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

STS - 51B, OV - 99, Challenger (7) **Time:04:27:PM**

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51B-V-01	HYD
	GMT: 119:16:12		**SPR** 24F013	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Water Spray Boiler 3 Controller A Inoperative. (ORB)

Summary: DISCUSSION: At 119:16:11:33 G.m.t., shortly after MECO, a BFS (backup flight system) fault 1 indicated an APU (auxiliary power unit) 3 lube oil overtemperature condition. The crew switched from water spray boiler controller 3A to controller 3 at an APU 3 lube oil temperature of about 320 deg F. The temperature continued to rise for an additional 20 seconds and reached a peak of 337 deg F. The crew was instructed to shutdown APU 3 to avoid reaching the 355 deg F lube oil temperature limit. The crew shut down APU 3 at 119:16:12:23 G.m.t., as requested. The APU 3 lube oil temperature had decreased to about 320 deg F at APU 3 shut down indicating that water spray boiler controller 3B was properly controlling lube oil cooling.

Postflight testing has not been successful in duplicating the water boiler 3A controller problem experienced in flight. The 3A controller will be removed and replaced with a spare controller and returned to the vendor for analysis. CONCLUSION: The APU 3 lube oil overtemperature condition most probably resulted from a water spray boiler 3A controller internal malfunction which could not be duplicated by postflight ground test. CORRECTIVE_ACTION: The water spray boiler controller 3A will be removed and replaced. The unit will be returned to the vendor for failure analysis and will be tracked by CAR 24F013. CAR ANALYSIS: Failure analysis at the vendor was unsuccessful in duplicating the anomaly. Vendor data was reviewed and it has been agreed that the anomaly is unexplained. The WSB controller has been returned to the spares inventory and no corrective action will be taken. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51B-V-02	MECH
	GMT: 119:16:21		**SPR** 24F009	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Right External Tank Door Motor B Inoperative. (ORB)

Summary: DISCUSSION: At lift-off, the right ET (external tank) door-open indication B was lost. Later, when the ET doors were closed, motor B did not operate. Motor A closed the door in single-motor time.

The postflight inspection at KSC showed that the connector which supplies ac voltage to the B drive motor and also carries the B open/closed door indications was disconnected. The connector was inspected for damage that could have caused it to demate under vibration, but none was found. However, the connector retention spring was found to be much weaker when compared with the connector springs for the three other ET drive motors. This same connector had been found demated in June 1984 and the remate after that was the last official mate of the connector until now. The connector is located in a position where it can be stepped on by personnel working in the area, except when a GSE (ground support equipment) air duct is installed that provides some protection. CONCLUSION: The connector may have been unlocked by personnel working in the area and subsequent launch vibrations could have caused it to demate. CORRECTIVE_ACTION: The cable half of the connector has been replaced and verified to be a tight fit when mated. The removed connector will be returned to the vendor for failure analysis which will be tracked on CAR 24F009. A specific requirement to inspect the ET door connectors will be added to the aft compartment closeout inspection procedures. A protective device will be implemented to prevent connector damage from personnel working in the area. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE pending failure analysis

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Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51B-V-03	INS
	GMT: 119:16:07		**SPR** 24F002	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Instrumentation Failures. (ORB)

Summary: DISCUSSION: A. SSME 2 GH2 outlet pressure (V41P1260A) failed off scale high shortly before MECO. This measurement has failed on a number of previous flights. A redesigned sensor installation, which is slightly different for each vehicle, has been implemented for both OV-099 and OV-103. The redesigned installation on OV-103 has flown 3 flights with no failures. This is the second failure of the redesigned installation on OV-099. The sensor will be replaced and the failure tracked on CAR 24F002.

CAR ANALYSIS: This is a repetitive type failure. Corrective action is to delete the sensor on SSME-2 on all vehicles. [not included in original problem report] B. Hydraulic system 2 main pump pressure B (V58P0215C) read about 80 psi low. The measurement range is 0 to 4000 psi and the 80 psi reading is within the instrumentation accuracy. No corrective action is required. Fly as is. CONCLUSION: See above. CORRECTIVE_ACTION: See above. EFFECTS_ON_SUBSEQUENT_MISSIONS: None, pending failure analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-51B-V-04	D&C
	GMT: 119:10:19		SPR AC9772	UA	Manager:
			IPR	PR	
					Engineer:

Title: The Abort Advisory Light Failed To Go Dim And The Lens Was Cracked. (ORB)

Summary: DISCUSSION: At about 119:10:19 G.m.t., when the abort advisory light was checked during the launch count, it was reported that the light did not go dim when the abort A command was removed, and that the lens was cracked. Normal light operation is based upon four light bulbs, two of which are activated by abort command A and the remaining two by abort command B.

