FLIGHT READINESS STATEMENT
STS-78/ET-79 AND STS-79/ET-80
Δ EXTERNAL TANK PROJECT REVIEW

EXTERNAL TANKS ET-79 AND ET-80, AS IDENTIFIED IN THE EXTERNAL TANK PROJECT DELTA FLIGHT READINESS REVIEW DATED MAY 31, 1996, ARE CONSIDERED READY TO SUPPORT FLIGHT UPON ACCEPTABLE DISPOSITION OF OPEN WORK AND/OR OPEN ACTIONS.

for J. RANDALL/EB01

M. PESSIN/EE31

P. SCHUERER/EH01

FOR J. EHL/CR01

for J. STRICKLAND/EL01

for J. BLAIR/ED01

FOR J. MCCARTY/EP01

M. SMILES/CR70

P. V. COUNTS/SA31, CHAIRMAN

Delta ET Project

STS-78/ET-79
STS-79/ET-80
Flight Readiness Review

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Agenda

• ***Overview***	***Jim Feeley***
• ***Prior Mission Performance Summaries***	
• ***Mission/External Tank Highlights***	
• ***Changes***	
• ***Senior Management Review NCDs: None***	
• SRM&QA Assessment	Terry McKeough
• KSC Processing	Fred Lockhart
• Verification/Certification	Jim Feeley
• Mission Unique Assessment	
• Special Topic - GO2 V/V Actuation Line Leakage	
• Readiness Statement	
• Appendices - A: Minor Changes - B: SRM&QA Assessment - C: KSC Processing - D: Previously reviewed material	

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Overview

- Review covers changes/differences/non-conformances not previously flown and/or reviewed

- This Delta review for STS-78/ET-79 and STS-79/ET-80 includes:
  - Prior mission performance summaries
  - Items not previously addressed at the Blocks 12 and 13 (ETs 71-80) ET Project FRR
  - Items specific to mission STS-78 and STS-79
  - Details of previously addressed items are available in appendix D

• **FRR Series**	**STS-78/ET-79**	**STS-79/ET-80**
- Block ET Project Review	5/3/95	5/3/95
- Mission Specific Reviews		
• ET/SRB Mate	4/30/96	6/4/96
• Delta ET Project (Baseline)	5/31/96	5/31/96
• Associate Administrator FRR	6/6/96	7/18/96
• Mission Management Team (L-2 Day)	6/18/96	7/30/96

Prior Mission Performance Summaries

System	STS-75/ET-76 (2/22/96)	STS-76/ET-77 (3/21/96)
OMRSD/LCC	No violations	No violations
Instrumentation	Nominal	Nominal
MPS	Nominal	Nominal
Hazardous Gas	Nominal	Nominal
TPS	Nominal	Nominal
ET disposal	Nominal	Nominal
Orbiter tile damage	Lower surface, below average • >1" = 11 • Total = 55	Lower surface, below average • >1" = 5 • Total = 32
Post flight photo review	• Crew photographs - No issues • Umbilical photographs - No issues	• Crew photographs - No issues • Umbilical photographs - No issues

Prior Mission Performance Summary

System	STS-77/ET-78 (5/19/96)
OMRSD/LCC	No violations
Instrumentation	Nominal
MPS	Nominal
Hazardous Gas	Nominal
TPS	Nominal
ET disposal	Nominal
Orbiter tile damage	Not available
Post flight photo review	Not available

Mission/External Tank Highlights

Mission	STS-78	STS-79
• **Launch**	6/20/96	7/31/96
- Window	10:49-13:19 EDT	23:42 EDT
- Pad	B	B
- Orbiter	Columbia (OV-102)	Atlantis (OV-104)
- Orbital inclination	39.0° - Insertion at 150NM	51.6° - Insertion at 170-213 NM
- ET photo coverage	• Umbilical well cameras • Crew photos from cockpit window	• Umbilical well cameras • Crew photos from cockpit window
• **Primary payload**	Life and Microgravity Spacelab (LMS)	4th MIR docking
• **Landing**	7/7/96	8/9/96
- Time	08:39 EDT	20:17 EDT
- Location	KSC	KSC
External Tank	**ET-79**	**ET-80**
• DD250 Acceptance	9/13/95	11/17/95
• Shipped to launch site	1/11/96	3/21/96

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Changes - List

- **New items since Blocks 12 and 13 FRR (5/3/95)**
  - **ET-79**
    - Alternate blowing agent in PDL-1034 foam (B01987A)
    - LH2 depletion sensor vibration requalification (B81365) *
  - **ET-80:** None
- **Previously presented at Block 12 and 13 FRR** **
  - **ET-79**
    - Alternate cleaning solvent for primed surfaces (B01964A)
    - GFP 17" umbilical revision (B01985B)
  - **ET-80**
    - LH2 aft dome acreage SOFI (B01987)

* Presented with Verification/Certification
** Included in Appendix D

Alternate Blowing Agent in PDL-1034 (B01987A)

Change:

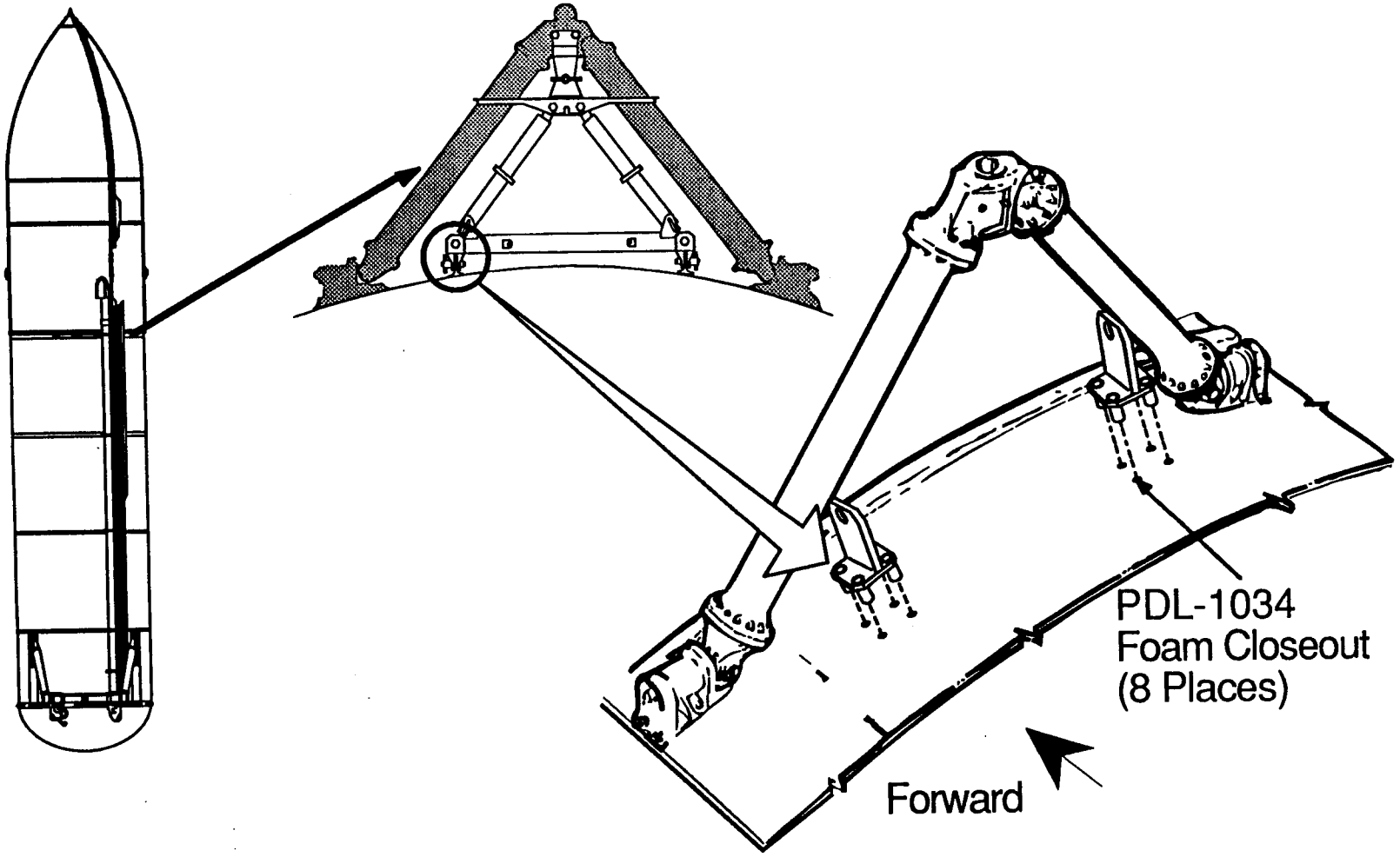
- Hardware
  - Replaced PDL-4034 foam with PDL-1034
    - Implementation approved at KSC for ET-79 and subs
      - ET/Orbiter jack pad closeout
      - ET/SRB aft fairing closeout
      - Third hardpoint load pad closeout (contingency)
      - Repairs as required
    - MAF planned implementation ET-88 and subs
- Documentation
  - Revised HCS to incorporate use of new STPs and STMs
  - Revised CIL to incorporate new generic retention rationale
  - Revised SE-16, Approved Materials and Processes document

Background/ Reason:

- 1990 Clean Air Act dictated phase out of CFC-11 due to ozone depletion issue
  - CFC-11 in PDL-4034 replaced with HCFC-141B

Alternate Blowing Agent in PDL-1034 (B01987A)

