FLIGHT READINESS STATEMENT
STS-104/ET-109
EXTERNAL TANK PROJECT
PRE-FLIGHT REVIEW

EXTERNAL TANK ET-109/STS-104, AS IDENTIFIED IN THE EXTERNAL TANK PROJECT PRE-FLIGHT REVIEW DATED MAY 18, 2001, IS CONSIDERED READY TO SUPPORT FLIGHT UPON ACCEPTABLE DISPOSITION OF OPEN/PLANNED WORK AND/OR OPEN ACTIONS.

N. E. OTTE/MP31

for J. BULLMAN/ED10

for P. M. MUNAFO/ED30

for A. O. GOODSON/QS01

Jody Singer for
A. A. McCOOL/MP01

for P. K. McCONNAUGHEY/ED20

S. D. ROSE/ED40

H. V. McCONNAUGHEY/TD60

J. W. SMELSER/MP31, CHAIRMAN

05/18/2001

Space Shuttle
External Tank

Pre-Flight Review

STS-104/ET-109

109NASAPFR.4250.05/2001

LOCKHEED MARTIN

05/18/2001

Space Shuttle
External Tank

Pre-Flight Review

STS-104/ET-109

109NASAPFR.4250.05/2001

LOCKHEED MARTIN

Agenda

Dawn Diecidue

Overview

Prior Mission Performance Summary

- ***STS-100/ET-108***

Current Mission/External Tank Highlights

- ***STS-104/ET-109***

Mass Properties Status

Changes: No significant items

Senior Management Review NCD

Special Topic: None

SRM&QA Assessment

KSC Processing

Verification/Certification

Mission Unique Assessment

Readiness Statement

Appendices

109NASAPFR.4250.05/2001

Overview

This review for STS-104/ET-109 includes:

- Items specific to missions STS-104
- First time differences and "out-of-family" non-conformances not previously flown and/or reviewed

FRR Series

• Michoud Operations President's Review	03/13/2001
• ET/SRB Mate Review	04/11/2001
• ET Project Pre-Flight Review	05/18/2001
• Space Shuttle Vehicle FRR	05/31/2001
• Pre-launch Mission Management Team Review	06/12/2001

Prior Mission Performance Summary

STS-100/ET-108, 04/19/2001 Launch

System	***Performance***
• ***OMRSD***	• OMRSD Waiver WK10080 processed / approved during launch count – GH2 vent valve actuation pressure dropped below requirement • The pressure drop correlated to LO2 system vent valve cycling confirming that a lower facility supply pressure caused the pressure drop • Loading continued with no issues • LH2 replenish and subsequent launch operations were not impacted – Preliminary RCN in work to allow transient pressure excursions
• ***LCC***	• No ET LCC Violations
• ***Instrumentation***	• Nominal
• ***MPS***	• Nominal
• ***ET Hazardous Gas***	• No ET Violations

Prior Mission Performance Summary

STS-100/ET-108, 04/19/2001 Launch

System	***Performance***
• ***TPS***	• No issues
• ***ET Disposal***	• Nominal
• ***Film Review - Post-Launch***	• No ET related issues
• ***Orbiter Tile Damage***	• Foam performance in-family of NCFI flights – Lower surface hits • Diameter > 1" = 4 • Total = 42
• ***Film Review - Post-Flight***	• No ET related issues

109NASAPFR.4250.05/2001

Mission/External Tank Highlights

STS-104/ET-109 (as of 05/16/2001)

Mission	***STS-104***
Launch	***06/14/2001 (NET)***
• Window	3:11 p.m. EDT
• Pad	39-B
• Orbiter	Atlantis (OV-104)
• Orbital Inclination	51.6 degrees/122 nautical miles
• ET Photo Coverage	• Crew photos from cockpit window • Umbilical well cameras
Primary Payload	• International Space Station (ISS) Assembly Flight 7A – Joint Airlock - Provides station-based Extravehicular Activity, or space walking capability using both U.S. and Russian spacesuits – High Pressure Gas Assembly - Supports space walk operations and augments the Service Module gas resupply system
Landing	***KSC, 06/25/2001, 11:51 a.m. CDT (NET)***
External Tank	***ET-109***
DD250 Acceptance	05/03/2000
Shipped to Launch Site	10/20/2000

109NASAPFR.4250.05/2001

Agenda

Overview

Prior Mission Performance Summary

Current Mission/External Tank Highlights

ET-109 Mass Properties ***Rick Spring***

Changes: No significant items

Senior Management Review NCD

Special Topic: None

SRM&QA Assessment

KSC Processing

Verification/Certification

Mission Unique Assessment

Readiness Statement

Appendices

Mass Properties Status

STS-104 / ET-109

Specification Weight = 58,432 lbs.

