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

STS - 7, OV - 99, Challenger (9) **Time:04:30:PM**

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Prelaunch	Problem	**FIAR**	**IFA** STS-7-V-01	MPS
	GMT: Prelaunch		**SPR** 07F003	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: MPS LH2 High-Point Bleed Disconnect Leaked During ET Propellant Servicing (ORB)

Summary: DISCUSSION: During ET LH2 propellant servicing a leak was noted in the T-0 umbilical. The leak went above the 3.6% redline value. Therefore, a stop flow and revert was initiated. The leak persisted when flow was reinstated. A test was conducted to isolate the leak. It was found that when the high-point bleed valve was closed the leak diminished to below 1% at the T-0 umbilical. This verified that the leak was in the 1.5-inch LH2 bleed disconnect located at the T-0 umbilical. Propellant servicing continued by cycling the high-point bleed valve to a closed position when the leak at the umbilical reached 36,000 ppm. The high-point bleed valve was maintained in the closed position until the manifold pressure started to rise due to the gas bubble. Then the valve was opened to bleed the gas bubble until the disconnect leakage again went to redline. After several cycles of the high-point bleed valve each cycle resulted in a longer open time until the valve was eventually left open all the time with the disconnect leakage staying below 1%.

Postflight the ground half of the disconnect and the interface seal on the flight half were removed from the T-0 umbilical, replaced and returned to the contractor for failure analysis. CONCLUSION: The 1.5-inch LH2 high-point bleed disconnect at the T-0 umbilical leaked during ET LH2 propellant servicing. Disconnect leakage decreassed to an acceptable level after several cycles of the high-point bleed valve. CORRECTIVE_ACTION: The ground half of the MPS LH2 high-point bleed disconnect and the interface seal on the flight half were removed from the T-0 umbilical, replaced for STS-8 and returned to the contractor for test and analysis. Failure analysis will be tracked on CAR 07F003. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:00:05	Problem	**FIAR**	**IFA** STS-7-V-02	INS
	GMT: 169:11:38		**SPR**	**UA**	**Manager:**
			IPR	**PR**	

Engineer:

Title: Operational Instrumentation Failures (ORB)

Summary: DISCUSSION: A. The freon coolant loop (FCL) 2 coldplate network flowrate (V63R1305A) failed off-scale low at 169:11:32:59 G.m.t. (T-1 sec). KSC replaced a blown fuse and the measurement is now operational. Freon coolant loop 1 flowrate (V63R1105A) was used to assess coolant flow through the aft avionics bays during the flight, but that measurement is inoperative at the present time. A spare sensor is available for replacement, if required.

B. The MPS engine 3 GH2 outlet pressure (V41P1360A) failed off-scale high at 169:11:38 G.m.t. (T+345 sec). The failed sensor was replaced. This is the first failure for this measurement. The installation of the redesigned GH2 flow control valves (MCR 7310) will relocate this sensor and add line brackets to reduce the vibration environment. The sensor was operational during STS-7 for a sufficient time period to determine the operational status of the flow control valve. C. The MPS engine 2 GH2 outlet pressure (V41P1260A) failed off-scale high at 169:11:40 G.m.t. (T+443 sec). The failed sensor was replaced. This sensor failed on STS-1 and -2 and was relocated for STS-3. It also failed on STS-6. The excessive vibration environment in addition to the higher thrust levels is causing fatigue-induced breakage of the 0.007-inch diameter gold leads of the sensing element. The installation of the redesigned GH2 flow control valves (MCR 7310) will relocate this sensor and add line brackets to reduce the vibration environment. The sensor was operational on STS-7 for a sufficient time period to determine the operational status of the flow control valve. D. The APU 1 turbine exhaust gas temperature 1 (V46T0142A) dropped from 800 deg F to 74 deg F for 4 minuts at 169:11:46 G.m.t. and returned to normal. The redundant measurement, APU 1 turbine exhaust gas temperature 2 (V46T0140A), is available to the crew and ground personnel for display and monitoring. One of the 2 measurements is required for launch. The failed sensor was removed and replaced for STS-8. E. The right OMS pod fuel tank temperature (V43T5315A) dropped to 32 deg F for 2 data samples, then returned to normal (80 deg F) during prelaunch at 169:08:04 G.m.t. Either this measurement or the right OMS pod oxidizer tank temperature (V43T5215A) is required for launch. To prevent a launch delay, OMS pod tank temperatures can be determined from the right RCS oxygen and fuel tank temperatures. Launch redlines will be changed to add the use of the RCS measurements as backup. This measurement is inaccessible for troubleshooting until the OMS pod is removed. The fix is deferred. Fly as is. F. The external tank (ET) LH2 ullage pressure stuck at 33 psia from T+122 to T+338 seconds causing the GH2 flow control valve to remain closed and resulted in the ullage pressure dropping below the control band for 20 seconds. The Orbiter interface and electronics check out showed good circuits. The cause is believed to be a sticky ET sensor. New ET sensors are supplied with each new ET. The Orbiter signal conditioner will be removed and replaced prior to STS-8. G. The APU 2 gearbox bearing temperature 2 (V46T0262A) failed off-scale low at landing 175:14:02:53 (G.m.t.). A redundant measurement, APU 2 gearbox bearing temperature 1 (V46T0261A), is available to the crew and ground personnel for display and monitoring. One of the 2 measurements is required for launch. The failure was isolated to the splice terminal board and was due to a loose lug. The repair has been completed. H. The APU 3 gearbox lube oil temperature (V46T0354A) lagged the APU 3 gearbox lube oil return temperature (V46T0350A) by 25 deg F during APU startups until nominal run temperatures were reached. This condition was observed during ascent and entry. This measurement is a backup for APU 3 lube oil out pressure (V46P0353A) for launch. A faulty sensor lead wire has been repaired for STS-8. CONCLUSION: See above. CORRECTIVE_ACTION: See above. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:01:37	Problem	**FIAR**	**IFA** STS-7-V-03	PYLD
	GMT: 169:13:10		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Anik Sunshield Hung-up During Closure (ORB)

Summary: DISCUSSION: The crew reported a slight hesitation in travel of the TELESAT sunshield when it was first closed after the payload bay doors were opened. A smaller hesitation was noted during the subsequent closures. The hesitation did not prevent the sunshield from being fully closed or performing its function.

Postflight inspection found that a small Teflon rub strip which had been laced to one of the sunshield panels was pulled loose. This rub strip provides a low friction surface for ground operations should the adjacent panels of the sunshield contact one another during the open/close cycle. During closure one panel of the sunshield apparently caught on the rub strip at the point when a small gap existed for an access panel seam. It tore loose from the sunshield material and rolled up in a spiral fashion between the sunshield panels causing them to bind as they closed. CONCLUSION: The sunshield hesitation was caused by binding when a dislodged rub strip caught between adjacent panels during deployment. CORRECTIVE_ACTION: For STS-8 a single piece rub strip design will eliminate the gap at the access panel seam. The resulting elimination of the access area will be evaluated during STS-8 checkout flow. A final design fix will be implemented for future flights.
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:04:20	Problem	**FIAR**	**IFA** STS-7-V-04	ECLSS
	GMT: 169:15:53		**SPR** 06F006	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: High Oxygen Flow On Pressure Control System (PCS) 1 And 2 (ORB)

Summary: DISCUSSION: High oxygen flow occurred on PCS 1 and was coincident with a transition from nitrogen flow. Approximately two hours later a high oxygen flow occurred on PCS 2. Manual control of the ARPCS was used successfully.

The OV-103 oxygen/nitrogen control panel was flown on OV-099 for STS-7. It had never been screened for high flow problems. The OV-099 control panel was removed after STS-6 and has been returned to the vendor where testing continues. (See problem STS-6-11). CONCLUSION: The cause of the improper operation of the cabin pressure regulator on the oxygen/nitrogen control panel is unknown. Manual control procedures as used on STS-7 will be the primary mode of control on STS-8.