ET/Orbiter Jack Pad Closeout



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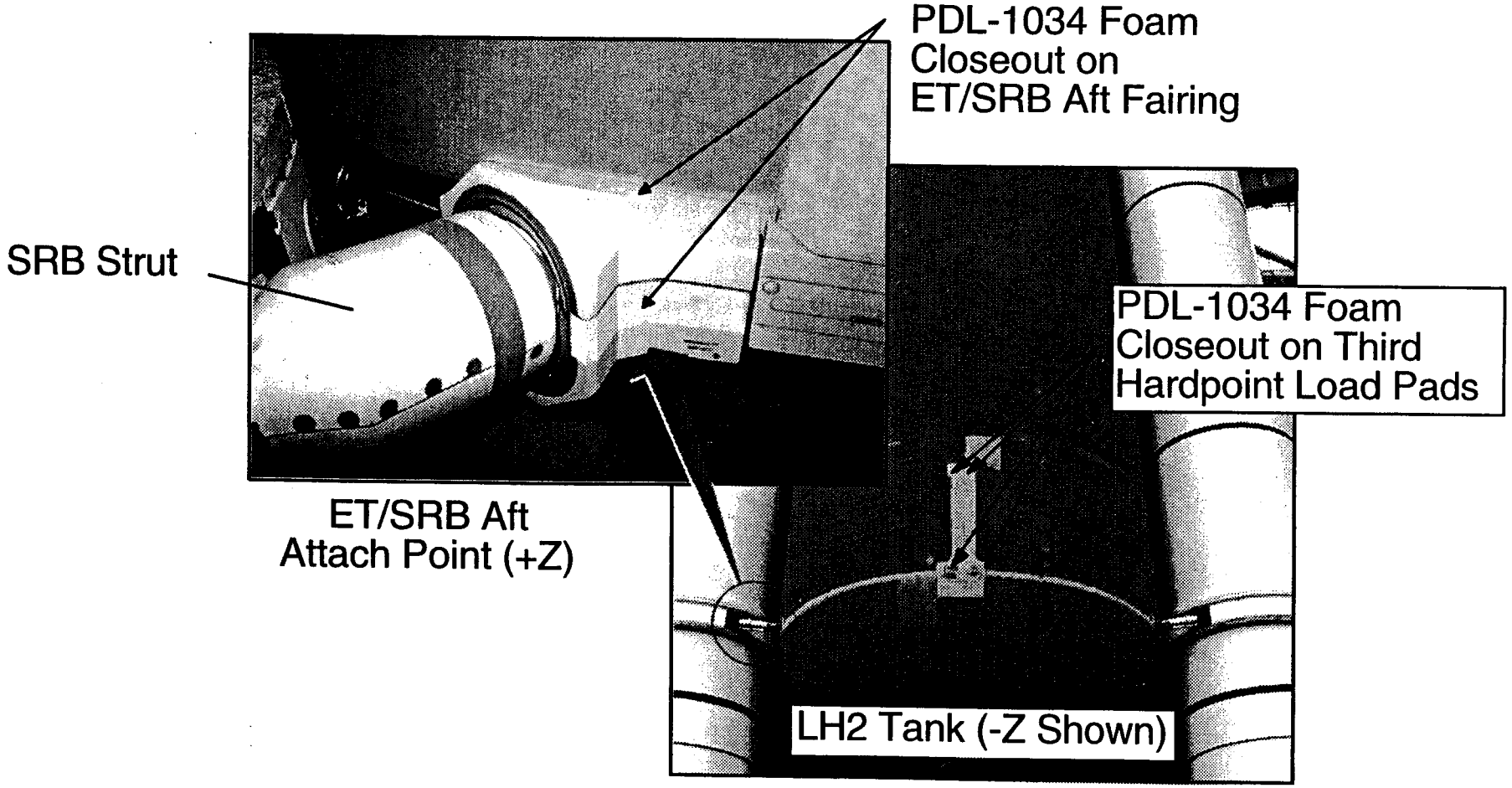
Alternate Blowing Agent in PDL-1034 (B01987A)

- ***ET/SRB Aft Fairing Closeout***
- ***Third Hardpoint Closeout***



Alternate Blowing Agent in PDL-1034 (B01987A)

Basis for Certification:

- Development/certification test program
  - Wind tunnel
  - Radiant ablation
  - Combined environments
  - PAL ramps
  - Coupon tests
  - Manufacturing validations
- Training/personnel certification
  - KSC training requirements revised to include demonstration on scheduled closeout mock-ups
- Stress analysis
  - Meets required FS of 1.10

Agenda

• Overview	Jim Feeley
• Prior Mission Performance Summaries	
• Mission/External Tank Highlights	
• Changes	
• Senior Management Review NCDs: None	
• ***SRM&QA Assessment***	***Terry McKeough***
• KSC Processing	Fred Lockhart
• Verification/Certification	Jim Feeley
• Mission Unique Assessment	
• Special Topic	
- GO2 V/V Actuation Line Leakage	
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SRM&QA Assessment

as of 5/24/96

Item	Status
• **Alerts**	None
• **MRB Assessment**	Complete - No issues/no impact to hazard controls
• **Hazard Assessment**	Complete - All hazard reports were re-assessed and hazard controls verified
• **Corrective Action Problem Summaries (CAPS)**	All CAPS closed - No constraints to launch

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Agenda

• Overview	Jim Feeley
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• Changes	
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• SRM&QA Assessment	Terry McKeough
• ***KSC Processing***	***Fred Lockhart***
• Verification/Certification	Jim Feeley
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KSC Processing - Status

as of 5/24/96

- **Discrepancy Reports (DRs)/Problem Reports (PRs) Review**
  - All PR/MRB discrepancies/dispositions similar to previously flown vehicles and are within existing database

- **Limited Life Component/ET Status**
  - All within required life through scheduled launch date
    - ET-79 S&A device expires 7 year lot verification on 8/31/96
    - Lot verification test not planned

- **OMRSD Exceptions/Waivers:** None

• **Changes**	STS-78/ET-79	STS-79/ET-80
- ET modifications *		
• Mod Kits	1	1
• DC&R (Discrepancy Check and Report)	0	0
• Bldg 45	0	0
• FEC (Field Engineering Change)	0	0
- OMRSD	0	0
- Software *	3	3
• SIM Load	6/7/96	7/17/96
• SIM Launch	5/23/96	7/19/96

* Included in Appendix C

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Agenda

• Overview	Jim Feeley
• Prior Mission Performance Summaries	
• Mission/External Tank Highlights	
• Changes	
• Senior Management Review NCDs: None	
• SRM&QA Assessment	Terry McKeough
• KSC Processing	Fred Lockhart
• ***Verification/Certification***	***Jim Feeley***
• ***Mission Unique Assessment***	
• Special Topic	
- GO2 V/V Actuation Line Leakage	
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Verification/Certification

as of 5/24/96

Item	Status
• **NSTS 07700, Volume X Baseline** - Revision L, Change 218	**No constraints**
• **Certification documentation** - Hardware Certification Sheets (HCS) • ET-79 - Alternate blowing agent foam (B01987A) * • T001G/T002F/T003E/T005F/ T006M/ T007K/T008G/T011F/T013D/ T017G/T019T/T022C • ET-80 - T001F, LH2 aft dome acreage SOFI (B01987) **	**Approved - No issues**
- Certificates of Qualification (COQ) • E118B, LH2 level sensor re-qualification (B81365)	**Approved - No issues** • To be presented
• **Waivers/Deviations**	**Complete - No issues**

* Previously presented with Changes

** Included in Appendix D (Previously discussed at Block 12/13 FRR, 5/3/95)

LH2 Depletion Sensor Vibration Requal (B81365)

Issue:

- LH2 Engine Cutoff (ECO) level sensors vibration environments exceed qualification limits

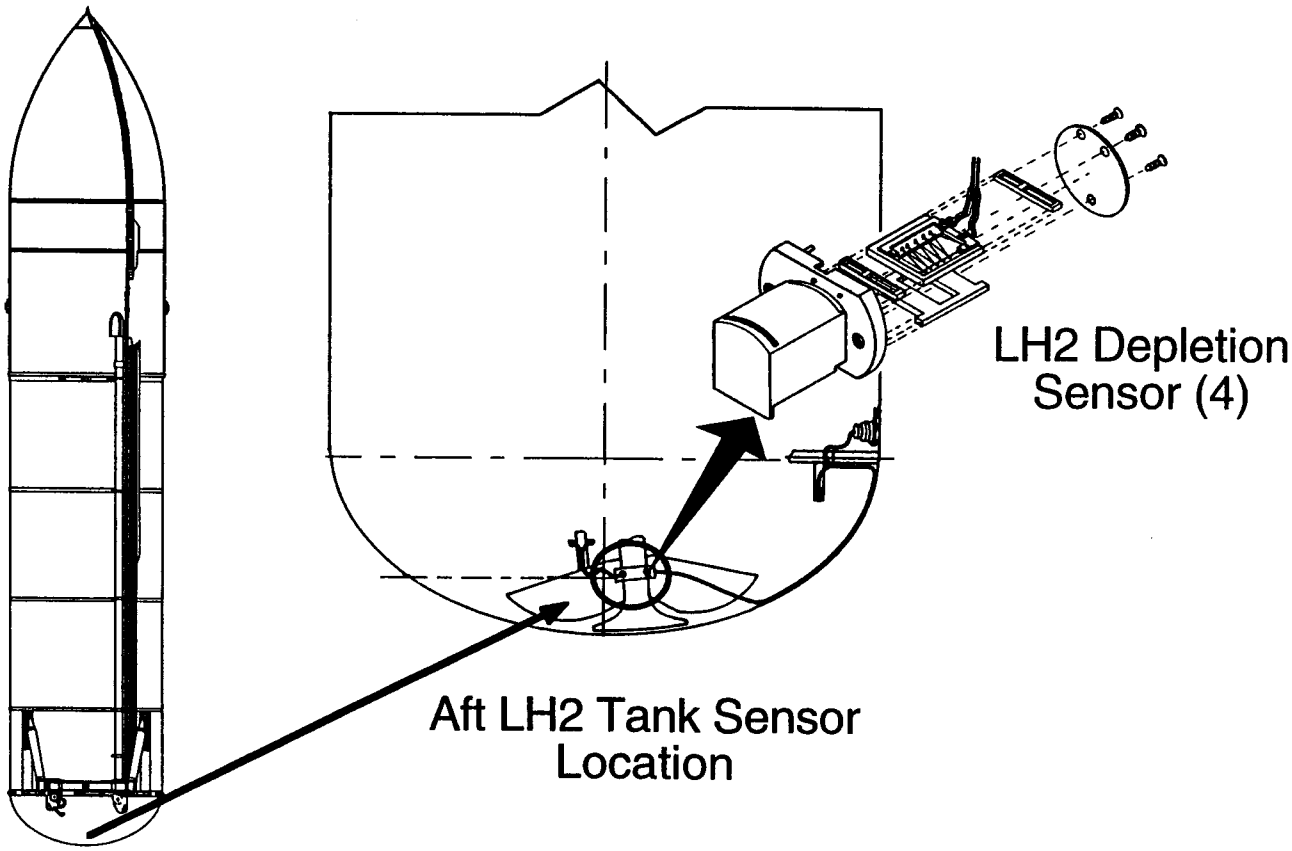
Background/ Discussion:

- Recent vibration test of LH2 siphon assembly to obtain proper SLWT qualification environments for the ECO sensors was performed in 3/96
  - Results showed environments at ECO sensor location greater than sensor qualification test levels
- Vibration tests to requalify ECO sensors to updated environments performed

Status:

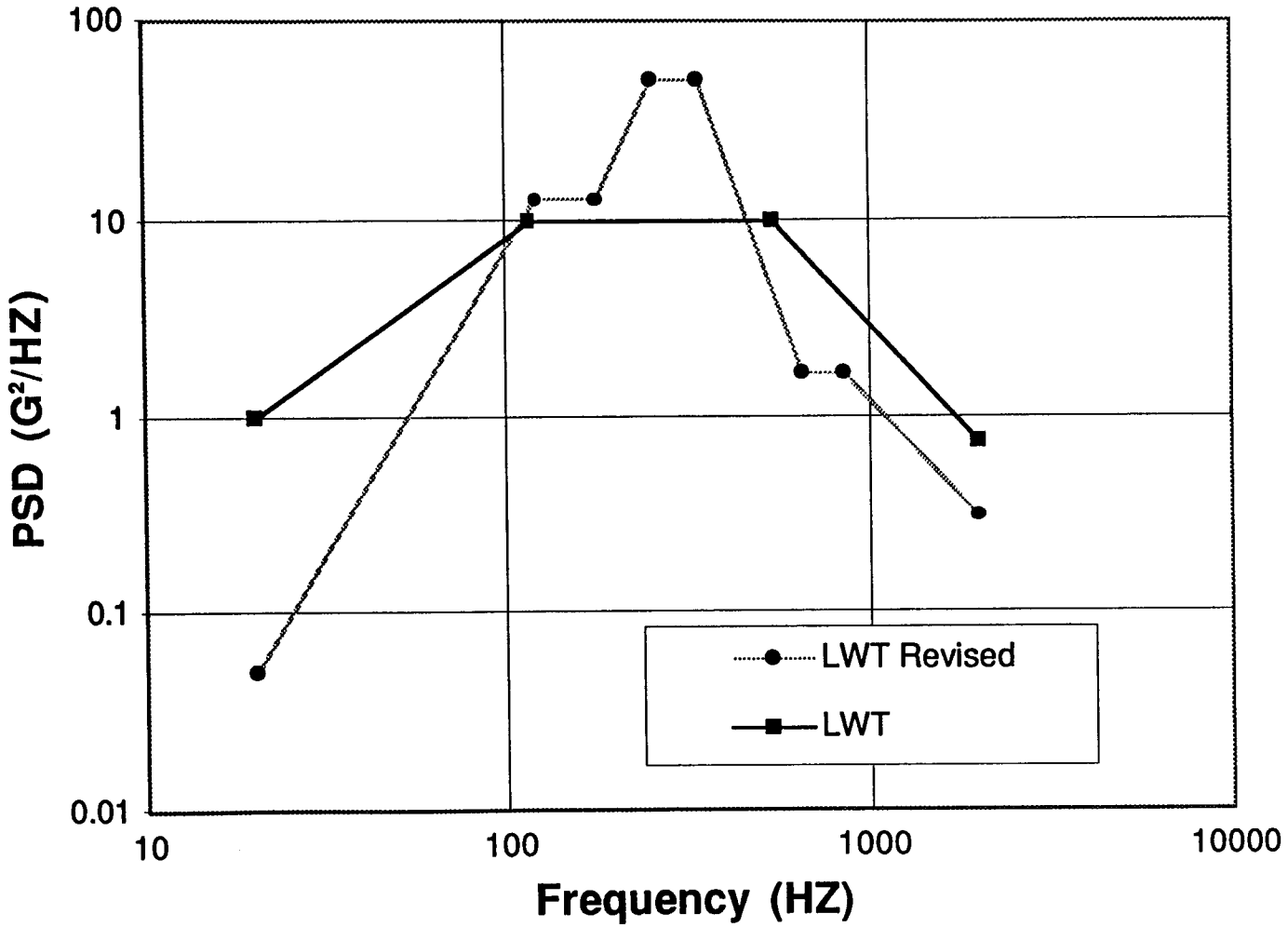
- Requalification tests complete - No issues
- Revised Certification of Qualification approved

LH2 Depletion Sensor Vibration Requal (B81365)



LH2 Depletion Sensor Vibration Requal (B81365)

ECO Sensor Test Profiles - X Axis Random Vibration



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Mission Unique Assessment

as of 5/24/96

Category/Item	STS-78/ET-79	STS-79/ET-80
• **Review of MRB actions using updated loads**	Complete - No issues	Complete - No issues
• **MPS Preflight Prediction Package**	ECD 6/10/96	ECD 7/21/96

Agenda

• Overview	Jim Feeley
• Prior Mission Performance Summaries	
• Mission/External Tank Highlights	
• Changes	
• Senior Management Review NCDs: None	
• SRM&QA Assessment	Terry McKeough
• KSC Processing	Fred Lockhart
• Verification/Certification	***Jim Feeley***
• Mission Unique Assessment	
• ***Special Topic – ET-80 GO2 V/V Actuation Line Leakage***	
• ***Readiness Statement***	
• Appendices	
- A: Minor Changes	
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ET-80 GO2 Vent Valve Actuation Tube Leakage

Issue:

- A 60.2 scim leak was detected during performance of ET-80 GO2 vent valve actuation 3/8" QD leak check
  - OMRSD allows no leaks in excess of 60 scim
  - Line pressurized to 750 psig with helium
  - Leak detected using flow meter

Background/ Discussion:

- Troubleshooting detected audible leak in wall of GO2 vent valve actuation tube inside of Intertank
- Leak located at approximately 18" from tube end in the -Y/+Z quadrant of the Intertank
- Tube configuration
  - 0.25" stainless steel
  - Nominal wall thickness = 0.028"
- Tubing from lot HSM was previously identified as discrepant in 1994
  - Accepted for flight based on:
    - Inspection of tubing during flaring
    - Proof test prior to installation
    - Leak checks following installation
  - All uninstalled tubing from lot HSM scrapped
  - Tube from lot HSM installed on ETs 79 thru ET-80 in the following locations:
    - GO2 vent valve actuation lines in Intertank
    - Hazardous Gas Detection System
    - GH2 vent valve sense lines

ET-80 GO2 Vent Valve Actuation Tube Leakage

Background/ Discussion (cont):

- Tube removed from ET-80 and returned to MAF for failure analysis
  - Replaced discrepant tube with tube from lot 001 supplied by different manufacturer

Failure Analysis:

- 10X visual inspection of OD found two cracks (0.4" and 0.75")
- Leak checked at MAF with GHe at 50 psig
  - 39 sccm @ 50 psig ≈ 35 scim @ 750 psig
- Further examination of OD with stereo microscope found that the 2 cracks were part of a 2.7" continuous crack
- Cracks penetrated 90% of wall thickness
  - Chemical agents used during tube manufacturing found in cracks

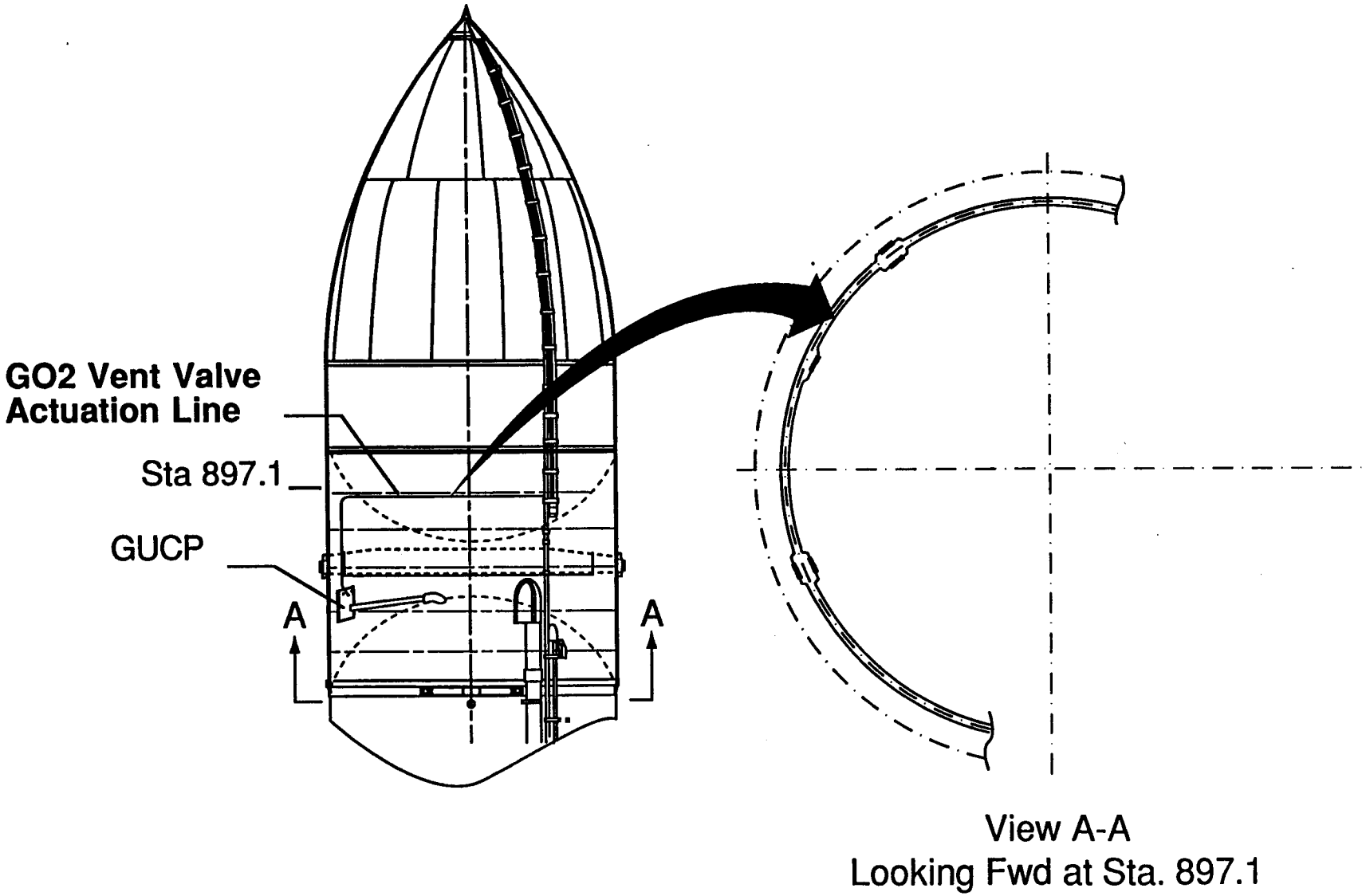
Rationale for Flight:

- All applications are ground use only
- All applications are Crit 3
- Operational checks at KSC verify adequacy for intended use
  - QD leak check
  - Vent valve timing checks

Corrective Action:

- MAF enhanced leak tests under review

ET-80 GO2 Vent Valve Actuation Tube Leakage



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ET-79 Readiness Statement

The External Tank, ET-79 is hereby certified and ready for STS-78 flight pending completion/closure of open and planned work

Dennis R. Deel
Vice President, External Tank Project
Lockheed Martin Manned Space Systems

ET-80 Readiness Statement

The External Tank, ET-80 is hereby certified and ready for STS-79 flight pending completion/closure of open and planned work

Dennis R. Deel
Vice President, External Tank Project
Lockheed Martin Manned Space Systems

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Appendices

- **A: Minor Changes**
- **B: SRM&QA Assessment**
  - NCD Assessment Criteria
- **C: KSC Processing**
  - Processing/Planned Work Schedules
  - PR/MRB Summaries
  - OMRSD Exceptions/Waivers: None
  - OMRSD Changes (RCNs): None
  - Limited Life Components
  - Modification Summaries/Status
  - Software Changes
- **D: Previously reviewed material**
  - Changes
  - Waivers/Deviations

Class II or JS/DCN Changes

- All Class I/II JS/DCN changes have been reviewed by MSFC Resident Office
- All Class II STP/STM/Standards changes have been reviewed by MSFC M&P Lab
- These changes are acceptable for flight and summarized in this appendix (presentation not required)
  - Presentation criteria - Selection for presentation based on changes affecting:
    - Processes
    - Configuration
    - Material
    - Alternate Hardware
  - Presentation rejection criteria - All changes that do not affect configuration, material or processes
    - Revise Point of Incorporation
    - Drawing Clarification
    - Non-Flight Hardware Installation/Removal
    - Datum Changes
    - Update Usage/List of Materials (L/M)
    - Drawing Incorporation Errors
    - Manufacturing Aid
    - Drawing Errors
    - Fastener Type/Grip
    - Tolerance Change
    - Productivity
    - Minor changes taken care of by initial release of Class I Change (Same categories as above)

Class I/II or JS/DCN Changes - List

Change No.	Description
H34809-744	Removed dimensions locating buttstraps from edge of panel and added note 14 to locate buttstraps over center of panel gaps within 0.030"
H34809-915	Removed requirement for blind fasteners to be gauged per STP 2014 on Intertank electrical installation. Fully threaded fasteners installed in nut plate
H34809-941	Deleted gap requirement after 0.004" feeler setting. Gap verification not achieved due to subsequent movement of faying surfaces
H34809-999	Replace canceled MIL spec for 302 full hard stainless steel sheet with active equivalent spec AMS 5906
H35809-127	Allow 6" minimum shield overlap at 305W01 J23 and J33 connectors only
H35809-134	Revise LH2 forward sensor mast installation to correct directional arrows showing washer location
H35809-328	Correct flag note to include protective cover plates required for return of umbilical tooling to MAF
H35809-332	Remove requirement to record location of defect after removal from flange lapping acceptance criteria - Defect recorded prior to removal

Class I/II or JS/DCN Changes - List, Materials

Change No.	STM/STP	Description
H35809-339	STP 1536	Revise to incorporate various clarifications/corrections resulting from SS-1171 validation activities
H35809-343	STP 2003	Add new countersunk requirements for curved surfaces
H35809-365	STP 1516	Make MA25S ablative material density consistent with STM and defined cleaning requirement for non-primed aluminum
H35809-378	STM H718	Correct test specimen size, reduce in-plane shear strength requirement and correct conflicting requirements between STM and STP
H35809-401	STP 7534	Update to current boilerplate and revise terminology for coating/sealing
H35809-437	Std 26L9/ 26L10	Revise blind bolt (100° head) and blind bolt (protruded head) Standard to reflect vendor changes
H35809-444	Std 34L1/2/ 3/10 Std	Clarify locking torque values for test fasteners
H35809-453	STP 1506	Define cleaning requirements of non-primed aluminum

Class I/II or JS/DCN Changes - List, Materials

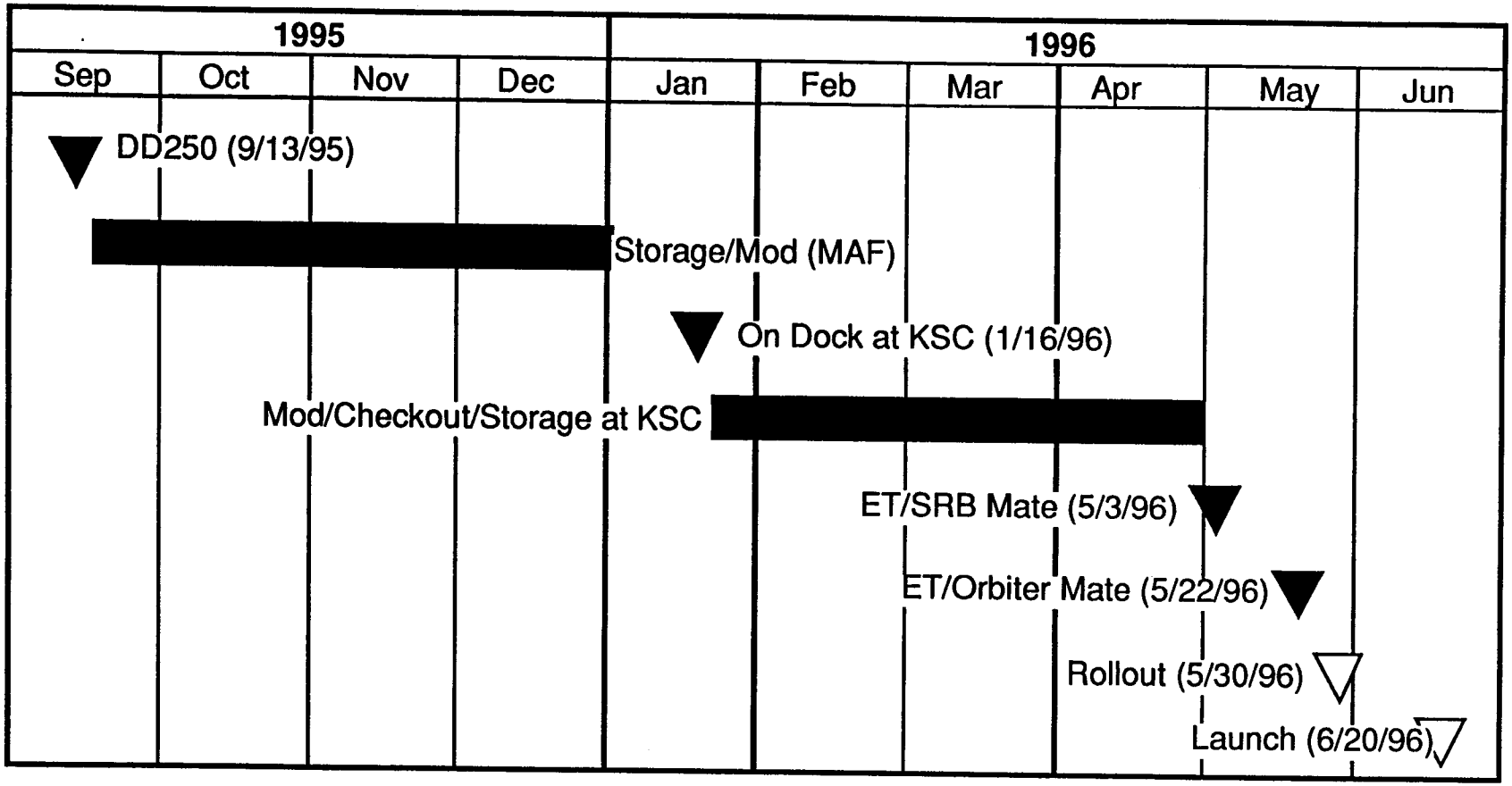
Change No.	STM/STP	Description
H35809-452	STP 7524	Add dimension tolerance on test specimen and replace ASTM requirements with STM H718 requirements
H35809-454	STP 1509	Define cleaning requirements of non-primed aluminum
H35809-458	Std 55L10	Definine interchangeability relationship that cleaned coded parts can replace uncoded parts
H35809-466	EQTP 1003	Adjust fingerprinting ranges for ET foams with HCFC-141B blowing agent due to increased data base size

MRB Assessment Criteria

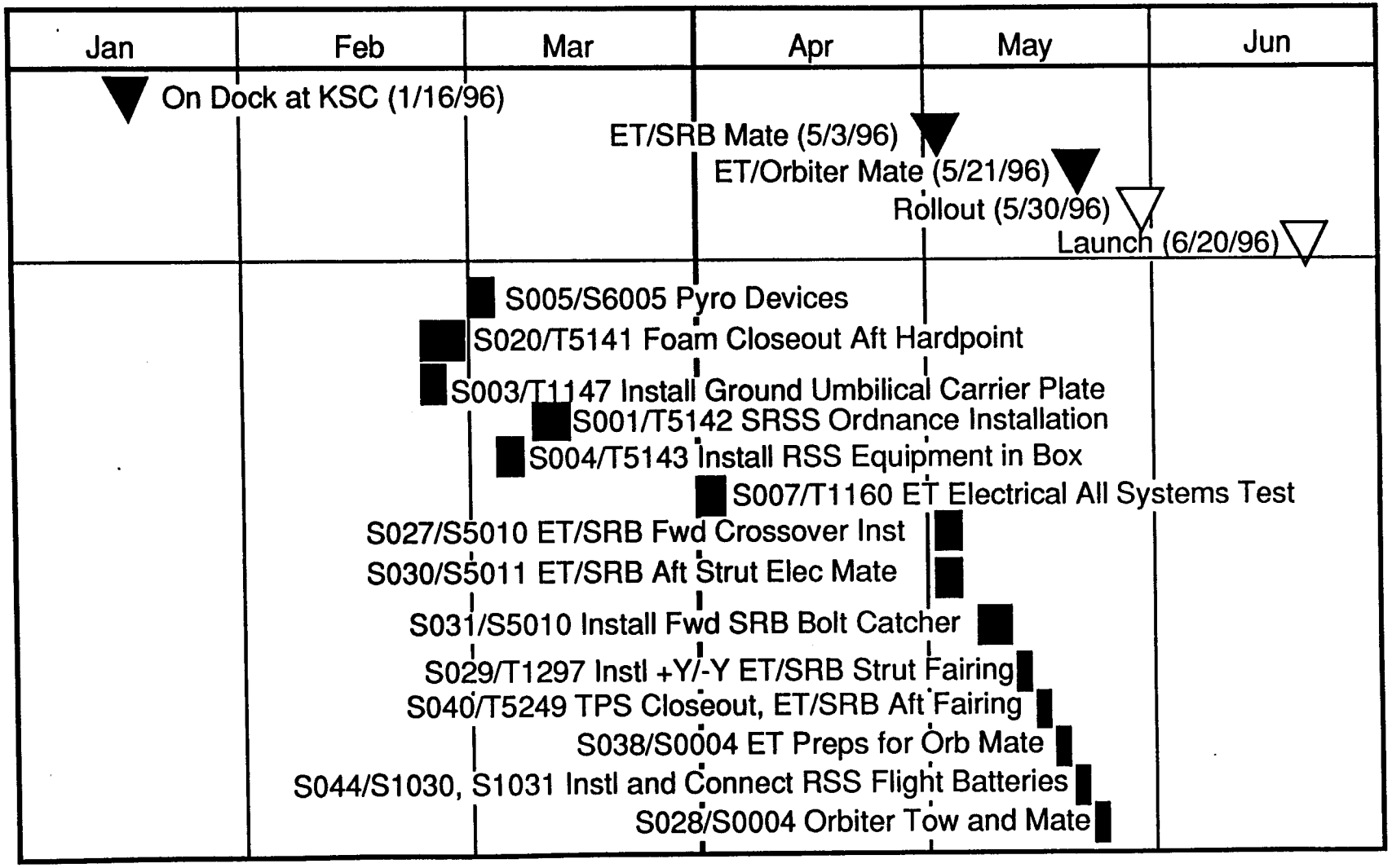
- Assessment of all MRB Items
  - Adequacy of technical dispositions
  - Completeness of required repair/retest
  - First time occurrences/SMR
  - Verification of margin of safety assessment/documented
  - Review of impact to hazards
  - Engineering review for impact to loads

ET-79 Processing Schedule

C1



ET-79 Planned Work



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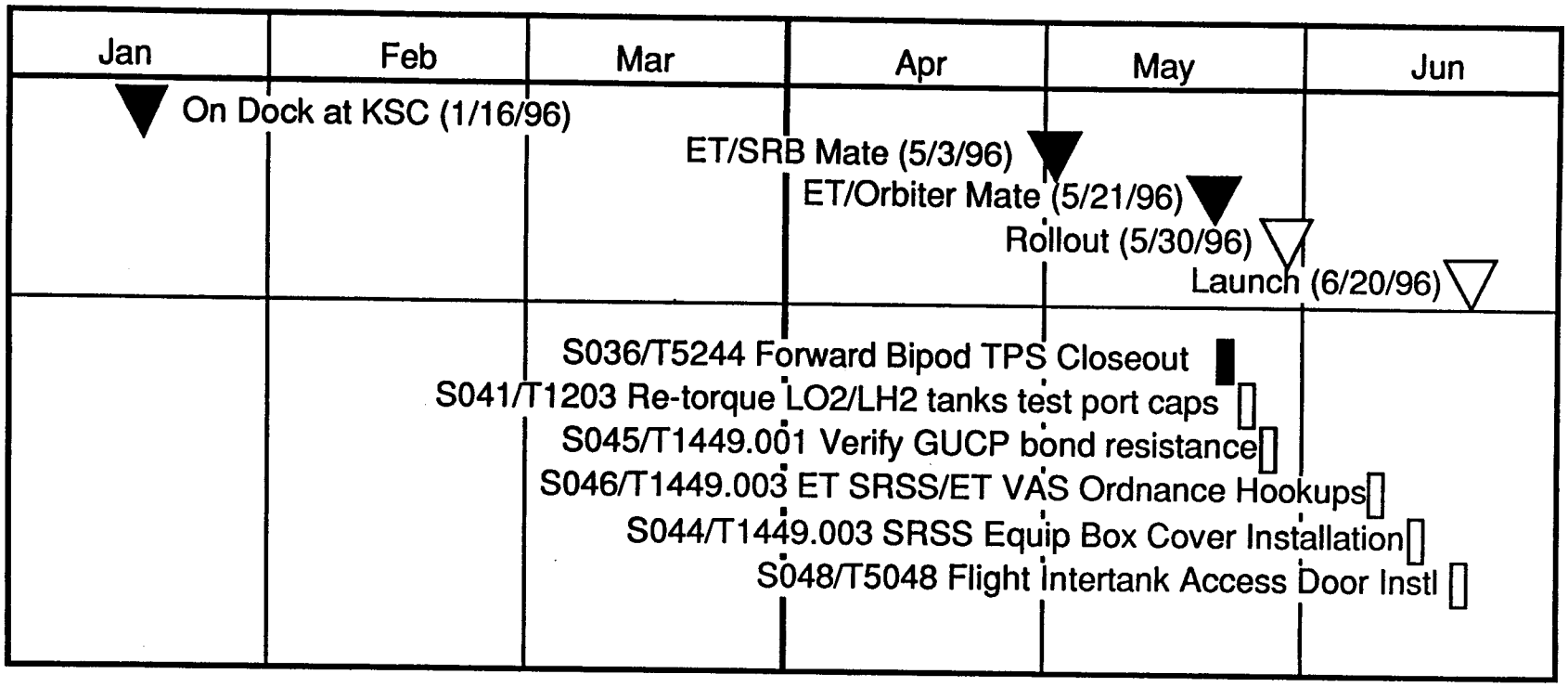
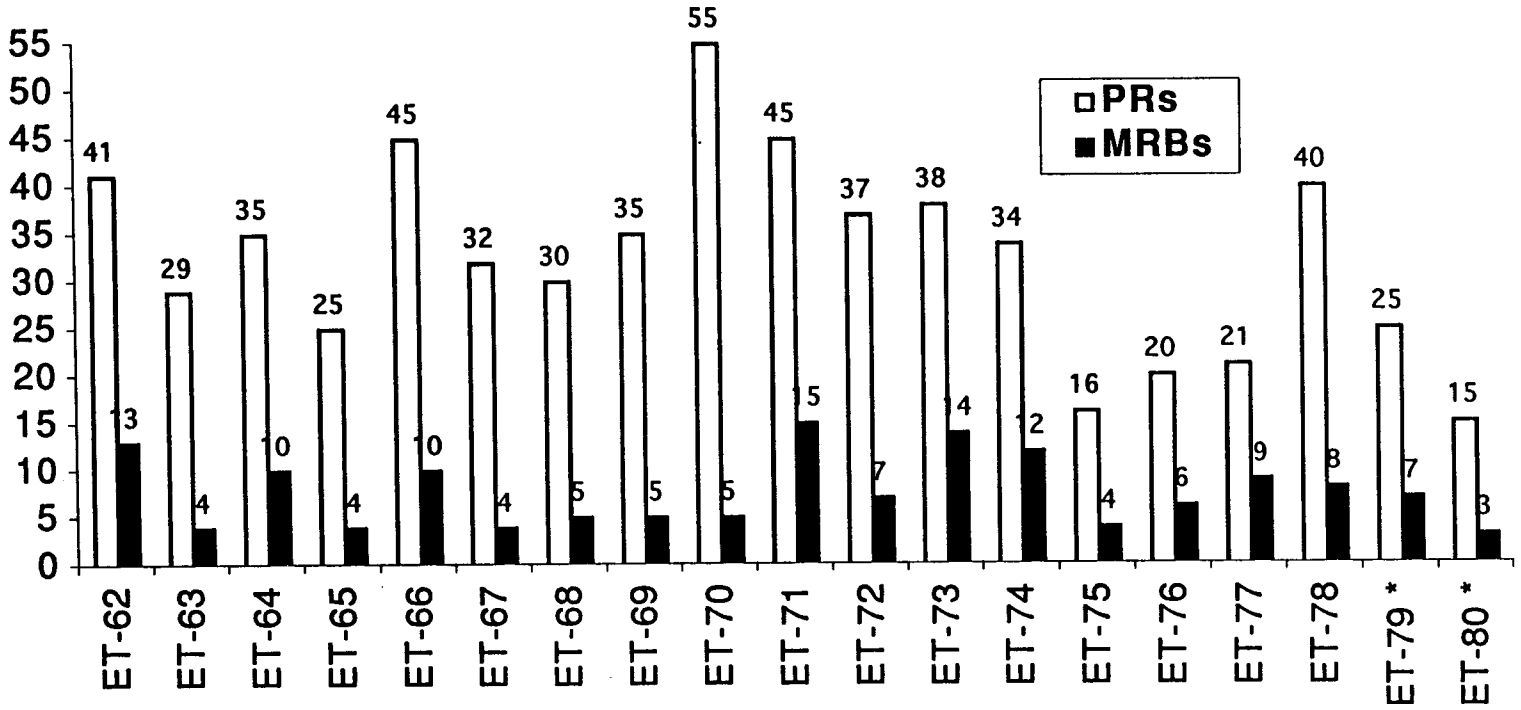
ET-79 Planned Work