ET-109 Weighing

- ET-109 was weighed at MAF on May 2, 2000 using the Weigh Tronix weighing system
  - Predicted Weight 58,253 lbs.
  - As-weighed 58,404 lbs.
  - Delta to Predicted +151 lbs.

Mission Planning

- MMC-ET-SE40, ET Project - Mass Properties Weight and Balance Report, was submitted May 3, 2000 to support mission planning
- Coordination with Level II on May 1, 2001 indicates approximately 1,510 lbs. performance margin for STS-104

109NASAPFR.4250.05/2001

Agenda

Overview

Prior Mission Performance Summary

Current Mission/External Tank Highlights

Mass Properties Status

Changes: No significant items

Senior Management Review NCD

- ***LO2 Dome ODG-11 Repair*** — ***Glen Wadge***

Special Topic: None

SRM&QA Assessment

KSC Processing

Verification/Certification

Mission Unique Assessment

Readiness Statement

Appendices

LO2 Tank Dome Weld Repair (SMR-99-001B)

Issue

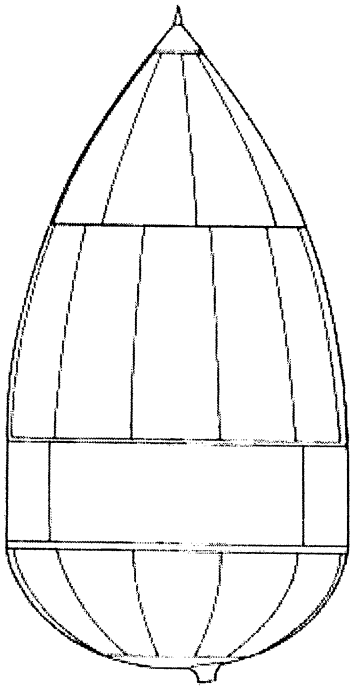
- Non-standard initial weld of LO2 tank dome gore weld ODG-11 resulted in low weld elongation (≈1.0%) which drove unique full length repair
  - 4 weld passes required for initial weld compared to standard 3 pass weld
    - No parameter violations were noted for any pass
  - Required use of standard 1" and wide panel (18") data to demonstrate repair weld properties

Background

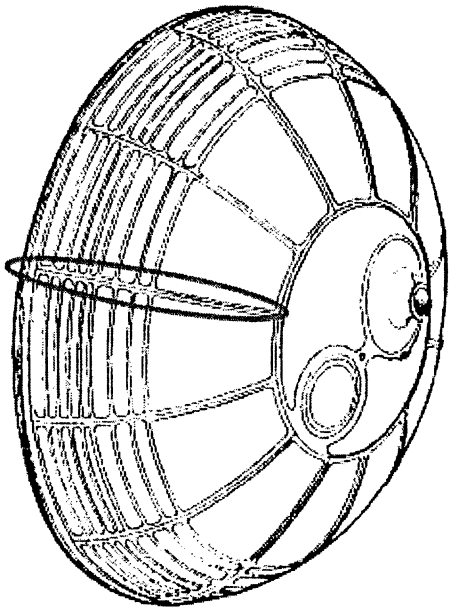
- LO2 tank dome installed on ET-109 originally allocated to ET-104
  - Dome reallocated to allow time to mitigate anomaly on ODG-11 weld
    - Weld repair on ODG-11 to mitigate low initial weld elongation

LO2 Tank Dome Weld Repair (SMR-99-001B)