CORRECTIVE_ACTION: Testing of the OV-099 control panel at the vendor continues. This problem will be tracked on CAR 06F006. CAR ANALYSIS: High flow believed to be caused by the Aneroid Chamber acting as a resonator under certain flow conditions. The resultant standing waves caused the Aneroid Poppet to vibrate and float in its normal control position (to the point of drawing the high flow section open). The N2/O2 panel has been modified to remove the resonances. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:00:05	Problem	**FIAR**	**IFA** STS-7-V-05	GN&C
	GMT: 169:11:38		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Right Outboard Elevon Actuator Channel 4 Position (V58H9055A) Indicated A One-Time Deflection (ORB)

Summary: DISCUSSION: One time during ascent for a period of 1.5 minutes, the Operational Instrumentation (OI) Elevon Actuator position dropped from a value of +0.463 degree to off-scale low, then returned to normal.

The problem was not seen on the closed-loop GPC measurement. It was only present on the redundant OI measurement and the ACIP measurement which is pigtailed off of the wiring to the OI subsystem. The anomaly did not repeat during the flight, nor did it repeat during extensive troubleshooting at KSC. CONCLUSION: The cause of the data shift in the telemetry measurement of the right-hand outboard elevon position is unknown. CORRECTIVE_ACTION: NONE. Fly as is for STS-8. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:01:57	Problem	**FIAR**	**IFA** STS-7-V-06	HYD
	GMT: 169:13:30		**SPR** AC5702	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Hydraulic System 2 Accumulator Bootstrap Pressure Decay (ORB)

Summary: DISCUSSION: During prelaunch operations, the hydraulic system 2 bootstrap accumulator indicated a slow leak - 80 psi per day. At this leak rate only one accumulator pressure recharge would be necessary during the mission. Recharging could be done with the recirculation pump. However, on day one of the mission, the leak increased to 100 psi/hr. Low bootstrap pressure causes an FDA crew alert. Circulation pump 2 was operated during the first sleep period to maintain pressure. For the remainder of the flight, pressure was maintained by recharging the accumulator using the timer mode. For entry, circulation pump 2 was placed into continuous

operation so that sufficient suction pressure was available for APU and main hydraulic pump start-up. This resulted in nominal system operation during entry, landing and rollout.

A fluid leak is suspected through the unloader valve which is used to charge the accumulator. CONCLUSION: The hydraulic system 2 accumulator bootstrap pressure decayed prelaunch and the leak increased the first day in orbit. Probable cause of the pressure decay is a fluid leak through the unloader valve. CORRECTIVE_ACTION: The accumulator and the unloader valve for hydraulic system 2 have been removed and replaced. Both units have been returned to the contractor for failure analysis. This problem will be tracked on CAR AC5702. CAR ANALYSIS: Failure analysis indicates that the cause of failure is improper piston seal cure and/or cylinder bore finish is out-of-specification. It may be concluded that the anomaly is not a generic problem. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** 000:10:04	Problem	**FIAR**	**IFA** STS-7-V-07		GN&C
	GMT: 169:21:37		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: IMU 1 BITE Resolver Limit Threshold Exceeded At Attitude Of 120 Degrees (ORB)

Summary: DISCUSSION: Shortly after the STS-7 first satellite deployment, several IMU 1 BITE/T messages were received. Subsequent investigations revealed that the messages were triggered during the resolver limit determination for the outer roll axis. This was caused by the software algorithm that is used for the 1X-resolver-angle minus the whole-angle difference determination. The whole angle uses resolver offset compensation whereas the 1X angle is uncompensated. The compensation plus the harmonic error at a roll gimbal angle of about 120 degrees caused the limit to exceed the 1-degree threshold and produced the BITE/ messages. During the remainder of the mission, the IMU 1 BITE/T annunciation was masked using a software read/write procedure and IMU 1 performance was nominal.

The harmonic error in the roll axis at 120 degrees for IMU 1 is slightly higher than the error on the other IMU's used for OV-102 and OV-099, but there is no hardware problem. CONCLUSION: 1. The IMU 1 outer roll resolver limit threshold was exceeded because the software algorithm compared the 1X/8X resolver angles with the 8X offset compensation. 2. There is no problem with IMU 1 hardware. CORRECTIVE_ACTION: 1. As a temporary fix, software change request CR 59864 was approved to increase the resolver limit threshold to 1.5 degrees for STS-8 and subsequent vehicles. 2. A permanent fix (CR 59872) to remove the resolver offset from the software algorithm is being reviewed. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:04:20	Problem	**FIAR**	**IFA** STS-7-V-08	APU
	GMT: 169:15:53		**SPR** 07F005	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: APU 2 Fuel Service Line Temperature Fell Below Lower FDA Limit On Orbit (ORB)

Summary: DISCUSSION: At approximately 169:15:53 G.m.t. the APU 2 fuel service line temperature (V46T0283A) dropped below the lower FDA limit of 42 deg F. The crew switched from APU 2 heater system B to system A and proper thermal operation was reestablished.

Postflight testing isolated the problem to the APU 2 heater system B thermal switch (S26B). The switch was removed, replaced and sent to the vendor for failure analysis. CONCLUSION: A failed thermal switch in APU 2 heater system B allowed the APU 2 fuel service line temperature to drop below the lower FDA limit. CORRECTIVE_ACTION: The APU heater system B thermal switch was removed and replaced. Failure analysis for the thermal switch will be tracked on CAR 07F005. CAR ANALYSIS: Failure analysis didn't identify a cause of failure. What it did identify was the inability of low voltage signals (as in this application) to break down a thin film on the contacts (the amount of silicon found on the contacts was not enough to cause a failure). The failure rate of these switches has been determined to be .98% and no changes are planned. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:10:27	Problem	**FIAR**	**IFA** STS-7-V-09	APU
	GMT: 169:22:00		**SPR** AC5531	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: APU 2 and 3 Seal Cavity Drain Leaks (ORB)

Summary: DISCUSSION: Although the APU 2 and 3 seal cavity drains leaked during the flight, no leak was large enough to cause any concern for APU operation. Flight data indicated that the APU 3 seal cavity drain pressure dropped to 4-psia prior to the day-5 on-orbit check out and APU 2 had fallen to 1 psia.

Postflight, all 3 APU seal cavities were leak checked and no leaks were found. Should small leaks recur, they would not be harmful to APU operation. However, if the seal cavity drain pressure leaks to 0 psia and a significant fuel leak occurs, freezing and blocking of the drain line is possible. CONCLUSION: The APU 2 and 3 seal cavity drain leaks were not large enough to cause concern for APU operations. No leaks were found, postflight, during seal cavity leak checks on all 3 APU's. CORRECTIVE_ACTION: All 3 APU's have been leak checked and are ready for flight. This problem will be tracked on CAR AC5531. See problem STS-6-13. CAR

ANALYSIS: Unable to duplicate APU 2/3 seal cavity drain leaks post-flight. However, the APU-3 seal cavity drain line relief valve cracking pressure was measured to be high (24 psig measured vs. 15 plus 4, minus 2 psig allowable). An explanation for the higher cracking pressure was provided but did not relate to the flight problem. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:03:18	Problem	**FIAR**	**IFA** STS-7-V-10	OMS
	GMT: 169:14:51		**SPR** 07F025	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: L OMS Heaters, Fuel Cross Feed High Point Bleed Line Heater, System A, Failed And Oxygen Low Point Drain Line Heater, System B, Was Erratic (ORB)

Summary: DISCUSSION: The left OMS fuel cross feed high point bleed line heater, system A, dropped to the lower FDA limit of 50 deg F as measured on V43T6238A. The crew switched to heater system B and the temperature cycled normally. The minimum FDA limit was reduced from 50 deg F to 41 deg F and the crew switched back to heater system A. Monitoring of heater system A verified that the fuel cross feed high point bleed line heater had failed. Heater system B was then successfully utilized for the remainder of the mission. Postflight testing revealed a failed system A heater thermostat. The thermostat (S1101) was removed, replaced and returned to the contractor for failure analysis.