PR/MRB History (1994-1996)



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ET-79 DR/PR/OMRSD Waiver/Exception-Summaries

as of 5/24/96

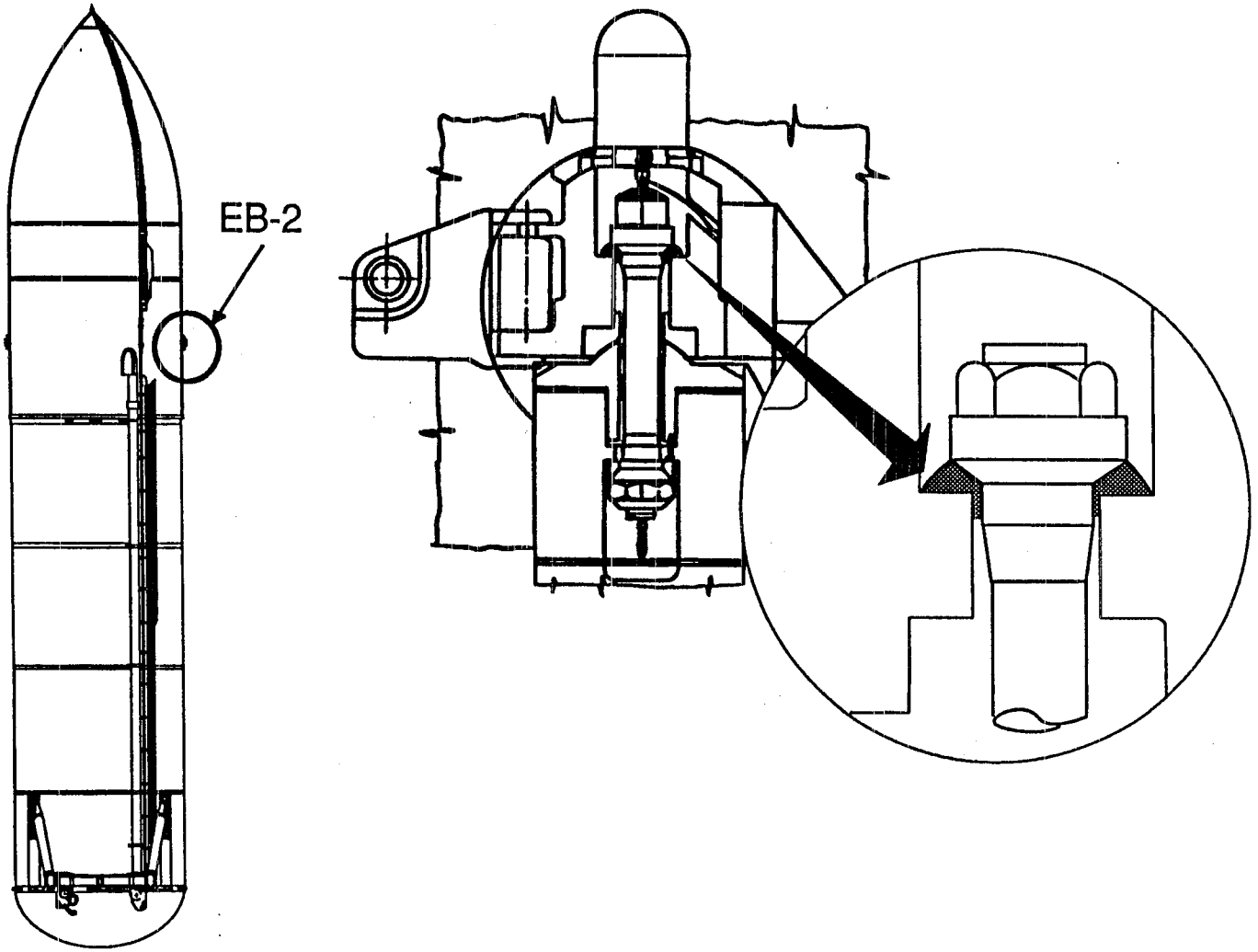
System	Discrepancy Reports	Problem Reports	MRB Items *	Waivers/Exceptions
• Electrical	0	0	0	0
• Propulsion/ Pneumatics	0	5	1	0
• Range Safety	0	0	0	0
• Structures	1	4	1	0
• Thermal (TPS)	0	16	5	0
Total	**1**	**25**	**7**	**0**

* Included in Appendix C

ET-79 PR/MRBs - Summary, Prop/Pneumatics

PR No./Status	Title/Description	Disposition
PET-79-FP-0005	Raised metal on outer edge of LH2 17" disconnect	• Use as repaired - Raised metal removed - Finish restored

ET-79/SRB Pyro Bolt Installation



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ET-79 PR/MRBs - Summary, Thermal

PR No./Status	Title/Description	Disposition
PET-79-TS-0011	PDL component mix exceeded maximum temperature • Actual = 81°F • Max allowable = 80°	• Use as is - Temperature requirements established for bulk mixes
PET-79-TS-0012	-Y aft fairing foam flow restrictor was partially removed during fairing closeout trim operations	• Use as is - Removed loose foam/debris - Analysis indicates that the configuration was acceptable for mission specific environments assuming that the 2 foam flow restrictors were not on the fairing

ET-79 Limited Life Components

Cycle Sensitive

Description	Part No.	Serial No.	Limit	Required	Remaining
LH2 Manhole Cover Assy	80914081488-019	000142100	100	1	100
LO2 Tank Mechanical Assy	80912002000-019	000126610	100	1	100
LH2 Tank Mechanical Assy	80914002000-009	000116810	100	1	100
LO2 Manhole Cover Assy	80911001205-010	000216190	100	1	100
LO2 Fwd Ogive Cover Plate	80911001207-029	000145140	100	1	100
LH2 Manhole Cover Assy (Aft Dome)	80911001444-010	000104740	100	1	100
		000150930	100	1	100

ET-79 Limited Life Components

Age Sensitive

Description	Part No.	Serial No.	Limit	Initiation	Expiration
External Tank	80901000000-270	00000072	6 Yrs	9/95	9/2001
RSS Battery A	10406-0133-801	2000194	2 Yrs 90 Days	7/95 5/20/96	7/97 8/18/96
RSS Battery B	10406-0133-801	2000195	2 Yrs 90 Days	7/95 5/20/96	7/97 8/18/96

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ET-79 Limited Life Components

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
Confined Detonating Fuse	10315-0002-825	AAB	318	2/96	3/97
	-826	AAB	270	2/96	3/97
	-827	AAB	227	2/96	3/97
	-828	AAB	461	2/96	3/97
	-831	AAB	458	2/96	3/97
Confined Detonating Fuse Manifold	10312-0001-107	AAW	2002307	7/93	7/97
	10312-0001-107		2002308	7/93	7/97
Safe & Arm Device	10311-0001-803	AAH	2000429	8/92	8/96 *

* 7 year shelf life verification test not planned - Inventory expended

ET-79 Limited Life Components

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
NSD	SEB26100094 -201	JHT	00093 00094	8/94 8/94	8/98 8/98
Separator Assy GUCP	PD500020-059	AAF	0000837	5/96	5/99
Cartridge Assy	PD500020-030	AAF AAF	70006 70007	5/96 5/96	5/99 5/99
Linear Shaped Charge	PD500016-050	AAJ	0001586	6/95	6/98