The check involved sending both abort commands simultaneously from the MCC (mission control center); removing them sequentially; noting the light first dimming, and then extinguishing. Under certain lighting conditions in the cabin, it is difficult to discern dimming of the abort light, and this has been a recurring problem. Subsequent troubleshooting verified that both the A and B abort commands were getting to the abort light individually and producing the proper illumination. Also, the abort light was extinguished when both commands were removed and the unit was thus declared operational for launch. Postflight troubleshooting indicated that there was no equipment malfunction. However, since the lens was cracked, the abort light was removed, replaced, and the replacement unit has been verified operational. Since the dimming of the abort light is difficult to discern unless it is viewed directly, a change to the launch count procedure will be made. The abort A and B commands will be sent individually as well as simultaneously to obtain a positive indication of light operation, no matter what viewing angle is used. CONCLUSION: The failure to discern the abort light dimming after the abort A command was removed is attributed to cabin lighting conditions and viewing angle. CORRECTIVE_ACTION: The unit was removed (due to the cracked lens), replaced, and the replacement unit has been verified operational. A change to the launch count procedure will be made to provide a more positive indication of light operation. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-51B-V-05	DPS
	GMT: 119:17:32		SPR	UA	Manager:
			IPR	PR	
					Engineer:

Title: Onboard System Management Displays Exhibited Erratic Values. (FSW)

Summary: DISCUSSION: Onboard display SPEC's 67, 69, 210, and 220 displayed erratic data for several measurements while the telemetry data displayed on the ground was normal. Analysis of a software dump of the SM GPC (systems management general purpose computer) indicated that the incorrect values were the result of an overlay

of data used for transferring GPC input parameters from the input buffer to the SM parameter data tables. This was caused by an incorrect length specification for the FDA (fault detection annunciator) limits of parameters L01V1201V and L01C0204A. The software structure for these limits allowed only one half-word per limit value when two half-words should have been allocated. Consequently, when a change to these values was uplinked, and adjacent pointer was overwritten and the data in the table was shifted, resulting in incorrect data display. A patch was uplinked to restore good values to this pointer and the FDA was inhibited for the remainder of the flight for the two parameters with invalid limits.

CONCLUSION: The erratic data was the result of incorrect word length of two updated FDA limits. CORRECTIVE_ACTION: The inflight software patch corrected the problem with the exception of the need to inhibit the FDA on the Spacelab parameters. No further activity is required for this problem since this was a unique software implementation for STS 51-B. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51B-V-06	TPS
	GMT: 119:17:27		**SPR** 24F001-10	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Right OMS Pod Thermal Protection System Protrusion. (ORB)

Summary: DISCUSSION: Shortly after ascent the crew reported a piece of material was protruding from near the center of the right OMS pod. A review of downlinked TV identified the protruding object as a peeled back inboard corner of a AFRSI (Advanced Felt Reusable Surface Insulation) blanket. Analysis indicated the damage was not a safety-of-flight issue; however, some damage to the honeycomb structure beneath the AFRSI blanket was expected.

Postflight inspection showed the forward inboard edge of the carrier panel with AFRSI attached was peeled back exposing the carrier panel and OMS pod structure. The outer skin of the structure was delaminated over an area approximately 3 x 14 inches beneath the peeled-back panel. The AFRSI is bonded to this 8 x 24 inch panel which is attached to the OMS pod with 4 fasteners. The inboard fastener had been torn from the carrier panel but remained intact in the structure. A crazed area around the other 3 fasteners appears to be the result of the lifting of the forward edge of the carrier panel over its entire 24 inch length. This was the first flight of the right OV-104 OMS pod which was installed on OV-099 for STS 51-B. The carrier panel/AFRSI configuration of the affected area differed from that previously flown. On the OV-104 pod the AFRSI is bonded to a fiberglass plate which, in turn, is attached to the OMS pod structure with fasteners. On previously flown OMS pods FRSI (Felt Resuable Surface Insulation) was directly bonded to the structure. The damaged structure will be repaired without removing the OMS pod from the vehicle, and both OV-104 pods will be returned to the previous FRSI configuration. CONCLUSION: The OMS pod damage was due to the failure of a new fiberglass Y-web door carrier panel to resist the air

stream forces. This resulted in the cracking and peeling back of the carrier panel exposing the graphite epoxy honeycomb structure to entry temperatures. Both OV-104 OMS pods will be returned to the FRSI configuration successfully flown on OV-099 and OV-103 pods. CORRECTIVE_ACTION: The OMS pod structural damage has been repaired and the previous FRSI configuration for both OV-104 OMS pods has been re-established. Indepth failure analysis will be tracked on CAR 24F001-10. EFFECTS_ON_SUBSEQUENT_MISSIONS: None, pending failure analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR** HEN 0050F	**IFA** STS-51B-V-07	GFE
	GMT: 119:19:02		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: The Galley Did Not Dispense Water. (GFE)

Summary: DISCUSSION: The crew reported early in flight that the galley did not dispense hot or cold water. The crew could make the water dispenser work by banging on the side of the galley.