Background

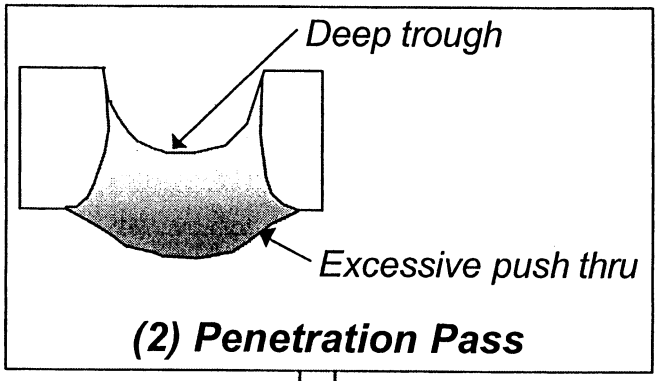


LO2 Tank

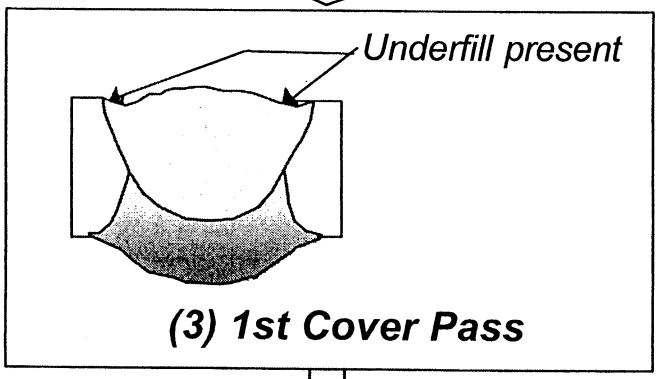


LO2 Tank Dome

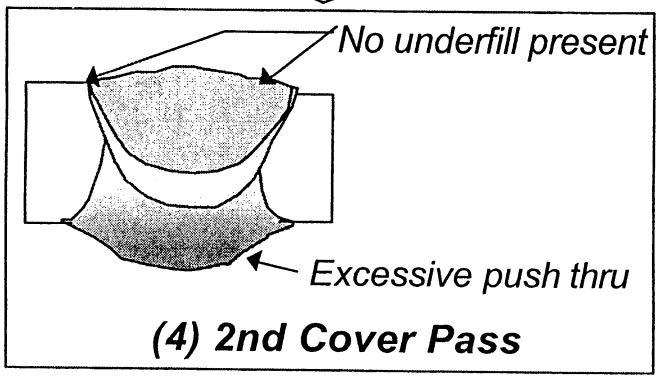
(1) Seal Pass



(2) Penetration Pass



(3) 1st Cover Pass



(4) 2nd Cover Pass

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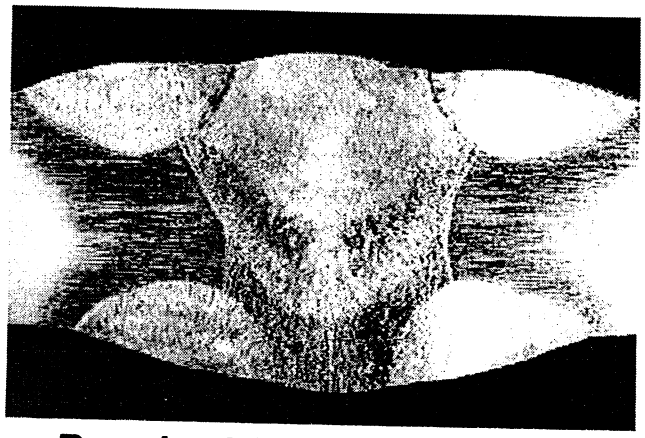
LO2 Tank Dome Weld Repair (SMR-99-001B)

Actions Taken

- Determined non-standard ODG-11initial weld properties using test panel with 4 pass weld sequence and same external weld geometry to duplicate hardware
- Sectioned cores from ODG-11 flight hardware for macrostructure comparison to test panels
- Test panel results:
  - Tensile results of 4 pass initial weld met repair allowable
  - Disparity in elongation
    - Some test panels produced 1.5 - 2.0% elongation @ RT and 0.5 - 1.0% @ -320ºF
    - Typical initial welds produce values of 4.0-6.0% @ RT and 3.0-5.0% @ cryo temperature
    - Typical repair welds produce values of 4.0-5.0% @ RT and 2.5-4.0% @ cryo temperature
- Evaluated series of repair options to increase overall elongation of weld
- Selected optimum full length repair method
  - Four repair beads added at the initial weld fusion lines
  - Maintained acceptable tensile properties
  - Produced acceptable elongation
    - No reduction in elongation in shaved condition



Repaired from OSL and ISL

LO2 Tank Dome Weld Repair (SMR-99-001B)

Discussion

- Repair option development panels and repair simulation wide panels demonstrate repair strength capability and elongation
  - Test 1" samples from repair option development results
    - *Ultimate tensile strength*

	RT		Cryo Temp (-320°F)	
	Actual (ksi)	Required (ksi)	Actual (ksi)	Required (ksi)
– Average	42.2	N/A	49.5	N/A
– Minimum (ksi)	39.7	30.0	45.2	35.0

    - *Elongation*

	RT	Cryo Temp (-320°F)
– Average	5.4	3.4
– Minimum	5.0	2.0

Note: Results correlate with standard repair weld data

  - Wide panels (required for combined full length repair and additional local repairs)
    - *Ultimate tensile strength (panels proofed to 30 ksi @ RT)*
    - *Panels tested at cryogenic temperature (-320°F)*

	Actual (ksi)	Required (ksi)
– Panel #1	41.3	35.0
– Panel #2	53.2	35.0
– Panel #3	47.4	35.0

LO2 Tank Dome Weld Repair (SMR-99-001B)

Rationale for Acceptance

Presented to / accepted by MAF and MSFC Senior Management Review Boards

- Test
  - Welds are adequately proof tested (assures > 4 mission lives based on standard fracture assessment)
  - Proof test demonstrates > 117% of flight limit load based on a strength assessment (temperature corrected)
  - Panel testing showed repair met or exceeded design repair weld strength and elongation values

LO2 Tank Dome Weld Repair (SMR-99-001B)

Rationale for Acceptance

- Analysis

  Fracture

  - Suspect micro structure mitigated by 4 pass repair performed on hardware
  - Repaired weld meets typical repair weld strength and elongation (in-family)
  - Post proof x-ray and penetrant inspection (ISL and OSL) of repair was acceptable
  - In-family repair enveloped by repair weld fracture data base

  Stress

  - Standard weld analysis performed for proof and flight conditions
    - Used as-built measured peaking and mismatch
    - Used standard weld repair allowables verified by test
      - Assessed strain levels for ODG-11 weld since strain capability was initially a concern
  - Results
    - FS = 1.32 (1.26 required)
      - Maximum predicted weld strain < 1.0%

Agenda

Overview

Prior Mission Performance Summary

Current Mission/External Tank Highlights

Mass Properties Status

Changes: No significant items

Senior Management Review NCD

Special Topic: None

SRM&QA Assessment

Terry McKeough

KSC Processing

Verification/Certification

Mission Unique Assessment

Readiness Statement

Appendices

109NASAPFR.4250.05/2001

SRM&QA Assessment

as of 05/16/2001

Item	***Status***
• ***ALERTS***	• None Open
• ***MRB Assessment***	• Complete - No issues/no impact to hazard controls
• ***Hazard Assessment***	• Complete - All hazard reports were re-assessed and hazard controls verified
• ***CIL Retention Rationale***	• Complete - No issues/no impact to CIL retention rationale
• ***Corrective Action Problem Summary (CAPS)***	
• S-083, Post proof NDE concerns	• ET-109 cleared – Pending implementation of corrective action
• S-085, Sanded/shaved Al 2195 welds	• ET-109 cleared - Rationale accepted at PRCB, 12/04/00 – Pending implementation of corrective action
• S-086 LH2 Tank Tooling Pin Impact - ET-115 Senior Management Review	• ET -109 cleared - Isolated Case

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Agenda

Overview
Prior Mission Performance Summary
Current Mission/External Tank Highlights
Mass Properties Status
Changes: No significant items
Senior Management Review NCD
Special Topic: None
SRM&QA Assessment
KSC Processing
Verification/Certification
Mission Unique Assessment
Readiness Statement
Appendices

Fred Lockhart

109NASAPFR.4250.05/2001

KSC Processing

as of 05/16/2001

Discrepancy Reports (DRs)/Problem Reports (PRs) Review

- PR/MRB discrepancies/dispositions similar to previously flown vehicles
  - All KSC/MRBs have been reviewed by MAF Reliability for potential SMR
  - No items were elevated to the SMR

Limited Life Component/ET Status

- All within required life through scheduled launch date plus 90 days

OMRSD Exceptions/Waivers

- None

Changes

- ET modifications

– Mod Kits	0	
– DC&R	0	
– Bldg 45	0	
– FEC	1	KET-0070, Intertank thrust panel foam venting

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KSC Processing - Status

as of 05/16/2001

Changes

- Requirements
  - LCC 4
  - OMRSD 2
  - Facility 0
  - Software 0

- Definition of safety critical item (LCN 1062 R1) *
- Generic ground wind update for Block II and Non-Block II SSMEs (LCN 1067) *

  * *Not presented - No impact to ET*
- ICE-FG-01 No ice zone update (LCN 1065 R2)
- Increase Nose Cone heater outlet maximum temperature from 325 to 350 deg F. (RCN MS15473R1 and LCN 1060 R1)
- Lowered nose cone purge QD leak check pressure and minimum leak rate (RCN KT15490)

SIM Launch (S0044) *05/21/01*

SIM Load (S0056) *06/04/01*

109NASAPFR.4250.05/2001

Launch Commit Criteria Change

ICE-FG-01 No Ice Zone Update

Description:

- Revise Figure F-01, Ice Area Limits on External Tank to clarify no ice zone specifics
  - No ice zone encompasses 360° forward of Station 371 and +/-30° between Stations 371 and 537
  - 1/16 inch maximum thickness acreage ice area encompasses +/-100° between Stations 371 and 2058

Reason for Change:

- Eliminate potential for misinterpretation
  - Explicit boundaries were not specified on the graphical depiction

Status:

- LCN 1065 R2- Pending Level II approval, ECD 05/25/01

OMRSD and Launch Commit Criteria Changes

Nose Cone Heater Outlet Temperature Requirements

Description:

- Increase the Nose Cone heater outlet maximum temperature limit from 325° F to 350° F
  - Maximum allowable temperature limit reflects the temperature limitation of the 3/8 inch QD seal

Reason for Change:

- Allow for higher Nose Cone heater outlet temperatures due to cold ambient conditions and to allow for transient conditions when switching between the Primary and Secondary Heaters
  - Previous limit set to preclude auto ignition of the RSS linear shaped charge and to protect against Nose Cone SLA bondline temperatures

Status:

- RCN MS15473 R1 - Pending Level III/II approval, ECD 05/25/01
- LCN 1060 R1- Pending Level III/II approval, ECD 05/25/01
- IRN TC-1542 - Approved 04/17/00 (PRCBD S052333DP)

OMRSD Change

Nose Cone Purge Leak Check Requirements

Description:

- Revise the minimum allowable leak check pressure from 2100 to 1800 psig and reduce the allowable leak rate limit from 600 to 500 scims

Background:

- During some ambient temperature conditions, the purge does not go above 1900 psig without heat and only reaches 2100 psig with the nose cone purge set point between 100° F to 115°F and the Facility GN2 pressure set to the max of 3100 psig
  - 2100 psig leak check limit was determined originally based on pressures after start of cryogenic load
  - 1800 psig limit is based on the OMRSD minimum operational purge limit per File II
- This change maintains the same size leak with a lower pressure and changes the allowable leak rate from 600 scims to 500 scims

Reason for Change:

- Eliminate potential waivers and formalize workaround procedures
  - Accommodates differences in ambient temperature vs system performance where the minimum pressure cannot be achieved

Status:

- RCN KT15490 - Approved 04/27/01 (PRCBD S053294YT)

Agenda

Overview

Prior Mission Performance Summary

Current Mission/External Tank Highlights

Mass Properties Status

Changes: No significant items

Senior Management Review NCD

Special Topic: None

SRM&QA Assessment

KSC Processing

Verification/Certification Readiness Statement

Dawn Diecidue

Appendices

- A: Minor Changes
- B: SRM&QA Assessment
- C: KSC Processing
- D: Level II Waivers/Level III Deviations
- E: Previously Presented Items

Verification/Certification

as of 05/16/2001

Item	***Status***
NSTS 07700, Volume X, Book 1, Baseline	**Complete - No issues**
• Revision M, Change 271	
Certification Documentation	
• Certificates of Qualification (COQ)	**No new items**
• Hardware Certification Sheets (HCS)	**Complete - No issues**
– In-line venting of Intertank thrust panels (B02059A) - Design change implemented on ET-108	
• Documentation revised after closure of IFA T-087PF	
– T501K, Acreage Foam (NCFI 24-124)	
– T504M, Closeout Foams (SS-1171)	
– T507M, Closeout Foams (BX-150)	
– Composite Nose Cone Certification Update (B02058)	
• S511E, Composite Nose Cone Bulkhead Assembly S518E, Composite Nose Cone Installation and Spike Assembly	
Deviations/Waivers	**No new items**

109NASAPFR.4250.05/2001

Mission Unique Assessment

as of 05/16/2001

	STS-104/ET-109
Review of MRB actions using updated loads	*No new loads or environments requiring assessment have been identified at this time*
MPS Preflight Prediction Package	*ECD 06/04/2001*

109NASAPFR.4250.05/2001

Readiness Statement

The External Tank, ET-109, is certified and ready for STS-104 flight pending completion/closure of open and planned work

Appendices

A: Minor Changes

B: SRM&QA Assessment

- NCD Assessment Criteria

C: KSC Processing

- PR/MRB Summaries
- Limited Life Component Status
- OMRSD Exceptions/Waivers: None
- Software Changes: None
- Facility Modifications: None