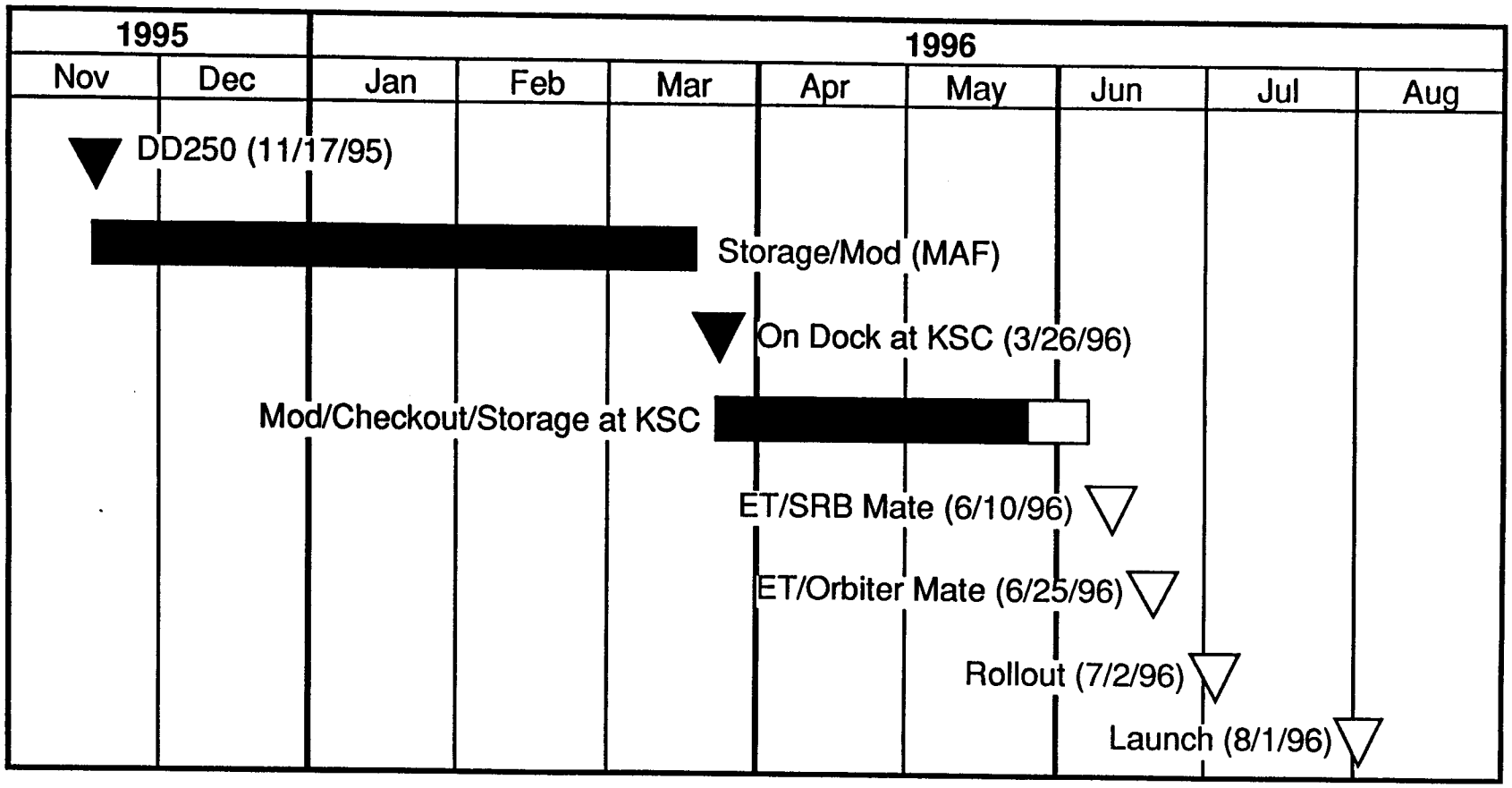
ET-79 Modification Summary

No.	Description	Status
B493/B02009	Electrical bonding of the Integrated Receiver/Decoded (IRD)	Closed

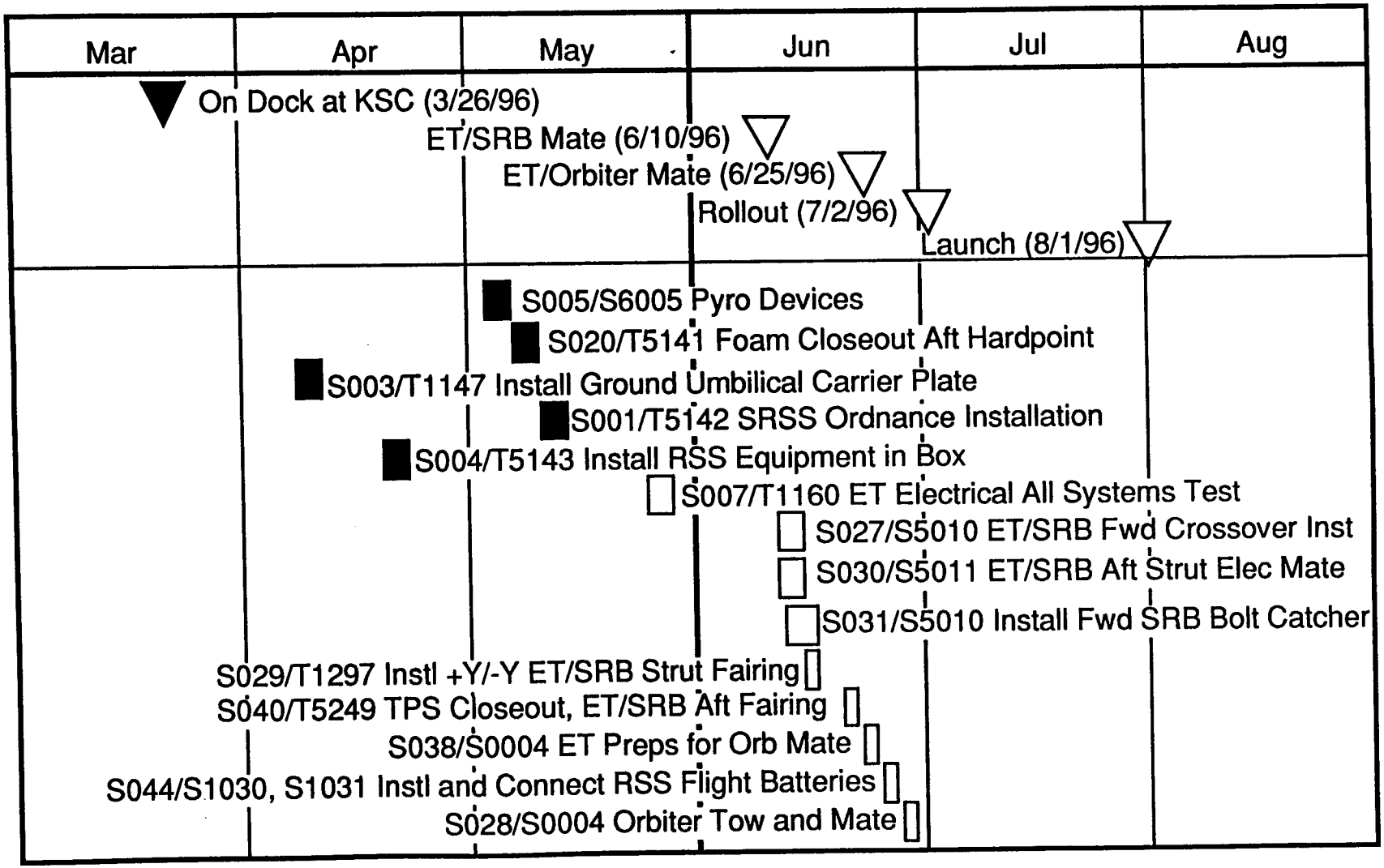
Software Changes

Description	Reason	Status
• Revised engine inlet temperature exception monitoring limits - Was: -305°F to -276°F - Now: -302°F to -287F°	Ensures early detection of a trend towards an engine inlet temperature anomaly	Approved
• Changed manual operation of LO2 recovery from revert procedure to an automated software procedure	Automated recovery from revert procedure that was previously performed manually by console operator	Approved
• Changed the LO2 pump Variable Frequency Drive (VFD) software exception limits	To preclude exception and error messages on the LO2 pump VFD digital controller card	Approved

ET-80 Processing Schedule

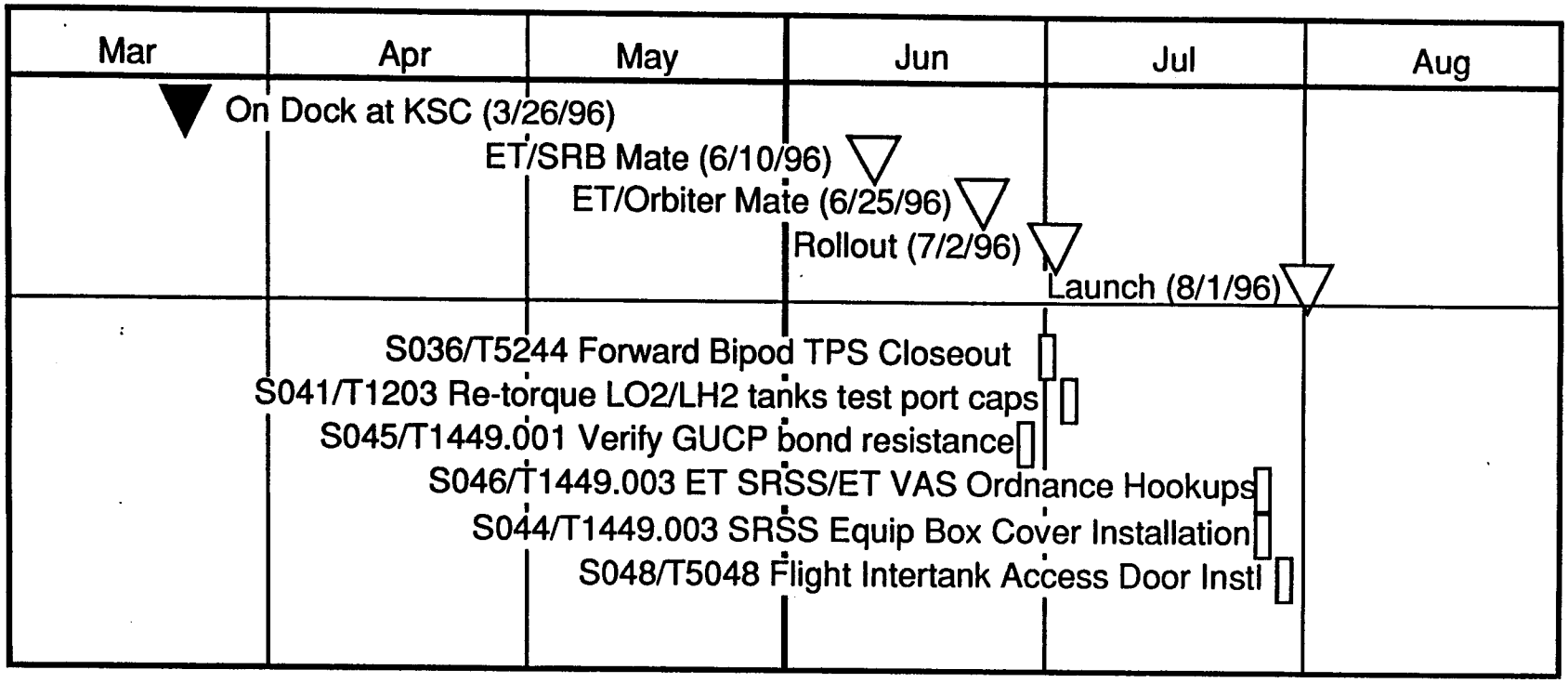


ET-80 Planned Work



LOCKHEED MARTIN

ET-80 Planned Work



ET-80 DR/PR/OMRSD Waiver/Exception-Summary C20

as of 5/24/96

System	Discrepancy Reports	Problem Reports	MRB Items	*Waivers/Exceptions
• Electrical	0	0	0	0
• Propulsion/ Pneumatics	0	3	1	0
• Range Safety	0	0	0	0
• Structures	0	2	0	0
• Thermal (TPS)	0	10	2	0
Total	**0**	**15**	**3**	**0**

* Included in Appendix C

LOCKHEED MARTIN

ET-80 PR/MRBs - Summary, Prop/Pneumatics

PR No.	Title/Description	Disposition
PET-80-FP- 0002	GO2 2 inch disconnect to umbilical disconnect has 8 each drilled head fasteners installed • Should be non-drilled head fasteners	Use as is • Drilled head fasteners were made from non-drilled head bolts with correct part number for this installation • Fastener integrity not diminished

ET-80 PR/MRBs - Summary, Thermal

PR No.	Title/Description	Disposition
PET-80-TS-0006	Damaged SLA on the forward edge of the -Y vertical strut fastener cut out	• Use as repaired using Type I SLA without trimming the cut out
PET-80-TS-0007	Void in TPS on +Z side of -Y vertical strut	• Repair void using PDL-4034 - Bondline configuration changed

ET-80 Limited Life Components

Cycle Sensitive

Description	Part No.	Serial No.	Limit	Required	Remaining
LH2 Manhole Cover Assy	80914081488-019	000154270	100	1	100
LO2 Tank Mechanical Assy	80912002000-019	000143200	100	1	100
LH2 Tank Mechanical Assy	80914002000-009	000143210	100	1	100
LO2 Manhole Cover Assy	80911001205-010	000241000	100	1	100
LO2 Fwd Ogive Cover Plate	80911001207-029	000168980	100	1	100
LH2 Manhole Cover Assy (Aft Dome)	80911001444-010	000125400 000171990	100 100	1 1	100 100

ET-80 Limited Life Components

Age Sensitive

Description	Part No.	Serial No.	Limit	Initiation	Expiration
External Tank	80901000000-270	00000073	6 Yrs	11/95	11/2001
RSS Battery A	10406-0133-801	TBD	2 Yrs 90 Days	TBD	TBD
RSS Battery B	10406-0133-801	TBD	2 Yrs 90 Days	TBD	TBD

ET-80 Limited Life Components

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
Confined Detonating Fuse	10315-0002-825	AAB	319	2/96	3/97
	-826	AAB	271	2/96	3/97
	-827	AAB	228	2/96	3/97
	-828	AAB	462	2/96	3/97
	-831	AAB	469	2/96	3/97
Confined Detonating Fuse Manifold	10312-0001-107	AAW	2002304	7/93	7/97
	10312-0001-107		2002306	7/93	7/97
Safe & Arm Device	10311-0001-803	TBD	TBD	TBD	TBD

ET-80 Limited Life Components

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
NSD	SEB26100094 -201	TBD	TBD	TBD	TBD
Separator Assy GUCP	PD500020-059	AAF	0000839	5/96	5/99
Cartridge Assy	PD500020-030	AAF AAF	70011 70012	5/96 5/96	5/99 5/99
Linear Shaped Charge	PD500016-050	TBD	TBD	TBD	TBD

ET-80 Modification Summary

No.	Description	Status
B493/B02009	Electrical bonding of the Integrated Receiver/Decoded (IRD)	Closed

Alternate Cleaning Solvent (B01964A)

D1

Change:

- Freon TMC and/or solvent reducer replaced with MEK for manual cleaning of primed surfaces

Background/ Reason:

- 1990 Clean Air Act dictates phase out of Freon TMC due to ozone depletion issue
- EPA targeted elimination of Cyclohexanone (component of solvent reducer) due to toxicity/hazardous substance

Basis for Certification:

- Test program demonstrated successful removal of typical contaminants (silicone, tape residue, oil, Krytox, zinc chromate paste)
- Certification tests in conjunction with TPS alternate blowing agent test program
  - Combined environments
  - PAL ramps
  - Cryoflex

LOCKHEED MARTIN

GFP Umbilical Disconnect Revision (B01985B) D2

Change:

- Update ET drawing to reflect revised GFP umbilical part numbers

Background/ Reason:

- RI revised part numbers for LO2 and LH2 umblicals for ET-79 and subs
  - Follower arm bearing revised
  - Aero fairing rework - Plug unused instrumentation wire hole

Basis for Certification:

- Similarity - Function of umbilical unchanged

LH2 Aft Dome Acreage SOFI (B01987)

Change:

- Hardware
  - Replace CFC-11 blowing agent in NCFI 22-65 foam material used on ET LH2 aft dome acreage with HCFC-141b blowing agent in NCFI 24-57 foam material
- Documentation
  - Revised HCS and CIL to reflect new part number
  - Revised OMRSD File II/Volume 3 to limit ET age life to 2 years

Background/ Reason:

- 1990 Clean Air Act dictates phase out of CFC-11 due to ozone depletion issue

Basis for Certification:

- Development/certification test program
  - Wind tunnel
  - Radiant ablation
  - Combined environments
  - Coupon tests
  - Manufacturing validations

Level II Waivers - Baseline

Document/ Requirement	Authority	Paragraph	Waiver No.	Effectivity
NSTS 07700 Vol. V - Information Management Requirements				
Generic part name, type, common designation, and part manufacturer H4 code are not required for EEE parts status printout	S00127B 6/28/88	Table C.5 Item 2SR-10	6	ETs 49 & up
Data required in limited life status report is supplied in acceptance data package	S00127B 6/28/88	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	S00127B 6/28/88	Table C.6 Item 2SR-7	10	ETs 49 & up

Level II Waivers - Baseline

Document/ Requirement	Authority	Paragraph	Waiver No.	Effectivity
NSTS 07700 Vol. X - Space Shuttle Flight and Ground System Specification , Book 1 Requirements				
Electrical wiring of redundant systems NSTS 08080-1, 20A/4B	S40732G 6/18/88	Table 2.0	362	ETs 23, 27-29, 31 & up
Electrical bonding per MIL-B-5087B (2)	S040732M 9/9/88	3.6.14	378	ETs 23, 27-29, 31 & up
Soldering, circuit boards & connectors	S040732M 9/9/88	3.6.15.1.1	379	ETs 23, 27-29, 31 & up
PD7400106 circuit boards	S040732M 9/9/88	3.6.15.2.1	382	ETs 23, 27-29, 31 & up
PCM MUX and pressure transducer circuit boards	S040732M 9/9/88	3.6.15.2.1	383	ETs 23, 27-29, 31 & up
Range safety system compliance with AFETRM 127-1 and SAMTECM 127-1	S94934 9/10/88	3.5.4.12	388	ETs 28 & up

Level II Waivers - Baseline

Document/ Requirement	Authority	Paragraph	Waiver No.	Effectivity
NSTS 07700 Vol. X - Space Shuttle Flight and Ground System Specification , Book 1 Requirements				
CIL fail safe and redundancy requirements	S040201E 4/3/87	3.5.1.1.1 Thru 3.5.1.1.3	401	ETs 23, 27-29, 31 & up
2058 Frame, Bearing Stress	S40793H, H-R1 11/22/88	3.2.2.1.5.2	452	ETs 23, 27-29, 31 & up
Soldering of electrical connectors	S094779C 2/21/91	3.6.15.1.1	573	ETs 37, 41 & up

Level II Waivers - Baseline

Document/ Requirement	Authority	Paragraph	Waiver No.	Effectivity
NSTS 08060, Rev. F - System Pyrotechnic Specification				
Design pyrotechnics for reliability - No redundant tumble valve	S003422E 6/24/88	3.1	60	ETs 23, 27-29, 31 & up
Use 40M36298 connectors	S040732F 6/24/88	3.4.1	61	ETs 23,27-29, 31 & up
Epoxy to separate dissimilar metals on LSCs	S040732F 6/24/88	3.5.8	62	ETs 23, 27-29, 31 & up
Circuit resistance check not required after connector mate in tumble system	S040732F 6/24/88	7.3	63	ETs 23, 27-29, 31 & up
Prevent adverse effects of common mode currents	S040732F 6/24/88	8.2.1	64	ETs 23, 27-29, 31 & up

Level II Waivers - Baseline

Document/ Requirement	Authority	Paragraph	Waiver No.	Effectivity
NSTS 08060, Rev. F - System Pyrotechnic Specification				
Fire circuit wiring shall be routed separately	S040732F 6/24/88	8.2.3	65	ETs 23, 27-29, 31 & up
NSTS 07700-10-MVP-01 - Shuttle Master Verification Plan				
Environmental acceptance of ET components	S002130H 3/7/89	3.7.1	13	ETs 23, 27-29, 31 & up
NSTS 08123, Rev. B - Certification of Flexible Hoses and Bellows				
LH2 feedline bellows	S0052023G-R1 8/2/91	1.2	3	ETs 42 - 45, 47 & 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 the ET	S40732K 9/27/88	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 GUCP leg	S87020L 8/17/88	3.4.2.1	21	ETs 23, 27-29, 31 & up