Postflight troubleshooting at KSC was able to repeat the problem. Probable cause of the galley failure to properly dispense water is an intermittent in the control panel microprocessor. The galley was removed, replaced and returned to JSC for further troubleshooting. Failure analysis will be tracked on FIAR HEN 0050F. CONCLUSION: Failure of the galley to dispense water unless the crew banged on the side of the galley was probably caused by an intermittent in the control panel microprocessor. CORRECTIVE_ACTION: The galley has been removed and replaced. Troubleshooting on the control panel microprocessor is continuing at JSC. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51B-V-08	APU
	GMT: 120:13:26		**SPR** 24F012-010	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Auxiliary Power Unit 3 Seal Cavity Drain Line Heater 3A Failed. (ORB)

Summary: DISCUSSION: At 120:15:10 G.m.t., the APU (auxiliary power unit) 3 fuel pump drain line temperature (V46T0386A) dropped to 45 deg F, which is the fault detection annunciation limit. The APU 3 fuel pump drain line heater had been cycling at about 60 deg F. Control was switched from the A heater to the B heater, and the temperature was observed to climb to the normal range where it remained for the remainder of the mission.

Postflight troubleshooting has isolated the problem to a failed thermostat. The thermostat will be removed and replaced. CONCLUSION: The APU 3 fuel pump drain line temperature drop was due to a failed heater thermostat. CORRECTIVE_ACTION: The APU 3 fuel pump drain line heater thermostat will be removed and replaced. The thermostat will be returned to the vendor for failure analysis. The results of the analysis will be tracked by CAR 24F012-010. CAR ANALYSIS: Failure analysis indicated that Thermal Switch contact resistance was erratic and high. The contaminant on the contacts appears to be oxides from the bemetal disc and wear particles from the striker pin. Since this switch was fabricated, the vendor has instituted design and process changes to improve switch life. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51B-V-09	ECLSS
	GMT: 119:19:42		**SPR** 24F004	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Smoke Detector In Avionics Bay 2A Failed Self-test. (ORB)

Summary: DISCUSSION: At about 119:19:42 G.m.t., during the fire/smoke sensor test, the avionics bay 2A sensor did not annunciate an alarm. The avionics bay 2B sensor did annunciate an alarm. At about 120:13:10 G.m.t., the crew repeated the test on sensor 2A for 60 seconds and again failed to get an alarm. The smoke concentration measurement was normal.

Postflight, the 2A sensor was removed and replaced. The replacement unit passed the fire/smoke sensor test. The failed 2A sensor has been returned to the vendor for failure analysis. CONCLUSION: The avionics bay 2A smoke detection system did not annunciate an alarm due to an internal failure in the sensor. The cause of this failure will be determined during failure analysis. CORRECTIVE_ACTION: The avionics bay 2A fire/smoke sensor has removed, replaced and reverified to be operational. The failed sensor has been returned to the vendor for failure analysis. The results of this analysis will be tracked via CAR 24F004. EFFECTS_ON_SUBSEQUENT_MISSIONS: None, pending the results of failure analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51B-V-10	RCS
	GMT: 120:12:47		**SPR** 24F007	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Right Reaction Control System Thruster R4D Injector Heater Failed. (ORB)

Summary: DISCUSSION: At 120:12:47 G.m.t., the right RCS (reaction control system) thruster R4D fuel and oxidizer injector temperatures dropped below the heater

thermostat low set point of 71 deg F. The injector temperatures continued to decrease, but appeared to finally stabilize at 57 deg F. Data review verified all other primary thruster injector temperatures had cycled and were maintaining temperatures above the 71-deg F heater thermostat set point. This implied that the R4D thruster heater or heater thermostat had failed. Based upon vehicle attitude, thermal analysis indicated the R4D thruster injector temperatures would remain stabilized at about 57 deg F for the remainder of the Spacelab mission. This level was above the 55 deg F flight rule limit for declaring the thruster lost.

After the on-orbit thruster hot-fire checkout, the R4D heater started to cycle. The heater cycles were occurring at approximately 64 deg F which was below the thermostat set point of 71 deg F. Post-mission testing revealed that the R4D thruster heater was failed in the on position. The thruster heater is regulated by a solid-state on-off device which controls to a minimum and maximum temperature. The heater controller appears to be failed. The R4D thruster will be remove and replaced. Failed-on or -off thruster heaters can be easily accomodated by system management during mission activities. Failed-on heaters can be cycled on and off manually to maintain acceptable temperature limits. An acceptable temperature range can be maintained for failed-off heaters by periodic thruster firing or vehicle-attitude adjustment. CONCLUSION: The RCS thruster R4D heater failure most probably resulted from a failed solid-state heater controller. CORRECTIVE_ACTION: The R4D RCS thruster will be removed and repaired at KSC. The heater and controller will be replaced by the vendor at KSC. The failure analysis on the heater and controller will be tracked by CAR 24F007. CAR ANALYSIS: The vendor has isolated the problem to changes in the temperature/resistance scaled output of the heater/sensor assembly. Cause of the deviations was a fracture in the .00007 dia. sensor wire, held together by surrounding material. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51B-V-11	C&T - Navaids
	GMT: 119:16:04		**SPR** 24F005 and 24F006	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: S-Band Upper Right Antenna Reflected Power Was High And Link Performance Was Erratic On Upper Left Antenna. (ORB)