The left OMS oxygen low point drain line heater, system B, as measured on V43T6236A shifted control ranges several times during the mission. The heater control range shifts were from 68 - 82 deg F to 63 - 85 deg F. Except for the random heater control range shifts the heater operated satisfactorily during the mission. The shifts in heater control ranges were all within the FDA limits. Postflight testing was not conducted on this heater thermostat. CONCLUSION: The left OMS fuel cross feed high point bleed line heater thermostat, system B, failed. The left OMS oxygen low point drain line heater thermostat, system B, shifted control ranges during the mission with no adverse effects on heater performance. CORRECTIVE_ACTION: The left OMS fuel cross feed high point bleed line heater thermostat, system A, was removed and replaced. Failure analysis for the thermostat will be tracked on CAR 07F025. The left OMS oxygen low point drain line heater thermostat, system B, will be flown as is and monitored for performance. CAR ANALYSIS: Failure has been isolated to a thermal switch. Suspected cause is a thin film of silicon built up on the contacts and the signal strength not being able to break down the film. Failure analysis is not complete. This is the second reported incidence of a switch failure of this type (see Flight Anomaly 6-18). [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:03:03	Problem	**FIAR**	**IFA** STS-7-V-11	C&T
	GMT: 169:14:36		**SPR**	**UA**	**Manager:**
			IPR	**PR**	

Engineer:

Title: OPS 1 Recorder Rewind Caused Interference On OPS 2 Recorder Playback (ORB)

Summary: DISCUSSION: At about 169:14:36 G.m.t., the OPS 1 recorder, during rewind operations, interferred with OPS 2 recorder data playback. The OPS 1 recorder rewind operation was stopped and normal OPS 2 recorder playback continued. There was minimal impact on the recorder operationsons for the remainder of the flight.

Postflight, the OPS 1 recorder was verified to be sending actual data (not noise) during rewind. Also both line driver circuits (FM signal processor and T-zero umbilical) were active during rewind. Thus both OPS 1 and OPS 2 recorders were sending data simultaneously to the single communications channel that is available for recorder dump. This indicates that the serial data inhibit circuit for the OPS 1 recorder rewind operation either has failed or was not incorporated. The inhibit feature was not verified during vendor acceptance test; nor was it checked at KSC after installation. Since loss of the rewind feature during OPS 2 recorder dump has only minor impact on recorder operations, the OPS 1 recorder, serial number 14, is usable as is for flight. CONCLUSION: A modification to inhibit serial data output during OPS 1 recorder rewind was either not implemented or the circuit failed. Failure of the circuit or the absence of the inhibit signal does not cause loss of data if the OPS 1 recorder rewind operation is not used during an OPS 2 recorder dump. CORRECTIVE_ACTION: The OPS 1 recorder (S/N 14) will be flown as is for STS-8. The recorder will not be rewound simultaneous with OPS 2 recorder playback. The recorder data output inhibit feature, during rewind operations, will be verified at the factory during future recorder acceptance tests. The interference during playback will be investigated and corrected on the S/N 14 recorder when the recorder is returned to the vendor after STS-8. EFFECTS_ON_SUBSEQUENT_MISSIONS: Loss of the rewind feature has only minor impact on recorder operations since the only purpose is to allow repositioning of the OPS 1 recorder while dumping the OPS 2 recorder. This can be accomplished by stored program command while the spacecraft is not over a telemetry site.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 002:08:04	Problem	**FIAR**	**IFA** STS-7-V-12	DPS
	GMT: 171:19:37		**SPR** 07F009	**UA**	**Manager:**
			IPR	**PR**	

Engineer:

Title: CRT 3 Failed And Did Not Respond To On-Orbit Testing. (ORB)

Summary: DISCUSSION: On day three of the mission, CRT (Cathode Ray Tube) 3 went blank. The crew cycled input power and performed the stand-alone self test, but could not isolate the failure to the LRU level. The other two forward CRT's were used for the remainder of the flight. Postflight, the stand-alone test was repeated and the failure was isolated to Display Unit 3 (DU3).

Vendor testing determined that the high and low voltage power supply in DU3 had failed. Component testing and analysis is continuing. CONCLUSION: Failure of the high and low voltage power supply in Display Unit 3 caused CRT 3 to fail on orbit. CORRECTIVE_ACTION: DU3 has been removed and replaced. Failure analysis is continuing at the vendor on components in the power supply. Component analysis will be tracked on CAR 07F009. CAR ANALYSIS: Failure analysis disclosed a failed High Voltage Power Supply (HVPS) and a defective Current Regulator Transistor in the Low Voltage Control Module. The HVPS failed due to arcing (a function of contamination and operating hours) and the Current Regulator Transistor failed due to electrical overload. The vendor instituted contamination control procedures and the CAR is considered closed. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 002:20:15	Problem	**FIAR** EE0561, EE0562	**IFA** STS-7-V-13	C&T
	GMT: 172:07:48		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Several Wireless Crew Communications Units (WCCU's) Failed (ORB)

Summary: DISCUSSION: Postflight analysis of the returned units and the crew debriefing revealed that:

a. The unit "B" leg unit (S/N 1007) was completely dead. The power capacitor had a short. The failed capacitor was removed and replaced. See FIAR EE0562. b. The unit "C" wall unit (S/N 1014) was drawing high current. Found another shorted capacitor. The failed capacitor was removed and replaced. See FIAR EE0561. c. The unit "C" leg unit (S/N 1013) was left "on" after the flight and the battery leaked. The unit was cleaned and procedures checked to insure all units are turned off after use. d. The unit "B" wall unit (S/N 1064) antenna connector was bent. The antenna was removed and replaced. Antenna components are expendable items. e. The unit "A" leg unit was noisy depending on location in the cabin. The noise was duplicated during ground testing. Evaluation continuing. f. The unit "E" wall unit was noisy. Replacing with the spare "E" wall unit in flight eliminated the problem. The noise has not been encountered on the ground but testing is continuing. CONCLUSION: Most of the WCCU poblems occurred after the first battery replacement with a fresh battery. The resulting higher voltage may have caused a short in the power capacitor in the "B" leg unit. A shorted capacitor was also found in th "C" wall unit. CORRECTIVE_ACTION: The failed capacitors were sent to reliability for analysis. Until failure analysis results can be obtained, the flight units will be repaired, tested, and flown using existing component types. Failure analysis of the shorted capacitors will be tracked on FIAR's EE0561 and 0562. CAR ANALYSIS: Troubleshooting revealed a shorted power capacitor in the input power circuit. Subsequent investigation revealed that the capacitor was underrated to its application. A change (CCBD #G1268) has been approved which modifies all units with burned-in capacitors of a higher voltage rating. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 002:23:07	Problem	**FIAR**	**IFA** STS-7-V-14	C&T

GMT: 172:10:40	**SPR**	**UA**	**Manager:**
	IPR	**PR**	
			Engineer:

Title: Constant Key On Air-To-Air At Middeck Audio Terminal Unit (ORB)

Summary: DISCUSSION: The UHF transmitter was continuously keyed when the middeck audio control panel A/A (air-to-air) loop was in the T/R (transmit/receive) mode.

