Testing at KSC determined that a short within the lighting circuit for the aft mission and event timers caused a fuse to blow resulting in the anomaly.

Both timers and the panel itself have been checked and no shorts found. Vehicle testing will have to wait until system checkout after OV-102 power up. The aft mission and event timers on OV-099 operated properly during STS-6. CONCLUSION: A short in the lighting circuit for the aft mission and event timers caused a fuse to blow. Since the timers and the panel were checked with negative results; the short, if found, may be in the OV-102 wiring. CORRECTIVE_ACTION: At the next power up of OV-102, the vehicle wiring will be checked for a possible short, and the wiring replaced if necessary. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification		Documentation	Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-5-V-16	Galley
	GMT:		SPR	UA	Manager:
			IPR	PR	
					Engineer:

Title: The OWDA (Orbiter Water Dispenser Assembly) Failed to Dispense Water in Either Automatic or Manual Bypass Mode. (ORB)

Summary: DISCUSSION: Postflight testing of unit demonstrated that the rehydration port (needle) was plugged with a core from the food package septum. This core resulted from the food package being improperly seated in the package holder in the OWDA.

CONCLUSION: To preclude recurrence, a hold-down device for the food package is required. In the event the needle should become damaged or otherwise inoperable, a replaceable needle should be incorporated. CORRECTIVE_ACTION: A hold-down device for the food package will be provided and a replaceable needle will be added for STS-6 and subsequent. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification		Documentation	Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-5-V-17	EPD
	GMT:		SPR	UA	Manager:
			IPR	PR	
					Engineer:

Title: Forward Port and Starboard Payload Bay Lights Inoperative (ORB)

Summary: DISCUSSION: During STS-5, the crew reported that the forward port and starboard payload bay lights were inoperative. Testing at KSC determined that the forward port light had failed and that the forward starboard light was operating. All seven payload bay floodlights and the forward starboard light electronics assembly were returned to the manufacturer for additional analysis.

The manufacturer determined that both the forward port and starboard lights were failed and that all other lights and the electronics were working satisfactorily. The forward starboard light failure was not detected at KSC because the crack was not large and it took repeated starts at the manufacturer before the light failed. CONCLUSION: The light failures were the results of the cracked lamps caused by thermal and vibration stress at the anode end of the lamp. CORRECTIVE_ACTION: All lights in the payload bay on OV-099 have been modified to reduce anode heating and the lamp mountings have been redesigned to reduce vibration stress. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-5-V-18	RCS
	GMT:		SPR	UA	Manager:
			IPR	PR	
					Engineer:

Title: OV-102 Primary Thruster F4D Failed-Off. (ORB)

Summary: DISCUSSION: On mission day 4, a fault message was received that F4D had failed-off and was therefore deselected. This means that the thruster had no indicated chamber pressure for three consecutive pulses or for 240 milliseconds continuous. Examination of flight data shows no chamber pressure for three pulses and a cool-down on the fuel leak detector, indicating fuel cold flow. Apparently the oxidizer valve did not respond or did not receive the open commands.

Testing of the control circuits at KSC did not repeat the problem. The RJD and the thruster have been removed for failure analysis. Analysis of the RJD did not reveal the source of the problem. Thruster failure analysis remains to be completed. CONCLUSION: Troubleshooting to date has not determined the source of the problem. CORRECTIVE_ACTION: No corrective action is required for OV-099. All OV-099 thruster valves were pulse tested in the OPF (Orbiter Processing Facility) prior to STS-6 and worked properly during the mission. EFFECTS_ON_SUBSEQUENT_MISSIONS: None expected.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-5-V-19	EPD
	GMT:		SPR 05F017	UA	Manager:
			IPR	PR	
					Engineer:

Title: Ac 1 Phase B Inverter Disconnected From The Ac 1 Bus. (ORB)

Summary: DISCUSSION: Ac 1 phase B inverter disconnected from the ac bus during the payload bay door "close" operations on entry day. Ac 1 phase B voltage and current data during the disconnect was reviewed and indicated that it was a false overload trip. The auto trip function for the ac sensor for ac 1 was disabled and the

inverter was reconnected to the bus for entry. During entry, another overload caution and warning indication occurred however none of the ac 1 loads were affected. Postflight data review of ac 1 phase B voltage and current again indicated a false overload indication during entry.

KSC monitored the overload command line from the inverter to the ac sensor until vehicle powerdown and the problem did not reoccur. The inverter and the ICDA (Inverter Current Detector Assembly) were returned to the vendor for failure analysis and the problem could not be repeated. CONCLUSION: The problem is most likely an intermittent problem within the ac 1 ac sensor or the phase B inverter overload circuit. The problem is not considered generic due to the large number of hours of operation of this equipment on OV-101, OV-102, and OV-099. CORRECTIVE_ACTION: If the problem should occur on STS-7, the auto trip function for the circuit can be disabled as was done on STS-5. Suspect components in the inverter and ICDA will be changed out and LRU's will be returned to flight usage. Failure analysis of the suspect components within the LRU's will continue and the problem will be tracked on CAR 05F017. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-5-V-20		ECLSS
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: High O2 Flow During Transition From N2 to O2 Flow. (ORB)

Summary: DISCUSSION: While operating with the pressure control system (PCS) 1, a high O2 flow condition exceeding 5 lbs/hr occurred during switchover from N2 to O2 flow and caused both the master alarm and FDA (Fault Detection Annunciation) alerts at various times during the mission. These alarms did not occur while operating on PCS2. The FDA delay was changed during the flight from 2 seconds to 15 seconds, but this action was ineffective since some transients exceeded 15 seconds. The N2/O2 control panel was removed from OV-102 and returned to the vendor for hardware evaluation.

The high O2 flow during switchover from N2 to O2 flow was repeated during vendor testing. The anomaly was isolated to the 8 psia regulator on system 1. Flow was restricted across the orifice between the high flow regulator damper chamber and the poppet assembly during transition from 200 psig to 100 psig (switchover). The source of the restriction is believed to be contamination in the orifice/screen assembly, although the contamination was lost during the disassembly. When the regulator was reassembled, it retested within the specification limits, and the high flow during switchover from N2 to O2 did not recur. CONCLUSION: The high O2 flow during switchover from N2 to O2 flow was caused by restricted orifice flow between the high flow regulator damper chamber and the poppet assembly. The restricted orifice flow is believed to be the result of contamination between the orifice and one of the two protective filters. CORRECTIVE_ACTION: The acceptance test procedure (ATP's) for the 8 psia and 14.7 psia regulator will be revised to add a flow test on the damper chamber orifices during component level testing. The ATP on the O2/N2 control panel will be revised to add a switchover test at the vendor prior to delivery of the hardware. A switchover test will be performed on OV-103. EFFECTS_ON_SUBSEQUENT_MISSIONS: If high O2 flow occurs during STS-6, the crew can inhibit the high O2 flow caution and warning and FDA alerts. Backup

instrumentation, i.e., cabin pressure and PPO2 are available to monitor performance.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-5-V-21		C&T
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: Radar Altimeter No. 1 False Lock-On. (ORB)

Summary: DISCUSSION: The no. 1 radar altimeter experienced a false lock-on during STS-5. Data indicated that during ascent, on-orbit OPS-8, and entry phases of the mission radar altimeter 1 indicated a lock-on at approximately 8 feet. This altitude value remained until the vehicle reached 43 feet during landing at which time no. 1 began to track properly. No. 2 altimeter performance was nominal throughout the mission.

Three days prior to STS-5 launch, no. 1 radar altimeter had been replaced due to a self-test problem. The normal zero-altitude calibration was made on the new unit and apparently the technician accidentally turned an ususd analog adjustment in addition to the proper digital output adjustment. This increased the low-altitude gain of the receiver to the extent that the false lock-on occurred from the leakage between antennas. Postflight tests on the vehicle have verified that the analog output was badly misadjusted. Further testing duplicated the flight problem at which time the adjustment was properly made. Normal operation was restored. CONCLUSION: The analog output adjustment on radar altimeter no. 1, was improperly set after installation just prior to launch. This increased the low-altitude gain of the receiver causing a false lock-on during flight. CORRECTIVE_ACTION: A new procedure is being isued to verify proper analog adjustment after each unit is installed. The altimeter adjustments on OV-099 will be properly verified prior to flight. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-5-V-22		MECH
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: Left Main Gear Inboard Wheel Locked Up During Landing. (ORB)

Summary: DISCUSSION: During the last 60 ft of landing roll the LHIB (left hand inboard) wheel locked up for about 50 ft and then rolled free for the remaining 9 ft. Subsequent brake inspection revealed that the no. 3 stator on the LHIB brake was broken into 3 small and one large segments. The adjacent rotors and the no. 2 stator were also damaged.

The exact sequence of events causing the failure is uncertain but relative deflection between the axle/wheel and the brake torque tube has been shown to be the major cause of the failure. This relative deflection results in several conditions which attribute to the failure: 1) the outboard stators and rotors absorb higher braking energy than the inboard elements, 2) the outboard stators and rotors rub and are loaded against the wheel and torque tube respectively, 3) the outboard rotors experienced excursions inboard and outboard along the wheel splines. These deflection induced effects were negated in a recent laboratory test of the wheel/brake assembly by incorporating a saddle (or spacer) between the axle and torque tube and using a stiffer axle. The tests were performed using STS-5 unfailed brake components, and a similar braking schedule as the failed brake from STS-5. There was no evidence of a strength related failure of the brake. In addition to the deflection induced problems, the braking profile experienced on STS-5 contributed to the failure. The brake application at high velocity and longer rollout/braking time enabled the higher stress region of the stator (near the splines) to reach very high temperatures (approximately 1600? F) while still under load. Berylium carbide build up was found on the heat sinks of the failed brake and other unfailed brakes. This does not appear to be a cause of the failure but is an indication of higher temperature regions or hot spots on the brakes. Hard braking followed immediately by moderate braking until stopped results in a shorter stop time from initial brake application until stop. This braking profile keeps the berylium from getting hot while under load due to heat soak back in areas where the stator failed on STS-5. Qualification testing and STS-6 braking results substantiated this technique. CONCLUSION: Landing loads during rollout produce relative deflections of the wheel, brake and axle resulting in damage to the stators and rotors. Brake application at high velocity and longer rollout/braking time resulted in loads at reduced strength. Tests demonstrate that for reduced deflections and different brake profiles the brake performance meets the energy specification. Near normal braking requirements were met on STS-6. CORRECTIVE_ACTION: The saddles installed for STS-6 sufficiently reduced the adverse deflections between brake components. Crew procedures have been revised to repeat the STS-5 DTO [hard braking starting at 140 knots down to 80 knots as on STS-5 followed immediately by moderate braking (4 to 8 ft/sec?) until stopped]. This prodedure was successfully accomplished on STS-6. EFFECTS_ON_SUBSEQUENT_MISSIONS: Less brake damage should be found on subsequent missions. All brakes will be inspected for evidence of failure, yielding, hot spots, galling, bending or scraping after STS-7.

Tracking No	**Time**	**Classification**		**Documentation**		**Subsystem**
MER - 0	**MET:**	Problem	**FIAR**	**IFA**	STS-5-V-23	OMS
	GMT:		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Right OMS Nozzle Coating Damaged. (ORB)

Summary: DISCUSSION: The right OV-102 OMS nozzle was found to have some coating damage following STS-5. Initially, it was thought that the damage was due to scratches on the nozzle. Later evidence showed the damage to be due to localized buckling. The nozzle from STS-5 was removed and examined and found to have several areas where the coating was separated and spalled off. There were two small cracks in parent metal along the midweld. Examination of coating damage verified engine firings indicating damage took place early in mission. Special cameras were installed for STS-6 launch and the films revealed nozzle distortion during main engine ramp up. Examination of the STS-6 OMS right-hand nozzle revealed slight buckling in one area and slight coating damage at the midweld. There were no cracks in the STS-6

nozzles.

CONCLUSION: The OMS nozzle is experiencing an environment that is greater than that for which it was designed. The OV-102 right-hand nozzle was successfully flown for five missions. The right-hand nozzle for 102 performed satisfactorily after sustaining damage during STS-5. The right-hand nozzle for OV-099 performed satisfactorily after slight damage during STS-6, and is acceptable for use on STS-7. CORRECTIVE_ACTION: The OMS nozzles will be thoroughly inspected following each flight and evaluated for acceptability for the next flight. The design of the OMS nozzle is also being changed to increase the thickness in the affected area from 0.018 to 0.034-in. EFFECTS_ON_SUBSEQUENT_MISSIONS: None. Future flights may require nozzle change out and use of spare nozzles until the redesigned nozzle becomes available.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-5-V-24		C&T
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: Monitor Display of VTR Playback Out of Sync. (ORB)

Summary: DISCUSSION: The STS-5 crew reported at the postflight debriefing that the onboard TV monitor display of the VTR playback had improper horizontal sync. The problem appears to be a sync signal incompatibility between the VTR playback and the onboard CCTV console monitor (TVM) display. The play-back scene is visible but not properly displayed. The STS-5 TVM/VTR configuration loops the input to the VTR through the TVM. Testing indicates the removal of the TVM input lines to the VTR during playback eliminates the problem. Further investigation is continuing to identify specifically which unit(s) should be modified.

This is not a problem for the OV-099 VTR configuration. The VTR on OV-099 does not interface directly with the TVM--the VTR video input output interfaces are with the CCTV VSU (video switching unit). Thus, there is no problem on STS-6 through STS-8. The next known mission that will employ the STS-5 TVM/VTR configuration is for OAST-1 on STS-14. The STS-9 (Spacelab 1) OV-102 configuration has not yet been finalized. CONCLUSION: A sync signal incompatibility probably exists between the VTR playback the onboard CCTV console monitor (TVM) display when the input to the VTR is looped through the monitor on the STS-5 configuration. CORRECTIVE_ACTION: Use the hardware as is for OV-099 where the VTR does not interface directly with the TVM. Continue to pursue identification of hardware modifications to the TVM and/or VTR for playback compatibility in the STS-5 TVM/VTR configuration. EFFECTS_ON_SUBSEQUENT_MISSIONS: No effect for OV-099 TVM/VTR configuration. STS-14 is the first known mission which uses the STS-5 TVM/VTR configuration.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-5-V-25		CREW
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: The Port Side EMU Lights Did Not Function Properly. (ORB)

Summary: DISCUSSION: The crew reported that two batteries stored in the batter conditioner failed the conditioner test and that subsequently two other batteries stored in the conditioner passed the conditioner test but after a time delay. It was also reported that the two cells which passed the conditioner test after the time delay were installed in the port side of the EMU light assembly, became bright for a short time, and then decayed. Batteries from stowage were installed in the starboard side of the EMU light assembly and the lights worked properly. When the battery conditioner senses nominal voltage on a battery, it lights a green light. If in the connditioning process, the battery does not achieve nominal voltage a timer completes the conditioning period (6 minutes) and lights the same green light. Crew procedures require another attempt if the conditioner timed out and if the green light is not lit quickly during the second attempt, reject the battery. It is concluded that two of the batteries timed out twice and were placed in the EVA lights and failed and that the other two cells were discharged to the point that they could not light the green lights during the conditioning attempt. It has been determined that the battery conditioner, which is used to remove a passivation layer (lithium choloride) from the batteries imposed a 20 milliamp load on the batteries while they were stored in the conditioner, which resulted in the batteries being discharged. It has been determined that the passivation layer problem is no longer of concern and therefore the battery conditioner is not required.

CONCLUSION: The battery conditioner discharged the battery cells which were stored in it. CORRECTIVE_ACTION: Delete the battery conditioner and tape battery terminals during storage conditions to protect against inadvertant battery discharge. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.