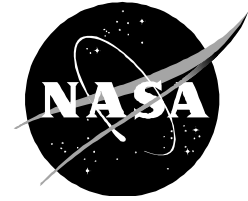


National Aeronautics and
Space Administration

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Reply to Attn of: DS-10-006

May 6, 2010

TO: Distribution

FROM: DS/Chief, Space Transportation Vehicle Division

SUBJECT: STS-132 MOD Space Transportation Vehicle Division Flight
Readiness Review (FRR) Delta Data Pack/Prelaunch Systems Issues

The enclosed data pack is provided to aid in the preparation for STS-132. The inputs are provided from Space Transportation Vehicle Division Flight Control Team disciplines for STS elements (Orbiter, SSME, SRB, and ET). The focus of this data pack is in-flight operations and the list of items in each section is not necessarily comprehensive.

This publication coincides with the L-1 Week Division Flight Readiness Review for the flight. Changes or issues that require updates after this publication will be provided by the on console team at the L-1 briefing.

If you wish to be removed from distribution for future data packs, please reply to **Whitney Maples**.

Original signed by:
Greg Oliver

Enclosure
Distribution: See list

A. Open Flight Anomalies

None

B. New Operations

GNC:

DAP configurations and constraints - (C. S. Draper Laboratory Memo delivered 4/30): The current version of the flight rules and crew procedures contain the preliminary data from C. S. Draper Laboratory. Final results of Draper Analysis indicate that DAP parameters need to be changed for some SSRMS operations with the ICC-VLD payload. This requires flight rule modifications. A R/T FR CR will be submitted by 05/07/10 to Flight Rule ULF4_C8-1 Orbiter DAP Modes and Priorities.

VRCS to Momentum Manager Direct Handover - The VRCS to Momentum Manager Direct Handover will be certified for STS-132. At MOD FRR it was thought that this operation may not be certified for flight; however, Draper has certified this operation. Flight Rule changes will not be required.

Dual Docked Ops (DDO) - The STS-132/ULF4 team is being asked to protect for the possibility of DDO with the docking of 23S. Discussions are on-going, but from a GNC perspective, due to the complexity of docking, the DDO rendezvous would occur on ISS assets. Orbiter control is not being considered outside of the maneuver to and from attitude. If required, to protect for plume impingement, the Star Tracker doors may be closed prior to the DDO and re-opened at the completion of the DDO.

B. New Operations BOOSTER:

Logic Change Notice (LCN) 01312 - Main Engine Shutdown Switch Anomaly (SSME-36) Update - SSME-36 protects for a failure of one or both of the Main Engine shutdown pushbutton contacts. Currently, the LCC effectivity is starting at the transition to OPS 1 down to T-31 seconds, with a one-time check for a shutdown command (both contacts failed hot) at approximately T-9:30. This update takes advantage of additional monitoring capability provided in OI-30 and expands the LCC effectivity to include OPS 9, and will continuously monitor for a shutdown command in GLS down to T-0. Currently, if a shutdown command were issued at T-0, an engine shutdown would occur at MM102, resulting in an RTLS off the pad. This update would provide an automatic GLS cutoff and would result only in a pad abort. This change has been reviewed extensively and approved by the MPS/SSME community. The A/E FTP approved the change on 4/30/10, and it is expected to be approved at the LCCWG on 5/5. Once approved, a manual implementation will be used if needed for STS-132, and the automated GLS capability will be available for STS-133. No open work is required for Booster.

C. Operational Workarounds

EECOM, INCO:

Orbiter ISS C&W Inhibited to FD5 - The MRM1 payload will be hooked up to the Orbiter OIU and PDI for telemetry and command capability while the module is in the payload bay. INCO and ACO have developed procedures to handle MRM1/OIU malfunction scenarios and these will be exercised during integrated sims.

Because the MRM1 payload uses the OIU and has its own TFL, the Orbiter will not support ISS return link and ISS C&W monitoring capability for the first two docked days. This topic has been talked at the FOR and will be going to a JOP in the near future.

To alert crew on the shuttle of ISS emergency events, normally, Orbiter Caution & Warning parameters for ISS Fire, Depress, and Tox Atm events are enabled when docked to the ISS and hatches are open. On STS-132/ULF4 the MRM1 payload will require the use of TFL 199 which does not contain the Orbiter ISS Caution & Warning parameters. Until the customer no longer requires TFL 199, projected to occur immediately after MRM1 Unberth on FD5, the Orbiter ISS C&W parameters will remain inhibited. The orbiter crew will maintain insight into any ISS emergency events via tones heard through the Docked Audio Interface Unit (DAIU) and will monitor ISS status via ship-to-ship (big-loop comm) and calls from MCC-H.

D. Anomaly Resolution

EGIL:

Anomalies that Occurred during STS-129 (last flight of OV-104)

AR4395: Erratic Fuel Cell 3 O2 Flowmeter - On Flight Day 7, Fuel Cell 3 O2 flow went erratic until Flight Day 12 before returning to a nominal reading. *The plan is to fly as is.*

AR4398: Mid Starboard Payload Bay Floodlight Failed - On Flight Day 8, the Mid Starboard Payload Bay Floodlight Failed. *It was replaced with a new light.*

IPR 132V-0001: FC2 H2 Pump Motor has noise - During prelaunch of STS-129, FC2 H2 Pump Motor Voltage (H2 motor stat) experienced numerous 4 bit-flip toggles. The H2 motor stat is the instrumentation used to measure the performance of the fuel cell's H2 motor, and it is sensitive to noise on the bus. Similar multi-bit toggles of the H2 motor stat have been observed during previous flights. KSC Troubleshooting has produced similar signatures but they have been unable reproduce the exact signature seen during STS-129. The Fuel Cell community discussed writing a dev for the LCC (FCP-04), but is pressing forward with leaving the LCC as-is for STS-132. This issue will be processed as a UA with the prime suspect being the sensor itself. There are no operational impacts. Failure of this sensor would just lead to loss of insight. *The EGIL group is comfortable flying as-is.*

D. Anomaly Resolution EGIL, cont.:

Anomalies That Occurred During KSC Processing

IPR 132V-0010: Middeck Flood Light #1 not working - The middeck floodlight #1 stopped working. Troubleshooting verified that the lamp assembly was receiving proper voltage, so *the lamp was changed out.*

IPR 132V-0020: Airlock Floodlight #1 has Failed - Airlock Floodlight #1 stopped working on 03/22/10. *It was R&R'd and has been successfully retested.*

Anomalies That Occurred during STS-131 (last flight)

IPR 133V-0001 – During prelaunch of STS-131, the FC2 H2 Pump Motor Voltage (H2 motor stat) increased from a nominal value of 0.62 V to 0.98 V over a four and a half minute period before dropping back down to a nominal value. There were additional subsequent increases of smaller magnitude. A data review from previous flights of this vehicle (OV-103) showed that similar signatures were seen on FC2 for STS-128, STS-120, STS-63, and STS-42, but were not seen on STS-119, STS-124, STS-116, and STS-114. Data review seems to indicate that this condition is specific to OV-103. Discussion on this condition is in progress.

D. Anomaly Resolution

EECOM:

FES Hi-Load Core Freon Leak - Small Freon leaks in the FES cores are expected due to corrosion and are documented every flow. During ground testing on OV-104, an increase in the previously baselined leak rate of $\sim 3.0 \times 10^{-3}$ sccs (~ 0.0057 %/day) was observed. At its highest rate, the OV-104 observed leak was on the order of $\sim 8.44 \times 10^{-3}$ sccs (~ 0.016 %/day). This kicked off a pressure integrity test where the leak rate did not increase after the Freon loops were subjected to ~ 2 times their normal operating pressure and then returned to normal operating pressures. This test was conducted to demonstrate that the leak was not in danger of propagating. It should be noted the observed leak rates are well below the maximum allowable OMRSD Freon loop leak rate of 0.5%/day as well as within the nominal observed Freon loop leakage of 0.5%/month. *A PRT was conducted and concluded this leak is not an issue for flight and the FES core will fly as-is.*