Onboard troubleshooting determined that switching the middeck A/A channel to OFF or Receive removed the problem from the UHF channel. It was determined that the problem could be in the ACCU (audio central control unit), the MHA (multiple headset adapter) or the WCCU (wireless crew comunicating unit). The problem could not be repeated during extensive testing at KSC and analysis of flight audio tapes has not determined the cause of the problem. Postflight testing of the WCCU in use at the middeck audion panel has eliminated it as a source of the keying. If the problem recurs, the UHF transmitter will be constantly keyed whenever the middeck AA channel switch is in T/R. This problem can be overcome by placing the channel switch in the Receive only position. Other than inconvenience, this problem should have no effect on the mission or vehicle safety. CONCLUSION: The cause of the constant keying is unknown. A simple inflight procedure can be used to eliminate the problem if it recurs. CORRECTIVE_ACTION: NONE. Fly as is. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	**Time**	**Classification**		**Documentation**		**Subsystem**
MER - 0	**MET:** 003:05:07	Problem	**FIAR**		**IFA** STS-7-V-15	C&T
	GMT: 172:16:40		**SPR**		**UA**	**Manager:**
			IPR		**PR**	
						Engineer:

Title: Paper Hangup In The Text And Graphics Hardcopier (ORB)

Summary: DISCUSSION: At about 172:16:40 G.m.t. the TAGs (text and graphics) hardcopier failed to output after the first sheet of paper was transmitted. This unit had experienced the same problem before flight with an occassional paper hangup. Moisture collects on the paper feed guides internal to the developer and causes the paper to adhere to the guides. New guides (with slots) that preclude the problem have been developed and demonstrated but there was insufficient time to incorporate the modification in the unit flown on STS-7.

Postflight the vendor found an occasional paper hangup. However, the main cause of the anomaly was found to be a physical misalignment of the paper feed plate with the developer housing. One of two locator dowel pins was pushed back and was not in the plate alignment hole. The plate was slightly askew and this caused the paper to hang up. CONCLUSION: During hardcopier assembly, a locator dowel pin was improperly installed which allowed misalignment of the paper feed plate with the

developer housing and this caused a paper hangup in the hardcopier. CORRECTIVE_ACTION: The TAGS unit (with paper guide modification) destined for OV-102 has been installed and verified on OV-099 for STS-8. This unit has had no problems with paper hangup. The failed unit will be properly reassembled, will contain the new paper guides, and will be scheduled for OV-102. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 003:22:38	Problem	**FIAR**	**IFA** STS-7-V-16	RCS
	GMT: 173:10:11		**SPR** 07F021	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Right RCS System B Fuel Isolation Valve Manifold 3, 4, and 5 Position Miscompare (ORB)

Summary: DISCUSSION: At 173:10:11 G.m.t., or about 4 hours after the OMS/RCS fluid interconnect mode, an open and a closed indication were both observed via downlink on the right RCS system B fuel manifold 3, 4 and 5 isolation valve. On board, the valve indicated closed. After returning to the normal RCS fuel flow configuration with both system A and system B fuel manifold valves commanded open, the system B fuel isolation valve did not open. The same open command is also sent to system B oxidizer valve which did open. The open command circuitry uses inverted logic and if an open indication is present then power cannot be applied to open the valve. Although this parallel fuel flow path was lost, fail operational/fail safe redundancy still existed to feed RCS fuel to manifold 3, 4 and 5.

The most probable cause of the position miscompare is a failure of the open position microswitch on the valve. Postflight troubleshooting confirmed that the problem was in the valve. CONCLUSION: The right RCS system B fuel isolation valve for manifold 3, 4 and 5 indicated both open and closed when the valve was closed and the valve could not be opened. Failure of the open position microswitch is the most probable cause of the position miscompare and the failure of the valves to open. CORRECTIVE_ACTION: The right RCS system B fuel manifold 3, 4 and 5 isolation valve actuator has been removed and replaced. The failed actuator has been returned to the vendor for failure analysis. This problem will be tracked on CAR 07F021. CAR ANALYSIS: Apparent actuator failure was due to contamination in the valve position indicators (by Haydon). Contamination in the position indicator switches floated in zero G and shorted the switch contact to ground (causing simultaneous open and close indications) and shorted between the contacts (causing continuous close commands) thus preventing the valve from re-opening when commanded. All switches are now tested for contamination by PIND (Particle Impact Noise Detection) testing. [not included in original problem report]
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 001:01:50	Problem	**FIAR**	**IFA** STS-7-V-17	PYLD
	GMT: 170:13:23		**SPR**	**UA**	**Manager:**
			IPR	**PR**	

Engineer:

Title: Vibration During PALAPA Spin-Up Reported By The Crew. (ORB)

Summary: DISCUSSION: The crew noticed a slight vibration at an approximate rate of 60 Hz during PALAPA spin-up. This vibration had no effect on the PALAPA deployment or the crew-related activities.

The Orbiter IMU data during spin-up has been reviewed and shows no evidence of the reported vibrations. No other Orbiter data to measure vibration of this low order is available. The overall pointing accuracy achieved for the PALAPA deployment (including all Orbiter and PAM errors) was less tha 0.25 degree. The PALAPA spacecraft and its PAM are spin-balanced separately and are not spun as an assembly after mating. This same spin-balance procedure has been followed for all four spacecraft/PAM combinations deployed to date with no reported spin-up vibrations. It is possible that a very small deviation in the axis of the center of mass of the combined spacecraft/PAM from the axis of the spun-balanced components could cause a small vibration. CONCLUSION: The reported vibrations had no effect on the PALAPA deployment or crew activities. The overall PALAPA pointing accuracy was excellent. CORRECTIVE_ACTION: NONE
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 004:04:27	Problem	**FIAR**	**IFA** STS-7-V-18	OMS
	GMT: 173:16:00		**SPR** 07F012	**UA**	**Manager:**
			IPR	**PR**	

Engineer:

Title: Right OMS Aft and Total Fuel and Oxidizer Gaging Lost (ORB)

Summary: DISCUSSION: Approximately 5 days into the mission all right OMS gaging system outputs reached zero. This had no effect on the mission since quantities can be estimated by using flow rate times burn time.

Postflight testing isolated the problem to the totalizer is supplied power from two orbiter fuses. Both of the power feed fuses were blown. CONCLUSION: The cause of the blown fuses is unknown. CORRECTIVE_ACTION: The totalizer has been replaced with a spare. The failed unit has been returned to the vendor for failure analysis and will be tracked on CAR 07F012. CAR ANALYSIS: The loss of oxidizer and propellant quantity gaging was due to blowout of the Totalizer Power Supply fuses when a common paper clip bridged two exposed connections in the Totalizer. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 004:05:13	Problem	**FIAR**	**IFA** STS-7-V-19	APU
	GMT: 173:16:46		**SPR** 07F026	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: APU 3 Water Injector Cooling Line System A And Seal Cavity Drain Line System B Heaters Failed Off (ORB)

Summary: DISCUSSION: At approximately 173:16:45 G.m.t. the APU 3 water injector cooling line temperature (V46T0503A) dropped to approximately 47 deg F. The crew switched from the A heater system to the B heater system and proper thermal operation was reestablished. At approximately 174:02:30 G.m.t. the APU 3 seal cavity drain line temperature (V46T0386A) dropped to 44 deg F. Since both the APU 3 water injector cooling line and seal cavity drain line heaters are controlled by the same switches (S11 for system A and S12 for system B on panel A12) the crew switched both the A and B system heaters to the on position. All line temperatures returned to normal for the remainder of the mission.

Postflight testing could not duplicate the water injector cooling line heater failure; however, testing did isolate the seal cavity drain line heater failure on system B to a failed thermal switch (S132B). The thermal switches for both heaters were removed, replaced and sent to the contractor for failure analysis. CONCLUSION: The APU 3 water injector cooling line heater on system A failed in flight probably due to a failed thermostat (S03A). The APU 3 seal cavity drain line heater thermal switch on system B failed. CORRECTIVE_ACTION: The APU 3 water injector cooling line, system A, and the seal cavity drain line, system B, heater thermal switches were both removed and replaced. Failure analysis for the thermal switches will be tracked on CAR 07F026. CAR ANALYSIS: Analysis disclosed a thin film on the points but not enough to cause failure. Silver contacts rather than gold are now in use. This is the suspect cause. Considered to be a random failure. No further action is planned. Close this CAR. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 004:19:51	Problem	**FIAR**	**IFA** STS-7-V-20	APU
	GMT: 174:07:24		**SPR** 07F010	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: APU 3 Underspeed Shutdown (ORB)

Summary: DISCUSSION: During the APU 3 startup for flight control system on orbit checkout, the APU ramped up to a normal pressure of 1000 psi but the second pulse was only about 550 psi. At the reduced pressure the APU was able to hold the load of pressurizing the hydraulic pump, but shut down when the load was applied as the on orbit checkout procedure was started.

During the second on-orbit checkout attempt 7 hours later, APU 3 started in 5.5 seconds and ran at 550 psi for about 8 pulses (hydraulic pump depressurized). The pressure then ramped up to 950 psi over 4 pulsed and remained at that level, or higher,for the remainder of the checkout procedure. Postflight, APU 3 was removed and replaced. Inspection at the vendor revealed 304 steel and KEL-F particles, some over 100 microns in size, in the flow control valve. Contaminant of this size in the flow control valve can allow fuel leakage back to the pump inlet reducing the fuel flow to the gas generator. 304 steel is a normal material in the valve but KEL-F is not used in the valve or any place in the system. Manufacturing, assembly, cleaning and inspection procedures are being reviewed. CONCLUSION: The APU 3 underspeed shutdown was due to fuel starvation when the hydraulic load was demanded during the on-orbit flight control system checkout. The fuel starvation was probably caused by contamination in the flow control valve. The valve contamination allowed fuel leakage back to the pump inlet reducing the fuel flow to the gas generator. CORRECTIVE_ACTION: APU 3 was removed and replaced. Failure analysis and follow-on actions for the APU will be tracked on CAR 07F010. CAR ANALYSIS: Contamination was the problem. Clean room has been upgraded. Work benches have had a special coating applied and facility cleaned up. Test stands have had all lines removed and replaced with new material. Final filter was replaced with a larger one just ahead of the test valve. Close this CAR. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 005:21:47	Problem	**FIAR**	**IFA** STS-7-V-21	DPS
	GMT: 175:09:20		**SPR** 07F017	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Received Failed BITE Message For The Right Display Driver Unit (ORB)

Summary: DISCUSSION: During deorbit preparations, a failed BITE message was observed for the right DDU (display driver unit). At the same time, the crew reported that the right ADI and other hardware that is powered or driven by the right DDU was working properly. The remaining dedicated displays also operated normally after they were activated for entry and landing.

Postflight data showed that the BITE circuitry indicated properly during ascent; however, the data also confirmed that a DDU failed BITE message was present beginning the day before deorbit preparations and for the remainder of the mission. Proper operation of the dedicated displays was re-verified at KSC and it was confirmed that the bite circuit was producing a right DDU failure message. CONCLUSION: Since the DDU is functioning properly, it appears that a failure occurred in the BITE circuitry of the right DDU. CORRECTIVE_ACTION: The right DDU, serial no. 7, was removed and replaced with DDU no. 14 and proper operation was verified. The failed unit has been returned to the vendor for failure analysis. The problem will be tracked on CAR 07F017. CAR ANALYSIS: Analysis was inconclusive but did indicate that the problem was caused by one of two circuit cards. It is suspected that a high resistance contact on one of the cards was eliminated when they were removed and replaced. Additional testing could not duplicate the failure. Close this CAR. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 006:02:10	Problem	**FIAR**	**IFA** STS-7-V-22	HYD
	GMT: 175:13:43		**SPR** 07F014	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Water Spray Boiler 3 Water Depleted During Entry And Landing (ORB)

Summary: DISCUSSION: During entry at about 175:13:43 G.m.t. WSB 3 (water spray boiler 3) water tank quantity decreased by 44 pounds during blackout. Post blackout the quantity was falling rapidly and switching to controller B did not correct the problem.

Normally hydraulic fluid by-passes the WSB until fluid temperature reaches 210 deg F. At this temperature the fluid is routed through the WSB heat exchanger and water spraying is initiated. Postflight data indicated that the hydraulic fluid went as high as 225 deg F and the hydraulic bypass valve failed to go to the commanded WSB heat exchanger position. The WSB controller thus maintained water spraying at a maximum rate, but since no cooling could be accomplished, most of the water eventually dumped overboard. However sufficient water remained in the heat exchanger to maintain APU 3 lube oil temperature within acceptable limits throughout rollout. Postflight at KSC proper operation of controller A and B was verified. The bypass valve actuation using controller A was normal but some hesitation was noticed using controller B. This indicated an intermittent problem with the bypass valve or the motor actuator assembly. The motor actuator was removed and the valve could be positioned freely by hand. A new motor actuator was installed and proper operation was verified on both controllers. Flight experience has shown that, for normal ascent and entry operations, adequate hydraulic cooling is available with the loss of the WSB hydraulic cooling system. For AOA however there is a concern that a failure similar to that experienced on STS-7, could result in loss of cooling water and subsequent shutdown of the associated APU due to loss of lube oil cooling. Flight procedural work arounds are being investigated to prevent rapid water depletion. CONCLUSION: Water spray boiler 3 water depleted during entry and landing. Probable cause is an intermittent in the bypass valve or the motor actuator assembly. CORRECTIVE_ACTION: The bypass valve motor actuator has been removed and replaced. Proper operation has been verified. The original actuator has been returned to the vendor for failure analysis. Investigative results will be tracked on CAR 07F014. A contingency plan is being developed for manual control to prevent rapid water depletion. EFFECTS_ON_SUBSEQUENT_MISSIONS: Potential change in flight contingency procedures to prevent rapid water depletion.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 006:02:16	Problem	**FIAR**	**IFA** STS-7-V-23	GN&C
	GMT: 175:13:49		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Left Air Data Transducer Assembly Did Not Initially Indicate Deploy (ORB)

Summary: DISCUSSION: During entry, at about 175:13:49 G.m.t., the left air data transducer assembly (ADTA) was commanded to deploy for one minute and fifty-four (54) seconds but the deployed indication was not received. The crew alternately stowed and redeployed the ADTA and this action produced the proper deployment and indication.

Postflight, TPS tile gap filler was found in the vicinity of the probe base. Also, wrinkles were found in the thermal barrier that is between the base and the probe well structure which indicates that tile gap filler had been wedged in between. Adjacent to the wrinkled area the TPS on the probe base had been sheared off indicating improper clearance (0.047 inches required) between gap filler (normally bonded to the fixed adjacent tile) and the rotating probe base tile. Following TPS repair procedures the proper deployment of the ADTA was demonstrated. Previous OMRSD requirements did not specify a demonstration of ADTA deployment following TPS repair near the ADTA. CONCLUSION: The stall condition of the ADTA was due to improper clearance between the gap filler and the rotating probe base tile. Review of acceptance test results indicates that ADTA clutch slippage one minute and fifty-four seconds is within design limits. CORRECTIVE_ACTION: Following TPS repairs the left ADTA was successfully stowed and deployed. OMRSD requirements will be changed to require ADTA deployment following TPS repair or replacment activity in the ADTA vicinity. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-7-V-24		MECH
	GMT: Postlanding		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Right Inboard Brake Damage Indicated During Tow. (ORB)

Summary: DISCUSSION: A damaged right inboard brake was indicated during tow. The tow was not continued until the right brake was removed.

The number 3 and 4 rotors on the right inboard brake were in several pieces and there was general damage throughout the brake. During the anomaly investigation two retainer washers were found missing on the right outboard brake. Eddy current tests found seven cracked retainer washers on the STS-7 brakes and 17 on the STS-8 brakes. Cracked retainer washers may have been flown on previous flights with no serious effects but none were ever identified during postflight tear down until after STS-7. The washers are Molybdenum TZM alloy, which has a high melting point but is brittle. It was determined that these washers were probably cracked during manufacture or assembly. Structure/thermal analysis indicates that flight and landing environments will not crack the retainer washers. CONCLUSION: One or more retainer washers failed on the right inboard brake during landing and/or tow on STS-7. Several retainer washers had cracks that probably occurred during manufacture or assembly. Failure of a cracked washer or washers on the right inboard brake resulted in debris that damaged two brake rotors. CORRECTIVE_ACTION: All cracked or suspect washers on the STS-8 brakes have been replaced. All washers were inspected by eddy current testing after brake assembly and run-in. Quality requirements including traceability,

procedures and inspection will be improved. Design improvements are being investigated. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-7-V-25	Water and Waste
	GMT:		SPR 07F018	UA	Management System
			IPR	PR	Manager:
					Engineer:

Title: WMS Slinger Stopped And Urine Collection System Flow Erratic (ORB)

Summary: DISCUSSION: Postflight, the crew reported that the waste collection system (WCS) slinger failed on the fifth day of the mission and that the urinal and commode air flows were low.

After the slinger failure, the crew continued to use the WCS in a degraded mode. Although the air flow was low, it was adequate for collection of urine and feces. The WCS was removed from OV-099 and sent to the vendor's facility for troubleshooting. The slinger failure was due to a failed microswitch. The microswitch was x-rayed and appeared to have failed internally. The microswitch, an item furnished by the integrating contractor, was returned to the contractor for further troubleshooting. Initial findings indicate corrosion inside the microswitch. The vendor conducted extensive troubleshooting to determine the cause of the degraded air flow. In the laboratory the WCS air flow was normal. The poor air flow may have been due to water carryover into the odor/bacteria filter from ground servicing operations. A routine inspection has not been required prior to launch to verify absence of water in the duct. CONCLUSION: The slinger failure was due to a failed micorswitch. The postflight air flow was normal during tests at the vendor. If there was water carryover into the odor/bacteria duct due to ground servicing, it could account for the poor air flow. CORRECTIVE_ACTION: The OV-103 WCS was installed into OV-099 for STS-8. A procedure will be performed at KSC to verify that water does not enter the odor/bacteria filter duct prior to launch. Closeout of the failure analysis for the microswitch will be tracked on CAR 07F018. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-7-V-26	Windows
	GMT:		SPR	UA	Manager:
			IPR	PR	
					Engineer:

Title: Window 5, Right Center, Pitted In Upper Center Portion (ORB)

Summary: DISCUSSION: The crew noticed a small pit in the outer pane of the right center window on the mission.

Postflight the pitted window pane was removed and a detailed inspection showed that the pit damage had a center crater with a maximum depth of 0.017 inches and an approximate diameter of 0.15 inches surround by scattered tangential cracks to about 0.250 inches in diameter. The outer pane is for thermal protection and the glass is fused silica 0.61 inches thick. Each orbiter window has 3 panes of glass. Cabin pressure integrity is provided by two underlying panes. Reduced structural strength of a windshield thermal pane due to this type of damage could cause loss of the thermal pane during the latter phases of entry after entry heating. Loss of a thermal pane could be safely sustained during the later phase of entry. However, if a large impact crator is sustained on orbit, loss of the window thermal pane can be prevented by flying a benign thermal entry and maintaining crush pressure on the thermal pane. CONCLUSION: The most probable cause of the window pit was a meteoroid impact. Loss of the window thermal pane will not cause loss of cabin integrity. CORRECTIVE_ACTION: The pitted window pane has been replaced for STS-8. Windows are inspected for damage after each flight and will be replaced if required. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-7-V-27		TPS
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: Thermal Protection System (TPS) Damage (ORB)

Summary: DISCUSSION: The overall TPS damage was less on STS-7 than on STS-1 and 2, but worse than the TPS damage on STS-6.

1. There was more debris damage noted to the lower TPS surface on this flight when compared with previous flights. This damage was primarily to the left chine area and the damage definitely occurred during ascent. 2. There was more felt reusable surface insulation (FRSI) discoloration than on STS-6, primarly along the side fuselage at the FRSI-to-tile interface. The STS-7 alpha profile started pitch down during the high heating regime at the velocity used on STS-1 thru 5 resulting in the same top surface temperature and discoloration that was seen on OV-102. STS-6 flew a delayed pitch down alpha profile shielding the OMS pods and the top fuselage. 3. Twelve tile corners were broken on the rudder speed brake along with heavy fraying of the right-hand split line thermal barrier. Broken corners have been observed on the speed brake tiles after previous missions. 4. A portion of one tile on the left main landing gear door fractured at door opening as had occurred on previous missions. Also the nose landing gear thermal barrier sustained slight damage. 5. The advanced felt reusable insulation (AFRSI) was severely damaged on the right OMS pod blankets and incurred minor damage on the left OMS pod blankets. 6. Tile slumping was noted on 4 tiles of the leading edge structural system (LESS) lower access panel and on 4 tiles on the elevon leading edge carrier panels. CONCLUSION: 1. The damage to the lower TPS surface, primarily in the left chine area, was attributed to particle impacts from the external tank during ascent such as ice or insulation. 2. Discoloration of the FRSI primarily along the side fuselage was caused by higher top surface heating after a return to the early pitch down alpha profile. 3. Corners broke on twelve rudder speed brake tiles due to engine start up dynamics. The split-line thermal-barrier damage was

attributed to the excessive water dump from the water spray boiler during entry. 4. The main landing gear door tile damage was attributed to close tolerances or the kinematics of the door during activation. The nose landing gear thermal barrier incurred slight damage at door activation. 5. The AFRSI damage on the right OMS pod blankets was attributed to the excessive water dumped during entry from the water spray boiler. The left pod AFRSI damage was due to aerodynamic errosion and/or debris from the ET during ascent. 6. The slumping of 4 LESS tiles was caused by thermal flow attributed to improperly installed thermal barriers. The slumping of 4 elevon tiles may have been caused by local attached flow as a result of up-deflected elevons. CORRECTIVE_ACTION: 1. The damaged tiles were either repaired or replaced depending on the severity of the damage. 2. The FRSI was recoated or replaced depending on the severity of the damage. STS-8 will fly the STS-6 delayed pitch down alpha profile. 3. The rudder speed brake tiles and the split-line thermal barrier were repaired. 4. The left main landing gear door tile was removed and replaced. The nose and the left main gear door thermal barriers were replaced. 5. The right OMS pod AFRSI was relaced except for 6 blankets. The left OMS pod AFRSI blankets were repaired. 6. The 8 slumped tiles of the LESS and elevon were repaired and all thermal barriers inside the left hand LESS lower access panels and inside 6 of the 22 right hand panels were replaced correctly. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-7-V-28		STR
	GMT:		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: CCTV Monitor Bracket On Aft Flight Deck Debonded From Port Sidewall (ORB)

Summary: DISCUSSION: This same bracket debonded from the sidewall during ascent on STS-6. A faulty bond and slight mispositioning of the camera mount were the suspected causes. The bracket was repositioned to conform with the blueprint and rebonded.

A new fitting with a larger footprint has been designed. It will be bolted and bonded to a doubler which will in turn be bonded to the cabin wall providing a stiffer installation area. CONCLUSION: Structural deformation most probably caused the camera bracket to debond. CORRECTIVE_ACTION: A redesigned stiffer mounting installation will be implemented for STS-8. The mounting will be proof tested after installation. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-7-V-29		C&T
	GMT:		**SPR** 07F028	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Radar Altimeter #1 Had Intermittent Lock Until 1000 Feet (ORB)

Summary: DISCUSSION: Radar altimeter unit 1 attempted to lock, locked and provided data for about one second, lost lock and attempted to reacquire from 4000 feet down to approximately 1000 feet. Performance was nominal from 1000 feet through rollout.

Postflight sensitivity measurements showed that the unit 1 sensitivity had dropped 6 dB since its last measurement was taken. This makes it 11 dB less sensitive than unit 2. CONCLUSION: Altimeter #1 RF sensitivity has degraded to an unacceptable level. The cause of the degradation awaits vendor troubleshooting. CORRECTIVE_ACTION: Altimeter #1 has been replaced with the flight spare. The unit has been returned to the vendor and the problem will be tracked on CAR 07F028. CAR ANALYSIS: Investigation disclosed that the output of the RF Cavity Oscillator was low by about 5-6 db and the frequency was high by approximately 11 MHz. The Cavity Subassembly (P/N 10051830) was changed and proper operation was restored. This is believed to be an isolated condition and will be noted for any trend indication. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-7-V-30	OMS
	GMT:		**SPR** 07F020	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: The Left Hand OMS Nitrogen Regulator Exhibited Leakage During The Deorbit Burn (ORB)

Summary: DISCUSSION: Review of the flight data from the deorbit burn revealed the left hand OMS nitrogen regulator was leaking at a rate of 7700 SCCH. The downstream pressure increased 1 PSI every 10 seconds throughout the entire burn. At engine shutdown the downstream pressure was 356 PSI versus a specification value of 360 PSI maximum.

CONCLUSION: The left hand OMS nitrogen regulator leaked during deorbit burn increasing the downstream pressure at a rate of 1 PSI every 10 seconds. CORRECTIVE_ACTION: The left hand OMS nitrogen regulator was removed and returned to vendor for test and analysis. The regulator was replaced for STS-8. Failure analysis for the regulator will be tracked on CAR 07F020. CAR ANALYSIS: Testing at the supplier did not verify the reported leakage rate. No cause for the reported leakage rate could be found. The most probable cause is a particle or contaminant that was displaced during disassembly or test. No corrective action is considered necessary. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 1	**MET:**	Problem	**FIAR**	**IFA** STS-7-V-31	CCTV

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

Title: The crew reported payload bay CCTV camera B was "blooming" and provided erratic azimuth and elevation angles. Camera C had a cable hang-up problem. (ORB)

Summary: DISCUSSION: During SPAS proximity operations, the crew reported that the payload bay CCTV camera B automatic light control (ALC) was no performing as expected. Also the encoder was counting out angle rates faster than the camera appeared to be moving. This caused some pointing problems. Manual light control was initiated for the remainder of SPAS operations. In addition, camera C would hang up on its control cable when pointed forwards and pitched upward at angles above sixy (60) degrees.

Under certain scene lighting conditions, the ALC mode switches on panel A7A1 will have little discernible efect on picture quality as viewed on the TV monitor. Manual control of the iris to decrease light intensity on the monitor causes automatic circuits to increase the gain of the silicon intensifier tube which can cause noise (snow) on the picture. The optimum picture quality for intense lighting of the scene can be obtained in ALC with the mode select switch on panel A7A1 in "peak". The camera functioned nominally after the SPAS operation in the ALC mode. Postflight analysis and test of the CCTV camera system did not indicate any anomalous performance with camera B. Videa tape recorder playback data indicated that camera B was responding porperly to the panel A7A1 mode select switches when actuated by the crew in the automatic light control mode. The crew observed fast encoder angle rates versus camera motion of camera B could not be duplicated during ground test and is unexplained. The encoder angle data is not critical to TV operations. The control cable to camera C was found to ge improperly routed. CONCLUSION: The camera B ALC operation was normal as designed. The cause of the encoder angle problem with camera B is unknown. The camera C control cable was inproperly routed. CORRECTIVE ACTION: All camera control cables were checked for proper routing. The camera C control cable was rerouted to prevent hang up. An engineering drawing change has been made to detail the proper CCTV camera control cable routing on all cameras. Operationsal procedures for camera control are being reviewed. EFFECTS ON SUBSEQUENT MISSIONS: none

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Tracking No	**Time**	**Classification**		**Documentation**		**Subsystem**
MER - 2	**MET:**	Problem	**FIAR**		**IFA** STS-7-V-32	C&T - Antennas
	GMT:		**SPR**		**UA**	**Manager:**
			IPR		**PR**	
						Engineer:

Title: Lost Payload Interrogator RF Link on System 1. (ORB)

Summary: DISCUSSION: During proximity operations, the SPAS-01/payload interrogator (PI) communications radio frequency (RF) link lock was lost several times. The

crew reported loss of link lock coincident with the FM communication system operating on the upper hemi antenna.

The PI is designed with a wide-band (50 MHz) receiever which operates in an upper frequency band of 2248 to 2300 MHz and in a lower gand of 2200 to 2252 MHz. Because of this wideband input, there are necessary design features in the automatic gain control (AGC) loops that control the gain of the input amplifier. These design features allow a strong undesired signal to mask the detection and tracking of the desired signal resulting in loss of link lock. The FM system operates at a frequency of 2250 MHz and the SPAS-01 operates at 2237.5 MHz. Both frequencies fall within the PI lower frequency band that was used on STS-7. Postflight data review indicates that the FM communications system carrier frequency was present during each of the RF dropouts. In most cases, the FM was radiating through the upper hemi antenna and/or hemi antenna switching was occuring. Either condition can cause the observed RF dropouts. In fact, FM radiation from the lower hemi can cause RF link loss depending on multipath reflections, antenna boresight angles, payload location relative to the PI antenna, antenna side-lobe patterns, and the associated complex spatial energy nulls and peaks surrounding the vehicle. If SPAS/PI communications RF link dropouts are to be prevented, then all other onboard transmitters operating at frequencies within the PI bandwidths must be turned off. CONCLUSION: The SPAS-01/PI RF link lock was caused by FM frequency interference, multipath reflections, or a combination of both. CORRECTIVE ACTION: Flight procedures will be changed to preclude the operation of FM communications during SPAS-01 proximity operations. EFFECTS ON SUBSEQUENT MISSIONS: Real-time closed-circuit television will not be transmitted from the Orbiter to the ground via the FM communications link during SPAS-01 proximity operations.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-7-V-33		MECH
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: Doors For The Waste Collection System, Several Lockers, and Access To The Graphics System Did Not Function Properly On Orbit. (ORB)

Summary: DISCUSSION: The Crew Reported:

1. Between 30 and 40 percent of the locker doors had latches that were hard to actuate and varying degrees of effort were required to latch them. Two lockers on the top rows beneath the pantry could not be totally latched. 2. Two modified lockers that incorporated a new spring design also experience the same misalignment problems as the basic locker design. 3. The doors in front of avionics bay 3 on the starboard side of the airlock when opened would scrape against the airlock panel. This was apparently cause by a shift in the dimensions of the crew cockpit. 4. The text and graphics system (TAGS) access door used for functional access to the TAGS was jammed closed apparently because of distortion in the cabin. 5. The waste collection system door would not close due to distortion of the door frame. CONCLUSION: Similar conditions were experienced on STS-6. The basic cause of the problem is attributed to cabin deflections which have increased as a result of the weight reduction

program accomplished after OV-102. Inadequate clearance between the locker doors and the door frames coupled with vehicle flexure in orbit probably caused excessive misalignment and distortion in the latching mechanisms and support frames. Test data have demonstrated that structural integrity is not an issue. CORRECTIVE_ACTION: No hardware fixes are to be incorporated for STS-8. Data will be obtained during the next 3 flights of OV-099 and 103 to assess the specific problems and to provide a base for the development of fixes for OV-099 and subsequent vehicles. No corrective action is required on OV-102 at this time. EFFECTS_ON_SUBSEQUENT_MISSIONS: Fixes will be developed for OV-099, 103 and 104 based on flight data obtained from the next 3 OV-099 and 103 flights.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-7-V-34	MECH
	GMT:		SPR 07F022	UA	Manager:
			IPR	PR	
					Engineer:

Title: Forward ET Attach Shear Bolt Was Outside The Mold Line ()

Summary: DISCUSSION: Postflight inspection showed that the secondary piston for the forward ET (External Tank) attach shear bolt exceeded the mold line by about 0.060 inch which is 0.030 inch beyond the specification valve.

Postflight inspection showed that the flange on the secondary piston had sheared, allowing the piston to protrude beyond the mold line. The bolt protrusion was within specification limits after STS-1 through 6 even though the secondary piston flange was cracked on the three pistons inspected (STS-2, 5 and 6). The problem was probably worse on STS-7 due to an undersize fillet radius with an undercut at the radius and a small chamber at the circumferential edge. However, after failure of the flange, the angle of shear caused a diametral wedging action that limited the over travel of the secondary piston. As a worst case, the ET yoke will limit the travel of the bolt shank, stopping the secondary piston no more than 1/2 inch beyond the mold line. This would not be a safety of flight issue. Postflight analysis has determined that a redesign of the secondary piston would be required to limit overtravel to within the specification value after the flange shears on the secondary piston. CONCLUSION: Failure was caused by the shearing of the flange on the secondary piston. Wedging action failure limited the overtravel of the secondary piston. CORRECTIVE_ACTION: Fly as is for STS-8. A redesign of the secondary piston is being evaluated. Corrective action will be tracked on CAR 07F022. CAR ANALYSIS: Examination of the hardware revealed that the piston flange had partially sheared. Analysis/investigation concluded that the bolt would jam in the sleeve before it was forced through (leaving a hole). The forward attach mechanism was redesigned to preclude plug protrusion. All old design mechanisms have been used or discarded. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-7-V-35	PYLD
	GMT:		SPR AC5725	UA	Manager:

			IPR	**PR**		
						Engineer:

Title: SPAS Electrical Disconnect Left-Hand Umbilical Talkback Failed To Indicate Stowed Position (ORB)

Summary: DISCUSSION: Prior to the SPAS deployment when the crew retracted the SPAS/Orbiter electrical disconnect, the left-hand (LH) umbilical stowed indication was not received. The right-hand umbilical stowed indication was proper. The crew visually verified that the LH umbilical was fully retracted (stowed) and SPAS deployment proceeded normally.

During preflight operations, the noted anomaly occurred twice. Initially, a stowed postion microswitch was found to be electrically inoperative. The switch was replaced and the stowed indication was proper. The switch was returned to the integrating contractor's facility for failure analysis. Later at the pad during SPAS electrical disconnect verification, the LH stowed indication was lost again. Physical "jiggling" of the switch in place produced an intermittent stowed indication. This suggested an improper rigging in the switch actuation mechanization or a possible intermittent electrical condition. Since the umbilical arm stowed postion could be verified visually by the crew through the Orbiter aft windows, a decision was made to fly "as is" for STS-7. Postflight, the SPAS electrical umbilicals and position switches were removed and stored for future use. Later, the LH umbilical position microswitch and wiring were verified to be electrically operational. The switch had no mechanical damage. Postflight analysis indicated that the rigging for switch actuation must be redesigned. The SPAS will not be flown again until STS-11 and a complete verification of the LH umbilical stowed indication circuitry will be made prior to that flight. CONCLUSION: The most probable cause of the anomalous stowed indication was improper design of the rigging in the switch actuation mechanization. CORRECTIVE_ACTION: Failure mode analysis is in progress for the failed microswitch. A redesign of the switch/retract arm switch actuation mechanization is in progress. This activity is being tracked on CAR AC5725. CAR ANALYSIS: It was concluded that design of the switch installation made the switch difficult to adjust and susceptible to damage if allowable overtravel was exceeded. As a result, MCR 8011 (Rev. 6) was processed to redesign upper and lower switch installations in the Umbilical Retract Arm assembly. Wiring between indicator switches to talkback indicators was changed to be compatible with the new installations. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	**Time**	**Classification**		**Documentation**		**Subsystem**
MER - 0	**MET:**	Problem	**FIAR**	**IFA**	STS-7-V-36	MPS
	GMT:		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: MPS Helium Pneumatic System Leakage Post-MECO (ORB)

Summary: DISCUSSION: The MPS pneumatic helium regulator pressure indicated a rapid pressure decay subsequent to propellant system vacuum inerting and closure of the helium pneumatic system source pressure isolation valves. The initial decay rate was approximately 80 psi/min which equates to a 7500 scim helium leak.

A similar problem was experienced during prelaunch operations where the engine 2 LO2 prevalve solenoid had a helium leak of 8000 scim's in a solenoid valve that supplies helium to the prevalve actuator. The solenoid valve was removed and replaced and a system decay test accomplished with recorded helium leakag of less than 200 scim's. The analysis of the solenoid valve revealed contamination. Postflight leakage testing of the helium pneumatic system did not duplicate the flight problem. Each solenoid valve was actuated and the helium system leakage measured. CONCLUSION: The pressure decay was probably caused by helium leakage in a pneumatic syste solenoid valve. A similar problem was experienced during prelaunch operations and was caused by contamination in a solenoid valve for the LO2 prevalve on engine 2. The problem was not duplicated during postflight testing. CORRECTIVE_ACTION: A solenoid valve for the engine 2 LO2 prevalve was replaced prior to STS-7 launch. Will continue to monitor system performance. Fly system as is. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-7-V-37		TPS
	GMT: Postlanding		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Rudder Speed Brake Seal Damaged (ORB)

Summary: DISCUSSION: Postflight inspection revealed that seven (7) rudder speed brake seals were damaged. Five seals had cracks. Some had small triangular pieces missing and three were bent flat. A portion about 5 inches by 2 inches of the aft top corner seal was torn off. All damaged seals were made of 8-mil thick Inconel sheet. The cracks occurred in the reverse bend section of the seal, the area closest to the flow stream.

Based on OV-102 experience the seal on the aft bottom corner had been beefed up using 15-mil thick Inconel. When the corner seal was found damaged, after previous missions, the adjacent seal was often cracked. The seals damaged on STS-7 were the aft top corner seal, two seals adjacent to a corner seal, three seals at the forward end near the hinge line, and an adjacent seal. The entry aerodynamic loads and deflection between the rudder speed brake panels probably flattened the seals resulting in the failure. The seals provide thermal protection by preventing flow from entering around the perimeter between the closed rudder speed brake panels during entry. The entry aerodynamic loads occur after the seals have served their primary purpose. Rudder speed brake seal damage is a refurbishment cost and turnaround consideration but not a safety of flight issue. Redesigns are currently under consideration. One would eliminate the reverse band in the seal and act similar to a lead spring. Another could change from the Inconel spring to compressible FRSI. CONCLUSION: Seven rudder speed brake seals were cracked and/or flattened probably due to the entry aerodynamic loads and deflection between the rudder speed brake panels. CORRECTIVE_ACTION: Seven (7) rudder speed brake seals were removed and replaced for STS-8. Design of the seal is being evaluated. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE
