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

STS - 43, OV - 104, Atlantis (9) **Time:04:16:PM**

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Prelaunch	Problem	**FIAR**	**IFA** STS-43-V-01	ECLSS
EECOM-01	**GMT:** Prelaunch		**SPR** 43RF01	**UA**	**Manager:**
			IPR 44V-0001	**PR**	
					Engineer:

Title: Cabin Vent Valve Failed to Indicate Closed. (ORB)

Summary: DISCUSSION: After vent-down from the cabin leak test on the August 1st launch attempt, no closed indication was received from the cabin vent valve. A subsequent cabin leak test verified the valve was closed, and a decision to fly-as-is was made.

Analysis performed by the vendor shows that a failed actuator in the microswitch assembly within the vent valve caused the lack of a closed indication. CONCLUSION: The failure of the vent valve to indicate closed was caused by a failure of the microswitch which is used to detect that the valve is closed. CORRECTIVE_ACTION: The vent valve assembly has been replaced. The failed valve was shipped to the vendor for analysis and repair. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-43-V-02	HYD
MMACS-01	**GMT:** 214:15:11		**SPR** 43RF02	**UA**	**Manager:**
			IPR 44V-0002	**PR**	
					Engineer:

Title: No Cooling on Water Spray Boiler 2 on Ascent (ORB)

Summary: DISCUSSION: Water spray boiler (WSB) 2 failed to provide cooling to the auxiliary power unit (APU) 2 lube oil throughout the mission. APU 2 (serial number 208) has been involved in lube oil overtemperatures during 7 of its 8 flights. WSB 2 did not cool the lube oil on controller A following ascent. The crew switched to controller B when the lube oil return temperature reached approximately 297 ?F. The APU was operated for an additional 1.5 minutes on the B controller, but no cooling was observed. The APU was shutdown when the lube oil return temperature reached 323 ?F. The WSB is designed to control the lube oil temperature at 250 ? 2 ?F.

An extended flight control system (FCS) check-out using APU 2 was performed and the WSB 2 did not cool on either controller. The WSB was started on controller B, then switched to controller A when the lube oil return temperature reached 291 ?F with no evidence of spraying. The APU was shutdown when the lube oil return temperature reached 307 ?F (bearings reached 340 ?F). The total APU run time was approximately 11 minutes. The boiler was declared failed for the mission and a late start of the associated APU for entry was mandated. During descent, APU 2 was activated at terminal area energy management (TAEM) because of the loss of cooling from WSB 2. The APU 2 lube oil reached 259 ?F before shutdown after wheel stop with no evidence of cooling from the boiler. However, since there have been many incidences in which lube oil temperatures have reached 259 ?F prior to spray initiation, the boiler may not have gotten the opportunity to function. CONCLUSION: During troubleshooting at KSC, the visual inspection of the external surfaces of the wire harnesses and connectors revealed no anomalies. The lube oil spray valve and hydraulic spray valve were both subjected to pulse flow tests with the water tank pressurized and using both controllers A and B. (The flight configuration was not violated when performing these tests.) The tests demonstrated no flow through the lube oil spray valve or audible valve action on either controller. The hydraulic spray valve also demonstrated no flow on the A controller. However, the hydraulic spray valve operated normally when tested on the B controller. In all cases, ground support equipment indicated controller/wiring continuity. Breakout boxes were then inserted at the controller connectors to determine valve coil resistance, insulation resistance, and voltage. Both coil resistance and insulation resistance were nominal. The voltage going to the coils of both valves was measured at a nominal value of 25 to 28 Vdc. During the voltage tests, audible valve action was noted on the lube oil spray when tested on the A controller. (No valve response data were recorded for the lube oil valve on the B controller or the hydraulic spray valve on the A or B controller.) No flow was noted or expected since the voltage tests were performed with the water tank depressurized. After the voltage tests were completed and because of conflicting data results, the hydraulic valve was again subjected to a pulse flow test with the water tank pressurized and using controller A. This time, the valve demonstrated normal flow. Both valves were again subjected to a final unpressurized pulsing tests on both controllers. In all cases, normal audible valve action was noted. Since KSC troubleshooting results pointed to an intermittent mechanical failure of both valves, the lube oil and hydraulic spray valves were removed and sent to the vendor for full failure analysis. The vendor tests did not duplicate the original anomalies. CORRECTIVE_ACTION: The troubleshooting of the WSB 2 failure resulted in the replacement of the lube oil spray valve and hydraulic spray valve. The replacement valves passed initial pulse test (depressurized). The old valves were sent to the vendor for failure analysis under CAR 43RF02-010. Because of conflicting test data on the water spray valves and previous lube oil contamination concerns, the APU/WSB system 2 has been hot oil flushed. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-43-V-03	INST
INCO-02	**GMT:** 214:16:50		**SPR** 43RF12	**UA**	**Manager:**
			IPR 44V-0014	**PR**	
					Engineer:

Title: Payload Data Interleaver (PDI) Decommutator Loss Lock on SHARE Data. (ORB)

Summary: DISCUSSION: At 222:16:42 G.m.t., Payload Data Interleaver (PDI) decommutator 2 began processing SHARE data. Eight minutes later, decommutator 2 started dropping in and out of lock on format seven SHARE data. One minute after the drops started, decommutator 2 lost lock completely. Decommutator 3 was activated

and used as prime for the rest of the flight.

CONCLUSION: Troubleshooting during the flight verified a deviation in the SHARE data stream of approximately 4 percent. This is within the PDI specification range which allows a deviation up to 10 percent. Further postlanding troubleshooting at KSC isolated the PDI decommutator 2 as the "most probable cause" failure mode.
CORRECTIVE_ACTION: The PDI was removed and replaced. The removed unit was returned to the vendor for failure analysis.
EFFECTS_ON_SUBSEQUENT_MISSIONS: If this problem recurred during flight, a loss of payload data corresponding to the failed decommutator would result. An available functioning decommutator within the PDI would be selected to process the payload data as mission termination could result depending on the importance of the payload data.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-43-V-04	PRSD,EPD&C
EGIL-01	**GMT:** 215:09:30		**SPR** 43RF03	**UA**	**Manager:**
			IPR 44V-0008	**PR**	
					Engineer:

Title: PRSD H2 Tank 1 Heater B Failed Off (ORB)

Summary: DISCUSSION: At 215:09:40 G.m.t., hydrogen tank 1 heater "B" failed off. The heater would not come on in either the auto or the manual modes. Heater "A" functioned normally and allowed the tank to continue to supply hydrogen to the fuel cells. Hydrogen tank 1 was depleted to a quantity that would still provide full mission duration should heater "A" also have failed.

Troubleshooting at KSC determined that the 5A fuse F2 in the heater control box 1 was failed open. The fuse was removed and replaced. The removed fuse was subjected to failure analysis. The heater circuit was retested with the new fuse and performed nominally. No discrepancies were found in the heater wiring. A similar failure occurred on STS-40 (IFA STS-40-V-03) with hydrogen tank 3 heater "A". The failure was traced to a chafed wire and a blown 5A fuse in the heater controller. During STS-4, a blown 5A fuse caused hydrogen tank 2 heater "B" to fail off (IFA STS-4-16). No cause for this blown fuse was found. CONCLUSION: Failure analysis revealed that the STS-43 fuse failed due to a manufacturing defect in the fuse link. The link separated at the end cap. Scanning electron microscope examination of the fuse indicated that damage existed in the fuse link from the time of manufacture. CORRECTIVE_ACTION: Fuse F2 has been removed and replaced. Metallurgical sectioning of the end cap is in progress to better characterize the failure mode. This is the first occurrence of this type of fuse failure and is considered an isolated incident. Even if the problem recurs, redundant tank heaters and tanks are available to insure crew safety and mission success. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR** BFCE-029-F038	**IFA** STS-43-V-05	GFE
INCO-01	**GMT:** 214:17:48		**SPR**	**UA**	**Manager:**
			IPR 44V-0004	**PR**	
					Engineer:

Title: Closed Circuit Television System Camera D Inoperative (GFE)

Summary: DISCUSSION: On flight day (FD) 1 of the STS-43 mission, the crew reported that no video output was available from closed circuit television system (CCTV) camera D after it was powered on. All three Gamma lights also came on when camera D was powered up, but no Automatic Light Control (ALC) lights were lit. Normally, one Gamma light and two ALC lights will illuminate upon initial camera powerup. A subsequent attempt on FD 2 was also unsuccessful. Each time camera D was powered, an S76 "camera overtemp" message was displayed. Camera D was unusable for the entire mission.

CONCLUSION: During postflight troubleshooting at KSC, the in-flight problem was duplicated, along with the anomalous Gamma and ALC indications. CCTV camera A was placed in Camera D's slot and operated nominally, thus confirming that the problem was with camera D itself. Camera D has been sent to the vendor for further evaluation. CORRECTIVE_ACTION: Camera D was removed and replaced with a functioning camera. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-43-V-06	APU
MMACS-02	**GMT:** 214:15:32		**SPR** 43RF04	**UA**	**Manager:**
			IPR 44V-0003	**PR**	
					Engineer:

Title: APU 1 Fuel Pump/Gas Generator Valve Module Overcooling (ORB)

Summary: DISCUSSION: Auxiliary power unit (APU) 1 [serial number (S/N) 305] experienced erratic cooling while on the fuel pump/gas generator valve module (FP/GGVM) cooling system "A" after APU shutdown following ascent. Investigation has determined that two anomalies exist with the cooling system. The first anomaly involves the APU S/N 305 cooling manifold configuration which allows direct impingement of the spray water or ice build-up on the fuel pump (FP) temperature sensor. This results in a temperature plot indicative of erratic cooling. This condition is unique to this APU and has been seen on OV-104 (STS-37, -38, and -43) as well on OV-103 (STS-26, -29, and -30) when the APU was installed on this vehicle.

The second anomaly is the result of an out of specification water valve timer control box. The timer control box is designed to open the water valve for 1 second and close for 4 seconds. However, the data review indicates that this time box allows valve-open pulse of 4 seconds or more. Longer valve-pulses result in minor overcooling. Further investigation has shown that this condition has existed in APU position 1 on OV-104 for seven flights (STS-27, -30, -34, -36, -38, -37, and -43). The timer box for cooling system "B" is operating within specification. CONCLUSION: APU S/N 305 has a unique fuel pump cooling signature because the FP manifold allows water to spray on the FP temperature sensor. The timer control box for APU 1 system "A" is out of specification as well, and this condition has been present since the box was installed on OV-104 prior to STS-27. The FP/GGVM cooling systems are checked for function; however, the time specification is not verified in the OMRSD. The overcooling condition poses no problem to the APU or vehicle. The pulse data from system "A" will be reviewed on upcoming flights to insure that the time control box is still operating within its historical data base. CORRECTIVE_ACTION: Fly as is with the APU 1 system "A" timer control box until vehicle major modification which removes the FP/GGVM cooling system completely. No action is required on APU S/N 305 as this APU is being removed because of an unrelated problem (Ref. IFA No. STS-43-V-12). EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-43-V-07	C&T
INCO-04	**GMT:** 216:13:07		**SPR** 43RF05	**UA**	**Manager:**
			IPR 44V-0006	**PR**	
					Engineer:

Title: Low Ku-Band Power Indication (ORB)

Summary: DISCUSSION: During the STS-43 mission, the Ku-Band power out indication (V74E2511A) indicated a drop in power and a subsequent recovery after 22 minutes. During this period, TV was downlinked from the Orbiter indicating that the Ku-Band system was functioning properly despite the low power indication. Following the first occurrence, three subsequent low power indications were noted during the mission. None presented any impact to mission operations.

CONCLUSION: Postflight troubleshooting was unable to duplicate the problem The cause of this in-flight anomaly is currently unknown. CORRECTIVE_ACTION: None. Since troubleshooting requires the removal of the Ku-band deployed assembly (which represents a significant impact to turnaround activity), no further troubleshooting will be performed. EFFECTS_ON_SUBSEQUENT_MISSIONS: None. Insight is lost into the Ku-band output power, however, this represents no impact to mission operations.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-43-V-08	C&T
INCO-05	**GMT:** 216:21:30		**SPR** 43RF06	**UA**	**Manager:**
			IPR 44V-0005	**PR**	

Engineer:

Title: S-Band Power Amplifier 2 Degradation (ORB)

Summary: DISCUSSION: String 2 of the S-band power amplifier (PA) (serial no. 306) exhibited a gradual power degradation throughout the STS-43 mission. The traveling wave tube (TWT) installed in PA 2 was serial number 050. TWT's with serial numbers 0XX (similar to the TWT installed in PA 2) were processed at excessive cathode temperatures which , in combination with a higher-than-optimum cathode operating temperature, results in typically short lifetimes of approximately 2000 hours (reference IFA STS-28-08). TWT 050 had approximately 1963 hours of usage prior to STS-43, which was very near the expected operational lifetime. On the last orbit, string 1 of the PA was selected and operated nominally through the end of the mission.

CONCLUSION: PA 2 reached the end of its operational lifetime during the STS-43 mission. CORRECTIVE_ACTION: PA 306 has been removed and replaced. The replacement PA (serial no. 303) has TWT serial numbers 211 and 249, which are expected to meet the design lifetime of 20,000 hours. PA 306 will be repaired by installing 2XX series TWT's in both strings. EFFECTS_ON_SUBSEQUENT_MISSIONS: None. All other flight PA's have 2XX series TWT's installed with the exception of PA 307 (installed on OV-103) which has TWT 064 in the string 1 position. Although this unit was processed with an excessive cathode temperature, it has been operated at lower cathode temperatures than the other OXX series TWT's. It successfully passed an extended 2000-hour burn-in with no degradation and currently has approximately 2650 hours. Should one TWT in a PA fail in flight, a backup is available.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-43-V-09	PRSD
EGIL-04	**GMT:** 220:18:09		**SPR** 43RF07	**UA**	**Manager:**
			IPR 44V-0007	**PR**	

Engineer:

Title: PRSD H2 Manifold Valve 1 Failed Open (ORB)

Summary: DISCUSSION: At 220:18:09 G.m.t., hydrogen manifold 1 isolation valve failed to close when commanded. The crew was performing the flight day 7 pre-sleep cryogenic configuration. The cockpit switch was cycled to OPEN then CLOSE in an unsuccessful attempt to close the valve. The valve had cycled nominally five times earlier in the mission. Pressure data confirmed that the valve had failed in the open position. The valve was left open for the remainder of the flight. During postlanding operations, the valve was successfully cycled five times.

This valve is closed during sleep periods to preclude loss of all cryo should a massive line leak occur. Failure was believed to be either in the valve itself or in the bulkhead connector. The bulkhead connector has a manufacturing flaw that may cause intermittent operation. No spares for the bulkhead connector currently exist. Similar intermittent operation has been observed on two previous flights of this vehicle. On STS-34, oxygen manifold 2 valve failed to close when commanded. It did close the

next day and also operated on the ground. The problem could not be repeated. On STS-37, oxygen manifold 2 valve again failed to close on command. It did close when commanded about 36 hours later and it operated successfully on the ground. The command circuitry for the oxygen manifold 2 valve was rewired to a different bulkhead connector and the manifold valve operated successfully this flight. CONCLUSION: Troubleshooting at KSC failed to reveal any mechanical problem with the valve or the electrical circuitry powering the valve. The most likely cause was an intermittent loss of continuity through the bulkhead electrical connector where the valve actuation circuit passes. CORRECTIVE_ACTION: Three of the unused fuel cell end cell heater discrete measurement circuits will be spliced into the hydrogen manifold valve 1 circuitry, two downsteam of the bulkhead connector, and one downstream of the mid power control assembly 1. If the problem recurs, these discrete measurements will verify if and where power is lost to the valve, thereby allowing more concise corrective action to be taken. If the problem recurs, a redundant hydrogen manifold valve is available to isolate a massive hydrogen system leak if necessary. If manifold valve 1 should fail closed, redundant hydrogen tanks will allow all three fuel cells to continue functioning. If the bulkhead connector is causing intermittent continuity, it will be removed and replaced when a suitable spare is available. EFFECTS_ON_SUBSEQUENT_MISSIONS: Fuel cell and cell heater discrete measurements will be monitored on subsequent OV-104 missions to determine the cause of the hydrogen manifold valve failing to operate when commanded.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-43-V-10	D&C
EGIL-03	**GMT:** 219:17:13		**SPR** 43RF08	**UA**	**Manager:**
			IPR 44V-0013	**PR**	
					Engineer:

Title: The mid starboard floodlight failed. (ORB)

Summary: DISCUSSION: Analysis of Mid Power Controller 3 current signatures during an unscheduled payload bay activity indicated a possible payload bay floodlight problem. Subsequent in-flight troubleshooting confirmed failure of the mid starboard floodlight (#3) and indicated that the RPC had tripped. Post-flight troubleshooting isolated the failure to the lamp assembly.

CONCLUSION: The anomaly was caused by a failed floodlight. CORRECTIVE_ACTION: The lamp has been removed and replaced. Final corrective action will be documented on the CAR. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-43-V-11	ECLSS
EECOM-02	**GMT:** 223:02:32		**SPR** 43RF09	**UA**	**Manager:**
			IPR 44V-0016	**PR**	
					Engineer:

Title: The PPO2 Sensor C Failed. (ORB)

Summary: DISCUSSION: The oxygen partial pressure (PPO2) sensor located in position C began diverging downward from the values indicated by sensors A and B. The sensor gradually drifted to a low indication of approximately 1 psia by landing.

Three sensors are installed in the Orbiter. Two of these are controls and are installed in positions A and B. The third sensor (position C) is used only for voting should one of the other sensors fail. All three sensors had accumulated approximately 5100 hours of use before this failure. Although the electrochemical cell in the sensors has a rated life of 6200 hours, this was the last planned usage of all three sensors because of concerns over the premature end-of-life failures experienced since STS-26. The useful life of the sensors is determined by several factors. Among these are the operating time, the storage time, and the storage temperature. Although there is not an existing requirement for the storage temperature, optimally it should be less than 75?F. The sensors are stored in the Orbiter Processing Facility high bay where the temperature is generally between 75 and 80?F. CONCLUSION: PPO2 sensor C experienced a premature end-of-life failure, probably due in part to a higher-than-recommended storage temperature. CORRECTIVE_ACTION: All three PPO2 sensors have been replaced. New sensors (MC250-0002-3065) are under development with an expected first use on STS-42 (OV-103). Paperwork is currently in work to impose a maximum allowable temperature requirement on the storage of the sensors. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

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Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-43-V-12	APU
MMACS-03	**GMT:** 223:11:58		**SPR** 43RF10	**UA**	**Manager:**
			IPR 44V-0018	**PR**	
					Engineer:

Title: APU 1 Anomalous Chamber Pressure During Entry (ORB)

Summary: DISCUSSION: Auxiliary power unit (APU) 1 [serial number (S/N) 305] experienced abnormal gas generator chamber pressure pulses for approximately 35 seconds during entry. The abnormal condition was characterized by a non-zero chamber pressure between pulses of the gas generator valve module (GGMV). This anomalous chamber pressure was most likely caused by a leaking GGVM (S/N 3033) pulse control (PC) valve. The condition occurred approximately 42 minutes after APU startup. The anomaly did not cause any degradation of the APU performance or shifts in the turbine speed. The chamber pressure recovered and returned to normal for the remainder of entry (approximately 46 minutes).

The leakage was probably caused by contamination lodged on the PC outlet seat, that was later dislodged. A larger PC outlet set leak would have caused the APU to shift to high speed (113 percent), at which time the shut off (SO) valve would have taken control of the APU. This GGVM PC valve outlet seat and poppet have accumulated approximately 14 hours of run time and a total of 84,550 cycles. The total wetted exposure time of the SO valve outlet seat is approximately 14 months. The APU GGVM

passed the vehicle system liquid leak check prior to flight, and no leakage was evident during ascent. CONCLUSION: APU 1 ran continuously in normal speed throughout entry, but anomalous gas generator chamber pressure pulses were experienced for a 35 second period. The most probable cause was fuel leakage past the PC valve during closure because of contamination lodged on the PC outlet seat. The contamination became dislodged when the 35 second period ended. The low level of leakage which occurred did not significantly affect the APU system performance. A large PC outlet leak would have caused the GGVM SO valve to take control of the APU at high speed. APU's receive a liquid leak check of the GGVM PC and SO valves prior to each flight. Also, the APU's are monitored during their prelaunch operation. Failure analysis is being tracked by CAR 43RF10-010. CORRECTIVE_ACTION: The APU 1 will be removed and replaced before the next (STS-44) flight. A helium leak check of the GGVM will be performed at the vendor and the APU fuel system will be inspected for contamination. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-43-V-13	MPS
None	**GMT:** Postlanding		**SPR** 43RF11	**UA**	**Manager:**
			IPR	**PR** MPS-4-10-0795	
					Engineer:

Title: MPS 4-Inch Disconnect Leak (ORB)

Summary: DISCUSSION: An audible leak emanating from the main propulsion system (MPS) liquid hydrogen (LH2) 4-inch disconnect region was detected during a postlanding inspection of OV-104 at the Kennedy Space Center. A more detailed inspection revealed that a crescent-shaped piece of the 4-inch disconnect flapper seal (approximately 0.13 in. wide by 1.2 in. long) had broken off and was lodged between the closed seat and the flapper. This created an audible leak of the MPS helium purge gas.

This particular OV-104 disconnect had flown eight flights with no previous problems. Performance of the seal was verified prior to the STS-43 flight by a closed seat leak check. A five-flight interval detailed visual inspection of the seal was performed five flights ago and no discrepancies were found. Damage to the seal possibly occurred during the two STS-43 launch scrubs or during final launch operations. A broken seal on the Orbiter 4-inch disconnect was previously experienced on STS-26 (STS-26R-14). It was determined that the STS-26 problem had occurred because of improper flapper shimming which caused premature seal-to-seat contact at the edge of the seal closest to the flapper pivot axis. This 4-inch disconnect unit was on its first flight after having been refurbished. The STS-43 seal damage occurred in the same area as that of STS-26, i.e., on the edge of the seal closest to the flapper pivot axis. Inspection of the disconnect assembly revealed that its build configuration was correct. No evidence of unusual wear or rubbing was noted, and no indication of damage due to foreign-particle contact or strike was evident. However, the flapper was found to have a higher-than-usual amount of wobble. Some amount of wobble is desirable, as it aids in achieving a uniform flapper-seal-to-closed-seat contact. However, an excessive wobble condition could cause the flapper seal to prematurely contact the closed seat at an excessive angle, causing the flapper seal edge to tear as the flapper drives to the fully closed position. Analysis of the fracture surface showed fatigue-like (step-wise) crack propagation with intermittent tearing between areas of fatigue. A leaking LH2 4-inch disconnect seal is a criticality 1 condition for return-to-launch-site and trans-Atlantic abort landing ascent aborts. Since LH2 is still present in the MPS lines

following External Tank door closure, the seal leak could allow the aft compartment hydrogen concentration to exceed flammability limits. CONCLUSION: The leak in the 4-inch Orbiter LH2 disconnect assembly was caused by damage to the flapper seal that was most probably the result of the flapper wobble. The wobble resulted in premature seal-to-seat contact at an excessive angle. This caused the flapper seal edge to tear when the flapper drove to the fully closed position. Cryogenic shock of the seal during LH2 loading operations could also increase the likelihood and magnitude of the premature seal-to-seat contact. CORRECTIVE_ACTION: 1) A software modification has been approved that will reduce the amount of LH2 residuals available to be ingested into the aft compartment. 2) An evaluation of flapper motion during closure is in work to develop new inspection and flapper adjustment requirements. 3) Consideration will be given to modifying the LH2 loading procedures to lessen the cryogenic shock on the 4-inch seal once this phenomenon and its relationship to the seal failure is understood. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-43-V-14	MECH,HYD,LDGR
None	**GMT:** Postlanding		**SPR** 43RF15	**UA**	**Manager:**
			IPR 44V-0028	**PR**	
					Engineer:

Title: Right-hand Outboard Brake Pressure 4 Low (ORB)

Summary: DISCUSSION: Data analysis during rollout indicated that the pressure (V51P0744A) in one of the two hydraulic lines supplying the right outboard brake was approximately 200 psi lower than the other. It was also lower than the two right inboard brake pressures. This anomaly was also noted on the previous flight of OV-104 (reference IFA STS-37-V-17). Troubleshooting after STS-37 failed to reproduce the anomaly. The decision was made to fly STS-43 as-is, with the most likely cause being transient contamination in the control module that was cleared during bleeding of the brake lines.

Extensive troubleshooting following STS-43 in the as-flown configuration intermittently reproduced the anomaly. The system was then reconfigured such that the servo valve module was controlled by brake/skid control box B (box A is the normal configuration). The anomaly was again reproduced, thus isolating the problem to the servo valve which controls pressure in the affected brake line. It was also noted that the anomaly occurred only when the fluid was warm, although it is not known whether this was a contributing factor. The servo valve module was removed and replaced, and will undergo failure analysis. CONCLUSION: This anomaly was most likely caused by an intermittent condition in the servo valve. CORRECTIVE_ACTION: The control valve module has been removed and replaced. Final corrective action will be documented on the CAR. EFFECTS_ON_SUBSEQUENT_MISSIONS: None anticipated. A recurrence may result in uneven braking and increased tire wear.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-43-V-15	GN&C
None	**GMT:** 222:12:27		**SPR** None	**UA**	**Manager:**
			IPR 44V-0029	**PR**	

Engineer:

Title: -Z Star Tracker Light Shade Shutter Light Leak (ORB)

Summary: DISCUSSION: During the STS-43 mission, the -Z star tracker (ST) exhibited an intermittent star presence even after the light shade shutter was closed due to a bright object alert (BOA). The BOA is normally caused when the sun or the sunlit earth is near the ST field of view. The intensity level was equivalent to a +2 or +3 magnitude star, indicating that the amount of light getting by the shutter was extremely small. Mission operations were not impacted and there was no degradation in ST performance. The intensity of the intermittent light source was too small to have been identified by the subsystem operating program as a valid navigation star.

CONCLUSION: The -Z ST light shade shutter was not fully closed when commanded by the BOA signal. This condition could have been caused either by a worn mechanism, or by debris stuck in the mechanism. CORRECTIVE_ACTION: In-flight troubleshooting at KSC failed to duplicate the problem. No damage was found in the light shade shutter mechanism and no debris was found in the mechanism. The ST will remain in OV-104. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-43-V-16	MPS
None	**GMT:** 223:12:23		**SPR** 43RF14	**UA**	**Manager:**
			IPR	**PR** MPS-4-10-0814	

Engineer:

Title: Right Main Engine Repressurized to 33 psia During Entry (ORB)

Summary: DISCUSSION: During the STS-43 entry repressurization, the Space Shuttle main engine (SSME) 3 LO2 inlet pressure unexpectedly tracked the LO2 manifold pressure. Postflight troubleshooting of this anomaly revealed reverse leakage of the LO2 bleed check valve (CV 35, S/N 9301).

Prior to removing CV 35 from OV-104, the valve was x-rayed. The x-rays revealed that both the flappers were open as well as not showing any evidence of the flapper spring tangs. A visual inspection of the valve after removal confirmed that both the flapper spring tangs were missing. A new valve was installed and leak tested and an inspection of the main propulsion system and ground support equipment for the missing spring tangs was initiated. This inspection did not recover the missing tangs. The check valve was shipped to the vendor for confirmation of the spring material and a failure analysis. The specified spring material properties have been verified and it was concluded that the spring tang failures were caused by wear of the spring-end coils inner-diameter surface against the flapper shaft. The S/N 9301 check valve was installed on OV-104 on October 19, 1988, prior to the STS-27 mission, and flew seven flights prior to this failure. A review of the flight history of these valves identified one previous failure--a broken spring that was discovered following STS-3 (CAR 03F035). This breakage occurred in the "loop" section of the spring and was attributed to improper spring installation and a resultant overload condition. As a result of the failure, all check valves in the fleet at that time were x-rayed to confirm correct spring installation and a mandatory inspection point was added at the vendor to screen for similar spring installation problems. The spring that failed during STS-43 was properly

installed. Qualification testing experience with these valves included successfully accomplishing 2000 ambient temperature cycles, 1000 cryogenic (-320 ?F) cycles, and 2000 cycles at +130 ?F. Also, random vibration testing was successfully performed at cryogenic temperatures (-300 ?F). This testing consisted of 3.3 hours with the valve closed and 10.0 hours with LN2 flow, per axis. A failed check valve is of no concern for nominal missions unless there is uncontained upstream damage. For aborts (RTLS/TAL), a failed CV would result in excessive GHe usage that could result in the loss of GHe for the aft compartment purge (RTLS/TAL abort critical). In the event of an engine shutdown with uncontained upstream damage, a failed CV could result in the inability to isolate propellant from a fire/explosion hazard or lead to an overpressure condition for the aft compartment. CONCLUSION: The anomalous repressurization of SSME 3 during the entry of STS-43 was the result of reverse leakage past CV 35. This check valve is designed to allow a GHe repressurization flow of 4 scfm through its bleed orifice. However, the spring that is required to properly seat the two flappers within the valve failed, allowing a higher-than-normal repressurization flow. The cause of the excessive spring wear that lead to the failure is not currently known. However, being investigated is the possibility of increased flapper cycles and accelerated spring wear as a result of flow phenomena during LO2 loading operations. CORRECTIVE_ACTION: For OV-104, the failed valve (CV 35) was removed and replaced. CV 33 has been replaced and CV 31 has also been replaced for STS-44. Investigation into the cause of the failure will continue under CAR 43RF14. Although the missing spring tangs have not been found, it has been confirmed by the SSME Project that any particles which pass the 1000-micron feedline screens will not adversely affect engine performance. Every flow, the OMRSD requires a reverse leak test of CV 31, CV 33 and CV 35. EFFECTS_ON_SUBSEQUENT_MISSIONS: None expected. The OV-104 bleed check valves will be replaced prior to STS-44. Also, the current plan is to refurbish the OV-102 and OV-103 bleed check valves with new springs to support the next flight of these vehicles.