	Presentor:
	Organization/Date: Orbiter/6-29-05

BACKUP INFORMATION

	Presentor:
	Organization/Date: Orbiter/6-29-05

PREVIOUS FLIGHT ANOMALIES

BACKUP

	Presentor:
	Organization/Date: Orbiter/6-29-05

STS-107 IN-FLIGHT ANOMALIES

BACKUP

STS-107-V-01: AC2 SLUGGISH CURRENT SIGNATURE	Presentor:
	Organization/Date: Orbiter/6-29-05

Observation:

- During vent-door and PLBD opening, and KU-band antenna deployment, the AC2 phase B current exhibited a sluggish response
- AC2 phase B exhibited intermittent small current drops during steady-state

Concern:

- AC2 phase B inverter and wiring suspect due to anomalous current signature
- Potential loss of a single AC bus phase

Discussion:

- During motor startup Phase B current decreased to about half the expected value, then increased to its nominal value within ½ to 1 ½ seconds
- During this time period, the AC 2 bus phase A and C current increased an equal amount to compensate for phase B sluggish response

STS-107-V-01: AC2 SLUGGISH CURRENT SIGNATURE

Presentor:

Organization/Date:
Orbiter/6-29-05

Discussion: (cont)

- During steady-state periods, there were periodic occurrences of small amperage fluctuations of the same type (phase B dropping, phase A and C increasing)
- No loss of function was observed during the sluggish current events
  - All actuator motor drives were within the nominal two motor drive time
- The AC2 phase B Power Static Inverter (PSI) and the wiring from the inverter to circuit breaker panel MA73C and switch panel L4 is common to all signatures
- The probable causes of this anomaly are believed to be either the AC 2 bus phase B inverter or an intermittent wiring contact between the AC 2 phase B inverter and panels L4 and MA73C

STS-107-V-01: AC2 SLUGGISH CURRENT SIGNATURE	Presentor:
	Organization/Date: Orbiter/6-29-05

Actions Taken:

- While STS-107 was the first in-flight occurrence of this signature, review of STS-107 ground processing data found two smaller motor startup signatures occurred during preflight testing
  - One was a vent door 8 & 9 cycle, the other event had an unknown cause but was similar
- A review of the PRACA history of the power static inverters revealed no previous instances of this type of anomaly
- Extensive system(s) checkout performed during the OV-103 OMM flow verified proper system performance and no anomalous current traces during motor operation
  - Complete checkout of all AC buses performed
- Reviewed STS-105 (last flight of OV-103) ground and flight data - no anomalous AC signatures found

STS-107-V-01: AC2 SLUGGISH CURRENT SIGNATURE

Presentor:

Organization/Date:
Orbiter/6-29-05

Risk Assessment:

- Loss of a single AC Inverter is Criticality 1R2
  - All Critical AC equipment is redundantly powered
  - AC Motors can be started and operated on 2 phases of an AC bus with the exception of the cabin fan
    - Although the AC motors are certified to start and run on two phases, the actuators are certified for operation with only one of the motors operating on two phases - the other motor must be operating on all three phases
    - The cabin fan is able to operate on 2 phases, however it has not been certified to start on 2 phases
      - MOD has a procedure for this contingency which has not been executed on orbit, but was demonstrated in SAIL

STS-107-V-01: AC2 SLUGGISH CURRENT SIGNATURE

Presentor:

Organization/Date:
Orbiter/6-29-05

Acceptable for STS-114 Flight:

- Extensive system(s) checkout performed during the OV-103 OMM flow verified proper system performance and no anomalous current traces during motor operation
  - Review of STS-105 (last flight of OV-103) ground and flight data found no anomalous AC signatures
- During STS-107 no motors or functions were lost due to the “sluggish” AC2 phase B current response
- All critical AC loads are redundantly powered
- Loss of a single AC Inverter is Criticality 1R2
  - Flight rules exist for failed inverter
  - All motors are designed to start and operate on two phases of an AC bus with the exception of the cabin fan
    - MOD contingency procedure exists

# OV-107-V-02: PRSD EDO O2 TANK 7 HEATER FAILURE	Presentor:
	Organization/Date: Orbiter/6-29-05

Observation:

- EDO O2 tank 7 ‘A’ heater string (A1 & A2) failed to turn on in manual mode via cockpit switch

Concern:

- Loss of cryo tank heater function may result in loss of cryo consumables and potentially impact mission duration

Discussion:

- Both the EDO and orbiter cryo tanks utilize two (A and B) heater strings, each capable of being operated in either manual or auto mode
  - Both A and B heater strings are normally utilized in auto
  - Use of one heater assembly results in slower tank pressurization rate, but is adequate for mission use

OV-107-V-02: PRSD EDO O2 TANK 7 HEATER FAILURE

Presentor:

Organization/Date:
Orbiter/6-29-05

Discussion: (cont)

- At MET 00:21:46, the O2 tank 7 A and B heaters were activated in manual mode (heater switch turned to ON) for tank Current Level Detector (CLD) checkout
  - The A heater string (A1 & A2) failed to activate – downlink and bus current draw indicated A heaters off, B heaters on
  - The tank heaters were then activated in auto mode (heater switch turned to AUTO)
    - Both “A” and “B” heaters operated nominally - verified by downlink and bus current draw
- Review of pre-flight checkout data indicated nominal heater operation in auto and manual modes
- EDO pallet and tank heater/controller had not been flown for almost five years (STS-90 - April,1998)

OV-107-V-02: PRSD EDO O2 TANK 7 HEATER FAILURE

Presentor:
Organization/Date: Orbiter/6-29-05

Actions Taken:

- Potential causes of anomaly were identified:
  - O2 tank 7 heater switch
  - EDO to orbiter interface connector
  - Wiring between cockpit switch and interface connector
- Preliminary troubleshooting plan had been developed to isolate the failure in the electrical circuit
- OV-103 PRSD tank heater checkout performed during this OMM/processing flow verified no anomalies
  - 3 O2 tanks were removed and re-installed during OMM - all electrical checkouts were performed and heater functions were verified.
  - Note that STS-114 is flying only 5 PRSD tank sets – no EDO pallet

OV-107-V-02: PRSD EDO O2 TANK 7 HEATER FAILURE

Presentor:

Organization/Date: Orbiter/6-29-05

Risk Assessment:

- No criticality assigned to condition of "failed off heaters in manual mode"
  - Redundant heater operation available in auto mode
  - Redundant heater assemblies, A & B
    - Use of one heater assembly results in slower pressurization rate, but adequate for mission use
- Risk mitigation actions are in place to screen failures
  - Complete checkout of cryo system controller/heaters and electrical circuit performed at OMM and for LRU retest

# OV-107-V-02: PRSD EDO O2 TANK 7 HEATER FAILURE	Presentor:
	Organization/Date: Orbiter/6-29-05

Acceptable for STS-114 Flight:

- Review of OV-103 flow processing data verified nominal heater operations in both auto and manual modes
- Redundancy exits for all orbiter cryo tank heaters
  - Manual and auto switch modes
  - Redundant A & B heater strings
    - One heater string is acceptable for mission use
- Flight rules exist for failed heater assembly
  - Utilize commodity from tank with failed heater until consumables from the other tanks support nominal EOM +2 contingency days
  - Worst case is loss of tank commodity and early end of mission
- Not a safety-of-flight issue

	Presentor:
	Organization/Date: Orbiter/6-29-05

STS-105 IN-FLIGHT ANOMALIES

BACKUP

STS-105-V-01: LEFT OMS OXIDIZER CROSSFEED LOW POINT DRAIN LINE HEATER FAILURE	Presentor:
	Organization/Date: Orbiter/6-29-05

Observation:

- Left OMS crossfeed oxidizer low point drain line B heater stopped cycling

Concern:

- Loss of redundancy in heater system

Discussion:

- Low point drain line B heater had been cycling on/off at 63°F and 87°F per temp sensor (V43T6236A) control points
- After ~ 4 days of B heater operation, the heater failed to turn on at the 63°F set point
- Crew switched heaters from B to A when the line temperature reached 41°F
  - Heater cycling returned to normal ranges for A heaters (53°F to 71°F)

STS-105-V-01: LEFT OMS OXIDIZER CROSSFEED LOW POINT DRAIN LINE HEATER FAILURE	Presentor:
	Organization/Date: Orbiter/6-29-05

Actions Taken:

- KSC troubleshooting confirmed that the thermostat was failed open
- Failed thermostat was replaced and successfully retested

Risk Assessment:

- Failed open thermostat/failed off heater is Crit 2R/3
  - Redundant heater system exists
    - Manual switch throw required
    - Sufficient reaction time exists
- Loss of redundant heater system
  - Orbiter attitude workarounds would be necessary for thermal control
    - Potential ISS mission impact

STS-105-V-01: LEFT OMS OXIDIZER CROSSFEED LOW POINT DRAIN LINE HEATER FAILURE	Presentor:
	Organization/Date: Orbiter/6-29-05

Acceptable for STS-114 Flight:

- Failed thermostat (B-string) was replaced and successfully retested
  - Redundant heater string (A-string) verified to be functioning properly following B-string repair
- Redundant heaters and thermostats exist
- Not a safety of flight issue

STS-105-V-02: LOSS OF AC2 PHASE 'A' DURING MPM STOW

Presentor:
Organization/Date: Orbiter/6-29-05

Observation:

- During pre-deorbit stow of the RMS Manipulator Positioning Mechanisms (MPMs), the mechanism drove at dual motor time, but motor 2 was missing AC2 phase A

Concern:

- Failure reduces AC2 Mid Motor Controller Assembly 2 (MMC2) bus phase power redundancy to affected motors

Discussion:

- At payload bay door opening and when MPMs were first deployed, all three phases were present on MMC2 AC2
  - However, only 2 of 3 phases were present when the RMS MPMs were stowed

STS-105-V-02: LOSS OF AC2 PHASE 'A' DURING MPM STOW

Presentor:

Organization/Date:
Orbiter/6-29-05

Discussion: (cont)

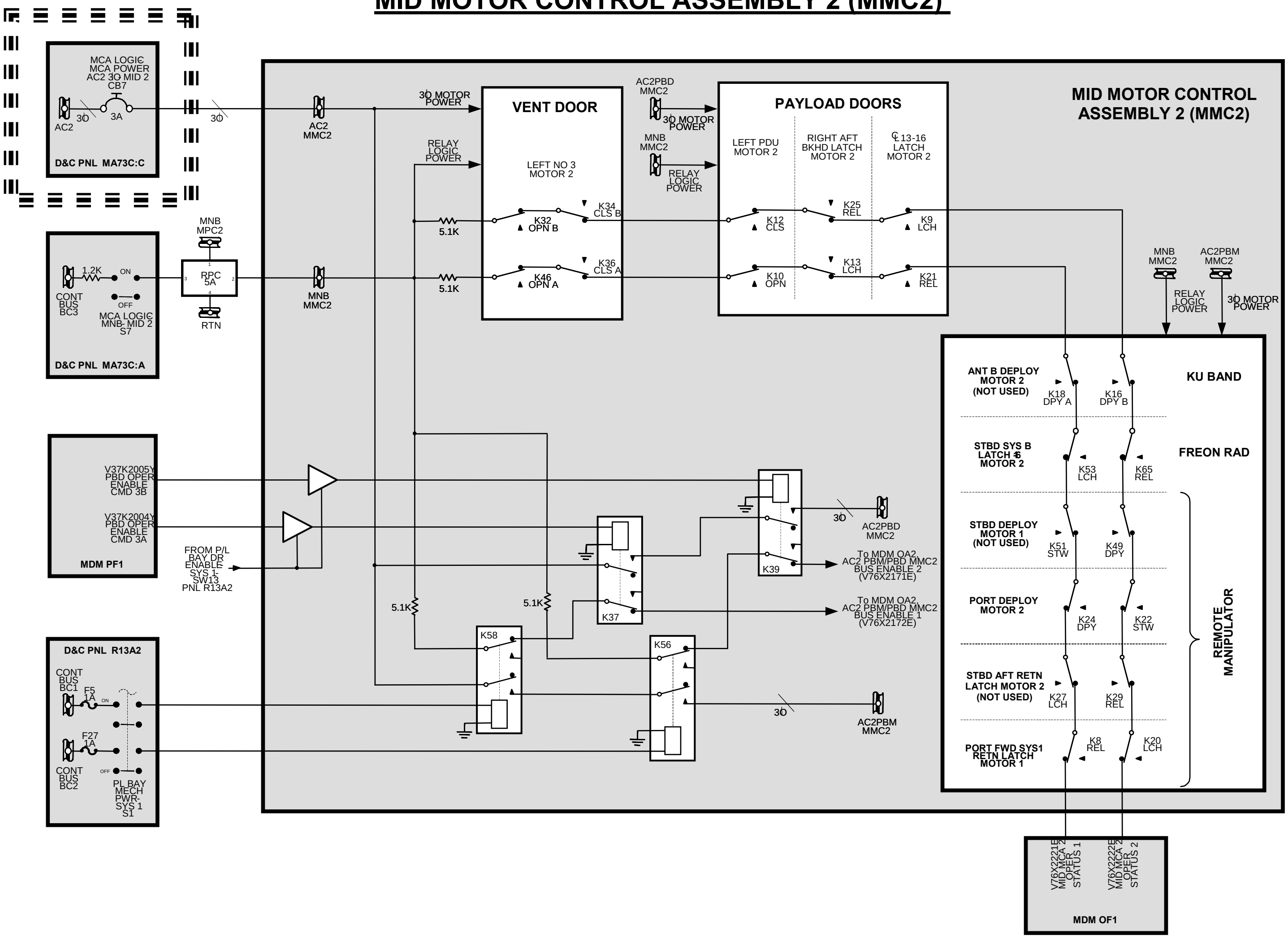
- The AC2 MMC bus provides power to various components, all of which were found to have phase A current missing after this point in time
  - Port payload bay door drive motor 2
  - Starboard payload bay door aft bulkhead latch motor 2
  - Payload bay door centerline latch 13-16 motor 2
  - Left vent door 3 motor 2
- All motors powered by the MMC2 AC2 are designed to operate on two phases
- A three phase ganged AC circuit breaker CB7 on panel MA73C provides protection to MMC2 AC2 power circuits
- Based on observed anomalies and circuit analysis, the most probable cause of this failure was believed to be a contaminated contact in the circuit breaker

STS-105-V-02: LOSS OF AC2 PHASE 'A' DURING MPM STOW

Presentor:

Organization/Date: Orbiter/6-29-05

MID MOTOR CONTROL ASSEMBLY 2 (MMC2)



STS-105-V-02: LOSS OF AC2 PHASE 'A' DURING MPM STOW	Presentor:
	Organization/Date: Orbiter/6-29-05

Actions Taken:

- Post-landing KSC troubleshooting isolated the problem to the MMC2 AC2 power circuit breaker CB7 on D&C panel MA73C
  - Oxidation on the contacts has historically been the root cause of circuit breaker problems
  - The OMRSD provides for cycling the CB at least 5 times in an attempt to clean the contacts and clear the problem
  - Circuit breaker 7 was cycled and phase 'A' was recovered with the second cycling of the breaker

STS-105-V-02: LOSS OF AC2 PHASE 'A' DURING MPM STOW	Presentor:
	Organization/Date: Orbiter/6-29-05

Actions Taken: (cont)

- Decision made to remove panel MA73C to perform additional troubleshooting and functional testing (completed 5/28/02, ref. PRR# 90805N)
  - Panel MA73C was functionally tested with discrepant CB7 cycled repeatedly with no replication of failure
  - D&C PRT directed to remove and replace CB7 following completion of testing
  - Failure analysis of the CB was not performed – D&C PRT agreed the failure showed symptoms of previously failed circuit breakers (ref FA report 01-033)
    - Condition attributable to either contact oxidation or casing debris contamination inside the circuit breaker
    - Casing debris contamination has been observed / documented in 4 previous failure analyses

STS-105-V-02: LOSS OF AC2 PHASE 'A' DURING MPM STOW

Presentor:

Organization/Date:
Orbiter/6-29-05

Risk Assessment:

- Motor Control Assembly (MCA) AC motors are driven by 3 phase power sources; a failure of one phase will not result in the loss of the capability to drive that motor
- All of these actuators have redundant motors
  - Capable of performing the intended function with one of two motors, given the remaining motor is powered by all 3 AC phases
  - Redundant motor receives power through a separate circuit breaker/bus
- OMRSD and Flight Rules recovery procedures are available to recover circuit breaker function if required (ref S00GEN.695)

STS-105-V-02: LOSS OF AC2 PHASE 'A' DURING MPM STOW	Presentor:
	Organization/Date: Orbiter/6-29-05

Acceptable for STS-114 Flight:

- Anomaly isolated to MA73C panel circuit breaker 7, condition attributed to contact oxidation or casing debris contamination inside the circuit breaker – recovered by OMRSD procedure
  - Circuit breaker 7 removed and replaced
- Circuit breaker function is verified during system ground testing and operations
- Vehicle systems redundancy and workarounds exist to accommodate circuit breaker failures
  - In the event of a similar failure, all MCA AC motors will function with only 2 of 3 phases energized
  - Actuators are designed with redundant motors and are capable of performing the intended function with one of two motors
    - Redundant motor receives power through a separate circuit breaker/bus
  - OMRSD and Flight Rule recovery procedures are available to recover circuit breaker function if required

	Presentor:
	Organization/Date: Orbiter/6-29-05

ORBITER CRITICAL PROCESS CHANGES

BACKUP

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Critical Process Change Definition:

- A critical process change is defined as a change to a process which affects TPS or structures, or other flight hardware associated with criticality 1, 1R or 1S failure mode.
  - This is basically a combination of the program agreements regarding functional criticality and the basic engineering definition of a physical hardware process.
  - Definition Agreed to by JSC VEO for FRR Reporting

- The basic definition of engineering process change is a physical change to a hardware process, which, if implemented, has the potential to negatively affect the integrity of the product (wrong process or material chosen etc.) without the degraded characteristics being detectable by any of the imposed inspection and verification methods.
- Sometimes associated with the term “controlled process”
  - Definition used by NASA Engineering for “critical process”

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

IDMRD Changes (MCNs):

MCN OM3124 PRCS Pilot Fuel/Oxidizer Pilot Operated Valve (FRS & 7.11)

- **Incorporates a reduced allowable PRCS Oxidizer Pilot Operated Valve helium leak rate at the WSTF depot.**
  - Reduced pressure from 350 psig to 50 psig
  - This change results in a reduction in fuel valve extrusion failures when paired with an oxidizer valve that leaks less than 50-60 scch
- **Incorporate a new PRCS Fuel Pilot Operated Valve seal extrusion screen utilizing the current trace from the water response ATP.**
  - The fuel valve H2O response current trace shall be evaluated for evidence of pilot seal extrusion
  - No evidence of extrusion is allowed. Fuel valve current trace shall exhibit only a nominal shape

CRITICAL PROCESS CHANGES

Presentor:
Organization/Date: Orbiter/6-29-05

Engineering Design Change Proposals (EDCPs):

Cleanliness Requirements for Reaction Control Systems Thrusters and Components (EDCP-V0527A)

- Remove reference to Marquardt filter specification & replace with Aerojet specification
- Update Aerojet documentation
  - Deleted Trichlorotrifluoroethane, IPA or PF5060 are still available for use
  - Change monitoring of atmospheric contamination and fluid contamination from “once every day the facility is in use” to “once each week the facility is in use”. Reference the correct NASA requirement spec - SE-S-0073
  - Added Aerojet Process Specification PS-0103, Contamination Control Quality Provisions to applicable documents section since it is an approved spec referenced in other Marquardt process specs
  - Change solvent used for rinse test from “solvent conforming to MIL-C-81302 in accordance with procedure of ARP-598” to “solvent in accordance with the procedure of PS-0103
- There is no change to the form fit or function of the vernier or primary thruster
- The cleaning process specification updates provides proper document references and Aerojet best practices

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Engineering Design Change Proposals (EDCPs) – cont:

Ultrasonic Cleaning Spec Update for Reaction Control Systems Thrusters and Components (EDCP-V0528A)

- Remove reference to Marquardt filter specification & replace with Aerojet specification
- Update Aerojet specification
  - Add frequency requirement for the cleaner - 40 kHz
  - Identify preparation of detergent for two different methods (recirculating and batch method)
  - Reference the correct NASA requirement spec - SE-S-0073
  - Specify the type of water to be used - hot distilled or deionized
  - Define the procedure for producing a fresh solution for the recirculating method
- There is no change to the form fit or function of the vernier or primary thruster
- The new ultrasonic cleaning process specification provides equivalent cleanliness per revised requirements

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Engineering Design Change Proposals EDCPs – cont:

Hi-Load Duct Heater Acceptance Test Procedure Revision (EDCP- SH-PR-0500)

- Revise ATP specification SVHS7425-722
  - Clarify resistance test procedure to use oven only if ambient temperature is out of specified limit range of 60F-80F.
  - Revise resistance requirement across open thermal switch from “over-range” to “greater than 9.9 Mega Ohm”
  - Add NASA inspection points
  - Revise instrumentation table per latest required format
  - Clarify shipping instruction to allow use of equivalent shipping container
  - Clarify test procedure for test set up and configuration
- Reason for change
  - February 10, 2004 OCCB action item (reference EDCP SH-PR-0494 and OCCB action item briefing on 3/24/2004) to clarify test procedure to define criteria when oven can be used
  - Resistance value revision provides equivalent value in proper unit rather than meter over-range indication which is dependent on unique meter
    - New Ohm meter has larger range than 10M Ohm range (old meter)
  - NASA MIP’s are added as required per USA contract

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Engineering Design Change Proposals (EDCPs) - cont:

Flex Line Drawing Update (.062 & 0.75 inch diameter) (EDCPs 1804714-001 & 1806145-001) Senior Aerospace

- Update drawings to reference Senior Aerospace process specifications instead of Parker Metal Bellows and canceled MIL-STD specs

Fabricating and Machine Practices	Is: MPD-58	Was:	ES1018-5
Fusion welding and Inspection	Is: MPD 24	Was:	MIL-W-8611
Identification Markings	Is: MPD-4,	Was:	MIL-STD-130
Penetrant Inspection	Is: MPD-44	Was:	CPS 3011
Radiographic Inspection	Is: MPD-83	Was:	MIL-STD-453
Passivation	Is: MPD-16	Was:	ES1024

- Update drawings to reference material spec changes
- Update drawings to reflect company change from Parker Metal Bellows to Senior Aerospace, SSP

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

These 3 EDCPs are the latest in an ongoing process to implement the change from environmentally harmful cleaning fluids to environmentally friendly cleaning fluids per EPA standards

- Use Of Non-Ozone Depleting Substances For Cleaning The Flash Evaporator System (Hamilton Sundstrand EDCP SH-PR-0486) {FRS 7.1}
- Updated cleaning method for Specification for Application of Epoxy Adhesive (Hamilton Sundstrand EDCP APU-1788R1) {FRS 7.12}
- Water Spray Boiler Non-Ozone Depleting Substance Cleaning Process (EDCP SH-PR-0487) {FRS 7.13}

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

Flash Evaporator Drawing Revisions Hamilton Sundstrand EDCP SH-PR-0491, Rev. A) {Ref FRS 7.1}

- Drawing revisions to reflect actual requirements the FES is manufactured to
- Drawing updates to reflect, previously approved, cleanliness specification SVHS14724
  - Material capability with HFE 7100 was shown to be acceptable in qualification test report number SVHER22382, dated June 26, 2002
- Allows use of alternate Fiberglass (Micarta®) washer
  - The material change for the washer uses a material already included in the Material Identification and Usage List (MC02) and certified for the FES.
- Allows use of GHe as an alternate to GN2 for in-process Testing
  - Materials used to build FES components are compatible with GHe
- Certification by similarity.
  - There is no impact to the certification of the Flash Evaporator Subsystem.

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

ME271-0091 Flexhose Drawings Updates (Senior Aerospace EDCP 1804323-025-001 & EDCP 1804323-003-001) {Ref FRS 7.1}

- New Flex hoses manufacturer Senior Aerospace converted necessary drawings and documents obtained from Parker Metal Bellows (OEM) in accordance to their policies and operating procedures requirements
  - None of the changes made to the drawings and ATP modify the design, fabrication or performance of the flex hoses
- Allows Senior Aerospace to recreate a new top assembly drawing for ME271-0091 ½ inch diameter flex hoses
- ME271-0089 and ME271-0091 flex hoses are needed to support OV-105 OMM
- Facility certification of Senior Flexonics - SSP was conducted in March of 2000
  - First Article Regimen has been satisfied
- Certification done by similarity and analysis

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) cont:

ADTA Mounting Bracket Bolt Installation Torque Reduction (Honeywell EDCP AADT-005) & V070-703058 ADTA Assembly Drawing {Ref FRS 7.8}

- AADT installation torque reduced to correspond with M&PE's guideline of Class 2 torque for 10-32 fastener
  - Minimizes potential future repair costs due to damaged inserts
- Revised torque in vendor ATP from 40-45 in-lbs to 35-40 in-lbs (Class 2)
- Revised torque in ADTA Assy drawing V070-703058 from 40-50 in-lbs to 35-50 in-lbs
  - M&PE satisfied that currently installed LRUs with non-damaged inserts are acceptable as is up to 50 in-lbs
  - Wider torque range allows currently installed hardware to remain as-is and precludes CM-driven dash number roll
- OMI calls out to install ADTA assemblies into vehicles to 35-50 in-lbs, but OMI not directs to torque to lower end of specified range

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

RCS Isolation Valve - Contamination Control Procedure Update (VACCO 73835-EDCP-0001, Rev B) {Ref FRS 7.11}

- Turco 4215 is being replaced with Oakite 126 and Oakite 1300
  - M&P concurs that the Oakite 126 and Oakite 1300 are compatible with stainless steel and aluminum materials respectively
  - Both Oakite types are aqueous detergent-like cleaners used during intermediate processing
- Virgin freon is being added where distilled freon is used
  - Virgin freon is made through an organic synthesis process, while distilled freon is recovered freon which uses a distillation process
  - M&P concurs with the use of virgin freon since both types of freon are required to comply with the same purchasing Mil-Spec
- Amended certification statement provided in OCR, no change in form, fit or function of the isolation valve

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

Lear Romec Test Point Couplings ATP Revision (NSLD EDCP NSLD-LR-0101) {Ref FRS 7.11}

- EDCP deletes the requirement to perform a leak check during EB weld integrity test at 7500+100/-0 PSIG
  - This requirement was inadvertently added to the ATPs and carried over to the current revisions
  - The IDMM does not require leak check during EB weld integrity proof pressure test at 7500+100/-0 PSIG (Original repair cert)
  - It is not a procurement specification requirement to perform a leak check during a weld integrity proof pressure test at 7500+100/-0
  - Lear Romec Test Procedures (TPs) do not require leak check during the EB weld integrity test (Original built)
  - The leak check requirement during weld integrity test was deleted from OMS/RCS ATP (RSC-M-0006) and approved by VECB on 08/05/2002
- All leak check tests (Proof and Operating) that are required by procurement specification remain unchanged to ensure redundancy
- EB weld integrity proof pressure of 7500+100/-0 PSIG is still in effect, the pressure is held for 5 minutes and hardware is inspected for physical damage after this test is performed

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

Replace Aerojet EB Weld Specification for RCS Thrusters (Aerojet EDCP-V0513 Rev B) {Ref FRS 7.11}

- RCS Thruster drawings callout MPS-1609 as the specification for electron beam (EB) welding of Space Shuttle Orbiter thrusters
- Drawings still specify MPS-1609, but Aerojet specification will be used for build of spares.
  - Whenever a drawing specifies MPS-1609, Aerojet specification 04-01-000-00 will be automatically invoked.
  - MPS-1609 will be purged from the system.
  - Both inplant and outplant welding is performed per 04-01-000-00.
  - MPS-1609 is specific to Shuttle hardware while Aerojet spec is a generic weld spec for various programs
  - All production units will undergo penetrant and radiography inspection per 04-01-000-00
  - Certification by similarity
- Processes are in place to maintain the integrity of the Shuttle hardware - facility certification, periodic facility audits

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

Bearing Housing As-Cast Radius (Hamilton Sundstrand EDCP APU-1732) {Ref FRS 7.12}

- Remove requirement to machine as-cast radius of 0.150" nominal to 0.062" nominal
  - The smaller radius of 0.062" in the casting was designed to minimize material cross-section which in turn was to minimize heat transfer to the turbine shaft bearings
  - Thermal Analysis performed at Hamilton Sundstrand predicted insignificant thermal affects between the two radius dimensions
  - Stress Analysis performed at Hamilton Sundstrand showed no detrimental affects on bearing housing, in fact it was shown that fatigue life was slightly increased
  - Analysis information can be found in the closeout of CAR AE1834
  - Certification by test & analysis
    - Results from stress/thermal analysis along with flight data show that there are no significant temperature variations with a bearing housing with the larger radius of 0.150" nominal

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

Cushioned Loop Clamps (Hamilton Sundstrand EDCP APU-1782) {Ref FRS 7.12}

- Specification AMS 5510 replaces MIL-S-6721:
  - M&P analysis of AMS 5510 was found to be equivalent with the MIL-S-6721 with the exception of slight variations in the allowances for titanium and nickel allowed in the steel
    - M&P has evaluated the variations and considers any differences to be a negligible variable within this steel material with no impact to performance of the product
  - Based on Hamilton Sundstrand review of Quality documentation after clamp vendor relocation and merger:
    - There is no impact on product being delivered from Kirkhill-TA Co. (Valencia, CA) compared to that which was delivered from TA MFG Co. (Glendale, CA)

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

Update Parts Cleaning Methods (Hamilton Sundstrand EDCP APU-1783R1) {Ref FRS 7.12}

- Update vendor pre-cleaning specification
  - Added ultrasonic cleaning in brominated solvent
  - Added ultrasonic cleaning with fluorocarbon solvent
  - Updated procedure to add control of water, rinse agents and vapor degreasing. Added processing tank temperature range and use of rust inhibitor
  - Material compatibility has been tested and determined acceptable
  - This solvent is used by other manufacturers of space shuttle hardware
  - Note: Previous replacement of vapor degreasing with aqueous method for solvent flush was not effective in all cases
- Joint review conducted with SRB on 11/12/04

CRITICAL PROCESS CHANGES

Presentor:
Organization/Date: Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

ME271-0079 Hydraulic Flexhose Correct Swage Fitting Tool, Update Assembly Procedure and Allow Use of R160 Braiding Machine (Titeflex EDCP 106056A) {Ref FRS 7.13}

- EDCP updates procedure PS359/V to show revised dimensions for -20 hose size fourth swage die set tool (IS 1.650 ID, WAS 1.640 ID), and include more detailed hose assembly and swaging instructions to improve product quality for all ME271-0079 high pressure hoses
  - Allows the use of an updated hose flex-section (Titeflex hose series R160-20) to fabricate -20 hose size assemblies
    - The R160-20 flex-section is identical to the current R159-20 flex-section except for use of a more modern braiding machine
- Certification of the ME271-0079 size -20 high pressure class 1 hose assemblies was completed by delta qualification testing performed by Titeflex
  - Qualification in accordance with MIL-H-38360B as specified by ME271-0079

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

FCP Unitized Electrode Assembly (UEA) Manufacturing Vacuum Incorporation (UTC Fuel Cells EDCP ORB-0410) {Ref FRS 7.14}

- EDCP modifies Unitized Electrode Assembly (UEA) molding specification (FCPC 46092) to allow the use of vacuum down to 25"Hg below ambient pressure and change minimum resin pre-stage temperature from 185°F to 150°F
  - Boeing M&P review has verified vacuum process as benign
- Updates UEA drawing (FC42749) to identify new processed UEA's and to correct UEA design thickness
- Process change results in reduction of bubbles in UEA frame and associated scrap rate
  - During UEA molding process, many layers of epoxy resin flow under heat and load to form the unitized electrode assembly
  - Pockets of air entrapped in resin can lead to unacceptable bubbles in the UEA and subsequent rejection
  - Incorporation of vacuum during the molding process, and a larger pre-stage temperature range (150°F - 280°F) allows for greater control during UEA molding and less parts rejected
- Certification by similarity

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date: Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

Revision to ATP for LO2 17" Feed Line MC271-0074-0201 (Arrowhead EDCP-2003-01) {Ref FRS 7.15}

- Revised ATP MPS-ATP-13541-303
  - Deleted Freon and associated equipment
    - Clean adapter plates with IPA instead of Freon
  - Proof test with LN2 instead of Freon
    - Subsequent operational test also uses LN2
  - Improved calibration of T641 Functional Motion Fixture with the Interface Control Tool (ICT) by adding dimensional inspection of the ICT before it is used
    - Adjust the calibration of the T641 based on the results of the dimension inspection
    - IPA, instead of Freon, to be used to clean the T641 adapter plates
  - Tightened environmental conditions to conform to MC271-0074
  - Revised the pressure in the line during the cryogenic operational test to 200 +/- 10 psig to conform to MC271-0074
- Certification not affected by the ATP change

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

Proof Pressure Test Unit Programmable Logic Controller (PLC) Upgrade (Corning EDCP-04-001) {Ref FRS 7.24}

- This EDCP authorized Corning to upgrade the current Pressure Test Unit G.E. Fanuc Programmable Logic Controller, which is obsolete, to a Delta V control system
  - The Programmable Logic Controller is being upgraded and has no effect on the proof pressure test unit
  - Eliminates all pushbuttons and pilot lights by adding a graphical computer dynamic interface (Human Machine Interface -HMI)
  - Close-loops the window differential pressure control system to give more reliable, and more consistent stress levels across the window surface to eliminate the potential for overshoot that normally occurs by operator
  - Eliminated the temperature controller portion by integrating the current controller into Delta V
  - Integrated window pressure set points and oven bake-out temperatures and soak times into the controller to eliminate the need for multiple manual operator settings
- Performance of the new test equipment was verified by testing strain gauged aluminum panels
- No impact to certification

CRITICAL PROCESS CHANGES

Presentor:	
Organization/Date:	Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

Annealed Window Panes Revised Proof Pressure Values (Corning EDCP-04-003) {Ref FRS 7.24}

- During the verification test of a strain-gauged aluminum panel in a forward window pane configuration, it was discovered that previously delivered annealed window panes had not been proof pressure tested to the required 8500 psi stress. Per MC332-0006, all annealed window-panes must be proof tested to 8500 psi stress
- Three Corning Standard Operating Procedure documents were changed to incorporate the revised proof pressure test values
  - These documents include: #56217 Acceptance Test Procedure, #55031 Space Shuttle Pressure Test Witness, and #45006 Pressure Testing of Space Products
- Evaluation resulted in generation of revised proof pressure values for the testing of annealed window panes to ensure the fulfillment of the 8500 psi stress equivalent
- The results do not impact the fit, form, function, reliability, safety, maintainability, and manufacturability of the window-panes
- No impact to certification

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

New STE for MC147-0016-0003 MPM Rotary Actuators (Curtiss-Wright EDCP CPS6932ECP001) {Ref FRS 7.26.1}

- Revised ATP CPS6932 procedure to reflect new Special Test Equipment (STE)
  - Updated CPS6932 to new CPS format
  - Added new acceptance test rig (STE 50155) & removed reference to prior test rig (LAB-8174)
    - Old and new STE similar in design
  - Corrected non-technical grammatical errors
  - Removed reference to prior test rig (LAB-8174). Add provisions for Inspection Stamps for pass/fail criteria
- Facility certification effort completed in support of manufacture of new OBSS hardware
- No impact to hardware certification

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

MLG Wheel Bearing Grease Replacement (Goodrich EDCP 58710) {Ref FRS 7.26.1}

- Two different replacement greases were successfully evaluated
- This change replaces the current MLG wheel bearing grease with two greases as identified in Goodrich specification SS 32.7
- Delta qualification test program successfully completed
- Certification update approved
- New grease not used on OV-103 for STS-114

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Engineering Design Change Proposals (EDCP's) - cont:

ME449-0010-0010 Laser Weld Option for Temperature Transducer (RdF Corporation EDCP 14032, Rev A) {Ref FRS 7.33}

- Adds the laser weld option to vendor drawings
  - In addition to the current weld method of TIG (Tungsten Inert Gas), allows laser welding to weld the sheath to RdF part number 21018 (mandrel)
- Increased production probe yield possible due to new capabilities of RdF Corp
- Certification update by test and similarity
  - Refer to documents MAR# 13156 and N850-ERF-02-172 for qualification test reports

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Engineering Specifications:

MA0106-333 Rev F Application of Lock & Retaining Compound to Threaded Electrical Fasteners & Mechanical Fasteners {FRS 7.9}

- Change allows alternate primer to be utilized

MA0108-307 Rev C Corrosion Preventive Finish for Electrical Bonding {FRS 7.9}

- Revises the specification with additional controls & revised dimensions
  - Acceptance criteria coining depth & resistance measurements
  - Introduced contemporary test equipment for electrical bond verification
  - Introduced a survey technique appropriate for the new resistance measuring equipment
- Performed testing at HB and demonstration / training technique at KSC

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Engineering Specifications - cont:

ML0301-0023 {FRS 7.17-2}

- Wing Leading Edge Installation & Assembly Specification
  - Revised to reflect current operating procedures
  - Clarified packaging requirements
  - Added insulator massaging
  - Clarified shimming practices
  - Clarified fastener installation
  - Added lockside compensation for minimum gap assessment
  - Clarified electrical bonding requirements

ML0601-9024 {FRS 7.18}

- Added requirements to use Pressure Sensor Tool on Class 1 & Class 2 SIP tile installations
  - The PST is basically a dot of pressure sensitive material connected to a signal conditioner, which is in turn connected to a laptop.
  - The laptop display indicates a good or bad interface between the SIP and structure.

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date: Orbiter/6-29-05

Engineering Specifications - cont:

ML0601-0001 {FRS 7.18}

- Tile to tile installation gap changed to account for deflection of MLG & NLG doors
  - Required that some MLGD tiles be reworked (sidewall shaved) or replaced (the vast majority) to ensure the tile-tile gaps were acceptable
  - The NLGD gaps (in general) are still on the high side of the specification upper limit and did not require rework

ML0601-9028 {FRS 7.18}

- Tile sidewall loading change to account for in-flight deflection of MLG & NLG doors
  - Reduced the high compression mylar pull limit from 2.5 psi to 1.5 psi for trailing edge of MLGD and limited tiles on the NLGD hingeline
    - No modification to the thermal barrier configuration was needed to meet the new requirements

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Engineering Specifications - cont:

ML0308-0036 Installation Procedure for T-0 Carrier Assembly, Umbilical Disconnect S70-0529 LO2 & S70-0517 LH2 {FRS 10.1}

- Procedural update to reflect current best practice for electrical connector & umbilical Carrier Panel Installation
  - Updated the GSE electrical cable mate procedure at the T-0 Interface to reduce the potential of damage to electrical pins/connectors during installation
  - Minor changes to the mechanical mate procedure, mainly resequencing of operations

ML0308-0116 Operation Procedure for Orbiter Towing & Vertical Mate to ET in VAB at KSC {FRS 10.1}

- Lowered max load value on Orbiter aft structural attach shell assembly in the +/- X direction from 5000 to 4000 lb max during soft mate to prevent possible failure/buckling of the GSE turnbuckle during Orbiter - ET mate

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Engineering Drawings:

V070-332504 Inner & Outer Egress & External Airlock Hatch Seals (Ref CAR KB4841) {FRS 7.20}

- Drawing requirement was modified and added ASTM D1414 inspection specification for proper tool usage to obtain accurate dimensional check prior to seal acceptance & shipment
- Procurement document was updated to restate packaging & shipment per drawing requirements
- Coordinated with OPS engineering to update OMI to use method & techniques of seal inspection as defined in the drawing

V070-703058 ADTA Assembly {Ref FRS 7.8}

- Briefed as part of Honeywell EDCP AADT-005

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Other:

Post-MECO ET Photo Maneuver {FRS 6.10}

- The post-MECO ET photo maneuver has been modified to use the SSME MPS dump to provide primary vehicle pitch around moment needed to attain the desired photo maneuver attitude
  - No change to the MPS Dump or SSME gimbal angles during the dump
- The modified procedure provides for an earlier and closer photo of the ET after the start of the MPS dump (MECO + 2 minutes) rather than after the dump is complete at MECO + 4 minutes
- Prior to STS-114, a manual RHC pitch maneuver at 2 deg/sec was performed post MPS dump to maneuver to the ET photo attitude. The new procedure places the pitch axis in free drift via DAP PBIs and allows the pitch moment from the dump to develop the initial pitch rate. The pitch rate is manually maintained via the RHC and upon reaching attitude, the pitch axis is returned to attitude hold mode via DAP PBI to damp the pitch rate.
- The procedure has been tested in off-line simulation, SMS and SAIL, and crew is trained to this procedure

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Other - cont:

GN&C Tools requiring baseline at OCCB {FRS 6.11}

- On-Orbit Flight Control System Simulation (FCSSIM), Version FCS30V4
- Transition Flight Control System Simulation (TFCSSIM), Version TFCS30V1
- Notch Filter Analysis Tool (NOTCHANALYSIS), Version NOTCHANALYSIS30V1
- Combined Orbiter/ISS Mass Property Generation Tool (MASSPROP), Version MASSPROPV2

Mission specific analysis supercedes generic SODB Entry GN&C limits {FRS 6.12}

- Mission specific analysis to verify adequate Entry FCS stability & control margins has been reinitiated starting with STS-114
- The results of such analyses will supercede the generic SODB Volume V Entry GN&C certification limits used for STS-107 and prior missions until generic certification is reestablished
- Analysis verified acceptable Entry FCS performance up to the dispersion levels accounted for in the design of the STS-114 nominal EOM and intact abort phases

CRITICAL PROCESS CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Other - cont:

STS-114 I-Load Patched for Avionics Bay 1, 2 & 3 Fans (SCR 92954) {FRS 7.1}

- Modifications incorporated in avionics bays 1 & 2 resulted in a higher delta pressure values
- Avionics bay 3 delta P upper limit was lowered, to narrow the fan operating range
- The STS-114 BFS & flight software loads were approved before the revised delta P limits were incorporated
- These STS-114 I-Load patches update the BFS & flight software for the revised delta pressure valves for avionics bays 1, 2 & 3

CRITICAL PROCESS CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Other - cont:

TPS Damage Assessment Process {FRS 7.29 & 7.30}

- The TPS damage assessment process & the analysis capability has been developed to assess observed damage and provide thermal information to the Shuttle Mission Management team for determination of actions required for safe entry
- New tools being developed for TPS Damage Assessment Tools require baselining at OCCB
- TPS Damage Assessment Tools development covered under special topics

Aeroheating Tool development for RTF

- New tools being developed and existing tools updated to support aeroheating analysis of ascent debris impacts require baselining at OCCB
- Aeroheating Tool development covered under special topics

	Presentor:
	Organization/Date: Orbiter/6-29-05

ORBITER ENGINEERING REQUIREMENTS BACKUP

ENGINEERING REQUIREMENTS WAIVERS/DEVIATIONS	Presentor:
	Organization/Date: Orbiter/6-29-05

Engineering Requirements Pending Approval:

- **RCN OV16778 V55 – Orbiter Aft Gas Sample System (OAFGSS)**
  - This RCN updates installation & inspection requirements and deletes vacuum decay test specification and associated remarks no longer applicable to the current bottle configuration used.
  - To be signed OSB DPRCB

ENGINEERING REQUIREMENTS WAIVERS/DEVIATIONS

Presentor:
Organization/Date: Orbiter/6-29-05

Engineering Requirements Pending Approval: (cont)

- **OMRS Waiver WK10457 Engine 1 Recirculation Pump Dry Spin Test**
  - During performance of the LH_2 recirculation pump dry spin test, the engine 1 recirculation pump speed indicator failed
    - Resistance checks identified an Open found in the sensor circuitry
    - These speed sensors have a history of failures at cyrogenic conditions due to the thermal stresses on the
  - Pump current measurements provide an indirect method of verifying nominal pump operation
    - Pump current traces are very distinct and do not vary significantly pump to pump
  - Pressures downstream of the pump can be monitored as an indicator of pump functionality

ENGINEERING REQUIREMENTS WAIVERS/DEVIATIONS	Presentor:
	Organization/Date: Orbiter/6-29-05

Engineering Requirements Pending Approval: (cont)

- **OMRS Exception EK10452 RRCS Fuel GHe Tank Instrumentation Accuracy Verification**
  - RRCS fuel GHe Tank P1 transducer measurement of 72.7 psi exceeded the allowable offset of ± 63.5 psi
    - Results in a quantity reading approximately 1.5% low - OMRSD allows ±1.3% quantity bias error
    - No impact to propellant quantity gauging if offset is a straight bias
  - Redundant P2 transducer measurement operating nominally
  - P1 & P2 are averaged and utilized by PASS to calculate the quantity of propellant remaining in the tanks
  - This slightly out-of-spec fuel system tank pressure measurement (P1) will have negligible impact in-flight
    - In the unlikely event of a P1 failure, the RRCS fuel tank quantity will be calculated using the P2 measurement only
    - LCC RCS-01, requires 1 of 2 measurements to be operating nominally

ENGINEERING REQUIREMENTS WAIVERS/DEVIATIONS	Presentor:
	Organization/Date: Orbiter/6-29-05

Engineering Requirements Pending Approval: (cont)

- **OMRS Waiver WK10461 Humidity Excursion in VAB**
  - Mini Portable Purge Unit (MPPU) chiller compressor shutdown resulting in shutdown of the MPPU and loss of purge flow to all 3 purge circuits
    - Purge was manually restarted, however the chiller was still non-operational, resulting in unconditioned purge to be applied to the vehicle for approximately ½ hour
    - Chiller was brought back on line and proper purge to the vehicle was restored approximately 15 minutes later
  - Similar conditions have occurred in the past with negligible effect to the vehicle systems
  - Affected subsystems are reviewing this data and the potential affect to their system to verify no concerns exist

ENGINEERING REQUIREMENTS	Presentor:
	Organization/Date: Orbiter/6-29-05

OMRSD Orbiter RCN List

SS16797R1	P 114V	S00 - LOX FEEDLINE BELLOWS HEATER		6-17-05 6/17/05
OV16778	R 114 NV	V55- ORB AFT FUSE GAS SAMPL S		ECD - 6/14/2005
SS16762R2	A 114 M	S00 - 2 ND INTEGRAT	S053297UK	05/13/05 05/13/05
KS16719	A 114 M	S00 - PROPELLANT LO	S053297TG	04/14/05 04/14/05
OV16706R3	A 114 M	V42 - THRUSTER COVE	S053297UB	05/10/05 05/10/05
OS16681	A 114 M	F2V1-RCD RCN STS-11	S053297PV	03/28/05 03/28/05
KS16680R1	A 114 M	S00 - GH2 LEAKAGE M	S053297QM	04/12/05 04/12/05
KS16679	A 114 M	S00 - MDM DISCRETE	S053297QL	04/17/05 04/18/05
OV16659R2	A 114 M	V46-FUEL PUMP INLET	S053297QV	04/26/05 04/27/05
SS16656R1	A 114 M	S00 - ORB-ET MATE X	S053297ND	03/04/05 03/04/05
OV16647R1	A 114 M	V58- WSB PGME/H20 U	S053297NY	03/08/05 03/09/05
KV16646	A 114 M	V05 - DELETE WCCS	S053297NV	03/08/05 03/09/05
KV16645	A 114 M	V05 - ET/ORB DISCON	S053297NW	03/08/05 03/09/05
KV16640R1	A 114 NV	V66 - SLIDEWIRE INS	S053297NT	03/08/05 03/09/05
OV16602R1	A 114 M	V58 - WSB PGME TANK	S053297ME	01/21/05 01/21/05
KS16589R2	A 114 NV	S00 - CLOSEOUT PHOT	S053297NQ	04/12/05 04/13/05
OV16575R1	A 114 M	V54 - OBSS TEMP SEN	S053297LJ	12/16/04 12/17/04
SS16571R3	A 114 M	S00 - STS-114 TANKI	S053297KW	04/08/05 04/08/05
SS16570R2	A 114 M	S00 - UMBILICAL ELE	S053297KY	12/21/04 12/21/04
OV16560R1	A 114 M	V70 - UPDATE MEDS M	S053297KM	11/15/04 11/16/04
KS16557R1	A 114 M	S00 - STBD RMS PROV	S053297MC	01/26/05 01/31/05
KV16556R1	A 114 M	V55 - STBD RMS PROV	S053297MD	01/26/05 01/31/05
OS16553	A 114 NV	F2V1 - T-0 CONNECTO	S053297KQ	12/21/04 12/21/04
OV16548R3	A 114 NV	V53 - CAPTURE LATCH	S053297LC	12/21/04 12/21/04
OV16535R2	A 114 M	V61 - GN2 SYSTEM DE	S053297JW	10/25/04 10/26/04
KV16527	A 114 NV	V66 UPDATE CREW STA	S053297KK	11/15/04 11/16/04
OV16511R1	A 114 M	V55 - ORB/ET UMB DE	S053297KV	12/10/04 12/10/04
OV16500R2	A 114 NV	V00 - CLOSEOUT PHOT	S053297JY	02/04/05 02/08/05
OV16497R2	A 114 M	V61 - ARS AVIONICS	S053297HK	10/04/04 10/06/04
SS16490R1	A 114 M	S00 - LOX LOADING 2	S053297HN	10/19/04 10/20/04
SS16479R4	A 114 M	S00 - INTEGRATED TA	S053297GL	10/04/04 10/05/04

ENGINEERING REQUIREMENTS

Presentor:

Organization/Date:
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OMRSD Orbiter RCN List – cont

OV16477R1	A 114 M	V53 - ODS/PMA POWER	S053297HC	11/15/04 11/16/04
KV16474R1	A 114 M	V45 - FUEL CELL BAC	S053297HH	10/19/04 10/20/04
OV16464R2	A 114 M	V54 - OBSS STBD MPM	S053297KL	11/23/04 11/23/04
KV16460R1	A 114 M	V78 - EWBMTAU ASSY	S053297HJ	11/26/04 11/29/04
KS16452	A 114 M	S00 - ET UMB DIGITA	S053297GT	08/08/04 08/12/04
KV16451	A 114 M	V76 - ET UMBILICAL	S053297GU	08/08/04 08/12/04
OV16431R2	A 114 M	V64 - AIRLOCK SUPPO	S053297GW	08/22/04 08/25/04
OV16427R2	A 114 M	V61 - ATMOSPHERIC R	S053297GY	08/22/04 08/25/04
KV16420R2	A 114 M	V55 - OMDP/CONTINGE	S053297FD	09/24/04 09/29/04
OV16410R2	A 114 M	V42 - PRIMARY THRUS	S053297NH	02/25/05 02/28/05
KS16390R4	A 114 M	S00 - PIC REDUNDANT	S053297EW	12/06/04 12/07/04
KS16347R2	A 114 M	S00 - GENERAL CLOSE	S053297EJ	05/20/04 05/20/04
KV16325R1	A 114 NV	V74 - S-BAND POWER	S053297DW	03/30/04 04/02/04
KS16324	A 114 NV	S00 - S-BAND POWER	S053297DY	03/30/04 04/01/04
OV16311R2	A 114 M	V30-RCDRCN FLEX SEC	S053297FF	06/17/04 06/24/04
SS16302R2	A 114 M	S00 - LOWER GH2 PRE	S053297BY	04/21/04 04/21/04
KS16285R1	A 114 M	S00 - REMOVAL OF MC	S053297HZ	10/04/04 10/05/04
KV16283	A 114 M	V72 - MCDS REMOVAL/	S053297DN	03/18/04 03/22/04
KV16278	A 114 M	V67 - ORBITER CLEAN	S053297BD	10/23/03 10/27/03
KS16266R2	A 114 M	S00 - STRAY VOLTAGE	S053297MB	01/26/05 01/31/05
KV16257R2	A 114 M	V70 - OI-30 FLIGHT	S053297FL	06/28/04 06/29/04
KV16247R2	A 114 NV	V63 - AMMONIA SYSTE	S053297EH	04/15/04 04/19/04
KV16242R1	A 114 NV	V61 - O2 SUPPLY FLE	S053297MG	02/04/05 02/08/05
SS16224R1	A 114 NV	S00 - ECO POINT SEN	S053297BW	02/09/04 02/11/04
OV16223	A 114 NV	V41 - MPS ECO POINT	S053297BU	02/09/04 02/11/04
KS16209R1	A 114 NV	S00 - PRELAUNCH MDM	S053297Q	07/25/03 07/29/03
KV16200R1	A 114 M	V46 - APU FILE III	S053297E	06/25/03 06/25/03
KS16199R1	A 114 M	F2V3 - APU FILE II	S053297D	06/23/03 06/24/03

ENGINEERING REQUIREMENTS

Presentor:

Organization/Date:
Orbiter/6-29-05

OMRSD Orbiter RCN List – cont

OV16198R1	A 114 NV	V45 - FC REACTANT V	S053296ZU	06/23/03 06/24/03
KV16191R1	A 114 NV	V61 - LES O2 SUPPLY	S053297HR1	06/24/03 06/25/03
SS16153R3	A 114 NV	S00 - MPS CAUTION A	S053297T	08/23/03 08/26/03
KV16145R1	A 114 M	V45-PRSD INTEGRITY	S053296WN	02/26/03 02/27/03
KS16137R1	A 114 NV	S00 - LES SUPPLY GA	S053296WY	06/14/03 06/16/03
OV16078	A 114 NV	V66 - TETHER SLIDE	S053296WC	01/22/03 01/22/03
OV16062	A 114 NV	V30 - RCD WLE SAMPL	S053296VN	12/18/02 12/23/02
OV16035R1	A 114 NV	V09 - WLE RCC HANDS	S053296VD	11/15/02 11/21/02
KV16027R1	A 114 NV	V63 - ACCUMULATOR A	S053296TU	10/15/02 10/16/02
OS16026	A 114 M	S00-RCD RCN PCM/PDI	S053296TQ	10/02/02 10/02/02
KV16024	A 114 NV	V62 - WASTE LINE RE	S053296TM	09/25/02 09/26/02
KV16023	A 114 NV	V64 - WASTE H2O SCU	S053296TN	09/25/02 09/26/02
KV16008R1	A 114 M	V46 - APU FUEL/DRAI	S053296TH	10/15/02 10/17/02
KV16000	A 114 NV	V51 HYDRAULIC SYS C	S053296TD	09/18/02 09/19/02
KV15992R2	A 114 NV	V00 - ORB HOISTING,	S053296TV	12/18/02 12/23/02
OV15979	D 114 NV	V45 - FC MANUAL PUR	S053296QH	11/06/02 11/06/02
OD15978	D 114 NV	F9-V2-FC MANUAL PRG	S053296QJ	11/06/02 11/06/02
KV15952	D 114 NV	V42 - THRUSTER INSP	S053296VB	10/30/02 11/01/02
OV15864R1	A 114 M	V51-LDG CIRCUIT BUS	S053297L	08/11/03 08/14/03
OS16635	A NF NV	F2-V3 - TBI/TIME DE	S053297NL	03/08/05 03/09/05
KV16633	A NF NV	V51 - LMG/RMG DOOR	S053297NM	03/08/05 03/09/05
KV16595R1	A NF NV	V66 - UPDATE TO TAB	S053297NJ	03/08/05 03/09/05
OV16576	A NF NV	V71 - DELETE STAR T	S053297MH	02/04/05 02/08/05
OV16519R1	A NF NV	V71 - STAR TRACKER	S053297NK	03/16/05 03/17/05
KS16481R1	A NF NV	FILE I - RE-INSTATE	S053297HG	12/21/04 12/21/04
KV16453	A NF NV	V78 - MADS/OEX REQU	S053297GD	07/16/04 07/19/04
OS16443	A NF NV	F2V3 - APU FUEL TAN	S053297GE	08/08/04 08/12/04
OV16442	A NF NV	V46 - APU FUEL ISOL	S053297GF	08/08/04 08/12/04

ENGINEERING REQUIREMENTS

Presentor:

Organization/Date:
Orbiter/6-29-05

OMRSD Orbiter RCN List – cont

OS16435R1	A NF	NV	F2V3 - GYRO FLIGHT	S053297FK	06/14/04	06/18/04
OV16417R1	A NF	NV	V62 - RCD RCN -REQU	S053297FG	05/27/04	06/03/04
OV16391	A NF	NV	V70 - IDP POWER-OFF	S053297EG	04/15/04	04/19/04
KV16367	A NF	NV	V74 - SOLID STATE R	S053297EB	03/26/04	03/30/04
SS16355R2	A NF	NV	S00 - LH2 RECIRC RE	S053297FH	06/17/04	06/24/04
KS16340	A NF	NV	F2V3 - S-BD PWR AMP	S053297DU	03/30/04	04/01/04
KS16334	A NF	NV	F2V3 - OPS AND PAYL	S053297DD	02/27/04	03/01/04
KS16333R1	A NF	NV	S00 - OPS AND PAYLO	S053297DE	02/27/04	03/01/04
KV16332	A NF	NV	V75 - OPS AND PAYLO	S053297DF	02/27/04	03/02/04
KV16327R1	A NF	NV	V74 - POWER SPEC AM	S053297DV	03/30/04	04/02/04
KV16323	A NF	NV	RCD RCN V76 - CRITI	S053297EE	03/26/04	03/30/04
KV16300R3	A NF	NV	V43 - STORAGE REQUI	S053297CM	09/14/04	09/15/04
KV16299R3	A NF	NV	V42 - STORAGE REQUI	S053297CN	09/14/04	09/15/04
KV16286R2	A NF	NV	V61 - COOLING TABLE	S053297FC	06/28/04	06/29/04
KV16282	A NF	NV	V73 - FLIGHT INSTRU	S053297CD	12/11/03	12/11/03
KV16271R1	A NF	NV	V30 - BORESCOPE REQ	S053297CC	01/16/04	01/21/04
KV16263R1	A NF	NV	V54-PAYLOAD DEPLOY	S053297BJ	12/17/03	12/18/03
KV16262	A NF	NV	V41 - RCD RCN TO CO	S053297AC	09/30/03	10/01/03
KV16255R1	A NF	NV	RCD RCN V67-ORBITER	S053297AB	09/25/03	09/29/03
KV16250R1	A NF	NV	RCD RCN: V53-ORBIT	S053297AA	02/09/04	02/12/04
KV16246	A NF	NV	V46 - RCD RCN RQMT	S053297Z	10/06/03	10/07/03
OS16245R1	A NF	NV	F2V3-LRU ACCEPTANCE	S053297AV	10/06/03	10/07/03
OS16237	A NF	NV	F2V3 RCD RCN MPS EF	S053297U	07/17/03	07/21/03
OV16234R2	A NF	NV	V76 - FMEA/CIL BASE	S053297AN	09/17/03	09/18/03
KV16229	A NF	NV	RCDRCN: V58- HYDRAU	S053297CV	02/09/04	02/11/04
OV16222R2	A NF	NV	V62-CREW MODULE VAC	S053297CU	02/27/04	03/02/04
OV16216R1	A NF	NV	V05 - RCD RCN DTR R	S053297C	07/21/03	07/23/03
KV16215R1	A NF	NV	RCD RCN V66 - PT SL	S053297B	07/10/03	07/11/03
KV16214R3	A NF	NV	RCD RCN V63-FCL1/RA	S053297A	08/14/03	08/15/03

ENGINEERING REQUIREMENTS

Presentor:

Organization/Date:
Orbiter/6-29-05

OMRSD Orbiter RCN List – cont

KV16204R2	A NF NV	V74 - RADAR CHECKOU	S053296ZV	08/06/03	08/07/03
OS16202R1	A NF NV	F2V1 - CIRCUIT BREA	S053297	06/06/03	06/10/03
OV16193R3	A NF NV	V72 - EIU/OPS RECOR	S053297N	08/11/03	08/14/03
KV16192	A NF NV	V00 - OMS/RCS PRESS	S053296ZT	06/11/03	06/12/03
KV16187	A NF NV	RCD RCN V30 - EFFEC	S053296ZB	04/30/03	05/01/03
OS16184	A NF NV	F2V3 - ADD WINDOW P	S053296ZH	04/30/03	05/01/03
KV16182	A NF NV	RCD RCN V51-NOSE LA	S053296ZG	05/22/03	05/27/03
KV16148R3	A NF NV	V78 - WB MICRO TAU	S053296WQ	05/08/03	05/08/03
OS16136R1	A NF NV	VOL3-ODS LIMITED AG	S053297K	10/06/03	10/06/03
OS16128	A NF NV	F2-V3-MPS LH2 RECIR	S053296ZE	05/30/03	06/02/03
OS16126R2	A NF NV	F2V3 - RCC CERT LIM	S053296WP	03/30/04	04/01/04
OS16124	A NF NV	S00 - T-0 CONNECTOR	S053296WL	03/06/03	03/07/03
OV16090R1	A NF NV	V53-ODS LUBRICATION	S053296WV	07/16/04	07/19/04
KV16088	A NF NV	V76 - ESSENTIAL BUS	S053296VW	01/08/03	01/08/03
KV16073	A NF NV	V78 - MICRO SGU/TAU	S053296WM	02/19/03	02/21/03
SS15991R2	A NF NV	FILE I - REWRITE FO	S053297DK	03/26/04	03/30/04
OV15982R5	A NF NV	V30 - RCM PHASE II	S053296TW	01/31/03	02/05/03
OV15973R3	A NF NV	V30 - RCM PHASE II	S053296TY	01/22/03	01/23/03
OS15968R2	A NF NV	F2V3 RMS LIMITED LI	S053296TC	12/09/02	12/10/02
OV15924R1	A NF NV	V62 - SUPPLY/WASTE	S053297LE	12/21/04	12/21/04
KV15909R1	A NF NV	V43 - EXTERNAL LEAK	S053296VF	12/05/02	12/06/02
KV15899R1	A NF NV	V42 - EXTERNAL LEAK	S053296VM	12/05/02	12/06/02
OS15498R4	A NF NV	VOL3-MUFFLER FOAM L	S053296U	02/26/03	02/28/03

ENGINEERING REQUIREMENTS	Presentor: Al Beckner
	Organization/Date: Orbiter/6-29-05

RCNs (mandatory):

- **SS16797R1 – LO_2 Feedline Bellows Heater**
  - This RCN will regulate LO_2 feedline bellows heater operation to assure prevention of critical ice build up on bellows while also minimizing potential heat load impacts to LO_2 loading, terminal count and safing operations
  - Changes the LO2 Feedline Bellows Heater termination time from T-1 minute 52 seconds to T-9 minutes and counting
    - LCN 01173R01 makes same change to LCC
  - Updates Table S00E00.122 ET/ORB/SSME Safing for Loss of Bleed requirements for clarity and added safing requirement for the Fast Fill operation.
  - Reference LCN 01173R01

ENGINEERING REQUIREMENTS

Presentor:

Organization/Date:
Orbiter/6-29-05

OMRSD Orbiter Waiver & Exception List

EXC/WAIVER #	EFFECTIVITY	INITIAL STS	TITLE	DATE APPROVED
WK10457R1	31-39	114	E1 Recirc Pump Dry Spin Test	**RELEASED**
EK10450	31-32	114	ODS AVIONICS TIME & CYCLE EXPIRES 6/1	**6/6/2005**
EK10444	31	114	AFT FUSELAGE GHE CONCENTRATION	**WITHDRAWN**
WK10443	03/30/05 - 03/30/05	114	STRUCT LEAK TEST PEREQUISITE NON-COMPLIANCE	**6/9/2005**
WK10439R1	04/14/05-04/14-05	114	AFT HELIUM BACKGROUND CHECK	4/14/2005
EK10438	31	114	DTV MUX VIP/VTR VERIFICATION	4/24/2005
EK10432	01/18/05-1/18/05	114	AIRLOCK LCG LINE	**DISAPPROVED**
EK10430	31	114	DEDICATED HYD LANDING GEAR EXTENSION	3/22/2005
WK10426R1	06/14/03 03/07/05	114	FCL2 RADIATOR OUT PRESS XDCR TOLERANCE	3/16/2005
EK10425R1	02/22/05 03/06/05	114	AIRLOCK WATER SUPPLY	3/17/2005
WK10424	10/04/02 03/15/05	114	FES TOPPING/HI-LOAD	**WITHDRAWN**
WK10422	31	114	OBSS PWR AND TEMP SENSOR	3/17/2005
EK10421R2	02/10/05 03/03/05	114	FCL1/2 JOINT LEAK CHECKS	3/17/2005
EK10420	06/13/04 03/08/05	114	V30 - DRAG ANGLE SPECIAL DETAILED INSP.	3/21/2005
WK10417	6/13/04 - 6/13/06	114	ET DOOR DRIVE PDU LIMITER SLIP TEST	3/17/2005
WK10415	31-39	114	MADS FDM CAL MANUAL	3/4/2005
WK10402	9/5/04 - 9/7/04	114	OPF 3 ECS PURGE OUT	12/15/2004
WK10380	31 RCN	114	LH2 PREVALVE SCREEN INSPECTION	3/17/2005
EK10381R2	6/22/04 - 7/31/04	114	WCL SAMPLING POST POWER DOWN	6/21/2004
WK10379	FLT. 31	114	PBD DRIVE ACTUATOR TORQUE LIMITER	10/14/2004
WK10376	31 RCN	114	LO2 PREVALVE SCREEN INSPECTION	3/17/2005
WK10367R2	5/13/03 - 8/21/03	114	MPS ORB/ET DISCN LOAD TEST & SHIM HEIGHT	1/14/2004
WK10353R2	9/4/04 - 9/4/04	116	IDP1 POWERED ON FOR LESS THAN 30 SECONDS	11/25/2003
EK10344	8/21/03 - 9/22/03	116	S-BAND POWER AMP OPERATION	8/23/2003
WK10341	3/19/03 - 7/16/03	121	ECLSS FAN NON-OPERATIONAL TIME EXCEEDED	10/16/2003
WK10269R1	FLT. 31	121	H2O TANK-A POAT FLT COMPRESSABILITY CK	9/11/2002
EK10197	6/15/01 - 2/15/02	121	V30 - INCREMENTAL STRUCTURAL XRAYS	3/12/2002
EK10183	3/1/02 - 3/1/03	118	V30 - FORWARD FUSELAGE BULKHEAD NDE INSP.	1/23/2002
WK10182	1/5/02 - 1/15/02	118	FWD PURGE TEMPERATURE EXCURSION	1/24/2002
WK10181R1	12/18/01 - 12/18/01	118	UNPLANNED PURGE INTERRUPTION	1/25/2002
EK10146R1	FLTS. 31-40	118	WATER SEPERATOR ASSY REMOVAL	10/31/2001

Note: During the OV-103 Flt 31 Flow, OV-103 has been assigned to STS-116, STS-118, STS-121 and STS-114

ENGINEERING REQUIREMENTS

Presentor:

Organization/Date:
Orbiter/6-29-05

OMRSD OMS Pods Waiver & Exception List

OMS POD ASSIGNMENTS (completed flights)				
EXC/WAIVER #	**EFFECTIVITY**	**INITIAL STS**	**TITLE**	**DATE APPROVED**
LP01 (33)				
WK10372	7/1/03 - 7/1/03	121	TOTALIZER OXID MEASUREMENT	3/4/2005
WK10217	12/20/01 - 3/7/02	121	LEFT POD TRICKLE PURGE	3/20/2002
RP03 (31)				
EK10452	32-39	114	RRCS FUEL GHE TANK P1 XDUCER ACCURACY	PRELIMINARY
EK10406R1	11/8/04 - 12/1/04	114	EDUCTION OF MANIFOLD RP03	1/31/2005
WK10299	Flt 32-40	121	RP03 TK302 DYNATUBE LEAK RATE	12/11/2002
WK10304	Flt 32-41	121	RRCS OX SEC REG LOCKUP OUT OF BAND- RP03	1/8/2003
EK10327	FLTS. 32-40	121	RRCS OXID B-Leg Pad Reg Lockup Pressure	5/28/2003

Note: LP01 & RP03 re-assigned to OV-103 from OV-104

ENGINEERING REQUIREMENTS

Presentor:

Organization/Date:
Orbiter/6-29-05

IDMRDD MCN List:

OM3206	A	020705	42V015	PRIMARY THRUSTER		S164535HM	2/24/05	2/24/05
OM3203	A	012605	74V052	S-BAND TRANSPONDER		S164535HJ	2/28/05	3/3/05
OM3201	A	011805	41V028	EIGHT INCH FILL AND DRAIN		S164535HH	3/2/05	3/3/05
OM3199	A	011405	74V001	TACAN	020305	S164535HG	2/28/05	3/3/05
OM3197	A	120204	76V045	ADVANCED MASTER EVENTS CONTROLLER	012605	S164535HF	020205	020305
OM3196	A	120204	76V040	ENHANCED MASTER EVENTS CONTROLLER	012605	S164535HE	020205	020305
OM3195	A	112204	72V008	BACKUP FLIGHT CONTROLLER	120204	S164535FT	011005	011005
OM3194	A	112204	75V005	TEMPERATURE TRANSDUCER	010705	S164535GU	020405	020405
OM3193	A	110304	61V201	IMU FAN ASSEMBLY	111504	S164535GM	111904	111904
OM3192	A	110104	76V029	MID JETTISON CONTROL ASSY	110204	S164535GL	111604	111704
OM3191	A	102204	42V011	RCS; GHC, HELIUM HIGH PRESSURE	112204	S164535GP	121304	121404
OM3190	A	102204	42V010	RCS; GHC, HYPERGOLIC SERVICING	112204	S164535GN	121304	121404
OM3189	A	100704	73V004	D & C PANEL ASSEMBLY	100704	S164535GF	101304	101304
OM3188	A	100604	79V010	RATE GYRO ASSY (RGA - SRB)	101404	S164535GJ	102204	102204
OM3187	A	100604	79V008	RATE GYRO ASSY (RGA - ORBITER)	101404	S164535GH	102204	102204
OM3167A	A	092304	59V027	STAR TRACKER DOOR ACTUATOR	101404	S164535GC	121704	121704
OM3166	A	092104	78V002	OEX DATA RECORDER	093004	S164535GE	100804	101104
OM3165	A	092104	59V021	ACTUATOR, VENT DOORS 8 & 9	093004	S164535GD	100804	101104
OM3164	A	083104	72V005	MULTIPLEXER/DEMULTIPLEXER	091704	S164535GB	100804	101104
OM3163	A	082404	73V004	D & C PANEL ASSEMBLY	083004	S164535FZ	090104	090104
OM3162	A	081904	74V018	S-BAND POWER AMPLIFIER	083004	S164535FY	091704	091704
OM3161	A	081104	76V005	MID POWER CONTROLLER ASSY #2	082004	S164535FW	083004	083004
OM3160M	A	080904	75V002	SHUTTLE TAPE RECORDER	081904	S164535FV	091404	091404
OM3159	A	080504	73V004	D & C PANEL ASSEMBLY	081004	S164535FU	081104	081104
OM3158	A	072804	73V004	D & C PANEL ASSEMBLY	072904	S164535FT	080404	080404
OM3157	A	072704	33V011	WINDOW PANEL ASSYS	072904	S164535FQ	080404	080404
OM3156	A	071904	73V004	D & C PANEL ASSEMBLY	072204	S164535FN	072604	072604
OM3155	A	071504	73V004	D & C PANEL ASSEMBLY	071504	S164535FG	071904	071904
OM3154	A	071404	71V001	AIR DATA TRANSDUCER ASSY (ADTA)	071504	S164535FK	072604	072604
OM3153A	A	070904	76V008	AFT POWER CONTROLLER ASSY #1	080604	S164535FH	082004	082004
OM3152	A	070704	63V014	AMMONIA BOILER AUTOMATIC CONTROLLER	072204	S164535FL	080204	080304
OM3151	A	070204	62V301	BROMOTRIFLUOROMETHANE FIRE SUPPR. SUBSYS.	092304	S164535FM	100804	101104
OM3150	A	063004	73V004	D & C PANEL ASSEMBLY	070104	S164535FF	070604	070704
OM3149	A	062304	73V004	D & C PANEL ASSEMBLY	062304	S164535ET	062404	062404
OM3148	A	062204	72V005	MULTIPLEXER/DEMULTIPLEXER	062404	S164535EU	070204	070204
OM3147	A	061704	52V001	CARBON BRAKE ASSY, MLG	071504	S164535FJ	080204	080304
OM3146	A	061604	42V016	RCS VERNIER THRUSTER	061704	S164535EP	062904	062904
OM3145B	A	061404	58V027	ACTUATOR, UMBILICAL RETRACTOR	012405	S164535GG	012705	020405
OM3144	A	061404	73V004	D & C PANEL ASSEMBLY	061704	S164535EL	061704	061804
OM3143	A	060904	45V003	FUEL CELL ASSEMBLY	061704	S164535EM	070904	070904
OM3142	A	052404	73V004	D & C PANEL ASSEMBLY	052604	S164535EJ	052804	052804
OM3141	A	050404	74V028	S-BAND QUAD ANTENNA	050404	S164535DZ	051004	051104
OM3140	A	050404	73V004	D & C PANEL ASSY	050704	S164535EF	051204	051204
OM3139	A	050304	45V018	DISCONNECT, FCP GAS REACTANT	050604	S164535EB	051004	051104
OM3138	A	050304	45V011	DISCONNECT, CRYOGENIC FLUID	050604	S164535EA	051004	051104
OM3137	A	042204	54V013	LATCH ASSY - MIDDLE WEIGHT KEEL		S164535EH	060704	060704
OM3136	A	042104	79V003	ROTATION HAND CONTROLLER	061704	S164535EN	062504	062504
OM3135	A	042004	76V034	MAIN DC POWER DIST ASSY'S 1, 2, 3	042304	S164535DW	051004	051104
OM3134	A	041504	45V021	PRSD SOLENOID VALVES	042804	S164535DY	051204	051204
OM3133M	A	040204	73V089	ANNUNCIATOR CONTROL ASSY	100104	S164535DK	100804	101104
OM3132	A	030804	61V307	N2/O2 CONTROL PANEL	032504	S164535DU	041304	041304

ENGINEERING REQUIREMENTS

Presentor:

Organization/Date:
Orbiter/6-29-05

IDMRDD MCN List: cont

OM3131	A	022504	72V005	MULTIPLEXER/DEMULTIPLEXER	030504	S164535DT	032504	032504
OM3130	A	022404	45V015	PRSD H2 FLOW CONTROL PANEL	030504	S164535DQ	032304	032304
OM3129	A	021804	41V026	PREVALVE, SHUTOFF (12 IN) PROPELLANT	022704	S164535DP	030904	030904
OM3128A	A	021604	73V004	D & C PANEL ASSY	021904	S164535DN	022504	022504
OM3127	A	021304	79V002	AEROSURFACE SERVO AMPLIFIER	022004	S164535DM	042704	042704
OM3126	A	020904	42V015	RCS PRIMARY THRUSTER	021604	S164535DL	030204	030204
OM3125	A	020404	72V001	MASS MEMORY UNIT (MMU)	020904	S164535DJ	021204	021304
OM3124	A	012804	42V015	RCS PRIMARY THRUSTER	020904	S164535DH	021304	021304
OM3123	A	011204	73V004	D & C PANEL ASSY	011304	S164535BY	011604	011604
OM3121	A	010704	72V007	DISPLAY UNIT (DU)	012604	S164535DG	021204	021304
OM3120	A	121103	73V106	FLOODLIGHT, PLB, BLKHD	121203	S164535BV	010904	010904
OM3119M	A	120903	41V028	8 IN. FILL & DRAIN VALVE	121803	S164535BW	021204	021304
OM3118	A	120303	73V004	D & C PANEL ASSY	120303	S164535BU	120503	120503
OM3117	A	110503	73V004	D & C PANEL ASSY	110603	S164535AU	110703	110703
OM3116	A	110303	73V004	D & C PANEL ASSY	110403	S164535BN	110503	110503
OM3114	A	102103	73V004	D & C PANEL ASSY	102103	S164535BJ	102303	102403
OM3113	A	100703	74V028	S-BAND QUAD ANTENNA	101003	S164535BG	110403	110403
OM3112A	A	100703	74V026	UHF ATC ANTENNA ASSY	101603	S164535BH	102903	103003
OM3111M1	A	100603	41V033	4 IN. DISCONNECT ASSY, TYPE I (ORB SECT.)	110303	S164535BL	111703	111703
OM3110	A	100103	33V001	HATCH LATCH ACTUATOR	100303	S164535BK	102903	103003
OM3109	A	092303	76V008	AFT POWER CONTROLLER ASSY, #2	092603	S164535AZ	100703	100703
OM3108	A	092303	73V004	D & C PANEL ASSEMBLY	092403	S164535AY	092603	092603
OM3107	A	091703	51V002	NOSE LANDING GEAR WHEEL & TIRE ASSY	091903	S164535BC	100303	100503
OM3106	A	091703	51V001	MAIN LANDING GEAR WHEEL & TIRE ASSY	091903	S164535BB	100303	100503
OM3105	A	090403	76V010	AFT POWER CONTROLLER ASSY, #4, 5, 6	022004	S164535AW	030904	030904
OM3104	A	082603	45V020	STRUT ASSY, CRYO TANK SUPPORT	101003	S164535BD	102003	102003
OM3103	A	081903	76V001	FORWARD POWER CONTROLLER ASSY, #1	090403	S164535AV	091803	091903
OM3102M	A	081803	73V004	D & C PANEL ASSEMBLY	081903	S164535AT	082003	082003
OM3101	A	081503	62V200	WASTE COLLECTOR SYSTEM	072004	S164535FP	072604	072604
OM3100	A	080803	74V042	SWITCH BEAM CONTROLLER ASSY	080803	S164535AM	081403	081503
OM3099	A	071003	61V200	AVIONICS COOLING ASSEMBLY	050704	S164535EC	052104	052104
OM3098	A	070903	62V006	H2/H2O SEPARATOR	112103	S164535BQ	120503	120803
OM3097	A	070903	71V002	INERTIAL MEASUREMENT UNIT (IMU) (KT-70)	071003	S164535AK	071503	072103
OM3096	A	070303	74V023	KU-BAND DEPLOYED ASSEMBLY	101304	S164535GK	2/15/05	2/15/05
OM3095A	A	062703	79V003	ROTATION HAND CONTROLLER	112103	S164535BM	010604	010604
OM3094	A	060303	63V301	FLOW CONTROL ASSY	081503	S164535AQ	092303	092303
OM3093	A	050903	41V029	VALVE, SHUTOFF, LO2/LH2, 1-1/2 AND 2 IN	051303	S164535AG	051603	052003
OM3092	A	042203	58V023	STEAM DUMP NOZZLE	042303	S164535AB	050603	050703
OM3091	A	031403	79V009	DEVICE DRIVER UNIT	061003	S164535AJ	091203	091503
OM3090	A	030703	73V004	D & C PANEL ASSEMBLY	030703	S164535V	031103	031103
OM3089A	A	022503	73V004	D & C PANEL ASSEMBLY	030503	S164535T	030603	030603
OM3088	A	021703	63V014	AMMONIA BOILER AUTOMATIC CONTROLLER	060903	S164535U	072303	072303
OM3086	A	020503	73V004	D & C PANEL ASSEMBLY	021103	S164535M	021403	021403
OM3085	A	011003	73V111	PILOT DISPLAY UNIT	012003	S164535L	012103	012103
OM3084	A	010703	41V009	DISCONNECT, 1.5 INCH	010803	S164535J	011003	011303
OM3083	A	121102	73V004	D & C PANEL ASSEMBLY	121602	S164535H	121702	121802
OM3082	A	120502	45V011	DISCONNECT, CRYOGENIC FLUID	121102	S164535G	121202	121302
OM3080	A	111202	73V004	D & C PANEL ASSEMBLY	111302	S164535D	111402	111402
OM3079	A	101502	75V010	TAPE REEL ASSEMBLY	092603	S164535BA	100303	100503
OM3078	A	100902	76V028	HYBRID LOAD CONTROLLER	103002	S164535B	110502	110502
OM3077	A	092602	79V011	SPEED BRAKE THRUST CONTROL	112002	S164535E	120302	120302
OM3076	A	091202	73V108	LIGHT ASSEMBLY, INTERIOR, DC POWER	102902	S164535C	012203	012203
OM3067	A	051302	72V005	MULTIPLEXER/DEMULTIPLEXER	060702	S064975ZJ	010703	010803
OM3056M	A	012602	42V016	RCS THRUSTER VERNIER		S064975YM	121202	121302

ENGINEERING REQUIREMENTS

Presentor:

Organization/Date:
Orbiter/6-29-05

IDMRDD MCN List: cont

OM3056M	A	012602	42V016	RCS THRUSTER VERNIER		S064975YM	121202	121302
OM3055A	A	012602	43V007	OMS ENGINE	042304	S164535DV	051804	051804
OM3054	A	120701	61V012	WATER PUMP PACKAGE, PRIMARY & SECONDARY	011002	S064975YB	012902	013002
OM3014A	A	050901	79V008	RATE GYRO ASSEMBLY - ORBITER	070804	S164535BE	080304	080304
OM3012A	A	050101	72V008	BACKUP FLIGHT CONTROLLER	033103	S064975YG	040103	040203
OM3011	A	042501	74V003	AUDIO CENTRAL CONTROL UNIT	060704	S164535EK	061804	061804

IDMRD Waivers & Exceptions

WW00321	A	122004	42V015	PRIMARY THRUSTER	MC467-0028-5200	633	UNSTABLE PULSE DURING ATP	S164535HB	010605
WC00315	A	090104	61V200	AVIONICS FAN	SV755524-6	G4604	SHELF MAINT. PERF POST TIME		041505
WC00312	A	051204	74V028	S-BAND QUAD ANTENNA	V070-742560-0020	AX1729	PITCH PLANE A/R EXCEEDED	S164535EG	052504
WW00311	A	050604	42V015	PRIMARY THRUSTER	MC467-0028-5001	327	2 UNSTABLE PULSE DURING ATP	S164535ED	052504
WW00310	A	080403	42V016	VERNIER THRUSTER	V070-421060-009	203	UNSTEADY IMPULSE DURING ATP	S164535AP	082003
WW00309A	A	080403	42V015	PRIMARY THRUSTER	MC467-0028-5112	452	UNSTABLE PULSE DURING ATP	S164535AN	082003
WC00308A	A	050503	61V200	AVIONICS FAN	SV755524-6	IC305	SHELF MAINT. PERF POST TIME	S164535AF	062503
WC00307A	A	050503	61V200	AVIONICS FAN	SV755524-6	BU105	SHELF MAINT. PERF POST TIME	S164535AE	062503
WC00306A	A	050503	61V200	AVIONICS FAN	SV755524-6	GP501	SHELF MAINT. PERF POST TIME	S164535AD	062503
WW00305A	A	031103	42V015	PRIMARY THRUSTER	MC467-0028-5001	428	UNSTABLE PULSE DURING ATP	S164535W	032603
ZC00304	A	012803	74V052	S-BAND TRANSPONDER ASSY	MC478-0106-1002	202	SPECIFICATION NOT MET PER ATP	S164535P	031903
ZC00303	A	012803	74V052	S-BAND TRANSPONDER ASSY	MC478-0106-1002	202	LRU TESTING OUT OF TOLERANCE	S164535N	031903
WC00302	A	011003	74V018	S-BAND POWER AMP ASSY	MC478-0106-2501	305	OUT OF TOLERANCE SPUR	S164535K	012203
WC00300	A	092502	76V028	HYBRID LOAD CONTROLLER	MC450-0058-0001	MYF0004	HLCA AFT2 O/WEIGHT .12 LBS	S164535A	111302

ENGINEERING REQUIREMENTS

Presentor:

Organization/Date:
Orbiter/6-29-05

OVEI SCNs & Waivers

SCN	Released In / As	MCR	NAME / CONTENTS	STATUS
01-1007	Rev E Change 50	18985	Water Spec and Marking for Shipment Spec	Approved via CCBD # S164563
01-1008	Rev E Change 50	18985	Avionics Radiation Requirements	Approved via CCBD # S164578
01-1009	Rev F	23071	Avionics Burn-In Requirements	Approved via CCBD # S164360
01-1010	Rev F		Rev F Relwase, Deletes OV-102, reduce superfluous data, all non-technical	Approved via CCBD # S164818
01-1011	Post Rev F Change	23353	Static Dissipative Materials	OCCB OSB S164885Approved 04-04-05
01-1013	Post Rev F Change	19758	Insert Micro-WIS and ET UMB CAM Mission Kits	OCCB OSB S164883 Approved 04-05-05
01-1014	Post Rev F Change		Payload Heat Exchanger Deviation - Based OV-102 Waiver for Ferry Flight Configuration	OCCB S164884 Approved 04-12-2005
01-1015	Post Rev F Change	19755	OBSS Mission Kit And Requirements Change	OCCB OSB S164888 Approved 06-06-05
01-1017	Post Rev F Change	23410	Tyvek Cover Update	OCCB OSB S164860B Approved 05-05-05

Waiver #	EFFECTIVITY	INITIAL STS	TITLE	STATUS
OV103A0063	Flt 31 & subs	114	Orbiter Landing Sink Rate Restriction for OBSS	**Released**
OV103A0062	Flt 31 & Subs	114	Window 7 & 8 Redundant Panes Factor of Safety is less 1.92 S/B $\geq$ 2.0	**Approved**

ENGINEERING REQUIREMENTS	Presentor:
	Organization/Date: Orbiter/6-29-05

OVEI Waiver:

- **OV103A0065 Window 7 & 8 Redundant Panes do not meet Factor of Safety**
  - Ref. CR S062633 for equivalent NSTS 07700 Volume X Factor of Safety waiver (approved)
  - The original overhead redundant window stress analysis (SD77-SH-0178) resulted in a 4% negative margin of safety to a factor of safety of 2.0 for 16.0 psi critical design pressure load for windows No. 7 and 8.
  - Reduced factor of safety accepted in previous 6.0 Loads Stress Report (STS 85-0254, page 6.10.5.60A).
  - This was considered an acceptable risk by the NASA Window and Crew Module SSM's as documented in STS 85-0254 (1988).
  - Formal project level documentation (OVEI waiver) & program documentation (NSTS 07700 waiver [S062633]) were processed per OCCB

ENGINEERING REQUIREMENTS WAIVERS/DEVIATIONS

Presentor:
Organization/Date: Orbiter/6-29-05

OVEI Waiver:

- **OV103A0063 Orbiter Landing Sink Rate Restriction for OBSS**
  - To provide positive structural margin for the OBSS, a restricted loads set has been analyzed
  - The orbiter landing sink rate allowable is to 8.4 f/s and the minimum landing weight increased 197K Lb when the OBSS is flown
    - Minimum ISS mission orbiter landing weight to date and all currently baselined future ISS orbiter landing weights, including LON, are greater than 197K lb
  - The full intent of OVEI requirement 3.2.2.2.1.9 is not met
    - 3.2.2.2.1.9 Landing Loads. Loads resulting from landing and rollout maneuvers shall be considered. These loads will be based on a maximum sinking speed of 9.6 ft/sec with zero crosswind and 6.0 ft/sec with 20 knot crosswind at the design landing weight of 207k lb specified in 3.2.3.11.2. A maximum sink speed of 6 ft/sec with zero crosswind and 5.0 ft/sec with 20 knot crosswind shall be used with the maximum landing weight of 240k lb specified in 3.2.3.11.2. Rollout and towing loads shall be in accordance with MIL-A-8862.

ENGINEERING REQUIREMENTS	Presentor:
	Organization/Date: Orbiter/6-29-05

11 approved LCC Changes related to MPS for STS-114

- LCN 01112, Effectivity Change for ET-10 per S063048 Action
- LCN 01121R02, LH2 Ullage Pressure Control Band Update for ET
- LCN 01125R03, Bipod Heater Web/Slot Temp Limits & Power Deadface
- LCN 01126R02, ET Camera Power Deadfacing
- LCN 01132, HAZ Gas Redundant HIM Update
- LCN 01146R03, Change Max Slot Temp and Min Web Temp Limits for ET Bipod
- LCN 01120R01, ECO Point Sensor Modification LCC Update
- LCN 01134R01, Removal of References to Non-Block II Engine Configurations
- LCN 01135R02, SSME Pogo Purge & Ancillary Upper Limit Change
- LCN 01150R01, MPS Condition Yellow Assessment
- LCN 01156R01, GOX Vent Hood Purge Termination
- LCN 01170R02 , STS-114 ET Prepress Cycle LCC
- LCN 01173R01 , ETLO2 Feedline Bellows Heater Monitoring Time

ENGINEERING REQUIREMENTS	Presentor:
	Organization/Date: Orbiter/6-29-05

10 Approved LCC Changes for Avionics/EME:

- LCN 01120 ECO Point Sensor Modification LCC Update
- LCN 01121 LH2 Ullage Pressure Control Band Update To ET-05
- LCN 01125 Bipod Heater Web/Slot Temperature Limits And Power Deadfacing
- LCN 01126 ET Camera Power Deadfacing
- LCN 01131 SRB Bus C Power Anomaly
- LCN 01134 Removal Of References To Non-Block II Engine Configuration
- LCN 01135 SSME Pogo Purge & Ancillary Upper Limit Change
- LCN 01146 Change Max Slot Temp Limits For ET Bipod
- LCN 01149 Hydrogen Burn System PIC Cap Voltage Anomaly
- LCN 01154 Launch Data Bus FEP Data Validity

ENGINEERING REQUIREMENTS	Presentor: Al Beckner Organization/Date: Orbiter/6-29-05

LCNs – Mandatory:

- **LCN 01173R01 – ET LO2 Feedline Bellows Heater Monitoring Time (SSID ET-16)**
  - RCN SS16797, if approved, will change the LO2 Feedline Bellows Heater termination time from T-1 minute 52 seconds to T-9 minutes and counting, accordingly a change to the ET-16 ET LO2 Feedline Bellows Heater Current monitoring time period ending effectivity must be made to end monitoring prior to the new termination time.
  - This LCN changes the time period ending effectivity from T-1 minute 57 seconds to T-9 minutes and counting.

ENGINEERING REQUIREMENTS	Presentor: Al Beckner
	Organization/Date: Orbiter/6-29-05

LCNs – Mandatory: cont.

- **LCN 01170 – ET Prepress Cycle LCC Change (SSID ET-04)**
  - **ET-04, ET LH2 Prepressurization Cycle Anomaly) (STS-114)**
    - Change Requirement (2) from 13 to 11 maximum command cycles during prepressurization
  - **ET-04, (ET LH2 Prepressurization Cycle Anomaly) (STS-114 - 999)**
    - Delete Requirement (3), 5 command cycles for 1.0 second prepress pulses
      - Cleanup of SSID to reflect Block II SSME configuration which requires 0.5 second prepress pulses
    - Delete Redline Derivation (6)
      - Provided derivation of 1.0 second prepress
    - Add “in-family” terminology to Redline Derivation

ENGINEERING REQUIREMENTS	Presentor: Al Beckner Organization/Date: Orbiter/6-29-05

LCNs - Mandatory: cont.

- **LCN 1153R02 – Fuel Cell Performance**
  - Changes Fuel cell current/power redline from 450 amps maximum to 10 kW maximum.
    - 450 amp redline exceeds the fuel cell's certified maximum power output of 12 kW.
    - 10 kW steady state redline is realistic and insures nominal fuel cell / main bus loading.
  - Allows loss of one fuel cell OI current measurement (utilize F9 panel meter as backup)
  - Updates allowable steady state performance variations to be consistent with Flight Rules (0.5 volts below FCP performance curve must be investigated)
  - Updates Consequences of Exceeding Redline to include:
    - High fuel cell current/power could result in overheating.
    - Potential fire hazard associated with a cross-over leakage.

ENGINEERING REQUIREMENTS WAIVERS/DEVIATIONS	Presentor:
	Organization/Date: Orbiter/6-29-05

LCNs - Mandatory: (cont)

- **LCN 01161R03 - STS-114 Minimum Equipment List Mission Specific Exceptions**
  - Updates Appendix H with standard operations to define mission specific equipment and exceptions

- **LCN 01166R01 – Natural & Triggered Lightning Constraints**
  - Added sections 1.4.C.1.b.1) and 1.4.C.1.b.2) to define the conditions that need to be satisfied in order to be allowed to fly through an attached anvil cloud

ENGINEERING REQUIREMENTS WAIVERS/DEVIATIONS	Presentor:
	Organization/Date: Orbiter/6-29-05

LCNs – Mandatory: (cont)

- **LCN 01172 – MPS LO2 Engine Inlet Temperature Update for ICD (SSID MPS-25)**
  - This LCN will add a requirement for the SSME LO2 inlet temperature to be no warmer that -281.7 F (178 R) between T-75 seconds and T-31 seconds as indicated by the MPS LO2 engine inlet transducers.
    - The ICD requires the LO2 temperature at the SSME LO2 low pressure turbo pump inlet be no warmer than 178 R (MPS LO2 engine inlet transducers).
    - The SSME controller monitors a LOX upper limit redline of 186.5 R on the SSME PBP Discharge temp measurements per LCC SSME-20.
    - These measurements are located in a different area of the SSME and would not necessarily detect an off nominal high bulk LOX temperature at the SSME inlet.
    - This will protect the engine ICD upper limit of 178 R max at start as the LOX temperature at the engine inlets will have already peaked and will be continually decreasing from T-31 seconds to SSME start.
    - Logic will remain 2 of 3 which is acceptable for a LOX bulk temperature evaluation at the engine inlets.
  - Discussed concept for this LCN at DPRCB 6/17/2005

ENGINEERING REQUIREMENTS	Presentor:
	Organization/Date: Orbiter/6-29-05

SODB STS-114 DCNs: (approved)

- P1-1984 STS-114 Mass Properties Posted, Volume II
  - The Volume II specific mass properties for STS-114 based on OCFR4 Cycle assessment and TDDP OCFEF114 was posted
- P1-1983 STS-114 SSME Operational /Performance TAG Values, Volume I
  - The change was replacement of Table 4.3.1.1-17 to support STS-114
- P1-1984 STS-114 Payloads, Volume IV
  - The changes were replacement of STS-107 payload data with the payload data on STS-114.
- P1-1992 STS-114 Mass Properties Posted, Volume II
  - The Volume II specific mass properties for STS-114 based on the FRRR1 Cycle assessment and TDDP FRRBF114 was posted
- P1-1996 Main Landing Gear Sink Rate with OBSS Installed, Volume V
  - Updated SODB to reflect need to limit similar to OVEI waiver OV103A0063
  - The orbiter landing sink rate is limited to 8.4 f/s and the minimum landing weight increased 197K Lb when the OBSS is flown

ENGINEERING REQUIREMENTS

Presentor:

Organization/Date:
Orbiter/6-29-05

SODB DCNs – Non-Flight Specific

P2-0806, Table 4.3.1-20, Liquid Oxygen Low-Level Shutdown---Amendment 359--
November 13,2001, Volume I
Subsystem: OMS

P1-1913, Constraint to FES Primary Controller Reconfiguration---Amendment 360--
November 29,2001, Volume I
Subsystem: ECLSS

P1-1914, APU QD Symbol Update---Amendment 82--November 29, 2001, Volume IV
Subsystem : APU

P1-1916, OMS/RCS Crossfeed Line---Amendment 361--February 12, 2002, Volume I
Amendment 391A and 391B--February 12 and 28, 2002 (respectively) Volume II
Subsystem: OMS/RCS

P1-1939, Table 4.9-2, OMS Load Error and Flow Rate/Mixture Ratio Error---Amendment 401-A--
February 12, 2002, Volume II
Subsystem: OMS/RCS

P1-1932, Translation Hand Controller Change---Amendment 366--July 30, 2002, Volume I
Subsystem: GN & C

P1-1933, Update to Modular Memory Unit---Amendment 367--September 4, 2002, Volume I
Subsystem: Orbiter Instrumentation

P1-1938, OMS Propellant Tank Loading---Amendment 369--September 26, 2002, Volume I
Subsystem: OMS/RCS

P1-1945, Vernier Reboast Constraints---Amendment 371 and 371a--November 18, and
December 2, 2002 (respectively), Volume I
Subsystem: OMS/RCS

ENGINEERING REQUIREMENTS

Presentor:

Organization/Date:
Orbiter/6-29-05

SODB DCNs – Non-Flight Specific (cont)

P1-1957, Landing Weight for Flight Phase per Inclination---Amendment 374--March 24, 2003, Volume I
Reflects Volume X, Book 1 Change

P1-1961, Revision to Payload Bay Floodlight Minimum On-time---Amendment 376--June 11,2003, Volume I
Subsystem: VECB Approved

P1-1955, 1.75-Hour Vernier Reboast Sessions---Amendment 377--July 16, 2003, Volume I
Subsystem: OMS/RCS

P1-1958, Auxiliary Power Unit Hydraulic Main Pump---Amendment 378--August 13, 2003, Volume I
Subsystem: Hydraulics

P1-1966, New Mass Properties Tables---Amendment 412 and 412A--February 12 and March 22, 2004 (respectively), Volume II
System: Mass Properties

P1-1968, Mass Properties of STS-114 Based on OCRF2 Cycle---Amendment 410--November 19, 2003, Volume II
Subsystem: Mass Properties

P1-1969, MEDS IDS Power-On and Power-Off---Amendment 379--April 12, 2004, Volume I
Subsystem: Data Processing

P1-1977, Mass Properties of STS-114 Based on OCRF4 Cycle---Amendment 413--August 5, 2004, Volume II
Subsystem: Mass Properties

P1-1972, Orbital Instrumentation System Changes---Amendment 380--August 25, 2004, Volume I
Subsystem: Orbiter Instrumentation

ENGINEERING REQUIREMENTS	Presentor:
	Organization/Date: Orbiter/6-29-05

SODB DCNs – Non-Flight Specific (cont)

P1-1975, Gould TACAN Deletions---Amendment 381, Volume I, Amendment 1, Volume I-A,
Amendment 28, Volume III—January 19, 2005
Subsystem: Navigation Aids

P1-1978, Update Landing Gear Mass Property Values in Table 5.1-1---Amendment 414A,
--December 9, 2004, Volume II
Subsystem: Mass Properties

P1-1980, Middeck Retention Net Stowage Net, Volume I – Amendment 384
--
P1-1985, Fuel Isolation Value Pressure Constraint, Volume I

ENGINEERING REQUIREMENTS	Presentor:
	Organization/Date: Orbiter/6-29-05

SODB DCNs: In-process (open), non-flight specific

- P1-1971, Ku-Band Updates
  The Preliminary DCN has been packaged and signed-off by the SSM. Is currently being reviewed by the PM.
- P1-1979, Hydraulic Main Pump Changes
  The Preliminary DCN has been packaged by the SSE and is being reviewed by the SSM.
- P1-1981, Orbiter Boom Sensor System
  Currently being written by the SSM.
- P1-1982, Thermal Window Pane ,Seals and Pressures, Volume I
  This DCN has been approved by the SSM and is being reviewed by the PM.
- P1-1994, Orbiter Docking System, Volume I
  The text has been written and is being reviewed by the SSE and then to be reviewed and approved by the SSM.
- P1-1993, Entry GN&C Mission Specific Assessment, Volume V
  Preliminary DCN was approved by the SSM, PM, and SODB Book Manager. The PDCN was briefed to and approved by the Boeing TCB and is scheduled for the JSC ORB on June 17, 2005. Should become Amendment 22 when approved by ORB.

	Presentor:
	Organization/Date: Orbiter/6-29-05

CONFIGURATION CHANGES AND CERTIFICATION STATUS BACKUP

	Presentor:
	Organization/Date: Orbiter/6-29-05

POST STS-107 CONFIGURATION CHANGES BACKUP

CONFIGURATION CHANGES AND CERTIFICATION STATUS	Presentor:
	Organization/Date: Orbiter/6-29-05

Post STS-107 RTF Mods - Overview

- 44 Post STS-107 Mods Authorized for OV-103 STS-114
  - 8 Significant RTF Modifications
  - 5 TPS / LESS Related Modifications
  - 4 Structures Related Modifications
  - 5 ECLSS and Flexhose Related Modifications
  - 1 Hydraulics / Water Spray Boiler Related Modification
  - 3 TCS Related Modifications
  - 10 Crew Systems Related Modifications
  - 1 Mechanical Systems Related Modification
  - 1 Purge, Vent & Drain Related Modification
  - 6 Avionics Related Modifications

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Post STS-107 RTF Mods

- 8 Significant RTF Modifications
  - MCR 19755 Orbiter Boom Sensor System (OBSS)
  - MCR 23278 SSOR & WVS UHF Antenna Relocation
  - MCR 19758 Wing Leading Edge Micro-TAU Instrumentation
  - MCR 23288 ET Umbilical Digital Camera
  - MCR 19735 Wing Leading Edge Spar Sneak Flow Protection
  - MCR 19763 Lower WLE Carrier Panel Horse Collar Gap Filler Redesign
  - MCR 23141 Thicker Side Thermal Windows 1 & 6
  - **MCR 23410 RCS Thruster Protective Covers**
    - **Overview presented in main briefing material**

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 19755 Orbiter Boom Sensor System (OBSS)

- The OBSS provides capability for on-orbit inspection of the Orbiter thermal protection system (TPS) and reinforced carbon-carbon (RCC) and repair support in the event of damage to these systems during a mission
  - Implements CAIB requirement to provide method for on-orbit inspection of the TPS after launch
- The boom is used as an extension of the Orbiter remote manipulator system (RMS) and utilizes three Orbiter manipulator positioning mechanism (MPM) pedestals on the RH sill for mounting provisions
- The boom, sensors and associated RMS mods are NASA GFE responsibility
  - Two sensor packages, used for the inspections, are mounted at the end of the boom
    - Sensor Package 1 - Laser Dynamic Range Imager (LDRI) / Intensified Television Camera (ITVC)
    - Sensor Package 2 - Laser Camera System (LCS)8822

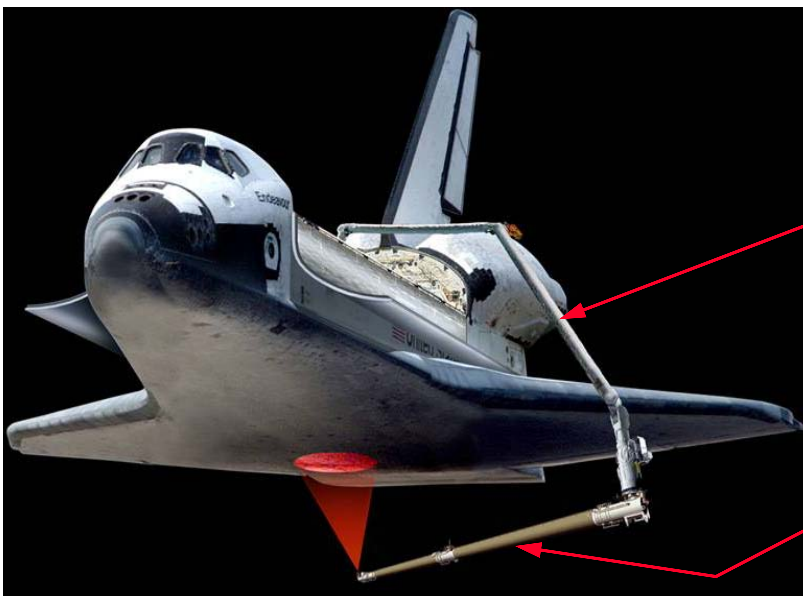
POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 19755 Orbiter Boom Sensor System (OBSS)

- Boeing is responsible for all Orbiter side interface hardware including
  - MPMs
  - Associated wiring and instrumentation for OBSS power & control
  - Orbiter systems integrations tasks such as loads, dynamics, stress and thermal analysis; Orbiter envelope/clearance analysis; and requirements documentation

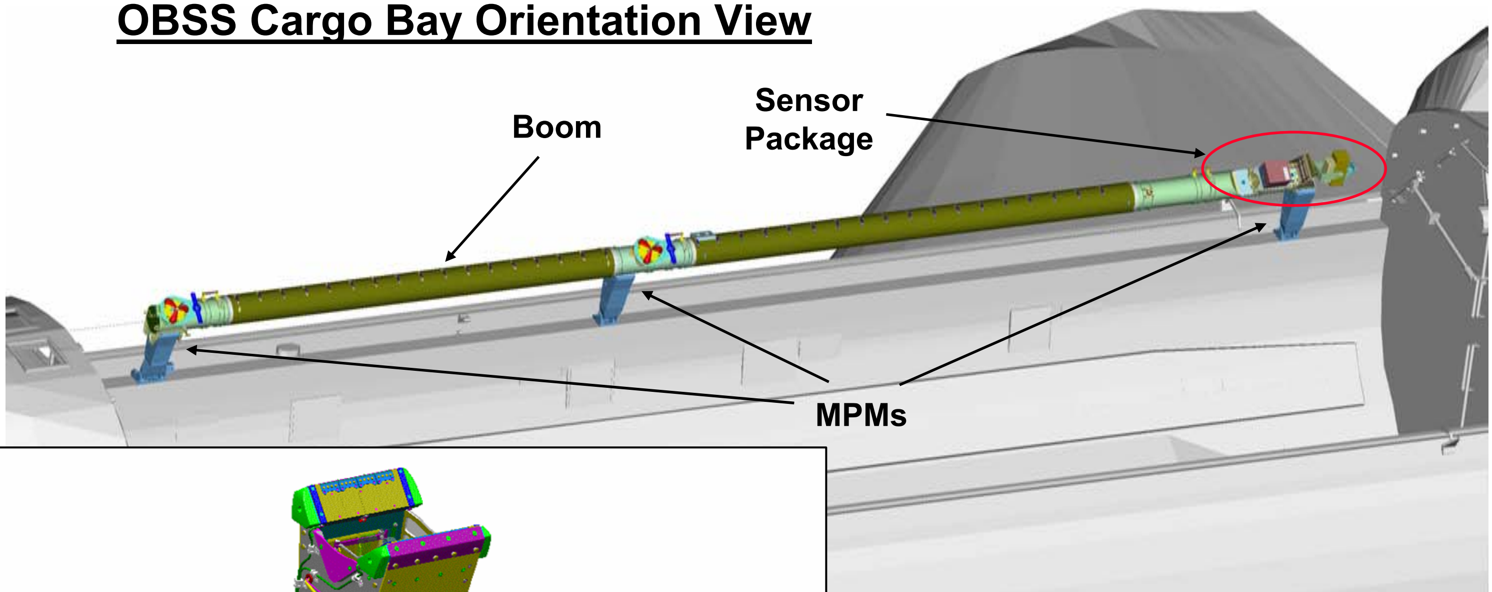


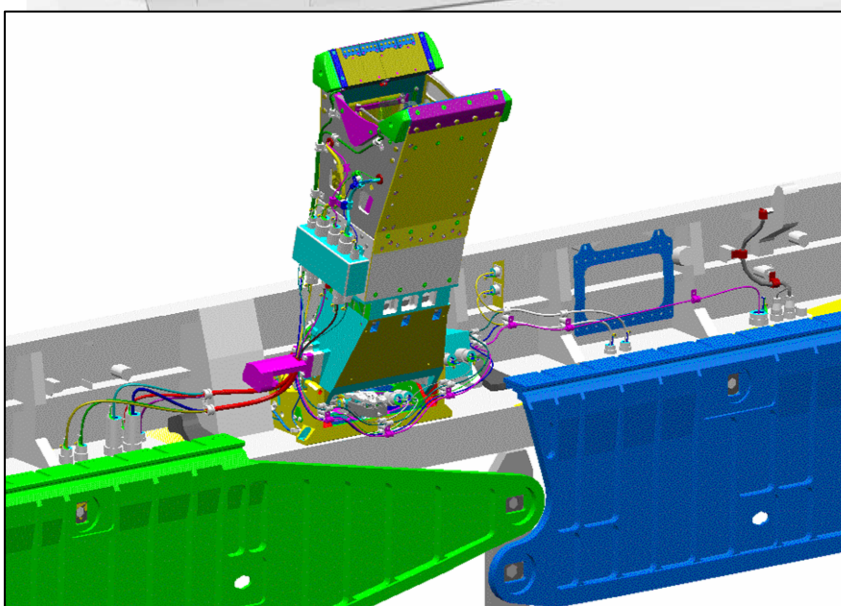
MCR 19755 ORBITER BOOM SENSOR SYSTEM (OBSS)

Presentor:

Organization/Date:
Orbiter/6-29-05

OBSS Cargo Bay Orientation View



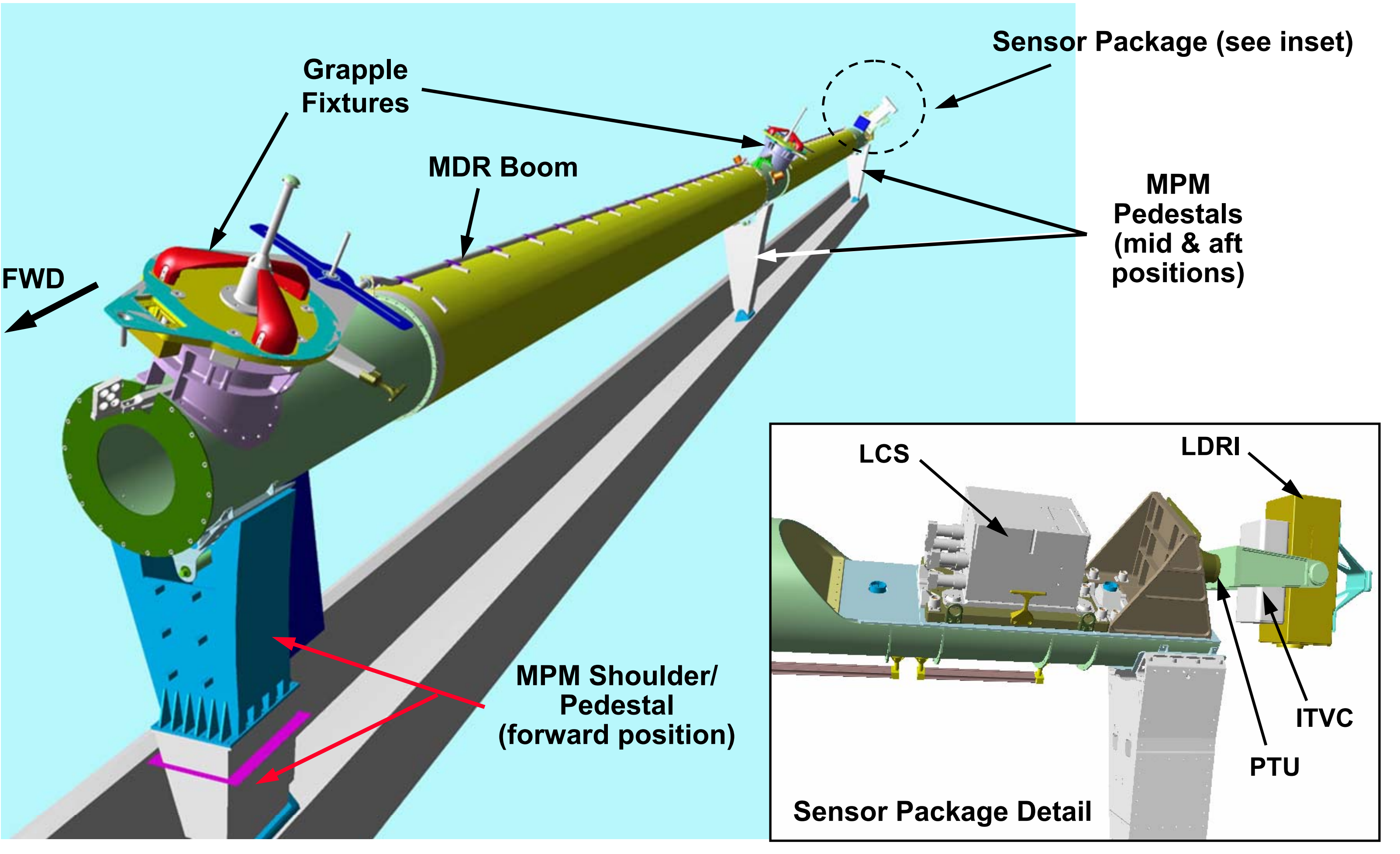


Shoulder Pedestal Installation Detail

MCR 19755 ORBITER BOOM SENSOR SYSTEM (OBSS)

Presentor:
Organization/Date: Orbiter/6-29-05

OBSS Installation Overview

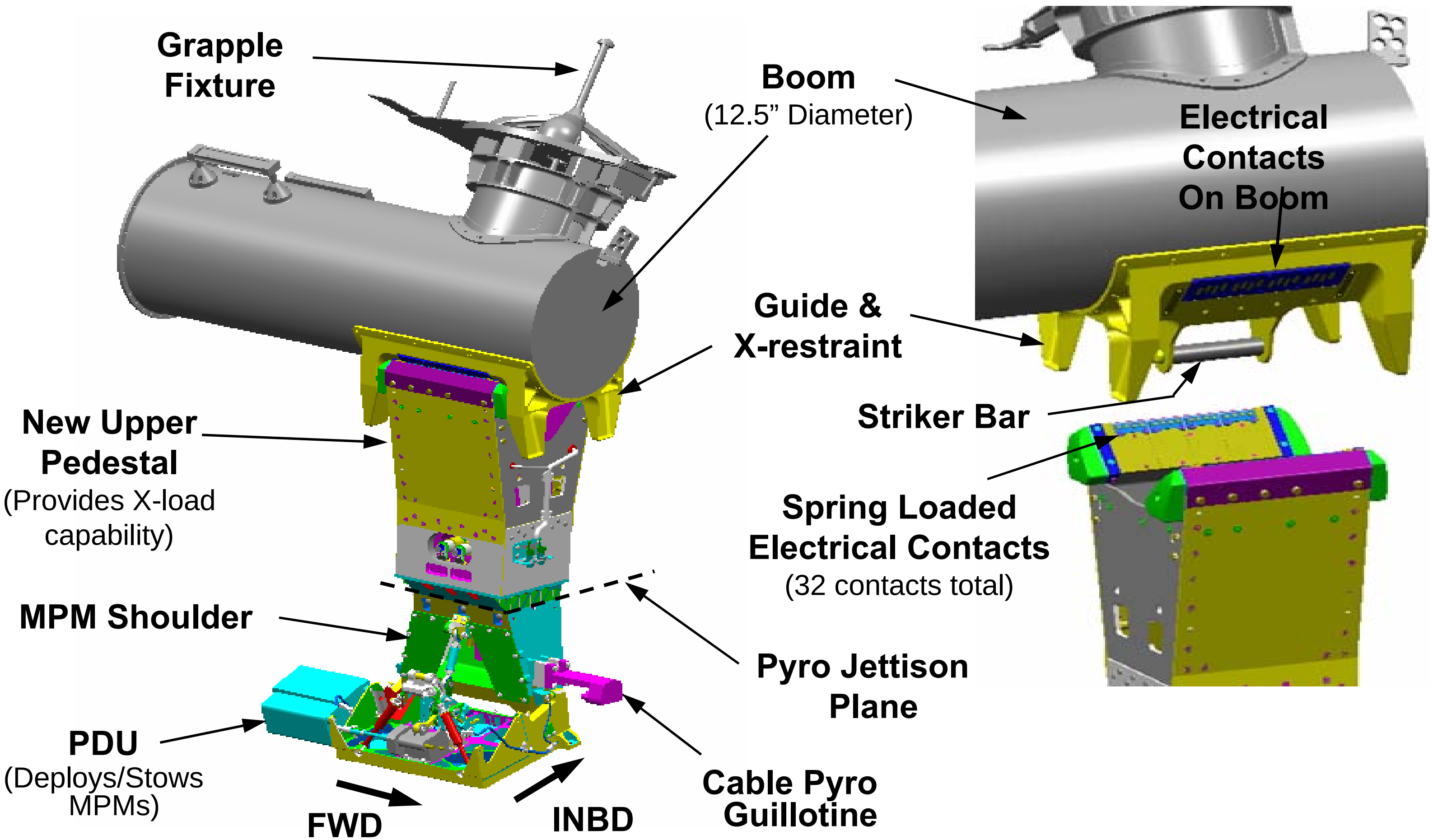


MCR 19755 ORBITER BOOM SENSOR SYSTEM (OBSS)

Presentor:

Organization/Date:
Orbiter/6-29-05

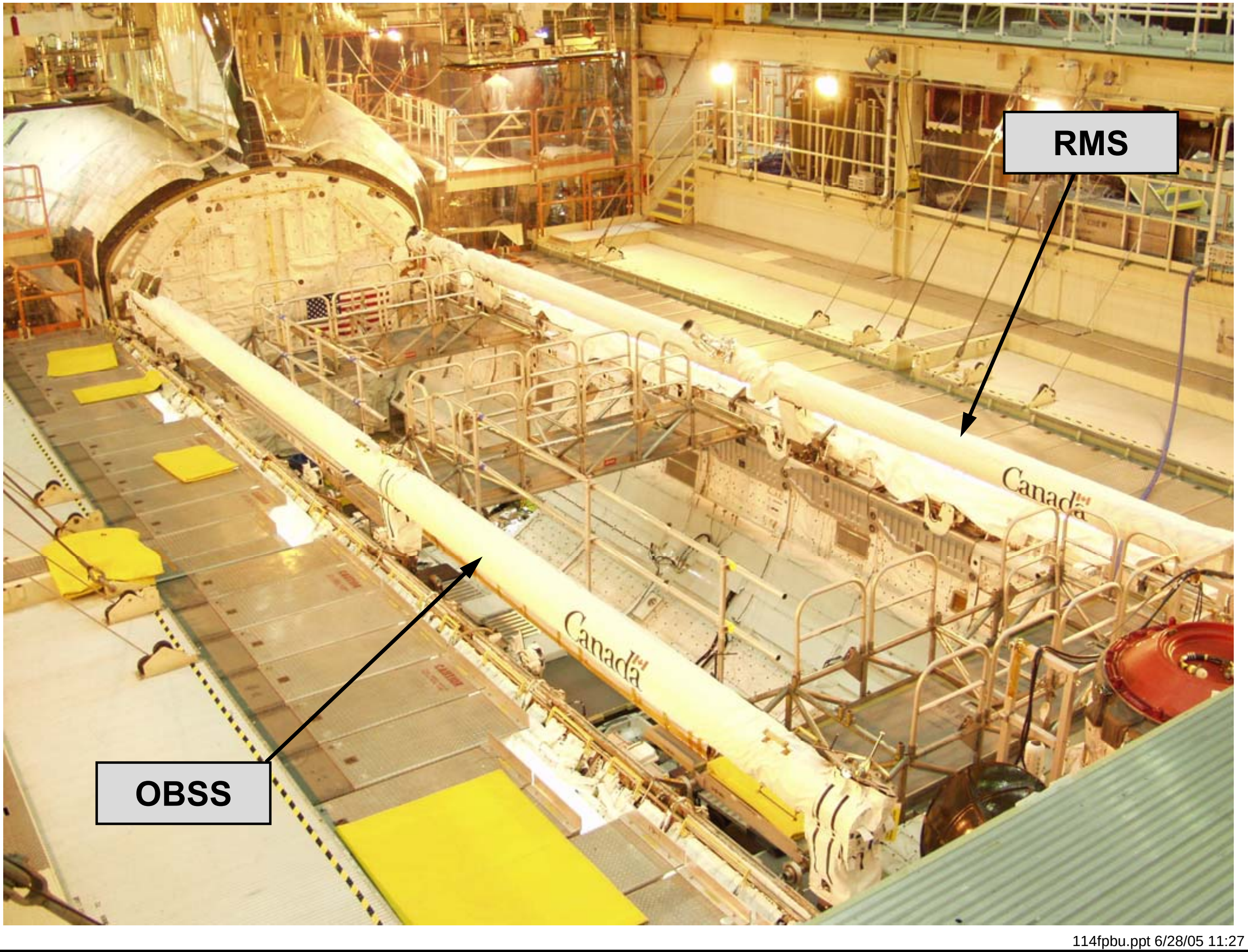
OBSS Shoulder Pedestal Detail



MCR 19755 ORBITER BOOM SENSOR SYSTEM (OBSS)

Presentor:	
Organization/Date:	Orbiter/6-29-05

OBSS Installed in OV-103



POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 23278 SSOR & WVS UHF Antenna Relocation

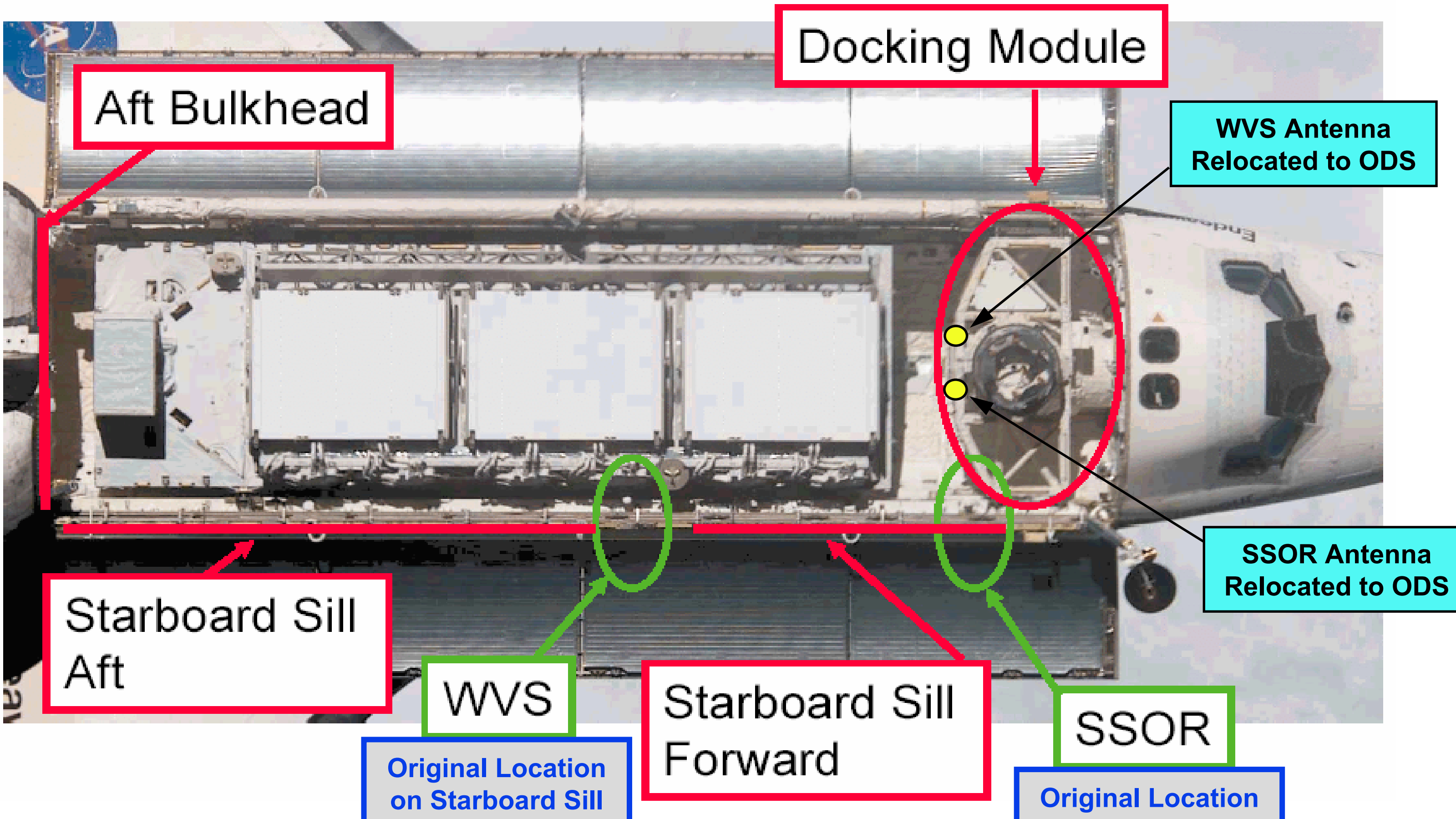
- Relocates the SSOR and WVS UHF antennas from their original payload bay starboard sill location to the aft, upper ODS truss
  - Required to remove interferences for mounting locations on the starboard sill for installation of the inspection boom and MPMs
- Modification involves -
  - New coax cables / mounting clips for rerouting of the associated antenna power and coax cables
  - New antenna mount brackets for the new antenna location
  - TCS blanket changes

MCR 23278 SSOR & WVS UHF ANTENNA RELOCATION

Presentor:

Organization/Date: Orbiter/6-29-05

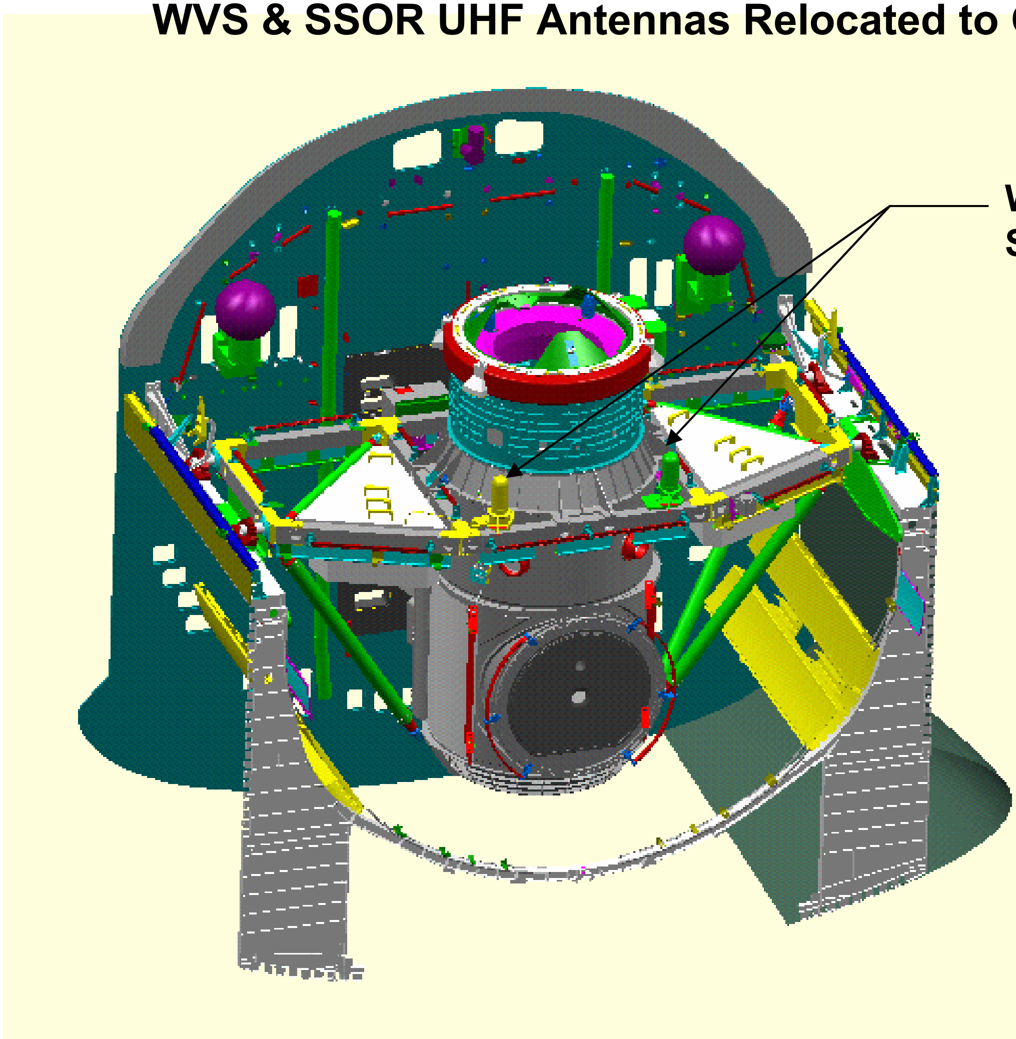
WVS & SSOR UHF Antenna Relocation Overview



MCR 23278 SSOR & WVS UHF ANTENNA RELOCATION

Presentor:
Organization/Date: Orbiter/6-29-05

WVS & SSOR UHF Antennas Relocated to ODS Truss

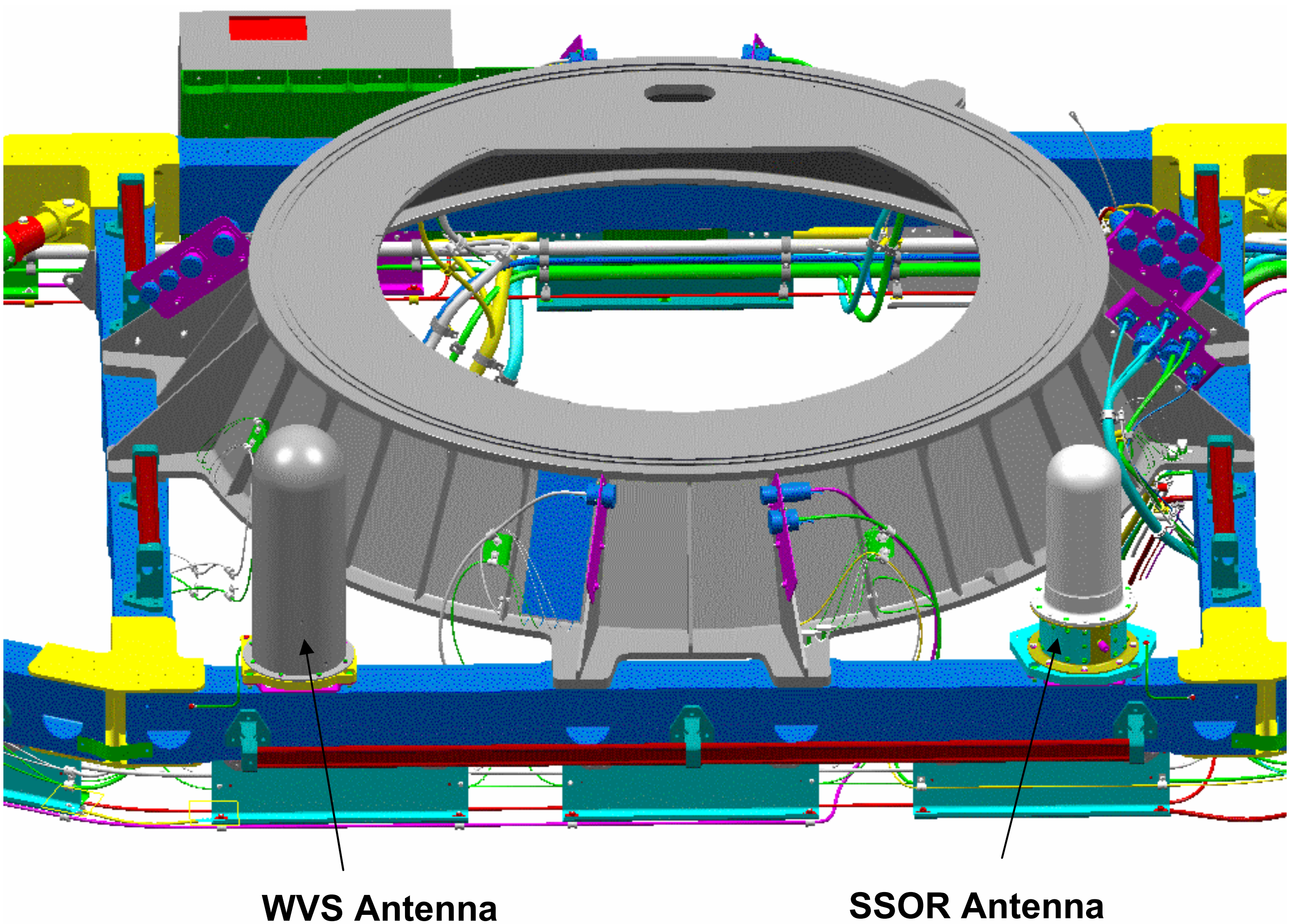


MCR 23278 SSOR & WVS UHF ANTENNA RELOCATION

Presentor:

Organization/Date: Orbiter/6-29-05

WVS & SSOR UHF Antenna Installation on ODS Truss



POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 19758 Wing Leading Edge Micro-TAU Instrumentation

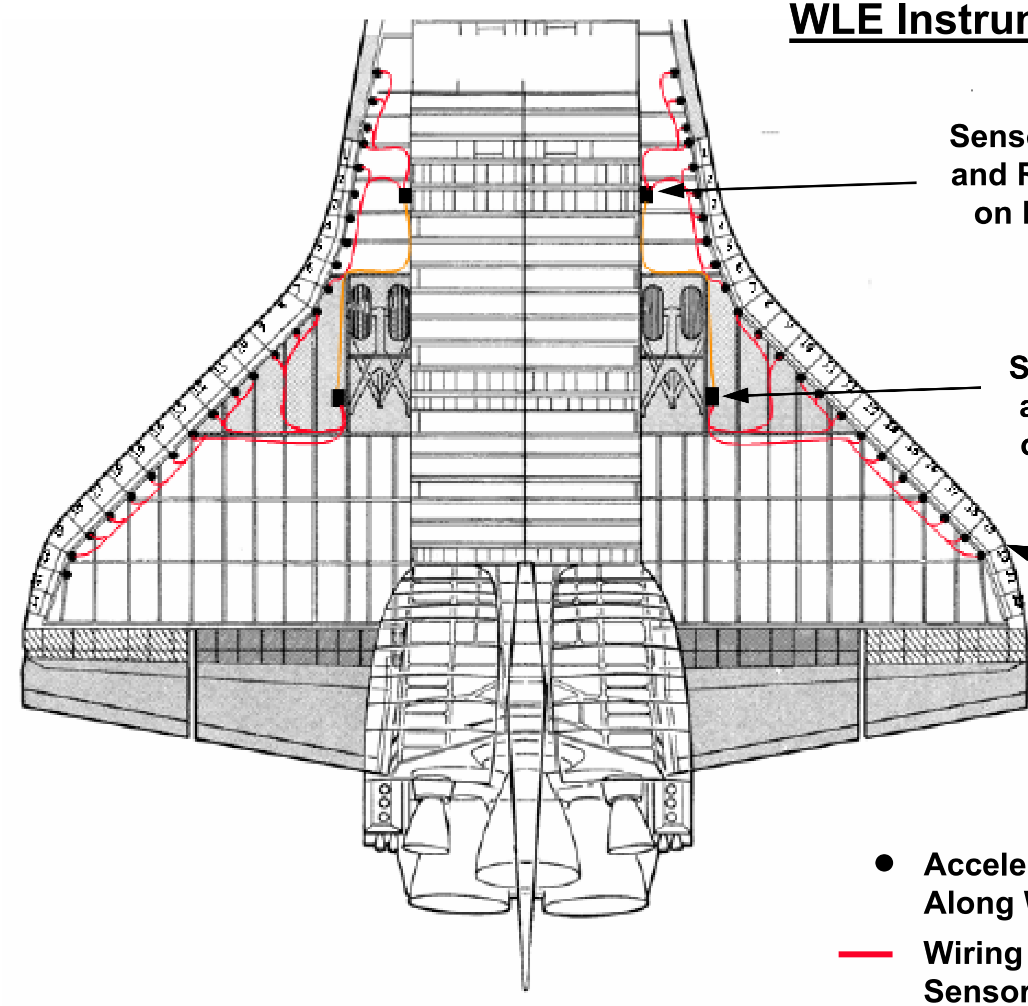
- Installs 66 accelerometer and 22 thermal measurements in the wing leading edge area of each wing with wiring to crew compartment panel interface for capability of capturing instrumentation data
- The instrumentation provides an impact detection system, used primarily for ascent monitoring with some MMOD/on-orbit capability
  - Serves as means to help identify and narrow areas for inspection to complement visual inspection capabilities
  - Data is collected and communicated to ground via PGSC/laptop computer
- The sensor instrumentation, certification and functionality is NASA GFE responsibility
- Boeing has responsibility for installation engineering and installation certification
  - AFD, PLB, wing installation of GFE sensors, mounting structure, wire harnesses and flight deck A13 panel modification

MCR 19758 WING LEADING EDGE MICRO-TAU INSTRUMENTATION

Presentor:

Organization/Date: Orbiter/6-29-05

WLE Instrumentation Overview

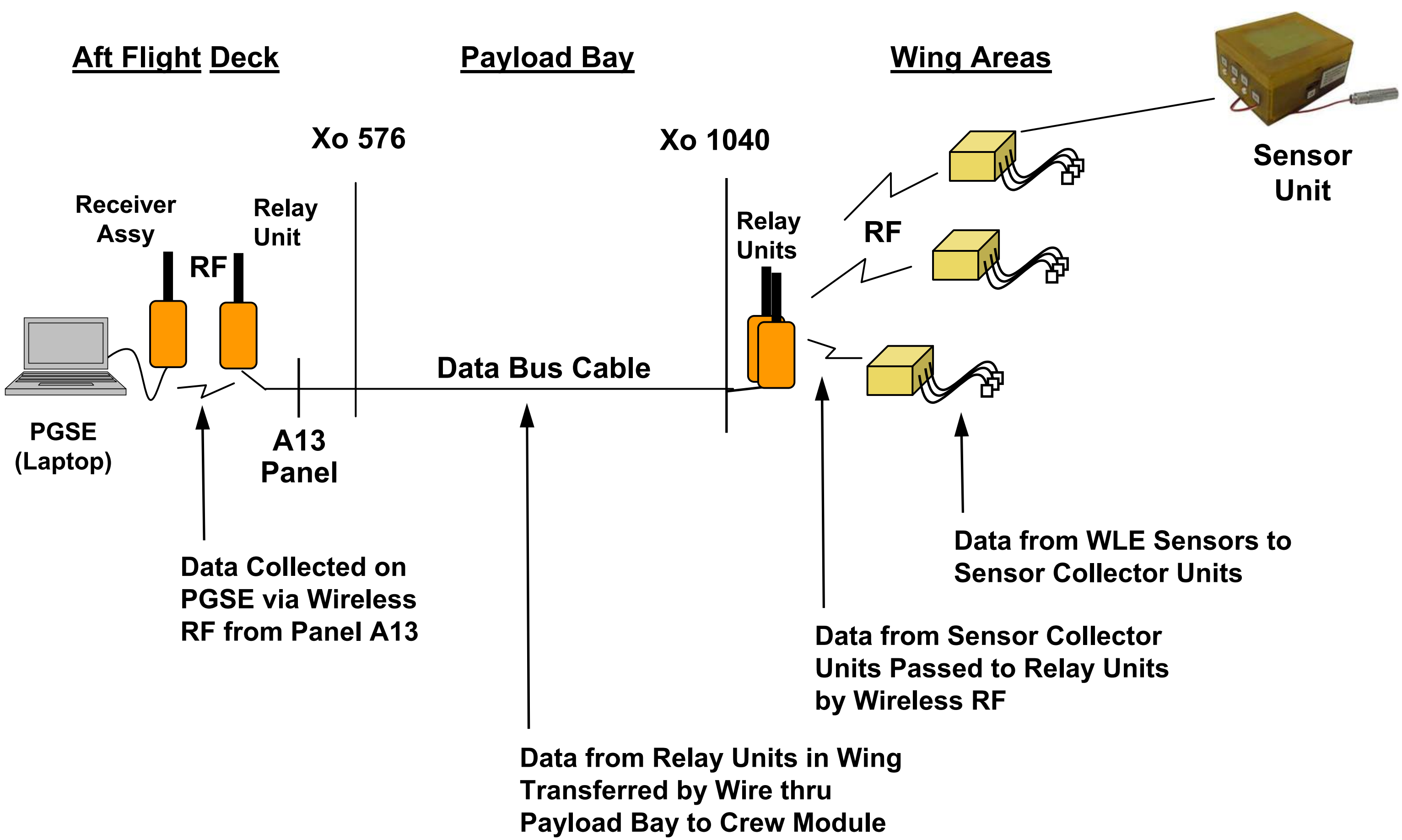


MCR 19758 WING LEADING EDGE MICRO-TAU INSTRUMENTATION

Presentor:

Organization/Date:
Orbiter/6-29-05

WLE Instrumentation Overview

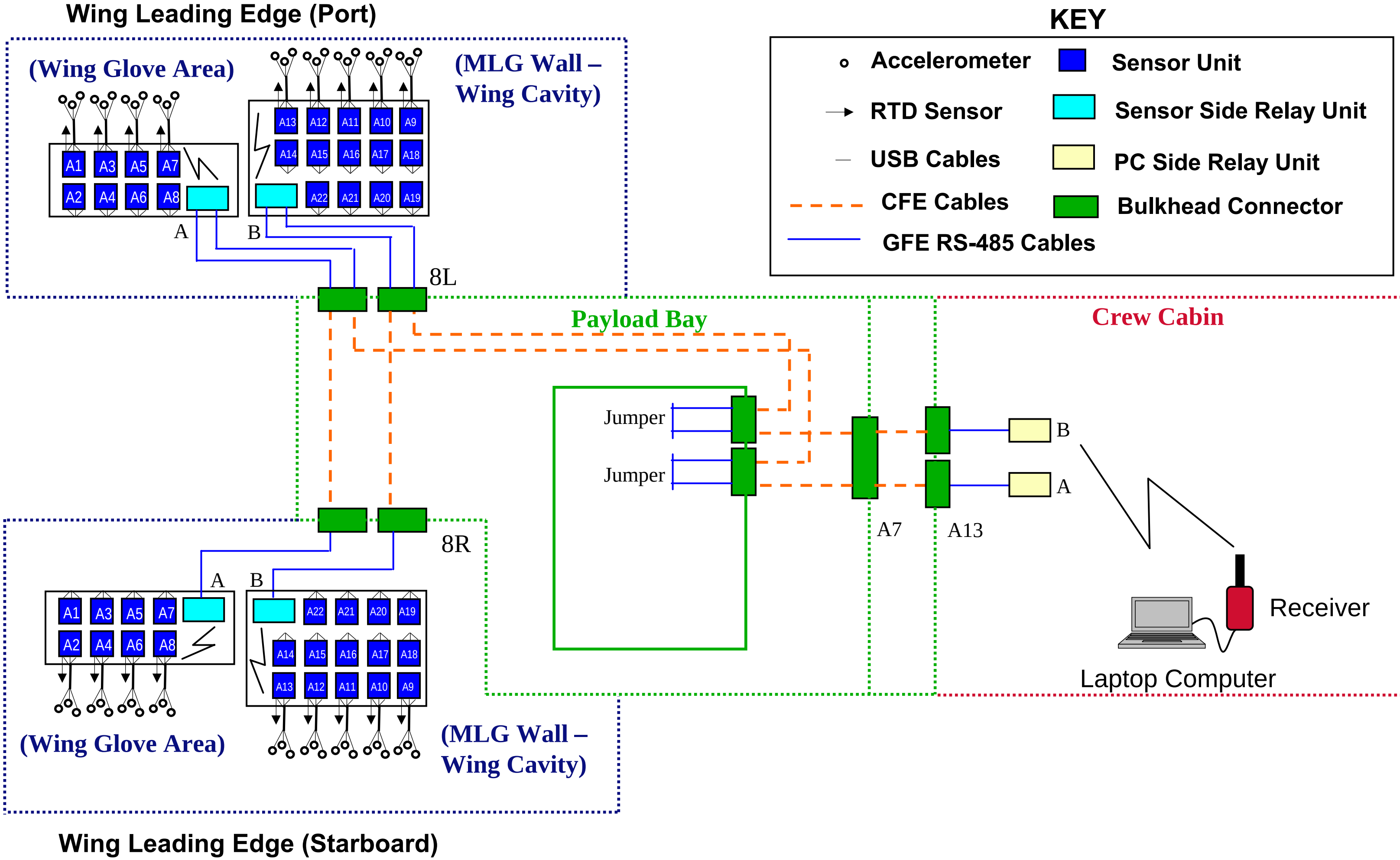


MCR 19758 WING LEADING EDGE MICRO-TAU INSTRUMENTATION

Presentor:

Organization/Date:
Orbiter/6-29-05

WLE Instrumentation Schematic Overview

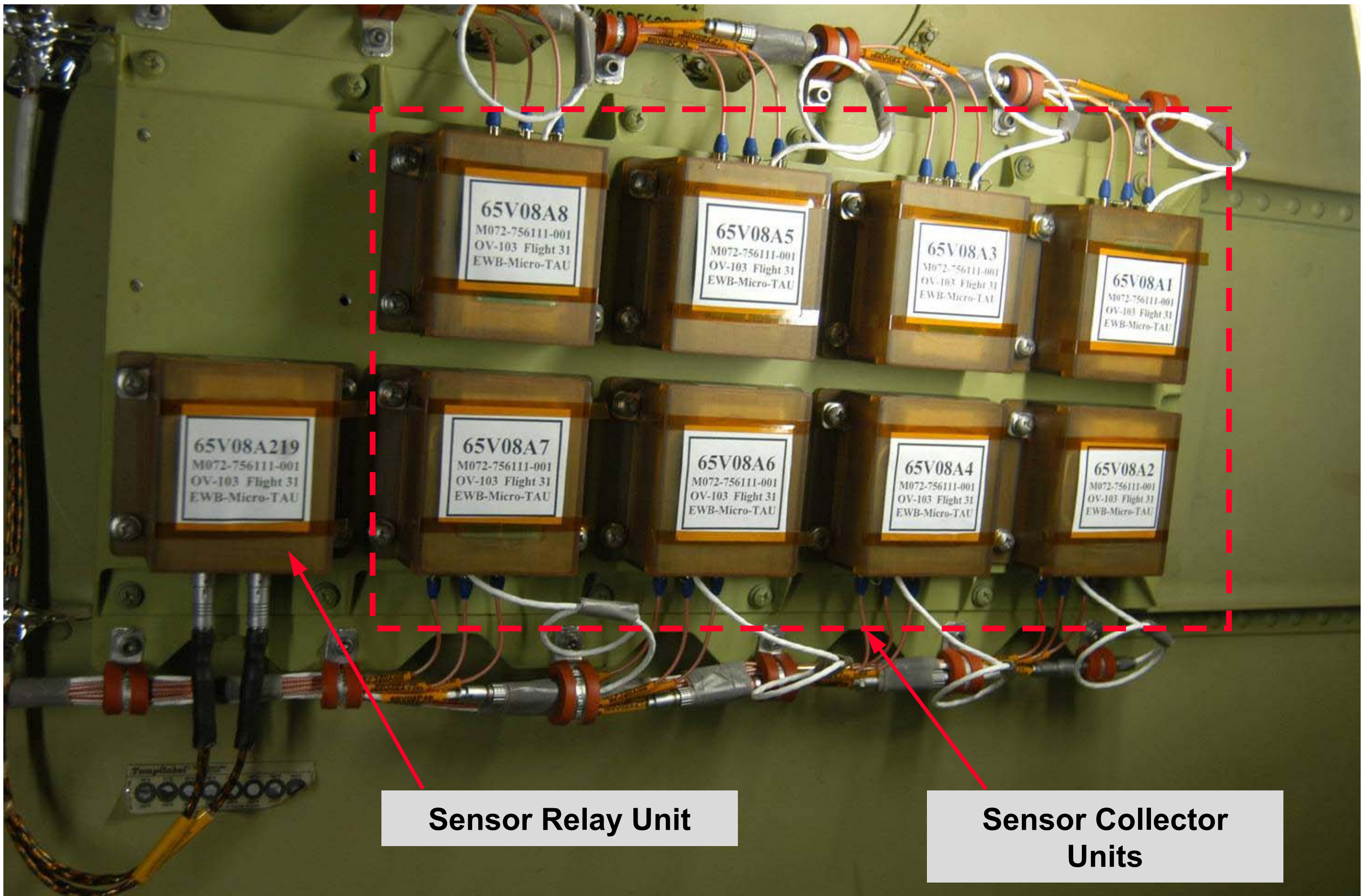


MCR 19758 WING LEADING EDGE MICRO-TAU INSTRUMENTATION

Presentor:

Organization/Date:
Orbiter/6-29-05

Sensor Collector Units & Sensor Relay at Wing Glove Location

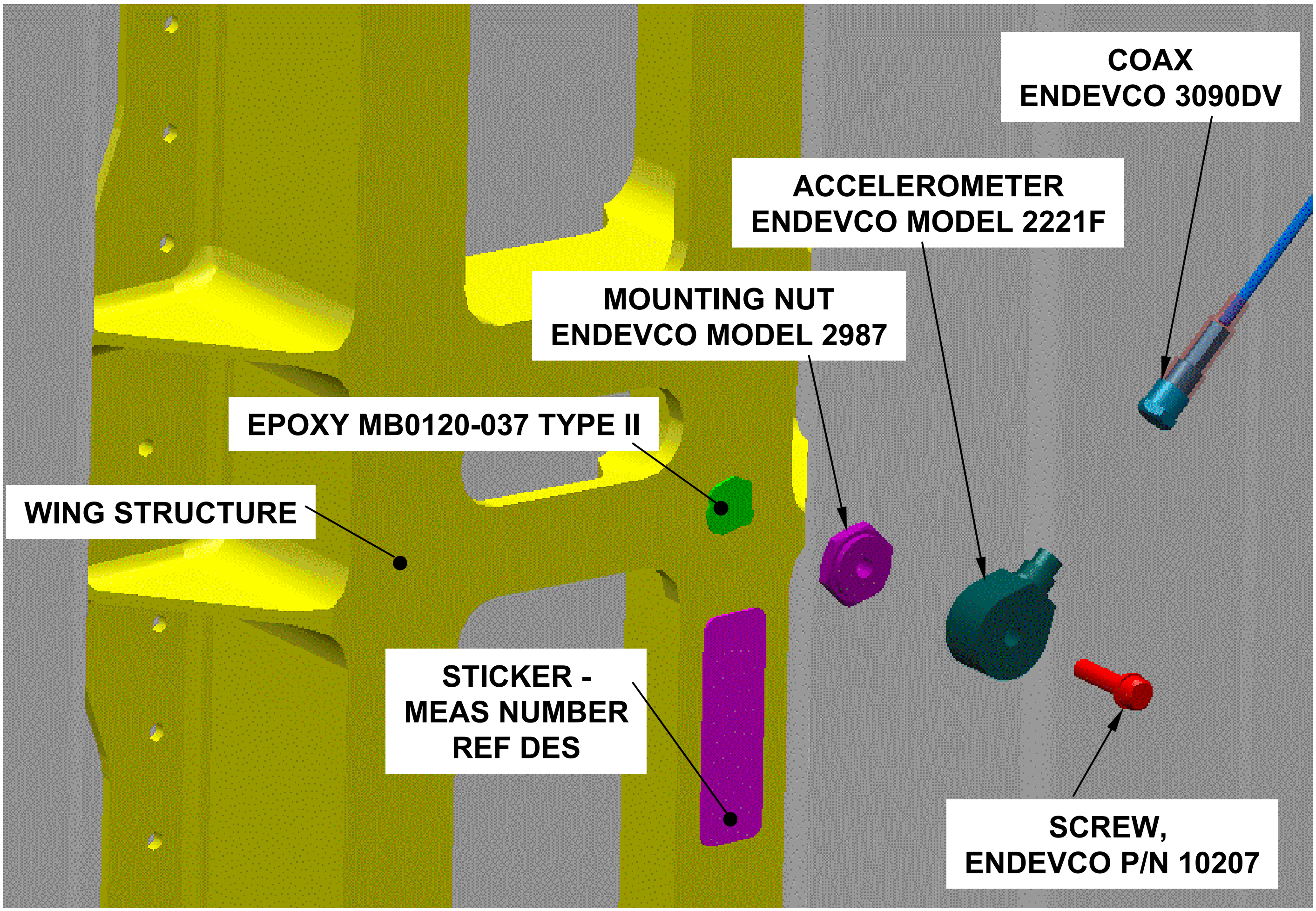


MCR 19758 WING LEADING EDGE MICRO-TAU INSTRUMENTATION

Presentor:

Organization/Date: Orbiter/6-29-05

Accelerometer Mounting Arrangement on WLE Spar Structure

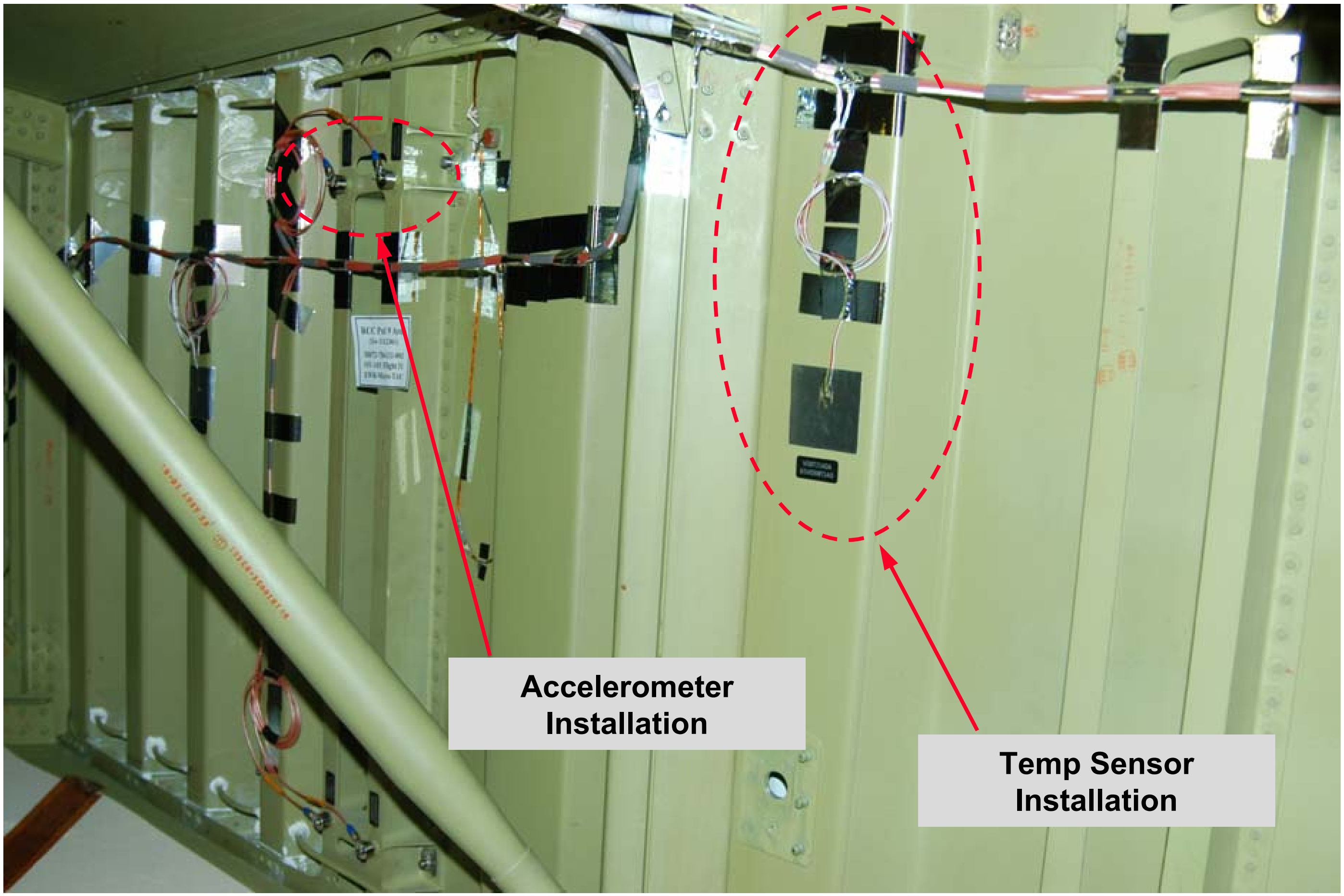


MCR 19758 WING LEADING EDGE MICRO-TAU INSTRUMENTATION

Presentor:

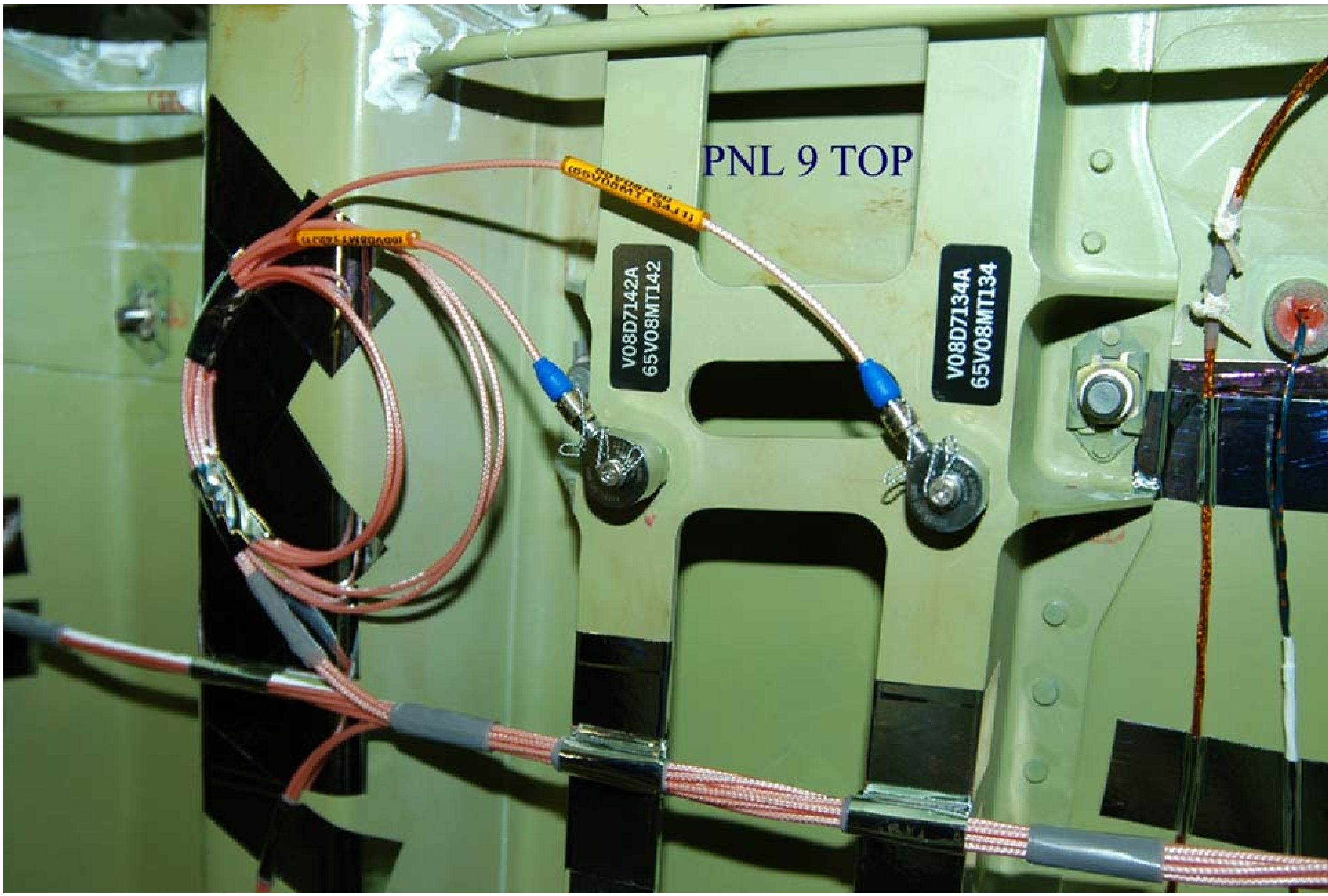
Organization/Date: Orbiter/6-29-05

Typical Accelerometer & Temp Sensor Installation on WLE Spar



# MCR 19758 WING LEADING EDGE MICRO-TAU INSTRUMENTATION	Presentor:
	Organization/Date: Orbiter/6-29-05

Accelerometer Mounting Arrangement on WLE Spar Structure

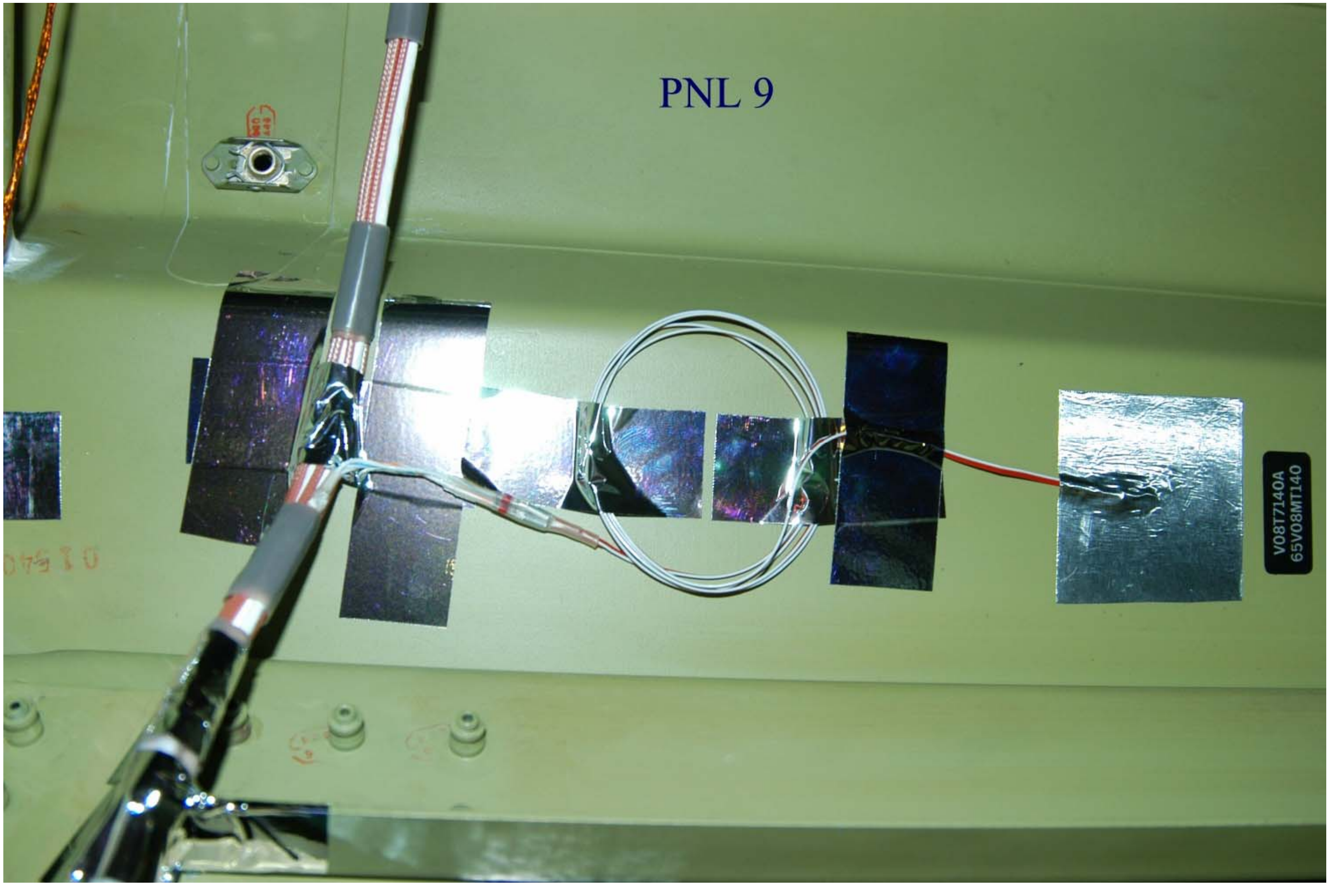


MCR 19758 WING LEADING EDGE MICRO-TAU INSTRUMENTATION

Presentor:

Organization/Date:
Orbiter/6-29-05

Temp Sensor Mounting Arrangement on WLE Spar Structure



POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

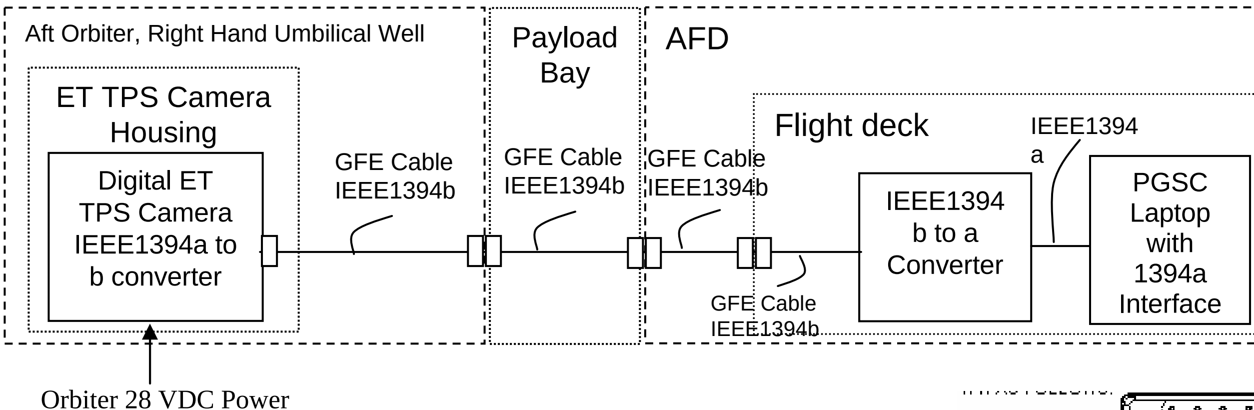
MCR 23288 ET Umbilical Digital Camera

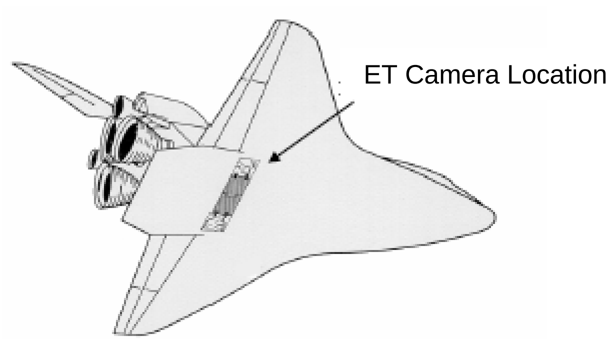
- Incorporates new GFE LO2 external tank (ET) umbilical well digital still camera and harnesses to crew compartment panel interface
- Provides functionality to capture and downlink high resolution ET sep photo images
- Camera is a direct replacement for existing still camera and will use existing Shuttle interfaces and power services
- NASA responsibility for camera and 'fire wire' cable hardware, certification & functionality
- Boeing responsibility for hardware installation engineering and installation certification
- Implements CAIB return to flight recommendation to provide capability to obtain and downlink high resolution images of the External Tank (ET) after separation - existing camera film imagery of the external tank can only be recovered after end of mission

MCR 23288 ET UMBILICAL DIGITAL CAMERA

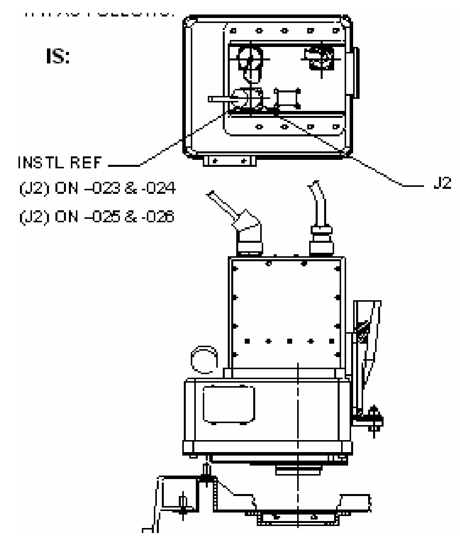
Presentor:
Organization/Date: Orbiter/6-29-05

Overview of ET Umbilical Digital Camera System





ET LO2 Umbilical Well



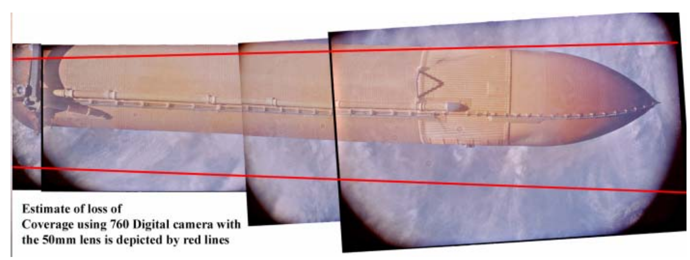
GFE Camera Instl Orientation

MCR 23288 ET UMBILICAL DIGITAL CAMERA

Presentor:

Organization/Date:
Orbiter/6-29-05

GFE Umbilical Digital Camera and Camera View



Camera View of ET

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

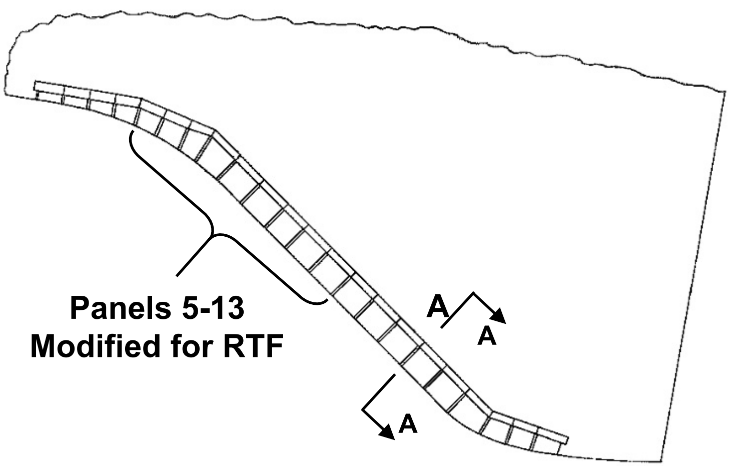
Organization/Date:
Orbiter/6-29-05

19735 WLE Spar "Sneak Flow" Protection

19763 WLE Lower Access Panel "Horsecollar" Gap Filler Redesign

- Two wing leading edge hardening modifications implemented to improve survivability based on findings from STS-107 investigation
- Both LESS mods implemented on critical panels 5-13 for STS-114 with remaining panels planned for subsequent flow

Orientation Views – Wing Leading Edge

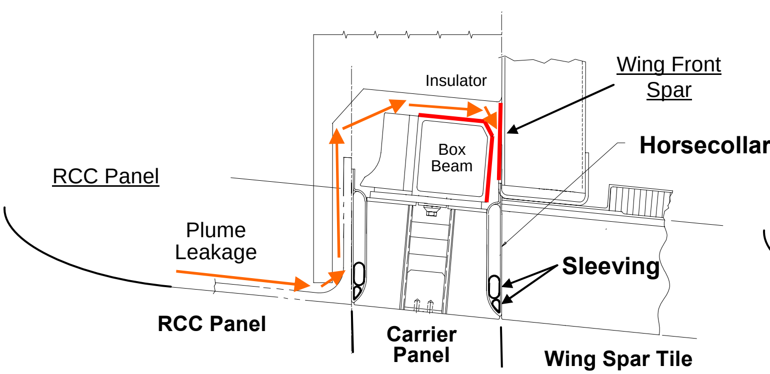


View A-A

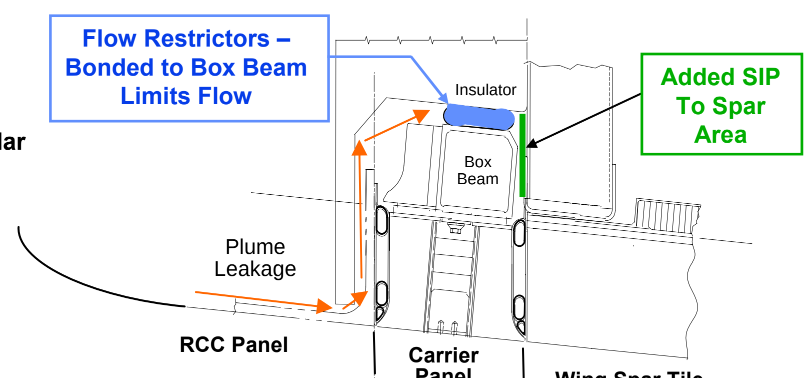
MCR 19735 WLE SPAR SNEAK FLOW PROTECTION MCR 19763 WLE "HORSECOLLAR" GAP FILLER REDESIGN	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 19735 WLE Spar Sneak Flow Protection addresses the wing spar vulnerability to sneak flow from plume ingestion into RCC cavity

- **Adds a flow restrictor to limit allowable plume flow to 50% across the flow restrictor**
  - **Sandwiched between the box beam and the removable insulator - bonded to top of box beam - spans the width of removable access panel between attachment points**
  - **Flow restrictors will reduce the forward to aft flow path and protect the spar against unacceptable temperature limits**
- **Also adds insulation to bare areas of wing front spar surface to maintain spar temperature gradients at certification levels**
  - **Strain Isolator Pad (SIP) bonded to the lower spar cap (0.090") and to the forward facing corrugations of the spar (0.160")**



Old Design



New Design

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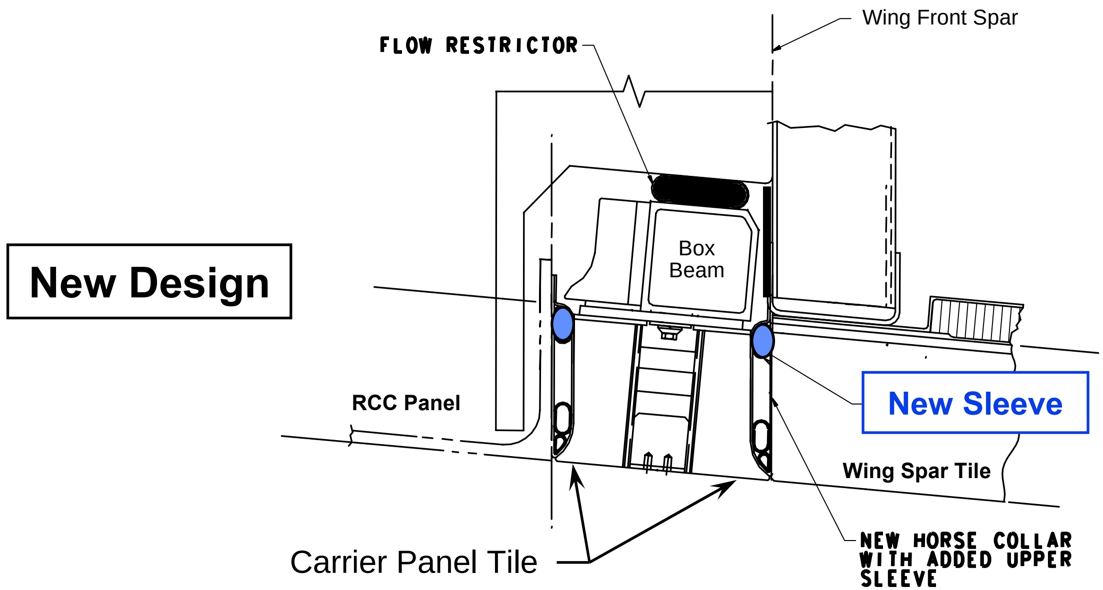
MCR 19735 WLE SPAR SNEAK FLOW PROTECTION MCR 19763 WLE "HORSECOLLAR" GAP FILLER REDESIGN	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 19763 WLE "Horsecollar" Gap Filler Redesign adds redundancy to lower LESS access panel horsecollar gap filler

- Horsecollar Gap Filler redesigned to add additional 0.50 DIA sleeving at IML end of the horsecollar
  - **Existing horsecollar has two sleeves at OML**
  - **New design adds additional sealing capability in the event of partial tile loss, preventing early ingestion of flow into LESS lower spar**
- Utilizes existing certified Nextel fabrics



POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 23141 Thicker Side Windows 1 and 6

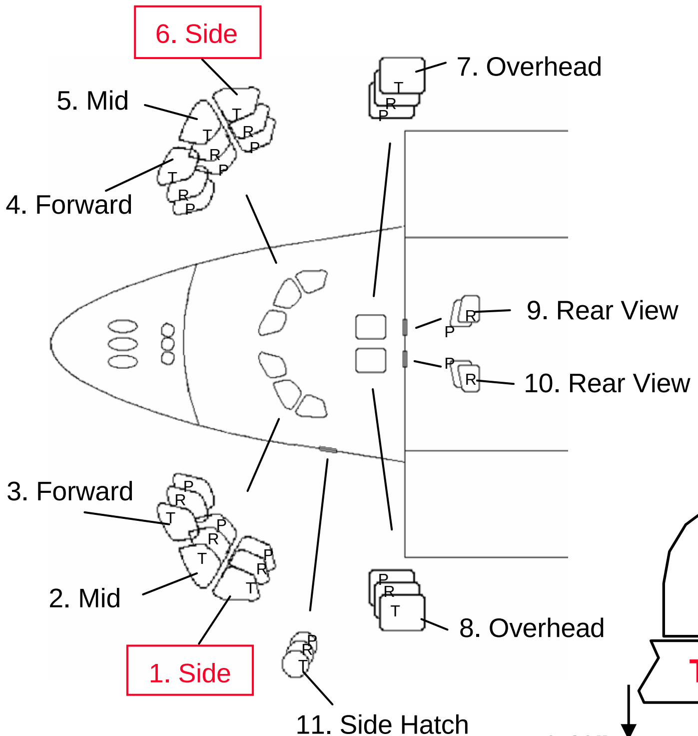
- Trend data shows ISS missions are generating significantly higher side and overhead window (W1, W6, W7, and W8) scrap rates due to orbital debris impacts
  - Cause due to Orbiter attitude, higher altitude, and increased mission duration of ISS missions, as well as increase in on-orbit/ascent debris
- Recent updates to debris transport analysis and Probabilistic Risk Assessment revealed potential negative safety margins for side window impacts from aluminum oxide and foam.
- Assessment determined that the side window pane thickness could be increased 0.30” from the existing thickness of 0.56” with minimal impacts
  - Window retainer modified to accommodate thicker glass and first row of TPS tile adjacent to window required modification to ‘taper out’ the increased in OML step
  - Of the 62 side window panes that had been scrapped up to STS-108 (12/2001) due to on-orbit hyper velocity impact or debris impact during ascent, 51 of these could have been saved with the thicker pane design
  - Thicker side windows will also provide additional strength margin for the aluminum oxide and foam ascent debris

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

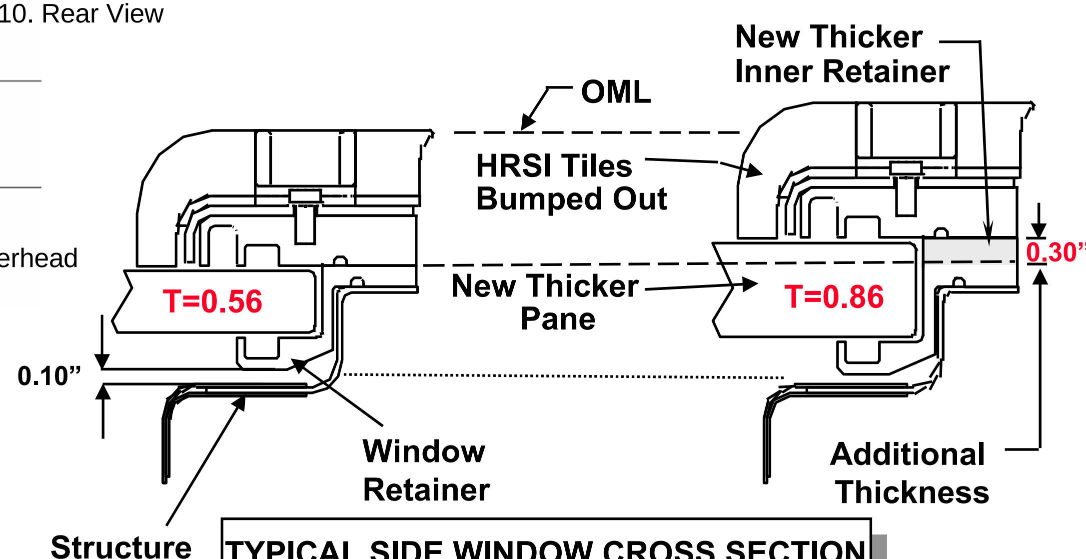
Organization/Date: Orbiter/6-29-05

MCR 23141 Thicker Side Windows 1 and 6



ORBITER WINDOW OVERVIEW

* Note that overhead window 7 & 8 mod will be performed in a future flow.



TYPICAL SIDE WINDOW CROSS SECTION

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	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 23410 FRCS RAIN COVER REDESIGN - MATERIAL CHANGE TO TYVEK®

BACK-UP

MCR 23410 FRCS RAIN COVER REDESIGN - MATERIAL CHANGE TO TYVEK®

Presentor:

Organization/Date: Orbiter/6-29-05

- Flight Rationale in place and accepted for isolated Qual test failure cases:
  - Water accumulation between lower thruster lip and cover following extended rain and wind+rain exposures
    - Met revised requirement of NMT 2 cc in *combustion chamber*
    - Cover redesign implemented to add “weep hole” at base of cover to drain any accumulated water
      - Rain-only Delta Qual (no wind) testing with weep hole design successfully completed 05/26/05 with no water accumulation
  - Cover debonding (including premature cover release)
    - PVA thruster application tightened up to help mitigate this possibility
    - Potentially due to facility start-up transients (not “real life” condition)
    - Covers demonstrated capability to withstood 2.5 in/hr rain + 29 mph “driving” wind for 30 min
    - Condition detectable at Pad by current inspections and TV coverage
    - Follow-on testing performed week of 6/20/05 obtained additional wind+rain data points and included facility mods to control start-up transients (not a cert requirement)
      - Extended exposure (> 1 hr) to rain with 30 mph “peeling” winds caused cover debond and eventual early release
      - No problems for winds below 30 mph

MCR 23410 FRCS RAIN COVER REDESIGN - MATERIAL CHANGE TO TYVEK®

Presentor:

Organization/Date: Orbiter/6-29-05

- Contingency scenarios for cover debonding and/or leakage during high wind/rain rate conditions to be based on following:
  - Decision to roll back RSS
  - Forecasted weather
  - Ice Team observations
  - Pad camera observations
  - Thruster location (pad orientation and planned operational environment)
  - Location and length of debond

MCR 23410 FRCS RAIN COVER REDESIGN - MATERIAL CHANGE TO TYVEK®

Presentor:

Organization/Date:
Orbiter/6-29-05

- Risks/Impacts associated with water intrusion into Primary Thrusters
  - Most likely operational risk from water intrusion is thruster deselect due to erroneous propellant leakage indication (caused by evaporative cooling of water in chamber) during ascent
    - CILs also document Crit 1 failures:
      - Contamination (ice) blockage of acoustic cavity or boundary-layer-cooling holes causing thruster burnthrough (wire-wrap mitigation)
      - Ice debris (considered unlikely)
      - PAD FOD source
  - Qual testing demonstrated that water penetrating an in-place cover accumulates at thruster lip/cover interface
    - Weep hole mod prevents accumulations in all but forward-firing thruster that could theoretically have water drain into injector
    - Typical flight plan does not call for forward-firing thruster use until Flt. Day 2
      - A small amount of water in forward-firing thruster would still be potentially OK for flight since water would sublimate out over Flight Day 1

MCR 23410 FRCS RAIN COVER REDESIGN - MATERIAL CHANGE TO TYVEK®	Presentor:
	Organization/Date: Orbiter/6-29-05

- Detailed Tyvek Certification and Implementation Status:
  - Two flight QSA (STS-114 & -121) approved on 6/17/05
    - Included Cert Deviation Rationale (no separate document) for requirements that were not met
  - KSC technician training scheduled for week of 6/27/05.
  - STS-114 hardware delivery (10 shipsets) scheduled 6/27/05
    - First cover use is ~36 hours prior to RSS rollback (~ 7/09/05)
  - Additional documentation updates support STS-114
    - Updates to ML0301-0075 spec to incorporate weep hole released
    - Updates to cover drawings to match Qual cover configurations released
    - FMEA/CIL 03-2F-121319-01 and -03 approved @ 6/22/05 PRCB
  - Follow-on testing to obtain additional wind/rain data points and better define bond capability scheduled for week of 6/20/05 (provides data for final Certification)

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Post STS-107 RTF Mods

- 5 TPS / LESS Related Modifications
  - MCR 17177 Main Landing Gear Door Tile Gap Rework
  - MCR 19746 FRCS TPS Carrier Panel Attach Stud Redesign
  - MCR 17177 Forward ET Attach Arrowhead Tile Redesign (Certified under MCR 23360)
  - MCR 19683 Main Landing Gear Door Corner Tile Void Fill Mod
  - MCR 19733 Reconfiguration of RSB Blankets to Support RSB Actuator R&R

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

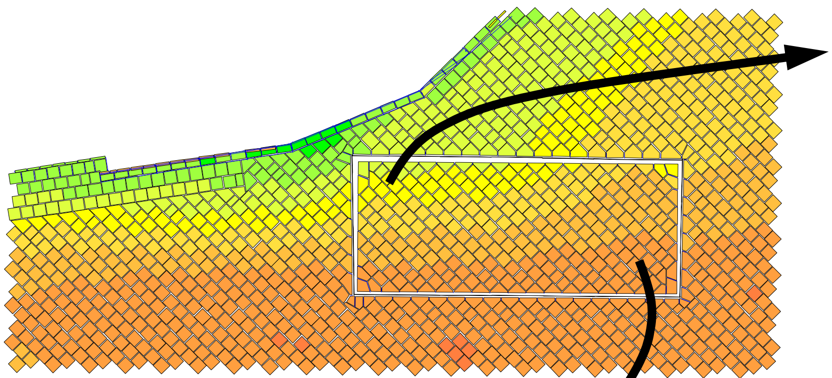
MCR 17177 Main Landing Gear Door Tile Gap Rework

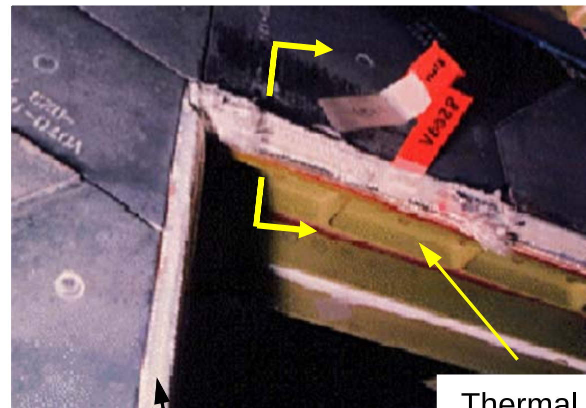
- The MLGD Thermal Barrier prevents Orbiter structural overheating throughout all phases of the mission and runs the entire perimeter of the MLGD
- Analysis performed for new main landing gear door thermal barrier redesign (MCR 19743) found that effects of 6.0 / PE loads cycles had not been accounted for in MLGD deflections
- Further analysis showed an effect on the current design MLGD tile/thermal barrier interface for the MLGD PE loads case at specific locations, which could lead to tile and thermal barrier damage during flight
  - Tile sidewall loads could be exceeded by over compression of the thermal barrier
  - Door side tile could contact the thermal barrier standoff

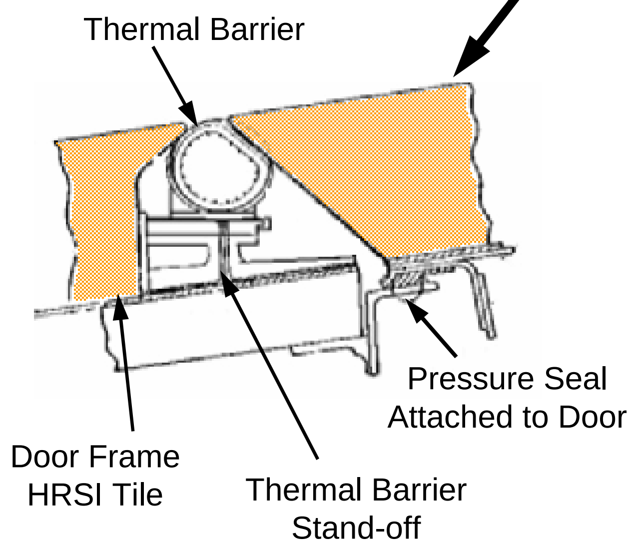
MCR 17177 MAIN LANDING GEAR DOOR TILE GAP REWORK

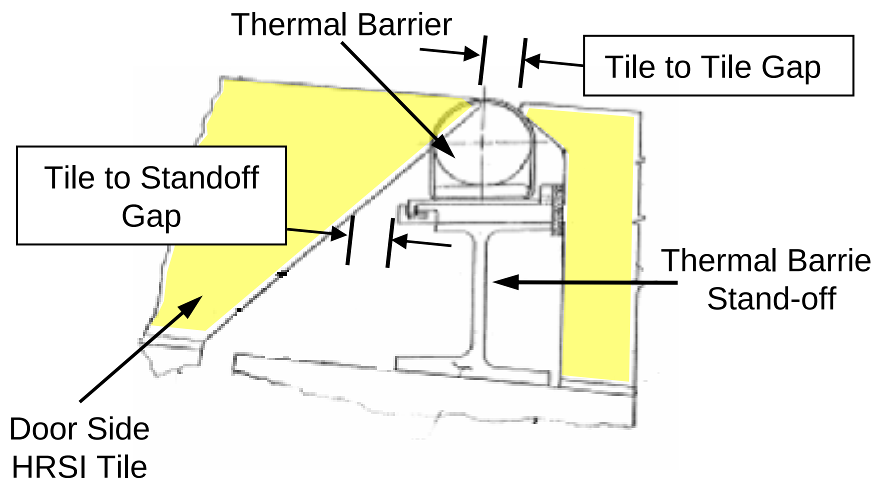
Presentor:

Organization/Date: Orbiter/6-29-05









Cross Sections Thru Thermal Barrier Area & Support Structure

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date: Orbiter/6-29-05

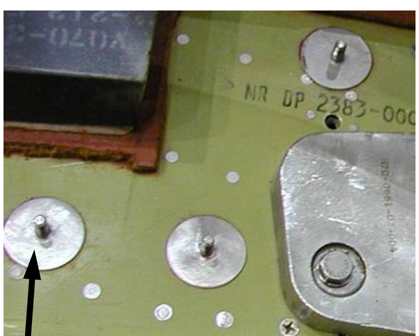
MCR 17177 Main Landing Gear Door Tile Gap Rework

- Corrective action to address the concerns identified in the analysis were implemented by increasing the tile to tile gap controlled by the ML0601-0001 specification
  - Gaps on vehicle were measured and reworked where required
    - Tile shaves were attempted in these locations to meet the new specification requirements, however tile replacements were ultimately required
  - Eliminates issues associated with potential thermal barrier over-compression and tile to standoff contact
  - Stress and Thermal analysis performed verified no issue with the changes in increased gap openings

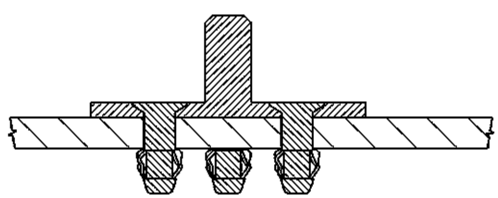
POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 19746 FRCS TPS Carrier Panel Redesign

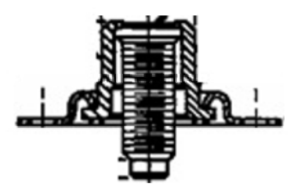
- Redesigns the FRCS carrier panels and access door installations to eliminate the use of bonded studs, which have a history of debond failure
  - Response to STS-107 UA Closure Team recommendation that use of bonded studs be eliminated on the Space Shuttle Thermal Protection System (TPS)
  - Eliminates scenario whereby loss of a bonded stud could allow either panel lifting in a corner location and create a heating flow path or complete loss of a panel, which would create a debris source
- The bonded studs were replaced by a more reliable mechanical attachment feature, either a new riveted stud design, or by the addition of a nutplate and fastener
  - 10 panels affected with a total of 11 bonded stud redesigns



Bonded Studs



Riveted Stud



Milson Nutplate

MCR 19746 FRCS TPS CARRIER PANEL REDESIGN

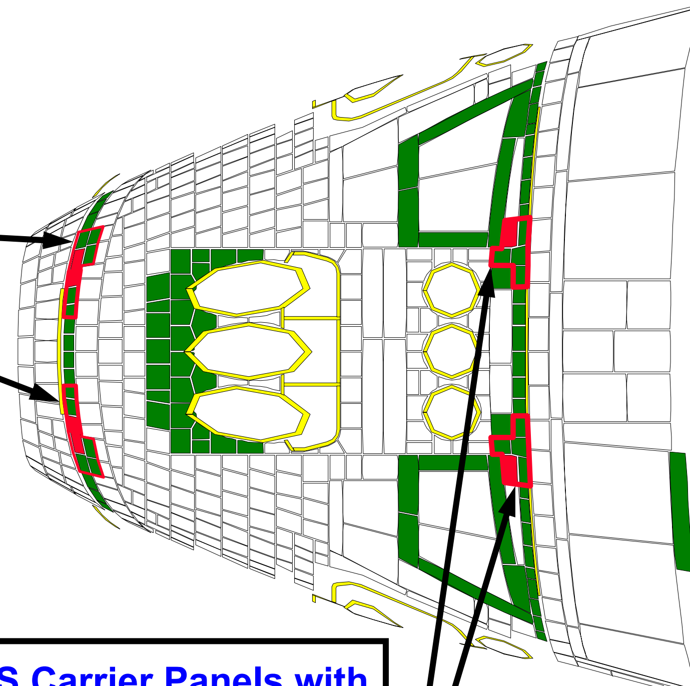
Presentor:

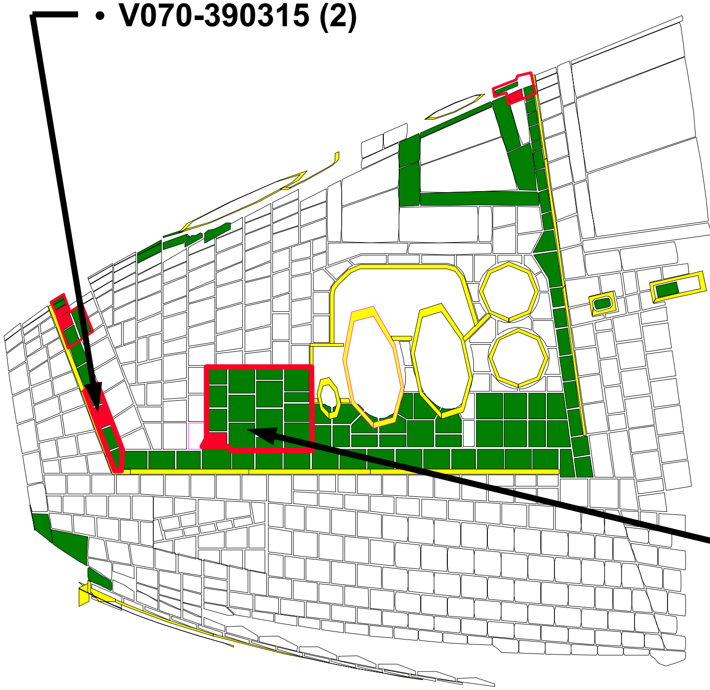
Organization/Date:
Orbiter/6-29-05

FRCS Carrier Panels with Bonded Studs replaced with Riveted Studs

Upper Forward
- **V070-390329 (2)**
- **V070-390317 (2)**

Lower Forward
- **V070-390315 (2)**





FRCS Carrier Panels with Bonded Studs Replaced With Panel Fasteners

Upper Aft
- **V070-390337 (2)**

Lower Mid
- **V070-390452 Door (2)**

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 17177 Forward Attach Arrowhead Tile Redesign

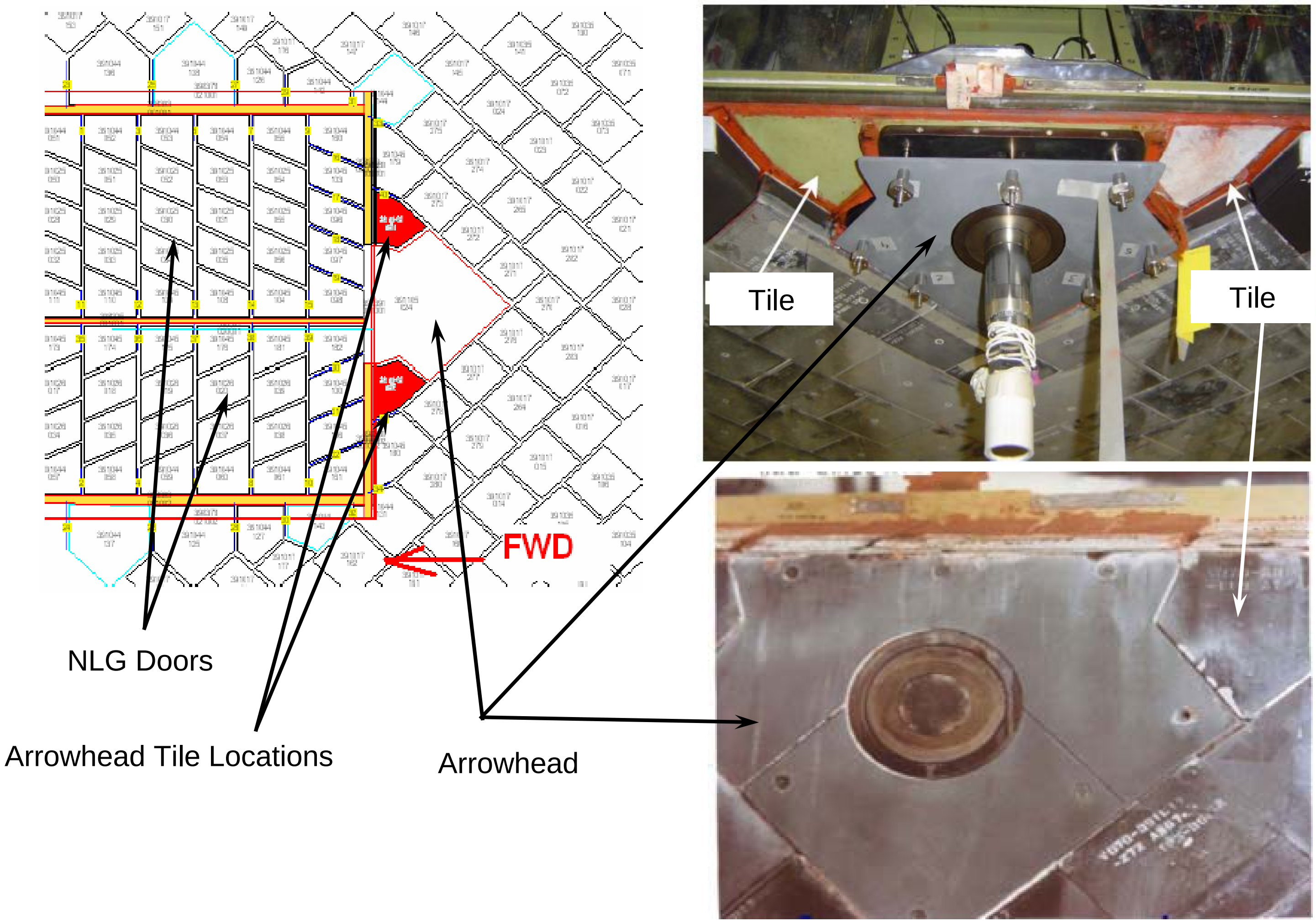
- Design changes to eliminate potential of in-plane cracking of two tiles which interface with both the arrowhead and the NLG door thermal barrier
  - These tiles were found cracked during inspection of OV-103 and OV-104 after tiles had been removed, following removal of the NLG door thermal barrier and gap fillers
    - Cracks found at densification layer of the tile, emanating from a filler bar relief cut in on the arrowhead side of the tile - drawing does not specify relief cuts
    - These two tiles have a dynamic interface to both the NLG door thermal barrier and the ET attach arrowhead, which subjects the tile to pyro shock load at ET separation
      - Pyro shock loading not considered in original certifications
  - Inspection of OV-105 tiles showed they did not have the relief cuts nor cracks (19 flights)

FORWARD ATTACH ARROWHEAD TILE REDESIGN

Presentor:

Organization/Date:
Orbiter/6-29-05

Forward Attach Arrowhead and Tile Orientation Views

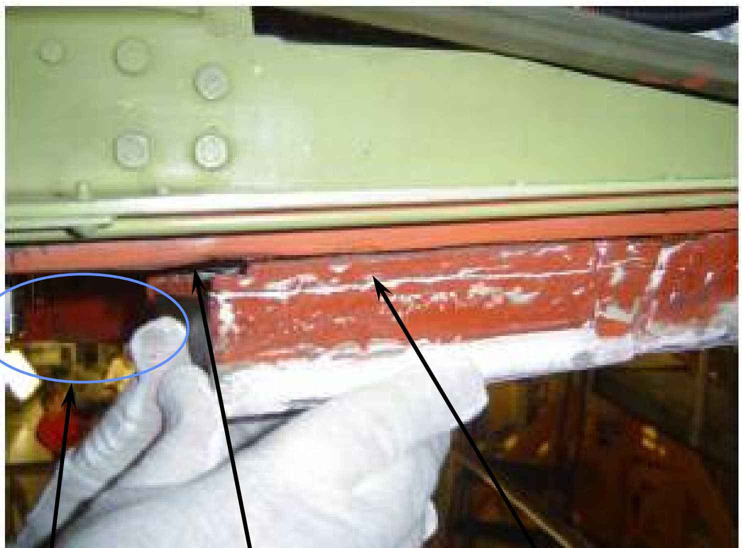


FORWARD ATTACH ARROWHEAD TILE REDESIGN

Presentor:

Organization/Date:
Orbiter/6-29-05

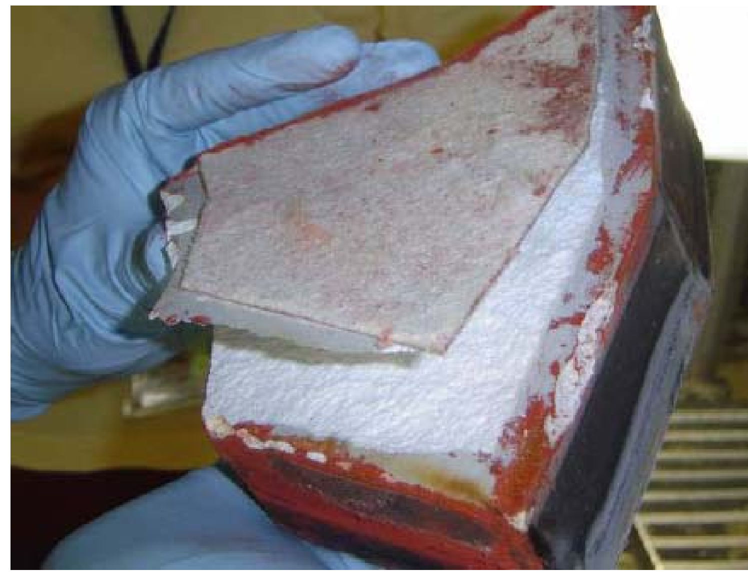
Illustrations of Arrowhead Tiles with Crack Damage



SIP relief Cut In Arrowhead Tile

Crack in Arrowhead Tile – NLG Door Thermal Barrier Interface

Arrowhead Cavity Location



Removed Tile Shown with Separation at the Densification Layer

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 17177 Forward Attach Arrowhead Tile Redesign

- Based on the findings, drawing updates were implemented to clarify requirement of no tile undercut and that SIP footprint should extend to the edge of the tile on the arrowhead side
  - Ensures that tiles are fabricated and installed to the properly installed and successfully flown OV-105 configuration
- Additionally, a 45° tile grain orientation change was implemented to the existing FRCI-12 tile material to increase tile strength thru-the-thickness by approximately 50%
  - Increases resistance to cracking; cracks run with the grain of the tile and will terminate at the bond line instead of running across a tile width
  - Mod provides additional strength margin against the flight pyro shock load
    - Pyro design and testing ensures very repeatable loads from vehicle to vehicle and from flight to flight

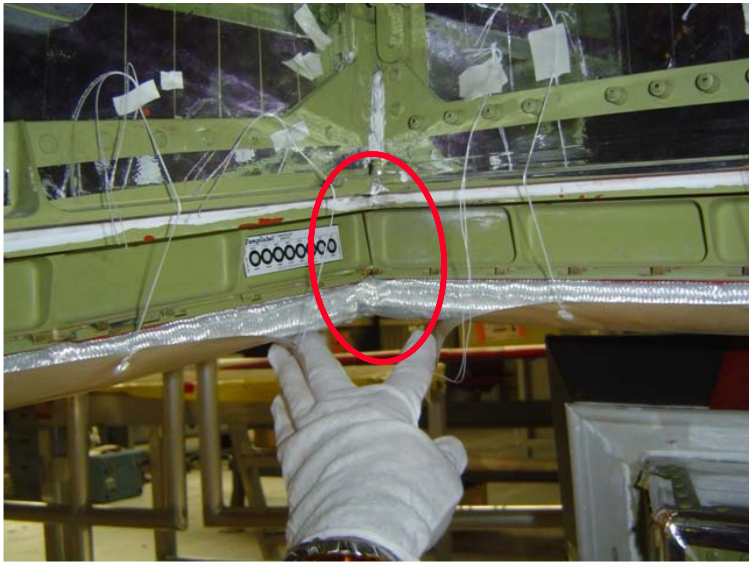
POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 19683 MLGD Corner Tile Void Fill Mod

- Mod adds insulation to fill void area under the forward/outboard and aft/outboard corners of the main landing gear door (MLGD) thermal barrier to eliminate a potential flow path at the barrier-to-barrier interface at these locations



POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 19733 Reconfiguration of RSB TPS Blankets To Facilitate RSB Actuator R&R

- Re-configures the vertical stabilizer blankets to move the interface between two rows of blankets off of the RSB cove access panels to reduce the number of removals required for any future actuator rework or inspection

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Post STS-107 RTF Mods

- **4 Structures Related Modifications**
  - MCR 23293 ET Shell (Salad Bowl) Material Change
  - MCR 17177 Improved Wing Leading Edge Spar Corrosion Protection
  - MCR 23280 Flipper Door No. 1 Plunger Galling Mod
  - MCR 11621 Aft Fuselage Strut Grip Length Correction

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 23293 ET Shell Material Change

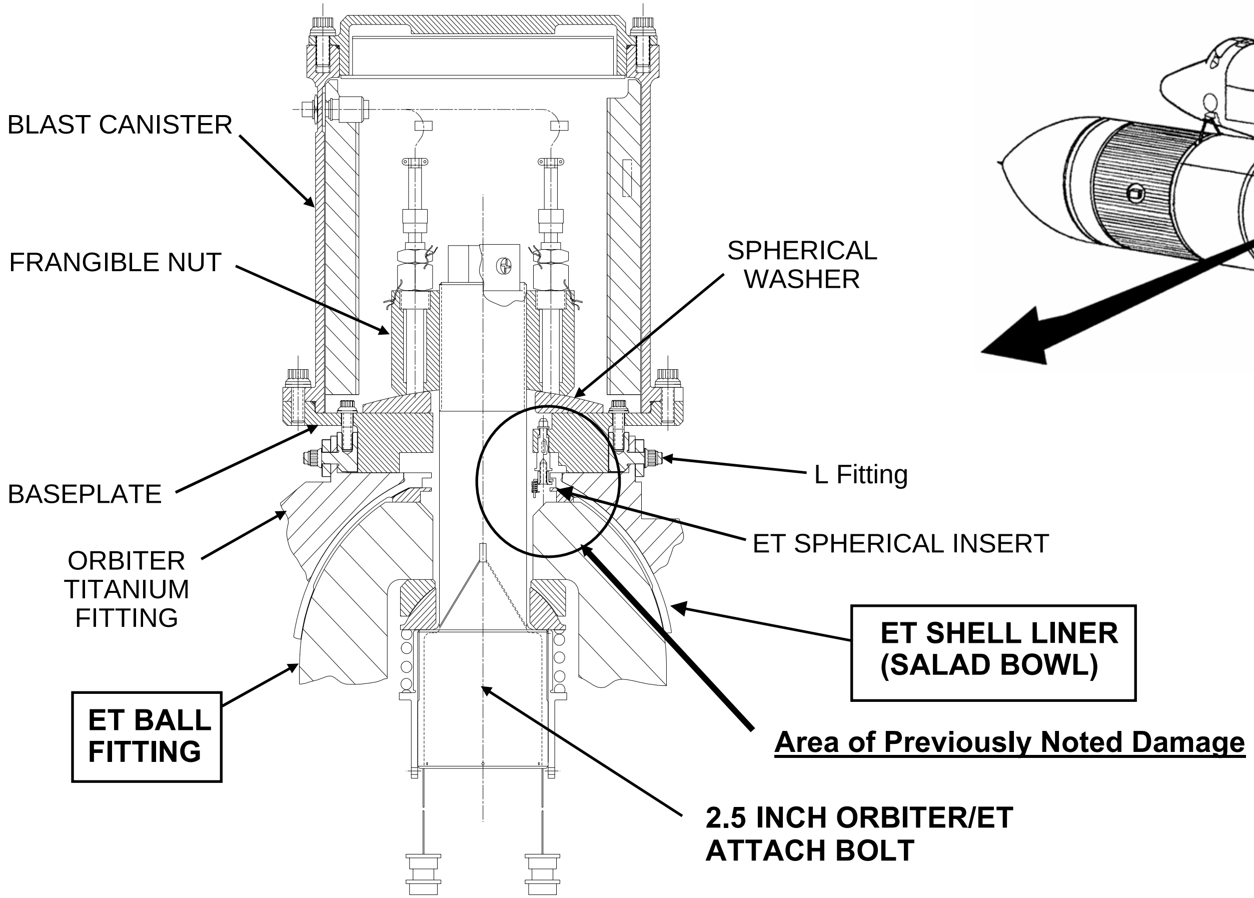
- Purpose of ET shell (salad bowl) assembly and ET spherical insert is to provide rotating surfaces for self alignment with the mating ET monoballs
  - A Kahrlon liner bonded to the aluminum ET Shell provides a consistent coefficient of friction during joint rotation to prevent bending stresses from being transmitted to the separation bolt
  - ET shell material yielding / displacements, caused by ET mate operations, could result in increased joint bending moments in the aft attach bolts and margin concerns at max flight loads
- Modification changes the ET/Orbiter aft attach interface shell material from 6061-T651 alum plate to higher strength 7050-T7451 alum plate to eliminate potential of local material yielding
- New design verified by analysis and validated by 3 simulated orbiter/ET mate demonstration tests
- Plan is to continue with current every flight OMRSD inspection for Kahrlon liner damage
  - Additional post-flight ultrasonic inspections will be implemented for the first three upcoming flights

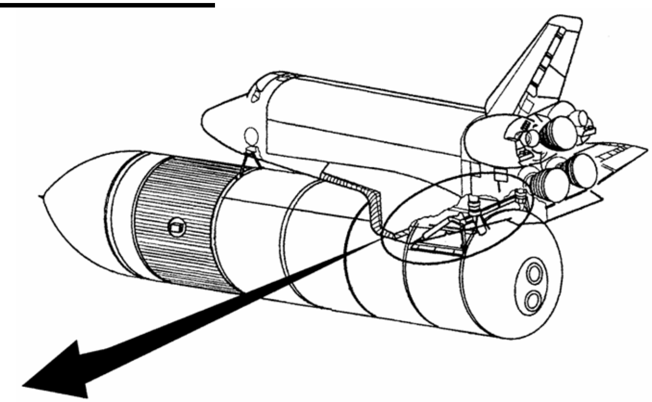
POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Orientation View of the Aft Attach Joint

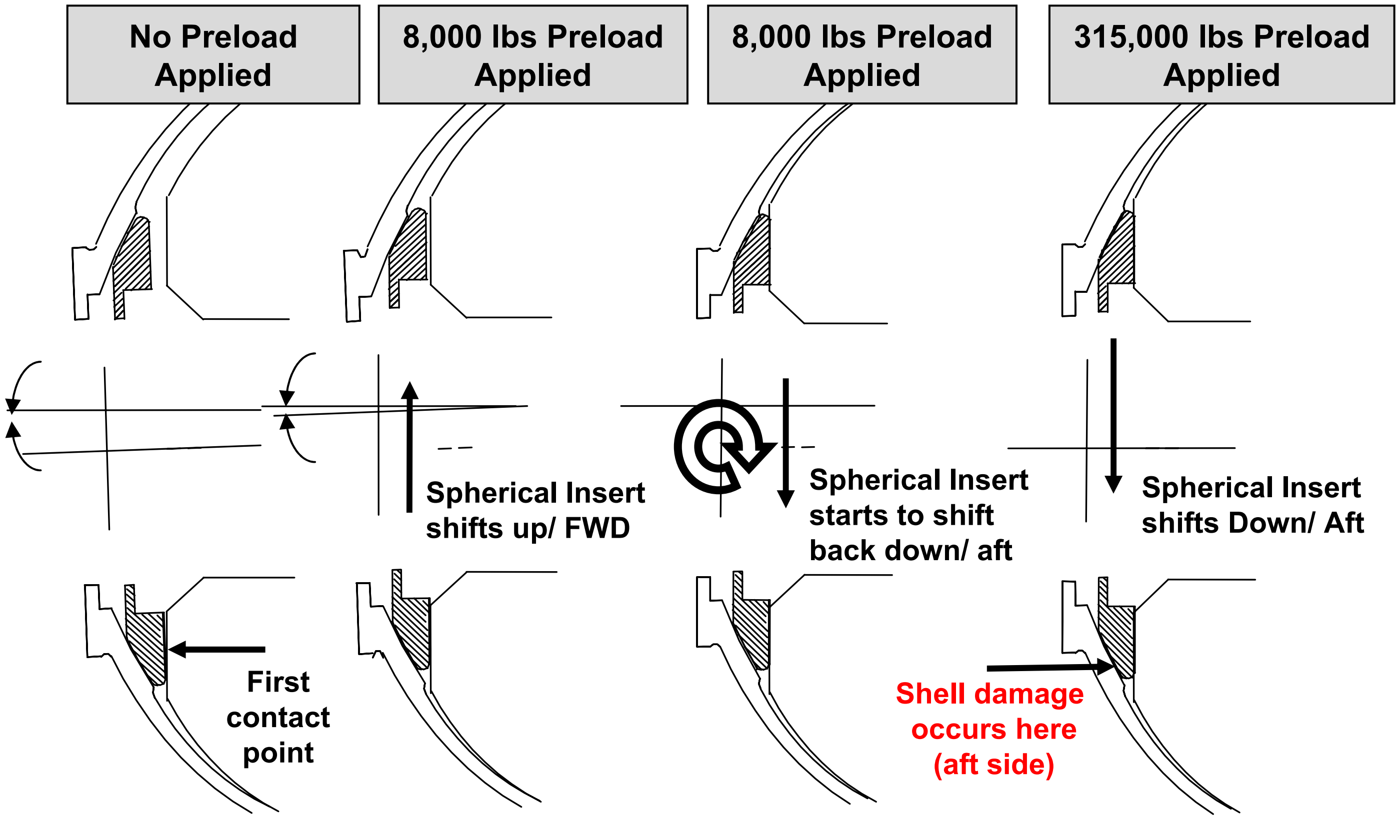




MCR 23293 ET Shell Material Change

Presentor:

Organization/Date: Orbiter/6-29-05



Orbiter approaches ET Ball at 30 +/- 15 minute hang angle

The Orbiter continues to engage the ET ball (at hang angle) until fully seated causing the spherical insert to translate Up/FWD. Then 8,000 lbs of preload is applied

The orbiter is rotated back to zero degrees. Spherical Insert starts to self-align, But gets hung up due to bolt preload

Spherical insert continues to self align as preload is increased. A compression load large enough to yield the shell material occurs before the insert finally self-aligns

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date: Orbiter/6-29-05

MCR 17177 Wing Leading Edge Spar Corrosion Protection

- Corrosion protection system improved to require two coats of koropon and one coat of white polyurethane paint on the acreage of the WLE spar (was one coat of koropon)

MCR 23280 Flipper Door 1 Plunger Galling Resolution

- Mod adds nickel plating to the plunger assembly to eliminate galling and hang-up of flipper door 1 during horizontal to vertical operations which required panel to be repositioned prior to flight
- During implementation of earlier modification (MCR 19555) to correct this problem with a stronger positioning spring, galling was observed on plunger and piston components which are like material

MCR 11621 Aft Fuselage Stabilizer Strut Fastener Grip Length Mod

- Corrected fastener grip lengths for aft fuselage stabilizing strut fasteners (two struts, one fastener each end) noted to have short grip length during inspection of OV-104
- Inspection of OV-103 showed that proper grip length fasteners were installed

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date: Orbiter/6-29-05

Post STS-107 RTF Mods

- 5 ECLSS and Flexhose Related Modifications
  - MCR 11621 Flexhose “Make-From / Make-Work” Changes
  - MCR 17177 ECLSS WMS Flexhose Conversions to Hard Lines
  - MCR 23249 Payload O2 and N2 Flexhose Removal
  - MCR 23282 ECLSS & MPS “Make-From” Flexhose Configurations
  - MCR 23367 Airlock Booster Fan Bypass Duct Mod

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 11621 Flex Hose Make-Work / Make-From Mods

- Redesigns driven by lack of flexhose replacements or the need to correct flexhose bend radius conditions
  - To provide flex hose replacements where spares did not support, make-from configurations utilized flex sections of available flexhoses and configured the hard line end sections to provide the same or similar design as the original configurations
  - Make work changes were implemented on flexhose hard line end sections or on the system hard lines to which the flexhoses are brazed to provide proper flexhose installation bend radius
  - These changes implemented as inspection findings dictated for flexhoses in the crew module ECLSS bay water coolant loops and the fuel cell freon coolant loops

MCR 17177 Conversion of Flexhose to Hardlines

- Redesign driven by flexhose fit issues and/or lack of flexhose spares replacements
  - Design, dynamics and stress analysis determined that hard lines configurations could be used to replace flexhoses in the crew module potable and waste water tank inlet, outlet & GN2 systems
  - Additionally, hardline replacements will provide greater robustness and are not susceptible to problems inherent to flexhoses

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 23249 Payload O2 and N2 Flexhose Removal

- The payload nitrogen and oxygen flex hoses, located in the payload bay at the Xo576 bulkhead, are no longer required for flight
- These lines are also located in an area of high vulnerability to ground processing damage and at zero spares balance
- Mod removes these flexhoses and installs a cap at the bulkhead dynatube connection and installs a new dynatube at the opposite end which was also capped
  - Mission kit tech orders established to manifest and install these flex hoses should they be required in the future

MCR 23282 ECLSS & MPS Make-From Flexhoses

- Establishes two MPS and three ECLSS 'make from' configuration 'double flexhose' assemblies from other flexhose configurations for which spares exist
- Implemented because these locations have spares shortages and are at high risk for need of replacement

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 23367 Airlock Booster Fan Bypass Duct

- Shuttle / ISS programs would like an additional extension day on docked station flights between STS-114 (LF1) and STS-120 (10A) - O2 cryo is the limiting factor
- Airlock Booster Fan Bypass Mod will be implemented for Cryo O2 savings by reducing consumption due to power down of the booster fan
  - Cryo savings will contribute to higher probability of gaining the extra on-orbit day for these missions – assessments indicate potential Cryo savings to 44 lbs maximum, approximately 4.5 hours
    - Cryo savings in addition to other power down options
  - Continued air flow exchange needed between Orbiter and ISS to control CO2 requires a bypass duct to route air around the non-operating fan to maintain minimum air flow
  - Analysis shows CO2 level can be maintained within limits based on the expected air flow exchange rate with bypass duct installed
    - If ppCO2 level approaches limit, powering on booster fan or installing a LiOH canister may be used to maintain ppCO2 level

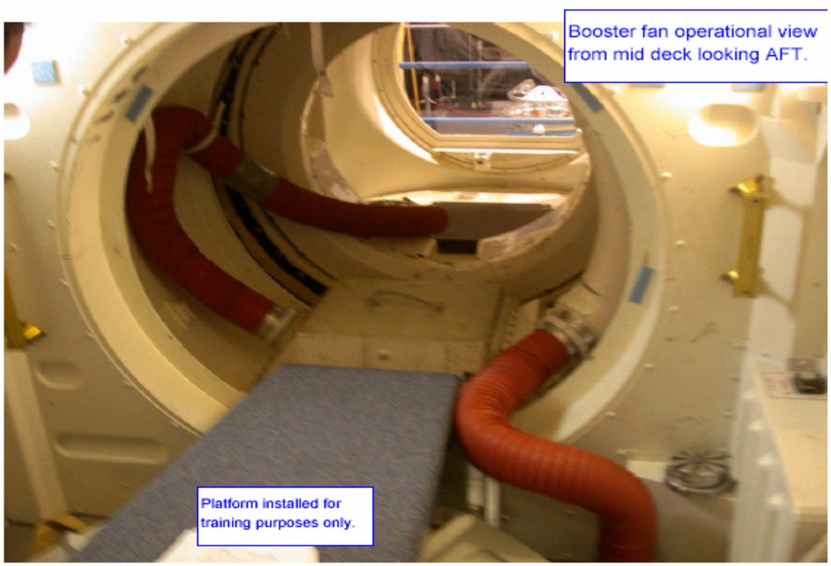
POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

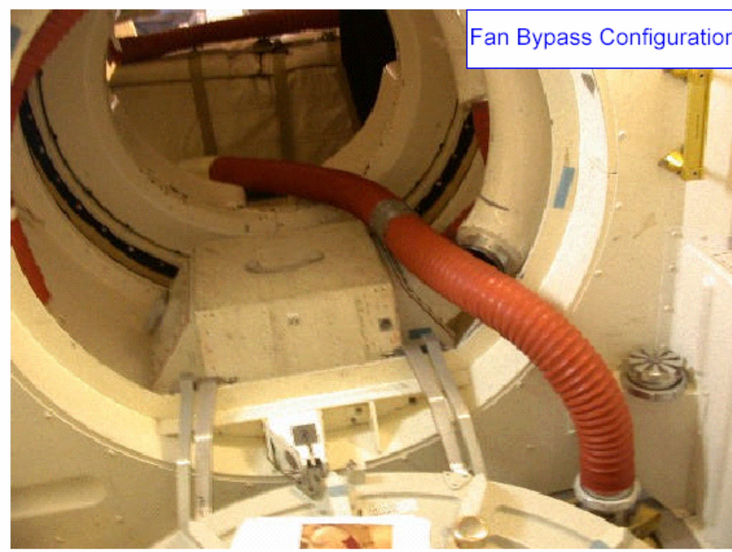
Presentor:

Organization/Date: Orbiter/6-29-05

MCR 23367 Airlock Booster Fan Bypass Duct

- Modification developed with Crew input, provides one new optimized 87” duct configuration which will be used for both the fan operational and fan bypass modes
  - Bypass configuration will be implemented on-orbit by the crew
- Airlock Booster Fan Bypass SDTO will evaluate performance (cryo savings and ability to maintain CO2 level within limits)





POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date: Orbiter/6-29-05

Post STS-107 RTF Mods

- **1 Hydraulics / Water Spray Boiler Related Modification**
  - MCR 23226 Water Spray Boiler 3 PGME Flight Demonstration

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 23226 Water Spray Boiler PGME Flight Demonstration

- Changes WSB 3 active cooling fluid from water to a mixture (47% / 53%) of PGME / water.
  - This will preclude spraybar blockage due to freeze-up following ascent APU shutdown, which could prevent WSB usage for early mission termination
  - Modification is only to the WSB 3 tank load - no vehicle hardware modifications required
- Flight Demonstration planned for STS-114 (and OV-104 STS-121) to validate the effectiveness of the PGME
  - Will confirm ground test results in flight environment and demonstrate coolant usage is consistent with predictions
  - Flight Demonstration Plan:
    - Perform prelaunch / ascent / post insertion per normal procedures
    - Start APU 3 after it has cooled to below hot restart limits (~MET 3.5 to 4 hr) and activate WSB 3
    - Operate APU until lube oil cooling is observed (approx <10 mins)
    - If cooling is not observed, switch WSB controllers from A to B at a lube oil outlet temp of 290 F - if still no cooling, shutdown at 320 F
    - Shutdown WSB and APU

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Post STS-107 RTF Mods

- **3 TCS Related Modifications**
  - MCR 23250 PRSD Tank Set 3 TCS Support to Strut Interference Mod
  - MCR 23353 Mid Fuselage He & GN2 Tank TCS Blanket EMI Mod
  - MCR 23405 Payload Bay MPM Contingency Interference Modification (PLB Door TCS Clips & Wire Harness Support Brackets)

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 23250 PRSD Tank Set 3 TCS Support Mod

- Provides an additional attach point for the tank set 3 TCS blanket support frame to prevent support frame contact and rubbing damage to adjacent boron strut

MCR 23353 Mid Fuselage He & GN2 Tank TCS Blanket Mod

- TCS multi-layer blanket grounding and electrostatic discharge potential for the six MPS helium and two ECLSS nitrogen mid-body tanks resulted in redesign to reduce risk of static buildup and discharge
- Blanket redesign replaced the inner layer Nomex cover with a grounded aluminized cover for these 8 mid body tanks with TCS blanket thermal covers

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 23405 Payload Bay MPM Contingency Interference Modification (PLB Door TCS Clips & Wire Harness Support Brackets)

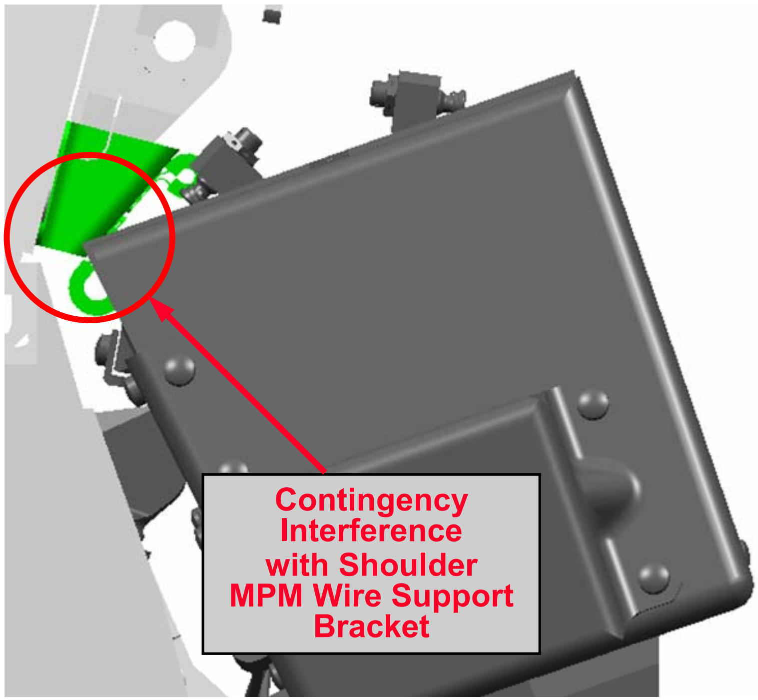
- Design change to eliminate the potential interference of payload bay door (PLBD) PLBD TCS blanket attach clips and harness support brackets during a contingency MPM jettison scenario
- Contingency Scenario
  - MPM system mechanical jam failure in deployed position requiring the OBSS or RMS and upper MPMs to be jettisoned to allow PLBD closure
  - Interference occurs between remaining lower MPMs and the TCS blanket clips and harness support brackets when PLBD's are driven closed
- Wire harness bracket interference is at both the port (OBSS) and starboard (RMS) MPM shoulder locations.
  - Mod installs a new wire support bracket designed to provide clearance to the lower MPM in the contingency scenario – wire harness routing is also revised in this area

MCR 23405 PAYLOAD BAY MPM CONTINGENCY INTERFERENCE MODIFICATION

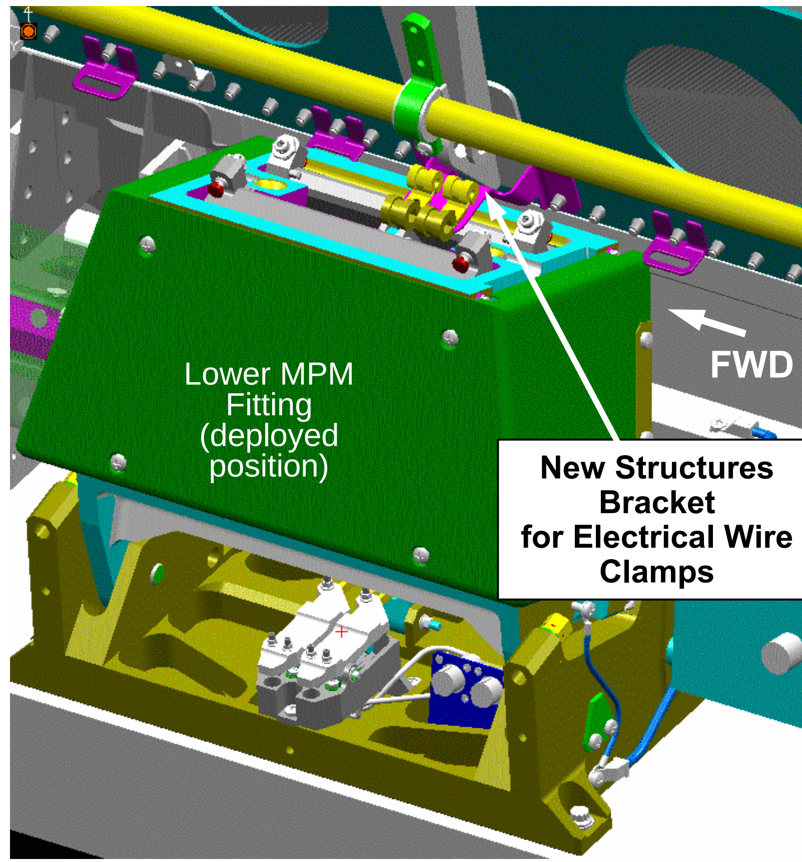
Presentor:

Organization/Date:
Orbiter/6-29-05

Electrical Bracket Modification at Shoulder MPM



Electrical Bracket Interference @ Shoulder MPMs (Xo679.5 LH 7 RH)



Interference Eliminated with Redesigned Bracket

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

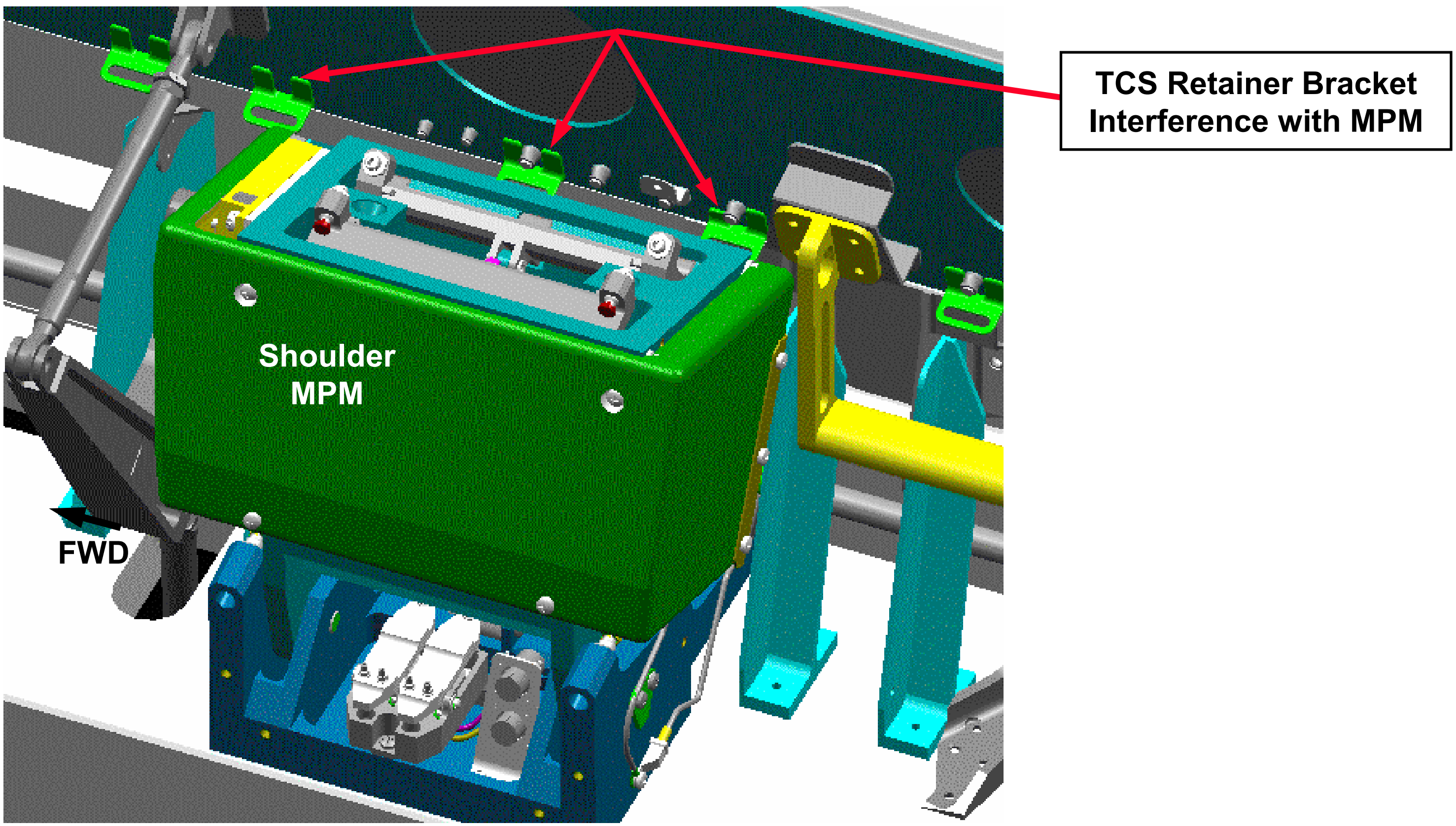
MCR 23405 Payload Bay MPM Contingency Interference Modification (PLB Door TCS Clips & Wire Harness Support Brackets)

- The TCS blanket clips create an interference problem at all MPM locations
  - 4 MPM locations LH (RMS) side -10 clips total
  - 3 MPM locations RH (OBSS) side - 7 clips total
- Mod corrects these interferences by rotating the clips 180º to relocate - total of 13 clips LH side and a total of 9 RH clips
  - 5 additional clip relocations required to accommodate associated TCS blanket redesign
  - An associated 9 TCS blankets are modified to attach to the new clip locations

MCR 23405 PAYLOAD BAY MPM CONTINGENCY INTERFERENCE MODIFICATION

Presentor:	
Organization/Date:	Orbiter/6-29-05

TCS Blanket Clip Modification (Shown at Shoulder MPM Location)

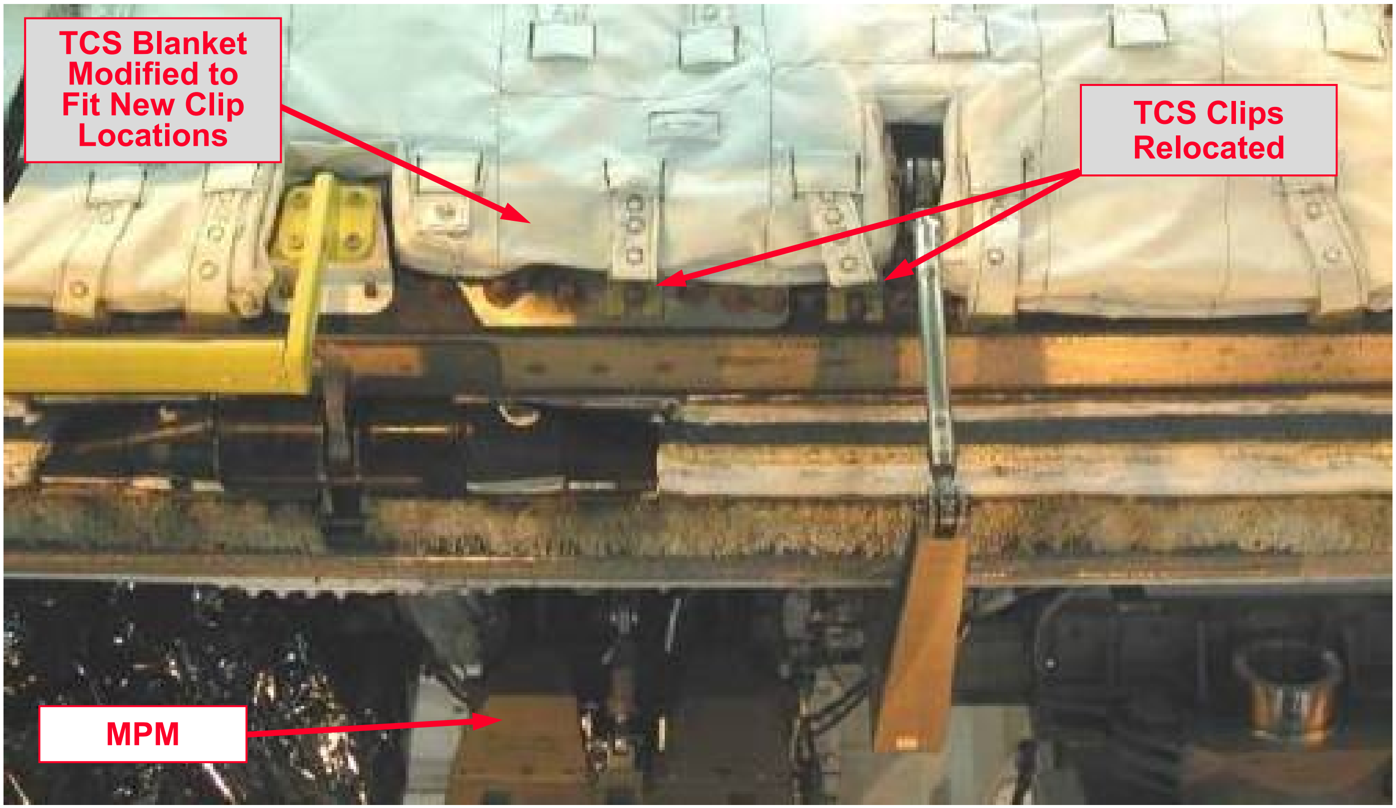


MCR 23405 PAYLOAD BAY MPM CONTINGENCY INTERFERENCE MODIFICATION

Presentor:

Organization/Date: Orbiter/6-29-05

TCS Blanket Clip Modification



- Interference eliminated at all MPM locations by rotating the TCS retainer brackets 180º
- TCS blankets at these locations modified to properly fit to relocated clips

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor: Organization/Date: Orbiter/6-29-05

Post STS-107 RTF Mods

- 10 Crew Systems Related Modifications
  - MCR 19815 Crew Module Wire Harness Restraints
  - MCR 19832 Payload Bay MPM Contingency Hardware Interference Modification (PLB Door Handrails)
  - MCR 19762 TSA Installation Bolts/Fitting Galling Resolution Mod
  - MCR 19697 Waste Management Compartment Port Wall Mod
  - MCR 19759 Emergency Egress Net Mechanism Modification
  - MCR 19762 Crew Optical Alignment Sight (COAS) Stowage Container Modification
  - MCR 19823 Forward & Aft Winch Installation Procedures Update
  - ➢ **MCR 19823 Waste Management Compartment Wet Trash Stowage Bag Installation for Flight**
  - MCR 19786 Port LWTSA Mission Unique Cushion for STS-114
  - MCR 23269 Port LWTSA Tile Repair Kit Accommodations

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 19815 Crew Module Wire Harness Restraints

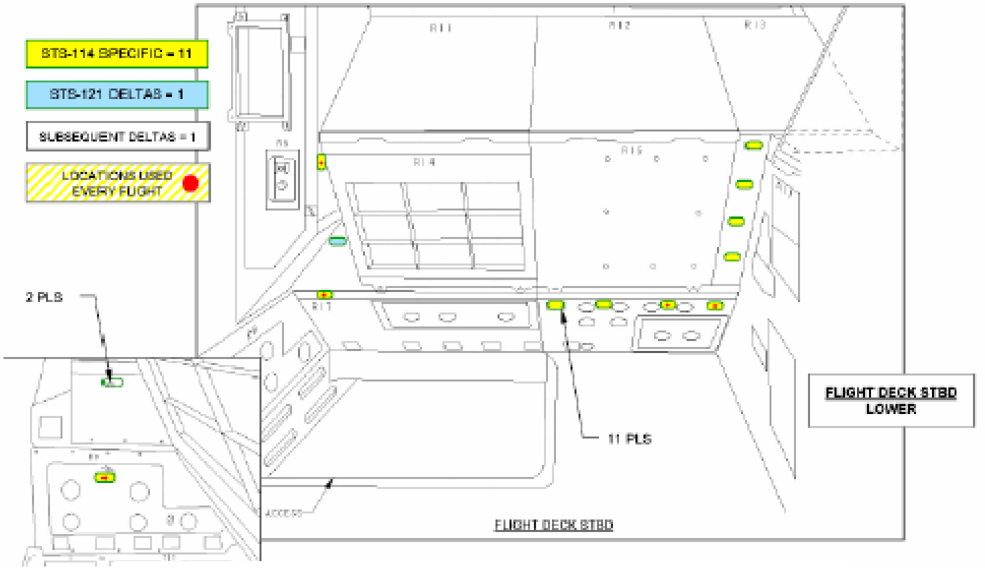
- Modification installs additional cable attachment clips to attach pre-routed GFE cables and cable coils in the crew module
  - Cable pre-routing saves approximately 40 hours of on-orbit setup time
- Due to the continuing increase in cables required for various powered equipment and the insufficient quantity of existing cable clips, general purpose grey tape was being utilized to pre-route cables
  - Evaluation of grey tape in this application determined that it could not be certified for launch, landing and 20G crash loads
- New aluminum clips are cold bonded in place and subjected to a pull test to verify bond integrity
  - Existing design velcro straps, verified to meet load requirements, will continue to be used with the existing and new clips to attach the cables
- 40 of the 100 total new design clips were required to be installed for STS-114 to meet mission specific cable pre-routing needs – all 100 clips were installed this processing flow

MCR 19815 CREW MODULE WIRE HARNESS RESTRAINTS

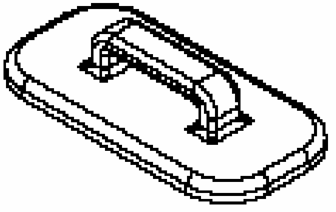
Presentor:

Organization/Date:
Orbiter/6-29-05

Examples Of Grey Tape Used In The Crew Module



Example Crew Module Clip Locations



New Design Clip

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

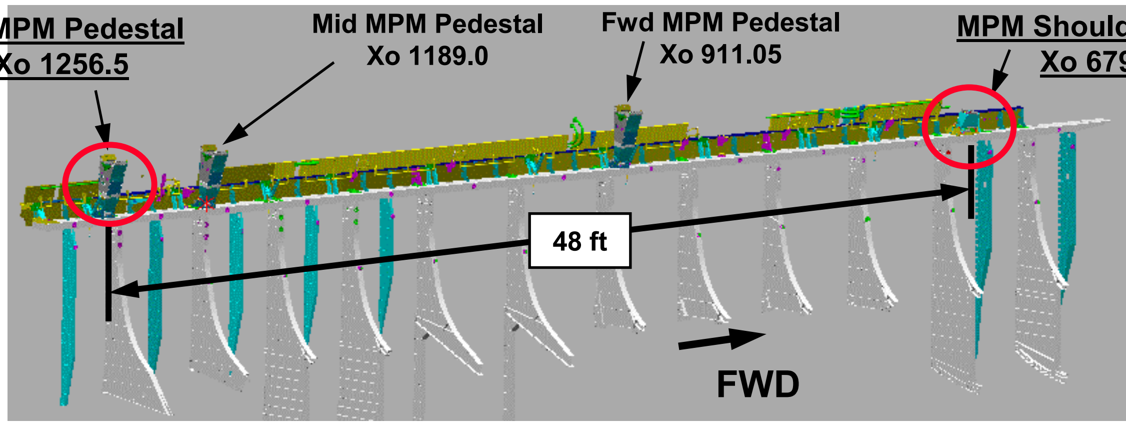
MCR 19832 Payload Bay MPM Contingency Interference Mod (PLB Door Handrails)

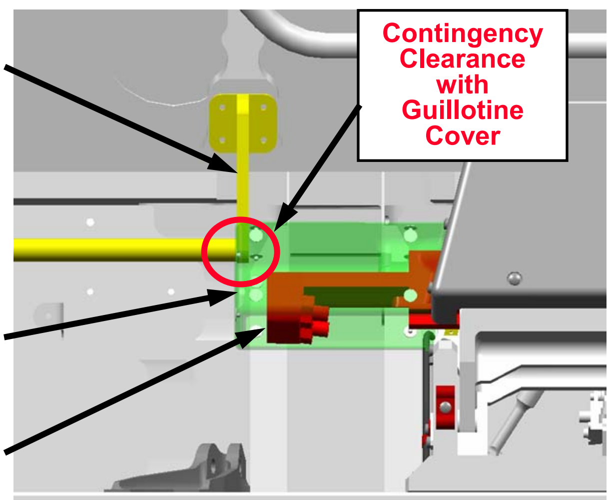
- Design change to eliminate the potential interference of payload bay door (PLBD) EVA handrails and attach fittings during a contingency MPM jettison scenario
- Contingency Scenario
  - MPM system mechanical jam failure in deployed position requiring the OBSS or RMS and upper MPMs to be jettisoned to allow PLBD closure
  - Interference occurs between remaining lower MPMs and the PLBD handrails and attach fittings when PLBD's are driven closed
    - Interference exists at two locations per side – at the shoulder MPM (fwd location at Xo 679.5) and the aft MPM pedestal (location Xo 1256.5)
- Modifications implemented to eliminate interferences
  - Forward shoulder location – redesigns the end fitting of the handrail to clear the MPM
  - Aft pedestal location - removes a short section of the EVA handrail and trims the associated handrail attach fitting on the payload bay door

MCR 19832 PAYLOAD BAY MPM CONTINGENCY INTERFERENCE MOD

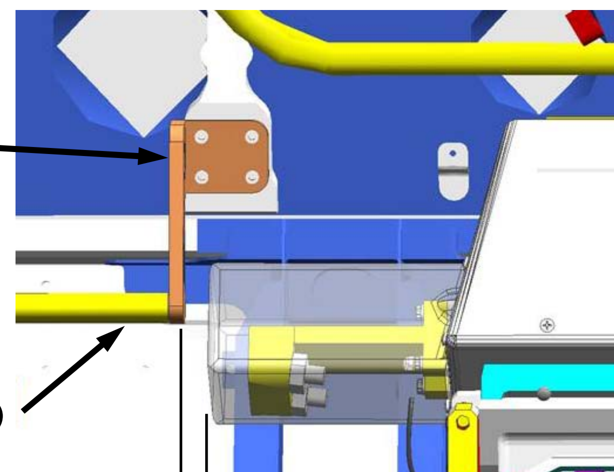
Presentor:

Organization/Date: Orbiter/6-29-05





Prior to Modification @ Shoulder Location
(Xo679.5)

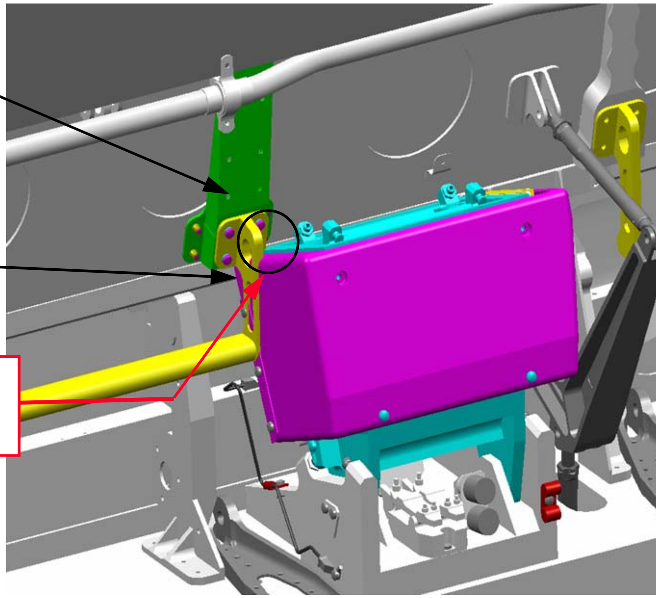


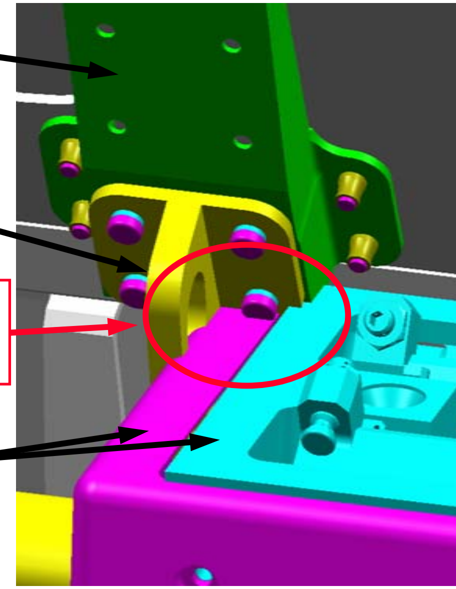
With Modification

MCR 19832 PAYLOAD BAY MPM CONTINGENCY INTERFERENCE MOD

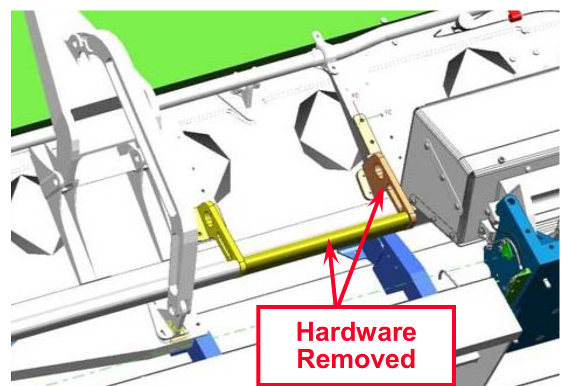
Presentor:

Organization/Date: Orbiter/6-29-05





PLBD Fitting Modified @ Aft Pedestal Location (Xo1256.5)



Handrail & Attach Fitting Removed @ X01256.5

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 19762 TSA Installation Bolts Galling Resolution

- Adds dry film lube to the bolts used to install the TSAs on the ODS truss to eliminate galling problems between the bolts and the threaded TSA attach fittings due to them being made of common material (stainless steel)

MCR 19697 Waste Management Compartment Port Wall Mod

- Modification baselined since OPF Rollout Review
- Modifies the waste management compartment port wall assembly wet and dry wipes dispensers & stowage cavities to use "off the shelf" wet wipe and dry wipe consumables

MCR 19823 Waste Management Compartment Wet Trash Stowage Bag Installation

- First use port wall wet trash bag (elbow bag) now installed prior to flight to save on-orbit crew time for first bag installation

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 19759 Emergency Egress Net Mechanism

- Modification provides a new adjustment mechanism for the emergency egress net with improved design and increased strength/capability to prevent mechanical failures previously encountered on the ground at KSC and once during operation on orbit

MCR 19762 Crew Optical Alignment Sight (COAS) Container Mod

- Modifies the COAS stowage containers by adding a nomex fabric lining to the foam cushions to prevent breakdown of the foam caused by usage wear and tear during installation and removal of COAS components

MCR 19823 Winch Installation Procedures Update

- Updates the aft bulkhead winch installation to be common to the forward bulkhead by tensioning the hook to position it in the housing rope guide

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 19786 Port LWTSA Mission Unique Cushion

- Redesigns the Port TSA cushions to accommodate the Payload Attachment Device (PAD), to be manifested as a contingency EVA tool

MCR 23269 Port LWTSA Tile Repair Kit Accommodations

- New cushions and retention straps in the mission specific area of the of the port LWTSA to support stowage of the Tile Repair Kit (TRK)

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

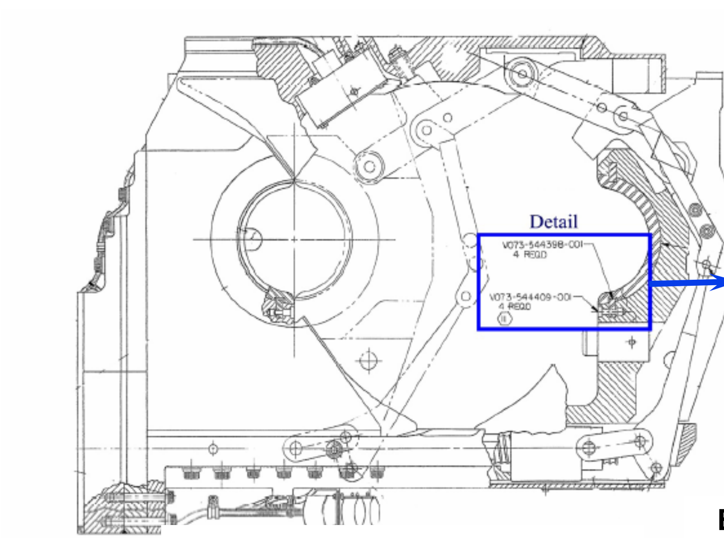
Organization/Date: Orbiter/6-29-05

Post STS-107 RTF Mods

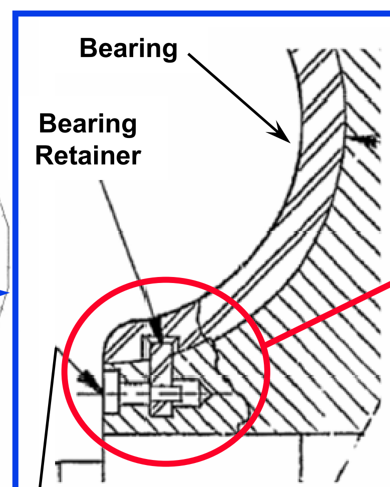
- 1 Mechanical Systems Related Modification

MCR 19785 Mid Weight Keel Latch Bearing Screw Locking Feature

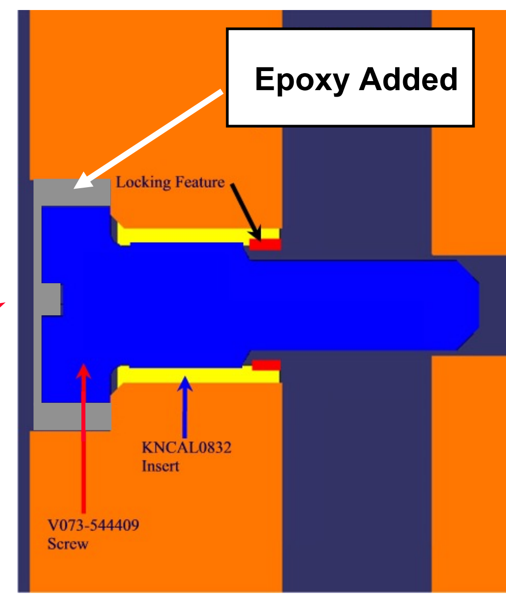
- Adds epoxy to the middle weight keel latch bearing retainer screw head as secondary fastener locking feature
- Threaded portion of retaining screw not of sufficient length to engage insert locking feature



Mid Weight Keel Latch



Bearing Retainer Screw



POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

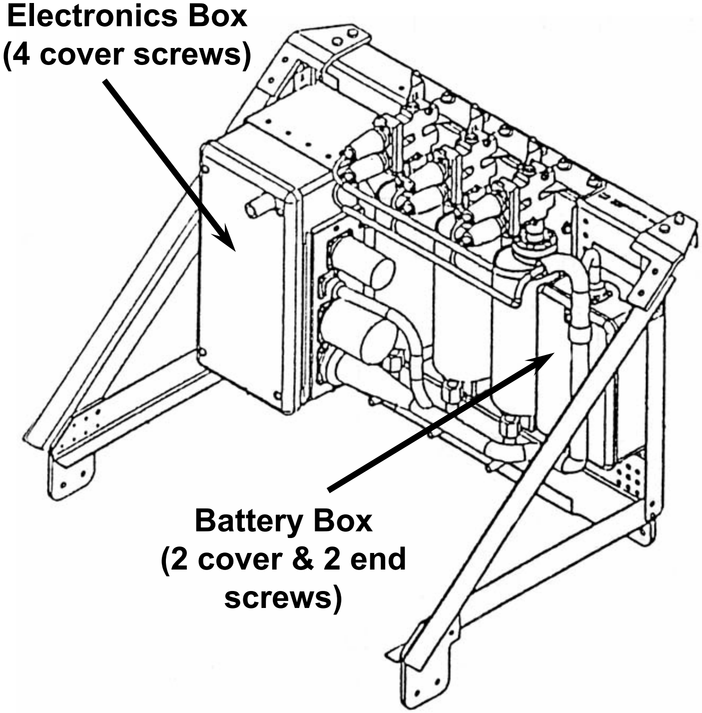
Presentor:

Organization/Date:
Orbiter/6-29-05

Post STS-107 RTF Mods

- 1 Purge, Vent & Drain Related Modification
  - ➢ **MCR 17177 Fastener change to the GFE Orbiter Aft Fuselage Gas Sampler System (OAFGSS)**
    - **Modification baselined since OPF Rollout Review**

- Changes the electronics box fasteners (4 cover screws) and battery box (2 cover screws & 2 end screws) from screws using Vibratite as a locking feature to fasteners with self-locking features
- GFE box part number changes drove update to Orbiter OAFGSS installation drawing dash numbers



POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:
Organization/Date: Orbiter/6-29-05

Post STS-107 RTF Mods

- 6 Avionics Related Modifications
  - MCR 23140 T-0 Pyro Command Redundancy
  - MCR 23354 Fuel Cell Flowmeter Fuse Changeout Mod
  - MCR 23287 Single String GPS Preamp Upgrade
  - MCR 23290 A7/R14 Panel Nomenclature Change
  - MCR 23246 IMU Slip Ring Modification
  - ➢ **MCR 23227 Connector Saver Redesign**
    - Modification baselined since OPF Rollout Review

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 23140 Pyro Command Redundancy

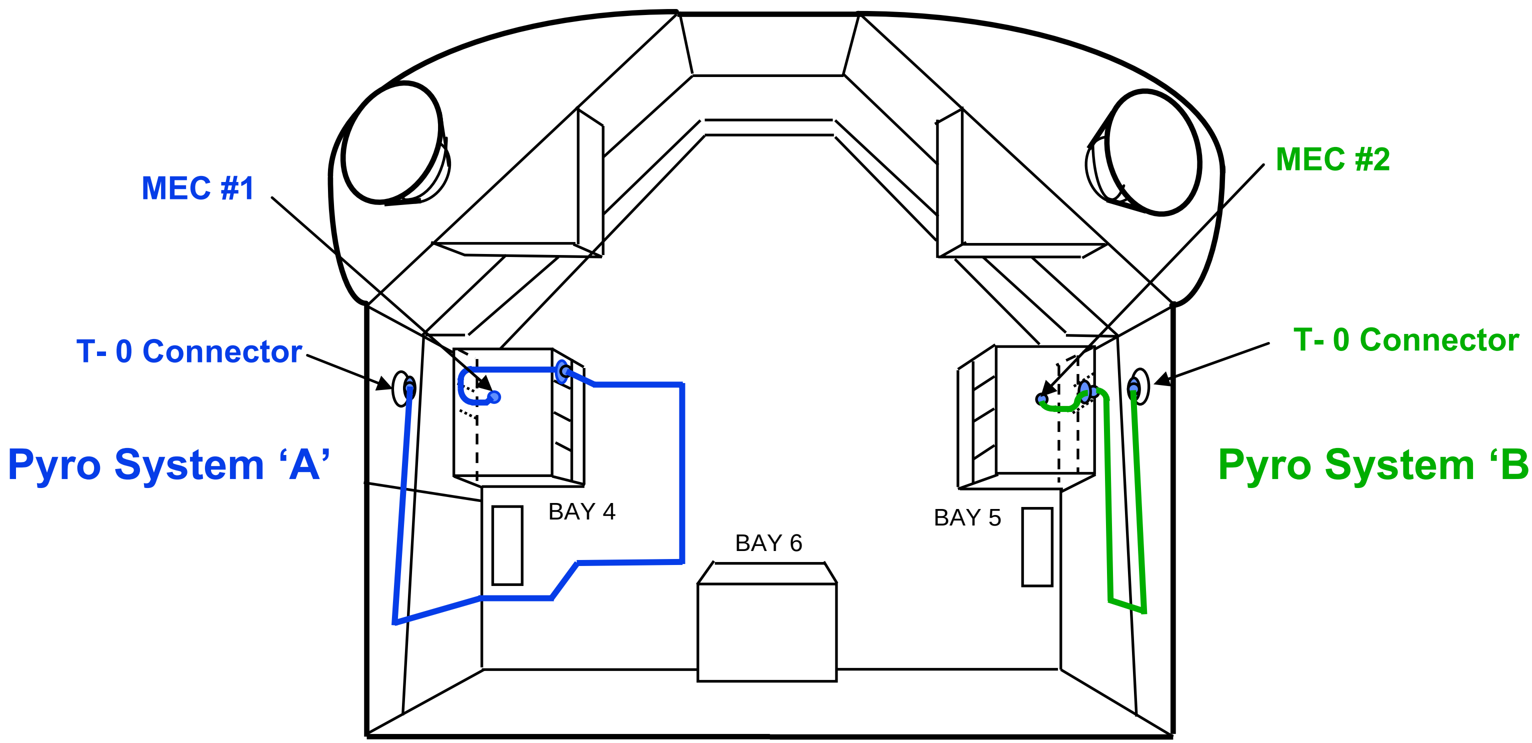
- During STS-112 the SRB Hold Down Post (HDP) and ET Vent Arm System (ETVAS) System ‘A’ pyrotechnics did not detonate due to the lack of receipt of a Fire command
  - The fully redundant System ‘B’ operated nominally
- A formal investigation team identified an open circuit in the Fire command path at the LH_2 T-0 umbilical as the most probable cause of the anomaly
  - Corrective actions addressed the most likely cause of the anomaly at the T-0 interface
- Further action was pursued to investigate introduction of additional command redundancy through *each* T-0
- To provide additional redundancy for these functions, the Orbiter Pyro Command Redundancy modification provides redundant copper paths through both T-0 umbilical interfaces
- The ground will comparably institute full copper path redundancy from the T-0 interface into the PIC Rack

MCR 23140 PYRO COMMAND REDUNDANCY

Presentor:

Organization/Date:
Orbiter/6-29-05

MEC 1 and 2 to T-0 Wire Runs



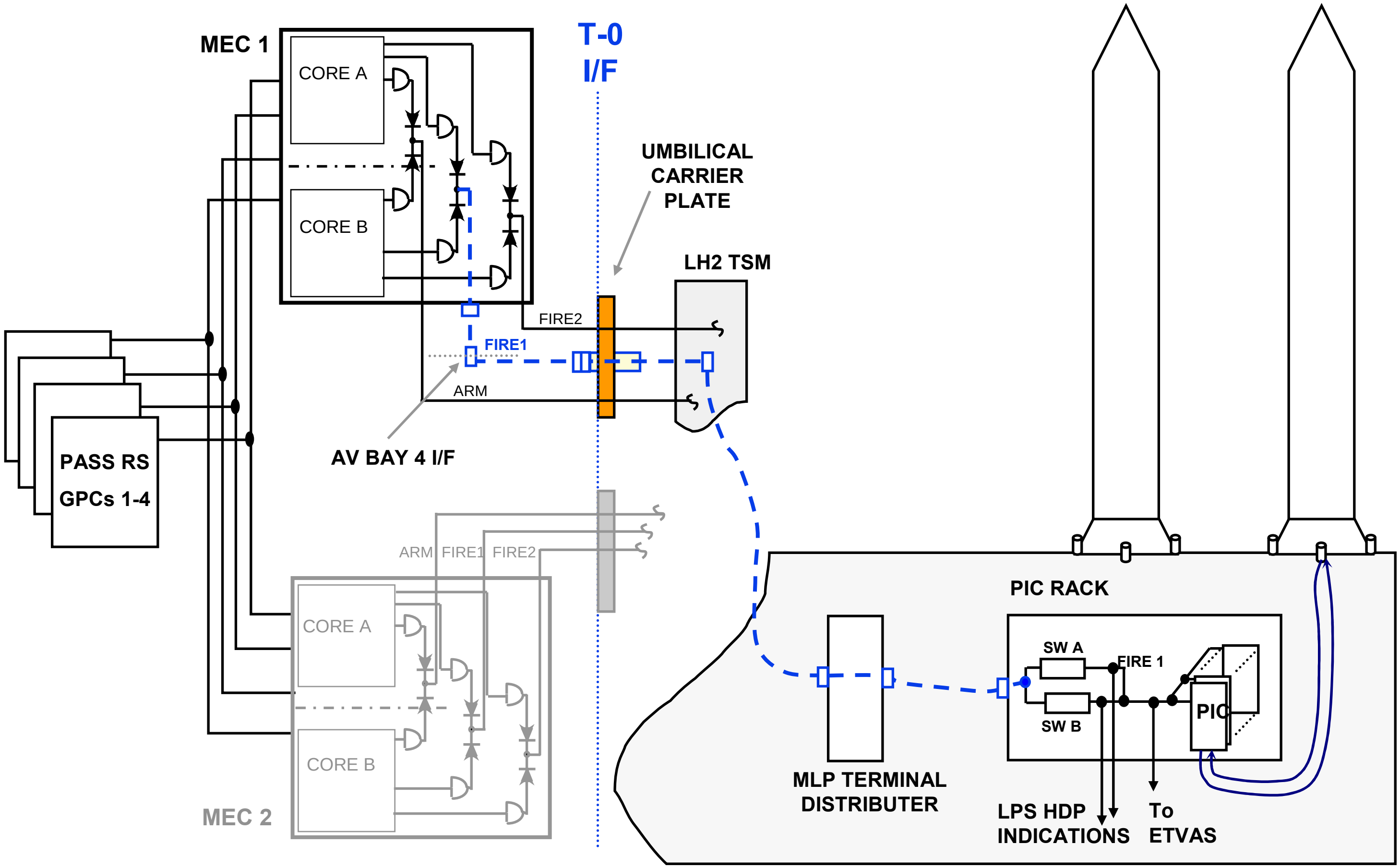
AFT FUSELAGE
VIEW LOOKING FORWARD

MCR 23140 PYRO COMMAND REDUNDANCY

Presentor:

Organization/Date:
Orbiter/6-29-05

HDP Pyro Command Path(s)



114fpbu.ppt 6/28/05 11:27 am

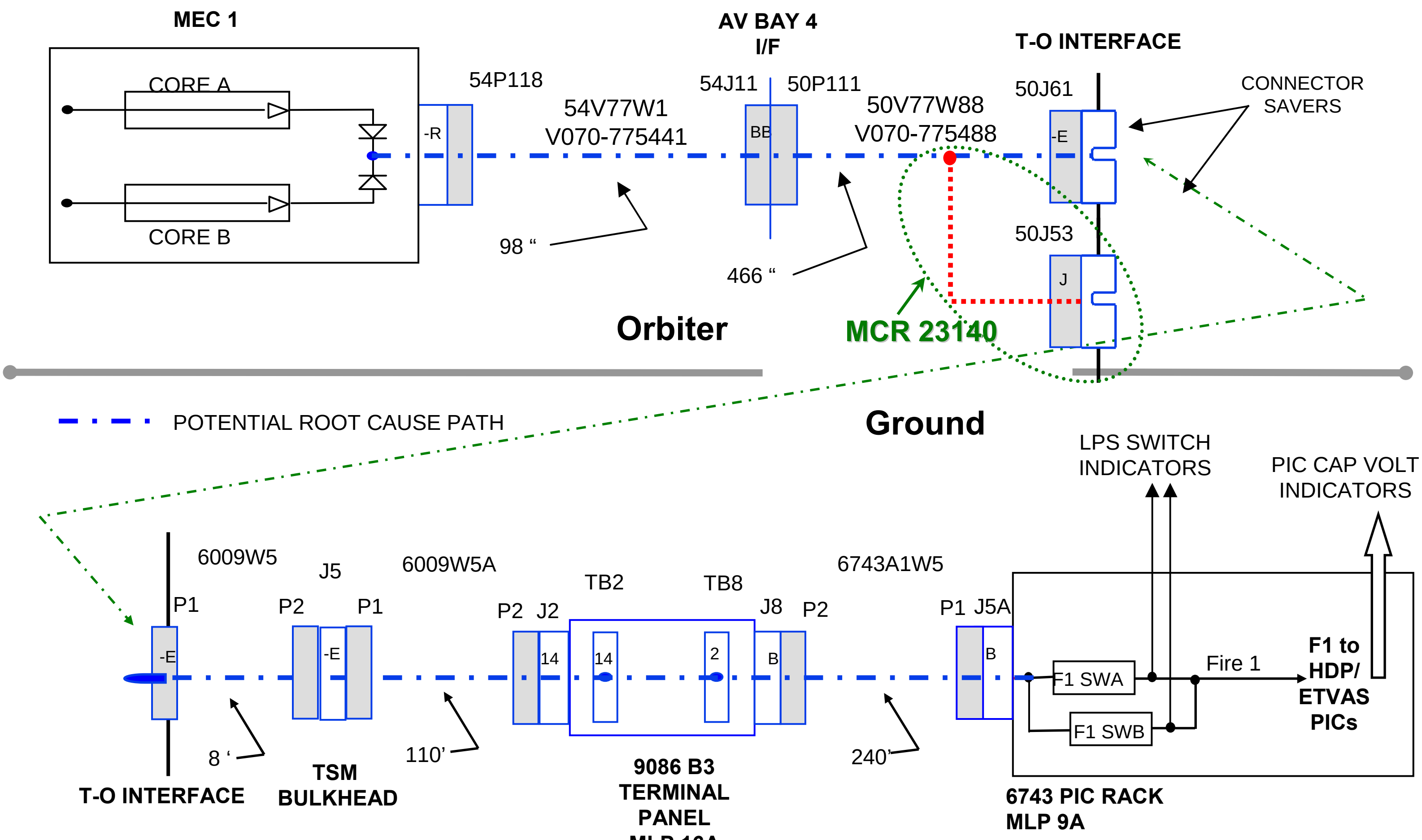
MCR 23140 PYRO COMMAND REDUNDANCY

Presentor:

Organization/Date:
Orbiter/6-29-05

System 'A' HDP / ETVAS Fire 1 Command Path

(Return not shown)

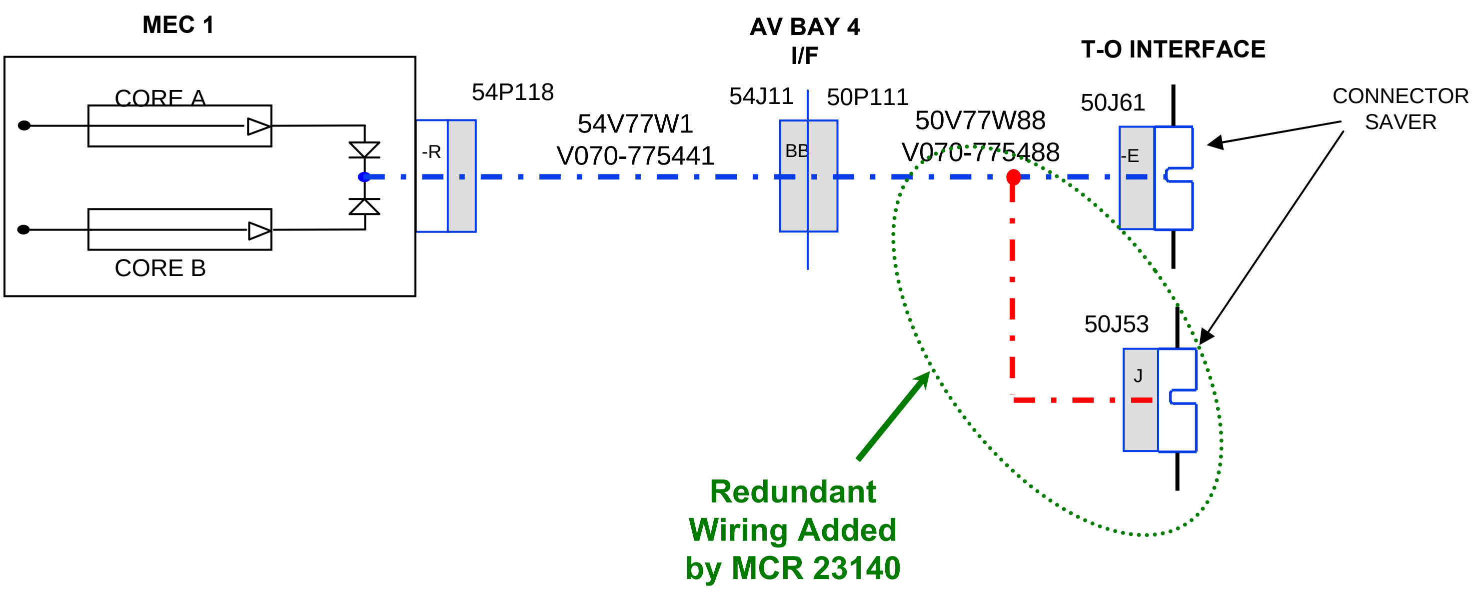


MCR 23140 PYRO COMMAND REDUNDANCY

Presentor:

Organization/Date:
Orbiter/6-29-05

Typical Orbiter HDP / ETVAS Command Redundancy Implementation



POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 23354 Fuel Cell Flowmeter Fuse Changeout Mod

- The fuel cell flowmeter is used to monitor flow of O2 and H2 reactants during operation of the orbiter fuel cell
  - It has been shown that a condition exists where the fuel cell flow meter printed wiring board (PWB) circuitry fails and results in the loss of function - some failures have shown evidence of charring on the circuit card
    - A potential ignition or combustion concern existed with the PWB epoxy/fiberglass composite material within the flow meter housing should an O2 or H2 leak into the housing exist at the same time
      - No such concurrent failure has ever been detected
- Mod changed the MPCA fuse amperage from 3 amp to 1 amp to reduce the risk and potential resulting hazard of overheated electrical components on the fuel cell flow meter circuit board
- Additionally, subsequent testing performed at WSTF indicated that ignition of the PWB material is not a credible failure mode

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date: Orbiter/6-29-05

MCR 23287 Single String GPS Pre-Amp Upgrade

- Replaces the 'Single-String' GPS DTO preamplifier and GPS DTO combiner previously installed on all orbiters with the operational 'Three-String' GPS preamplifier and combiner
- Required in order to support upcoming single-string GPS operational ramp-up flights and subsequent operational single-string GPS flights
  - DTO GPS preamplifier and combiner were only certified for flight tests

MCR 23290 Panel A7 / R14 Nomenclature Change

- Change baselines updates and clarifications to D&C panels A7 and R14 camera related switch and circuit breaker decals nomenclature
- Institutes commonality across the fleet as crew preference decals vehicle to vehicle were inconsistent or obsolete

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 23246 IMU Slip Ring Modification

- Failure investigation of an STS-108 IMU-2 anomaly indicated a generic problem with the installation of the IMU slip ring/brush block assembly
  - Unintended misalignment of the slip ring/brush block assembly caused wiring fatigue failures
- Modification implements design changes and measurements to eliminate this problem
  - Design certification simulated 20,000 hours of operation, equivalent to remaining design life of each IMU
- Modification hardware delivery schedule supported delivery of one unit to OV-103 for STS-114 (slot 2)
- Alleviates MOD flight rule concern of a MDF in the event of an IMU failure due to a generic concern

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:
Organization/Date: Orbiter/6-29-05

MCR 23227 Connector Saver Redesign

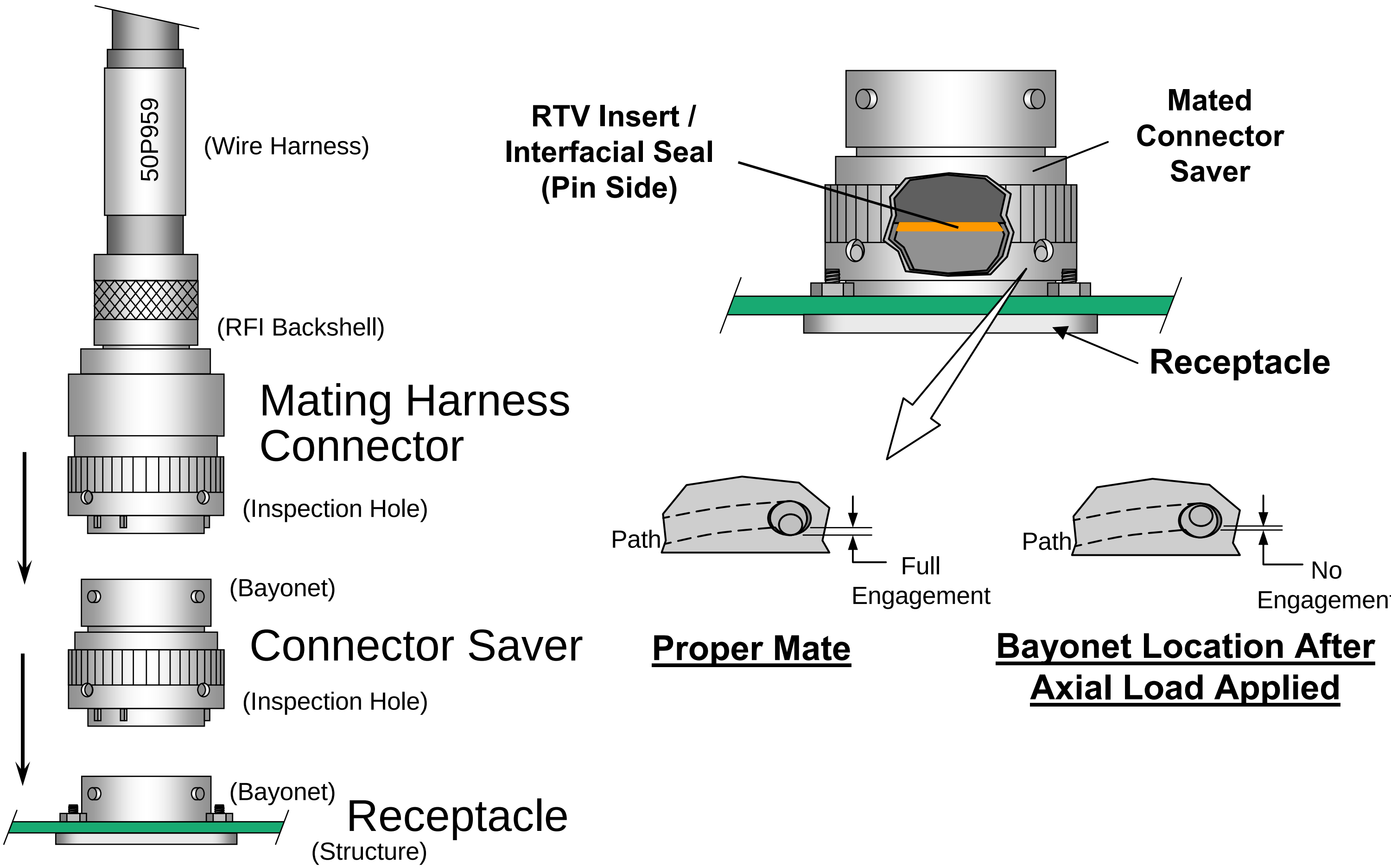
- Modification approved since OPF Rollout Review
- During implementation of connector savers as part of the previous Monoball Production Break Mod, it was found that the locking feature of the connector savers could become disengaged during the harness connector mate process after applying an axial load to the connector saver
- Investigations showed connector saver manufacturing discrepancies
  - Insufficient wavy washer spring force to react against the harness mating force and to keep the bayonet pins in the coupling ring locking detent
  - Incorrect RTV insert cross section at the pin locations could allow the insert shoulders to wedge into the mating harness receptacle sockets and prevent the bayonets from reseating into the detent area
- Necessitated interim corrective actions on existing hardware to ensure proper harness mates
  - Connector savers were either removed, or inspected for proper bayonet engagement and then safety wired or taped

MCR 23227 CONNECTOR SAVER REDESIGN

Presentor:

Organization/Date:
Orbiter/6-29-05

Monoball Harness Connector Saver Overview

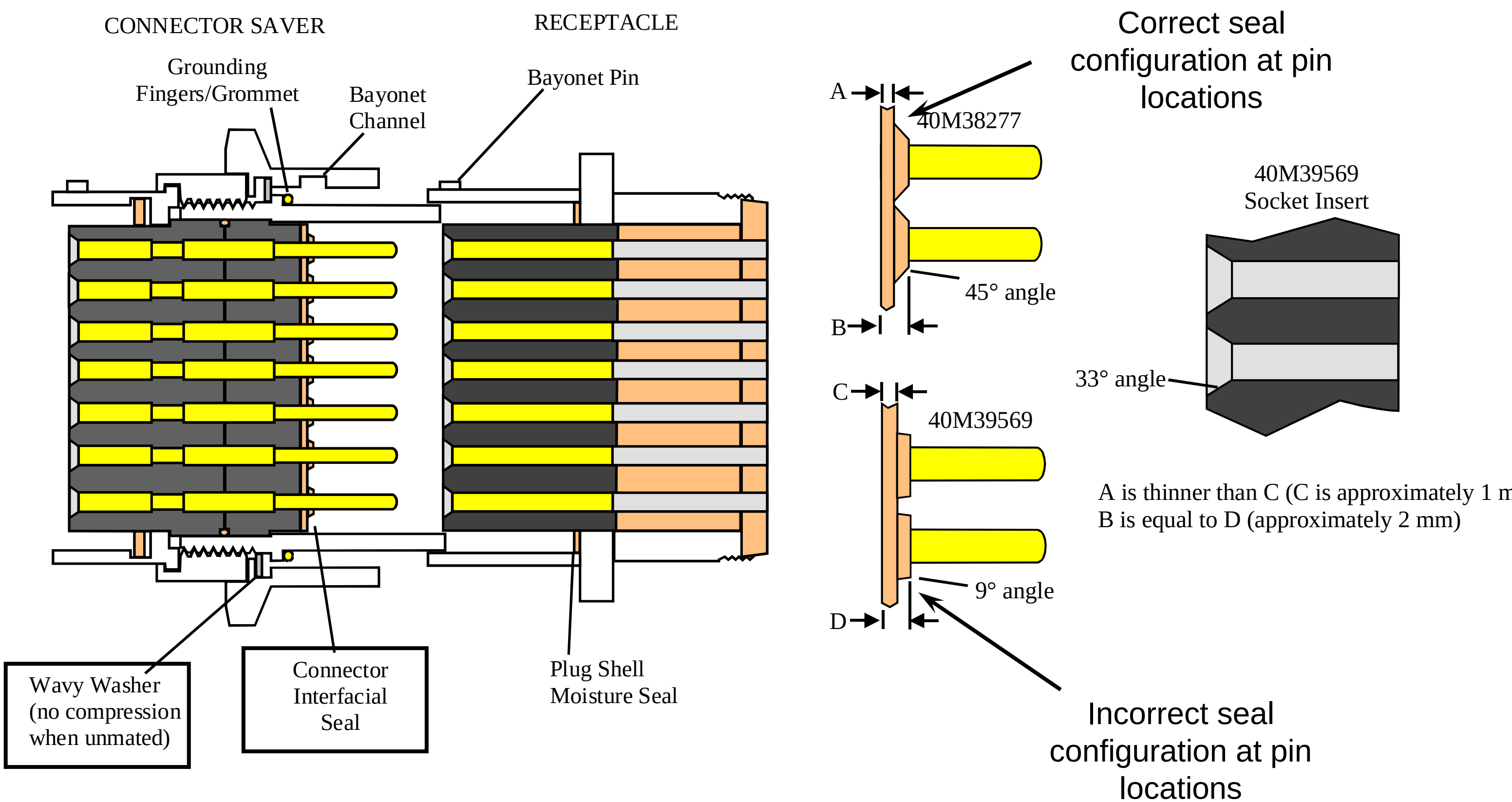


MCR 23227 CONNECTOR SAVER REDESIGN

Presentor:

Organization/Date:
Orbiter/6-29-05

Monoball Harness Connector Saver Detail



A is thinner than C (C is approximately 1 mm)
B is equal to D (approximately 2 mm)

POST STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 23227 Connector Saver Redesign (cont)

- Corrective actions implemented at the vendor to ensure the correct interfacial seal and wavy washer with proper spring force are installed
  - As well, safety wire provisions were added
- Modification was planned to be implemented during the next flow of OV-103, however, replacement of 3 T-0 Umbilical connector savers was required late in this flow and no spares of the current type were available
  - New design connector savers were installed at these three locations

CONFIGURATION CHANGES AND CERTIFICATION STATUS

Presentor:

Organization/Date:
Orbiter/6-29-05

OV-103 STS-114 Post STS-107 Modifications and Certification

MCR Number	Title / Description	Cert Req / CAR No. Cert Methodology (T)est (A)nalysis (S)imilarity	CR/CAR Status Submittal Date Approval Date Projected/Need(P) Actual(A)	Cert Status / Notes / Remarks
11621	**Flexhose "Make-From" / "Make-Work" Changes** Certification of flex hose "make-from" / "make-work" redesigns to accommodate flex hose replacements where spares did not support and to meet bend radius criteria. Changes implemented by EOTF as inspection findings dictated for flexhoses in the crew module ECLSS bay water coolant loops and for the fuel cell freon coolant loops *Post STS-107 Significant First Flight Change*	08-22-613890-001J Cert Method: A,S	Submittal: 01/19/05(A) Approval: 04/27/05(A)	ECLSS PR-EOTF's. (Ref. ECL-3-31-1664, 1665, 1667, 1681) Official approval received
11621	**Aft Fus Stabilizer Strut Fastener Grip Length Correction** Aft fuselage stabilizing strut fasteners (two struts, one fastener each end) noted to have short grip length during inspection of OV-104 – drawing grip length found to be incorrect. Inspection of OV-103 showed that proper grip length fasteners installed. Drawing has been corrected – verification mod only.	167-03-350013-001K Cert Method: S	Submittal: 12/08/04(A) Approval: 04/11/05(A)	
17177	**Fastener Change to the GFE Orbiter Aft Fuselage Gas Sampler System (OAFGSS)** Changes the OAFGSS electronics box fasteners (4 cover screws) and battery box (2 cover screws & 2 end screws) from screws using Vibratite as a locking feature to fasteners with self-locking feature. GFE box part number changes drove update to Orbiter OAFGSS installation drawing dash numbers	No Certification Impact	Not Applicable	
17177 23360	**Fwd Attach Arrowhead Tile Redesign** Design changes to eliminate potential of in-plane cracking of two tiles which interface with both the arrowhead and the NLG door thermal barrier. Implements 45° grain orientation change to the existing FRCI-12 tile material to increase tile strength and margin of safety. Additional drawing clarifications implemented to eliminate the potential of tile undercut and ensure proper SIP footprint area (similar to as-flown OV-105 configuration). These tiles were found cracked during inspection of the area on OV-103 and OV-104. **Note: Mod engineering released under MCR 17177 - Certification activity being worked under MCR 23360.**	31-07-391001-001Z Cert Method: T, A, S 31A-07-391001-001Z Cert Method: A 31A-07-391001-001Z (Errata) Cert Method: A 32-07-391001-001Z Cert Method: A	Submittal: 03/10/05(A) Approval: 06/27/05(P) Submittal: 04/01/05(A) Approval: 06/27/05(P) Submittal: 06/15/05(A) Approval: 06/27/05(P) Submittal: 06/17/05(A) Approval: 06/27/05(P)	Testing on FRCI-12 cross-grain material to determine material allowables will be utilized in stress and thermal analysis. Similarity is to flown OV-105 configuration. CAR also includes NLG Door TPS Deflection data specified by same CAR# on Attrition Matrix under OPS. Submits additional Stress Analysis Reports for NLG and Cross Grain Tiles (MCR 23360). (Ref: EAR# SJDOD-05-009, rev 1 and SJBOD-05-008, rev 1.) Errata to remove one sentence from attached EAR per NASA SSE request. New CAR required to submit additional EAR (Thermal Analysis).

CONFIGURATION CHANGES AND CERTIFICATION STATUS

Presentor:

Organization/Date:
Orbiter/6-29-05

OV-103 STS-114 Post STS-107 Modifications and Certification

MCR Number	Title / Description	Cert Req / CAR No. Cert Methodology (T)est (A)nalysis (S)imilarity	CR/CAR Status Submittal Date Approval Date Projected/Need(P) Actual(A)	Cert Status / Notes / Remarks
17177	**ECLSS WMS Conversion of Flexhose Installations to Hard Lines** Certification of hard line configurations which replaced flexhose configurations for the crew module potable and waste water tank inlet, outlet & GN2 systems due to flexhose issues and lack of spares replacements. Additionally, hardline replacement will provide greater robustness and are not susceptible to problems inherent to flexhoses. Changes have been implemented by EOTF. *Post STS-107 Significant First Flight Change*	02-23-623200-001D Cert Method: S	Submittal: 01/14/05(A) Approval: 06/16/05(A)	Establishes new -053 configuration. (Ref. WWM-3-31-031, ECL-3-31-616.)
17177	**Main Landing Gear Door Tile Rework** Revised TPS MLO spec to correct current TPS allowable gaps between the MLG door and adjoining structure tiles. Change a result of findings that surfaced during the redesigned MLG door thermal barrier MCR activity. Tile shaves implemented by PR, as required, based on new spec allowable gap dimensions around door perimeter.	14-07-199001-001M Cert Method: A 26-07-190001-001W Cert Method: A 26A-07-190001-001W Cert Method: A 26A-07-190001-001W (Errata) Cert Method: S 27-07-190001-001W Cert Method: T	Submittal: 03/16/05(A) Approval: 06/27/05(P) Submittal: 02/09/05(A) Approval: 06/24/05(P) Submittal: 04/01/05(A) Approved: 06/27/05(P) Submittal: 06/13/05(A) Approved: 06/27/05(P) Submittal: 06/17/05(A) Approved: 06/24/05(A)	MLGD Thermal Barrier Instl, (was 14-07-394001-001N, Mid Fus TPS Instl) Submittal date revised. Wing TPS Installation. Revised CAR rev letter and submittal date, was "U" and 2/15/05 Submits additional Stress Analysis Reports for MLG Edge Tile (Ref: EAR #SJBOD-05-003, rev 1.) Errata corrects part number called out on the Engineering Analysis Report #SJBOD-05-003, rev 1. CAR required to submit additional Cert data (M & P Test Report).
17177	**Wing Leading Edge Spar Corrosion Protection** Corrosion protection system improved to require two coats of koropon and one coat of white polyurethane paint on the acreage of the WLE spar (was one coat of koropon). RTV, 0.005" thick, also added in the WLE spar lower cap as an additional moisture barrier. The new coating system will provide additional protection against corrosive degradation and allow for the potential to align inspections with planned future OMM inspection intervals.	No Certification Impact (see remarks)	Not Applicable	CCBD/OCR S164659, approved 12/1/03, states 'this change does not affect hardware certification" - "materials are compatible for use in this area and environment. WLE spar nominal thermal environment remains below the surface coating limits."
19683	**MLGD Corner Tile Void Fill Mod** Mod adds insulation to fill the void under the forward/outboard and aft/outboard corners of the main landing gear door (MLGD) thermal barrier to eliminate a potential flow path at the barrier-to-barrier interface at these locations.	13-07-199001-001M Cert Method: S 13-07-199001-001M (Errata) Cert Method: S	Submittal: 09/11/03(A) Approval: 06/27/05(P) Submittal: 06/17/05(A) Approval: 06/27/05(P)	MLG Door Thermal Barrier Installation Errata required to provide similarity rationale statement to Page 2 of CAR

CONFIGURATION CHANGES AND CERTIFICATION STATUS

Presentor:

Organization/Date:
Orbiter/6-29-05

OV-103 STS-114 Post STS-107 Modifications and Certification

MCR Number	Title / Description	Cert Req / CAR No. Cert Methodology (T)est (A)nalysis (S)imilarity	CR/CAR Status Submittal Date Approval Date Projected/Need(P) Actual(A)	Cert Status / Notes / Remarks
19697	**Waste Management Compartment Port Wall Modification** *(Crew Systems)* Modifies the waste management compartment port wall assy wet & dry wipes dispensers & stowage cavities to use "off the shelf" wet wipe and dry wipe consumables. WMC Port Wall Assembly (V669-000661-015).	01-25-000661-015 Cert Method: S	Submittal: 12/06/04(A) Approval: 05/09/05(A)	WMC Port Wall Assembly (V669-000661-015). Ref. TPS NC03-011.
19733	**Reconfiguration of RSB Insulation Blankets To Support RSB Actuator R&R** Re-configures the planform of vertical stabilizer blankets to move the interface between two rows of blankets off of the rudder speed brake (RSB) cove access panels to reduce the number of removals required to access cove panels for any future actuator rework or inspection.	No Certification Impact (see remarks)	Not Applicable	Cert level drawing, V070-290101, was not affected (i.e., no dash number roll required). Design changes did not impact existing analyses; no new analysis required.
19735	**WLE Spar Sneak Flow Protection** Mod adds protection for the exposed lower two inches of the front spar in the event of convective heating conditions (sneak flow) caused from a 0.25" hole in the lower RCC surface, 44 panels per vehicle (panels 5-13 are mandatory for RTF). Adds flow restrictors to limit plume sneak flow over top of access panels, flow restrictors designed to limit allowable flow to 5% across the restrictor (reduced by half), extends gap fillers at end(s) of box beam to cover exposed box beam surface(s), and installs additional insulation (SIP) to the front spar.	39-08-199200-003T Cert Method: A 146-05-100004-002J Cert Method: A	Submittal: 10/06/04(A) Approval: 06/16/05(A) Submittal: 10/06/04(A) Approval: 06/24/05(A)	WLE Subsystem Installation Certification. Wing/Elevon Structural Assy Certification.
19746	**FRCS TPS Carrier Panel Redesign** Redesigns the FRCS carrier panels and access door installations to eliminate the use of bonded studs, (which have a history of failure) for installation of this hardware, replaced by mechanical fasteners, either a new riveted stud design, or by the addition of a fastener/nutplate, to provide a more reliable fastener system. Eliminates scenario whereby loss of a bonded stud could either create a flow path for plasma caused by the carrier panel lifting in a corner location or complete loss of a panel, which would also create a debris source.	29-07-391001-001X Cert Method: T, A	Submittal: 03/25/04(A) Approval: 06/15/05(A)	Update to reflect the redesign of FRCS Carrier Panel Installation. [Ref. IL #N852-KEH-04-016, 2/24/04, (TR); IL #TM-SJBOD-04-003, 3/11/04, (EAR)].

CONFIGURATION CHANGES AND CERTIFICATION STATUS

Presentor:

Organization/Date:
Orbiter/6-29-05

OV-103 STS-114 Post STS-107 Modifications and Certification

MCR Number	Title / Description	Cert Req / CAR No. Cert Methodology (T)est (A)nalysis (S)imilarity	CR/CAR Status Submittal Date Approval Date Projected/Need(P) Actual(A)	Cert Status / Notes / Remarks
19755	**Orbiter Boom Sensor System (OBSS)** The Orbiter Boom Sensor System (OBSS) provides capability for on-orbit inspection of the Orbiter thermal protection system (TPS) and repair support in the event the TPS is damaged during a mission. Implements CAIB requirement to provide method for on-orbit inspection of the TPS after launch. The boom is used as an extension of the Orbiter RMS and will utilize three Orbiter manipulator positioning mechanism (MPM) pedestals on the RH sill for mounting provisions. The boom, sensors and associated RMS mods are NASA GFE responsibility. Boeing is responsible for all Orbiter side interface hardware including MPMs, all associated interface wiring and controls, and Orbiter integrations tasks such as systems analysis, requirements documentation, stress / thermal / dynamics / loads analysis, and Orbiter envelope analysis.	01-44-000002-001K Cert Method: T, A	Submittal: 04/01/05(A) Approved: 04/04/05(A)	MPMs for OBSS - QSA reviews/approves Mission Block 1 Qual Test results. QSA covers 2 flight approval. Verbal approval per S. Grace/JSC
		02-44-000002-001K Cert Method: T, A	Submittal: 04/28/05(A) Approval: 06/21/05(A)	QSA reviews/approves Thermal, Loads and Stress Analysis. This previously listed as a CAR to transmit formal qual test report. CR/CAR's will be done later to transmit test report and analyses.
		05-44-000002-001K Cert Method: A	Submittal: 05/05/05(A) Approval: 06/21/05(A)	Cert Deviation required to allow use of MPM Junction Box Fuses and Relays that were not qualified to CR requirements.
		163-02-340004-002M Cert method: A	Submittal: 07/14/04(A) Approval: 06/15/05(A)	WVS S-Band antenna support bracket structure. This CAR submitted under MCR 23278.
		01-33-541562-001 Cert Method: T	Submittal: 09/20/04(A) Approval: 09/24/04(A)	MPM Electrical Checkout Unit GSE.
19758	**WLE Micro-Tau Instrumentation** Installs 66 accelerometer and 22 thermal measurements in the forward (wing leading edge) area of each wing with wiring to crew compartment panel interface for capability of capturing instrumentation data. The instrumentation provides an impact detection system, used primarily for ascent monitoring with some MMOD/on-orbit capability, and serves as means to identify and narrow area for inspection. Debris impact detection will complement visual inspection capabilities. Data is collected and communicated to ground via PGSC/laptop computer. The sensor instrumentation , certification and functionality is NASA GFE responsibility. Boeing has responsibility for engineering/tech orders (AFD, PLB, Wing) to install GFE sensors, interface structure mounting provisions, wire harnesses, mounting plates, and AFD A13 panel modification, and installation certification.	145-05-100004-002J Cert Method: A	Submittal: 09/10/04(A) Approval: 05/18/05(A)	Wing/Elevon Structural Assy Certification - covers the mounting plate/supports certification for the GFE sensor units & relay units and installation certifcation for the GFE Micro-TAU sensors/instrumentation. .
		58-09-362000-001BW Cert method: A	Submittal: 11/09/04(A) Approval: 04/11/05(A)	New blankets with cut lines that accomodate new wire harness supports and eliminate interference with the Boron Strut and Tank Set 5 PVD Duct.
		147-05-100004-002J Cert Method: A	Submittal: 05/17/05(A) Approval: 06/21/05(A)	Wing/Elevon Structural Assy. Submits revised Stress/Loads analysis TM-SJB0D-04-012 Rev B to cover the latest changes. .
19759	**Emergency Egress Net Mechanism** *(Crew Systems)* Modification provides a new adjustment mechanism for the Emergency Egress Net with improved design and increased strength/capability to prevent mechanical failures encountered multiple times on the ground at KSC and once during operation on orbit. Mission kit model MV0828A.	04-25-660101-002C Cert Method: S	Submittal: 06/25/04(A) Approval: 12/16/04(A)	Emergency Egress Net (V828-660101-003).

CONFIGURATION CHANGES AND CERTIFICATION STATUS

Presentor:

Organization/Date: Orbiter/6-29-05

OV-103 STS-114 Post STS-107 Modifications and Certification

MCR Number	Title / Description	Cert Req / CAR No. Cert Methodology (T)est (A)nalysis (S)imilarity	CR/CAR Status Submittal Date Approval Date Projected/Need(P) Actual(A)	Cert Status / Notes / Remarks
19762	**Forward & Aft Winch Installation Procedures Update** *(Crew Systems)* Updates the winch installation drawing to incorporate the latest installation procedures (as defined by JSC card #38926B) for the GFE SED33101570 winches. Updates the aft bulkhead winch installation to be common to the forward bulkhead by tensioning the hook to position it in the housing rope guide	10-25-650007-001N Cert Method: S	Submittal: 12/06/04(A) Approval: 06/21/05(A)	Winch installation drawing V070-650007.
19762	**TSA Instl Bolts/Fitting Galling Resolution** *(Crew Systems)* Designs, fabricates and certifies fasteners, modified by the addition of dry film lube, for the Tool Stowage Assembly (TSA) attach fittings, used to install the TSAs on the ODS truss. Also adds safety cable between the fasteners during the TSA installation. Mod eliminates galling problems between the TSA fasteners and the TSA attach fittings on the ODS truss, which are both made of the same stainless steel material, to prevent fastener seizing and potential breakage in the threaded attach fittings.	04-25-849-000100-001C Cert method: A, S	Submittal: 06/29/04(A) Approval: 01/14/05(A)	
19763	**Lower WLE CP Horse Collar Gap Filler Redesign** Redesigns the Lower Wing Leading Edge (WLE) access panel horse collar gap fillers on all 44 access carrier panels by replacing the horse collar gap filler with a design to add additional sleeving on the IML side of the seal using existing type materials (panels 5 - 13 are mandatory for RTF). Modification is expected to increase contingency margins in the event of damage causing partial loss of lower access carrier panel tile which could allow hot gases into the wing leading edge cavity. Redesign works in conjunction with MCR 19735 WLE Spar Sneak Flow Protection. STS-107accident findings determined that these panels are vulnerable to impact damage for conditions outside the current design criteria – this mod implemented as a corrective action.	39-08-199200-003T Cert Method: A	Submittal: 10/06/04(A) Approval: 06/16/05(A)	CAR submits stress report for the Wing Leading Edge Subsystem. CAR also tracked under MCR 19735.
19785	**Mid-Wt Keel Latch Bearing Screw Secondary Locking Feature** Adds epoxy to the middle weight keel latch bearing retainer screw head as secondary fastener locking feature. Threaded portion of retaining screw not of sufficient length to engage insert locking feature – application of epoxy corrects problem without need to disassemble and re-ATP latch.	No Certification Impact (see remarks)	Not Applicable	CCBD/OCR, approved 2/26/04, states 'certification is not affected' - "The addition of MB0120-008 epoxy as a secondary locking feature does not change fit or function of the latch." Mod utilizes certified materials and processes.

CONFIGURATION CHANGES AND CERTIFICATION STATUS

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Orbiter/6-29-05

OV-103 STS-114 Post STS-107 Modifications and Certification

MCR Number	Title / Description	Cert Req / CAR No. Cert Methodology (T)est (A)nalysis (S)imilarity	CR/CAR Status Submittal Date Approval Date Projected/Need(P) Actual(A)	Cert Status / Notes / Remarks
19786	**Port LWTSA Mission Unique Cushion Mod** *(Crew Systems)* Redesigns the Port TSA cushions to accommodate the Payload Attachment Device (PAD) and the Payload Bay Articulating Socket, which XA has determined for RTF, is needed to be manifested as a contingency tool (ref EVA CR H1052).	10-25-849-660516-001I Cert Method: S	Submittal: 06/25/04(A) Approval: 01/14/05(A)	
19815	**Crew Module Wire Harness Restraints** *(Crew Systems)* Installs 100 aluminum adhesively bonded clips in the crew module to be used with velcro straps to secure pre-routed cable bundles. 40 locations mandatory for STS-114 specific pre-routed cable arrangement - remaining locations by best effort for this flow. To be used in lieu of general purpose grey tape which is not certified for launch, landing or 20G crash loads.	01-25-650629-001 Cert Method: A 01A-25-650629-001 Cert Mehtod: S	Submittal: 02/15/05(A) Approval: 06/15/05(A) Submittal: 05/12/05(A) Approval: 06/14/05(A)	
19823	**Crew Optical Alignment Sight (COAS) Stowage Container Modification** *(Crew Systems)* Modifies the COAS stowage containers by adding a nomex fabric lining to the foam cushions. New foam cushions will be fabricated to which the nomex fabric lining will be added. The current COAS stowage containers have deteriorated foam that is particulating, believed to be due to wear and tear during installation and removal of COAS components. The nomex fabric will prevent wearing and particulating of the foam.	04-25-661620-001I Cert Method: S	Submittal: 01/11/05(A) Approval: 04/27/05(A)	COAS containers V620-660755 & V620-660740.
19823	**Waste Management Compartment Wet Trash Stowage Bag Installation** First use port wall wet trash bag (elbow bag) now installed prior to flight to save on-orbit crew time for first bag installation	04-25-001003-001C Cert Method: A	Submittal: 06/06/05(A) Approval: 06/21/05(A)	Certifies the Disposable Wet Trash Bag Assy. installed in the "on-orbit" location for launch and landing.
19832	**Payload Bay MPM Contingency Interference Modification (PLB Door EVA Handrails)** Evaluation of new CAD /CATIA model developed for OBSS showed interference between PLBD EVA Handrails and the lower MPMs at two locations in a contingency situation where the OBSS or RMS can not be stowed due to a MPM mechanical jam and are jettisoned. The remaining deployed lower shoulder MPM (fwd location at Xo 679.5) and the aft MPM lower pedestal (location Xo 1256.5) for both the RMS and the OBSS create an interference condition with the handrails. Mod redesigns the end fitting of the handrail at the forward shoulder location to clear the shoulder MPM and removes a short section of the EVA handrail and trims the associated handrail attach point on the payload bay door at the aft pedestal location to provide the necessary clearances.	03-25-650770-001C Cert Method: A	Submittal: 02/15/05(A) Approval: 04/23/05(A)	

CONFIGURATION CHANGES AND CERTIFICATION STATUS

Presentor:

Organization/Date:
Orbiter/6-29-05

OV-103 STS-114 Post STS-107 Modifications and Certification

MCR Number	Title / Description	Cert Req / CAR No. Cert Methodology (T)est (A)nalysis (S)imilarity	CR/CAR Status Submittal Date Approval Date Projected/Need(P) Actual(A)	Cert Status / Notes / Remarks
23140	**T-0 Pyro Command Redundancy** Orbiter mod adds a redundant electrical wire path to each of the two existing redundant A & B Pyrotechnic Initiation Circuitry paths for the ET Hold Down Post and the External Tank Vent Arm System PIC commands (Arm, Fire 1, Fire 2, and return functions). Redundant wire paths were spliced from existing (aft avionics bay MEC to T-0 umbilical) wiring runs, just prior to the T-0 umbilical to redundant T-0 connector pins. Similar wiring change made on the ground side from the T-0 umbilical to the ground pyro initiator circuitry hardware (PIC Racks). Additional investigation of the STS-112 Pyro System A anomaly, based on a CAIB observation, determined that additional redundancy would be of benefit due to the criticality of initiating these mission critical pyro events.	No Certification Impact (see remarks)	Not Applicable	CCBD/OCR S164601, approved 8/20/03, states 'no certification impact' - wiring mods are considered generically certified due to their use of qualified piece parts which make up the cable or assembly.
23141	**Thicker Side Windows 1 & 6** Recent updates to debris transport analysis and Probabilistic Risk Assessment revealed potential negative safety margins for side window impacts from aluminum oxide and foam. Thicker side windows provides additional strength margin. Trend data shows ISS missions are generating significantly higher side and overhead window (W1, W6, W7, and W8) scrap rates due to orbital debris impacts - the thicker windows will also provide scrap rate reduction due to on-orbit debris damage. Window perimeter splash tile are redesigned / replaced due to the thicker window profile. Note that window 7 & 8 mod will be performed in a future flow.	22-07-390001-001M Cert Method: A 23-07-390001-001M Cert Method: A 24-07-390001-001M Cert Method: A	Submittal: 10/08/04(A) Approval: 06/28/05(P) Submittal: 04/11/05(A) Approval: 06/28/05(P) Submittal: 06/17/05(A) Approval: 06/28/05(P)	CAR submits Stress, Aeroheating and Thermal analyses. CAR provides updates to aero analysis update. CAR required to submit revised analysis for a 2 flight certification for thicker windows mod.
23226	**Water Spray Boiler PGME Flight Demonstration** Changes WSB active cooling fluid from water to a mixture (47% / 53%) of PGME / water. This will preclude spraybar blockage due to freeze-up following ascent APU shutdown, which could prevent WSB usage for early mission termination. Flight Demonstration planned for STS-114 (and OV-104 STS-121) with 1 of 3 WSBs serviced with PGME/Water mixture (System #3) during which APU and WSB 3 will be reactivated on orbiter to validate the effectiveness of the PGME. No vehicle modifications are required. Ground servicing equipment & loading procedures will be updated and verified prior to implementation.	18-30-250-0019-001W Cert Method: A, T	Submittal: 12/08/04(A) Approval: 03/15/05(A)	Certification Deviation for STS-114 - full certification will be processed following two successful flight demonstration tests. CAR 18 supercedes CAR 17 submitted 11/08/04.

CONFIGURATION CHANGES AND CERTIFICATION STATUS

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OV-103 STS-114 Post STS-107 Modifications and Certification

MCR Number	Title / Description	Cert Req / CAR No. Cert Methodology (T)est (A)nalysis (S)imilarity	CR/CAR Status Submittal Date Approval Date Projected/Need(P) Actual(A)	Cert Status / Notes / Remarks
23227	**Connector Saver Redesign** During implementation of connector savers as part of the previous Monoball Production Break Mod, it was found that the locking feature of the connector savers could become disengaged during the harness connector mate process after applying an axial load to the connector saver. Investigations showed connector saver design deficiencies with insufficient wavy washer spring force to react against the mating harness force and to keep the bayonet pins in the coupling ring locking detent, and incorrect RTV insert cross section at the pin locations which could allow the insert shoulders to wedge into the mating harness receptacle sockets and prevent the bayonets from reseating into the detent area. Redesigned connector saver corrects the interfacial seal design and wavy washer spring force to keep the bayonet pins in the coupling ring locking detent as well as adding safety wire provisions. Replacement of three T-0 Umbilical connector savers was required late in this flow and redesigned units were used due to lack of spares availability.	No Certification Impact (see remarks)	Not Applicable	
23246	**High Accuracy Inertial Navigation (HAINS) IMU Slip Ring Redesign** During STS-108, HAINS S/N 207 failed with the third recorded failure of the 46 pin Azimuth Slip Ring. Analysis revealed the possibility of a generic flaw introduced by a uncontrolled process during manufacture of all the HAINS. The alignment of the 46 pin Azimuth Slip Ring and its mating Brush Block Assembly could cause unpredicted movement of the assemblies and fatigue fracture of the pin-outs of the Slip Ring. A redesign effort instituted control of the alignment of the assemblies during manufacturee, introduced potting in the Slip Ring pin-out field for extra strength, and redesignedthe Slip Ring clamp to eliminate bending the pins that had been fracturing.	04-17-409-0126-1003F Cert Method: T, A & S	Submittal: 01/31/05(A) Approval: 02/18/05(A)	Certifies redesigned HAINS after improved manufacturing process . This CAR transmits the Engineering Analysis Report describes the Qualification Test Procedure performed by the vendor to verify that the redesign of the Slip Ring/Brush Block installation satisfies the test requirments in the CR 17-409-0126-1003F
23249	**Payload O2 and N2 Flex Hose Removal** The payload nitrogen (N2) (OV-103 only) and oxygen (O2) flex hoses, located in the payload bay at the Xo576, are no longer required for flight and are located in an area of high vulnerability to ground processing damage. Additionally, these flexhoses (p/n MC271-0085-1012) were at zero spares balance. Mod removes the unused flexhoses and installs a cap at the bulkhead dynatube connection and installs a new dynatube at the opposite end which will also be capped. Tech orders are established to install these flex hoses should they be required in the future.	07-22-271-0085-0001K Cert Method: S	Submittal: 06/09/04(A) Approval: 12/17/04(A)	Certifies new flexhose configurations.

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MCR Number	Title / Description	Cert Req / CAR No. Cert Methodology (T)est (A)nalysis (S)imilarity	CR/CAR Status Submittal Date Approval Date Projected/Need(P) Actual(A)	Cert Status / Notes / Remarks
23250	**PRSD Tank Set #3 TCS Support /Strut Interference Mod** Provides an additional attach point for the tank set 3 TCS blanket support frame to prevent blanket support frame rubbing damage to adjacent boron strut.	53-09-362000-001BR Cert Method: A, S 60-09-362000-001BY Cert Method: S	Submittal: 11/17/03(A) Approval: 04/11/05(A) Submitted: 12/14/04(A) Approval: 04/11/05(A)	New Blanket Installation with the additon of 2 new Brackets w/support hardware. Errata submitted on 2/10/04 to correct vehicle effectivities. Required to add new dash number to provide the installation of a stand-off blanket that will provide the necessary rigidity and preclude Boron Strut rubbing damage. (Ref: TCS-3-31-3423, TCS-4-27-2048 & TCS-5-20-1756)
23269	**Port LWTSA Tile Repair Accomodations** *(Crew Systems)* New cushions and retention straps in the mission specific area of the of the port LWTSA to support stowage of the Tile Repair Kit (TRK).	11-25-849-660516-001J Cert Method: S	Submittal: 2/11/05 (A) Approval: 04/23/05(A)	
23278	**SSOR & WVS UHF Antenna Relocation** Relocates the SSOR and WVS UHF antennas from their original payload bay starboard sill location to the aft, upper ODS truss. Mod also involves new coax cables / mounting clips and rerouting of the associated antenna power and coax cables, new antenna mount brackets, and TCS blanket changes. Mod provides mounting locations on the starboard sill for installation of the on-orbit TPS inspection boom and MPMs.	163-02-340004-002M Cert Method: A 02-18-744120-001D Cert Method: T 119-04-341002H Cert Method: S 56-09-362000-001BU Cert Method: S	Submittal: 07/14/04(A) Approval: 06/15/05(A) Submittal: 03/10/05(A) Approval: 06/16/05(A) Submittal: 08/30/04(A) Approval: 06/28/05(P) Submittal: 08/24/04(A) Approval: 04/11/05(A)	Mid Fuselage Structural Instl. CAR is common to MCR 19755 mod. UHF EVA Comm Antenna. Thermal analysis due 02/15/05 Airlock/Truss Structure Assy. TCS Instl-Mid Fuselage.
23280	**Flipper Door #1 Plunger Galling Resolution Mod** Hang-up of flipper door 1 has been observed during horizontal to vertical operations and requires panel to be repositioned prior to flight. During implementation of earlier modification (MCR 19555) to install a stronger positioning spring, galling was observed on plunger and piston components because they are like material. Mod adds nickel plating to the plunger assembly to eliminate galling and hang-up.	No Certification Impact (see remarks)	Not Applicable	CCBD/OCR 164623, approved 1/23/04, states 'certification update not required for this change' - "The material used and the application of the nickle plating per MIL-C-26074 Class 2 Grade B are certified for use in the Orbiter."
23282	**ECLSS & MPS Make-From Flexhose Configurations** Establishes 2 MPS & 3 ECLSS 'make from' configuration 'double flexhose' assemblies from other flexhose configurations for which spares exist. Implemented because these locations have spares shortages and are at high risk for need of replacement.	05-22-271-0085-0001I Cert Method: S 05-10-271-0077-0003I Cert Method: S	Submittal: 12/04/03(A) Approval: 06/18/04(A) Submittal: 10/06/04(A) Approval: 05/18/05(A)	Certification of 3 new ECLSS make-from flexhose configurations. Certification of 3 new MPS make-from flexhose configurations.

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MCR Number	Title / Description	Cert Req / CAR No. Cert Methodology (T)est (A)nalysis (S)imilarity	CR/CAR Status Submittal Date Approval Date Projected/Need(P) Actual(A)	Cert Status / Notes / Remarks
23287	**Single String GPS Pre-Amp Upgrade** Replaces the 'Single-String' GPS DTO preamplifier and GPS DTO combiner previously installed on all orbiters for GPS string #2, with the operational 'Three-String' GPS preamplifier and combiner. DTO GPS preamplifier and combiner are only certified for flight tests; in order to support upcoming single-string GPS operational ramp-up flights and subsequent operational single-string GPS flights, the operational GPS preamplifiers and combiners are required. Also removes the existing OV-103 SIGI DTO.	No Certification Impact (see remarks) 03-18-473-0119-001B Cert Method: T, A	Not Applicable Submittal: 10/06/04(A) Approval: 04/11/05(A)	The Three String GPS L-Band Preamplifier was certified for operational use per CAR 01-18-473-0119-0001A, approved 3/5/99. CAR 01A-18-473-0119-0001A, approved 3/14/04, submitted an analysis and test to show that the on-board TACAN signal would not damage the GPS hardware or degrade the GPS performance. The Combiner was certified by CAR 01-18-413-0049-0001A, approved 3/4/99. These 3 CAR's were products of the Three String Mod MCR 18928. Certification for higher thermal temperature environment. QSA is for STS-114.
23288	**ET Umbilical Digital Camera** Incorporates new GFE LO2 external tank (ET) umbilical well digital still camera and harnesses with crew compartment panel interface functionality to capture and downlink high resolution ET sep photo images. Camera is a direct replacement for existing still camera and will use existing Shuttle interfaces and power services. NASA responsibility for camera and 'fire wire' cable hardware, certification & functionality. Boeing responsibility for hardware installation drawings and tech orders for camera, wiring, bulkhead feed-thru connector and panel A13 modifications, as well as installation certification. Implements CAIB return to flight recommendation to provide capability to obtain and downlink high resolution images of the External Tank (ET) after separation - current camera film imagery of the external tank can only be recovered after end of mission.	166-03-350013-001K Cert Method: A	Submittal: 05/19/04(A) Approval: 06/16/05(A)	Boeing instl cert of GFE hardware - Errata submitted on 6/30/04 to correct part numbers.
23290	**A7/R14 Panel Nomenclature Change** D&C panels A7 and R14 have camera related switch and circuit breaker decals that are inconsistent vehicle to vehicle or are obsolete. Crew preference decals have caused inconsistency and have been used to clarify or update panel nomenclature Change baselines updates and clarifies panel nomenclature to provide consistency across the fleet.	No Certification Impact (see remarks)	Not Applicable	CCBD/OCR S164728, approved 4/5/04, states that 'certification is not impacted'. D&C panels are (typically) generically certified, using the same rationale as wiring mods.
23293	**ET Shell (Salad Bowl) Material Change** Changes the ET/Orbiter aft attach interface shell material from 6061-T651 alum plate to higher strength 7050-T7451 alum plate to eliminate potential of local material yield during ET mate operations. Yielding / displacements in the aft attach joint could result in increased bending moments in the aft attach bolts and margin concerns at max flight loads. New design validated by 3 simulated orbiter/ET mate demonstration tests.	07-45-565201-001S Cert Method: A, S 102-03-350205-003D Cert Method: A, S	Submittal: 02/21/05(A) Approval: 06/16/05(A) Submittal: 02/25/05(A) Approval: 06/10/05(A)	Orbiter/ET Attach Separation System. Liner Assy Aft/ET Orb Assy Bearing Liner.

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OV-103 STS-114 Post STS-107 Modifications and Certification

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23353	**Mid Fuselage He and GN2 Tank TCS Blanket EMI Mods** TCS multi-layer blanket grounding and electrostatic discharge potential for the six MPS helium and two ECLSS nitrogen mid-body tanks resulted in redesign to reduce risk of static buildup and discharge. Blanket redesign replaced the inner layer Nomex cover with a grounded aluminized cover. These 8 specific mid body tanks required TCS blankets due to location driven thermal requirements.	11-22-282-0082-0050P Cert Method: S	Submittal: 11/10/04(A) Approval: 04/27/05(A)	CAR covers certification of both redesigned midbody specific ECLSS N2 and MPS helium tank TCS blankets. Note: Mod is specific to these subsystem tank locations as a result of investigation findings that showed other tanks/blankets do not have a similar grounding issue with their configuration. Official approval received.
23354	**Fuel Cell Flowmeter Fuse Changeout Mod** Changed fuse amperage from 3 amp to 1 amp to reduce risk and potential resulting hazard of overheated electrical components on the fuel cell flow meter circuit board. Potential hazard would be the concern of overheated electrical components in an oxygen or hydrogen rich environment due to leakage such as from a braze joint leak.	07-21-764430-001J Cert Method: S	Submittal: 03/07/05(A) Approval: 05/18/05(A)	Mid Power Control Assy 2. (Ref also PR -EOTF OEL-3-31-319) Implementation by EOTF to expedite installation.
23367	**Airlock Booster Fan Bypass Duct Modification** Booster Fan Bypass duct to be utilized for Cryo savings as a result of power down of booster fan on flights between STS-114 (LF1) and STS-120 (10A). Cryo savings will contribute to higher probability of gaining an extra on-orbit day for these missions. Continued air flow exchange requires the bypass duct to route air around the non-operating fan, while maintaining minimum air flow for CO2 control. Bypass duct configuration will be implemented on-orbit by the crew. Airlock Booster Fan Bypass will be evaluated for effectiveness by SDTO (cryo savings and ability to maintain CO2 level within the 7.6 mmHg limit).	15-35-643500-002Q Cert Method: A	Submittal: 02/15/05(A) Approval: 06/13/05(A)	Certification includes updated air flow analysis.

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OV-103 STS-114 Post STS-107 Modifications and Certification

MCR Number	Title / Description	Cert Req / CAR No. Cert Methodology (T)est (A)nalysis (S)imilarity	CR/CAR Status Submittal Date Approval Date Projected/Need(P) Actual(A)	Cert Status / Notes / Remarks
23405	**Payload Bay MPM Contingency Interference Modification (PLB Door TCS Clips & Wire Harness Support Brackets)** New CAD /CATIA model developed for OBSS showed interference between PLBD TCS blanket attach clips and harness support brackets, and the lower MPMs in a contingency situation where the OBSS or RMS can not be stowed due to a MPM mechanical jam and are jettisoned. Wire harness bracket interference is at both the port (OBSS) and starboard (RMS) MPM shoulder locations. Mod installs a new wire support bracket designed to provide clearance to the lower MPM in the contingency scenario - slight wire re-route in this area in addition. The TCS blanket clips create an interference problem at all MPM locations - 4 MPM locations LH side, 10 clips total and 3 MPM locations RH side, 7 clips total. Mod corrects these interferences by rotating and slightly relocating a total of 13 clips LH side and a total of 9 RH clips (additional clip relocations required to accommodate associated TCS blanket redesign) and modifies 9 associated TCS blankets to attach to the new clip locations.	132-02-370004-002H Cert Method: A 61-09-362000-001BZ Cert Method: S 21-09-260002AK Cert Method: S	Submittal: 01/26/05(A) Approval: 06/15/05(A) Submittal: 03/29/05(A) Approval: 06/11/05(A) Submittal: 03/16/05(A) Approval: 06/21/05(A)	Payload Bay Door Structural Assy - Electrical bracket TCS Installation. Ref also PR-EOTF TCS-3-31-351 - implementation by EOTF to expedite installation. TCS Fastener Installation. Ref also PR-EOTF TCS-3-31-351 (#2719) - implementation by EOTF to expedite installation.
23410	**Forward Reaction Control System (FRCS) Rain Cover Redesign -Material Change to Tyvek 1059B** Paper rain covers are being released at high velocity and becoming a debris hazard to the windows and TPS. Pieces are also lodging in the window thermal seal. Tyvek1059B material was chosen as a replacement to the current paper covers. The material as well as the shape and the application adhesive to promote a complete, low velocity shedding of the covers has been evaluated and tested. Boeing will provide the cover assembly and installation drawings and the new covers will be NASA fabricated. Qual testing will be a joint Boeing / NASA undertaking.	QSA 01-11-421534-001B Cert Method: T, A	Submittal: 06/17/05(A) Approval: 06/24/05(A)	Thruster Fly Away Rain Cover. Qual testing has been completed - QSA reviewed and signed off 6/17/05. Additional testing for rain rate and window impact in progress Cert Deviation rationale for RTF was documented in the QSA - separate Cert Deviation for STS-114 is not required.

	Presentor:
	Organization/Date: Orbiter/6-29-05

PRE STS-107 CONFIGURATION CHANGES BACKUP

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Pre STS-107 / J3 First Flight Mods - Overview

- 107 J3 modifications accomplished
  - 17 of these modifications will be flying for the first time and will be addressed in the following pages
    - 2 ECLSS Modifications
    - 1 PV&D Modification
    - 3 Hydraulics Modifications
    - 2 MPS Modifications
    - 2 Avionics Modification
    - 3 TPS Modifications
    - 2 Structures Modifications
    - 2 Crew Systems Modifications

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

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Pre STS-107 / J3 First Flight Mods

- 2 ECLSS Related Modifications
  - MCR 19343 MPLM Dedicated Heat Exchanger Mod
  - MCR 19389 Bay 4 GN2 Tank Mission Kit

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
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MCR 19343 MPLM Dedicated Heat Exchanger

- Multi-Purpose Logistics Module (MPLM) is a payload bay cargo element designed to transfer supplies to the International Space Station (ISS)
  - The MPLM has flown on previous ISS mission
- Active MPLM requires a cooling system to transfer perishable materials requiring refrigeration to/from ISS
- Orbiter and payload integration hardware mods required to support MPLM active cooling missions
  - STS-114 is not an active MPLM mission, however, the orbiter modifications required to support future active MPLM missions were implemented during this OMM
- Primary orbiter modification is installation of a dedicated payload heat exchanger which supports active cooling requirements for MPLM and middeck locker payloads which require forced air cooling

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor: Organization/Date: Orbiter/6-29-05

MCR 19343 MPLM Dedicated Heat Exchanger

- Orbiter hardware mods consist of the following:
  - Payload Heat Exchanger (water-to-freon 21) and Orbiter freon 21 plumbing
  - Orbiter water loop accumulator, water plumbing and water loop thermal control system, heater control panel (A14 Panel)
  - New Xo919 payload bay interface panel
  - System instrumentation
  - T-0 umbilical modification (port and starboard) to provide dedicated MPLM power and data ground service interfaces.
  - GSE modifications required to starboard side T-0 umbilical to support dedicated MPLM power and data ground service interfaces.

MCR 19343 MPLM DEDICATED HEAT EXCHANGER

Presentor:

Organization/Date:
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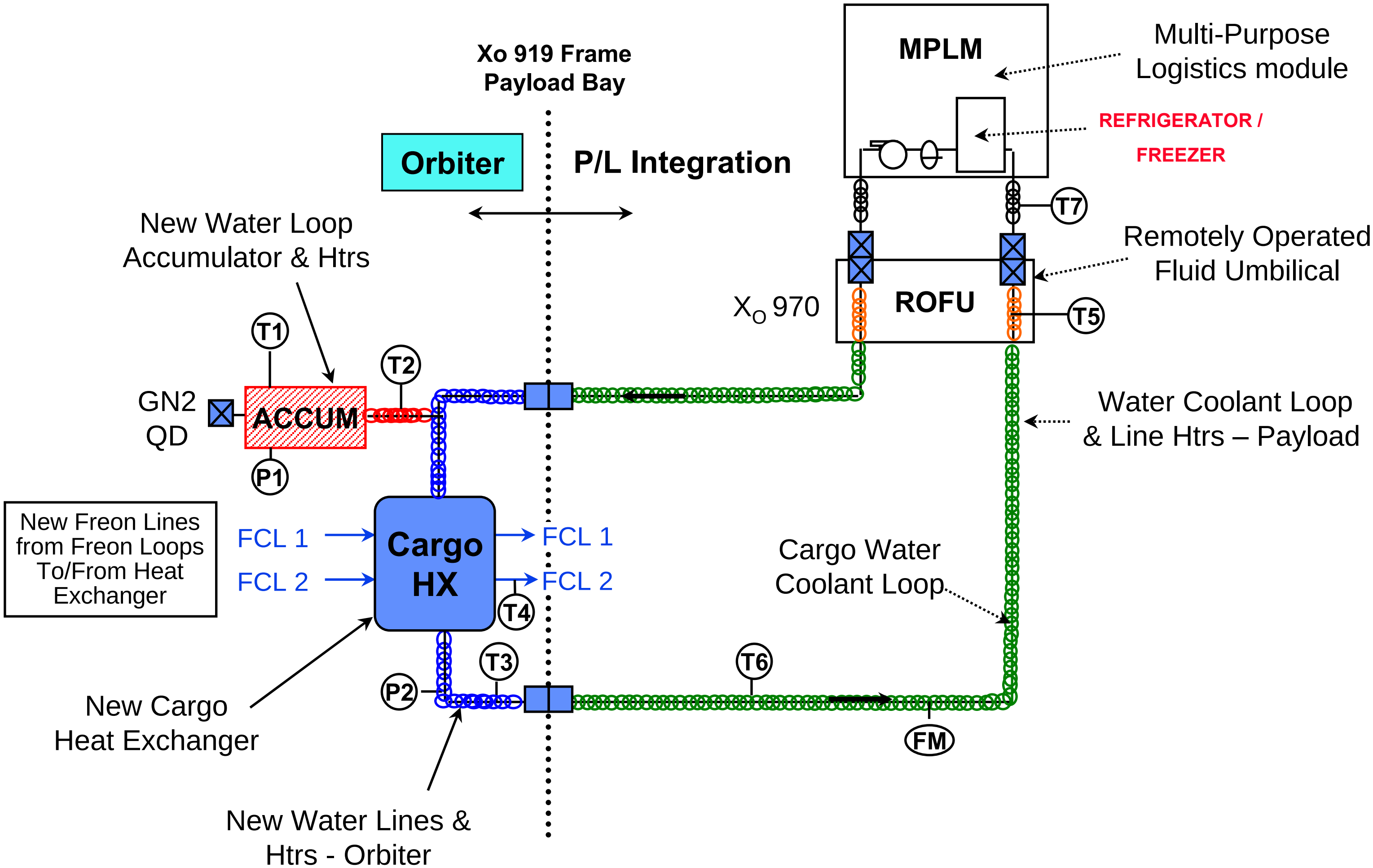
Schematic Overview of MPLM Hardware



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MCR 19343 MPLM DEDICATED HEAT EXCHANGER

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Organization/Date:
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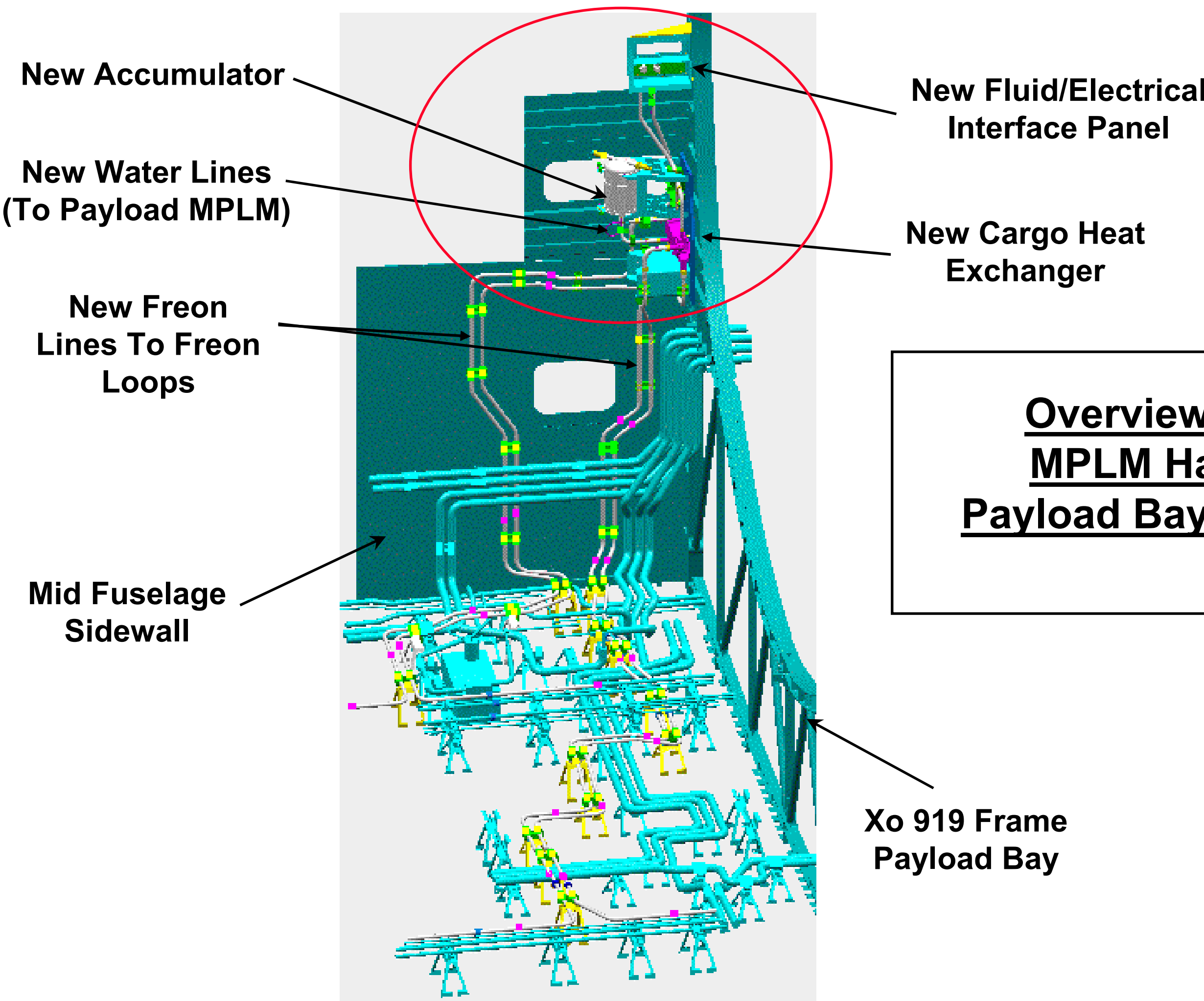

Overview of New MPLM Hardware Payload Bay 7 Portside

MCR 19343 MPLM DEDICATED HEAT EXCHANGER

Presentor:

Organization/Date:
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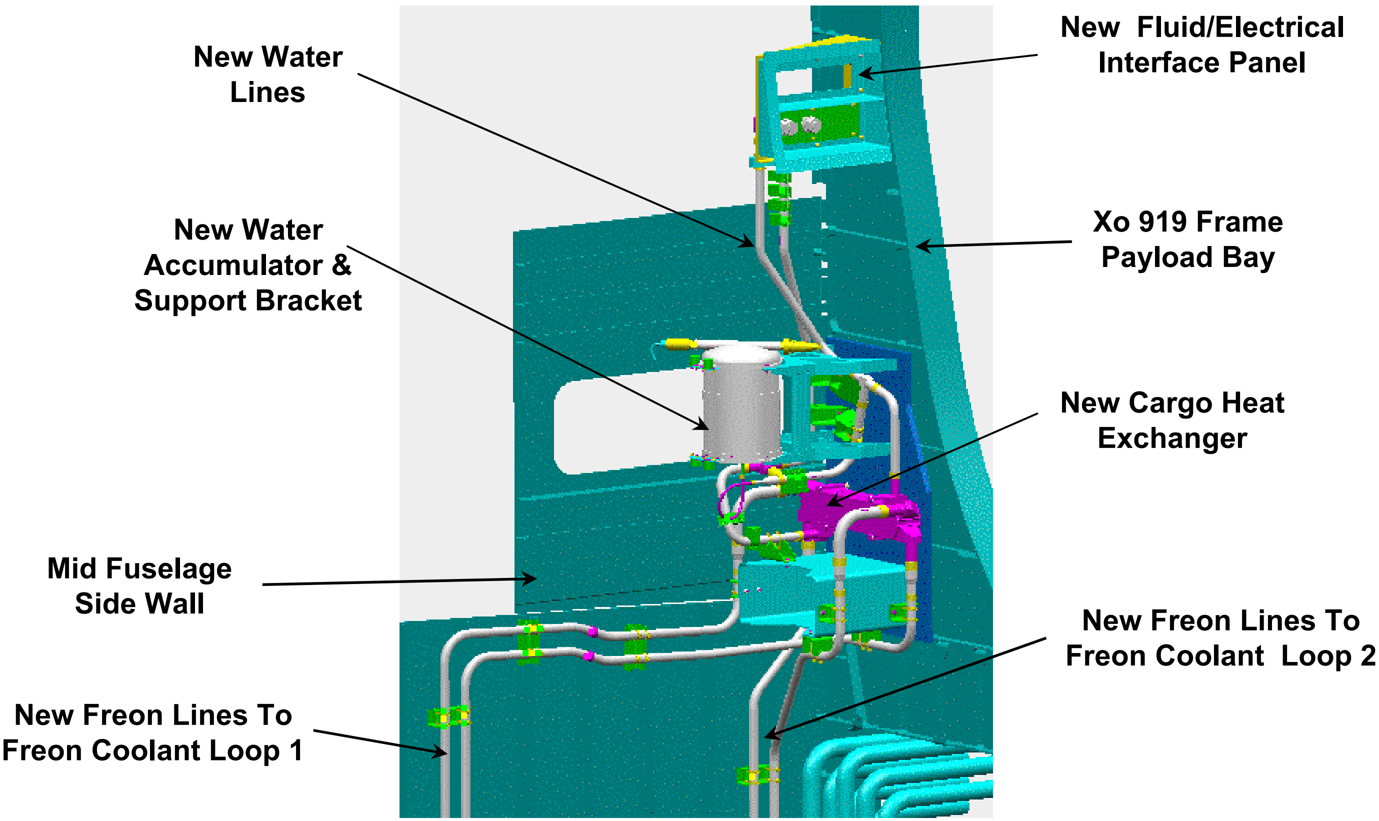
Overview of New MPLM Hardware Payload Bay 7 Portside



PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

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MCR 19389 Bay 4 GN2 Tank Mission Kit

- Re-engineers the Bay 4, RH side forward GN2 tank installation from a permanent vehicle installation to a mission kit installation (tech order manifested)
- Allows for a standard 6 GN2 tank configuration for the fleet and sets up the vehicle with two GN2 mission kit tanks in bay 4 RH
  - The mission kit enhancement at this location facilitates tank installations and removals (ground processing enhancement) based on mission GN2 requirements

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

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Pre STS-107 / J3 First Flight Mods

- 1 PV&D Related Modification

MCR 19271 WCCS Check Valve Deletion

- Window Cavity Conditioning System (WCCS) provides for depressurization and repressurization of the window cavities, prevents moisture and contamination from entering into the window cavities, and supplies purge conditioning to the window cavities to dry them during ground processing
- The WCCS contained desiccant / check valve manifold assemblies in the outer window cavity vent systems
  - 5 outer window vent systems each utilized one of these manifold assemblies consisting of two check valves (1 for ascent and 1 for descent) and a desiccant canister
    - The check valves provided an alternate or redundant flow path to vent the window cavity if the desiccant canister became clogged (Crit 1R2 system)

MCR 19271 WCCS CHECK VALVE DELETION

Presentor:

Organization/Date:
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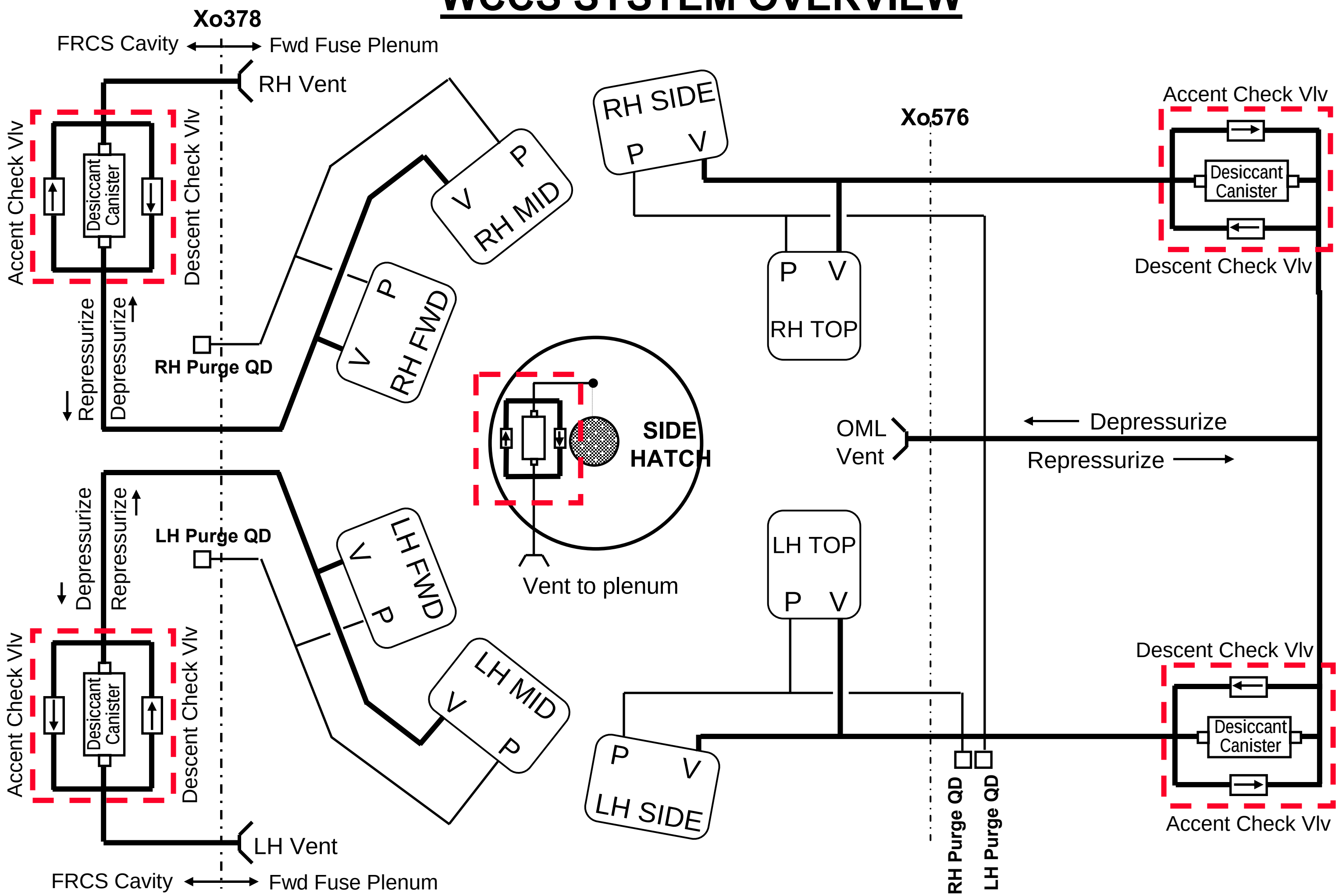
WCCS SYSTEM OVERVIEW



PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

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MCR 19271 WCCS Check Valve Deletion

- The WCCS system check valves required significant maintenance to assure the time/cycle limited valves operated properly as the redundant system flow path
  - Due to check valve cracking pressure drift concerns, valves were being refurbished each flight (valve body cleaned, o-rings replaced and lubricated, ATP performed)
- Mod removes the WCCS check valves and replaces them with an additional parallel desiccant cartridge to serve as the redundant system flow path
  - The dual desiccant system provides higher reliability and lower ground processing maintenance
  - No previous instances of desiccant canister clogging or failure to allow flow - flow test validate WCCS flow capability (thru canister) each flight
  - Canisters removed and refurbished every two mission (or sooner if beads indicate moisture)

MCR 19271 WCCS CHECK VALVE DELETION

Presentor:

Organization/Date:
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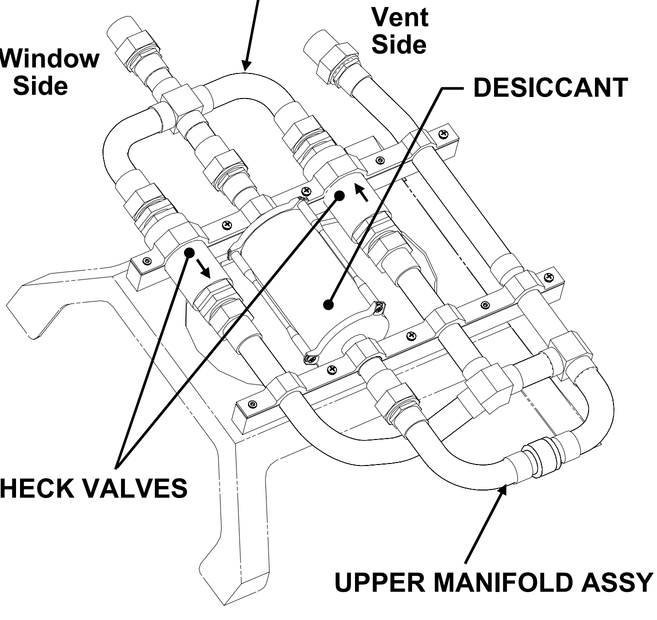
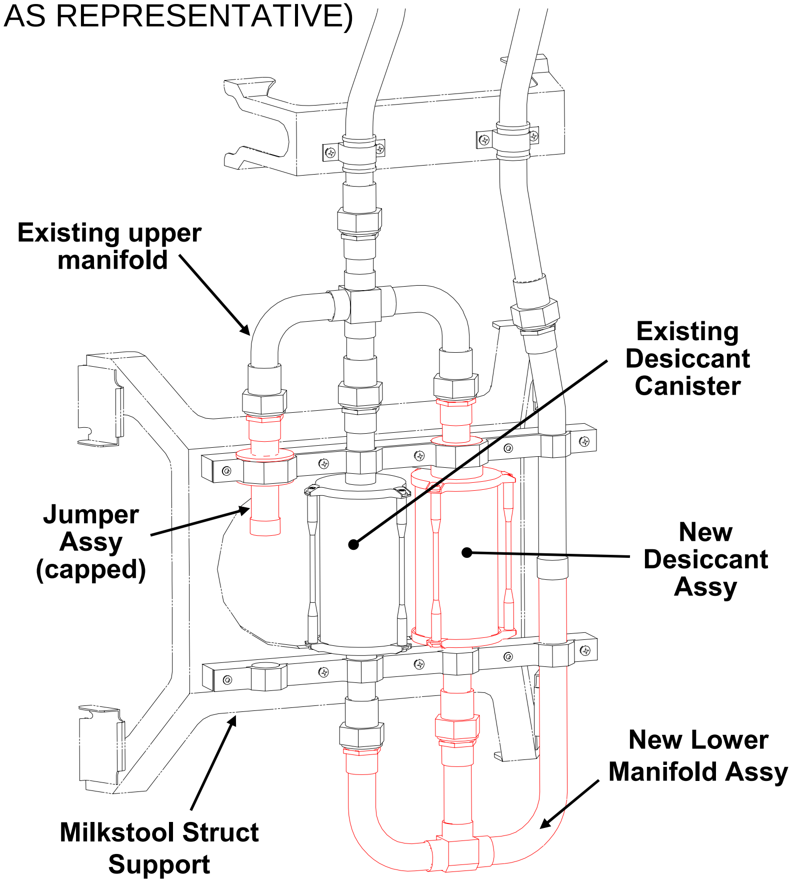
WCCS MANIFOLD BEFORE & AFTER MODIFICATION

(MIDBODY MANIFOLD SHOWN AS REPRESENTATIVE)



ORIGINAL CONFIGURATION



MODIFIED CONFIGURATION

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:
Organization/Date: Orbiter/6-29-05

Pre STS-107 / J3 First Flight Mods

- 3 Hydraulics Related Modifications
  - MCR 19610 Moog Hydraulic Actuator Changeout for Spool Stop Mod
  - MCR 19092 Relocate Hydraulic Main Pump Check Valve
  - MCR 23201 Hydraulic Main Pump Port Cap Joint Redesign

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
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MCR 19610 Moog Hydraulic Actuator Changeout for Spool Stop Mod

- During STS-101 frequency response test (FRT), rudder speedbrake secondary delta pressures (DPs) were unusually high in the open direction
  - Secondary DP is a measure of the pressure generated by each of the four servovalves to move the powervalve
  - The powervalve controls the hydraulic flow to the three motors to drive the speedbrake panels
  - High secondary DPs on all four servovalves indicated that the motion of the RSB power drive unit (PDU) power valve was mechanically restricted
    - A restriction of motion in the power valve may result in loss of control of the speedbrake (Crit 1 condition)

TYPICAL POWER VALVE DESIGN OF THE ORBITER FLIGHT CONTROL ACTUATORS

Presentor:

Organization/Date:
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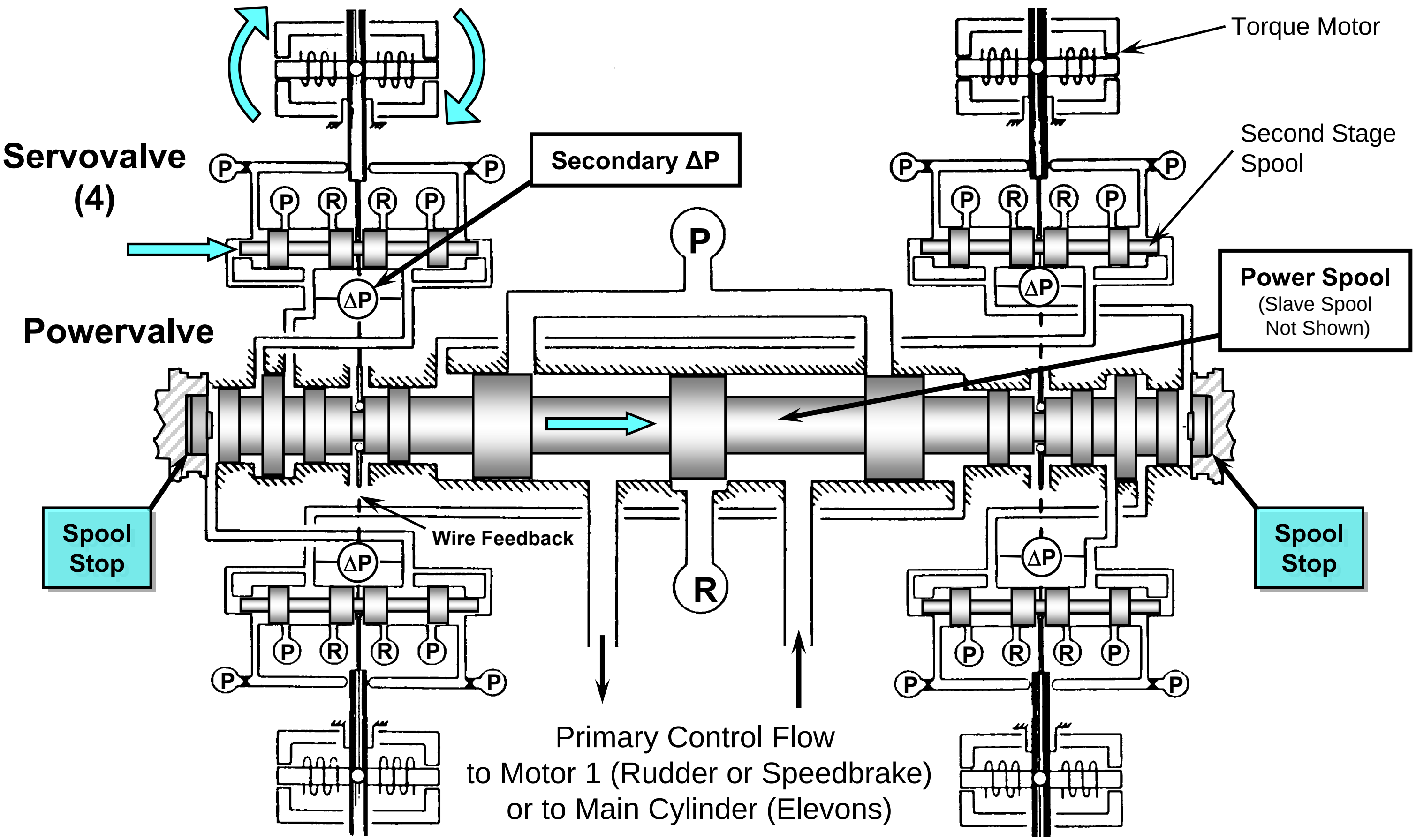
Servovalve / Powervalve Operation



PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

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MCR 19610 Moog Hydraulic Actuator Spool Stop Mod

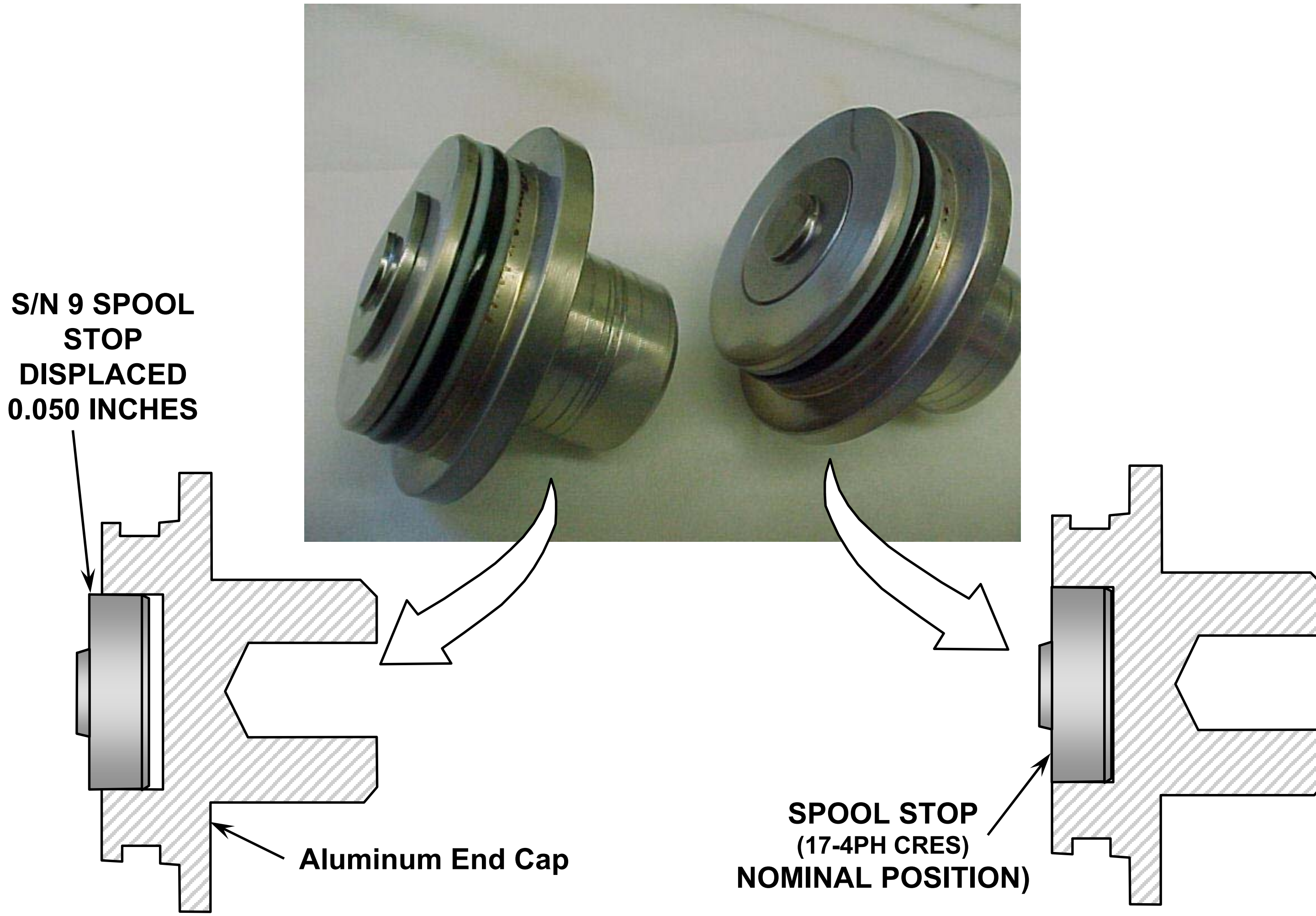
- Failure analysis determined that movement of the power valve's spool stop was restricting spool movement
  - The stainless steel spool stop was migrating out of it's aluminum end cap due to temperature cycles experienced during flight
  - Hydraulic fluid could enter through the gap created during the temperature cycles and push the spool stop out of position
- The same design is used on all Orbiter flight control actuators
  - Rudder/Speed Brake (1 per vehicle)
  - Main Engine TVC Actuators (6 per vehicle – 2 per SSME)
  - Elevon Actuators (4 per vehicle – 1 per elevon)

MCR 19610 MOOG HYDRAULIC ACTUATOR SPOOL STOP MOD

Presentor:

Organization/Date: Orbiter/6-29-05

Spool Stop Moved From Fully Seated Position Within End Cap



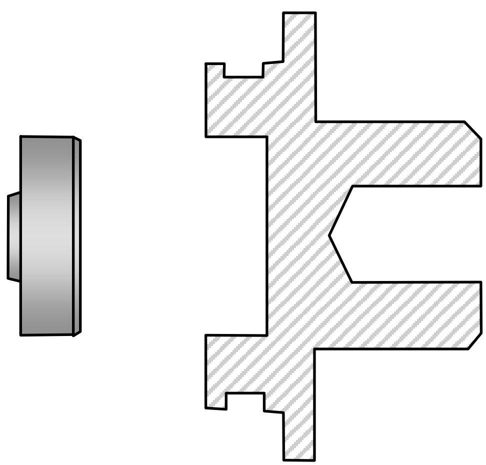
PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

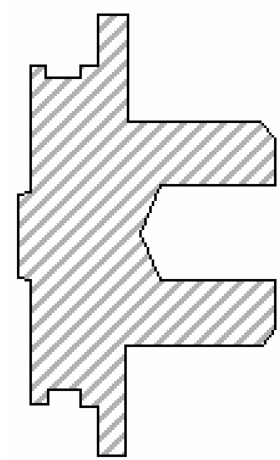
Organization/Date:
Orbiter/6-29-05

MCR 19610 Moog Hydraulic Actuator Spool Stop Mod

- Corrective action and modification was to replace the two piece spool stop design with a one piece spool stop design to eliminate the problem
- All flight control actuators on OV-103 (STS-114) have been modified to incorporate the new design



Two Piece Spool Stop Design



New One Piece Spool Stop Design

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 19092 Relocate Hydraulic Main Pump Check Valve

- Implements hydraulic system mods to move the hydraulic supply check valve from the filter module inlet to the main pump outlet
- Provides capability to perform high pressure leak test of the pump discharge lines in the OPF during normal GSE operation, as opposed to having to perform this check at the pad during APU hot-fire

MCR 23201 Hydraulic Main Pump Port Cap Joint Redesign

- Redesigned the hydraulic main pump port cap joint by replacing self-locking inserts and bolts with a more robust stud and nut design
- Corrective action resulting from finding that minor insert pullout was occurring due to the use of improper bolts in some pumps (dry film lubed, should be passivated) which was causing higher than expected fastener preload
- This condition could possibly lead to total insert shear-out, leading to housing separation and hydraulic fluid leakage (Crit 1R2)

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Pre STS-107 / J3 First Flight Mods

- 2 MPS Related Modifications
  - MCR 23043 MPS Delta-P Transducer Removal
  - MCR 23123 MPS Engine Cutoff Point Sensor Wiring

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date: Orbiter/6-29-05

MCR 23043 MPS Delta-P Transducer Removal

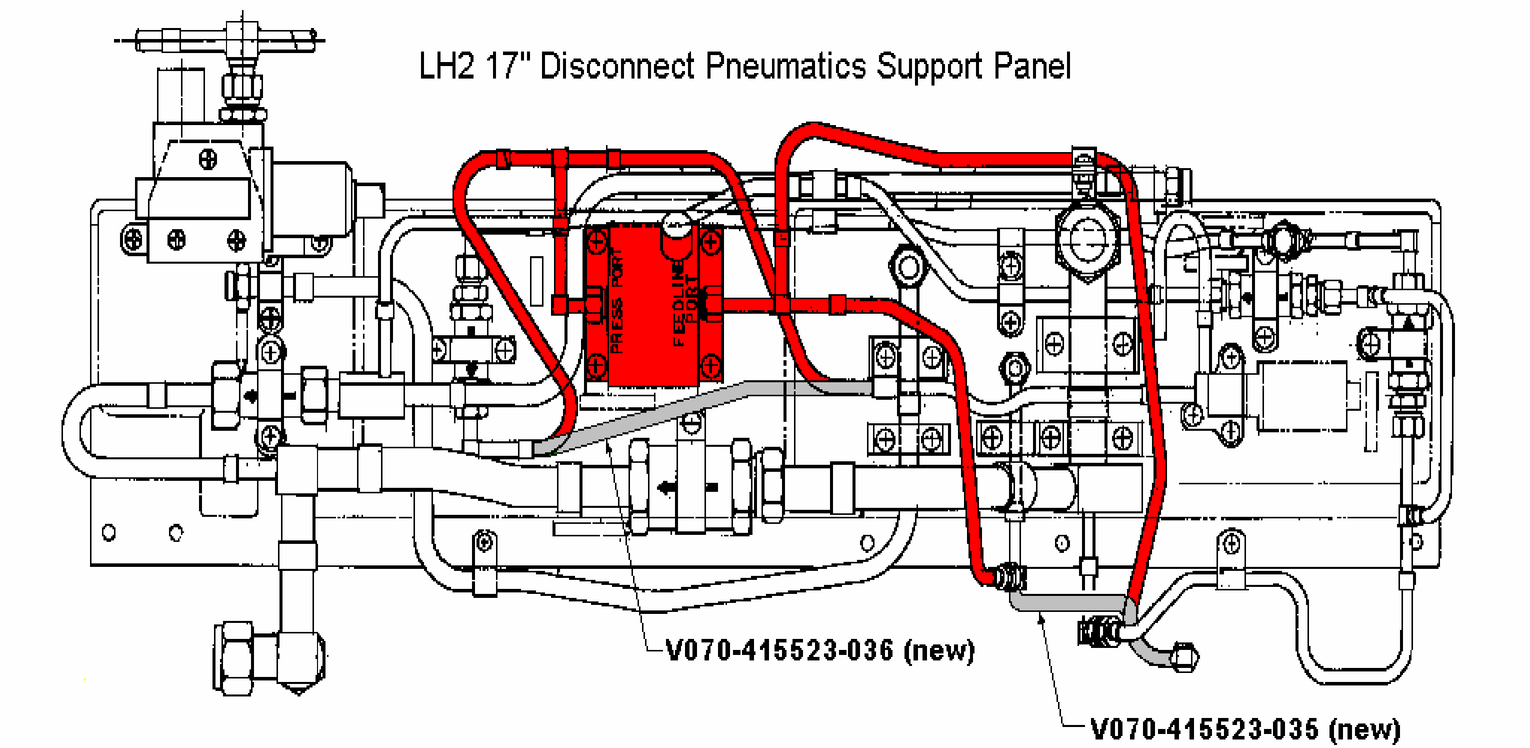
- The delta-P transducers have crit 1 CIL's for structural failure, but are no longer used
  - Used early in the program to constantly monitor propellant levels during tanking (not used during flight)
    - Provided a means of determining the propellant level in the ET LH2 and LO2 tanks between the point sensors in the bottom and top of the tanks
  - ET loading is now accomplished by timers and other system parameters based on experience of over 200 tankings
- Mod removes the delta-P transducers and their associated components/wiring as a safety improvement / risk reduction action
  - Eliminates associated criticality tracking, weight penalties of the unused hardware, and frees up 2 pressure (OI) data channels
  - Brings OV-103 and, and in a future flow, OV-104 in line with OV-105 original build configuration

MCR 23043 MPS DELTA-P TRANSDUCER REMOVAL

Presentor:

Organization/Date: Orbiter/6-29-05

DELTA P TRANSDUCER REMOVAL FOR LH2 DISCONNECT PNEUMATICS SUPPORT PANEL



New Lines Added

Lines/Parts Removed

- **Net reduction of 19 braze joints**
- **9 lbs weight reduction**

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 23123 MPS Engine Cutoff Point Sensor Wiring

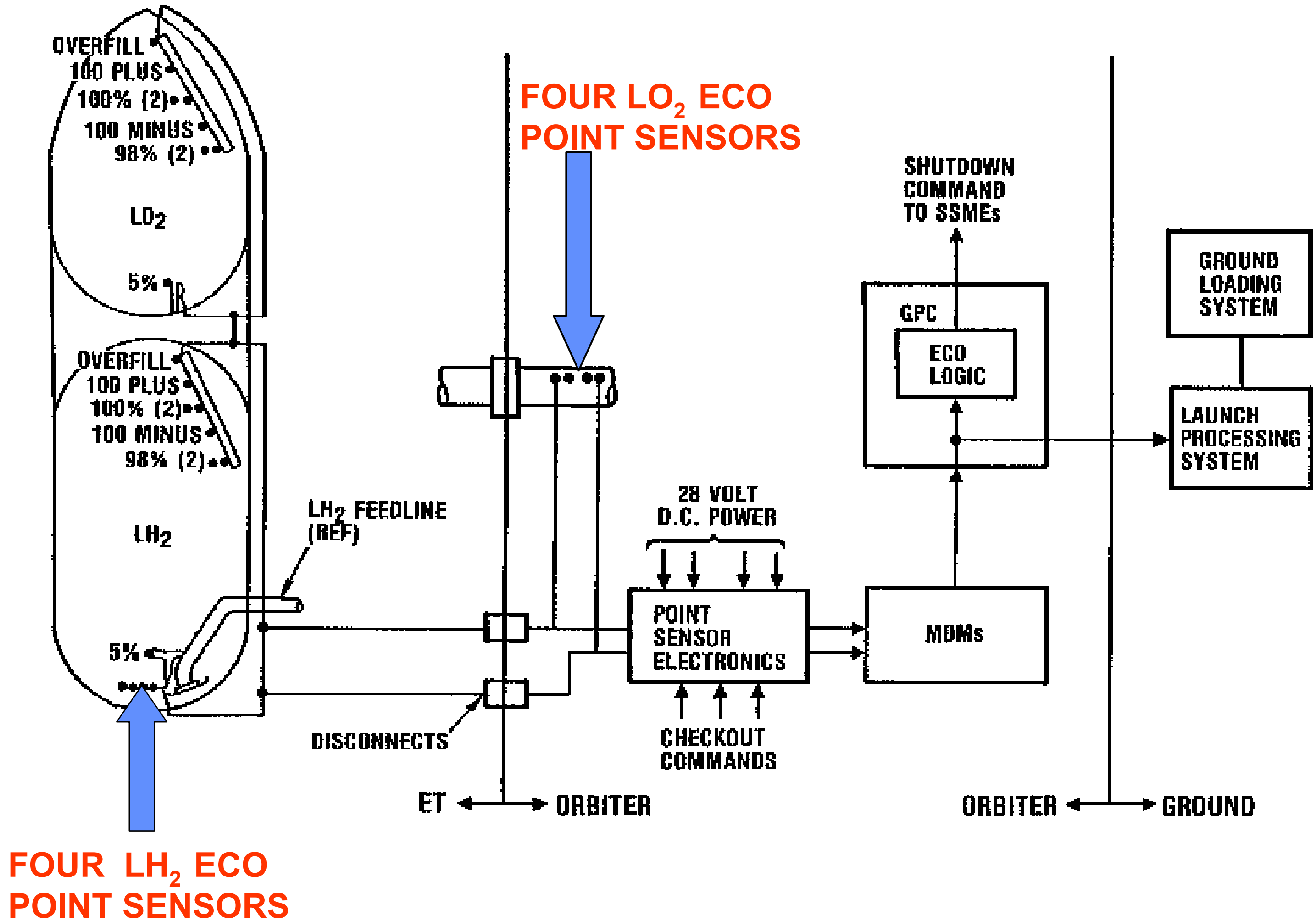
- Function of the MPS engine cutoff (ECO) point sensor system is to safely shutdown SSME's if LO2 or LH2 propellant tank depletion occurs
  - Four propellant depletion ECO point sensors located in the LH2 tank and four on the orbiter LO2 17-inch feedline
  - One Orbiter point sensor electronics box with four independent systems to power the sensors
  - Wet/dry status of the sensors are monitored by the Orbiter point sensor electronics box
    - If any two LO2 or two LH2 sensors provide dry signals prior to the MECO target velocity, the GPC will issue SSME engine cutoff commands
    - Minimum of any two of the four LO2 or two of the four LH2 ECO point sensor dry signals are required for GPC to issue a MECO command

MCR 23123 MPS ENGINE CUTOFF POINT SENSOR WIRING

Presentor:

Organization/Date: Orbiter/6-29-05

ET / ORB LIQUID LEVEL POINT SENSOR SYSTEM



PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

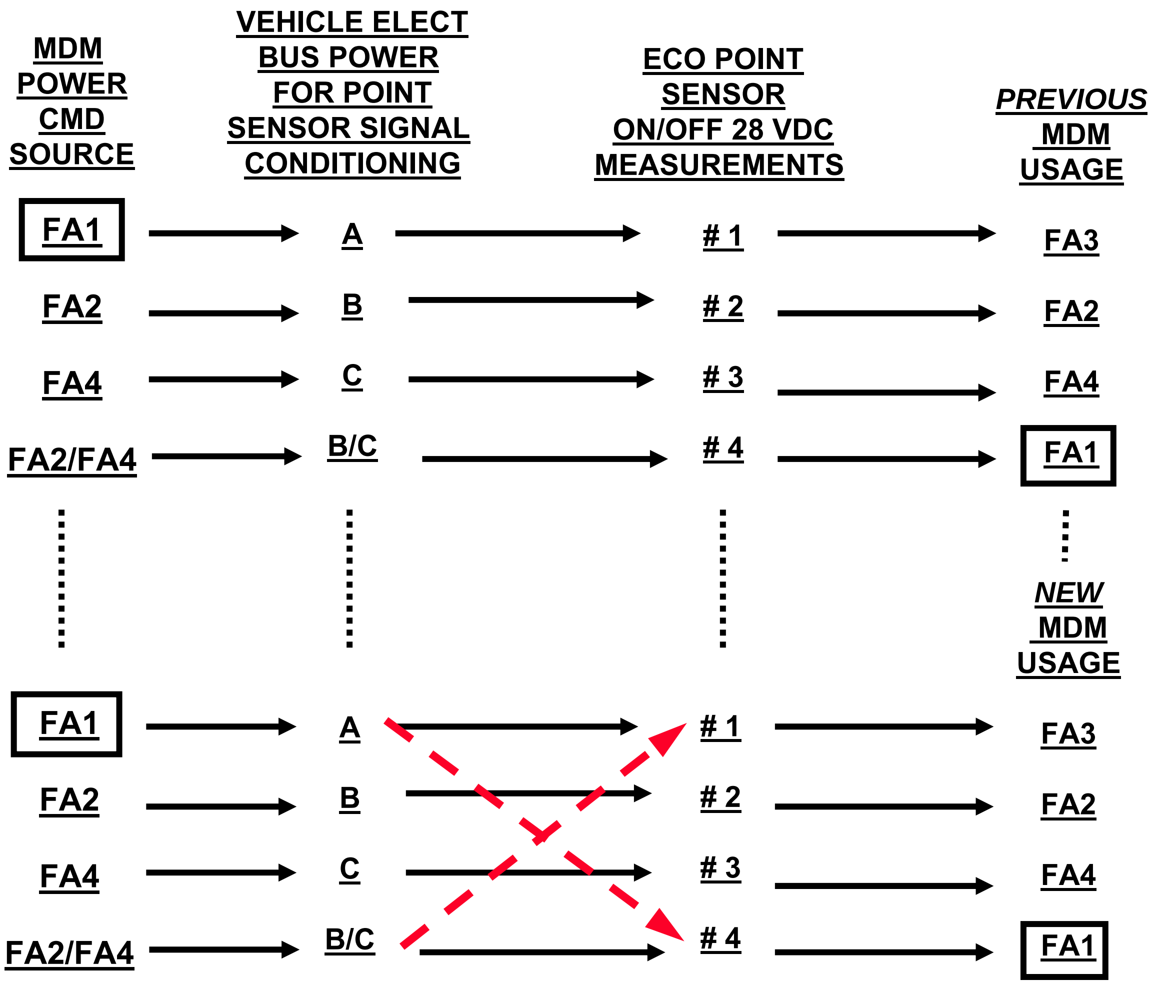
MCR 23123 MPS Engine Cutoff Point Sensor Wiring

- MDM FA1 power fail and one additional (LH2 or LO2) ECO point sensor would result in loss of 3 of 4 ECO point sensor measurements
  - Leaves inadequate instrumentation, preventing MECO command, should propellant depletion occur before the projected MECO target is achieved resulting in unsafe engine shutdown
- Vehicle wiring mod implemented results in loss of only one instead of two ECO sensors in the event of MDM FA1 failure
  - 28V power inputs 1 & 4 were swapped / repinned at vehicle electrical connectors 55P81 and 55P84 to the MPS point sensor electronics box in aft avionics bay 5
  - Reduces the ECO point sensor criticality to 1R3 from 1R2

MCR 23123 MPS ENGINE CUTOFF POINT SENSOR WIRING

Presentor:

Organization/Date:
Orbiter/6-29-05



Loss of MDM FA1 results in loss of 2 ECO point sensor GPC input commands

Vehicle wiring mod eliminates loss of 2 ECO point sensor measurement inputs with loss of MDM FA1

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PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

Pre STS-107 / J3 First Flight Mods

- 2 Avionics Related Modifications
  - MCR 19569 MPM Pyro Harness Mod
  - MCR 23160 COMSEC Redundant Power Wiring Mod

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 19569 MPM Pyro Harness Mod

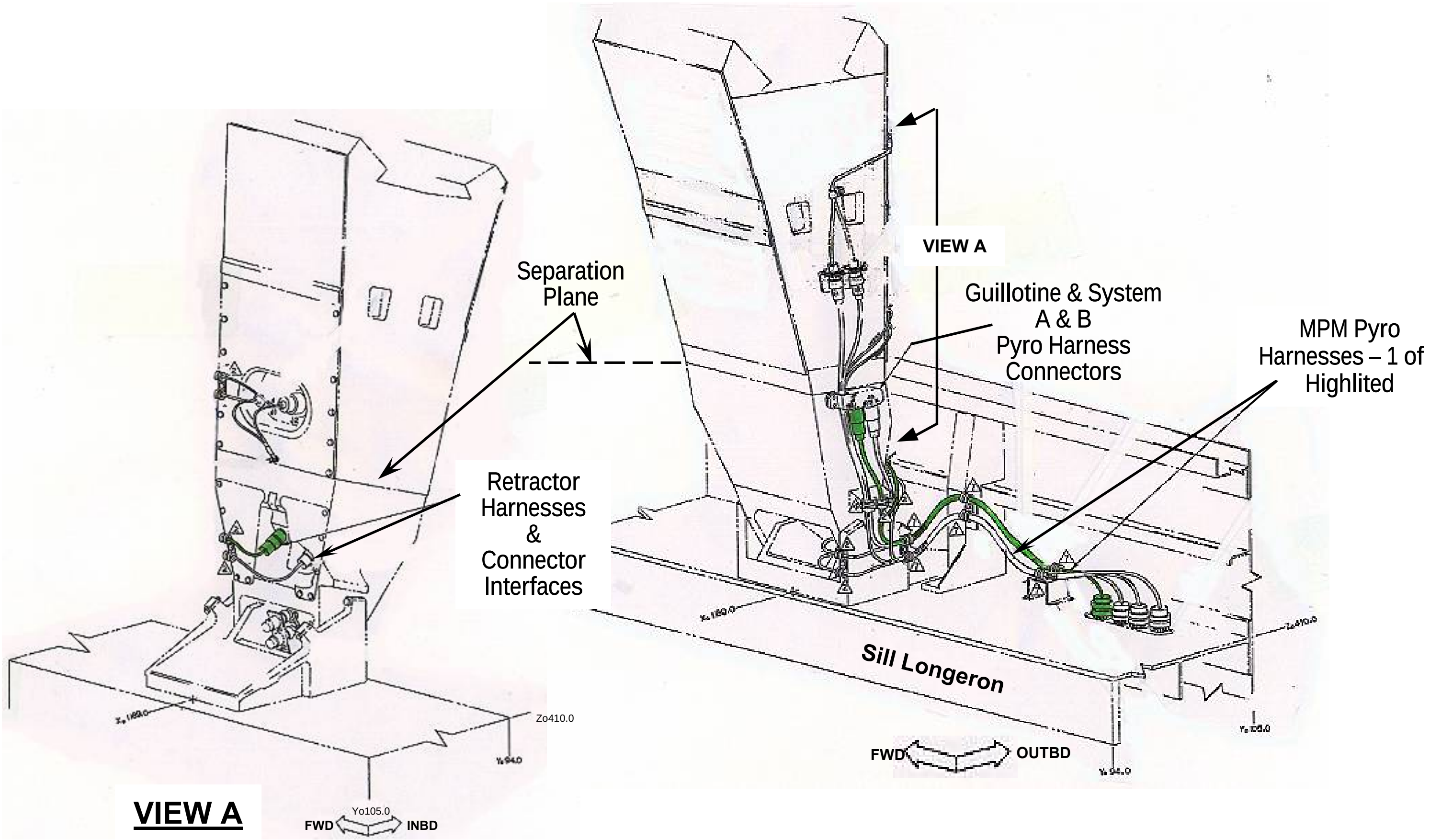
- MPM wire harnesses are multi-leg, carrying both pyro jettison circuits and MPM functional circuits
- Corrective action implemented because harness connector ID tags for jettison system retractor leg and guillotine leg had been previously found to be reversed
  - If the MPMs were required to be jettisoned, reversed installed harness would result in the Guillotine and the Retractor being fired simultaneously (out of normal sequence)
  - Analysis showed that, while this is not a desired situation, MPM separation will not be impeded by uncut wires
- Mod reworks existing MPM wire harnesses into two individual harnesses: one non-pyro and one pyro harness
  - Also changes the clocking of the guillotine pyro harness connectors to be different from the retractor connectors to preclude the possibility of harnesses connectors being improperly mated

MCR 19569 MPM PYRO HARNESS MOD

Presentor:

Organization/Date:
Orbiter/6-29-05

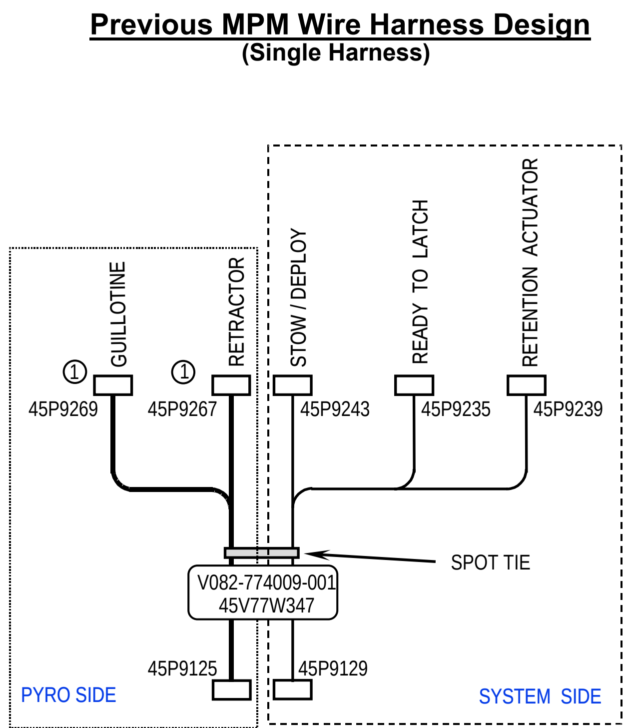
MPM Wire Harness Installation Overview

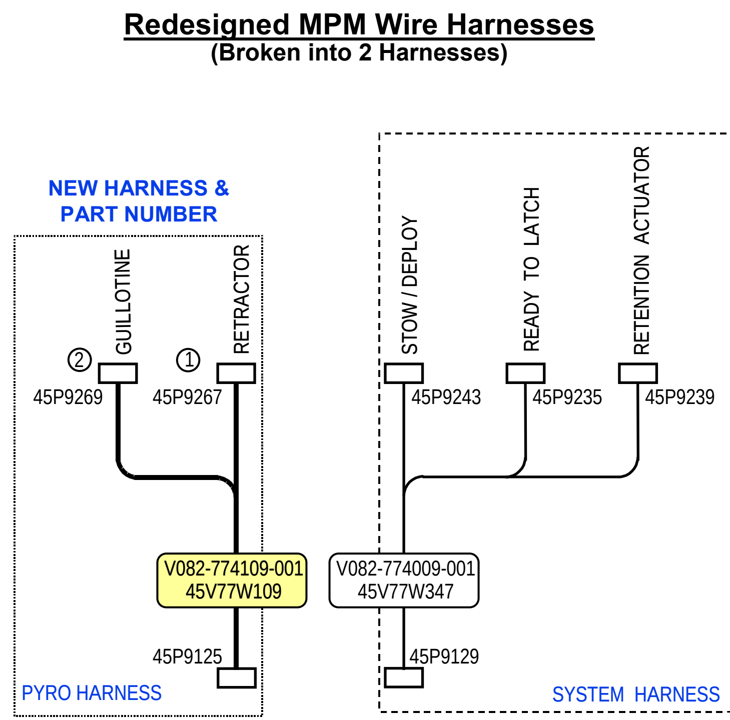


MCR 19569 MPM PYRO HARNESS MOD

Presentor:

Organization/Date: Orbiter/6-29-05





1 **EXISTING CONNECTORS HAVE IDENTICAL KEYING**

2 **GUILLOTINE CONNECTOR KEYING CHANGED**

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 23160 COMSEC Redundant Power Wiring Mod

- There are two Network Communications Security (COMSEC) boxes per vehicle, part of the Shuttle Orbiter S-Band communication system which provides a two-way link for voice, commands, and telemetry signals
  - The COMSEC is used for encryption and decryption of signals for communication / command security
- SAIL testing revealed that COMSEC units did not have full control power bus redundancy
  - Loss of either of the two control bus inputs would result in the loss (shut down) of one COMSEC Unit and the loss of its key load
- Modification implements wiring modification (swap wiring on two pins at electrical connector 81P143) to provide control bus power redundancy to both COMSEC 1 and 2

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Pre STS-107 / J3 First Flight Mods

- 3 TPS Related Modifications
  - MCR 19560 Piano Key Tile Carrier Panel Improvement
  - MCR 19725 Flight Demo of Advanced RSB Thermal Barrier Fabric and Coating
  - MCR 23158 ET Arrowhead Anti-Pinch Bushings

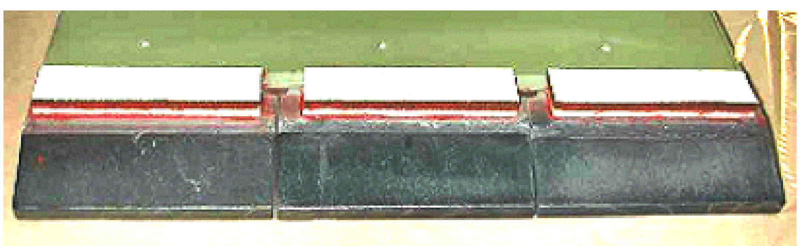
PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

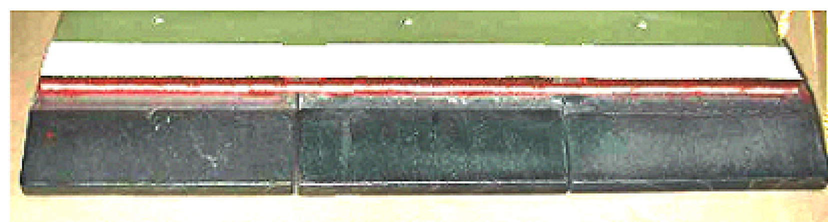
Organization/Date:
Orbiter/6-29-05

MCR 19560 Piano Key Tile Carrier Panel Improvement

- Eliminates tile to tile gaps of the protective insulation on the lower surface of the aft fuselage stub carrier panels
  - Eliminates heat flow paths which were allowing local filler bar and SIP charring at the aft end of the carrier panel tiles
- A sacrificial RTV edge member was also added to the aft side of the protective insulation material to facilitate maintenance



Previous Configuration



New Configuration

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

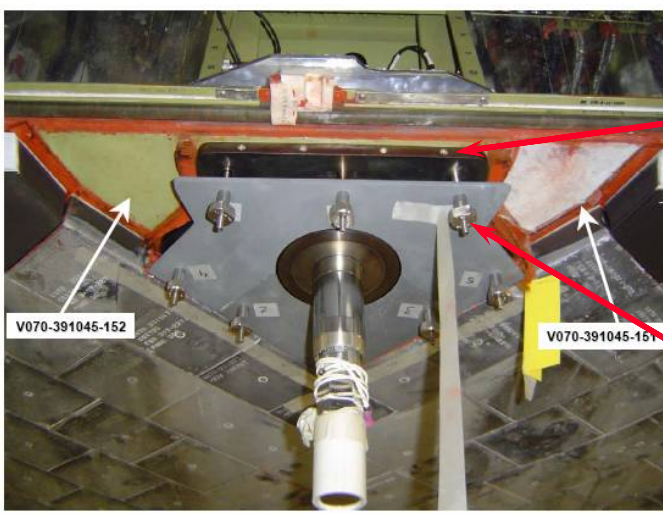
MCR 19725 Flight Demo of Advanced RSB Thermal Barrier Fabric and Coating

- Flight demonstration of a new, more durable 3-ply fabric and C-9 coating on the RSB trailing edge thermal barrier
  - Location chosen because it sees damage almost every flight.
- One side of the speedbrake will have a barrier made of existing material and new C-9 coating, and the other side will be made of both the new fabric and C-9 coating (for comparison)

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 23158 ET Arrowhead Anti-Pinch Bushings

- Adds a bushing sleeve to the inner mold line (IML) side of the arrowhead plate attach locations in the insulating blanket material
  - Purpose is to prevent snagging of blanket material during attachment fastener and standoff spacer installation and potentially pinching the blanket material between the arrowhead and structure
  - Eliminates blanket damage and potential of resultant step between the plate and tile along the outer mold line (OML)



Bushing sleeves added internal to the arrowhead assembly

Attachment Fastener & Standoff Installation Locations

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

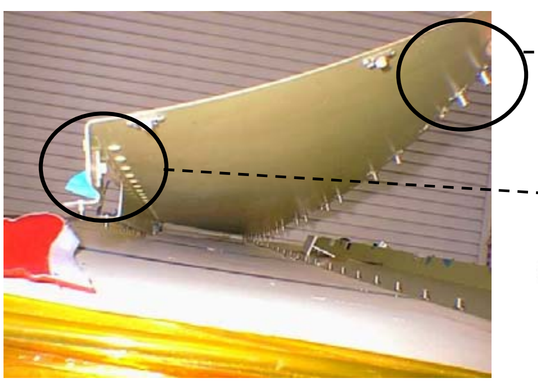
Pre STS-107 / J3 First Flight Mods

- 2 Structures Related Modifications
  - MCR 19558 Midbody Wire Tray Nutplate Redesign
  - MCR 23205 Acreage Doublers for Avionics Bays 4-6 Door Panels

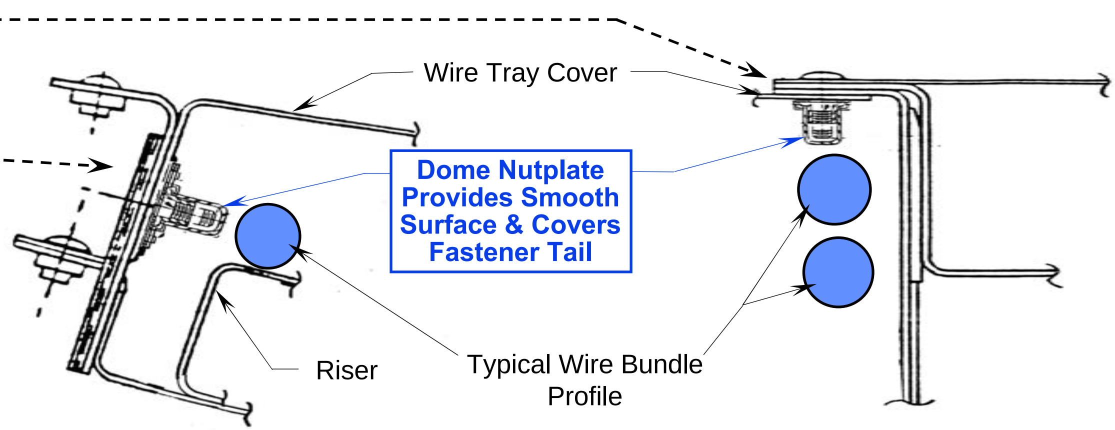
PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 19558 Midbody Wire Tray Nutplate Redesign

- Modifies midbody wire tray cover attachment nutplates to prevent wire damage and increase the number of nutplate re-use cycles
  - New design combines high re-use (50 cycle) nutplates with an added dome cover, which eliminates the sharp edge of the nutplate and covers the fastener tail, to better protect the wire bundles in the wire trays



Wire Tray Cover



Cross Sections Through Wire Tray

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 23205 Acreage Doublers for Av Bays 4-6 Door Panels

- Adds 0.040” thick doublers to each of the avionics bay 4, 5 & 6 honeycomb access doors (4 door panels per bay)
- Doors have experienced damage in the honeycomb panel facesheets (dings / minor cracking) due to ground handling - the doublers are intended to help provide damage resistance and durability

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES	Presentor:
	Organization/Date: Orbiter/6-29-05

Pre STS-107 / J3 First Flight Mods

- 2 Crew Systems Related Modifications
  - MCR 18755 Middeck Air Vent Covers
  - MCR 18755 Port LWTSA Hardwall Cushion Redesign and STS-114 Mission Unique Stbd LWTSA Cushion

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date:
Orbiter/6-29-05

MCR 18755   Middeck Air Vent Covers

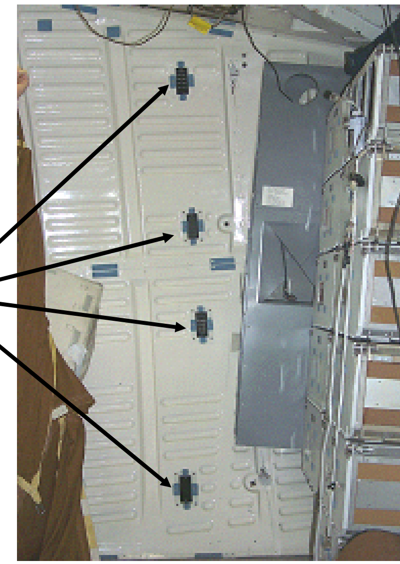
- Added removable nomex covers to the 2 starboard middeck wall center vents
  - Used to force more air through upper & lower vents when the air diverter ducts are utilized
  - Air diverter ducts previously flown - used to provide improved airflow around the in-flight stowage items, which restrict middeck air flow

CONFIGURATION CHANGES AND CERTIFICATION STATUS	Presentor:
	Organization/Date: Orbiter/6-29-05

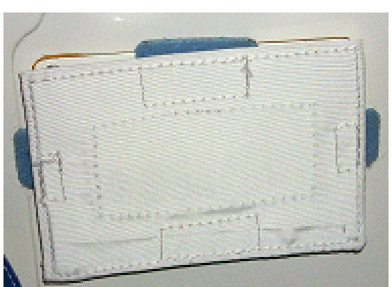
MCR 18755 Middeck Air Vent Covers (cont)

- Augments Existing Middeck Airflow
  - Area is used for in-flight stowage
  - Middeck air flow is being restricted by stowage items
  - Covered 2 wall center vents to force more air through upper & lower ducts
  - Diverter tubes previously added / flown on upper and lower ducts

Duct Vents



Center Duct Vent Covers



Lower Vent Duct

Upper Vent Duct

PRE STS-107 FIRST FLIGHT CONFIGURATION CHANGES

Presentor:

Organization/Date: Orbiter/6-29-05

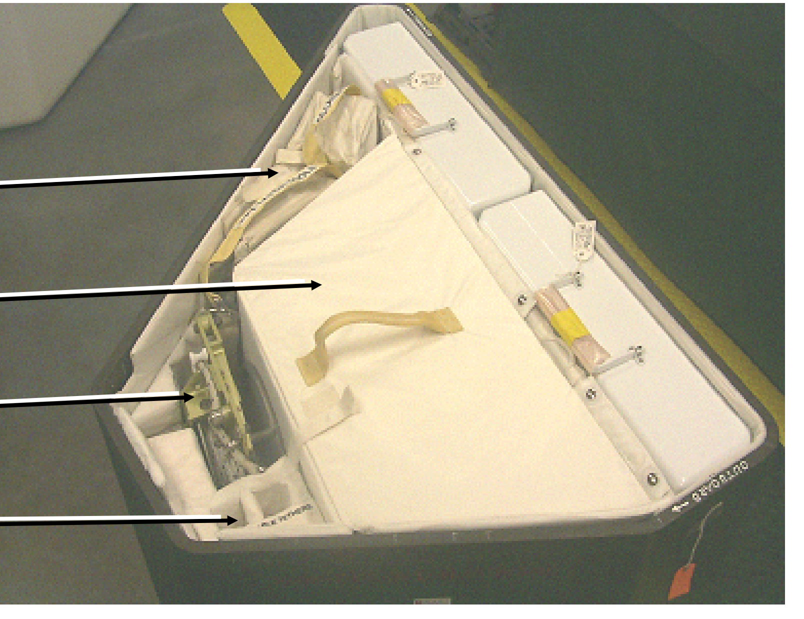
MCR 18755 Port LWTSA Hardwall Cushion Redesign and STS-114 Mission Unique Stbd LWTSA Cushion

- Provides a standardized stowage area within the TSA for commonly manifested contingency EVA tools (PLBD Latch Tools, RMS Rope Reel, Adjustable Tethers) and adds a new “hardwall” mission specific stowage area
  - Facilitates and lowers recurring cost of configuring and producing future port mission unique cushions - may be launched empty to accommodate return ISS stowage
- New Starboard TSA mission unique cushion assy will launch with the ESP2-W1 & W2 Cable Assy and return with the Flight Releasable Grapple Fixture (FRGF)

CONFIGURATION CHANGES AND CERTIFICATION STATUS	Presentor:
	Organization/Date: Orbiter/6-29-05

MCR 18755 Port LW Tool Stowage Assembly Cushion

- Standardized location of PLBD latch tools, RMS rope reel, adjustable tethers
- New standardized “hardwall” mission specific area
  - Facilitates and lowers recurring cost configuring and producing future port mission unique cushions
  - May be launched empty to accommodate return ISS stowage
  - Not utilized this flight



Latch Tools

Standardized Mission Specific Area

RMS Rope Reel

Adjustable Tethers

CONFIGURATION CHANGES AND CERTIFICATION STATUS

Presentor:

Organization/Date:
Orbiter/6-29-05

OV-103 STS-114 Pre STS-107 Modifications and Certification

MCR Number	Title	CAR Number	METHOD (T)est (A)nalysis (S)imilarity	Submittal Date Actual P=Plnd	Approval Date Actual P=Projected	Cert Status / Notes
10532	**Verify Non-Interference - Engine 2 Fluid Panel & Structure** Verifies elimination of interference at next assy by physical inspection and chamfers this part (Aft Fuselage Engine 2 Fluid Panel Shear Web) if required to eliminate interference with adjacent structure. (Ref EO V070-352778 A03).	No Certification Impact	N/A	N/A	N/A	
11621	**P/L Bay Door Drive Rod Bonded Closeouts** Adds fabric closeout strips to the mid fuselage sill PLB door drive rod penetrations holes to prevent debris migration.	No Certification Impact	N/A	N/A	N/A	No certification impact based on review of drawings and related background.
11621	**RH OMS Pod Titanium Attach Point Fitting** Changes out the attach point 2 aluminum fitting for a titanium fitting on OMS pod RP03. Mod unique to OV-103 RH OMS pod which is a converted static test article. All other pods had titanium fitting installed during build.	127-03-73A000015-1001F	A	1/18/05	TBD (P)	CAR to update certification for RP03 OMS Pod Config. with the titanium fitting.
11621	**Bay 10 Longeron Bridge Fitting Station Location Verification** Relocates longeron bridge fitting latch location markings for stations #270 0.82" aft and station #271 0.25" fwd on drawing. This is a verification issue only, EO V073-340290 A07 initially updated the drawing but the changes did not get incorporated at the 'A' Rev.	No Certification Impact	N/A	N/A	N/A	No certification impact based on a review of the EO and associated CR (02-340111-001).
11621	**Wing to Fus Xo 1191 Bolt Torque Change** The minimum class 3 torque requirement (1560 in-lbs) on a 9/16" RD111-4009-0936 wing-to-fuselage attach bolt at LH & RH Xo 1191 (1 on RH side, 1 on LH side) was found to be less than the minimum torque required to prevent joint gapping (S/B 1570 in lbs). Mod engineering revises the torque preload range for these bolts from 1560-1680 in-lbs to 1580-1680 in-lbs to increase preload range and margin to prevent joint gapping. Worked in conjunction with the torque check requirement implemented per OMRSD RCN KV15506R1.	159-02-340004-002M	A	07/19/01	08/21/01	CAR is for approval of the EAR # SJB0-01-23, Xo1191 Wing Spar Bolt Torque Increase.
11621	**Nose Cap Suppt Ftg Washer Instl** Corrects bolt callout and adds washers to prevent nosecap attach bolts from bottoming out before contacting attach fitting.	No Certification Impact	N/A	N/A	N/A	No Cert Impact - mod does not roll certified part numbers.
11621	**Add Cutlines for TCS Blanket Removal** TCS blankets for Bays 6 & 8 keels need cut lines added so that the blankets can be installed and removed without disconnecting wires or clamps and also provide proper fit around Tank set #5 PVD duct.	No Certification Impact	N/A	N/A	N/A	No Cert Impact - mod does not roll certified part numbers.

CONFIGURATION CHANGES AND CERTIFICATION STATUS

Presentor:

Organization/Date:
Orbiter/6-29-05

OV-103 STS-114 Pre STS-107 Modifications and Certification

MCR Number	Title / Description	CAR Number	METHOD (T)est (A)nalysis (S)imilarity	Submittal Date Actual P=Plnd	Approval Date Actual P=Plnd	Cert Status / Notes
11621	**Add Gap Fillers Fwd Fuselage Lower Surface** Installs gap fillers in NLG door area to prevent filler bar over-temp.	No Certification Impact	N/A	N/A	N/A	No Cert Impact - material used is similar to existing gap fillers.
12154	**ET Umbilical Door Latch and Drive Actuators (Torque Limiters) Modification** Redesigns the Orbiter / ET umbilical door latch & drive actuators (1 each per LH / RH ET door) by replacing the friction type torque limiters with the single ball type torque limiters to improve the reliability of the actuators.	03-45-287-0041-001H 03-45-287-0020-001H	A, T A, T	10/11/96 11/20/96	12/19/97 12/19/97	Umbilical Door Uplatch Actuator with ball / ramp type torque limiter. Umbilical Door Drive Actuators with ball / ramp type torque limiter Cert updates corrected random vibration requirements, submits test report & procedure update for door uplatch and door drive actuators.
		165-03-350013-001K 165A-03-350013-001K	A A	04/15/02 05/15/02	05/02/02 02/10/03	Certification of aft fus structural mod to accomodate new uplatch actuator Certification of aft fus structural mod to accomodate new uplatch actuator Note: Cert effectivity for 103 was 27-100, but mod deferred to J3 OMDP (flt 31)
16954	**Bay 12 PRLA Grounding Provisions** Mod adds holes to the to the gusset stiffeners just above the payload bay sill longeron in bay 12 LH/RH at Xo 1183.00 and XO 1220.00 for attachment of active latch wiring harnesses.	No Certification Impact	N/A	N/A	N/A	Cert not affected - no new part numbers created, no Stress Report required.
17112	**PLBD Expansion Joint Redesign** Design fix of PLBD expansion joints 1 and 2 to keep "dogbone" closeout seal assembly properly positioned during joint expansion and contraction. Replaced existing expansion joint dogbone seal retaining clips with longer extension brackets at the centerline and next outboard location to eliminate local structural damage and ensure proper function of expansion joint.	130-02-370004-002G 130A-02-370004-002G	A, S A, S	11/21/97 02/10/98	12/12/97 10/22/98	CAR 130A transmitted Analysis (IL) for OV-102 and OV-103 configurations.
17177	**FRCS Cone Bolts / Attach Bolt Torque Revision** Changes the installation torque of both the 10 "Z direction" cone bolts on the lower fwd fuselage FRCS sill and the corresponding FRCS installation bolts to a common class 2 torque to preclude cone bolt backout / torque loss on the cone bolts during mating bolt removal. FRCS installation OMI also revised to require cone bolt torque verification prior to module installation.	138-01-320101-058H	A	03/14/02	04/05/02	Approved attrition mod S086425DE.
17177	**EVA Short Slidewire Configuration Update** Installs the latest GFE config slidewire (red core to provide better visibility of damage to outer sleeving) and the short configuration to eliminate interference with payload. Boeing tech order M072-544700 E01 installs.	No Orbiter Certification Impact	N/A	N/A	N/A	Not a certified Boeing assembly. Possible GFE certification affected.
17177	**Re-ID Bay 2 RHS I/F Panel (ODS Elec Panel Reference Designator Change)** Deferred part re-ID from J2 - revised electrical panel ref des for ODS liner penetration interface panel located in payload bay 2 RH side to agree with coax ref des.	No Certification Impact	N/A	N/A	N/A	

CONFIGURATION CHANGES AND CERTIFICATION STATUS

Presentor:

Organization/Date:
Orbiter/6-29-05

OV-103 STS-114 Pre STS-107 Modifications and Certification

MCR Number	Title / Description	CAR Number	METHOD (T)est (A)nalysis (S)imilarity	Submittal Date Actual P=Plnd	Approval Date Actual P=Plnd	Cert Status / Notes
17177	**Re-ID Payload Bay Floodlights 2, 3, 4 and 7** Deferred part re-id from J2 for new floodlight part number.	No Certification Impact	N/A	N/A	N/A	
17177	**Hyd Sys Main Pump Washer Changeout** Installs larger diameter washers at the main hydraulic pump (to APU) mounting flanges to provide sufficient bearing area and minimize "coining" of the pump flanges during bolt torque.	04-30-580100-001F	N/A	03/06/02	03/26/02	CAR required to submit Stress Report.
17177	**GN2 Tank Interference Wiring Mod** Relocates bay 2 RH aft Xo693 wiring terminal board TB226 to alternate location and routes associated wiring to the new TB location to eliminate interference with the GN2 tank.	No Certification Impact	N/A	N/A	N/A	
17177	**Removal Of RTV on Engine Mounted Heat Shield** Removes RTV at the gap where the two engine mounted heat shield halves come together. OV-103 was the only vehicle which had the RTV requirement due to earlier belief that hydrogen gas could permeate into the aft compartment during ascent, however, it was determined that purge pressure in the aft compartment prevents this from occurring. The application of RTV is unnecessary work and removing this requirement achieves fleet commonality.	No Certification Impact	N/A	N/A	N/A	Review of cert files revealed no CR/CAR processed for addition of RTV on OV-103, so returning OV-103 to common configuration with OV-104 and OV-105 should not result in any certification impact. (ref V070-410005 D09 & CCBD S164329).
17177	**Removal of TCS Blanket Fasteners Above the Payload Bay Sill Longeron** Deletes TCS blanket attachment fasteners (tie-downs, studs & supports) above the payload bay sill longeron to eliminate unneccesary turnaround repairs. Sill longeron TCS blankets previously deleted, but attachment fasteners were left installed due to the processing flow impact of removal.	No Certification Impact	N/A	N/A	N/A	Certification Not Affected. TCS blankets were previously removed and these fasteners are no longer required.
17177	**Removal of Freon QD PD1 & PD2 and Payload GN2 Line 40 QD Dust Caps** Removes the requirement to install dust caps on freon system ground coolant QDs 50V63PD1 & PD2 located at the LH T-0 umbilical and payload GN2 ground coolant line no. 40 QD located at the RH T-0 umbilical for ferry flight. No technical requirement existed to re-install the dust caps following demate of the ground coolant QD's during processing, therefore the PRT determined that there was no need for the dust caps to be installed during ferry flight. Eliminates a ferry flight drawing configuration discrepancy.	No Certification Impact	N/A	N/A	N/A	Review of OV-105 flt 19 STS-113 FRR package shows that cert was not affected for this mod.
17177	**Thermal Tape Removal From Xo 582 Frame** Deletes the requirement to install thermal control (L-T-80) tape on the aft surface of the XO 582 frame - removal of this tape is required to perform structural inspection, driven by OV-102 J3 corrosion findings. Due to access restrictions that prevented re-installation of the tape from YO +50 to YO +105, the thermal effects of not re-installing the tape were analyzed and found to be acceptable. * Note small portion on OV-103 not completed due to access restrictions was deferred.	No Certification Impact	N/A	N/A	N/A	Certification not affected - mod does not impact top (certified) drawing.

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17177	**EMHS Threaded Fastener Torque** The MA0101-301 threaded fastener instl spec provides torque patterns and installation torque values for multiple fastener installations. To correctly install the EMHS all 192 fasteners must be installed before any torque on an individual fastener can be applied. To facilitate EMHS installation, this EO eliminates the need to utilize a torque pattern, instead to install all fasteners before final torque values are applied. The torque values are then again verified.	No Certification Impact	N/A	N/A	N/A	MA0101-301 process spec update. No certification impact.
17177	**RMS D&C Panel Extended Life Switches (GFE)** Single / direct drive switch on the GFE RMS D&C panel replaced with upgraded extended life switch. Original switch exceeded certified life because it is operated using "feathering technique" in single drive modes. GFE D&C panel installed by Orbiter tech order M072-730008 B06 updated to reflect RMS D&C Panel change from 51140E391-1 to 51140E391-3.	No Orbiter Cert Impact (GFE cert required)	N/A	N/A	N/A	Orbiter certification not affect, however GFE cert update required.
17177	**DMHS Threaded Fastener Torque** Clarifies the bolt installation & torque procedure for the dome heat shield bolt halves by specifying a top to bottom sequence of fastener installation prior to incremental torque for each dome half to provide proper distribution of bolt torque to the final class 2 torque. Expected to also reduce bolt hole galling damage caused by misalignment of dome heat shield and base heat shield structure mounting holes.	No Certification Impact	N/A	N/A	N/A	OV-105 flt 19 STS-113 mod website and FRR briefing indicated cert not affected.
17177	**OMS Engine Bolt Torque Change** Corrective action to replace existing RD111-4009-0308 fuel torus bolts with higher strength MD111-4020-0309 bolts and reduce fuel torus bolt torque to 54-60 in-lbs, enough to ensure both adequate seal and bolt strength margins to eliminate potential of bolt overload with new design V-seal.	17-12-621-0009-0001O	A	09/10/02	09/26/02	
17222	**RMS Elbow Camera Wedge Re-Engineer** The elbow camera wedge and thermal cover, part of the GFE SPAR configuration for the RMS assy, needed to be removed for off-line RMS processing and delivery (handling attach point) and then reinstalled in the OPF per SPAR drawing (out of station assembly - CM tracking issues). These parts have been removed from the SPAR drawing and are now installed by RMS instl tech order M072-544504, simplifying processing and paper tracking operations.	No Certification Impact	N/A	N/A	N/A	Tech order which installs the GFE is not a certified P/N; therefore certification will not be affected.
17605	**MEDS Scar** Installation of MEDS cabling/ wiring modifications & cooling hardware from the LH/RH AMI area to the forward flight deck for PLT/CDR displays and aft ADI display consoles. Multifunction Display Unit (MDU) is a liquid crystal display assy that generates, refreshes, and updates alphanumeric and graphical color formats from display data received from the IDP.	01-19-409-0185-0010A 01-19-409-0185-0020B 02-19-409-0185-0020C 03-19-409-0185-0020C 01-19-409-0185-0030A 03-19-730189-002F	T, A T, A T, A T, A T, A S	06/30/98 07/13/98 01/25/99 02/11/00 06/28/98 12/09/97	03/08/99 05/10/99 05/10/99 03/03/00 03/08/99 02/28/98	Certification of the Integrated Display Processor (IDP). Baseline Certification of Multifunction Display Unit (MDU). Approves "I" configuration for the LCDA MDU's. Certifies "J" configuration and subs for LCDA MDU's. Certification of the Analog-to-Digital Converter (ADC). Certification of the new MEDS Panel Assemblies. *See also MCR 18165 MEDS*

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17727	**Hydraulic Bellows Actuator** Replaced the three piston hydraulic accumulators with three new steel bellows accumulators, associated hardware/tubing, and wiring	01-30-284-0597-0001 02-30-364-0011-0024F	T, A S	10/07/98 06/01/98	11/19/98 07/13/98	Certification for new hydraulic acummulator. Certification for thermal control blankets.
17990	**PBD Aft Sealing Surface Redesign** Bonded spacers or shims (3 LH / 3 RH) to the aft PLBD sealing surface frame to improve compression on the Xo 1307 bulkhead environmental sea. Intent is to prevent air intrusion into the payload bay that could occur when the doors deflect due to ascent aero loads to eliminate TCS blanket damage, payload contamination / airflow impingement, or development of potentially high O2 concentrations.	130-02-370004-002G	A, S	11/21/97	12/12/97	
18099	**AV Bay 3A Cooling Mods (Follow-On)** Relocates the COMSEC panel In Av-Bay 3A to the middeck ceiling and re-routes the associated wires for the COMSEC panel to the new panel location. Removes and replaces (2) Av-Bay 3A Shelves (1 & 1A) with higher strength shelves to support new locker configuratons and updates locker fasteners to the new milson fastener design. *(Note cooling duct mods performed at previous OMM).*	06-22-613400-001F 137-04-331002G	A A	03/26/96 07/22/96	04/24/96 07/22/95	Certification for Bay 3A Ducting System. Certification for Bay 3A Duct Support Structure.
18165	**MEDS** Multifunctional Electronic Display System (MEDS) replaces by retrofit the Monochrome Multifunction Cathode Ray Tube Display Subsystem (MCDS) and dedicated display electromechanical flight instruments and associated electronic drivers with 11 Active Matrix Liquid Crystal, full-color flat panel displays, making cockpit displays available on any forward screen. Completely replaced forward panel structure; modified cockpit display and switch panels; replaced ducting for active cooling; installed power, flight critical bus, MEDS 1553 bus and analog signal wiring; removed MCDS triaxial cables and wiring; and installed 4 Integrated Display Processors (IDP) and 4 Analog-to-Digital Converters (ADC).	04-22-613760-001E	A	05/21/99	02/21/00	Certification for Active Cooling Ducting. *See also MCR 17605 MEDS scar*
18189	**Bay 2 Keel Blanket Relocation** Bay 2 keel pan blanket access holes to provide proper access penetration location for keel harness electrical connectors.	25-09-362000-001AP	S	12/20/96	01/27/97	
18189	**Re-ID Harness Behind Panel M013Q** Harness re-id only associated with previously implemented mod.	No Certification Impact	N/A	N/A	N/A	Wiring is generically certified.
18235	**Correct GN2 Line Interference** Re-routes the V070-614190 GN2 line (previously installed by this MCR as part of the additional GN2 tank provisions) to a new configuration to eliminate an interference issue with the G070-534784 GSE track pan at Xo 899 and Xo 1125. MR / procedural workarounds have been used prior to working this mod.	No Certification Impact	N/A	N/A	N/A	Certification not affected - utilizes previously certified materials.

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18315	**T-0 Cooling for ISS MPLM (Instrumentation Wiring)** Installs only instrumentation wiring in the crew module, midbody and aft in support of the active MPLM cooling scar, which remains as part of this original MPLM cooling scar mod (completed by MCR 19343).	No Certification Impact	N/A	N/A	N/A	Instrumentation wiring change only - wiring is generically certified.
18387	**Bay 5 Shelf 6 APCU Mounting Hardware Physical Verification** Mod relocates (1) nutplate and installs (2) inserts on avionics shelf 6.	02-24-635100-001D	A, T	11/08/96	07/16/97	
18509	**Condensate Separation Mod** Modification to the ECLSS waste management system which will allow condensate effluent to be separated from urine waste water and provide the capability to collect the separated condensate in CWC's at a new, permanent crew interface point. Mod driven by ISS requirement that Orbiter waste water dumps be inhibited during docked operations to preclude contamination of sensitive station components - collecting condensate in CWC's increases the waste tank ullage available for urine, extending the time required between waste water dumps. Mod involved laying in a new plumbing run to collect condensate from the humidity separator B test port and route it to a new collection interface QD in an existing middeck floor feedthru plate	01C-23-623200-001C 02-22-621-0008-0007F 03-22-621-0008-0007G 04-24-271-0089-1004E 05-24-271-0089-1004F	A S S S A,S	06/09/00 03/20/00 03/05/02 06/09/00 04/04/01	10/12/00 11/28/00 05/22/02 11/16/00 07/27/01	Certifies tubing installation for the condensate sparation line. Certifies fluid check valve for water separator system. Certifies additional humidity separator configurations. Certifies 3 new flexible tube assembly part numbers. Certifies additional flexible tube assembly part number.
18695	**Av Bay 3A Cabin Fan Package** Replaces the current avionics fan package in bay 3A with a cabin fan package which provides greater flow for cooling of future actively cooled middeck lockers planned for ISS flights. This mod was reversed, in part, because the new fan package consumed significantly more power and is not needed for STS-114 since there are no actively cooled lockers required (see MCR 19393).	02-22-610001-005B 03-22-621-0008-0005D 08-22-613400-001H	A T, A, S A, S	04/08/02 11/16/98 06/30/98	06/18/02 06/28/99 03/08/99	ARS system & cabin fan package acoustical noise level certification. Certification fo Fan Package. Certification for ECLSS Ducting.
18722	**External Airlock Heater Instl Bracket Removal** External A/L heater installation bracket removal (V828-341059-002) deferred from STS-96 (reference STR-3-A024\A027).	01A-22-363-0060-0001A	A	05/22/97	09/08/97	

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18738	**Hydraulic Oleophobic Filter System Improvement** Aging PDU shaft seals were causing increased hydraulic fluid leakage in the oleophobic filter system, causing filter saturation which could have resulted in a contamination issue for the orbiter, payloads and ISS due to overboard fluid leakage. To preclude the possibility of filter saturation, the oleophobic filters were removed and the rudder / speed brake PDU drain line and body flap PDU drain line were re-routed to the xo 1307 bulkhead	05-30-580709N	A	03/09/98	05/12/98	
18872	**Radiator Impact Protection + Man/Auto Isolation** Implements radiator panel freon tube protection to make penetration of a Freon tube less likely from M/OD impact by adding 0.020" thick aluminum doublers to the panel facesheet directly over the Freon tubes and wrapping external manifold tubes with an additional layer of beta cloth. Also adds isolation valves for capability to isolate the radiators from the Freon loops in the event of radiator Freon leakage - automatic leak detection and control via software in the event of a radiator leak.	03-24-203-0002-0013C 04-10-284-0472-0001F 01-24-284-0603-0001A 02-24-634480F	S T T, A A	09/14/01 12/16/98 05/18/99 10/21/99	11/15/01 03/17/99 06/27/99 12/11/99	Radiator & associated system hardware certification. Certification for Check Valve. Certification for Isolation Valve. Analysis addendum for line mounted pressure transducer.
18888	**Av Bay 1/2 Air Cooling and Middeck Power Panel Mod** Installed mods for future avionics bays 1 and 2 ISS payloads lockers requiring cooling capability - av bay 1 adds 350W of cooling and av bay 2 adds 150W of cooling capability. Added ducting scar and provisions for installing flex ducts and lockers. Added an electrical utility power panel for additional utility power requirements in the middeck ceiling.	13-22-613400-001L 04-19-730150C	T, A S	05/01/02 08/31/98	08/27/02 11/17/98	ECLSS ducting. CAR and Errata approved concurrently. Avionics certification.
18924	**MPS He Low Pressure 2 Way Solenoid Valve Configuration Upgrade & Recert** Config change / part dash number roll for the low-pressure two-way solenoid valves based on the vendor's manufacturing process changes and fatigue life capability testing. Current config valves with limited pressure cycle life capability will be restricted to locations which see very few pressure cycles per flight, while valves with 100-mission capability will be allowed in all locations. Certification for all the valves will then be upgraded to 100 missions. (All limited life valves to be removed prior to reaching the current 35-mission limit.)	04-10-284-0403-0001H	T, A	01/23/02	12/10/02	
19029	**DDU LRU Replacement for MEDS** Installed a new flight control power supply (FCPS) with redefined nomenclature as the "Device Driver Unit" (new DDU) to replace the Display Driver Unit (old DDU) as part of the MEDS modification in the crew compartment	01-17-464-0451-0001A	T, A	08/16/01	10/18/01	

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19033	**Umbilical Plate Gap Delta Pressure Transducers** Modification installed primary and redundant pressure transducers to measure purge pressure in the LH2 and LO2 ET/Orbiter disconnect plate gap. Provides direct and accurate verification of positive plate gap cavity purge during cryo loading, a major improvement over the current method of monitoring plate gap purge, which only provided a gross indication that purge was flowing. Modification utilizes an unused LH2 and LO2 umbilical electrical monoball GSE port as a permanent plate gap pressure tap site, a new flexhose and hardline ports the cavity pressure from each umbilical plate gap to the two redundant pressure transducers mounted on structure just aft of the umbilical area.	03-20-449-0178-0101D 01-10-415920-010	A A, S	01/18/01 01/18/01	02/26/01 07/27/01	Low Range Pressure Transducer (CAR approved for OV-103 Flight 30 & subs.) Umbilical Plate Gap Purge Pressure Measurements (same effectivity as above.)
19047	**Fwd Bulkhead Floodlight Coolant Line Removal** Removed X0576 bulkhead floodlight and associated water cooling lines, coldplate and supporting hardware to eliminate concern of potential line or colplate freezing and hardware/system damage. Installed additional TCS blankets on the bulkhead in the area vacated by the pre-existing hardware.	07-22-613890-001J 19-09-260002AI 47-09-362000-001BL	A, S A, S A	02/17/00 09/20/01 11/02/01	10/10/00 02/05/02 02/05/02	ECLSS - removal of fwd bulkhead floodlight coldplate & freon lines. Certifies new TCS insulation fasteners. Certifies new TCS installation configuration.
19092	**Relocate Hydraulic Main Pump Check Valve** Implements hydraulic system mods to move the hydraulic supply check valve from the filter module inlet to the main pump outlet. Provides capability to perform high pressure leak test of the pump discharge lines in the OPF during normal GSE operation, as opposed to having to perform this check at the pad during APU hot-fire. *Pre STS-107 (First Flight)*	02-30-621-0026-0001F 03-30-271-0079-1012L 03-30-364-0011-0024G 04-30-271-0079-1012M 04-30-580100-001F 05-30-271-0079-1012M 05E-30-281-0029-0002H 05F-30-281-0029-0002H	S S S S A T T A	10/19/00 10/19/00 04/25/02 07/18/01 03/06/02 04/03/03 10/27/02 11/08/02	7/5/01 05/08/01 09/26/02 09/28/01 03/26/02 03/22/04 02/10/04 11/08/02	Filter Module, Hydraulic Hose Assy, Hyd. Med. And High Pressure Adds new insulation blanket to hydraulic pump (Deferred to OMDP for OV105). Hose Assy, Hyd.,Med & High Pressure Revise washer size between pump and APU. Cert Test to reflect work on all ME271-0029 High Pressure Hoses. Pump, Hydraulic, Variable Delivery,3000 psi. Approval was delayed until CAR 06A was submitted which transmitted the Parker test procedure. The test procedure, #TP-1360, was previously proprietary. Parker changed the classification on 7/24/03. Cert Deviation to replace CAR 05D and to add gapping req'mts for the qualified pump configuration.
19099	**OMS/RCS Heater Test Point Relocation** OMS/RCS heater circuits require continuity test verification each time copper paths are disrupted, which required significant ground operations impact for removal of the AP59-63 and AP59-64 doors to access OMS/RCS heater test points located in the “dog house” cavity. The OMS/RCS heater test point connector has now been extended through the existing “dog house” cavity and penetrated into the aft compartment, allowing OMS/RCS heater checkout to be performed from the aft compartment.	152-03-350013-001K	S	11/05/98	12/02/98	CAR approved for OV-103 Flight 26 & subs.

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19112	**Wireless Video System (WVS) Installation** The WVS system is used to provide video documentation of EVA crew activities, utilizing cameras mounted to the EVA crew member's helmet. The vehicle side of the WVS is comprised of both Boeing provided scar hardware and GFE equipment. The vehicle system elements consist of the following: Seven GFE S-Band antennas, at various locations in the payload bay, for receiving video from the EVA helmet camera and one GFE UHF antenna, relocated to the ODS aft truss by MCR 23278, for sending commands to the helmet cameras. The structural mounting provisions for the antennas are Orbiter provided mission kit hardware. Two GFE transceivers are installed in midbody LH bay 5, shelf 5, serving as junction boxes for command (power and signal) functions from the crew module flight deck to the antennas and for transmitting video image from the antennas back to the flight deck. (see notes for continuation of description)	37-09-362000-001BB 14-09-367000-001X 157-02-340004-002L	S S S	05/14/99 05/14/99 03/11/99	07/15/99 07/20/99 04/14/99	Wireless Video Antenna Support Brackets. Modify and reroute retainers to support WVS. Wire tray modifications to support WVS. Orbiter provided the scar mounting provisions for the transceivers and coax cables, power wiring in the payload bay to carry antenna signal, antenna and transceiver power, and antenna heater power and command and signal between the transceivers and the flight deck. Power and heater control is provided by two switches (57 & 58) added to modified aft flight deck panel and flight deck control of camera and video functions is via a GFE WVS Interface Box (WIB) which will be installed as part of the Video Processing Unit (VPU) panel in flight deck mission station console R12.
19271	**WCCS System Check Valve Deletion** Window Cavity Conditioning System (WCCS) desiccant manifold check valves have required significant maintenance to assure the time/cycle limited (9 months) valves operate properly as the redundant system flow path (crit 1R2). WCCS provides for depressurization and repressurization of the window cavities, prevents moisture and contamination from entering into the window cavities, and supplies purge conditioning to the cavities to dry them during ground processing. Mod removes the WCCS check valves and replaces them with an additional parallel desiccant cartridge to serve as the redundant system flow path. The dual desiccant system provides for much higher reliability and lower ground processing maintenance. *Pre STS-107 (First Flight)*	02-14-381120H 06-14-381071-002H 103-04-332501-002C 103-04-332501-002C (Errata) 125-01-310004-003E	S A S S S	01/23/04 12/21/04 02/14/05 06/15/05 05/17/05	06/13/05 06/13/05 06/27/05(P) 06/27/05(P) 06/15/05	Desicant Canister Assy Certification. WCCS System Installation Certification. L. H. Egress Hatch Installation Incorporate Linda Estes comments. Upper Fwd. Fus. Struct. Assy-Revises installation of WCCS Check Valve Deletion
19309	**Vert Tail Inspection Port - TPS Insert Hole** The vertical tail tip forward spar shear pin is inspected at interval per V30 structural inspection requirements and requires a fastener to be removed from the structure to allow access for borescope inspection of the shear pin. The fastener is located under the filler bar at two adjoining tile and removal of both tiles is required to access the area to remove the fastener. Modification changes the local TPS tile configuration, making the footprint of one of these tiles large enough to incorporate a removable ceramic plug, integral to the tile, located above the structural fastener, allowing the fastener to be removed to perform the structural inspection without tile removal. A total of four tile in this area were locally redesigned to accommodate the larger footprint tile.	No Certification Impact	N/A	N/A	N/A	Cert is not affected - utilizes previously certified materials and processes.

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19309	**ET Door Fitting Corrosion Protection** Applied RTV corrosion protection between both LH/RH ET door hinge fittings and ET door to prevent development of corrosion due to dissimilar metals.	10-45-565000-001L	S	09/28/00	11/16/00	CAR approved for OV-103 Flight 29 & subs.
19309	**Vertical Stabilizer Shear Attach Bolt Inspection Access Mod (TPS)** Modifies mounting structure used to attach carrier panels at the side vertical tail to aft fuselage joint shear bolt area to facilitate future access to structural attach bolts for inspection. Replaced rivets in the support brackets with screws and nut plates.	No Certification Impact	N/A	N/A	N/A	Cert not impacted - no new dash numbers created at top (certified) drawing.
19309	**Crew Hatch Carrier Panel FRSI Plugs** Filler bar closeout rings at the bottom of the side hatch carrier panel fastener ceramic plug inserts were experiencing flow erosion, requiring the filler bar closeout rings to be removed and replaced on a frequent basis. Mod installs FRSI plugs (10 plugs in 4 tiles) in the ceramic inserts to prevent flow intrusion into the fastener/insert hole to prevent filler bar erosion (ceramic closeout plugs for the rings had been eliminated early in the program as a processing schedule savings).	No Certification Impact	N/A	N/A	N/A	Cert not affected - utilized previously certified materials and processes.
19343	**MPLM Dedicated Heat Exchanger Mod** Multi-purpose logistics module (MPLM) is an element of the International Space Station (ISS) designed to transfer supplies to the ISS. Active MPLM requires a cooling system to transfer perishable materials requiring refrigeration to/from ISS. Orbiter and payload integration hardware mods required to support MPLM active cooling missions. Primary orbiter modification is installation of a dedicated payload heat exchanger which simultaneously supports active cooling requirements for MPLM and Middeck Active Payloads. Orbiter hardware mods consist of the following: Payload Heat Exchanger (Water-to-Freon 21); Orbiter Freon 21 Plumbing; Orbiter Water Loop Accumulator, Water Plumbing and Water Loop Thermal Control System; Heater Control Panel (A14 Panel); new Xo920 Payload Interface Panel; Instrumentation; T-0 Umbilical Modification (Port and Starboard). GSE Modifications Required to Starboard Side T-0 Umbilicals to support dedicated MPLM Power And Data Ground Service Interfaces. *Pre STS-107 (First Flight)*	01-24-250-0001-0095A 01-24-282-0123-0001D 01-24-363-0038-0105B 04-24-610005-OFT(B) 07-20-449-0177-2101L 01-24-276-0044-0004A 162-02-340004-002M	T, A, S T, A T A, S T T, A A	04/18/02 08/07/02 06/26/02 04/22/02 05/31/02 04/26/02 03/28/02	07/30/02 02/10/03 08/25/02 05/13/03 07/29/02 06/18/02 04/29/02	Cargo Heat Exchanger. Payload Heat Exchanger Accumulator. Heater Line, ECLSS. Certifies the performance of the ATCS with the new Cargo Heat Exchanger. ME449-0177-2571 Pressure Transducer is intended for use on an MPLM water line. Active Thermal Control- Nitrogen Disconnect. Design Change to Secondary Structure to support Heat Exchanger and Accumulator to MPLM. Note: MPLM mod originally implemented under MCR 18315 (10/11/95) as primarily a payload mission kit to provide MPLM cooling during ground operations - design feasibility dictated a new approach was required. Payload Integration Hardware ultimately will consist of: Remotely Operated Fluid Umbilical (ROFU); Remotely Operated Electrical Umbilical (ROEU); MPLM Cooling Payload Integration Hardware; Payload Integration hardware for MPLM water loop & Flow Meter

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19376	**Milson Fastener Mod** Modification installs redesigned milson fasteners, modified to provide additional solid cross-section length to penetrate the vehicle wire tray shear plane in the crew module avionics bays locker locations, to restore capability of meeting the OVEI 20-g crash load requirement. Components modified in support of this mod include the lightweight middeck lockers, thermal debris panels, structural debris panels, turnbuckles and vehicle wire trays.	02-25-000907-001A 16-25-661602-001N 03-25-660800-001B 07-25-661612-001F 09-25-660511-001H 142-04-331002H	S S S S S A	03/28/01 03/28/01 05/07/01 03/28/01 04/25/01 07/10/00	06/25/01 05/29/01 06/29/01 07/05/01 06/25/01 08/22/00	MA9N Bags and Frame. Turnbuckle - Milson Fastener Modification. Eliminates over-rotation/ unintentional locking problem. Panel - Avionics Bay Closeout Kit. New Thermal/Debris Panel Thickness Requirements for New 20G Milson Fastener. Vehicle wire trays
19389	**Bay 4 GN2 Tank Mission Kit** Re-engineers the Bay 4, Right Hand Side Forward GN2 tank installation from a permanent (V070) installation to a mission kit installation (tech order instl). Allows for a standard 6 GN2 tank configuration for the fleet to minimize tank removals and sets up the vehicle with two N2 mission kit tanks in bay 4 RH to facilitate tank installations and removals (ground processing enhancement) based on mission N2 requirements. *Pre STS-107 (First Flight)*	No Certification Impact	N/A	N/A	N/A	Mod does not impact tank installation part numbers and function of the system not affected; piece-part changes and part number reassignments from vehicle to mission kit - cert not affected.
19393	**Av Bay 3A Revert to Avionics Fan** Plan was to install a cabin fan package in support of future bay 3A locker cooling, however, the cabin fan package was found to have a big power draw on cryo consumables. This mod reinstalled the original av bay fan package with some modifications to allow the cabin fan package to be 'interchangeably' installed by mission kit when future mission requirements dictate. Provides the flexibility in bay 3A to utlize either the lower power avionics fan when no payload locker cooling is required or the high power cabin fan when payload locker cooling is required.	13-22-613400-001M 4-22-621-0008-0005E	T, A A	5/1/2002 11/29/99	08/26/02 03/07/00	CAR for ducting. CAR was worked under MCR 18888R3. CAR for avionics bay fan package interchangability.
19400	**Modular Memory Unit Upgrade** New Modular Memory Unit (MMU) LRU is comprised of the Orbiter Solid State Recorder (SSR) and the Solid State Mass Memory Unit (SSMM). There are two MMU LRUs per Orbiter, the purpose of which is to replace the aging mass memory units (2 per vehicle), Ops recorders (2 per vehecle) and payload recorder (1 per vehicle) - 2 MMUs now perform the function of the 5 previous LRUs. SSMMs 1 & 2 are functionally transparent replacements for old MMUs 1 & 2; SSRs 1 & 2 perform all functions of previous OPS Recorders 1 & 2 and PL Recorder. MMU 1 is physically located in the avionics bay 1 slot vacated by the payload recorder and MMU 2 is located in the avionics bay 2 slot vacated by Ops Recorder 2. Benefits of the new MMU are: Replacement of outdated, less reliable electromechanical tape recorders with flash memory storage; provision of open architecture, which allows for growth; reduced LRU count from five to two LRUs with associated vehicle weight reduction of 165 lbs in the forward and reduction of avionics power consumption by 316 watts.	01-20-409-0241-0003B 01A-20-409-0241-0003B	T, A, S A	10/03/01 12/10/02	12/05/01 01/21/03	MMU certification. Submits MMU EAR # 1HB682

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19427	**MPS/SSME Interface Pre-Cast Foam Closeout** The process of 'foam in place' of the 12" LH2 feedline (F1) and the 2" recirculation return line (F4.3) at the Orbiter / SSME interface was a time and labor intensive task for both the installation and removal of the insulating foam (performed each flow because of SSME removal and installation). Design enhancement established pre-cast foam closeout sections for these joints - sections are taped in place with LT-80 tape and voids between the foam sections and the feedline are filled by injecting RTV through pre-drilled holes in the foam. Greatly enhances installation and removal process and time. Design concept previously fit-checked at each engine joint location and thermal characteristics verified at Stennis under cryo loading and engine firing conditions.	No Certification Impact	N/A	N/A	N/A	OV-105 STS-108 FRR briefing reports certification not affected (previously certified materials; performance validated by test). Pre-fabricated closeout meets intent of hardware and system certification
19470	**Mid Fuselage Wire Protection** Additional wire protection was originally installed by wiring installation specification in the payload bay wire trays as part of the corrective actions from the fleet wiring investigation. Engineering was subsequently released to ensure consistency across the fleet that all critical locations in the wire trays had proper wire protection. This consisted of separation of the AC2 and AC3 main engine controller (MEC) wiring on the RH side of the vehicle; addition of wire protection (convoluted tubing) at wire tray "gap" (or mainframe attach locations) for the RH and LH wire trays and at the lower two LH wire tray AC wire runs (bulkhead to bulkhead).	No Certification Impact	N/A	N/A	N/A	Wiring is generically certified.
19483	**Body Flap Fitting Bolt Anti-Spin Retainer Mod** The body flap attach fitting bolts are preloaded to maintain joint stiffness and prevent joint separation, and are checked for torque loss after each flight and re-torqued if bolt torque falls below allowed levels. There are four fittings with eight bolts each attached to the lower aft fuselage. Previously, the body flap stub carrier and access panels had to be removed each flow and the body flap positioned to allow access for personnel and tools to hold the bolt heads in position while the torque checks were performed on the fastener nuts in the aft fuselage. The modification adds permanent bolt head retainers to the fittings, which restrain the bolts from turning, significantly reducing the effort required to perform the torque check task and the associated risk of access area collateral damage as aft fuselage access only is now required to perform the torque checks.	161-03-350013-001K	A, S	04/05/01	05/16/01	CAR approved for OV-103 Flight 30 & subs.

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19484	**Cargo PC Wiring Implementation** Cargo PC was developed to decouple vehicle and cargo flight software reconfiguration, reducing the cargo software mission production template by utilizing portable general support computers (PGSCs) to provide software control and monitoring of payloads and payload functions. The Cargo PC system interfaces with the orbiter GPC via payload MDMs PF1 and PF2 spare channels. Implementation of Cargo PC involves orbiter scar wiring mods and payload integration wiring mission kits. Orbiter scar wiring installed in the crew module from payload MDMs PF1 and PF2 in middeck avionics bays 1 and 2 to the payload station distribution panel (PSDP) on the flight deck. Supporting payload wiring is routed from the orbiter interface at the PSDP to a PGSC interface in a flight deck payload interface panel (typical aft flight deck SMCH installation).	No Certification Impact	N/A	N/A	N/A	Wiring is generically certified.
19518	**APU Air Half Coupling Upgrade** The Orbiter APU air half couplings (AHC's) used to service hydrazine fuel and GN2 had a history of poppet leakage, resulting in a significant number of AHC R&R's in the history of the program. Replacement requires an extensive amount of SCAPE ops activity in a limited work space area in the aft fuselage with high potential of collateral damage to adjacent area subsystem hardware; additionally, the AHC has to be removed and sent to the HMF for repair. Modification replaces the J.C. Carter AHC's with the more reliable Orbital Science AHC's currently used in the OMS/RCS system. Should replacement be required, the AHC poppet seal replacement can be performed from outside the aft fuselage, at the servicing panel, without the need for recycling the AHC to the HMF for repair. There are a total of six AHC's, three for fuel and three for GN2, one each for the three APU systems located on the aft fuselage sidewall servicing panels AP56-01 and AP56-02.	01-16-276-0018-2453 17-09-061001AF	T, A A, S	05/08/01 10/17/01	08/09/01 10/31/01	Certification of Orbital Science air half couplings in APU system. Certification of associated TCS blanket modifications.
19527	**Orbiter Wire Redundancy Separation** 107 cases existed where redundant wiring for crit 1 functions had been routed together in common wire harnesses, condition had been previously waived. As part of the corrective actions from the fleet wiring investigation, it was determined these wires should be separated to reduce the risk of system failure where loss of a single wire harness could result in the loss of a critical function. Primary option was to separate redundant wires into separate existing or new harness runs, secondary option where physical relocation was not possible was to separate redundant wires within a bundle using barrier material (i.e. convoluted tubing or teflon or mystic tape). Completes the corrective action, which was partially performed in more accessible area during flow(s), in the areas which required more invasive OMM-type access. This mod also updates 6 aft wire harness drawings to require installation of convoluted tubing thru clamps and the necessary re-work in areas where installation previously allowed convoluted tubing between clamps or di	No Certification Impact	N/A	N/A	N/A	Wiring is generically certified. Additional mod description notes: Correction was not implemented if the determination was made that there would be significant risk to damaging wiring in the rework area versus benefit of the separation, or if major rework/redesign was required to accomplish (i.e. guillotines & hinged D&C panels).

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19530	**OMS Pod Stinger Access Panel Structural Mod** Adds a structural fitting to the 59-51 OMS pod helium access panel unsupported corner. During last OV-102 OMM OMS pod LP05 V30 structural inspection, a crack was detected in the helium tank access panel. Follow-on analysis identified a design deficiency at this area of the panel due to to severe vibro-acoustic environment during main engine ignition. This pod was repaired using an MR fitting and all other pods were inspected with no additional panel damage noted. The addition of a similar design fitting to strengthen the remaining pods access panel will prevent occurrence of similar cracks on OV-103's pods RP03 & LP01.	123-03-73A000015-1001F	A	07/11/01	07/30/01	"Structural Repair Brackets" on each pod's Helium Tank Access Door (59-51) to correct a negative margin of safety. CAR and Errata approved concurrently.
19533	**ET Monoball Production Break** The harnesses routed to the LH2 and LO2 electrical monoball are in a high traffic area and therefore vulnerable to damage during ground processing operations. Previously, the harnesses were demated from the monoball for access to the area and for temporary local stowage. Excessive and repeated flexing of the harnesses and exposure to incidental contact resulted in wire damage. Modification implements corrective action by adding a monoball wiring production break - existing wiring is shortened and terminated at one side of the production break. New harness sections, routed from the other side of the production break to the monoball, allows these harnesses to be completely removed from the vehicle during turnaround processing, eliminating damage concerns associated with temporarily stowing the harnesses and providing area access improvement. Three MPS helium lines were locally re-routed to allow room for the production break.	162-03-350013-001K	A	05/01/01	05/25/01	CAR approved for OV-103 Flight 30 & subs.
19535	**Heat Shrink Tubing for Pyro Harnesses** A finding from the fleet wiring investigation was that harnesses routed to various pyrotechnic devices in the orbiter are frequently handled and subjected to excessive flexing, resulting in possible damage. Corrective action identified to preclude damage is to add heat shrink tubing along the harness length to limit flexing and to protect the harness from damage, and an additional, localized overwrap sleeve, at the connector strain relief tang (saddle clamp), to minimize local stress concentration. A total of 17 pyro wire harnesses are affected by the mod, the 2 fwd ET sep pyro harnesses were modified during the flt 29 flow – the remaining 15 were modified during this OMDP: 3 aft umbilical sep, 4 ET sep & 8 RMS MPM sep.	No Certification Impact	N/A	N/A	N/A	Wiring is generically certified.

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19554	**Elevon Flipper Door Trailing Edge Bulb Seal Sub** The flipper door inconel wire mesh bulb seals help close out the flipper door to rub panel interface surface and aids in maintaining the shape and positive contact of the trailing edge seal to the elevon rub panel. These seals have a history of occasionally dislodging from their retainers and coming loose in flight and could become lodged in the wing trailing edge mechanisms. Access and repair or replacement of loose or lost seals is a time consuming ground operations task. Modification corrects the condition by adding fasteners to mechanically hold the seal in position.	No Certification Impact	N/A	N/A	N/A	According to OV-105 STS-108 FRR briefing backup material, cert is not affected.
19555	**Inboard Elevon Blade Seal Modification** The inboard elevon flipper door 1 blade seals were not remaining seated against the elevon mating surface during the Orbiter/ET mating process at all times and the frequency of the problem was increasing. Design change replaced the blade seal springs with new, stiffer springs – the intent was that the increased spring force would aid in reseating or keeping the blade seal seated. Note: during implementation of this mod, galling was observed on the plunger and piston components, found to be due to these parts being 'like' material. Follow-on mod to this change (ref MCR 23280, Post STS-107 Mod) added nickel plating to the plunger assembly to eliminate galling and hangup.	20-07-198000-001Q	A	07/13/01	11/06/01	
19558	**Midbody Wire Tray Nutplate Redesign** Potential exists for the sharp edge of the nutplates which are attached to the midbody wire tray covers to scuff the wire bundles in the wire trays. In order to prevent this wire damage and to increase the number of times the nutplates can be reused, modification authorizes design and installation of high reuse (50 cycle) dome nutplates (assembly of a high reuse nutplate and a plastic dome which covers the sharp edge of the nutplate). New High Reuse Dome Nutplate Specification required. *Pre STS-107 (First Flight)*	No Certification Impact	N/A	N/A	N/A	Nutplate is a standard part and requires no certification.
19560	**TPS Polyimide Seal Improvement - Spring Replacement** During the OV-102 OMM it was found that elevon cove polyimide seals utilizing the existing springs failed to maintain design gaps (allowed two piece seal to become cocked), thus preventing the seals from seating properly. Stiffer springs were installed in one location on a restricted MR basis, and provided favorable results. Follow-on mod implements this fix by replacing the #3 spring in the V070-198519-002 polyimide seal with a stiffer MS24585-C291 spring. *Baselined Attrition Mod.*	21-07-198000-001Q	A	09/28/01	11/15/01	

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19560	**FRCS Thermal Spring Clip Deletion** Deletes thermal transfer clips installed at the interface between the FRCS module and lower forward fuselage. Installation of these 477 clips is a time consuming process during FRCS mate and deletion of this hardware is a work savings process improvement for ground ops. Thermal analysis performed indicated that the clips are not required and their removal will not cause any structural thermal gradient concerns.	137-01-320101-058H	A	02/08/02	04/05/02	
19560	**Piano Key Tile Carrier Panel Improvement** Modifies the soft good installation & stackup on the lower surface of the aft fuselage stub carrier panels to eliminate a flow path which is causing local filler bar and SIP charring at the interface of the piano key carrier panel tiles. A sacrificial RTV edge member is also being added to the aft of the stackup to facilitate maintenance. *Pre STS-107 (First Flight)*	No Certification Impact	N/A	N/A	N/A	Mod doesn't affect top drawing and utilizes existing certified materials and processes - cert not affected.
19569	**MPM Pyro Harness Mod** Mod reworks existing MPM pyro harnesses into two individual harnesses: one non-pyro and one pyro harness and changes the clocking of the guillotine pyro harness connectors to be different from the retractor connectors to preclude the possibility of harnesses connectors being improperly mated. Corrective action implemented since harnesses connector ID tags for jettison system retractor leg and guillotine leg had been previously found to be reversed, which could cause the Guillotine and the Retractor to be fired simultaneously (out of normal sequence), which can hang up release of Manipulator Arm by uncut MPM wires. *Pre STS-107 (First Flight)*	04-44-000002-001I	S	7/18/2001	08/21/01	
19589	**Midbody Crossover Bracket Mod** Interference has existed between the Orbiter midbody centerline purge duct and the wire harnesses contained in the mainframe crossover trays at four locations, Xo 636, 750, 807, and 863 and has been accommodated by MR utilizing harness routing that minimizes the interference and teflon wrap to protect the harnesses in the contact area. Mod redesigned wire trays to eliminate the interference (fleet wiring investigation corrective action). The new wire trays curve around the purge duct and allow the harnesses to be mounted on the far side of the tray, keeping the wire harnesses away from the duct which will also accommodate future growth.	160-02-340004-002M	A	08/27/01	10/11/01	

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19596	**Inverter Distribution & Control Assy (IDCA) AC Wire Separation** Separated redundant AC wire runs in twelve locations where these functions were routed in common harnesses between the inverter distribution and control assemblies in avionics bays 1, 2 & 3 to their respective circuit breaker panels. Modification addresses fleet wiring investigation corrective actions and reduces the risk of critical AC bus circuit loss (both primary and secondary AC power) due to a single event. The redundant wires were either separated into existing or new harness runs (4 locations), or separated within a bundle using barrier material, convoluted tubing at 7 locations and teflon wrap at 1 location.	No Certification Impact	N/A	N/A	N/A	Wiring is generically certified.
19610	**Moog Hydraulic Actuator Changeout for Spool Stop Mod (SSME TVCs, Elevon & RSB PDU)** MCR supports the recycle and rework of the Moog hydraulic actuators to incorporate the re-designed spool stop. Actuators include the elevon actuators (4) SSME TVC (6) and Rudder Speed Brake (1). The mod incorporates a one-piece spool stop deign to correct the potential crit 1 failure mode of the previous two-piece, interference fit spool stop which was found could be moved out of position due to thermal expansion of trapped hydraulic fluid. *Pre STS-107 (First Flight)*	02-28-621-0053-0048B 02-30-621-0015-0004I 04-30-621-0014-0017I	T, A, S T, A T, A	10/31/03 10/02/03 10/02/03	02/10/04 02/10/04 02/10/04	CAR for RSB PDU CAR for SSME TVC Actuators CAR for Elevon Actuators Includes errata to correct vehicle effectivites Mod Background: During OV-104 STS-101 frequency response testing of the rudder/speed brake, high secondary differential pressures were observed. Analysis revealed that one of the Rudder power spool stops had moved out of its original position in the closure, restricting power spool stroke. A restriction of motion in the power valve may result in loss of speed brake control. Analysis concluded that thermal expansion of hydraulic fluid trapped between the spool stop and end cap caused the spool stop to gradually move out of its original position. Analysis also concluded that the interference fit of the stainless steel spool stop to the aluminum closure in the existing design did not ensure positive retentention above 150 degrees F and allowed the spool stop to move. The rudder/speed brake, elevon and SSME TVC actuators use an identical power spool stop design. The design mod is incorporation of a one-piece spool stop deign to correct the potential crit 1 failure mode.
19635	**Mid-Deck Cooling-Wire Tray/Milson Fastener Mod** Installs shims, doublers and longer milson fasterners as required to meet mideck avionics bay planarity requirements for installing future double payload air-cooled lockers	144-04-331-002H	A, S	10/15/02	01/22/03	
19648	**Aft Ballast Container Shim Mod** The aft ballast slugs are held in place within the ballast container by laminated shims, which fill the excess gap between the container cover and ballast slugs. If the shims are not installed correctly, i.e. not enough clamping pressure by the container cover, the shims can move or slip out since they are restrained inside the container only by friction. This mod provides a positive stop (using bolts/nuts), an increase in shim thickness and clarification of shim installation procedure to assure shims will not slip out of position on the foward side of the ballast containers.	No Certification Impact	N/A	N/A	N/A	Modifcation does not affect top drawing or alter original design intent

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19648-03	**FRCS RTV Seal Requirement** Provides modified optional requirements for sealing the periphery of the Forward Reaction Control Module (FRCM) to the Forward Fuselage structure at the environmental seal interface with RTV. Ground Ops requested change to due to damage to the bulb seals during FRCS removal and RTV cleanup. The requirement to apply an RTV seal around the FRCS perimeter can be eliminated or reduced, however is contingent upon successful FRCS cavity leak check results.	No Certification Impact	N/A	N/A	N/A	Cert not required per Boeing Structures and PV&D SSMs.
19725	**Flight Demo of Advanced Fabric and Coating on RSB Thermal Barrier** Flight demo of new, more durable 3-ply fabric and C-9 coating on the RSB trailing edge thermal barrier which sees frequent damage. One side of the speedbrake will have a barrier made of existing material and new C-9 coating and the other side will be made of both the new fabric and C-9 coating. This location was previously chosen for flight demonstration of a new durable fabric because it sees damage almost every flight. *Pre STS-107 (First Flight)*	18-07-290101-001R	S	09/02/04	06/13/05	
23019	**Bay 2 Keel Bridge Mod to Eliminate Bay 3 Keel Bridge Installation Interference** Modifies the bay 2 keel bridge by deepening the slot on the aft end such that the bay 3 keel bridge can be installed without having to remove the ODS or maneuver the bay 2 keel bridge. Background: External airlock installed in Bays 1 & 2 utilizes a keel bridge in bay 2. Adjacent bay 3 keel bridge is sometimes required to support a manifested keel camera. Prior to this mod, the hardware configuration dictated that adjacent bridges be installed from aft to forward, so that bay 3 bridge had to be installed before the bay 2 bridge, resulting in an undesirable Ops activity related to external airlock hardware removals. *Baselined attrition mod.*	109-02-340134-001E	A	03/25/02	04/19/02	Cert for modified Bay 2 Keel Bridge Fitting.
23021	**MEDS Panel 7 Cooling / Debris Vent EMI Mod** Modified panel F7 top cover to meet EMI/lightning requirements while providing for debris protection and meeting the requirements for ECLSS decompression. Previous panel design with slots replaced with holes.	No Certification Impact	N/A	N/A	N/A	Cert not affected - mod to panel didn't affect hardware to component level of certifcation and satisfied lightning protection requirement. . No formal EMI analysis was performed. ECLSS performed an informal air flow analysis to verifiy that sufficient decompression/cooling capability was maintained.
23043	**MPS Delta-P Transducer Removal** The delta-P transducers have crit 1 CIL's for structural failure, but are no longer used. Mod removes the delta-P transducers and their associated components/wiring, eliminating criticality tracking, weight penalties, and safety requirements. Used early in the program to constantly monitor propellant levels during tanking - ET loading is now accomplished by timers and other system parameters which are based on experience of over 200 tankings. *Pre STS-107 (First Flight)*	02-10-449-0164-0001E	S	02/08/02	04/08/02	MPS certification update by similarity to OV-105 config Additional mod background: Function of the Delta-P Transducer (installed only in vehicles OV-102, OV-103, and OV-104), along with their signal conditioner (located in avionics bay 6), provide a means of determining the propellant level in the ET LH2 and LO2 tanks between the point sensors in the bottom and top of the tanks by sensing differential pressure between the orbiter 17-inch feed lines and the GH2/GO2 orbiter 2-inch pressurization lines. Operate during tanking only, no in-flight function. Removal will free up 2 pressure (OI) data channels as well as eliminate 2 CRIT 1 CIL's (03-1-0410-03 and 03-1-0410-04). The removal of the Delta-P Transducers will not affect other flight hardware or preflight operations

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23070	**ET Cavity Ferry Door Attach Fitting** Adds an additional (8th) ET cavity ferry door fitting to preclude stress overload cracking seen in the adjacent fitting number 7.	102-03-355130-001B	A	12/21/01	01/24/02	
23077	**Forward Orbiter / ET Attach Fitting Stud Redesign** Current design of the studs could result in cracking of primary structure during ground installation of the bearing plate, when the square stud rotates into the sidewall of the cavity capture feature of the fitting flange due to point/line loading. The stud was modified to an oval shape to match the cavity shape and provide a larger bearing surface area.	08-45-562001O	A	08/16/01	10/15/01	Errata deletes Part Number V070-562025-003 (Errata for Log # 5281 CAR).
23123	**MPS Engine Cutoff Point Sensor Wiring** Failure of MDM (FA1) and one LH2/LO2 propellant depletion engine cut-off (ECO) point sensor results in 3 of 4 ECO point sensor measurements being non-functional. Two of the four ECO point sensor measurements (LH2 / LO2) are required for the propellant depletion ECO system to be functional and provide a safe MECO command and engine shutdown. Vehicle wiring mod implemented results in loss of only one instead of two ECO sensors in he event of MDM FA1 failure – reduces the ECO point sensor criticality to 1R3 from 1R2. 28V power inputs 1 & 4 were swapped / repinned at vehicle electrical connectors 55P81 and 55P84 to the MPS point sensor electronics box in aft avionics bay 5. Previous LCCs and OMRSDs required all four LH2 and LO2 ECO point sensors to be operational for launch. Failure of one sensor would result in a launch scrub with major impacts (LO2 Sensors can be replaced on the PAD but the LH2 sensor replacement would require a vehicle rollback to the VAB). OMRSD and LCC requirements revised as part of this change to allow launch with one failed sensor *Pre STS-107 (First Flight)*	No Certification Impact	N/A	N/A	N/A	Wiring Mod; generically certified. *Mod CCBD approved pre-STS-107, OV-103 flt effectivity moved up - now first flight.*
23158	**ET Arrowhead Anti-Pinch Bushings** The arrowhead plate blanket installation spacers and bolts occasionally catch or snag blanket fabric during installation, which causes blanket damage. This also results in a step between the plate and adjacent tile along the outer mold line (OML). A bushing sleeve will be added to slide over the existing spacers and adjacent blanket material to ensure that the blanket fabric cannot be pinched between the existing spacers and vehicle structure. *Pre STS-107 (First Flight)*	No Certification Impact	N/A	N/A	N/A	Modifcation does not affect top drawing and review of sub-tier drawing E.O's verified no impact to certication.

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23160	**Comsec Redundant Power Wiring** Implements wiring modification (swap wiring on two pins at electrical connector 81P143) to provide control bus power redundancy to COMSEC No. 1 and No. 2. *Pre STS-107 (First Flight)*	No Certification Impact	N/A	N/A	N/A	Wiring Mod; generically certified.
23167	**Arc Track Protection** Revised wire harness installation drawings to specify two layers of Teflon protection (Teflon convolute or tape) rather than a single layer of Tefzel convolute or single layer of Teflon tape. Involves revising engineering previously authorized by MCRs 19527 Orbiter Wire Redundancy & 19596 AC Bus Separation, which specified the Tefzel convolute or the single layer of Teflon tape. Arc track testing performed subsequent to implementation of these MCRs demonstrated that Teflon provides superior protection for wiring by preventing an arc track from crossing over to an adjacent wire bundle. Background: MCRs 19527 & 19596 were both authorized to separate wiring for critical functions to protect from losing the function due to a single wire damage event such as an arc track. Where separation via re-routing was not possible, Tefzel convolute or a single layer of Teflon tape was added to provide a barrier that was thought would protect against an arc track consuming wiring for both redundant functions.	No Certification Impact	N/A	N/A	N/A	Wiring Mod; generically certified.
23201	**Hydraulic Main Pump Port Cap Joint Redesign** Redesigned the hydraulic main pump port cap joint to replace self-locking inserts and bolt with a more robust stud and nut design. Corrective action resulting from finding that minor insert pullout was occurring due to the use of improper bolts (dry film lubed, should be passivated) which was causing higher than expected fastener preload. This condition could possibly lead to total insert shear-out, leading to housing separation and hydraulic fluid leakage (Crit 1R2). The new design provides better performance and is a more robust design. *Pre STS-107 (First Flight)*	06-30-281-0029-0002I 06A-30-281-0029-0002I	T, A T, A	7/22/03 8/12/03	02/10/04 02/10/04	Redesign of port pump cap joint with more robust stud, washer and locking nut design. Redesign of port pump cap joint with more robust stud, washer and locking nut design - submits ABEX pump qual test procedure for the pump port cap joint redesign.
23205	**Acreage Doublers for AV Bay 4-6 Door Panels** Adds 0.040" thick doublers to each of the avionics bay honeycomb access doors / panels for avionics bays 4, 5 & 6 (4 door panels per bay - doors are approx 10" x 44"). Doors have experienced damage / dings / cracking due to ground handling – the doublers are intended to help provide damage resistance and durability. *Pre STS-107 (First Flight)*	No Certification Impact	N/A	N/A	N/A	Modifcation does not affect top drawing or alter original design intent.

CONFIGURATION CHANGES AND CERTIFICATION STATUS

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OV-103 STS-114 Pre STS-107 Modifications and Certification

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			CREW SYSTEMS			
18755	**Sky Genie Installation / Stowage Kit** Crushed sky genie pouch mounting fastener grommets had been observed, attributed to torque engagement force of the fully-threaded installation screw. Modification installation replaces fully threaded screws with shoulder bolts to prevent grommet damage. Grommets will be repaired (returned to print) as required. *(Crew Systems)*	05-25-661607-001E	A, S	04/29/02	05/03/02	HPSC Bucket MCR - Crew Equipment. Sky Genie Installation Configuration Change to correct damaged mounting grommet and torn sky genie pouches.
18755	**Crew Seat Manual Drive Mechanism Hex Cap Retention Mod** Corrects condition where seat manual adjustment mechanism hex wrench caps were found to be debonded on flight crew seats (hex caps on all vehicles were rebonded at that time). Mod installs a tape/decal to the seat manual adjustment mechanism hex cap to ensure it stays in place for proper operation of manual crew seat adjustment feature. Additionally, procedural changes have been taken to decrease the use of the manual adjustment feature. *(Crew Systems)*	07-25-39129185-301E	A,S	08/19/02	09/26/02	Ref HDFF-TPS NC02-014R1
18755	**MA9N Frame Configuration Change** Crew identified that the MA9N soft stowage bag frame interfered with MA16N locker door, resulting in difficulty mounting the stowage bag frame and in opening/closing the locker door. This mod fabricated a new MA9N frame which increased the clearance to the adjacent locker by 3/16" and added strengthening braces to the frame assembly to better support the bag and eliminate an alignment problem with the installation toggle pin to locker MA9L attach points. *(Crew Systems)*	03-25-000907-001B 09-25-661612-001H	A, S S	6/13/02 5/29/02	7/29/02 6/25/02	Certification for MA9N container frame assembly. Certification for the V612-660574-018 structural panel assy mod. Ref HDFF TPS NC02-003R1.
18755	**Lightweight TSA Cushion Assy Modifications** Corrective actions implemented as a result of tool loss during STS-97 EVA and crew requested enhancements. Tray cushioning modified by adding stiffeners in the tool slots for improved tool retention. Addition of diagrams depicting proper tool orientation. Tray tether strap design improvement to provide a more secure tethering feature of the tray when it is removed from the tool stowage assembly (TSA) during EVA. Securing 'belt loop' added to cushion assembly *(Crew Systems)*	07-25-849-660516-001F 03-25-660300-001B	A, S S	2/28/02 2/28/02	3/27/02 4/1/02	Ref HDFF-TPS NC01-005R2.

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MCR Number	Title / Description	CAR Number	METHOD (T)est (A)nalysis (S)imilarity	Submittal Date Actual P=Plnd	Approval Date Actual P=Plnd	Cert Status / Notes
			CREW SYSTEMS			
18755	**Middeck Air Vent Soft Diverter Ducts** Added soft fabric air duct diverter tubes to stdbd middeck upper and lower air vent openings and covered 2 wall center vents to force more air through upper & lower ducts. Area is used for in-flight stowage, which was restricting middeck air flow - ducts provide improved airflow around the stowage items. (Original planned first flight was OV-104 STS-114). *(Crew Systems)* *Pre STS-107 (First Flight)*	02-25-669-660010-001A	S	11/22/02	03/24/03	Ref HDFF-TPS NC02-022R1.
18755 19541	**Port TSA Hardwall Cushion Redesign & STS-114 Mission Unique Stbd TSA Cushion Configuration** New Port TSA Generic Hardwall Cushion Assy - Standardized TSA location of PLBD Latch Tools, RMS Rope Reel, Adjustable Tethers and added new standardized "hardwall" mission specific stowage area. Facilitates and lowers recurring cost of configuring and producing future port mission unique cushions - may be launched empty to accommodate return ISS stowage. (Original planned first flight was OV-104 STS-114). *(Crew Systems)* *Pre STS-107 (First Flight)*	09-25-849-660516-001H	A, S	10/11/02	12/20/02	Mod & certification also covers mission specific STS-114 starboard TSA cushion configuration for acsent and descent: for ascent, provides secured stowage areas for FPMU (floating potential monitoring unit) and ESP2 (external stowage platform) cables; for descent, provides for FRGF stowage (flight releasable grapple fixture). Note: STS-114 TSA configurations are subject to change as mission requirements change. Ref HDFF-TPS NC01-006R1
19156	**Strap Restraints for Lightweight Middeck Ceiling/Floor Stowage Pallet Assy's** *(Crew Systems)*	05-25-669-002025-001D	S	04/30/02	05/13/02	Certifies use of the V828-660220-001, 002 & -003 and V828-660221-001, -002 & -003 pallet strap restraints
19541	**Port Lightweight TSA Cushion Mission Specific Configuration** Establishes the port LWTSA mission specific tool cushion cutout configuration, V849-660525-001, for STS-112. Note this configuration also has certification effectivity for OV-103 flt 31 & subs. *(Crew Systems)*	08-25-849-660516-001G	A, S	05/01/02	05/22/02	Ref HDFF TPS NC01-062.
19652	**Sleep Station Restraint Enhancements** Modifies the cumberbun, strap adjusters, arm holes, length and adds coating on attach hooks per crew recommendations *(Crew Systems)*	03-25-000610-048C	S	12/14/01	01/24/02	The 6 part numbers certified are part of the Sleep Station Restraint Assy (V669-000610-086).

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OV-103 STS-114 Pre STS-107 Modifications and Certification

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			CREW SYSTEMS			
19652	**Tissue Equivalent Proportional Counter (TEPC) Mounting Adapter Plate Mod** Eliminated minor interference between the inboard side of the Tissue Equivalent Proportional Counter (TEPC) and adjacent window shade assembly located in the crew module interdeck access area. Shifts attach hole pattern on the TEPC mounting adapter panel away from the window shade container. Interference caused by tolerance accumulation – combination of orbiter mounting hole locations, TEPC mounting adapter panel hole locations, TEPC units and window shade containers. *(Crew Systems)*	05-25-660007-001N	S	11/09/01	11/15/01	
19653	**Transfer of GFE Heavyweight Lockers to CFE (Boeing)** *(Crew Systems)*	17-25-661602-001P		07/05/04	05/09/05	Transfers GFE heavyweight lockers from GFE to Boeing CFE (15 GFE Experiment Lockers, P/N SED39119019-321 and 4 Double Lockers P/N SED33102424-321) - includes the release of drawings for these parts in EDS and milson fastener updates.
19653	**Window 7 Window Shade Mod to Eliminate Interference with COAS Bracket** Added a cutout to window shade 7 to eliminate an interference with COAS bracket. *(Crew Systems)*	04-25-661611-001J	S	11/15/01	01/09/02	
19670	**Nitrogen Transfer Hose Quick Disconnect Release Ring Mod** Adds ring extension assemblies onto the N2 QD on the teflon flexible hose assembly which mates with the resource transfer panel in the external airlock vestibule to allow crew member's hand to more easily activate the QD's actuating ring. *(Crew Systems)*	02-22-276-0054-1001A	S	03/25/02	04/25/02	

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ATTRITION CHANGES, OPS, EOTF & CERT VERIFICATION CERTIFICATION UPDATES

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OV-103 STS-114 Attrition Changes, OPS, EOTF & Cert Verification Certification Updates

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			ATTRITION CHANGES WITH OV-103 FLT 31 CERTIFICATION EFFECTIVITY			
18378	**Flash Evaporator & Control Assembly**	04-24-250-0017-0670C	T	11/07/03	06/18/04	Non-mod related. Certification for use of non-ozone depleting precision cleaning solutions Brulin 1990 and Vertrel MCAin in lieu of Freon 113 and Trichloroethane.
18593	**LH/RH Outboard Body Flap Actuator Housing Corrosion Protection**	02-28-621-0056-0012F	S	08/13/02	09/26/02	Establish MC621-0056-0032 configuration (replaces the-0022 config) for the outboard body flap actuators which adds epoxy primer Super Koropon to the exterior of the actuator housing for improved corrosion protection.
18593	**LH/RH Inboard Body Flap Actuator Housing Corrosion Protection**	02-28-621-0056-0004J	S	08/13/02	09/26/02	Establishes MC621-0056-0031 & -0034 (replaces -0021 & -0024) configuration for the LH & RH inboard body flap actuators which adds epoxy primer Super Koropon to the exterior of the actuator housing for improved corrosion protection.
19310	**TPS Attrition Mod for Use of More Durable FRCI-12 or AETB-8 Tile in Place of LI-900 Tiles.**	20-07-396001-002P 27-07-391001-001V 26-07-395001-001V 12-07-394710-002J	A A A A	03/29/01 03/29/01 03/29/01 03/29/01	08/01/01 06/07/01 06/07/01 06/07/01	OMS Pod TPS Instl (flt 31-100) Forward Fuselage TPS Instl (flt 30-100) Aft Fuselage TPS Instl (flt 30-100) PLB Door Hinge Cover TPS Instl (flt 30-100) Certification of LI-900 replacement tile. Tile replacement will be on attrition basis.
19531	**ET Umbilical Camera Configuration Updates**	163-03-350013-001K 163A-03-350013-001K	A A	05/17/01 08/28/01	07/05/01 10/19/01	Stress analysis for certification of new heavier GFE umbilical cameras. Stress Report for single ET camera condition. Mission equipment.
19683	**TPS Attrition Mod for AETB Tiles on Engine Dome Rings**	27B-07-395001-001V	A	03/28/05	06/21/05	Stress Analysis submittal for AETB-8 Tiles on Dome Heat Shield. Note: CAR's27 and 27A were withdrawn and superceded by CAR 27B.
19704	**WLE Spar Fitting Anchor Nut Interchangeability and Gap Change**	38-08-199200-003R	A	09/24/03	06/15/05	CAR submits IL to allow for interchangeability of the ME114-0064-0410 nut plates with the discontinued ESNA F12056-10-4 nut plates (Anchor nuts).
19767	**Aluminum Coldplate Edge Distance Redesign NEW ENTRY**	05-24-635100-001G	A,S	05/09/05	06/13/05	Coldplate redesign to increase edge distance of countersunk shelf mounting holes to eliminate possible leakage when fasteners are torqued on installlation.
23022	**Coldplate Design Improvements**	04-24-635100-001F	A, S	05/27/03	06/18/04	Coldplate redesign to increase the thickness of coldplate facesheet (more robust) and mounting fastner pad diameter (prevent coining).
23078	**APU Gas Generator (GG) Radiation Shield Redesign**	20-16-201-0001-0400AJ	A	07/15/04	09/22/04	Submits reports for the radiation shield redesign. Certification effectivity OV-103, but hardware not installed.

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OV-103 STS-114 Attrition Changes, OPS, EOTF & Cert Verification Certification Updates

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OV-103 FLT 31 OPS / CERT VERIFICATION RELATED CERTIFICATION UPDATES						
17276	**MPS 17" LH2/LO2 Disconnect 100 Mission Off-Limits Qual Test**	02-10-284-0389-1701C	T	02/25/02	07/15/02	Non-flight specific / non-mod related. CAR submits Addendum 'A' for 17-inch Disconnect 100 mission off-limits qualification test report, (pages 1-13) to the previously submitted Boeing Test Report # RSS99D0293.
18516	**Window Thermal Panes Cert Deviation for SRB BSM RTV Particle Impact**	21-07-390001-001L	T, A	09/16/02	09/26/02	Non-mod related. Cert deviation to document testing and analysis performed to clear margin concern due to the possibility of SRB Booster Sep. Motor RTV particles (100 micron to 0.25") impacting the orbiter themal panes.
18923	**Water Spray Boiler Coolant Development Study**	16-30-250-0019-0001V	T, A	02/25/02	03/14/02	To certify the use of an azeotropic solution of Propylene-Glycol-Monomethyl-Ether (PGME) and water(47% PGME and 53% water by volume) for the WSB core pre-load.
18992	**Main Landing Gear Strut Assy Cycle Update**	05-26-621-0011-0001N	T,A	01/31/05	04/27/05	Delta certification of the landing system to cover actual / expected gear cycling during processing flows, which has been significantly higher than expected and covered in original certification. Certification extension based on fracture / fatigue analysis and testing / inspection of system rotational pins
18992	**Nose Landing Gear Strut Assy Cycle Update**	09-26-621-0012-0001R	T,A	01/31/05	05/18/05	Delta certification of the landing system to cover actual / expected gear cycling during processing flows, which has been significantly higher than expected and covered in original certification. Certification extension based on fracture / fatigue analysis and testing / inspection of system rotational pins
19515	**RCC Certification Database Expansion**	36-08-399200-001R 37-08-199200-003R	A A	12/06/02 12/06/02	01/16/03 01/16/03	Expansion of the RCC certification database based on MOD trajectories enveloping future missions for the wing leading edge, nose cap and chin panel. Performed thermal, mass loss, stress, and mission life analysis which allows certification of these components to Thermal/Structural Enveloping Program (TSEP) 3.6.1 and approval to process DCN P2-0809 to Update SODB Vol. V TSEP Limits and Release TSEP 3.6.1. For OV-103, resulted in minor age life reduction only in the nose cap. CAR's submit (same) IL to release updated RCC Mission Life for PE Addendum B (SSD95D0233). Attrition Change.
23289	**NLG Tire Delta Certification for NWS**	05-26-194-0007-0002K 06-26-194-0007-0002K	T, A A	09/17/04 04/04/05	02/16/05 06/16/05	Non-mod related. Certifies Nose Tires for NWS used as primary method of directional control. Additional documentation for Nose Tire test report and requirements for Nose Wheel steering. Includes Thermal, Loads and Fracture Life Analyses.
OPS	**RCS Vernier Thruster Reboost**	21-11-467-0029-0001S	A, S	03/12/02	04/01/02	Mission 8A ISS Reboost - Certifies the VRCS capability to perform automated mission duty cycle firings of 8.72 sec ON / 15.28 sec OFF to support ISS reboost objectives
OPS	**RCS Vernier Thruster Reboost**	22-11-467-0029-0001T	A, S	05/13/02	05/29/02	Adds vernier thruster requirments for continuous unconstrained steady state firing for 500 seconds for ISS boost (meets the 0.2 deg/sec maneuver rate control requirement during ISS mated attitude control and maneuvers.)

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			OV-103 FLT 31 OPS / CERT VERIFICATION RELATED CERTIFICATION UPDATES			
OPS	**RCS Vernier Thruster Reboost**	23-11-467-0029-0001U	A, S	09/10/02	09/26/02	Certifies the VRCS capability to perform automated mission duty cycle firings of : 8.32 sec ON / 15.68 sec OFF for one hour ; 7.38sec ON / 16.62 sec OFF for one hour ; 0.56 sec ON / 23.44 sec OFF for 30 min to support ISS reboost objectives
OPS	**RCS Vernier Thruster Reboost**	25-11-467-0029-0001W	T, A	06/25/03	09/17/03	Establishes the latest VRCS misssion duty cycle firing envelopes to support ISS reboost sessions of up to 105 minutes. Also eatablishes the required session to session time delays or 'dwell times' to preclude compromising critical shuttle components. (STS-114 is first flight effectivity)
OPS	**Sleep Station Noise Attenuation**	04-25-001022-001E		08/19/02	11/12/02	Adjusts Snaps and Add Velcro to Improve Installation.
OPS	**External Airlock Support Subsystem - ECLSS**	06-35-643051-001E	A	07/31/02	09/26/02	Updates certification of the external airlock to allow pressurization of the ISS/orbiter stack with N2 through the ODS transfer panel.
OPS	**Life Support System - Certification of Water Dumps from CWCs & PWRs**	04A-23-623000-001E	T	08/02/02	09/26/02	Provides certification for the dumping capability of the supply and waste water dump nozzles when water is dumped from a contingency water container (CWC) and/or a payload water reservoir (PWR) pressurized with cabin pressure only.
OPS	**Coaxial Termination Cert Update**	02-18-413-0045-0001B	A, S	09/24/02	10/02/02	Approval of Coaxial Termination / power divider on all past and future Shuttle missions. Extends the certification effectivity of the ME413-0045-0001 coax terminator to cover OV-102, OV-104 & OV-105 (previously only OV-099 & OV-103 were covered). Also extends cert coverage for use of the termination plugs as part of the UHF ATC transceiver and the GPS system for all vehicles.
OPS	**Power Inverters-Cert Deviation**	02-21-495-0012-0004	A	06/10/05	06/21/05	Cert Deviation for exceedence of power factor requirement
OPS	**OMS/RCS Pod**	128-03-73A000015-1001F	S	06/03/05	06/24/05	Incorporates latest OMS/RCS Pod Structural Assenbly configurations.
HDFF-TPS NC05-011	**Middeck Floor/Ceiling Pallet Strap Assembly**	06-25-669-002025-001E	S	06/08/05	06/21/05	New configuration of the Middeck Floor/Ceiling Pallet Strap Assembly. Configuration not required for STS-114, but may be manifest if hardware delivery supports.
HDFF-TPS NC01-006	**Middeck Modular Stowage Kit**	18-25-661602-001Q	A	05/12/05	06/21/05	Adds Double Stowage Locker Assembly, which is being recertified to show locations where the Double Locker can be installed for flight.
HDFF-TPS NC03-003	**Stowable Sleep Station**	02-25-669601-001B	S	01/27/03	02/10/03	Addition of Rubber Gromments to Protect Against Sharp Edges
OPS	**Alternate MADS Recorder Tape**	05-20-435-0055-0002L	T, S	04/28/03	06/23/03	Provides similarity and analysis rationale for certification of alternate MADS recorder tape (Magnetic Tape) - Attrition.
OPS	**CO2 Absorber Element**	08-22-621-0008-0009H 09-22-621-0008-0009H	T T	10/29/04 03/24/05	12/17/04 06/15/05	Increases CO2 absorber element life from 39 days to 127 weeks. Cert deviation allows use of ISS stored cannisters that have a shelf life of >127 weeks.
OPS	**Aft Fus Ballast Installation**	03-03-851700-001A 03-03-851700-001B (Errata) CR 03-851700-001B	S S S	4/8/2005 05/31/05 05/31/05	06/17/05 06/17/05 06/17/05	Updates certification to reflect the addition of two additional ballast containers to the original certification to reflect the current 6 container configuraton. AVF-003713 Errata to CAR 03 to revise rev letter to "B" to match CR CR adds new dash numbers to reflect current ballast requirements.

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			OV-103 FLT 31 OPS / CERT VERIFICATION RELATED CERTIFICATION UPDATES			
Mid-Life Cert	**Orb/ET Umbilcal Separation Systems**	06-45-565330-001N	T, A	09/14/04	06/24/05	Adds omitted dash numbers identified during RTF Certification Verification Review.
Mid-Life Cert	**Filter, Window Cavity Conditioning System**	02-14-286-0053-0001F	S	02/07/05	06/13/05	Revised CR to change desiccant bead useage from one flight to two flights. In addition, differential pressure requirements for -0002 and -0003 filters are added.
Mid-Life Cert	**ET/Orbiter Disconnect, Purge Instl & Func.**	03-14-385070-001J	S	02/07/05	06/24/05	Revised CR to increase purge mission cycles to 3 from 2. Past experience has shown that 3 cycles is the minimum performed, not including scrubs.
Mid-Life Cert	**Flex Hose, PV&D**	04-14-271-0100-0001G	S	02/14/05	06/13/05	CR states there is one (1) pressure cycle on flex hose per mission. During a normal vehicle flow, the ET/Orbiter purge system with flex hoses installed will see at least two (2) pressure cycles, not counting a launch scrub. Revised CR from one (1) pressure cycle per mission to six (6) pressure cycles per mission, 2 cycles for ground testing and four (4) for launch, includes scrub. In addition, the CR flow duration for the flex hoses, ET/Orbiter purge system, needs updating from 5 hours of flow time to 12 hours, includes ET tanking.
Mid Life Cert	**Flexhose, RCS**	01-11-271-0084-0001H	T	04/08/05	05/09/05	35 flight delta qual vibration, static & surge deflection testing (35 flights). Certification by QSA.
Mid Life Cert	**Cert Deviation for Flexhose, Radiator Retract , ECLSS**	02-24-634717-002C	T	06/10/05	06/16/05	Delta qualification testing for 32 missions completed, however qual unit failed post-flexure proof test leakage check. Cert Deviation to be submitted due to qual test issues. CAR # revised from 01 to 02. CR revised to "C" rev on 4/28/05.
Mid Life Cert	**Flexhose, ME271-0089, ECLSS**	01-24-271-0089-1004H 02-24-271-0089-1004H	T T, S	4/15/05 4/27/05	05/26/05 05/12/05	3/8" Delta qualification testing complete. Certification by QSA 3/4" Delta Qualification testing at JSC complete. Certification by QSA.
Mid Life Cert	**Flexhose, ME271-0091, ECLSS**	QSA 01-22-271-0091-1102C 04-22-271-0091-1102C 05-22-271-0091-1102C	T, A, S A S	4/15/05 05/24/05 06/10/05	06/15/05 06/15/05 06/16/05	3/8" Delta qualification testing complete. Certification by QSA 1/2" Flex Hose, Certification by analysis. QSA submittal date from 4/27/05. **Superceded by CAR 05-22-271-0091-1102C** 5/8" Certification by similarity to 1/2" flex hose.
Mid Life Cert	**Cert Deviation for Flexhose, ME271-0085, ECLSS, Bulkhead Penetration Line**	08-22-271-0085-0001L	A	06/13/05	06/16/05	Cert Deviation for ME271-0085 Flex Hoses. Hoses were not tested to the actual flight vibration levels during their acceptance/qual testing. Bench testing and micro-wis data from some future missions needed to validate modal testing results.
Mid-Life Cert	**Overhead Audio Panel (IMU Acess)**	01-04-337792-001A 01-04-337792-001A (Errata)	S S	2/14/2005 06/15/05	06/27/05(P) 06/27/05(P)	Add Milson fasteners and retainer rings for high cycle panel use. Errata incorporates Linda Estes comments.
Mid-Life Cert	**OME Engine**	18-12-621-0009-0001P	A	03/08/05	06/15/05	Certifies engine operation with GN2 fill line pressurized.
Mid-Life Cert	**Bay 1 Longeron Bridges**	105-02-340111-001E 105-02-340111-001E (Errata)	S S	03/30/05 06/13/05	06/21/05 06/21/05	Certification update required to include bay 1 longeron bridges, added to the mission kit for external airlock / ODS. Necessary actions have been taken to be able to process certification - documentation cleanup to add stress report / I.L. AVF-003603. Errata corrects part number called out on page 1 of the CAR

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MCR or Tracking #	Title	CAR Number	METHOD (T)est (A)nalysis (S)imilarity	Submittal Date P=Planned Actual	Approval Date P=Projected Actual	Description / Comments
OV-103 FLT 31 OPS / CERT VERIFICATION RELATED CERTIFICATION UPDATES						
Mid-Life Cert	**Certification Requirement Update for the Halogen Fire Bottle Quantity Verification**	(CR) 23-282-0065-0001D	S	03/16/05	05/09/05	CR revision only needed to update the Life section from a yearly weighing of the bottles to a minimum Halon quantity verification required every flow, not to exceed one year. The updated CR complies with the NSTS 07700-10-MVP-01, Paragraph 3.7.3 requirement to checkout or inspect all Shuttle subsystems critical to flight safety or mission success before each flight and verify performance is satisfactory to support operations.
Mid-Life Cert	**Cert Deviation for Kevlar Over-wrap Pressure Tank Life Extension**	12-22-282-0082-0050Q	A,S	06/24/05(A)	06/29/05(P)	Material life extension of the kevlar over-wrap tanks whiach are past their 20 years certified life. M&P testing in work estimated to be complete March 4 required for cert update. Affects ECLSS, MPS and OMS/RCS. (AVF-002061) (see Isaac Andu, Dave Rigby and Ed Fitzgerald - SSMs) Cert Deviation to be submitted for STS-114. CAR still in work, submittal delayed to **06/21/05 following OCCB review of flight / cert rationale.** CR rev will also be submited.
Mid-Life Cert	**Forward Fuselage TPS**	30-07-391001Y	A,T	01/11/05	05/09/05	Supports certification of FRCI-12/LI-2200 tiles with class 1 white coating and replacement of LI-900 tiles with white coated FRCI-12/LI-2200 tiles with additional Analysis and Test Reports as required by the Aging Vehicle Assessment-Phase 1 report (KL0-04-001)
OPS	**NLG Door TPS Deflections**	31-07-391001-001Z 14-07-398001-001M	A,S A,S	03/10/05 03/16/05	06/27/05(P) 06/21/05	Certification update to reflect the updated dynamics, analysis and deflection environment for the nose landing gear door, adjacent forward fuselage TPS and thermal barrier. 31-07-391001Z being tracked under MCR 17177/23360 on Post STS-107 list.
OPS	**Cert Deviation for LH2 Feed Line Flowliner Cracks**	12-10-271-0073-0001E	A	05/02/05	06/13/05	Updates certification to account for feedline flowliner slot crack repair and 3450 htz driving mechanism limitation for the upstream flowliner bounding newly imposed SSME LPFTP speed limitation.

CONFIGURATION CHANGES AND CERTIFICATION STATUS

Presentor:

Organization/Date:
Orbiter/6-29-05

OV-103 STS-114 Attrition Changes, OPS, EOTF & Cert Verification Certification Updates

MCR or Tracking #	Title	CAR Number	METHOD (T)est (A)nalysis (S)imilarity	Submittal Date P=Planned Actual	Approval Date P=Projected Actual	Description / Comments
OV-103 J3 / FLT 31 PR-EOTF RELATED ITEMS & CERTIFICATION						
11621	**TCS Related PR EOTF Cert Update -Fwd Fus TCS Instl**	18-09-061001AG	S	05/07/02	01/23/03	Closes out 14 PR-EOTF actions to eliminate blanket interference with FRC structure. Ref V070-361900 D15.
19650	**ECLSS Crew Cabin Duct System EOTF Changes**	07-22-613760-001H	A	01/18/05	04/11/05	Certification of new crew module ARS "make-work" ducting configurations required to eliminate interferences or provide proper fit due to incorporation of OMM mods (MEDS, etc) - ref V070-613724-034, -035, V070-613780-069 & ECL-3-J3-1569, 1570, 1575, 1580, ECL-5-20-0817.
19650	**TCS Related PR EOTF Cert Updates**	49-09-362000-001BN	S	01/30/03	04/23/05	OV-103 PR EOTF to clarify PLBD blanket sleeving and ground stitch index requirements. New Thermal Blanket Installation - adds V070-364327-027&028 Blanket Assys and removes V070-364327-011&012 Blanket Assy.
		48-09-362000-001BM* 50-09-362000-001BO	A, S S	10/16/02 01/30/03	11/07/02 05/09/05	OV-103 PR EOTF revises the design of the ODS vent port TCS blanket by changing the inner cover material from aluminized to vented beta cloth for better durability and corrects fit and instl requirements to eliminate previous problems with the blanket loosening / detaching due to launch vibration and vestibule venting. (MCR 11621, but related change)
		51-09-362000-001BP	S	06/03/03	04/23/05	OV-103 PR EOTFs crew module X0576 bulkhead blankets - provides blanket configuration with a slit to accommodate tubing support bracket and updates blanket config by correcting dimension incorrectly changed during EO incorp.
		52-09-362000-001BQ	S	09/03/03	04/23/05	OV-103 PR EOTF revises the configuration of the external airlock aft hatch thermal blanket fiberglass stiffeners to remove the sharp ends which have been causing tears in the TCS blanket seams. New Blanket Assy establishes new stiffeners w/o the sharp angle ends.
		19-09-061001AH	S	01/27/03	04/11/05	Hydraulic water spray boiler blanket installation - clarifies ground strap quantity & grounding requirements.
19650	**TCS Related PR EOTF Cert Updates (cont'd)**	20-09-061001AI	S	08/11/04	06/13/05	Required to add new dash numbers configurations for FRCS TCS blanket to eliminate interference with electrical harness support brackets (ref PR-EOTF TCS-3-J3-2847, TCS-4-27-1868)
		55-09-362000-001BT	S	08/12/04	04/11/05	Required to add new dash numbers configurations for mid fuselage blankets to eliminate interferences (milkstools & tubing lines) created by 103-J3 PR-EOTF's. TCS-3-J3-3292, 3342, 3313, 329.
		54-09-362000-001BS	A, S	02/12/04	06/11/05	OV-103 PR EOTF PLB Door TCS - Corrects conflict of quantities/callouts for ground strap grounding point screws and washers between tech order and vehicle installation drawing. Approval sheet for CR
		03-09-363900-001B	A	08/12/04	04/11/05	Required to add new blankets to replace blankets that were too large to fit into the drag chute structure cavity. (Ref: PR-EOTF TCS-3-J3-3263).
		59-09-362000-001BX	S	11/09/04	05/09/05	Adds grounding provisions previously removed from the PLBD blankets. (Ref: PR-EOTF TCS-3-J3-3259 & 3260.)
		20-09-260002AJ	S	09/02/04	04/11/05	Required to add new blanket installations that relocated fasteners that previously interfered with stiffening ribs on the back of V070-336932 Avionics Bay 3 Panel in the Crew Module. (Ref: TCS-3-J3-3318).

CONFIGURATION CHANGES AND CERTIFICATION STATUS

Presentor:

Organization/Date: Orbiter/6-29-05

OV-103 STS-114 Attrition Changes, OPS, EOTF & Cert Verification Certification Updates

MCR or Tracking #	Title	CAR Number	METHOD (T)est (A)nalysis (S)imilarity	Submittal Date P=Planned Actual	Approval Date P=Projected Actual	Description / Comments
OV-103 J3 / FLT 31 PR-EOTF RELATED ITEMS & CERTIFICATION						
11621	**TCS Related PR EOTF Cert Updates (cont'd)**	02-09-362001-001B	S	12/16/04	04/11/05	Required to add new thermal coating installation dash numbers to change the dimensions of the paint pattern to match the footprint of the Manipulator Positioning Mechanism. (Ref: TCS-3-31-3433, TCS-4-27-2130 & TCS-5-20-1767)
		02-21-750021-001A	S	02/09/05	04/23/05	Required to add new blankets to replace blankets that couldn't be fabricated per print because of incompatible fastener(stud/ring) combinations. (Ref: TCS-794-8177, TCS-3-31-3440 & TCS-3-31-3457) Submitted to DM 2/7.
		21-09-061001AJ	S	03/29/05	06/21/05	Required to modify a blanket because the fasteners don't line up with the corresponding stud on the structure. (Ref: TCS-3-J3-341)
		62-09-362000-001CA	S	04/21/05	06/16/05	Required to modify a blanket to eliminate interference at starboard antenna base. (Ref: TCS-331-349)
11621	**Active Thermal Control PR EOTF Cert Updates**	02-22-613090-001C	S	01/26/05	05/09/05	Required new configuration to avoid interference by increasing ducting length. (REF: ECL-3-31-1580)
		02-22-613362-001E	S	03/07/05	06/16/05	Modifies the hard lines that the flexhose mates to provide correct flexhose bend radius and eliminate minor interference condition - Avionics Bay 3A due to extended tube ends. (Ref ECL-3-31-1681)
		02-22-613362-001E (Errata)	S	06/09/05	06/16/05	Errata to correct part number.
		05-24-634480J	S	05/05/05	06/21/05	Adds laminated washers and increases fastener grip length to eliminate gaps between the Xo807 payload interface panel and the structural frame. (Ref: ECL-3-31-1819)
		06-24-634480K	S	05/05/05	06/17/05	Required to modify coldplate installation drawing to document replacement of a damaged RGA #2 coldplate. EOTF #2251 (Ref: ECL-3-31-1745)
19650	**ECLSS Crew Cabin Duct System EOTF Changes**	08-22-613760-001J	S	03/30/05	06/15/05	Required to replace countersunk screws with pan head screws to attach the Cabin Return Air Orifice Plate since the Plate was not drilled to accept the countersunk screws. This rolled the dash number on the ECLSS Bay and Middeck Duct Installation. (Ref: ECL-3-31-1826)
11621	**ISSA (External Airlock) ECLSS Support Subsys PR EOTF Cert Update**	07-35-643051-001F	S	04/07/05	06/13/05	Establishing a new configuration of the Tech Order installation allows use of the existing Purge Valve Assy. This will eliminate the requirement to perform an unnecssary upgrade. (Ref: ECL-3-31-1841).
11621	**Kevlar/Epoxy Purge Duct EOTF Cert Update**	03-14-385130-002E 10-14-385102-002S	S S	04/18/05 04/20/05	06/16/05 06/16/05	Required to add new purge duct assemblies to facilitate installation. CAR added 4/25/05 to matrix. (Ref: PVD-3-31-0949).
19823	**Equipment Mounting Provision Installation Cert Update**	06-25-650505-001E	S	3/31/2005	6/21/2005	Updated the Equipment Mounting Provision Installation V070-650505 to relocate the Snap Stud MD128-0015-001 that supports the SORG water line adjacent to the Side Hatch Jettison T-Handle Cover Latch. (Ref: FCS-3-31-0800)
11621	**ET Ferry Door Fitting Installation**	03-355130-001C (CR Only)	S	05/10/05	06/21/05	Required to create fittings to facilitate installation of the ferry door on the bottom of the Orbiter. (Ref: MV0-074A-0557 & MV0-074A-0560) (Ref MCR 23070 on the Pre STS-107 list)

	Presentor:
	Organization/Date: Orbiter/6-29-05

MISSION KITS BACKUP

STS-114 MISSION KIT MODIFICATION SUMMARY

Presentor:

Organization/Date:
Orbiter/6-29-05

Orbiter Mission Kit Related Modifications For STS-114:

- MV0073A Bay 2 Keel Bridge Mod for Instl Enhancement
  - Modified the bay 2 keel bridge at the bay 3 keel bridge interace to allow installation / removal of the bay bridge without the need to remove the ODS and bay 2 keel bridge
- MV0073A Mid Weight Keel Latch Bearing Retainer Fastener Mod
  - Adds epoxy to the bearing retainer fastener head as secondary locking feature
- MV0082A RMS D&C Panel Switch Change (GFE)
  - Replaced RMS single / direct drive switch, which will exceed certified life, with upgraded extended life switch
- MV0082A RMS Elbow Camera Wedge & CCTV PTU (GFE)
  - Modified (higher strength) CCTV pan / tilt unit (PTUs) and two piece camera mounting wedge to facilitate installation ops

STS-114 MISSION KIT MODIFICATION SUMMARY	Presentor:
	Organization/Date: Orbiter/6-29-05

Orbiter Mission Kit Related Modifications For STS-114:

- MV0082A RMS MPM Pyro Harness Modification
  - Reworked existing MPM wire harnesses into two individual harnesses, one non-pyro and one pyro harness and changed the clocking of the guillotine pyro harness connectors to be different from the retractor connectors to preclude the possibility of harnesses connectors being improperly mated
- MV0082A RMS Modifications for OBSS
  - RMS and MPM wiring modifications to accommodate the OBSS
- MV0092A Orbiter Boom Sensor System
  - New mission kit - the OBSS provides capability for on-orbit inspection of the Orbiter thermal protection system (TPS) and reinforced carbon-carbon (RCC)
  - The boom and associated sensor packages are used as an extension of the Orbiter remote manipulator system (RMS) and will utilize three Orbiter manipulator positioning mechanism (MPM) pedestals on the RH sill for mounting provisions.
  - The boom, 2 sensor packages mounted at the end of the boom, and associated RMS mods are NASA GFE responsibility.

STS-114 MISSION KIT MODIFICATION SUMMARY	Presentor:
	Organization/Date: Orbiter/6-29-05

Orbiter Mission Kit Related Modifications For STS-114:

- MV0456A ET Umbilical Digital Camera
  - Incorporates new GFE LO2 external tank (ET) umbilical well digital still camera and harnesses to crew compartment panel interface
  - Provides functionality to capture and downlink high resolution ET sep photo images
- MV0465A Mission Kit Nitrogen Tanks
  - Converted payload bay 4 RH forward GN2 tank to a mission kit tech order configuration to facilitate tank removal or installation depending upon mission GN2 requirements
- MV0494A Single String GPS Preamp Upgrade
  - Replaces the single-string GPS DTO preamplifier and GPS DTO combiner previously installed on all orbiters with the operational 3-string GPS preamplifier and combiner.
  - Supports upcoming single-string GPS operational ramp-up flights and subsequent operational single-string GPS flights

STS-114 MISSION KIT MODIFICATION SUMMARY

Presentor:

Organization/Date: Orbiter/6-29-05

Orbiter Mission Kit Related Modifications For STS-114:

- MV0520A Radiator Panel Impact Protection
  - Addition of impact protection doublers to radiator panels included LH & RH radiator panel 4 mission kit
- MV0529A Removal of Forward Bulkhead Floodlight
  - Modification removed the forward bulkhead floodlight and associated coldplate due to potential of coldplate freeze-up and rupture concern
- MV0544A Tank Set 3 TCS Blanket Support Mod
  - Provides additional attach point for the tank set blanket support frame to preclude interference with boron strut
- MV0548A Payload Bay Bulkhead CCTV PTUs (GFE)
  - Modified (higher strength) CCTV pan / tilt units (PTUs)
- MV0573A Aft Ballast Container Shim Retention Mod
  - Added positive capture feature to the ballast container cover to weight slug shims

STS-114 MISSION KIT MODIFICATION SUMMARY	Presentor:
	Organization/Date: Orbiter/6-29-05

Orbiter Mission Kit Related Modifications For STS-114:

- MV0607A Sky Genie Stowage Bag Modification
  - Replaced mounting fasteners with shoulder bolts to prevent crushing of the bag mounting grommets
- MV0609A Avionics Bay 3A Fan Package Mission Kit
  - Tech order mission kit allows flexibility to install either the avionics bay fan or the cabin fan for avionics bay 3A cooling dependent upon payload locker cooling requirements
- MV0611A Window Shade 7 Mod
  - Trimmed to eliminate interference with COAS mounting bracket
- MV0617A EVA Slide Wire Changes (GFE)
  - Utilizing new “short” slide wire for STS-114 to eliminate interference between “long” slide wire and payload
  - Added modified slide wire aft cushion to provide improved coverage and thermal protection of the stainless steel end fitting - eliminates thermal related negative margin concern

STS-114 MISSION KIT MODIFICATION SUMMARY

Presentor:
Organization/Date: Orbiter/6-29-05

Orbiter Mission Kit Related Modifications For STS-114:

- MV0669A Middeck Airflow Augmentation
  - Installed new middeck wall vent covers and vent duct diverter tubes to improve airflow to middeck when utilizing starboard wall for stowage
- MV0669A WMC Port Wall Modifications
  - Waste management compartment (WMC) wall modified to accommodate ‘off the shelf’ wet & dry wipe dispensers
  - First use port wall wet trash bag (elbow bag) now installed prior to flight to save on-orbit crew time for first bag installation
- MV0828A SSOR & WVS UHF Antenna Relocation
  - Relocates the SSOR and WVS UHF antennas from their original payload bay starboard sill location to the aft, upper ODS truss to provide mounting locations on the starboard sill for installation of the OBSS and MPMs
- MV0828A Airlock Booster Fan Bypass Duct
  - Airlock booster fan bypass duct to be implemented for cryo O2 savings by reducing consumption due to power down of booster fan

STS-114 MISSION KIT MODIFICATION SUMMARY

Presentor:
Organization/Date: Orbiter/6-29-05

Orbiter Mission Kit Related Modifications For STS-114:

- MV0828A ODS TCS Blanket Modification
  - Revised vent port TCS blanket for a better installation fit to preclude shifting/loosening in flight (EOTF)
- MV0828A Emergency Egress Net Mechanism Upgrade
  - Higher strength / capability net adjustment mechanism
- MV0844A Middeck Power Utility Panel
  - Installed M063P electrical utility panel in middeck ceiling to accommodate additional usage needs
- MV0849A Port LW Tool Stowage Assembly Cushion
  - Added standardized “hardwall” mission unique stowage area to facilitate reconfiguration and accommodate ISS return stowage and improved cushion retention of the tools
- MV0849A Port / Starboard LW Tool Stowage Assembly Mission Unique Cushions
  - Flight unique cushions to accommodate mission requirements

STS-114 MISSION KIT MODIFICATION SUMMARY

Presentor:

Organization/Date:
Orbiter/6-29-05

Orbiter Mission Kit Related Modifications For STS-114:

- MV0849A TSA Bolt Galling Resoluton
  - Adds dry film lube to TSA installation fitting bolts to eliminate bolt to fitting galling condition
- MV0874A Wireless Video System
  - Wireless Video System incorporated on OV-103 during this OMM
- MV0886A Wing Leading Edge Micro-TAU System
  - New instrumentation provides an impact detection system, used primarily for ascent monitoring with some MMOD/on-orbit capability.
  - Installs 66 accelerometer and 22 thermal measurements in the wing leading edge area of each wing with wiring to crew compartment panel interface for capability of capturing instrumentation data

STS-114 MISSION KIT MODIFICATION SUMMARY

Presentor:

Organization/Date:
Orbiter/6-29-05

Orbiter Mission Kit Related Modifications For STS-114:

- MV0866A Payload Bay Latch Micro-TAU
  - Installed Micro-TAU units at three Orbiter latch locations (bay 8 and 2 RH longeron latches and bay 10 keel latch) to record actual orbiter to payload interface dynamics, allowing better characterization of MPLM payload trunnion friction and slip dynamics for loads models

Reference also Configuration Changes and Certification Status section and backup charts for additional description.

	Presentor:
	Organization/Date: Orbiter/6-29-05

UNEXPLAINED ANOMALIES

UNEXPLAINED ANOMALIES STATUS	Presentor:
	Organization/Date: Orbiter/6-29-05

- One new UA processed since the OPF Rollout Review
- Orbiter portion of UA presented / closed at OCCB 6-7-05

Orbiter UA	UA Board Approval Date
IPR 114V-0314, MPS/EPD&C, ECO Sensors 3 & 4 Erroneous Behavior	Presented at 6/7/05 OCCB. Pending KSC UA board closure

- The following six UAs were reviewed at the STS-114 OPO OPF Rollout Review:

Orbiter UA	UA Board Approval Date
IPR 114V-0082: ECLSS, Freon Coolant Loop 1 Flow Degradation	Deferred 3-11-05
IPR 114V-0205: ECLSS, 200 Second Delay Observed on the RFCA	Closed 3-10-05
IPR 114V-0103: No Uplink or Downlink Voice in ACCU 2 Configuration	Closed 1-31-05
IPR 114V-0113: Ku-Band Azimuth Command Appeared to Go Off for 1/3 sec	Closed 2-4-05
IPR 114V-0244: MEDS IDP 4 Reported a MIA Word Error	Closed 4-22-05
IPR 114V-0258: RMS System A Fwd Bolt Load Test Cal 1 was “No Go” - Should Be “Go”	Deferred 3-18-05

	Presentor:
	Organization/Date: Orbiter/6-29-05

SRQA BACKUP

	Presentor:
	Organization/Date: Orbiter/6-29-05

CATASTROPHIC / INFREQUENT ORBITER HAZARD CAUSES

CATASTROPHIC/INFREQUENT ORBITER HAZARD CAUSES

Presentor:

Organization/Date: Orbiter/6-29-05

Hazard No./Title	Cause	Effects	Controls
ORBI- 007C Loss of Outer Moldline Due to Debris Impact	Micrometeoroid or Orbital Debris (MMOD) Impacting the Orbiter	A micrometeoroid or orbital debris (MMOD) impact upon the Orbiter can result in damage to LESS RCC, critical TPS locations including lower surface door areas and elevon cove, as well as crew cabin windows.	Design: Tile, RCC and Window Design and Damage Threshold; as well as the Damage Tolerance Improvements (Front Spar Protection, MLGD Corner Void Elimination and Thicker Side Windows). - Warning Devices: Wing Leading Edge Micro TAU Instrumentation, Orbiter Boom Sensor System (OBSS with LDRI, ITVC and LCS cameras, and ISS Cameras. Special Procedures: Flight Planning (BUMPER & Critical Math Model), Flight Procedures (COMBO, Flight Rules & Crew Procedures) and Debris Avoidance Maneuvers. Reference IDBR-01 “External Debris Impacts to SSV”

Open Work:
1. Approval, baseline, and final documentation of Damage Assessment Tools.
2. Reassessment of ascent debris environment

CATASTROPHIC/INFREQUENT ORBITER HAZARD CAUSES

Presentor:

Organization/Date: Orbiter/6-29-05

Hazard No./Title	Cause	Effects	Controls
ORBI 036C "Fire/Explosion in the Aft Compartment Caused by Leakage of Flammable Fluids/Vapors in Contact With APU/Exhaust Duct Hot Surfaces"	Limitations of Insulation Design Permit Exposure of Orbiter Fluids/Vapors Leakage to APU Hot Surfaces	Fire would occur if APU hydrazine, lube oil, exhaust products or other flammable fluids/vapors leaked into these identified hot spots and may ultimately lead to loss of vehicle/crew. Hydrazine decomposition, an exothermic reaction, can also result in catastrophic damage.	<u>Design</u>: APU Insulation isolates most "hot spots" from flammable fluids and vapors. However the APUs cannot be completely insulated. A combination of design features are used to minimize potential subsystem fluids/vapors leakage and exposure of these APU hot surfaces in the aft compartment. <u>Safety Devices</u>: The prelaunch GN2 purge inert potential flammable fluid leakage. The MPS helium purge is activated during entry to reduce wake ingestion and provides some dilution of potential APU fluids along with other hazardous fluids/vapors leakage in the aft compartment. <u>Warning Devices</u>: The HGDS warns of leakage prior to launch. System instrumentation can detect leaks during flight. <u>Procedures</u>: Prelaunch procedures (LCCs) are in place to monitor external fluid leakage in aft compartment as well as the aft compartment GN2 purge. Flight Rules and Crew Procedures monitor external fluids/vapors leakage in the aft compartment.

CATASTROPHIC/INFREQUENT ORBITER HAZARD CAUSES

Presentor:

Organization/Date: Orbiter/6-29-05

Hazard No./Title	Cause	Effects	Controls
ORBI 344 "Water Spray Boiler System Failures Could Cause Loss of Two Auxiliary Power Unit / Hydraulic Systems"	Water or PGME/Water flowpath blockage or restricted flow due to low pressure environmentally induced freezing following ascent operation.	Two of three WSBs are needed for safe return. The Orbiter WSBs currently utilize de-ionized water (see note 1) for the active cooling (during ascent post-MECO and entry). Due to the higher triple point of water (32 Degree F and 4 TORR), the WSBs residual water flash freezes within the WSB container elements. WSB system (spray bar, heat exchanger, lines and fittings, exhaust duct) internal and external freeze ups due to exposure to low pressure environment could cause blockage of coolant flowpath, resulting in potential shutdown and loss of multiple APU/Hydraulic systems. Worst-case effect is loss of crew/vehicle.	Design: Propylene-Glycol-Methyl-Ether (PGME)/Water is utilized in the WSB core pre-load to prevent all ascent pre-MECO freeze-up problems, but not post-MECO. Warning Devices **-** System instrumentation will detect freeze up after APU start Procedures: Flight Rules and Crew Procedures specify the criteria for determining when WSB is considered lost, provide actions for the loss of a single WSB, loss of APU/Hydraulic System, loss of cooling capability from one WSB for descent results in a late start at Terminal Area Energy Management (TAEM) for the associated APU and contingency actions for loss of WSBs. Ascent/Entry Systems Procedures, Ascent Pocket Checklist and Entry Pocket Checklist document instructions for shutdown of the APU when the APU lube oil temperature is greater than 305 degree F, which is indicative of loss of WSB cooling.

Open Work: MCR 23226 "Evaluation of WSB PGME/Water for the whole mission" performs initial effort to evaluate and certify the PGME / Water Azeotropic solution to replace the Orbiter WSB's current water loading.
(1) STS-114 will fly 1 WSB with the PGME water solution.

	Presentor:
	Organization/Date: Orbiter/6-29-05

SPECIAL TOPIC
BACKUP

	Presentor:
	Organization/Date: Orbiter/6-29-05

BACKUP

COMPOSITE OVERWRAP PRESSURE VESSEL (COPV) STRESS RUPTURE ISSUE

COMPOSITE OVERWRAP PRESSURE VESSEL (COPV) STRESS RUPTURE ISSUE

Presentor:

Organization/Date:
Orbiter/6-29-05

Background:

- Original Cert of Orbiter tanks based on 2 sets of data:
  - JSC fleet leader test program – 25 vessels
    - Intended to envelope fleet tanks in both stress ratio and time
  - Statistical reliability models based on Lawrence Livermore National Lab (LLNL) vessel tests
    - LLNL tests had small 4.5” dia tanks with low strength Aluminum liners, pressurized to 68-86% of ultimate fiber stress
  - Differences exist between LLNL, fleet leader and flight tanks but are the only statistically large sample of data available

	LLNL Vessels	Fleet Leaders	Fleet Vessels
Diameter (in)	4.5	10.4	19 - 40
Liner Material	1100 Al	5086 Al	Ti-6Al-4V
Liner Thickness (in)	0.04	0.04	0.044 (RCS He) 0.104 (OMS He)
Overwrap Thickness (in)	0.04	0.25	0.285 (RCS He) 0.739 (OMS He)
Overwrap Pattern	delta axi-symmetric	Complex	Complex
Resin	DER 332/Jeffamine T-403	LRF-092	LRF-092
Fiber	Kevlar 49 380 Denier	Kevlar 49 Type 969	Kevlar 49 Type 969
Quality Control	Little, if any	High	High
# Build Spools	One	Multiple	Multiple
Pre-test Load	None	Proof test	Proof test

COMPOSITE OVERWRAP PRESSURE VESSEL (COPV) STRESS RUPTURE ISSUE	Presentor:
	Organization/Date: Orbiter/6-29-05

Additional smaller updates to life predictions

- Probability curves adjusted to include contribution of LLNL aluminum liner and variability in Kevlar fiber material from different spools
- Adjustment to stress ratios to account for Orbiter burst tests being run at faster pressurization rate than for LLNL tanks
  - Results in small increase to stress ratio
- Adjustment to stress ratios for creep effects – Orbiter tanks with titanium liners can share more load to the liners
- Review confirms relationship between burst strength and stress rupture capability
- Burst strength of a vessel is not just a material allowable
  - Orbiter tanks had burst strengths varying from 267 ksi to 331 ksi
  - Each tank has different layup, thickness of composite, details of liner around bosses – All contribute to burst strength
- Conclusion - Method assures specific tanks have been safely accounted for

COMPOSITE OVERWRAP PRESSURE VESSEL (COPV) STRESS RUPTURE ISSUE

Presentor:

Organization/Date:
Orbiter/6-29-05

Present Ground and Flight Reliability Values Applicable For Assessing STS-114

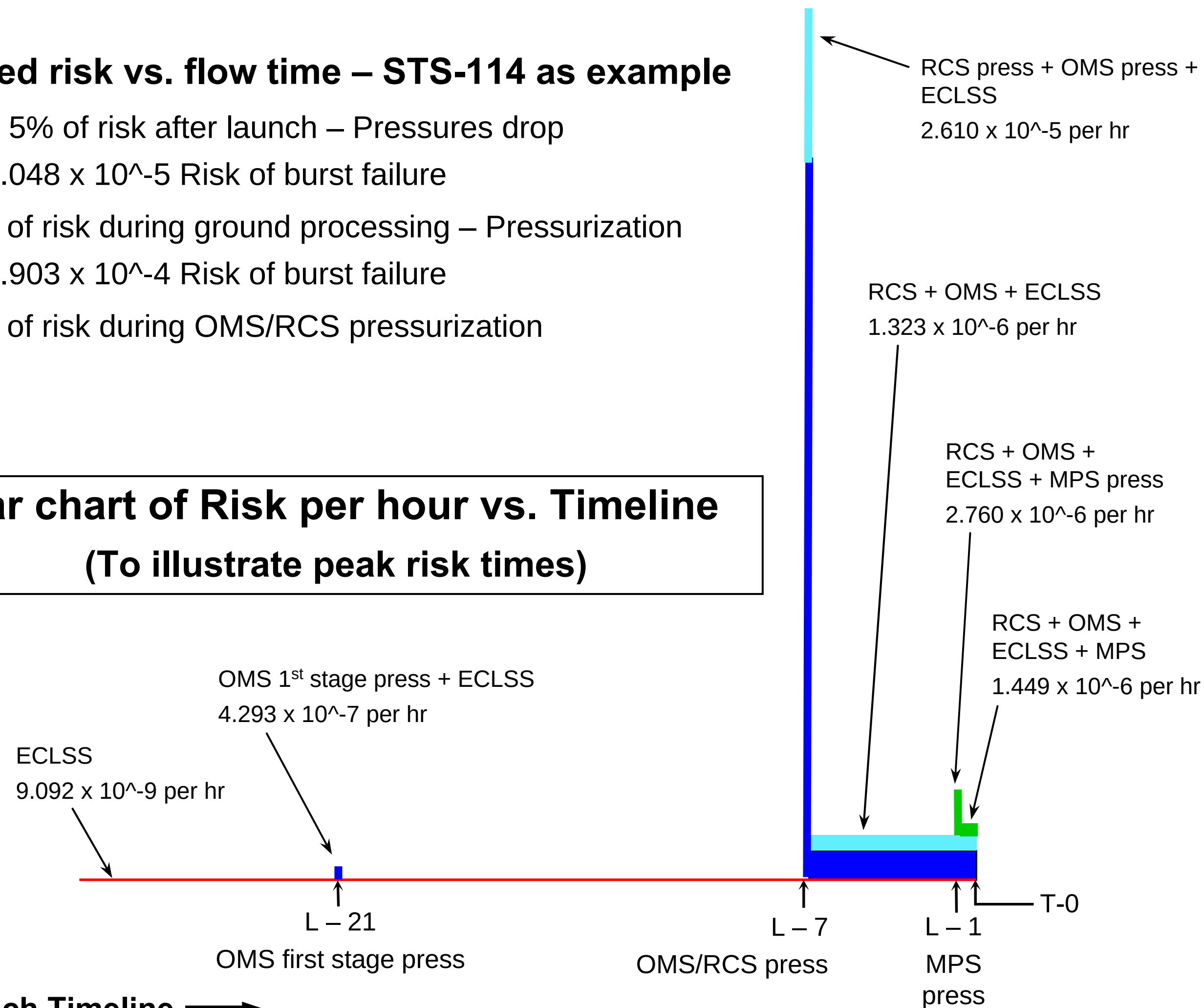
OV-103 COPV Sub-System	Past Accumulated Time t1 (Hours)	Current Estimated Mission Time (Hours)	No of vessels	Past OP Stress Ratio	Proposed Mission Stress Ratio	Conditional Probability of Survival	Conditional Mission Probability of Failure
OMS He-1	3743	100	1	0.575	0.575	0.9998455	0.0001545
OMS He-2	3431	100	1	0.575	0.575	0.9998481	0.0001519
RCS He	6254	195	2	0.515	0.515	0.9999860	0.0000280
RCS He	5875	195	2	0.515	0.515	0.9999862	0.0000276
RCS He	5686	195	2	0.515	0.515	0.9999863	0.0000274
MPS he	834	24	3	0.54	0.54	0.9999955	0.0000135
MPS He	834	24	7	0.47	0.47	0.9999999	0.0000006
ECLSS N2	73847	648	1	0.445	0.445	0.9999989	0.0000011
ECLSS N3	73847	648	1	0.445	0.445	0.9999989	0.0000011
ECLSS N4	73760	648	1	0.445	0.445	0.9999989	0.0000011
ECLSS N5	65262	648	1	0.445	0.445	0.9999989	0.0000011
ECLSS N6	61145	648	1	0.445	0.445	0.9999989	0.0000011
ECLSS N7	21900	648	1	0.445	0.445	0.9999991	0.0000009
System Probability of Survival			24			0.9995900	0.0004100

COMPOSITE OVERWRAP PRESSURE VESSEL (COPV) STRESS RUPTURE ISSUE

Presentor:
Organization/Date: Orbiter/6-29-05

- **Identified risk vs. flow time – STS-114 as example**
  - Only 5% of risk after launch – Pressures drop
    - 2.048 x 10^-5 Risk of burst failure
  - 95% of risk during ground processing – Pressurization
    - 3.903 x 10^-4 Risk of burst failure
  - 40% of risk during OMS/RCS pressurization

Bar chart of Risk per hour vs. Timeline
(To illustrate peak risk times)



Pre-Launch Timeline

Presentor:
Organization/Date: Orbiter/6-29-05

BACKUP

MPS POINT SENSOR ELECTRONICS BOX

	Presentor:
	Organization/Date: Orbiter/6-29-05

MPS Point Sensor Electronics Box Function:

- Normal MECO SSME shutdown is based on a calculated vehicle velocity
- Propellant depletion may occur due to variations in SSME performance, ET propellant loads and densities, vehicle performance, etc.
- The ECO sensors are armed when the calculated total propellant mass remaining is 32,000 lbm or upon second SSME failure after SRB separation
  - On the first pass through the logic after the arm command is activated, if any sensor indicates DRY, the logic will disable the first DRY LH2 ECO sensor to protect against a failed DRY sensor

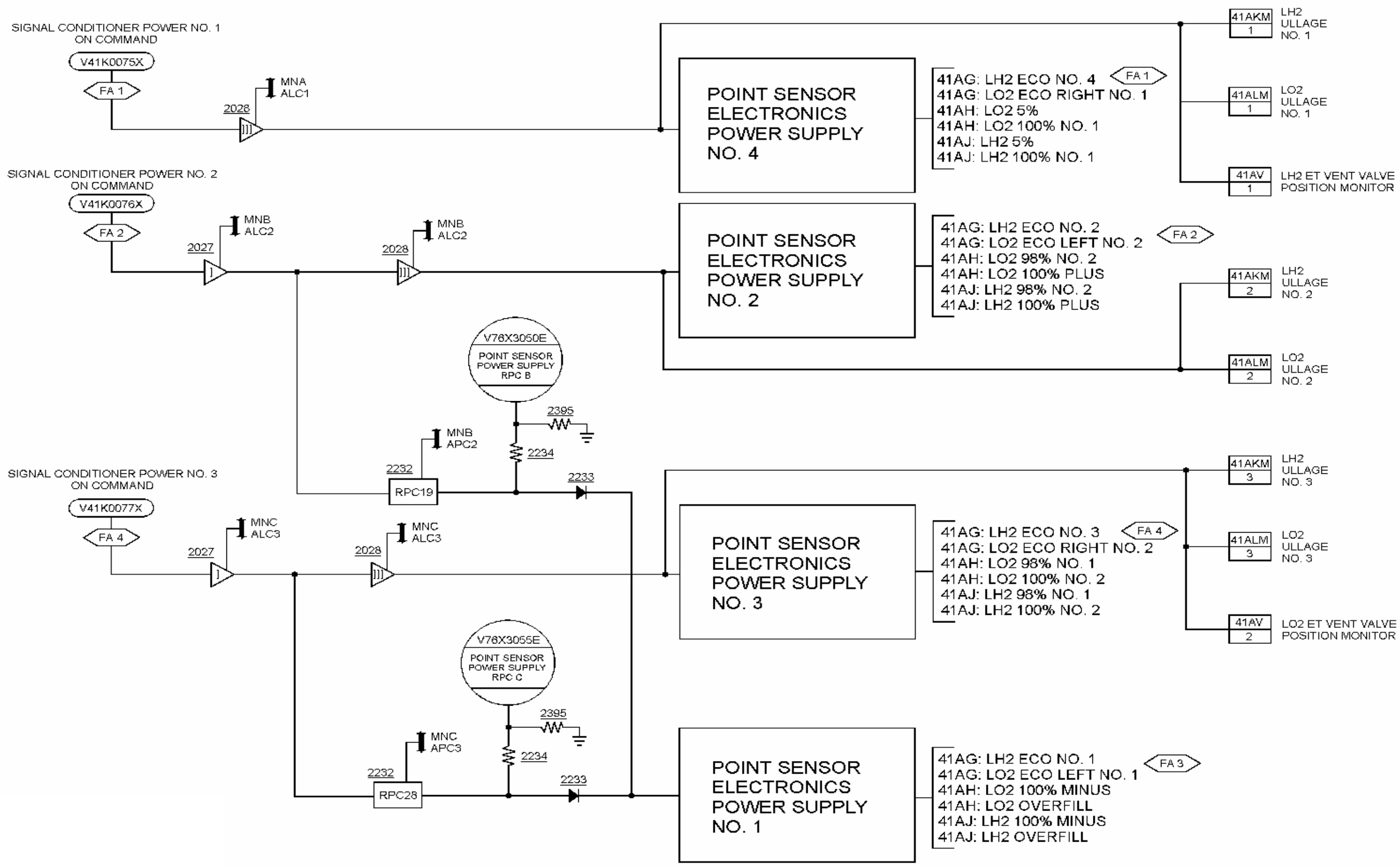
	Presentor:
	Organization/Date: Orbiter/6-29-05

MPS Point Sensor Electronics Box Function (cont):

- If LH2 propellant depletion occurs, any two of four LH2 DRY sensors will generate signals to the GPCs for initiation of the MECO SSME shutdown sequence
    - Two failed DRY LH2 ECO sensors after ARM or three failed DRY LH2 ECO sensors prior to ARM will result in early MECO – potential Crit 1
        - Flight rules call for a TAL abort if three ECO sensors fail DRY and uphill capability cannot be protected with MECO at the ARM command
    - Three failed WET LH2 ECO sensors (independent of ARM command timing) results in inability to shut down the SSMEs in a propellant depletion scenario – Crit 1

	Presentor:
	Organization/Date: Orbiter/6-29-05

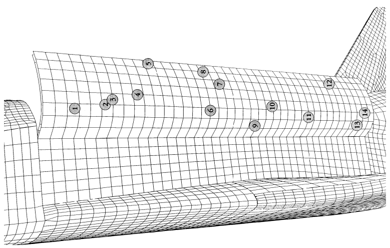
POINT SENSOR SIGNAL CONDITIONER POWER SUPPLY

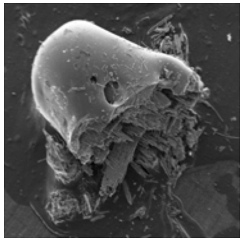


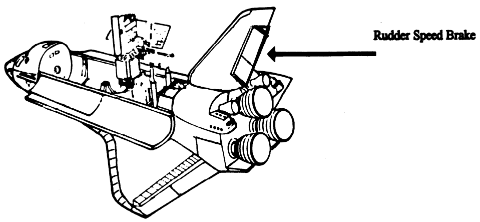
BACK UP CHARTS

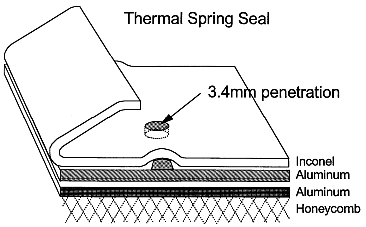
MMOD Risk Assessments Background

- **MMOD assessments have been part of SSP mission planning since STS-50**
  - Flight attitude has major influence on MMOD risks
  - By SSP direction (1996), flight attitude timelines have been designed to reduce MMOD risk & meet SSP guidelines for MMOD damage exceeding LOV failure criteria and radiator tube leak
  - Flight planning has been effective in avoiding potentially hazardous MMOD impacts:
    - Examples: STS-73 PLBD impact, STS-72 rudder speed brake impact (details in JSC-28033)









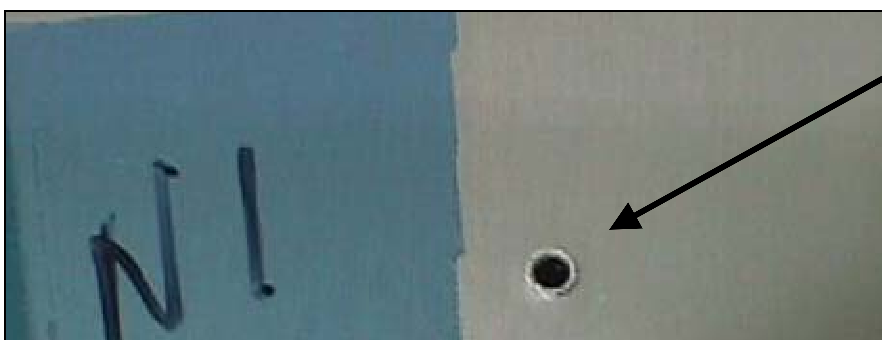
- **BUMPER code used in SSP and ISS MMOD risk assessments**
  - Approved by ISS & Shuttle Programs: ISS specifications (1992), SSP CMMDB (1997)
  - Used to evaluate MMOD protection design, perform trade studies & optimization
  - Used to verify compliance with protection requirements: ISS CoFR, SSP FRR

- **BUMPER provides a reasonable measure of MMOD risk based on comparison of BUMPER predictions to actual MMOD damage sustained on ISS, Shuttle and LDEF**
- **BUMPER MMOD risks are nominal values**
  - Are not worse case, nor on the high-side of actual risk
  - Based on nominal MMOD environment models, nominal failure criteria, nominal assessment of ballistic performance of spacecraft components as determined from hypervelocity impact tests and analyses

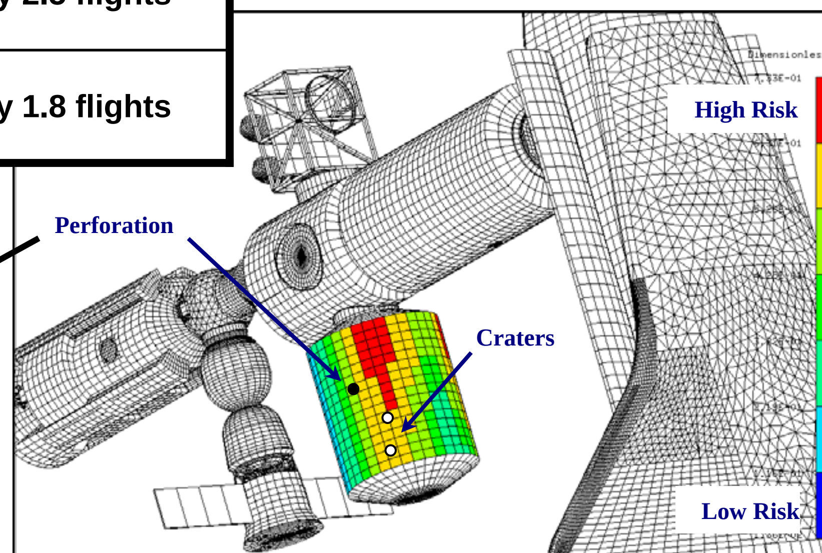
Verification/Validation
BUMPER comparison to observed ISS impacts

- **MPLM is inspected for meteoroid/debris damage post-flight**
  - 2 craters & 1 complete penetration of outer bumper observed after flight 1 (5A.1)
  - 7 craters & 1 complete penetration of outer bumper observed after flight 4 (UF1)
- **Observed damage to MPLM compares well with predictions using ORDEM2000 in BUMPER in terms of both location & severity**

	Risk of MPLM bumper perforation each flight	Frequency of bumper perforations
EXPERIENCE	**40%**	**1 every 2.5 flights**
PREDICTION	**55%**	**1 every 1.8 flights**



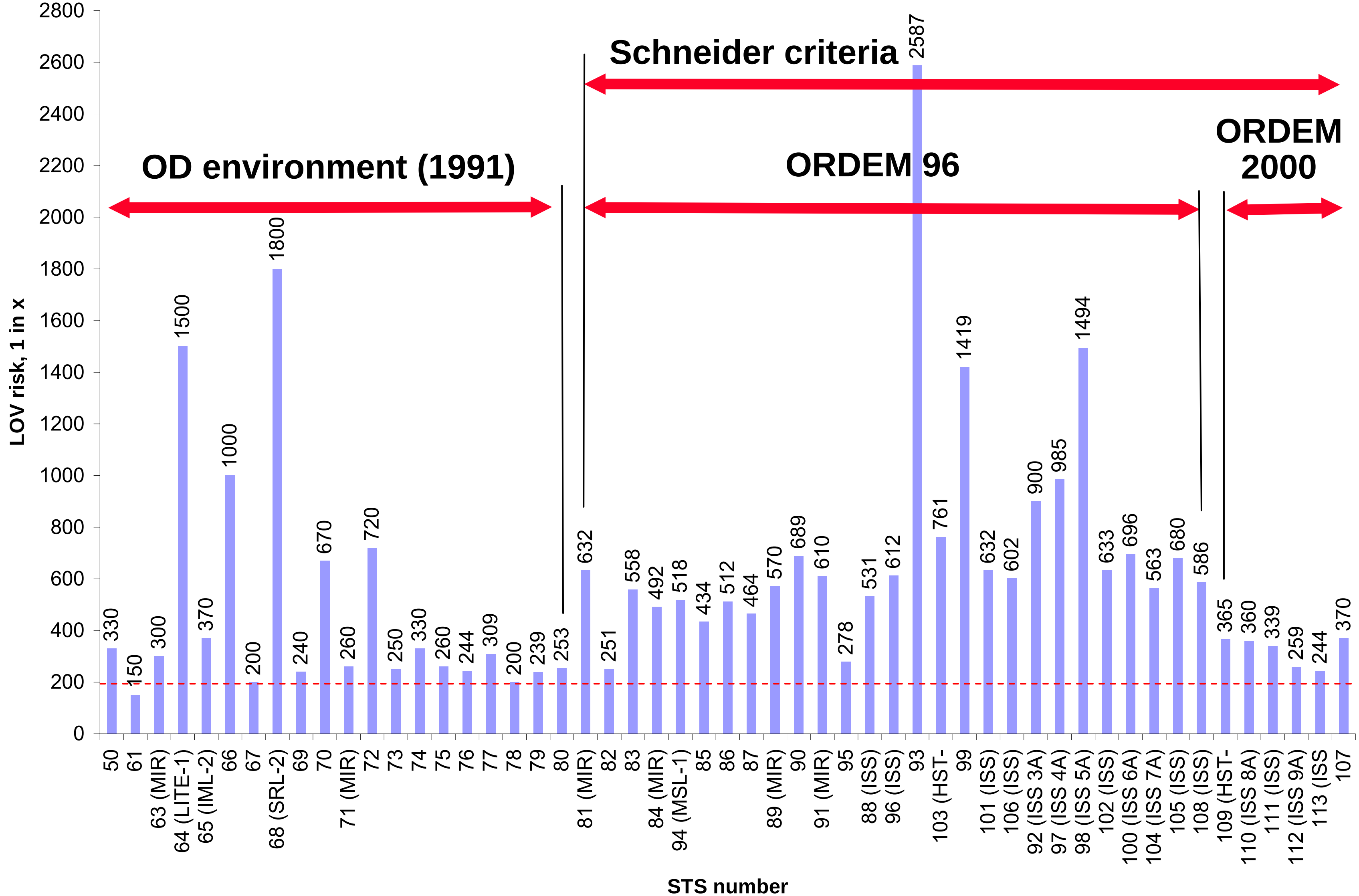
5A.1: 1.4mm diameter through-hole, 2.5mm diameter exterior crater



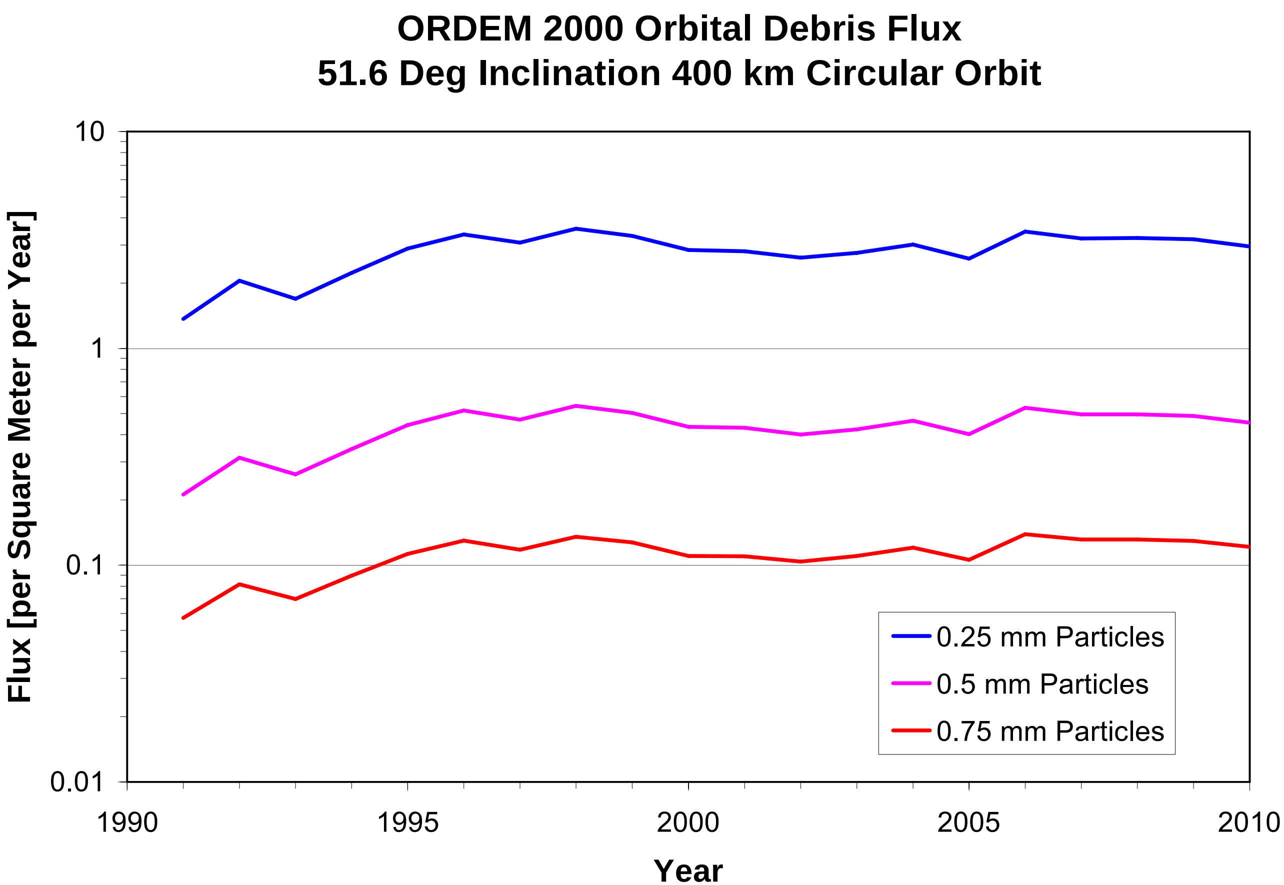
MPLM bumper perforation risk plot, with impact locations noted

Impact damage occurred near predicted high-risk area

Assessed MMOD LOV risks presented at FRR



ORDEM 2000 model fluxes



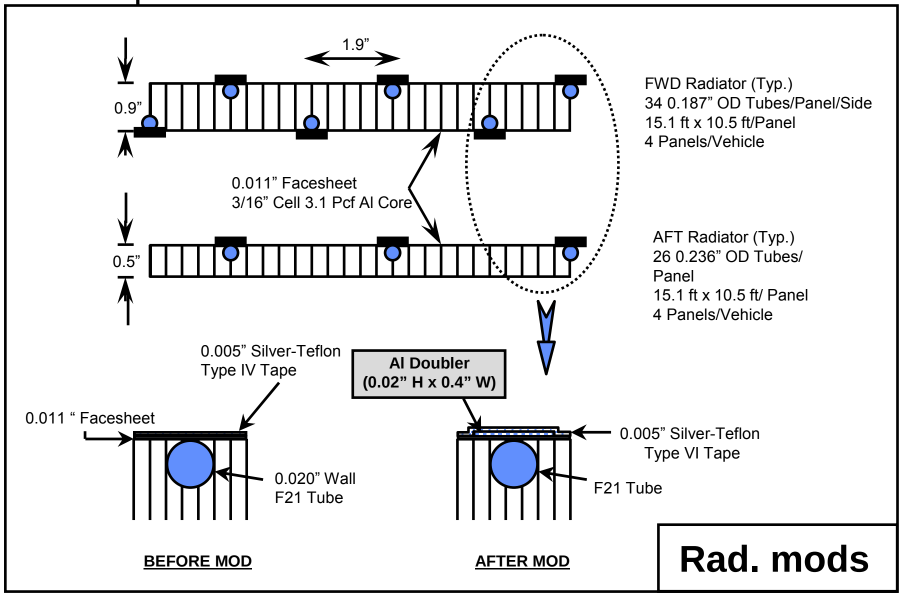
- The net result of the effects of the modeled sources and sinks for the period ~1996 – 2010 is that the mm-size flux stays approximately constant at 400 km altitude

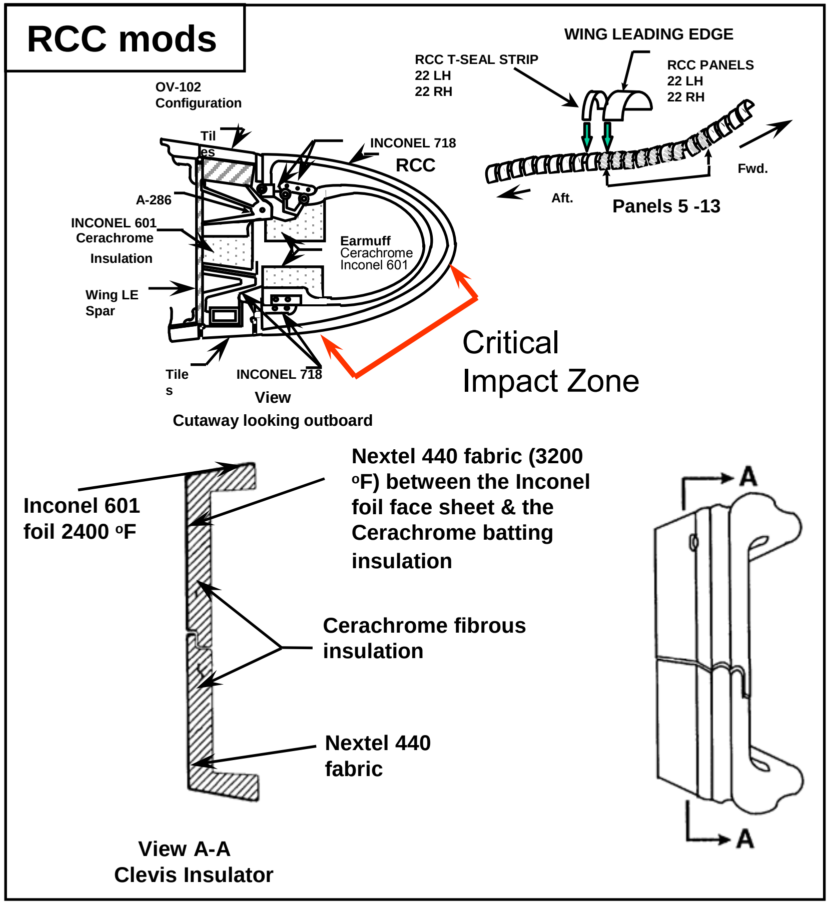
•Reference: Dr. Mark Matney

Shuttle modifications implemented to reduce M/OD risk

- **Wing Leading Edge insulation modification improved panel 5-13 damage tolerance**
  - Change in failure criteria for critical damage of reinforced carbon-carbon (RCC) panels no.5-13

- Radiator modifications to improve mission success
  - Doublers over radiator tubes
  - Automatic isolation valves
  - Additional beta-cloth protection to radiator panel interconnect lines



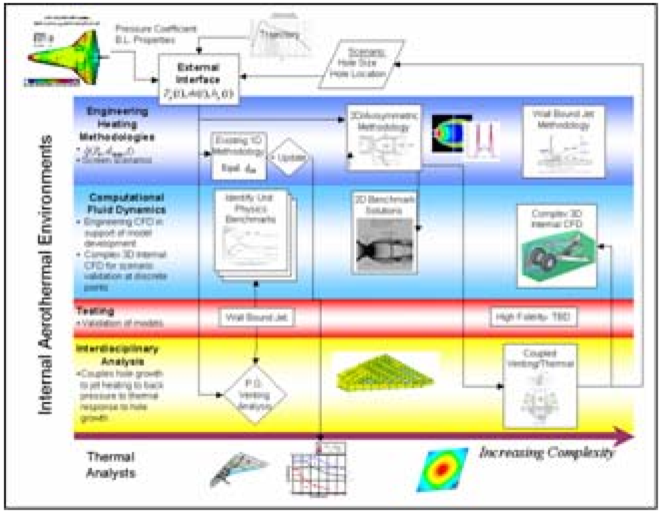


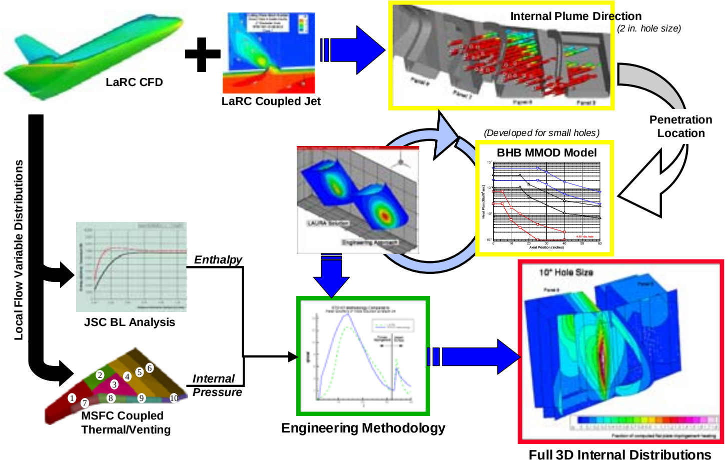
•Reference: E. Christiansen, “Shuttle MMOD Risk Assessments”, August 27, 2003.

- **Columbia investigation lessons learned**
  - In the course of completing the Columbia investigation significant insights and expertise were developed for analyzing RCC cavity penetrations
  - Recent BHB CFD results have grown from Columbia activities and build on the knowledge gained
  - The STS 107 Aerothermal team combined high fidelity CFD techniques with first order engineering principles and custom tools to successfully reproduce flight timeline measurements and explain Columbia debris evidence

- **Considering the variation in internal geometry, thermal protection system specification, and external flowfield conditions along the Shuttle wing leading edge, it is not possible to analyze all locations with full, higher fidelity math modeling tools**

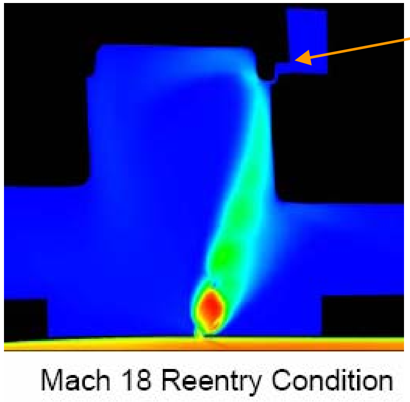
- **This assessment will take advantage of Columbia investigation insights and combine higher fidelity CFD results with conservative first order principles to provide full RCC coverage for maximum allowable MMOD penetration dimensions**



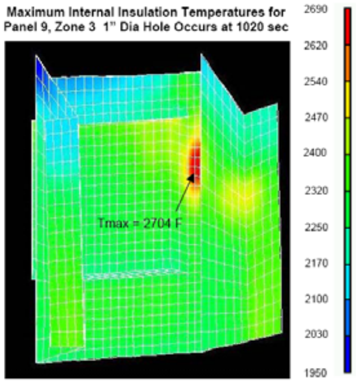


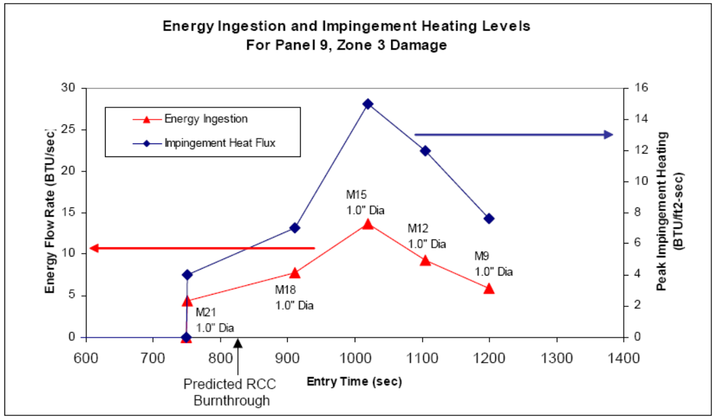
- ***MMOD Internal Flow Study* - Most complete assessment to date for RCC MMOD penetration and thermal analysis has been performed by BHB for a number of hole sizes and locations, including a 1” diameter hole in panel 9 at worst case hole growth zone (zone 3)**
  - BHB coupled high-fidelity CFD modeling at Mach 21, Mach 18, Mach 15, Mach 12, and Mach 9
  - Flow impinges on earmuff and stagnates on spar insulation
  - Full 3-D thermal analysis ***with certification models*** predict peak Incoflex temp of 2704°F, less than 2800°F limit
  - Results indicate that 1” diameter hole in panel 9 high heating zone will not fail internal insulation

- ***Relate all points on RCC back to these reference analysis results by appropriate application of first order principles***



sneak flow is not an issue for low momentum ingestion





Approach Genesis

- **Analysis objective: "***Establish hole dimensions across the RCC system that will not exceed reference calculation heating results***"**

- **Key drivers for jet impingement heating:**
  1. **Hole diameter**: *mass flux, flow turning, jet scaling*
  2. **Hole location:** *surface pressure, enthalpy profile drive energy flux*
  3. **Distance to surface:** *expanding jet properties, mixing with ambient flow*
  4. Impingement angle: Normal impingement is highest, sine fall-off with angle
     - Reference case peak heat flux stagnates on spar insulator
     - Glancing impingement reduces heat rate
  5. Surface temperature

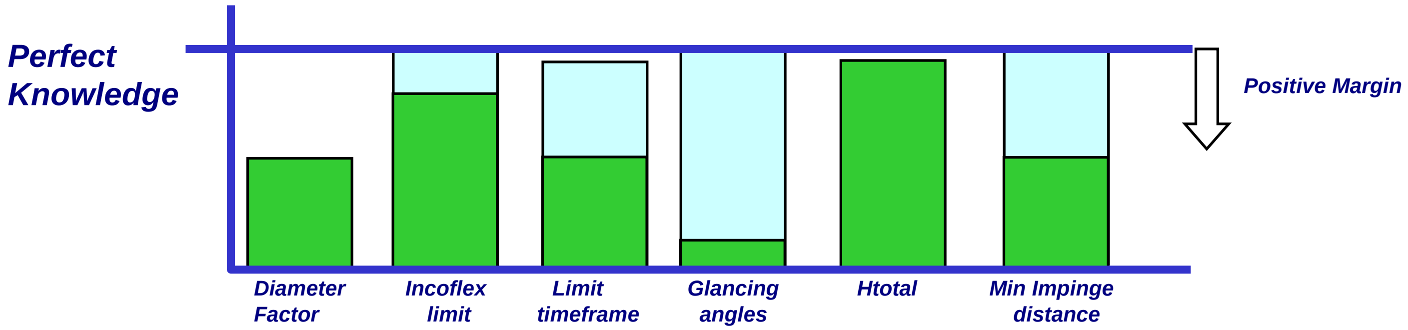
- **Develop a relationship between local heating drivers and conditions from the reference case that satisfies analysis objective**

- **Cutting to the chase:**

$$d_{allow} = Fac \cdot d_{ref} \cdot \left(\frac{P_{ref}}{P_{local}} \right)^{1/2.6} \left(\frac{r_{imp_{local}}}{r_{imp_{ref}}} \right)^{1.85/2.6}$$

Factor Determination/Conservatisms

- **CFD solvers are flight certified tools**
  - External surface solutions are known/validated for the past decade
- **Coupled internal/external solutions post 107**
  - CFD mass flow calculations match engineering/certified venting tools (STS107)
  - Flow paths and internal geometries are much more complicated than external solutions
  - Hole geometry effects unknown, but reasonably second order (for relatively low aspect ratio geometries)
  - Internal plume resolution grid dependent
    - Mach disk distance, barrel shock boundaries, internal shock structure, surface heating
    - Factors of 2 in localized heating observed for grid refinements and between solvers
- **Prudence and sound engineering dictates factor of 2 margin for heating**
  - ***Factor of 0.75 applied to reference diameter yields 47% of reference heating***
- **Additional conservatism**
  - Incoflex limit of 2800°F but reference only gets to 2700°F; may approach 20% of q_{ref}
  - Allowable damage at 1100 seconds rather than peak heating; may approach 45% of q_{ref}
  - Impingement angle effects; significant at glancing angles
  - Boundary layer thickness effects on H_{total}; thinnest BL at reference condition
  - Minimum impingement distance over sweep; increases “Ear Muff Allowable” area



Backup

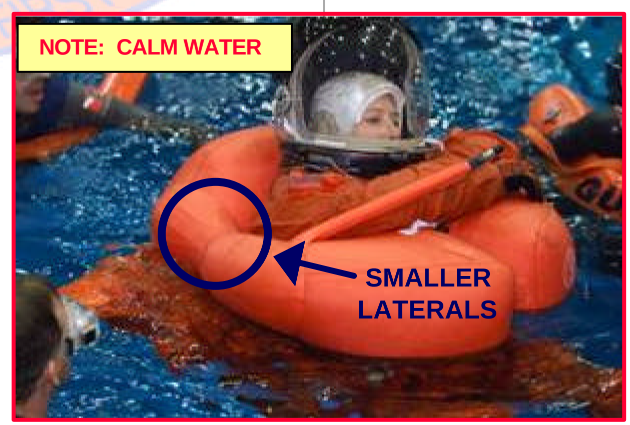
Shuttle Crew Escape Equipment (CEE)
Small Enhanced Life Preserver Unit (SELPU)

- **Problem**
  - From 1995 through 2004, WET-F/NBL water survival training events produced multiple negative crew comments pertaining to ability to safely maneuver and operate during water survival with existing (large) Enhance Life Preserver Unit (ELPU)
  - Negative crew comments culminated with an STS-114 crewmember reporting existing ELPU is unacceptable and does not maximize crew survivability
- **Activities completed to address problem**
  - Executed "fast-track" DDT&C of a crit-1 "smaller" life preserver unit for qty-3 STS-114 "smaller" stature crewmembers to maximize crew survivability, all IAW EA-WI-023
  - Executed wave-tank testing with 5% Asian female equivalent subjects to evaluate the following under sea-state-1 and sea-state-2
  - Completed qualification/flight hardware build-up, qualification testing, PTRS/RAESR processing IAW EA-WI-023 (with approved EA-002 exceptions)
  - SELPU preflight check-out
- **Activity remaining to be completed**
  - Final GCAR approval (pending safety documentation approval at PRCB)
- **Flight rationale**
  - Successful SELPU design qualification
  - SELPU preflight check-out test completion for each STS-114 unit
  - Expected successful GCAR completion/approval

Shuttle Crew Escape Equipment (CEE)
Small Enhanced Life Preserver Unit (SELPU)

LPU POSTURE IMMEDIATELY PRIOR TO WATER ENTRY

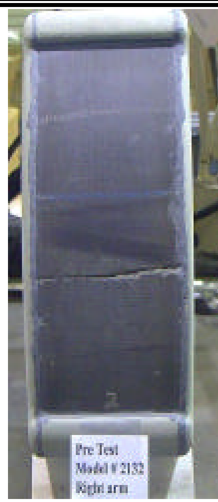
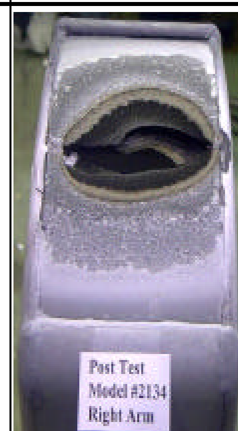
SMALL ELPU PROTOTYPE – RAFT INGRESS



SMALL ELPU PROTOTYPE

RCC Damage Criteria Rationale

Verification and Validation Results – Panel 9 Impact Specimens

Specimen ID (Facility)	Pre-Test Damage Description	Pre-Test Photograph	Test Conditions Temp (°F) / Press (psf)	Test Duration (seconds)	Post-Test Photograph	Test Observations	Time to Breach (seconds)		IML Hole Diameter (inches)		Remarks
							Test	Analysis	Test	Analysis	
2132	• Crack (0.020-inch wide) across entire specimen width		2960 / 127	900		• Survived 900 sec exposure with no visible breach	• No breach	• No breach	• None	• None	• RCC Damage Growth Tool returns "No IML damage predicted" for cracks 0.020-inch or less
2134	• Crack (0.040 to 0.060-inch wide) across entire specimen width • Coating Loss (0.19-inch)		2960 / 127	125		• Tested 125 seconds. • Resulted in slotted IML hole 2.25 x 0.5-inch	•Not App. Crack is a breach	•Not App. Crack is a breach	2.25 x 0.5 Equiv. Dia. 1.061-inch	3.189 x 0.377 Equiv. Dia 1.097-inch	• Revised Non-catalytic temperatures, 02-10-2005 • RCC Damage Growth Tool is conservative on IML hole size.