D. Anomaly Resolution

EECOM:

Anomalies that Occurred during STS-129 (last flight of OV-104)

STS-129 Waste Dump Line Blockage - On the last flight of OV-104, during the post-undocking waste water dump, the dump rate decreased to nearly 0 %/min after approximately 10 minutes. Nozzle temperatures did not indicate the presence of ice and later viewing of the nozzle with the RMS confirmed no ice was present. The following day, a CWC was dumped successfully out of the waste nozzle, indicating the blockage was upstream of the nozzle in the urine solids filter. The same minimal dump rate was observed at the initiation of a subsequent waste dump attempt thru the urine solids filter. Post-flight analysis of the urine solids filter has indicated an increased presence of urine solids. The root cause of the increased urine solids has not been identified. To mitigate the risk of another blockage, a citric acid flush of the waste water system has been performed to remove any residual solids in the system, and the urine solids filter has been replaced. Publication of the Urine Solids Filter Bypass IFM, reviewed and uplinked during STS-129/ULF3, has been implemented for STS-132/ULF4, and an additional Contingency Waste Water Dump filter has been manifested (2 filters on board) if a blockage occurs on STS-132.

D. Anomaly Resolution

EECOM, cont.:

PPO2 Sensor Calibration Issue - During pre-flight calibration of OV104's PPO2 sensors, the calibration screw for the PPO2 C amplifier bottomed out prior to reaching the targeted calibration set point, leaving the sensor reading ~0.04 psia higher than PPO2 sensors A & B. The PPO2 sensor in the 'C' position (s/n 012) was then swapped with the PPO2 A sensor (s/n 010) to exonerate an issue with the amplifier associated with the PPO2 C slot. Although the PPO2 C amplifier was shown to be working correctly, the calibration screw on the PPO2 A amplifier then bottomed out leaving the sensor within ~0.02 psia of sensors B & C. Although this minor sensor bias is acceptable for flight, sufficient spares and time were available and allowed for an R&R of PPO2 sensor s/n 012. PPO2 sensor s/n 007 has replaced s/n 012 and all 3 PPO2 sensors are now tracking well and have passed their initial calibration checks. Final calibration will be completed on 5/7/10.

D. Anomaly Resolution

MMACS:

Anomalies that Occurred during STS-129 (last flight of OV-104)

AR 4371, APDS Ball Screw Pair Sticking During Docking Ring Extension - During Docking Ring Extension, Ball Screw No 3 Linear Advance (V53H0705A) lagged behind the other ball screw pairs at the initiation of ring drive (MET 1/02:00:43) and appeared to be "stuck". At the same time Ball Screw No 1 Linear Advance (V53H0703A) rate increased to about 40% per minute. The maximum delta position between petals 1 and 3 was 2%, causing loss of Ring Alignment (V53X0782E). Four seconds later at MET 1/02:00:49, petal 3 released, indicated by a sharp jump in petal 3 base position, a decrease in the position of petal 1, and realignment of the ring. All three petal base positions tracked together until MET 1/02:01:35. The docking system experienced a similar signature where Ball Screw No 3 Linear Advance lagged behind and at the same time Ball Screw No 1 Linear Advance rate increased to about 55% per minute. The maximum delta position between petals 1 and 3 was 2.4%, which again caused the ring to lose alignment. Again, four seconds later at MET 1/02:01:39, petal 3 released, indicated by a sharp jump in petal 3 base position and a decrease in the position of petal 1. Ring alignment was maintained thereafter. Ring drive during docking operations as nominal. Post-flight checkout was nominal. *Per the Russian designers, play in the ring extension gearing can allow small amounts of misalignment as seen during the flight.*

D. Anomaly Resolution

MMACS, cont.:

Anomalies that Occurred during STS-129 (last flight of OV-104)

AR 4408, APU Injector Cooling Tank A Heater Failed to Activate - The APU Injector Cooling Tank temperature (V46T0500A) dropped to 46.3°F (as of MET 8/16:15) with the "A" heater selected (APU HTR TK/FU LN/H2O SYS 1A - AUTO, V46S0106E). This temperature is below the 55.3°F turn-on point typically observed during previous flights. The one exception was the last flight of OV-104 (STS-125): the tank heater turned on twice at the nominal 55.3°F point, then dropped to 52.3°F, at which point the "B" heater was selected (per the timeline). This may indicate the onset of the "A" heater failure. *Post-flight, the affected thermostat was replaced.*

AR 4412, APU 3 Drain Line A Heater Thermostat Control Range - APU 3 Fuel Pump Drain Line Temp 1 and Temp 2 (V46T0386A, V46T0370A) showed a higher-than-spec thermostat control range while the "A" heater was selected (APU HTR TK/FU LN/H2O SYS 3A - AUTO, V46S0306E). Temp 1, the transducer closest to thermostat S132A, indicates an average heater cycle range of 46°F - 77°F. The thermostat specification is 50°F - 70°F, and the ATP value is 53.0°F - 65.7°F.

The S132A thermostat exhibited a similar signature on STS-125 (cycle range of 45°F - 76°F), driving the inspection and subsequent repair of the thermostat thermal shunt (reference APU-4-31-0712). *Post-flight, the affected thermostat was replaced.*

D. Anomaly Resolution

MMACS, cont.:

Window Fastener Torque Loss - Recent torque check data on OV-104 and OV-105 has determined that torque loss is continuing on some fasteners, despite previous beliefs that the issue had been resolved. The OPO decided to accept the risk of some fasteners losing some of their torque. The risk acceptance is based on analysis that determined that positive margins of safety still exist for windows that have lost some preload on some of the fasteners. Lab data has also determined that fasteners that have lost some of their installation torque may still be providing sufficient preload to the joint. To mitigate the torque loss issue, both windows (2 and 5) on OV-104 with self-locking fasteners have been retorqued to 70 in-lbs prior in order to provide sufficient torque and preload margin.

D. Anomaly Resolution

MMACS, cont.:

Anomalies that Occurred during STS-131 (last flight)

Window Carrier Panel Ceramic Plug Liberation - During STS-131 post flight inspections, 14 window carrier panel ceramic plugs were found to be protruding/recessed and one was missing entirely. The missing plug was liberated after entry heating due to aero-loading. Analysis indicates minor risk due to the potential for plug liberation and impact with the OMS pods and vertical stabilizer. Data shows that structural thru-holes are not a concern, but TPS damage requiring EVA repair is likely should a plug strike a tile (complete loss of a tile expected). There is a concern however that should the OMS pods/vertical stabilizer be “peppered” due to the loss of several plugs there may not be enough T-RAD currently flown to repair multiple damage sites; however, this type of event is considered highly improbable. The plugs accessible at the pad (mainly around the windows) have been reworked utilizing a larger diameter cord locking feature. Torque testing has shown positive results with this design. There is no access to the payload bay door hinge line carrier panels at the pad so the liberation potential cannot be mitigated entirely. The risk was accepted for these locations since no catastrophic damage is predicted for ascent, any damage resulting from ascent liberation can be identified and repaired on orbit if required, and entry losses will only occur after heating is no longer a concern.

D. Anomaly Resolution

PROP:

Anomalies that Occurred during STS-129 (last flight of OV-104)

AR4413: Left RCS Quantity Bias during Powered Flight - During powered flight, the left RCS oxidizer and fuel quantities in the BFS biased upwards and then returned to normal prior to MECO. Similar behavior was seen on the previous flight of this vehicle (STS-125), but was not seen prior to that time. The data leads to the conclusion that the starred parameter for the left RCS fuel tank temperature biased to zero and then returned to normal. This parameter is not in the downlist, but the signature observed makes this the most likely reason for the bias noted in the data. Non-invasive troubleshooting has been performed at KSC with no likely failure mechanisms identified. The STS-132 crew has been notified of the prior behavior and the team is prepared should the failure repeat itself. The parameter may be added to the VP downlist for ascent to confirm that this is the case as it is only a theory at this time, though it is the only theory that fits the data.

D. Anomaly Resolution

PROP, cont.:

Anomalies that Occurred during STS-131 (last flight)

RCS Fu Helium Isolation Valve Anomalies - During normal ground processing, it was found that the right RCS helium pressurization valves were not preventing helium flow from the helium tank to the propellant tank indicating that the valve is either failed open to some extent or leaking at such a large rate that the difference is negligible. The vehicle flew with this problem and both the A and the B valves were kept open throughout the mission, and only closed during the post-landing valve test. The regulators themselves exhibited no problems during the flight.

Also, during the mission, both the left RCS Fuel helium press B valve and the forward RCS helium press A valve failed to indicated closed immediately after being closed. Both valves showed a significant delay between when the oxidizer valve indicated closed, and the fuel valve indicating closed. The former occurred during the first deorbit prep backout, and the later during the post-landing OMS/RCS valve test. Both problems are thought to be indications only (slow VPIs) and ground troubleshooting will take place to confirm whether this is indeed the case.

D. Anomaly Resolution

INCO:

Anomalies occurred during STS-129 (last flight of OV-104)

AR4384 documents a loss of Sequential Still Video (SSV) images during the mission. On Flight Day 4 MCC lost the SSV image. After troubleshooting the problem on the ground, INCO requested a power cycle of the SSV encoder unit onboard. Soon after the power cycle MCC recovered an image. SSV performed nominally for the duration of the mission. This type of problem has occurred in previous flights. *(No impact to STS-132 - postflight testing will be performed by Engineering)*

Anomalies occurred during STS-131 (last flight)

AR# 4644: K-Band Failure – The Ku band Failed during STS-131 for both Comm and Radar modes. The Ku band was not recovered after extended on-orbit troubleshooting. Post flight troubleshooting has isolated the failure to a transistor (Q6), located in the Exciter module of the Deployed Electronics Assembly. The loss of the K-Band during STS-131 drove multiple changes to the mission, including OBSS Inspection operations. Several of these workaround methods and procedures have been loaded onto a CD and will be flown on STS-132 to protect for another Ku-Band failure. Additionally, the crew has received training on these methods as well. It is not yet known if the Ku-Band unit installed on OV-104 would be susceptible to the same transistor failure (similar lot, P/N, etc..) or not. However, the unit installed on OV-104 did pass its preflight testing and this type of anomaly was confirmed to not be present.

D. Anomaly Resolution

INCO, cont.:

Anomalies occurred during STS-131 (last flight)

AR# 4677 - Camera C Commanded Zoom Issue Camera C had a stuck zoom motor and will be investigated post flight. *(NO impact to STS-132 - Different Camera)*

AR# 4674 - SSR2 Unexpected Mode to Standby - Solid State Recorder 2 (SSR2) unexpectedly moded itself to STBY and a data retrieval indicated that it also reported a corresponding Critical Bite Failure (CBF) for 2 seconds. INCO commanded it back to RCDA (same position, writing from the beginning of the segment) and the anomaly did not repeat. The team then performed a Comprehensive Self Test (CST) on the recorder and all results came back nominal. However, 17 seconds after the self test completed the recorder annunciated another 2-second CBF. The recorder then operated nominally for the remainder of the mission. No recorded data was impacted. *(NO impact to STS-132. Different SSR).*

DPS:

Anomalies That Occurred During KSC Processing

IFA STS-129-V-07 Damage to Protective Coating on MDU PLT1 (S/N 505) - During vehicle turnaround, a small area of damage was noticed on the screen of MDU PLT1. The MDU was replaced with a new unit (S/N 529) which has performed nominally.

D. Anomaly Resolution

BOOSTER:

Anomalies occurred during STS-131 (last flight)

STS-131 High Pressure Fuel Turbopump (HPFTP) Vibration Sensor Failure - At 7:19 MET, a vibration redline sensor (21° location) on the Left SSME HPFTP was disqualified from redline monitoring. The two remaining sensors remained qualified and the vibration redline was active throughout the remainder of powered flight. Post flight analysis of the data indicated that the HPFTP performed nominally, and that the sensor failed a high noise floor check, which is a common failure mode. *The SSME project will continue to analyze the hardware, and there are no constraints or open work required for STS-132.*

STS-131 Right MPS Inlet Pressure Sensor Failure - At 1:30 MET, the Right MPS LH2 Inlet Pressure Sensor failed off-scale low. This sensor is used in the event of a pre-MECO SSME shutdown, to verify integrity of the MPS manifold (ie. Contained shutdown), per Flight Rule A5-201. The SSME Low Pressure Fuel Pump Discharge Pressure sensor was available as a backup if needed. Failures of the inlet pressure sensors have occurred in the past, most recently on STS-117. *The Orbiter project will likely inspect and replace the failed sensor, and there are no constraints or open work required for STS-132.*

STS-131 Left SSME Nozzle Tube Rupture - During post-flight inspections, it was discovered that a nozzle tube ruptured on the Left SSME, approximately 9" aft of the Main Combustion Chamber to Nozzle joint. Further inspections revealed that a contamination in the tube caused an over-pressure condition which led to the tube rupture. The contamination has not been removed from the nozzle at this time, but was found to have a metallic appearance. The rupture resulted in a nozzle leak of approximately 0.5 lb/sec, which is well below the 7 lb/sec threshold that Booster requires to accurately identify a "Level 1" leak. *At this time the SSME has not yet declared this as an IFA, and there are no constraints or open work required for STS-132.*

E. Miscellaneous (i.e. catch all category)

DPS:

Launch Commit Criteria(LCC) Minimum Equipment List (MEL) DPS Updates - Due to MRM-1 contingency commanding needs, the Master Timing Unit (MTU) timing signal IRIG-B is required. This timing signal is typically only highly desired and not required. The change has been approved through the appropriate boards. All other DPS MEL items are standard for an ISS flight.

INCO:

BPSMU - STS-132 will only fly one BPSMU for use on the Shuttle flight deck as a separate source for A/G2. Normally two BPSMUs are flown (one as a backup). Due to an overall shortage of BPSMUs, STS-131 will permanently transfer a third BPSMU to ISS and therefore each subsequent Shuttle mission will only need to fly one BPSMU. If the lone BPSMU fails prior to docking, then the crew will need to use a VLHS to maintain a separate comm source for A/G2.

E. Miscellaneous (i.e. catch all category)

EECOM:

Orbiter Handheld Fire Extinguisher Mounting - During Entry of STS-129, the middeck handheld fire extinguisher mounted over the A/L Inner hatch was liberated from its mounting bracket and impacted the middeck floor. Two small dents were formed on the middeck floor and were noted for minor repair. Although the fire extinguisher did not show signs of damage, it was replaced with a spare. The most probable causes for the extinguisher to become liberated were improper Plastix tie placement, and or accidental dislodgement of the extinguisher by the crew. Additions have been made to the ground installation instructions and drawings to clarify proper Plastix tie placement for the flight deck and both middeck fire extinguishers.

LiOH Plan - A total of 36 LiOH cans are required for a 12+0+3 mission. In addition to the standard complement of 31 LiOH cans on the orbiter middeck, 12 additional cans are being flown in MRM1. Because the LiOH cans in MRM1 will not be retrieved until post-undocking, 5 LiOH cans will be taken from the ISS USOS Contingency Reserve during the docked mission. Once the cans in MRM1 are retrieved, the USOS Contingency Reserve will be at 36 cans which will preserve the ISS USOS Contingency Reserve redline throughout all remaining shuttle missions.

E. Miscellaneous (i.e. catch all category) EECOM, cont.:

Shuttle Crew Using ISS WHC - Three Shuttle Crewmembers will use the ISS WHC during the docked timeframe. A minimum of two Shuttle crew members using the WHC during the docked timeframe is needed to preclude having to offload the waste tank into a CWC. If the WHC becomes unavailable and insufficient waste tank ullage remains, a published IFM will be performed to create more ullage in the waste tank by offloading urine into a CWC and then dumping it post undocking.

Containment Options for Waste Tank Offload - Although an offload of the waste tank is not anticipated during the 132/ULF4 mission, in the event that it is required, an ISS CWC provides the best available leak and odor control properties due to its bladder thickness, construction, and coatings. Urine cannot be cleaned from a CWC; therefore use of an ISS CWC to store shuttle waste water prevents future use of any kind. Because there are currently only 3 ISS CWCs in inventory, use of a single bag would result in a significant reduction of the ISS inventory. To avoid this potential impact to the ISS inventory, EECOM will recommend a Shuttle CWC contained within two Ziploc bags be used in the event that a waste tank offload becomes necessary and the quantity and storage time of waste water is limited.

Pressure Plan - Further details of this items is standard open work.

E. Miscellaneous (i.e. catch all category)

GNC:

Air Data Probe Actuator Microswitch Failure (PR # NA2176-010): During ATP ambient-temperature cycle testing, the STOW 2 (S3) limit switch remained on after the actuator was operated from the stowed to the deployed position. The first failure occurred at around cycle number 160 and repeated a total of four additional times before testing was halted. Because the probes are operated only once during the mission, and given the nature of the ATP failures, it is highly unlikely that multiple DEPLOY or STOW indications would fail on during the mission. The problem is thought to be with stiction in the switch mechanism, or a weak return spring. Flight rationale is being developed based on preflight check out of the system, redundancy and the fact that the problem was only observed after multiple cycles of the actuator.

OMS TVC Controller issue (AR 003365): On STS-124, the Left OMS Secondary TVC (S/N 131) pitch and yaw position transducers failed to null during ascent. Subsequent testing and troubleshooting has determined that the problem was due to a low likelihood failure of the A6 circuit card becoming unseated, the exact cause of which has not been identified. Previously, it was thought that cause of the failure was compression set of the viton foam strips between the circuit cards and the TVC cover. However, testing has proven that the foam strips alone do not provide circuit card retention, so the 124 failure was not due to degradation in the viton foam. Flight rationale for STS-119 and subs was developed based on system redundancy and likelihood of a similar failure.

E. Miscellaneous (i.e. catch all category)

GNC, cont.:

SRB RGA failed ground testing: While performing ground tests designed to screen for damaged gyros, S/N 119 (last flown on STS-126) failed due to an out of tolerance condition in the yaw axis. The test was repeated and the unit passed. During further testing the unit exhibited out of tolerance conditions on one more occasion, however it was in the pitch axis. The OPO's proposed flight rationale relies on the redundancy of the SRGA system, as well as the pre-launch torque tests performed at T- 3:00 hours. There is still testing being done to identify the root cause of the SRGA failures and the rationale will be readdressed, if appropriate, based upon any further data.

E. Miscellaneous (i.e. catch all category)

GNC, cont.:

IMU Slip Ring Issue: A flaw exists in the design of the IMU tape cables used to transmit data to and from its inertial components (gyros, accelerometers, etc.) and the clamp used to hold the wires in place. The current design can create a small amount of flexure in some of the wires. This condition can, and has, led to breakage of slip ring wires during ground calibrations and flight operations. A modification to the IMU hardware has been designed and successfully implemented on S/N 210; this IMU has been installed in OV-104 in slot 1. The remaining IMUs on OV-104 have not had the modification performed and is susceptible to this failure mode. The modified IMUs eliminate the susceptibility of all three IMUs to the generic failure mode, and thus the need for early mission termination under the generic failure mode section of the flight rules.

E. Miscellaneous (i.e. catch all category)

EGIL:

Equipment Replacements/Additions

- PLB Floodlight Mid Starboard
- Middeck Floodlight #1
- Airlock Floodlight #1

Space Shuttle Systems Handbook (SSSH) – EGIL has informally update the SSSH drawing for the Fuel Cell H2 flow sensor and Fuel Cell Cell Performance Monitor (CPM) instrumentation. This update will be available on STS-131 and subs. This drawing change is due to rewiring of the Fuel Cell H2 Flow sensors, to separate them from the Fuel Cell CPM. Fuel Cell H2 Flow meters have a history of shorting, which due to common fusing with the CPM, caused the loss of that instrumentation as well. Rewiring of this instrumentation was completed for OV-104, and the H2 flow instrumentation is now separately fused from the CPM. Due to insufficient fuse locations in Mid Power Controller 2 (MPC2), the Fuel Cell 2 H2 Flow meter wiring is connected to MPC3. EGIL will track this as a known drawing error for SSSH, and only the EGIL SSSH books will be updated with a new drawing. The MALFUNCTION PROCEDURES book will not be updated to reflect this change. It was decided that since this would not be a time critical failure, that any deltas required could be read to the crew.

E. Miscellaneous (i.e. catch all category)

BOOSTER:

Master Events Controller Output Check Failed - During MEC1 transient output checks, the Right Hand SRB Range Safety System Power A OFF command did not have the expected voltage response (should be ~13 VDC, was 0 VDC). IPR 132V-0014 was opened, and after troubleshooting, the transient power checks were repeated and all readings were nominal. Initially this IPR was going to be closed out as an Unexplained Anomaly, but during the GSE teardown a tech noted that one of the GSE adapter cables that affected the RH RSS Power A signal was not fully mated. Based on this, the IPR was closed out as human error.

TVC Isolation Valve Misconfiguration - During some Orbiter Hydraulic System checkouts, the Hyd. System 3 MPS/TVC isolation valve was inadvertently opened without MPS Pneumatic pressure active to maintain the associated SSME propellant valves in the closed position. The concern would be for the SSME propellant valves to drift open and for potential contamination to enter the SSME/MPS system during the Orbiter rollout to the VAB. The MPS Pneumatic System was activated to ensure a position verification of propellant valve closure, and the IPR was closed out as human error.

E. Miscellaneous (i.e. catch all category)

BOOSTER, cont.:

Equipment Replacements/Additions

STS-132 is the 32nd flight of OV-104
 Inclination: 51.6 degrees
 Launch PAD: 39A/MLP 2
 External Tank: S/N 136 (Super Light Weight Tank)
 RSRM Set: RSRM-111: Left Side (A), Right Side (B)
 SRB Assembly: BI-143
 Orbiter Software: OI-34

SSME Hardware¹

Position Number	1(C)	2(L)	3(R)
Engine Number	2051	2052	2047
Engine Type	Block II	Block II	Block II
Last Hotfire	STS-128	STS-128	STS-128
Powerhead	6009	6018	6016
Main Injector	6007	2035	4027
MCC	6006	6022	6011
Nozzle	5004	5007	(2030)
Controller	AF62	AF60	AF39
HPFTP	8028	8027R1	8024R1
HPFTP R/L Deg. R	1860	1860	1860
LPFTP	4207	6005	2225
HPOTP	8224	8230	8325
HPOTP R/L Deg. R	1660	1660	1660
LPOTP	2231	6103	4207

NOTE: Items in parentheses have been changed out since the last hot-fire of the SSME.

SPACE TRANSPORTATION VEHICLE DIVISION FLIGHT READINESS REVIEW
FRR DELTA DATA PACK
STS-132 (OV-104)
May 6, 2010

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