D: Level II Waivers/Level III Deviations

Change Presentation Criteria

- Changes for Presentation
  - *Type I Documentation*
  - *Requirements*
  - *Configuration* (affects part interchangeability)
  - *Materials* (requires SE16 revision)
  - *Technical Changes to Processes* (STPs)
- Changes for inclusion in Appendix
  - *Minor configuration* (affects part interchangeability)
  - *Minor updates* - Does not affect part interchangeability, materials or processes
    - Revise point of incorporation
    - Drawing clarification
    - Non-flight hardware installation/removal
    - Datum changes
    - Update usage/List of Materials
    - Drawing incorporation errors
    - Manufacturing aid
    - Drawing errors
    - Fastener type/grip
    - Producibility
    - Update vendor list
    - Laboratory test procedures
    - Materials
- All Class I and Class II changes have been reviewed by the MSFC Resident Office
- All Class II STP/STM/Standard/Code sheet changes have been submitted to the MSFC Materials, Processes and Manufacturing Department for concurrence

Class I Minor Changes

Description

Reallocate ET-104 as-built LO2 tank dome to ET-109 (B02022C)

Reason

- ET-109 as-built LO2 tank dome completed production prior to ET-104 as-built dome due to unique weld repair of the ODG-11 weld

Basis for Certification

- Similarity – Al 2219 extrusions previously flown at other locations on ET
- Analysis - Presented with SMR

Class I Minor Changes

Description

Composite nose cone phenolic prepreg material re-qualification and certification update (B02058) - No change in resin chemistry or production process from previously flown composite nose cones

- Revised EIS allowing use of "S" and "A" Basis
- Revised HCS S511E and S518E to include test results
- Revised MUA 0389 to include test results
- Created MMC-ET-SE65 to document design allowables

Reason

- Raw material source location was changed (Same material and supplier - New location only)
  - Re-qualification required to certify prepreg using resin from new source
  - New design allowables based on 3 lots of prepreg material vs 1 lot from previous source

Basis for Certification

- Test - Material development program using first 3 lots of material
  - Minimal change to critical design properties
- Analysis
  - Critical factor of safety unaffected
  - Temperatures within mechanical property and hot gas test data base
  - Fingerprinting of all lots
- Similarity - Resin is of the same chemistry and production process as previously flown
- Inspection
  - Material receiving acceptance test (RAP)
  - Nose cone tag end coupon physical properties, mechanical properties, and permeability
  - 100% Non-Destructive Evaluation (thermography)

Minor Changes

Change No.	Discipline	Description	Effectivity
H35809-891	Propulsion	Drawing error – Recent audit finding found that drawing that specified use of 100° fasteners did not callout STP 2003 (countersunk and flushness requirements) in the list of process specifications. Revised LH2 siphon screen assembly drawing process specification sheet to include STP 2003.	ET-109 & sub
H36809-074	Propulsion	Producibility - Increased hole diameter tolerance (from 0.6255" to 0.6259") of LO2 feedline flange and support section to reduce NCDs. Increased hole diameter is size 0.0001" smaller than the smallest bushing diameter	ET-109 & sub
H36809-085	Propulsion	Producibility – Added requirement to clean HSP weld area of LH2 aft dome. Previously, the internal LH2 feedline and attaching hardware were cleaned after installation into the aft LH2 aft dome. Now , the feedline and attaching hardware are cleaned and then installed.	ET-109 & sub
H36809-100	Structural	Producibility – Trimmed 0.050" from each of two aft crossbeam cable tray cover TPS applications to reduce cover interference. Tolerance study showed potential interference at maximum material condition.	ET-109 & sub
H36809-138 / H36809-249	Structural	Producibility • Revised production sequence to install LH2 forward dome ISL lugs (forward mast sensor clips) prior to dome roundout. Reduces cycle time by permitting clips to be welded in the downhand position when the dome is positioned for weld repairs • Relaxed linear and angularity tolerances for locating welded clips. Clips found to be out of tolerance due to production sequence change – Potential dome deflection without frame installed not considered	ET-109 & sub

Minor Changes

Change No.	Discipline	Description	Effectivity
H36809-165	Structural	Producibility - Revised LH2 tank proof test requirements • Reduced load cylinder ramp rate from 0.5% per second to 0.25% per second • Increased the actual time requirements for the proof test • Decreased Y axis maximum deflections from 10.5" to 10.2" – No change to proof test load – Eliminates potential aborts - Tooling not capable of providing 10.5" deflection	ET-109 & subs
H36809-174	Structural	Drawing incorporation error - Revert back to original hole pitching that was used on the aft crossbeam prior to redesign. The drawing was revised during crossbeam redesign to equalize the attach hole pitching in the absence of an internal rib on the crossbeam. The change was not incorporated in the manufacturing paper and the old hole pitching was being used to date. Analysis shows that there is no impact due to revised hole pitching.	ET-109 & subs
H36809-250	TPS	Drawing error – Revised the –Y bipod fitting foam closeout trim pictorial. Graphic did not correctly show the Intertank stringer hat section adjacent to the subject trim.	ET-109 & sub
H36809-272	TPS	Producibility – Added TPS rework criteria to the LO2 feedline TPS application allowing rework of voids adjacent to feedline support ribs. Parts were previously being reworked on NCD.	ET-109 & sub
H36809-275	TPS	Producibility – Revised dimensional requirements that set the height for the foam closeouts over the GO2 pressurization line hard mount at Station 371. Previous requirement precludes normal trim operations. ICD allowed more tolerance that engineering drawing.	ET-109 & sub

Minor Changes

Change No.	Discipline	Description	Effectivity
H36809-281	TPS	Drawing error – Corrected the LH2 ice/frost ramp dimension. Erroneous dimension given was for the pressurization line/foam gap instead of the LH2 tank ice/frost ramp.	ET-109 & sub
H36809-324	Structural	Producibility – Eliminated interference between the isolator pad the Station 1623 ring frame aft weld bead (dual cover pass) by chamfering the isolator pad.	ET-109 & sub
H36809-383	TPS	Producibility – Revised LO2 umbilical cable tray TPS closeout dimension from 0.5" to 0.2" to eliminate interference when the tray is placed in the mounted position.	ET-109 & sub
H36809-389	TPS	Producibility – Revised both aft interface SRB cable tray foam dimensions from 1.2" to 1.1" to eliminate foam-to-foam interference. Interference precluded assembly bolts from aligning as required for assembly.	ET-109 & sub
H50001-812	TPS	Drawing error – Revised cable tray cover TPS application drawing to clarify number of counterbored holes, correct dimension tolerance and line work that indicated tangent points for radius.	ET-109 & sub

NCD Assessment Criteria

Assessment of all MRB Items

- Adequacy of technical dispositions
- Completeness of required repair/retest
- First time occurrences/SMR
- Verification of margin of safety assessment/documented
- Review of impact to hazards
- Engineering review for impact to loads
- Engineering review for reduced extrusion to plate weld allowables

LO2 Tank Dome Weld Repair (SMR-99-001B)

Cause and Corrective Action

- Cause
  - Three possible causes identified
    - Torch set-up (Tungsten flat size, i.e. width across truncated tip)
    - Backside gas mixture (Argon rich mixture can be detrimental)
    - Calibration issue
- Corrective action taken to address each possible cause
  - No similar problem in subsequent builds
  - Inspection performed on tungsten flat
  - Automatic control of backside gases and calibration gases

ET-109 DR/PR/OMRSD Waiver/Exceptions

as of 05/16/2001

System	Discrepancy	Problem	MRB Items	Exceptions/ Waivers
• Electrical	0	0	0	0
• Propulsion/ Pneumatics	0	1	1	0
• Structures	2	5	0	0
• Thermal (TPS)	2	12	3	0
Total	4	18	4	0

ET-109 Limited Life Components

Cycle Sensitive

Description	Part No.	Serial No.	Limit	Required	Remaining
LH2 Manhole Cover Assy	80914081488 -509	0000847960	14	2	14
LO2 Tank Mechanical Assy	80912002000 -500	0000878710	14	2	14
LH2 Tank Mechanical Assy	80914002000 -509	0000889730	14	2	14
LO2 Manhole Cover Assy	80911001205 -509	0000882050	14	2	14
LO2 Fwd Ogive Cover Plate	80911001207 -509	0000869600	14	2	14
LH2 Manhole Cover Assy -Aft	80911001444 -509	0000869620	14	2	14

ET-109 Limited Life Components

Age Sensitive

Description	Part No.	Serial No.	Limit	Initiation	Expiration
External Tank	80901010000-509	00000102	6 Yrs	5/2000	5/2006

Age Sensitive Pyrotechnics - 10 Years Life/Requires Lot Verification Tests After 4 and 7 Years

Description	Part No.	Lot No.	Serial No.	Latest Retest	Expiration
Separator Assy GUCP	PD5000020-059	AAH	0001165	02/24/1998	01/2002
Cartridge Assy	PD5000020-030	AAH	0001340	02/24/1998	01/2002
Cartridge Assy	PD5000020-030	AAH	0001345	02/24/1998	01/2002

ET-109 PR/MRBs, Propulsion/Pneumatics

PR No./Status	Title/Description	Disposition
PET-109-FP-0001 Item 1	• Inboard Lightning Contact Strip V527-415112 is debonded at upper inboard corner • Length of debond approx. 1/8 x 3/8 inch and 3/4 inch long along vertical and horizontal edge	• Use-as-is – Will not affect contact strip function – Identified as a BNA bonding procedure problem

ET-109 PR/MRBs, Thermal

PR No./Status	Title/Description	Disposition
PET-109-TS-0001 Item 1	Several small voids in the LH2 umbilical MBO foam aft recessed area exceeded the 1/8" inch dia acceptance criteria	• Use-as-is – (GFP hardware) BNA MAO spec does not distinguish between voids and porosity – Porosity determined to be acceptable by BNA
PET-109-TS-0006 Item 1	Foam interference on Intertank aft and -Z of EB-1/2 fitting with SRB disconnect assembly	• Use-as-is – Localized area trimmed to provide SRB Cable tray access – Remaining thick foam acceptable for flight
PET-109-TS-0009 Item 1	Intertank foam vented beyond drawing into the cryogenic zone on boundary valleys sidewall and stringer tops	• Use-as-is – vented foam provides adequate thermal protection ensuring that structural temperatures are maintained – Ice formation in the vent holes is unlikely – More severe conditions observed in similar locations (Intertank cracks) have not resulted in ice/frost formation

Level II Waivers - Baseline

Document / Requirement	Authority	Paragraph	Waiver No.	Effectivity
NSTS 07700, Volume V, Information Management Requirements				
Generic part name, type, common designation, and part manufacturer H4 code are not required for EEE parts status print out	PRCBD S000127B 06/28/88	Table C.5 Item 2SR-10	6	ETs 49 & up
Data required in limited life status report is supplied in acceptance data package	PRCBD S000127B 06/28/88	Table C.6 Item 2SR-7	8	ETs 49 & up
Requirement to deliver element pressure vessel historical data to EPO will remain at contractor facility	PRCBD S000127B 06/28/88	Table C.6 Item 2SR-7	10	ETs 49 & up

Level II Waivers - Baseline

Document / Requirement	Authority	Paragraph	Waiver No.	Effectivity
NSTS 07700, Volume X, Book 1, Space Shuttle Flight and Ground System Specification, Requirements				
Electrical bonding	PRCBD S040732M 09/09/88	3.6.14	378	ETs 23, 27-29, 31 & up
Soldering, circuit boards, and connectors	PRCBD S040732M 09/09/88	3.6.15.1.1	379	ETs 23, 27-29, 31 & up
PD7400106 circuit boards	PRCBD S040732M 09/09/88	3.6.15.2.1	382	ETs 23, 27-29, 31 & up
Pressure transducer circuit boards	PRCBD S040732M 09/09/88	3.6.15.2.1	383	ETs 23, 27-29, 31 & up

Level II Waivers - Baseline

Document / Requirement	Authority	Paragraph	Waiver No.	Effectivity
NSTS 07700, Volume X, Book 1, Space Shuttle Flight and Ground System Specification, Requirements				
Launch Probability	PRCBD S071290R1 04/10/00	3.2.1.2.14.1	682	ETs 102, 107 - 110
Applicability of Space Shuttle Manned Spacecraft Criteria and Standards (NSTS 08080-1)	PRCBD S061451 08/08/00	Table 2.0	683	ET-96 & up
NSTS 07700-10-MVP-01, Shuttle Master Verification Plan - Volume I, General Approach and Guidelines				
Environmental acceptance of ET components	PRCBD S002130H 03/07/89	3.7.1	13	ETs 23, 27-29, 31 & up

Level II Waivers - Baseline

Document / Requirement	Authority	Paragraph	Waiver No.	Effectivity
SL-E-0001 - Specification Electromagnetic Compatibility Requirement				
Wire marking is not applicable to ET	PRCBD S040732K 09/27/89	3.2.5	3	ETs 23, 27-29, 31 & up
SW-E-0002 - Ground Support Equipment General Design Requirements				
Factor of safety applied to yield for feet on ground half of GUCA	PRCBD S087020L 08/17/88	3.4.2.1	21	ETs 23, 27-29, 31 & up