Summary: DISCUSSION: At approximately 119:16:04 G.m.t., the upper right S-band antenna began to indicate reflected powers of 17 to 18 W with associated marginal forward link performance through TDRS (tracking and data relay satellite) on both the forward and aft beams. At approximately 123:13:29 G.m.t., the link performance on the upper left antenna also became erratic. Postflight inspection and tests found the upper right antenna to have erratic reflected power at high input-power levels and the upper left antenna to have a cross-threaded coaxial connector. Both antennas have been returned to the vendor and the input strip lines and the beam switches have been replaced. Also, the connector on the upper left antenna cable has been replaced. Vendor tests have not demonstrated any anomalous performance by the upper left antenna.

CONCLUSION: The most probable cause of the problem with the upper right antenna was burned contacts in the interim-sealed beam switch similar to what was seen on the original switches. The upper left antenna performance loss was possibly due to system tolerance buildup and/or vehicle attitude with associated antenna pattern characteristics. CORRECTIVE_ACTION: Both antennas have been repaired and reinstalled on the vehicle. The vehicle cable has been repaired and tested. Analysis of the detailed causes of the antenna problems will be tracked by CAR's 24F005 and 24F006. EFFECTS_ON_SUBSEQUENT_MISSIONS: None, pending results of CAR's 24F005 and 24F006.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51B-V-12	OMS
	GMT: 120:00:02		**SPR** 24F017	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Right Orbital Maneuvering System Oxidizer Low Point Drain Line Heater Set Point Drifted. (ORB)

Summary: DISCUSSION: The right OMS (orbital maneuvering system) drain-line temperature (V43T6237A) cycled at a low level between 61 and 65 deg F while operating on heater system A. The FDA (fault detection annunciation) lower limit was changed from 60 deg F to 45 deg F to prevent nuisance alarms. At 121:07:07 G.m.t., a fault message was generated when the lower limit of 45 deg F was violated. The crossfeed line heaters were switched from system A to system B. The temperature recovered and the system B heaters functioned correctly for the remainder of the mission.

CONCLUSION: The right OMS drain-line temperature dropped below the established 45 deg F FDA limit because of a failed thermostat. CORRECTIVE_ACTION: The crossfeed line heater system-A thermostat that controls the right OMS drain-line temperature has been removed and replaced. The thermostat will be returned to the vendor for failure analysis. The failure analysis will be tracked by CAR 24F017. CAR ANALYSIS: Failure history* reveals no other failure where the switch failed open. Therefore, this failure is considered to be an isolated instance. * Failure history is used because failure analysis wouldn't be completed in time to support the next mission. Failure analysis has not been entered on the CAR as of April 28, 1986. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51B-V-13	C&T - Ku-band
	GMT: 119:21:17		**SPR** 24F008	**UA**	**Manager:**
			IPR	**PR**	

Engineer:

Title: Ku-Band Failed Self Test. (ORB)

Summary: DISCUSSION: At about 119:21:17 G.m.t., during the Ku-band activation, the radar self test failed. This failure has not been seen previously on orbit. Specifically, the radar self-test data indicate that the system and EA (electronics assembly) 2 had failed. A review of the logic equation revealed three subtests that could have caused the test failure:

1. EA 2 power form (event). 2. Lobing enable radar (event). 3. Delta Alpha error greater than plus-5 volts or less than minus-5 volts, and Delta Beta error greater than plus-5 volts or less than minus-5 volts. The Delta Alpha and Beta error checks performed during the self test indicate a failure by setting the angle rate signal to zero. During the failed self test, the angle rates were proper therefore suggesting that the error may have occurred in one of the events. The Ku-band continued to operate successfully in the communications mode during the flight although the radar self test failed. Postflight, the Ku-band successfully passed thirteen self tests. In addition, the radar locked to the ceiling. CONCLUSION: The cause of the radar self-test failure is unknown. CORRECTIVE_ACTION: None, ground tests did not repeat the problem. CAR ANALYSIS: Comparison of pre- and post-flight data detected no change in equipment performance or characteristics. Ground testing was unable to repeat the anomaly. It is concluded that this is a one time failure to pass self test. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51B-V-14	APU
	GMT: 123:06:19		**SPR** 24F011	**UA**	**Manager:**
			IPR	**PR**	

Engineer:

Title: Auxiliary Power Unit 1 Gas Generator/Fuel-Pump B-Heater Failed On. (ORB)

Summary: DISCUSSION: At approximately 123:06:19 G.m.t., the APU (auxiliary power unit) 1 gas generator/fuel-pump B-heater failed on shortly after the B heaters were selected. Several APU 1 temperature measurements responded to the failed heater system with the APU 1 turbine fuel bypass measurement (V46T0128) reaching a high of about 206 deg F. The crew selected the APU 1 gas generator/fuel-pump A-heater system and the temperatures returned to normal for the remainder of the mission.

Postflight testing did not duplicate the flight problem. Contamination internal to the thermal switch most probably caused the switch to remain on by shorting across the contacts. The contamination subsequently cleared, resulting in acceptable postflight testing results. CONCLUSION: The APU 1 gas generator/fuel pump B-heater failed on most probably as a result of contamination internal to the thermal switch. The contamination subsequently cleared and this resulted in acceptable postflight testing results. CORRECTIVE_ACTION: The APU 1 gas generator/fuel pump B heater thermal switch will be removed and replaced. The thermal switch will be returned to the

vendor for failure analysis. The results of the analysis will be tracked by CAR 24F011. CAR ANALYSIS: This switch was faulty and had not been PIND tested. This is the first failure of this type in the program. Close this CAR. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51B-V-15	EPD
	GMT: 121:20:07		**SPR** 24F015	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: The Mid-Motor Control Assembly 2 Operations Status 5 Indicated Zero. (ORB)

Summary: DISCUSSION: At about 121:20:07 G.m.t., the MMCA (mid-motor control assembly) 2 operations status 5 indication read zero when there were no operations in progress. At about 123:11:08 G.m.t., an attempt was made to reset the status 5 indication by cycling MDM (multiplexer/demultiplexer) PF2, MDM FF4, and by cycling the MMCA 2 main bus C logic switch. These attempts were unsuccessful. Analysis showed that two relays in the MMCA-2 status-5 daisy chain were suspect. These were relay K7 that switches power from the AC 3 bus to the aft payload bay bulkhead-latch actuator B2 motor, and relay 26 that switches power from the AC3 bus to the right-hand vent 4 and 7 B1 motors. To prevent premature activation of the left aft bulkhead latch before payload bay door closure, CB (circuit breaker) 12 on panel MA73C was pulled to remove AC3 power from the suspect relays. This resulted in single-motor operation on the payload bay left aft bulkhead latch actuator, centerline latches 1 through 4, and centerline latches 5 through 8. The payload doors were successfully closed and all latch indications were received except for LAT 1 and LAT 2 on the left aft bulkhead latch. The crew visually verified that the left aft latches were engaged. (See problem STS-51B-18).

During postflight troubleshooting, relay K7 in MMC2 was found to be stuck in the energized position. MMC2 has been removed, replaced, and returned to the vendor for failure analysis. CONCLUSION: The operations status 5 erroneous indication was caused by failed relay K7 in MMC2. CORRECTIVE_ACTION: The MMC2 with the failed K7 relay has been removed, replaced and returned to the vendor for failure analysis. The results of the failure analysis will be tracked via CAR 24F015. EFFECTS_ON_SUBSEQUENT_MISSIONS: None, pending the results of failure analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51B-V-16	MPS
	GMT: 119:16:12		**SPR** 24F016	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: The Space Shuttle Main Engine Liquid Oxygen Pre-valve Open Indication Was Not Present During The Liquid Oxygen Dump. (ORB)

Summary: DISCUSSION: At about 119:16:12 G.m.t., the SSME (space shuttle main engine) 2 liquid oxygen pre-valve open indication was not present during the MPS (main propulsion system) liquid oxygen dump. Later, at about 119:16:17 G.m.t. during the vacuum inerting operations, the open indication was proper.

The pre-valve open indication was proper during mainstage operations. During prelaunch loading operations both the open and closed indications had operated properly. Postflight, the pre-valve was cycled many times and the open and closed indications were normal. A review of the flight data indicated that the pre-valve had cycled properly during the MPS dump. The problem could not be duplicated during troubleshooting at KSC. As a precautionary measure, the valve actuator that contains the valve position microswitches has been removed, replaced, and verified. The suspect actuator has been returned to the vendor for failure analysis. CONCLUSION: The cause for the missing liquid oxygen pre-valve open indication during the MPS liquid oxygen dump is unknown pending failure analysis. CORRECTIVE_ACTION: The pre-valve actuator, which contains the valve position microswitches, has been removed, replaced and verified. The suspect actuator has been returned to the vendor for failure analysis. The results of this activity will be tracked via CAR 24F016. EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending the results of failure analysis.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-51B-V-17		Atmospheric
	GMT: 123:09:30		**SPR**	**UA**		Revitalization Subsytem
			IPR	**PR**		**Manager:**
						Engineer:

Title: High Oxygen 2 Flow On Pressure Control System 2. (ORB)

Summary: DISCUSSION: At approximately 123:09:30 MET, a high oxygen 2 flow alarm occurred and the crew reported a loud "bang" coincident with the master alarm.

Prior to this alarm the cabin pressure and temperature had been dropping slowly due to the cooling effect of an attitude change. Also, as the spacelab DDM (drop dynamic module) operations were being performed and the DDM chamber vented overboard, an additional demand on the cabin pressure regulator was created. These two events caused a transition from low to high flow in the cabin regulator. This occurred as expected at a flow of approximately 0.9 lb/hour. The master alarm was triggered at a flow rate of 5 lb/hour approximately 45 seconds after the transition to high flow in the regulator occurred. Postflight tests of the regulator included both slow and rapid transition from low-to-high flow, maximum flow, and regulator lockup. All operations were normal and no unusual noises (loud bang) occurred. CONCLUSION: The high oxygen 2 flow alarm was the result of normal system response to cabin pressure demand. The time difference between regulator transition and the master alarm as well as KSC tests results show the loud "bang" that was reported did not come from the regulator. The loud noise may have been the result of structural deformation of the cabin due to pressure or temperature changes. CORRECTIVE_ACTION: None, KSC tests have verified proper operation of the cabin regulator.

EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-51B-V-18	MECH
	GMT: 126:12:28		SPR 24F010	UA	Manager:
			IPR	PR	
					Engineer:

Title: Paload Bay Door Close Sequence Failed On Port Aft Latches. (ORB)

Summary: DISCUSSION: At about 125:12:28 G.m.t., during the PLB (payload bay) door-closure sequence, the closed indications from the port PLB door aft bulkhead latch mechanism did not occur. Single (B1) motor drive or this actuator was used since the power to the B2 motor had been removed earlier. (problem STS-51B-15). The crew visually verified that the port aft bulkhead latches were engaged.

A review of the ac current traces indicated that the latch actuator had traveled for 41.5 seconds and then stalled. During postflight troubleshooting, the latch was released with the B2 motor which took 43.7 seconds; this correlated with the run time for latch operations observed on-orbit. Then the B2 motor (disabled on-orbit) was used to engage the latch and the run time was normal (51 seconds). Both closed indications were received, but the B2 motor continued to drive indicating that the power relay (K7) contacts in MMCA (mid motor control assembly) 2 had stuck in the energized position (problem STS-51B-15). The latch was then released with the B1 motor followed by a subsequent latch/release operation with the B1 motor, and all indications and run times were normal. There was no evidence of debris or damage to the port PLB door aft bulkhead latch mechanism during the postflight inspection. A review of the port PLB door temperatures indicated that the temperature gradients were not severe and should have not caused the latching problem. Based on the kinematics of an aft bulkhead latch mechanism layout, the latch actuator travels 56 degrees in 48 seconds (single motor run time). For a motor drive time of 41.5 seconds, the actuator would be 7.5 degrees from the total drive position. For the 41.5-second motor run time observed on orbit, all latching hooks were short of the total drive position as follows: Hook 1 by .04 degree, hook 2 by 1 degree, hook 3 by 2.8 degrees, and hook 4 by 6.4 degrees. Hook 4 (top) rotates a total of 72 degrees to reach the fully latched position. This indicates that the port PLB door aft bulkhead latch mechanism was not fully engaged; however, the latch was overcenter and structural integrity was maintained. CONCLUSION: The cause for the port PLB door aft bulkhead latch mechanism stall condition is unknown. CORRECTIVE_ACTION: Dual motor drive for the port aft bulkhead latch actuator has been restored by the corrective action of problem report STS-51B-15. Crew procedures and training to visually determine the latch position are being reviewed. Since the postflight troubleshooting and analysis have shown the port PLB aft bulkhead latch mechanism to be operational no further corrective actions will be taken. CAR ANALYSIS: Unable to duplicate flight problem postflight. Demonstrations have shown port aft PLBD latching operations to be nominal (after dual motor drive to closed position). Debris was not found in the latching mechanism. Since the failure was not repeatable and no debris was found, no corrective action will be taken. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-51B-V-19	BFS
	GMT: 126:14:12		SPR	UA	Manager:
			IPR	PR	
					Engineer:

Title: Backup Flight System Error Occurred When Updating Runway Table. (FSW)

Summary: DISCUSSION: At approximately 126:14:12:25 G.m.t., the ground controllers attempted to update the onboard runway maxi-table for landing. The BFS (backup flight system) then logged a GPC (general purpose computer) error 93 indicating an illegal address. The update should have been sent to the mini-table instead of the maxi-table. The mini-table was constrained to runway ID's 19, 20 and 21, whereas the uplink sent runway ID 12. Had the update of ID 21 been sent to the mini-table, as it should have been, there would have been no problem.

A word-by-word correction SSC (single-stage command) was transmitted, but it did not correct the right command word (ID12). However, the command did reset the error condition that allowed the processing of the two-stage execute command, which in turn allowed the processing of a two-stage buffer with an incorrect word. A subsequent load to the mini-table was accomplished successfully. The BFS performed normally throughout the remainder of entry, and no impact from the error was observed. CONCLUSION: An improper procedure was used in the correction of the TSC (two-stage command) buffer. The SSC should not have been sent until the error was received and interpreted by the ground. The correct procedure would have been to send a TSC buffer-clear command and uplink a corrected TSC. CORRECTIVE_ACTION: The correct procedure for TSC buffer correction has been documented in BFS Program Note, B08520. A CR (RD 2803) has been written to allow BFS to verify the TSC buffer following a word-by-word correction and prior to TSC execution. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-51B-V-20	MECH
	GMT:		SPR 08F011	UA	Manager:
			IPR	PR	
					Engineer:

Title: Left Main Landing Gear Brakes Damaged. (ORB)

Summary: DISCUSSION: Postflight inspection, removal, and disassembly of the brakes revealed that beryllium rotors had broken into several pieces on both main landing gear brakes. On the left outboard brake, rotor 3 was broken into 6 pieces and rotor 4 into 2 pieces. On the left inboard brake, rotor 4 was broken into 9 pieces. The carbon was damaged on all three broken rotors. Damage was very similar to that which occurred on STS-7, STS 41-C and STS 41-G with OV-099.

Analysis of the 49 channels of brake instrumentation added to the right main landing gear of OV-099 on STS 41-G has helped to characterize the brake/dynamic interaction. Brake damage on STS 41-G occurred on both the left and the right brakes while the brake damage on STS 51-B occurred only on the non-instrumented strut. Data analysis is continuing to better understand the brake/hydraulic dynamic interaction and to identify possible fixes to eliminate brake damage. CONCLUSION: Three beryllium rotors were broken into several pieces on the left main landing gear brakes. Brake damage is not considered a safety issue. Hard braking was demonstrated on STS-6 (OV-099) as a developmental flight test objective. CORRECTIVE_ACTION: Data analysis is continuing to better understand the high dynamic loading during braking and to identify possible fixes to eliminate brake damage. Brake instrumentation is planned as a target of opportunity for the right main landing gear of OV-103 after STS 51-G. Instrumentation is being considered for the left main landing gear of OV-099 and OV-103. A new brake redesign study has been initiated at the prime contractor and a preliminary design review is scheduled for about mid-August. CAR ANALYSIS: Some degree of brake damage occurs with nearly every mission. Several approaches have been put forward to redesign the brakes but only minor changes to the existing design have been approved. Damage to brakes does not represent a flight failure. Until proven corrective action is taken, the brakes will be new or refurbished to like new condition, incorporating all design changes approved to date and utilizing all new inspection criteria. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-51B-V-21		MPS
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: Main Propulsion System Pneumatic System Helium Pressure Decay Rate Was High After Start Of Purge During Entry And Postlanding. (ORB)

Summary: DISCUSSION: Postflight data review found that the MPS (main propulsion system) pneumatic system helium decay rate was high after start of purge during entry and postlanding. The helium began leaking at the start of purge during entry and the leakage rate increased postlanding.

Extensive postflight pressure decay tests at KSC have been unable to repeat the flight problem. Postflight data analysis indicated that the most probable leak source was in the liquid hydrogen feed system. CONCLUSION: The MPS pneumatic system helium pressure decay rate was high after start of purge during entry and postlanding most probably due to a transient leak in the liquid hydrogen feed system. CORRECTIVE_ACTION: Extensive postflight pressure decay tests at KSC have been unable to find a leak in the liquid hydrogen feed system. Normal turnaround pneumatic system leak tests will insure that specified leak conditions are not exceeded. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET: Postlanding	Problem	FIAR	IFA STS-51B-V-22		HYD
	GMT: Postlanding		SPR AC 9661	UA		Manager:

			IPR		**PR**	
						Engineer:

Title: Main Landing Gear Dump Valve Leaked Three Days After Landing. (ORB)

Summary: DISCUSSION: Postflight inspection of the left wheel well found that the landing gear door had been sprayed with hydraulic fluid. Further inspection found the main landing gear dump valve energized and over heated with a leak in the valve body where the solenoid mates with the valve.

Three valves had been left energized after postlanding systems shutdown when the landing gear arm/down switch was not reset. The main landing gear dump valve was pulled at Dryden and the hydraulic line was plugged. The redundant shut off valve and the main landing gear extend valve were removed at KSC. All 3 valves have been replaced and retested. Gold mylar insulating tape, covering the valve and the solenoid, traps heat inside the solenoid causing the solder to melt in about 30 minutes. An engineering order is being evaluated to remove the tape from the solenoids using the gold mylar insulation only on the valves. CONCLUSION: The main landing gear dump valve leaked three days after landing because the valve was energized and over heated causing a leak in the valve body solenoid interface.
CORRECTIVE_ACTION: The main landing gear dump valve, the redundant shutoff valve and the main landing gear extend valve were removed and replaced. Crew procedures will insure that power is removed from the valves during postlanding shutdown. An engineering order is being evaluated to remove insulating tape from the valve solenoids to increase the allowable time that the valves can be left energized. Failure analysis will be tracked on CAR AC 9661.
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

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

Title: Payload Bay Black And White TV Camera "A" Did Not Respond To Commands. (GFE)

Summary: DISCUSSION: During the postflight debriefing, the crew reported that they had difficulty operating the payload bay TV camera A during one of the aurora passes. The iris control switch apparently would not change the iris setting. The crew also stated that the camera operated properly when the camera view came into sunlight. The camera then worked properly for the rest of the flight. Postflight troubleshooting at KSC revealed that the RCU (remote control unit) was occasionally not accepting some commands. In some cases, it required 4 attempts to command the camera. This problem had been identified earlier on KSC PR V070-9-80003 and a modification to the RCU was initiated. The first modified unit is to be delivered to KSC (Kennedy Space Center) the week of June 10, 1985.

CONCLUSION: This problem was the recurrence of a known problem in the RCU which results in commands sometimes being lost. CORRECTIVE_ACTION: KSC will install the modified RCU at the next available opportunity. If it is not installed prior to the next flight, it is acceptable to fly as is because no cases have been observed where the command could not be performed, although it sometimes takes several attempts to accomplish. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-51B-V-24	GFE
	GMT:		SPR	UA	Manager:
			IPR	PR	
					Engineer:

Title: Wireless Crew Communications Leg Unit "A" Had A Stuck Push-To-Talk Button. (GFE)

Summary: DISCUSSION: The crew reported that WCCU (wireless crew communications unit) "A" had dead batteries when first used but operated properly after new batteries were installed. Later in the mission the PTT (push-to-talk) button stuck. The unit was still usable for intercom.

Postflight troubleshooting was unable to repeat the problem. The unit operated properly and has been returned to flight status. CONCLUSION: The PTT button on the WCCU "A" leg unit stuck in flight but operated properly during postflight troubleshooting. The anomaly is unexplained. CORRECTIVE_ACTION: The unit was bench tested, checked out and returned to flight status. Use of WCCU "A" will be monitored on future flights to verify proper operation in flight. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR HEN 0049F	IFA STS-51B-V-25	GFE
	GMT:		SPR	UA	Manager:
			IPR	PR	
					Engineer:

Title: The Aerodynamic Coefficient Instrumentation Package X-Axis Angular Accelerometer Data Were Unusable. (GFE)

Summary: DISCUSSION: The ACIP (Aerodynamic Coefficient Instrumentation Package) X-axis angular accelerometer data were unusable for the entire flight. Instead of a normal acceleration signature, the data began off-scale low and gradually increased to off-scale high over a short period (2 to 3 minutes). During postflight bench testing, the problem recurred; the filter circuit board was replaced, and the anomalous condition did not repeat. The unit was reinstalled in the vehicle and the problem returned. The X-axis data are not high priority on the next flight of this vehicle, therefore it is acceptable to fly as is.

CONCLUSION: The most probable cause is a problem in the accelerometer. CORRECTIVE_ACTION: Fly as is for the next flight of this vehicle and repair the unit during the next turnaround flow on the vehicle. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA	STS-51B-V-26	TPS
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: Left Outboard Elevon Tile Slumped And Gap Filler Breached. (ORB)

Summary: DISCUSSION: A detailed inspection of the elevons was conducted postflight as stated in flight problem report STS 51D-14. Minor tile slumps were identified on both the right and left elevons in several places and some minor mission pieces of gap filler were noted. There was no evidence of a major burn through and the damage observed was comparable to other flights. Several areas on the wing tips showed breached gap fillers.

Elevon carrier panels and wing tip structure were removed for more thorough inspection. No damaged structure was found; however, several Tempilabels showed temperatures of 500 deg F. Tests have shown Tempilabel changes can be caused by minor plasma flow passing directly over the Tempilabel dots. The Koropon coating on the aluminum structure adjacent to the indicating Tempilabels was not discolored. Koropon discolors at approximately 400 deg F. Normal tile and gap filler procedures will restore the minor damaged areas. CONCLUSION: Minor tile slumps and tile gap filler breaches occurred, however, the elevon/wing tip structure on OV-099 was not damaged during the STS 51-B flight. CORRECTIVE_ACTION: Detailed inspection of the elevon structure after carrier panel removal will be continued for several flights to assure no hidden damage is occurring. Frequency and details of the finalized inspection procedures will be included in an OMRSD change. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE