NASA

SECTION 32

	Presenter:
	Organization/Date: Orbiter 01/09/03

MISSION KITS BACKUP

MISSION KIT MODIFICATION SUMMARY	Presenter:
	Organization/Date: Orbiter 01/09/03

Orbiter Mission Kit Related Modifications:

- MV0221A New SCM Battery
- MV0225A CDR/PLT Seat Actuator Cap Retention Cover
- MV0458A EDO Pallet Logo
- MV0607A Sky Genie Fastener Change
- MV0669A MA9N Frame Assembly Redesign
- MV0886A Micro-WIS 12th Strain Gauge Measurement

	Presenter:
	Organization/Date: Orbiter 01/09/03

Special Topic
Back-Up Charts

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack

Presenter:

Organization/Date:
Orbiter 01/09/03

Thermal / Mechanical Cycle Profiles

Ball	Line	Thermal	Slow Fill (lbf)	Nominal (lbf)	MEOP (lbf)	1.5X (lbf)	1.75X (lbf)
2.24"	LO2 17"	LN2	11,000	41,000 + / - 15,000*	49,000 + / - 15,000*	61,000 + / - 22,500*	71,000 + / - 26,500*
1.75"	LO2 12"	LN2	6,200	24,000 + / - 16,500*	28,000 + / - 16,500*	36,000 + / - 25,000*	42,000 + / - 29,000*
1.25"	LH2 17"/ 12"	LH2	3,000	10,400 + / - 7,700*	14,800 + / - 7,700*	15,600 + / - 11,600*	18,200 + / - 13,500*

*200 cycles at 0.5 Hz

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack	Presenter:
	Organization/Date: Orbiter 01/09/03

History of Methods to Crack Test Samples

Ball	Test Sample ID	Notch	Notes
2.24"	HB-2.24-2a	Y	275 F to –100 F to crack
	HB-2.24-2b	Y	Dual EDM notches; Rapid thermal cycles (212 F to 32 F) to crack
	MSFC-2.24-1	Y	400 F to –100 F to crack
	MSFC-2.24-2	N	300 F to –100 F to crack
1.75"	MSFC-1.75-1	Y	EC / CT indications; Rapid thermal cycles (212 F to 32 F) to crack
	MSFC-1.75-2	N	Eddy Current indications; LN2 dunk (Amb to –320 F) to crack
1.25"	MSFC-1.25-1	Y	375 F to –100 F to crack
	MSFC-1.25-2	N	Not cracked

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack	Presenter:
	Organization/Date: Orbiter 01/09/03

Testing Summary

Ball	Test Sample ID	Branching Cracks	Material Islands	Loss of Parent Material	ECD
2.24"	HB-2.24-2a	Yes	Yes	No	1/9/03
	HB-2.24-2b	No	No	No	1/9/03
	MSFC-2.24-1	Yes	Yes	Yes	1/9/03
	MSFC-2.24-2	Yes	Yes	Yes	1/11/03
1.75"	MSFC-1.75-1	Yes	Yes	No	1/11/03
	MSFC-1.75-2	No	No	No	1/9/03
1.25"	MSFC-1.25-1	Yes	Yes	No	1/12/03

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack

Presenter:

Organization/Date:
Orbiter 01/09/03

Logistics Ball Status

PN	Name	NHA Name	NHA P/N	Qty	Location	S/N	Remarks
10950-59-3-9	Ball 2 1/4"	17" LOX BSTRA	10950-159	1	KSC VAB	1I15-1655-F-5	Shipped from NSLD for NDE 12/17/02
10950-59-3-9	Ball 2 1/4"	17" LOX BSTRA	10950-159	1	KSC VAB	9Z13	Shipped from NSLD for NDE 12/17/02
10950-59-3-9	Ball 2 1/4"	17" LOX BSTRA	10950-159	2	KSC VAB	12H10-1606F	Shipped from NSLD for NDE 12/17/02
10950-59-3-9	Ball 2 1/4"	17" LOX BSTRA	10950-159	1	Boeing HB	07-92-001	Shipped from AP residual for NDE 12/17/02
10950-59-3-9	Ball 2 1/4"	17" LOX BSTRA	10950-159	1	Boeing HB	07-92-003	Shipped from AP residual for NDE 12/17/02
10950-59-3-9	Ball 2 1/4"	17" LOX BSTRA	10950-159	1	Boeing HB	07-92-004	Shipped from AP residual for NDE 12/17/02
10950-59-3-9	Ball 2 1/4"	17" LOX BSTRA	10950-159	1	Boeing HB	07-92-006	Shipped from AP residual for NDE 12/17/02
10950-58-3-9	Ball 1 3/4"	12" LOX BSTRA	10950-185	5	NSLD	J15-1655F-5	To be transferred to KSC M&P for NDE 1/2/03
10950-58-3-9	Ball 1 3/4"	12" LOX BSTRA	10950-185	1	NSLD	12H10-1606F	To be transferred to KSC M&P for NDE 1/2/03
10950-58-3-9	Ball 1 3/4"	12" LOX BSTRA	10950-185	3	AP	TBD	To be transferred to KSC M&P for NDE 1/2/03
10950-58-3-9	Ball 1 3/4"	12" LOX BSTRA	10950-185	2	MSFC	TBD	Shipped from AP Residual 12/20/02
10950-60-3-9	Ball 1 1/4"	17" & 12" LH2 BSTRA	10950-166	4	NSLD	5D8-5	To be transferred to KSC M&P for NDE 1/2/03
10950-60-3-9	Ball 1 1/4"	17" & 12" LH2 BSTRA	10950-166	4	NSLD	9Z13	To be transferred to KSC M&P for NDE 1/2/03
10950-60-3-9	Ball 1 1/4"	17" & 12" LH2 BSTRA	10950-166	1	NSLD	8X20-1	To be transferred to KSC M&P for NDE 1/2/03
10950-60-3-9	Ball 1 1/4"	17" & 12" LH2 BSTRA	10950-166	15	AP	TBD	To be transferred to Boeing HB M&P for NDE 1/2/03
10950-60-3-9	Ball 1 1/4"	17" & 12" LH2 BSTRA	10950-166	2	MSFC	TBD	Shipped from AP Residual 12/20/02
2.25"	COTS Ball	Non Flight	N/A	5	MSFC	None	Direct Purchase from Mountain Alloy 12/20/02
2.25"	COTS Ball	Non Flight	N/A	3	Boeing HB	None	Direct Purchase from Mountain Alloy 12/20/02
2.25"	COTS Ball	Non Flight	N/A	2	Boeing JSC	None	Direct Purchase from Mountain Alloy 12/20/02

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack	Presenter:
	Organization/Date: Orbiter 01/09/03

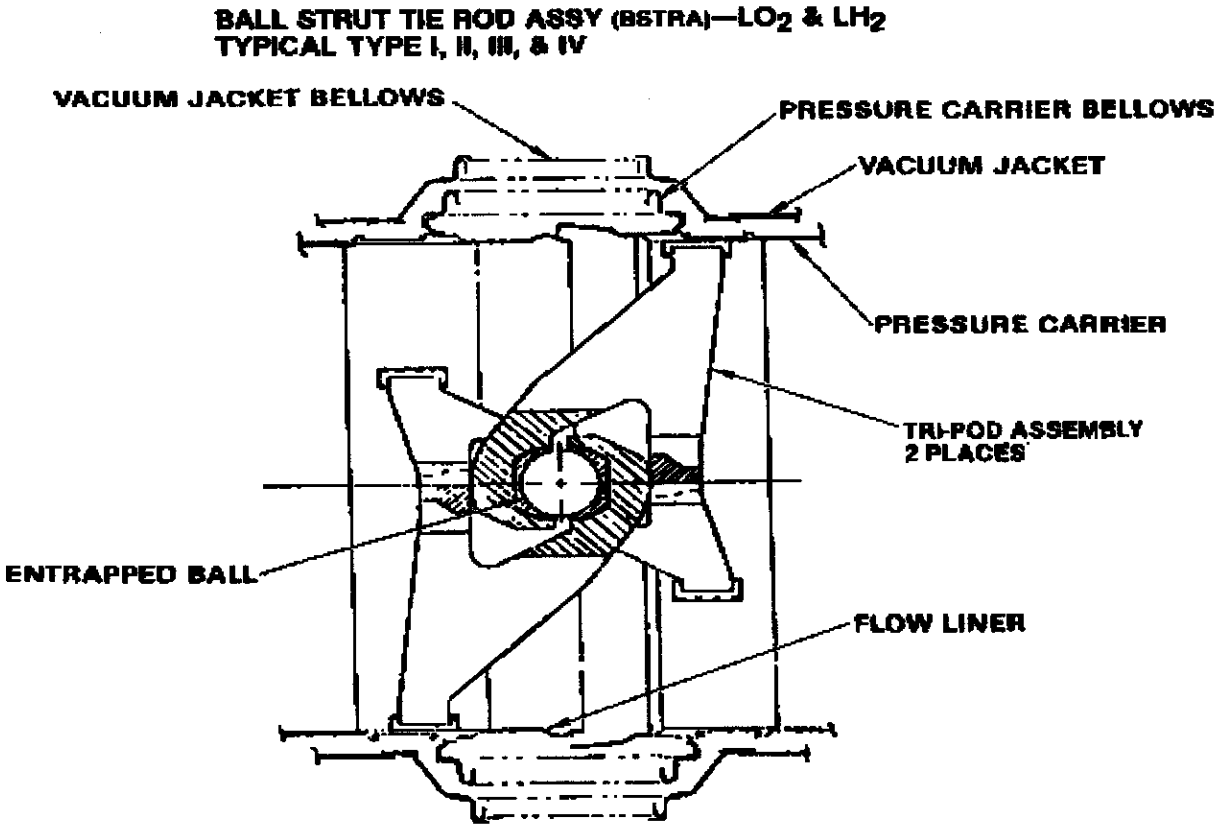
Team Structure:

- TMT - Ouellette, Snyder/Stefanovic, Mulholland, Grush, Browne, Reith/Rigby
- Qual and Test History - Peller, Baird
- Build Data - Fineberg, Baird
- Inspections - Frazer, Wagner, Allison
- M&P - Christensen, Jacobs, Curtis, Allison, Munafo
- Stress - Dunham, Kramer-White, Madera, Rocha
- Test - Peller, Applewhite, Templin, Munafo
- Vehicle Ops & Line Removal - Young, Albright, Dinsel
- Logistics - Saluter

- Web Sites
  - USA Hou - http://usa1.unitedspacealliance.com/usahou/projects/orbiter/support/mpsbstracracks.htm
  - Boeing Hou - http://hou-web02.tx.boeing.com/sfoc/orbiter/mps/BSTRAcrack.htm
  - USA KSC - http://usa1.unitedspacealliance.com/usago/orgs/eng330/mps-ssme/BSTRA_Crack/BSTRA_Crack.htm

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack	Presenter:
	Organization/Date: Orbiter 01/09/03

Typical BSTRA Assembly

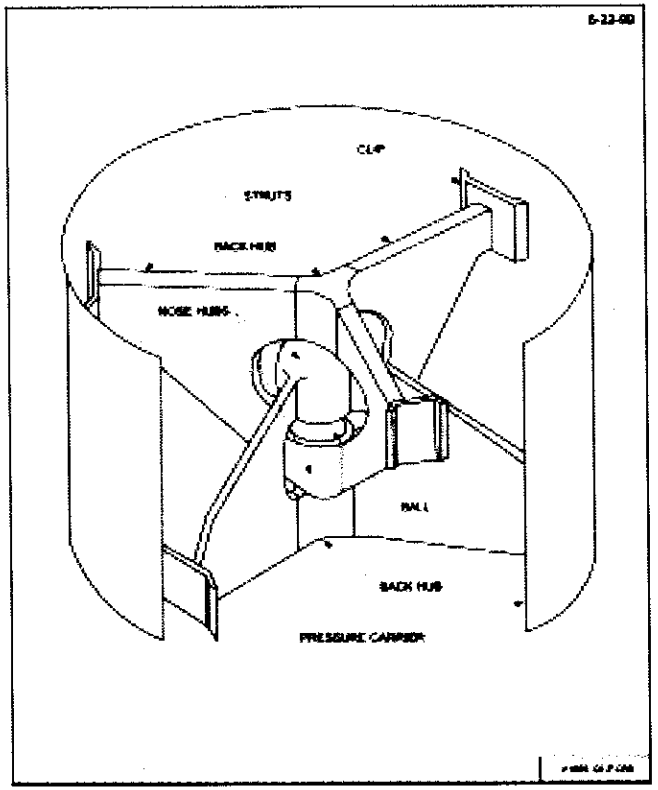


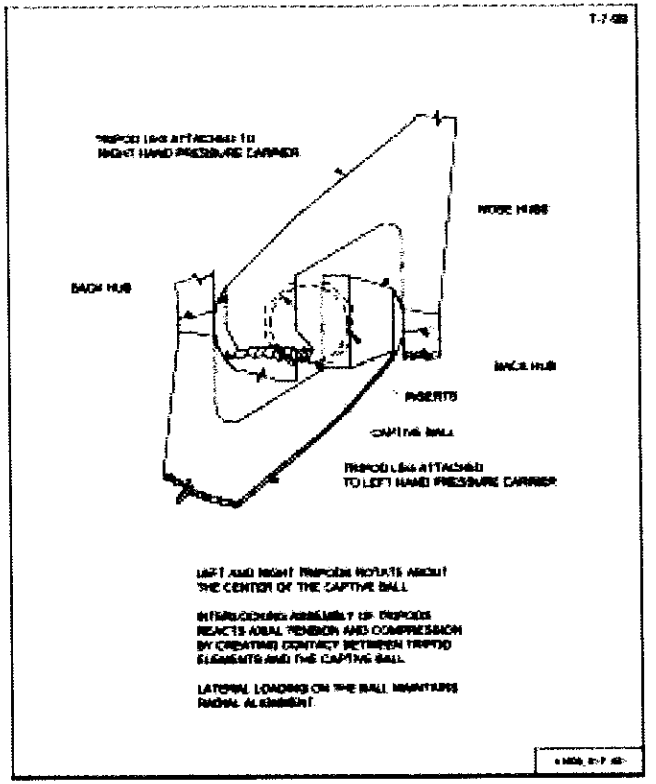
MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack

Presenter:

Organization/Date:
Orbiter 01/09/03

Typical BSTRA Assembly





MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack	Presenter:
	Organization/Date: Orbiter 01/09/03

M&P: History of Stoody Bearings in the Space Shuttle

- Stoody #2 is a cobalt based alloy developed for use in bearings
- Despite the material being uncharacterized for our use environment this material was selected based on its similarity to a material used successfully in the Saturn Program in a similar application (Stellite Star J)
- Testing by MSFC in 1978 found Stoody #2 to have a coarse microstructure (property variability) and extreme crack sensitivity
- Stoody #2 bearings were already installed in the MPTA and cost and schedule considerations made it highly desirable to not change materials
- Numerous discussions were held between the technical communities resulting in several test programs
- The apparent conclusion reached after all of the above was that risk of failure was low; recommendation was to continue with MPTA

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack	Presenter:
	Organization/Date: Orbiter 01/09/03

1977 Arrowhead Qualification Test Summary

2 ¼ 100 thermal cycles –320/+150 400 load cycles 50/90 kips –320°F

2 ¼ 400 thermal cycles –320/+150

1 ¾ 400 thermal cycles –320/+150

1 ¼ 100 thermal cycles –425/+150 100 load cycles 2/20 kips –423°F

Results:

Defect free by penetrant and metallurgical sectioning

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack

Presenter:

Organization/Date:
Orbiter 01/09/03

1978 MSFC Testing Summary

2 ¼ (x5) 10 thermal cycles –320/+212 100 load cycles 1.5x design max –320°F
5/8 (x6) 10 thermal cycles –320/+212 100 load cycles 1.5x dmax –320°F
7/16 (x6) 100 combined cycles –300/+600 1.25 dmax with vibration
1 ¼ (x2) 100 thermal cycles –423/+150 100 load cycles 1.1 dmax –423°F

Follow up testing of Cracked Balls

2 ¼ (3) 100 load cycles 1.5x design max –320°F
5/8 (3) 100 load cycles 1.5x dmax –320°F

Results:

2 ¼: No cracks observed, had to artificially induce cracks to test – no growth observed post test - 2 balls were found to be cracked by eddy current (2 of 5)
5/8: 3 cracks discovered after first five thermal cycles, no growth noted in rest of test 2 of the uncracked balls were discovered by metallurgical sectioning to be cracked (5 of 6)
7/16: No cracks observed during test, post test eddy current found two balls cracked and metallurgical sectioning found another (3 of 6)
1 ¼: One crack observed on receipt (eddy current), no growth noted during test (1 of 2)

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack

Presenter:

Organization/Date:
Orbiter 01/09/03

M&P: Interpretation of Material Data

- Stoody #2 has nil ductility at room temperature; assume this still applies at cryo
  - Brittle Material - low resistance to thermal/mechanical shock
- Coarse Microstructure
  - Results in property variations
  - Large acicular carbide precipitates
    - Stress concentration sites for crack initiation if at surface
- Largest thermal cycle occurs at manufacture
  - On casting, cools from roughly 2400°F to ambient; forms residual stresses
  - Followed by stress relief heat treatment; 1650°F for four hours with slow cool to ambient
    - Supposed to relieve residual stresses to manageable level
  - Cracks detected on receipt in 1978 MSFC test are most probably due to above cooling stresses

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack	Presenter:
	Organization/Date: Orbiter 01/09/03

M&P: Failure Mechanism

- Initial cause of cracks is not related to mechanical loads
  - Service load is compression
    - Hertzian stresses would produce spalling which is a localized chipping at the surface
      - Not observed in MSFC failures or on OV-103
  - Mechanical impact
    - Would expect hertzian stresses at impact location, again would produce spalling
      - Not observed in MSFC failures or on OV-103

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack	Presenter:
	Organization/Date: Orbiter 01/09/03

M&P: Failure Mechanism (cont):

- Data to date supports a thermal mechanism
  - Outer surface of bearing is trying to shrink as temperature decreases
    - Produces tensile stresses at outer fibers of bearing
    - Any scratches, nicks, casting defects, or other surface imperfections would act as stress concentrations and support crack initiation
  - Cracks would be circumferential
    - As observed in MSFC failures and on OV-103

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack	Presenter:
	Organization/Date: Orbiter 01/09/03

M&P: Flight Rationale Support

- Crack Arrest
  - Assumed mechanism is thermal stresses with possible residual casting stresses
    - Residual casting stresses would be relieved by crack formation
    - Thermal stresses can only grow crack if delta T increases
      - In brittle material, with no restraints, once initiated crack would propagate until stress at crack tip dropped below the ultimate strength of the material
      - Subsequent temperature cycles below that delta T could not produce a higher stress at the crack tip

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack	Presenter:
	Organization/Date: Orbiter 01/09/03

M&P: Flight Rationale Support (cont):

- FOD Generation (Spalling)
  - No reports of spalling at crack edges in 1978 MSFC report
  - No evidence of spalling at crack edges in what can be seen of the OV-103 crack
  - Conversations with two bearing suppliers provided anecdotal evidence that fractures are clean (no FOD)
  - Spalling would be against the strongest property of this material
    - Compressive strength is 300,000 psi

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack	Presenter:
	Organization/Date: Orbiter 01/09/03

M&P: Conclusions

- Concur with 1978 MSFC observation that material has a coarse microstructure with extreme crack sensitivity
- Concur with conclusion that risk of failure is low given use conditions and thermal screening
- Use of dye penetrant inspection as detection method for pre-existing cracks or post-acceptance screening is inadequate to detect cracks

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack	Presenter:
	Organization/Date: Orbiter 01/09/03

Stress: Loads Analysis

- Verification that LH2 line model changes, part of flowliner activity, does not impact PE cert loads is in work
  - Comparison of LH2 random vibration loads indicate model changes reduce line loads
    - PE still considered enveloping case
  - Vibration environments at the ET Attach end on the 17" disconnect were reviewed
    - Vibration in –014 spec and PE analysis is consistent with DFI flight data
  - Work on LO2 and transient environments is ongoing
- Mechanical loads schedule has been defined for testing

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack	Presenter:
	Organization/Date: Orbiter 01/09/03

Stress: Stress Analysis

- Stress Analysis will be performed on BSTRA ball alone FEM that can simulate cracks
  - Thermal gradient and mechanical contact loads
  - Checkout runs for 2.24" uncracked balls nearing completion

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack	Presenter:
	Organization/Date: Orbiter 01/09/03

LH2 17" Feedline Qualification Testing Summary

- ATP
  - Proof Press / Operational / Elevated Amb Temp / PC Leakage / VJ Pressure Rise
- Endurance
  - 2000 cycles @ 72%, 200 cycles @ 90%, 45 psig @ -300F
- Pressure Cycles
  - 50 cycles extended @ 90%, 50 cycles compressed @ 90%, 5 – 55 psig @ -300F
- Temperature Cycles
  - 100 cycles, Amb to -423F within 10 minutes
- Vibration
  - 13.3 Hours/axis, -400F @ ~20 – 35 psig
- Heat Transfer
  - LH2 @ 5 psig
- Jacket Implosion
  - 22 psid across VJ @ ambient
- Pressure Carrier Implosion
  - 30 psid across PC @ ambient
- Pressure Cycles
  - 1140 cycles total, 5 – 55 psig @ -300F
- Burst
  - 5 min @ 83 psig, ambient
- Post Test Inspection 6/9/82 – Some PC collapsing during implosion testing due to mislocated support. No BSTRA related anomalies.

MPS 17" Feedline Ball Strut Tie Rod Assembly Ball Crack

Presenter:

Organization/Date:
Orbiter 01/09/03

LO2 17" Feedline Qualification Testing Summary

- ATP
  - Proof Press / Operational / Elevated Amb Temp / PC Leakage / VJ Pressure Rise
- Endurance
  - 2000 cycles @ 72%, 200 cycles @ 90%, 200 psig @ -300F
  - Some excessive operational noise report at 1700 cycles – Cause ???
- Pressure Cycles
  - 50 cycles extended @ 90%, 50 cycles compressed @ 90%, 5 – 200 psig @ -300F
- Temperature Cycles
  - 100 cycles, Amb to -300F within 10 minutes @ 20 psig
- Vibration
  - 13.3 Hours/axis, -300F @ ~70 – 180 psig
  - Some VJ leaks noted and corrected
- Heat Transfer
  - LO2 @ 5 psig
- Jacket Implosion / Pressure Carrier Implosion
  - 22 psid across VJ @ ambient / 30 psid across PC @ ambient
- Pressure Cycles
  - 1940 cycles total, 10 – 220 psig @ -300F
- Burst
  - 5 min @ 395 psig, 3 min @ 440 psig, ambient
- Post Test Inspection 11/6/78 and 6/9/82 – Some movement of one support. No BSTRA related anomalies. No mention of actual tear-down.

SPACE SHUTTLE PROGRAM
Space Shuttle Vehicle Engineering Office
NASA Johnson Space Center, Houston, Texas

STS-107
FLIGHT READINESS REVIEW

FERRY READINESS
January 9, 2003

Ferry Plan Summary

- Ferry Planning Readiness Review conducted on 12/17/02 with no issues identified
- Ferry Flight Readiness Review to be conducted one day prior to planned ferry date
- Hardware summary:
  - Orbiter: OV-102 (Columbia)
    - NEOM ferry weight (lbs): 231732 (no fluids off-loaded)
    - NEOM ferry center of gravity (in): Xo 1109.7 Yo -0.2 Zo 371.9
      - » NEOM mass properties are within specified limits – Orbiter middeck ballast is not required
  - Attach hardware and ferry plugs are ready to support
  - Tailcone 2 ready to support
  - Shuttle Carrier Aircraft (SCA): NASA 911 is ready to support
- Configuration drawings have been released

Ferry Plan Summary - Continued

- DFRC seven day turnaround with ready-to-ferry on morning of day seven
- Flight plan
  - Three flight legs that will be performed over 2-days
- Prime landing sites, weather alternates and emergency landing fields selected
- Pathfinder: USAF C-141 or C-17 (purge equipment required)
- Purge – purge equipment will be deployed due to the potential for low temperatures at ferry overnight stop locations
  - Purge circuit 1 (OMS/RCS – ambient air temperature below 45 °F for greater than 2 hours)
  - Purge circuit 2 (Spacehab and Orbiter payload heat exchange/water lines requirement for ambient air temperature below 50 °F)
    - The Orbiter also requires that the ambient air temperature at landing be above 40 °F to avoid the potential for payload heat exchanger/water lines freezing prior to purge initiation

STS-107 FERRY READINESS STATEMENT

A Ferry Planning Readiness Review was conducted in accordance with the Space Shuttle Vehicle Engineering Office flight preparation process plan contained in NSTS 08117, Requirements and Procedures for Certification of Flight Readiness. This certifies that aircraft, equipment, and ferry requirements are ready to support Orbiter ferry operations.

Don L. McCormack, Jr.
MV/Manager, Ferry Operations

STS-107

FLIGHT READINESS REVIEW

January 9, 2003

Ground Operations

AGENDA

• Shuttle Processing	
• Integrated Operations	J. Taylor
• Shuttle Engineering	M. Young
• Launch and Landing	M. Leinbach
• Summary	M. Wetmore A. Allen C. Fontana

PROCESSING DIFFERENCES

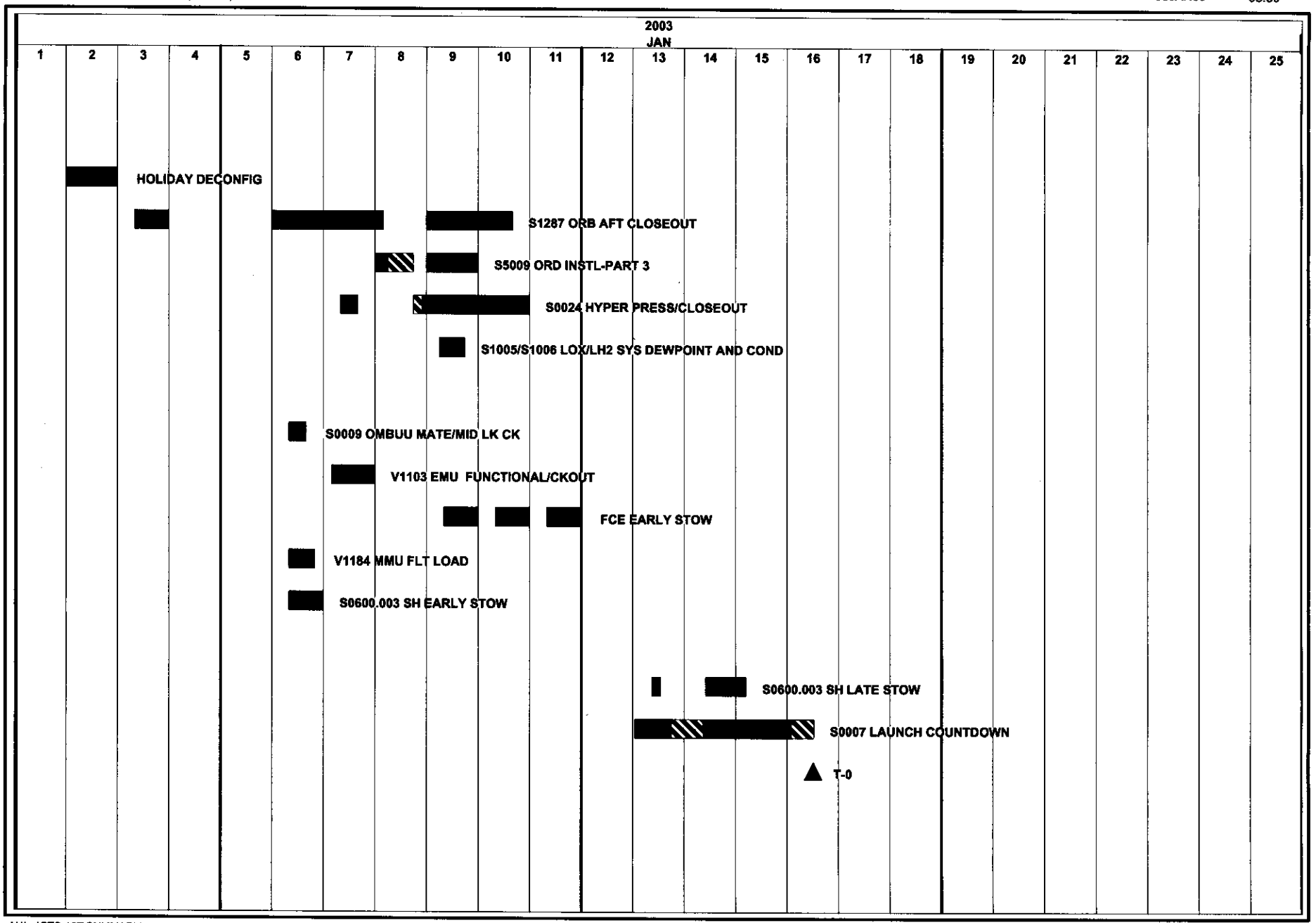
Presenter:
Jim Taylor
Organization/Date:
Ground Ops/01-09-03

- Processing Differences - VAB / Pad
  - Planned: Complete
    - 3 APU Confidence Run (Hotfire)
  - Unplanned: Complete
    - ECLSS O2 System Decay Test (FCP-165) during S0009
    - PRCBD S062145 - Video Quality Test for Freestar/Meidex
    - PR SB-BI-116-0005 SRB IEA cable connector inspection
  - The Hold Down Post / ETVAS Pyro Anomoly
    - A recurrence control action plan was enacted following the STS-112 pyro system failure.
      - The STS-113 pyro initiation was nominal after implementation of the action plan.
    - The STS-107 action plan is consistent with the STS-113 action plan

STS-107 / OV-102 Operations Summary

OPR: USA - J. Vevera, INTEG FM (1-2567)
NASA - J. Guidl, PH-A (1-9223)

06JAN03 08:50



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United Space Alliance

SHUTTLE ENGINEERING OVERVIEW

Presenter:
Mike Young
Organization/Date:
Ground Ops/01-09-03

The following Topics have been reviewed:

• Requirements Status – OMRS	To Be Presented
• TOPS Status	No Issues
• LCC/GLS Status	No Issues (in backup)
• Software, SCAN, and Configuration Status	No Issues
• Vehicle/GSE Modification Status	No Issues
• In-Flight Anomaly Status	To Be Presented
• Lost Item Problem Reports	No Issues (in backup)
• Time/Life Cycle	No Issues
• Critical Process Changes	No Issues
• Unexplained Anomalies	No Issues (in backup)
• Safety, Quality, and Mission Assurance	No Issues
• Engineering Topic	No Issues (in backup)
• Nonstandard Work Summary	No Issues

OMRS STATUS

Presenter: Mike Young

Organization/Date: Ground Ops/01-09-03

- Open Waivers/Exceptions

Waiver/ Exception#	System	Title	Status
WKxxxx	HYD	Ref: PR HYD-2-28-1197 V58AI0.020-A: Hydraulic fluid leakage at a swaged reducer at the outlet side of brake isolation valve #1 (50V58LV26)	To VECB: 1/10/03 Leak check performed at 500 psi circulation pressure. No leakage detected in 30 minutes

OMRS STATUS

Presenter: Mike Young

Organization/Date: Ground Ops/01-09-03

- Open Waivers/Exceptions (Cont'd)

Waiver/ Exception#	System	Title	Status
EKG10310	Swing Arms	Ref: U70-0503-00-001-0949 File VI OMRS G51FEGPA0.013 Pad A Orbiter Access Arm retract time is nominally 100 sec, should be between 105 and 140 sec	To PRCB: 1/10/03 Historically the OAA retract time has been measured and verified only against the max requirement. Exceeding min retract time has had no detrimental effect on Pad A OAA and launch structure hardware

INFLIGHT ANOMALY STATUS

Presenter: Mike Young

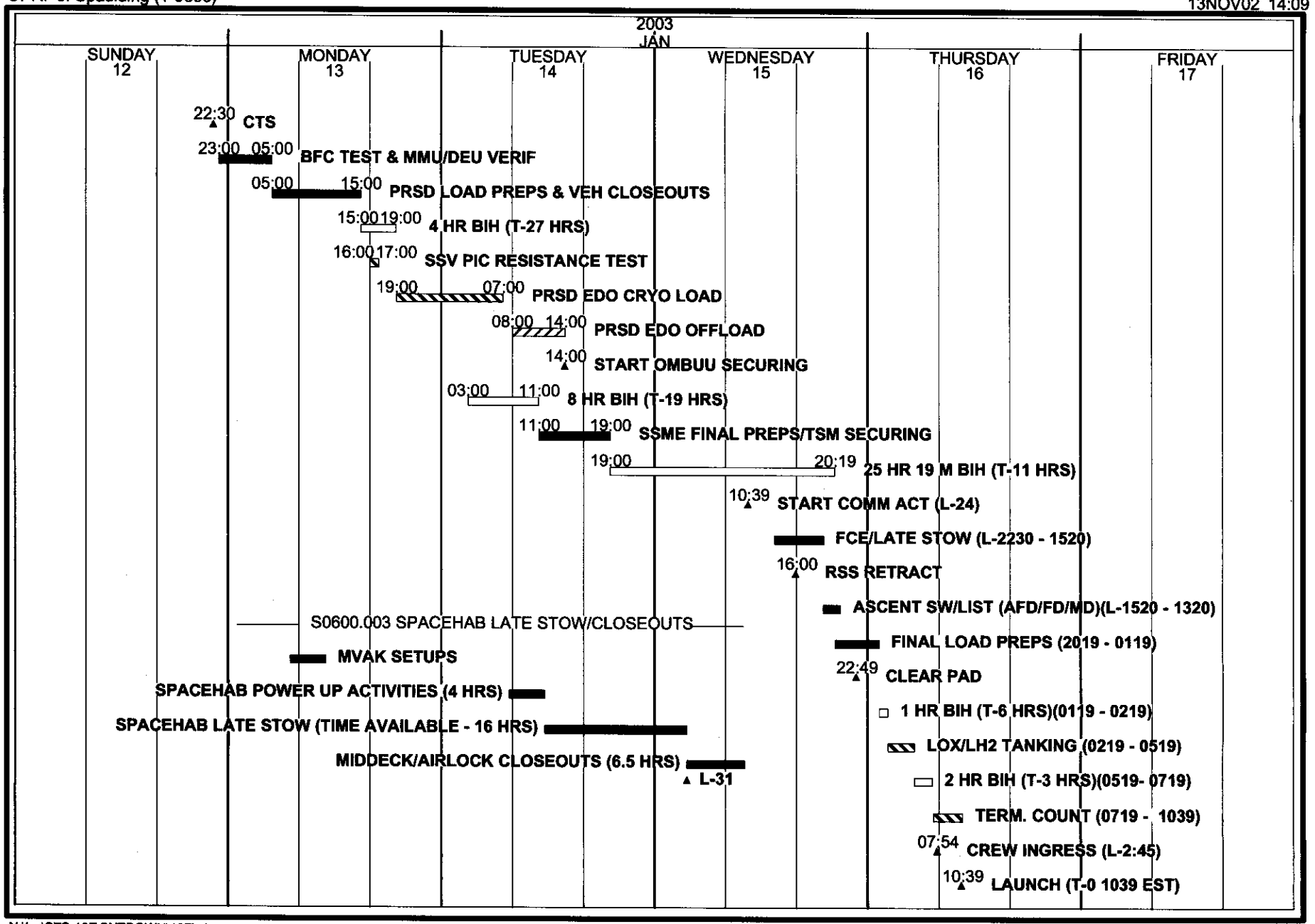
Organization/Date: Ground Ops/01-09-03

KSC IFA #	Description and Remarks	ECD
STS-113-K-01:	Orbiter Access Arm manual valves out of configuration. Investigation revealed a procedural error/omission. Procedure has been corrected and issue closed at PRCB	Closed 1/6/03
STS-113-K-02:	Facility Platform Contacted RMS. This issue is not applicable to STS-107	2/6/03

STS-107 / OV-102
Launch Countdown Summary

OPR: J. Spaulding (1-9306)

13NOV02 14:09



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United Space Alliance

NOTE: Actual Scrub turnaround timelines will be determined realtime based on specific conditions encountered.

STS-107

LAUNCH COUNTDOWN TURNAROUND OPTIONS

OPR: J. Spaulding (1-9306)
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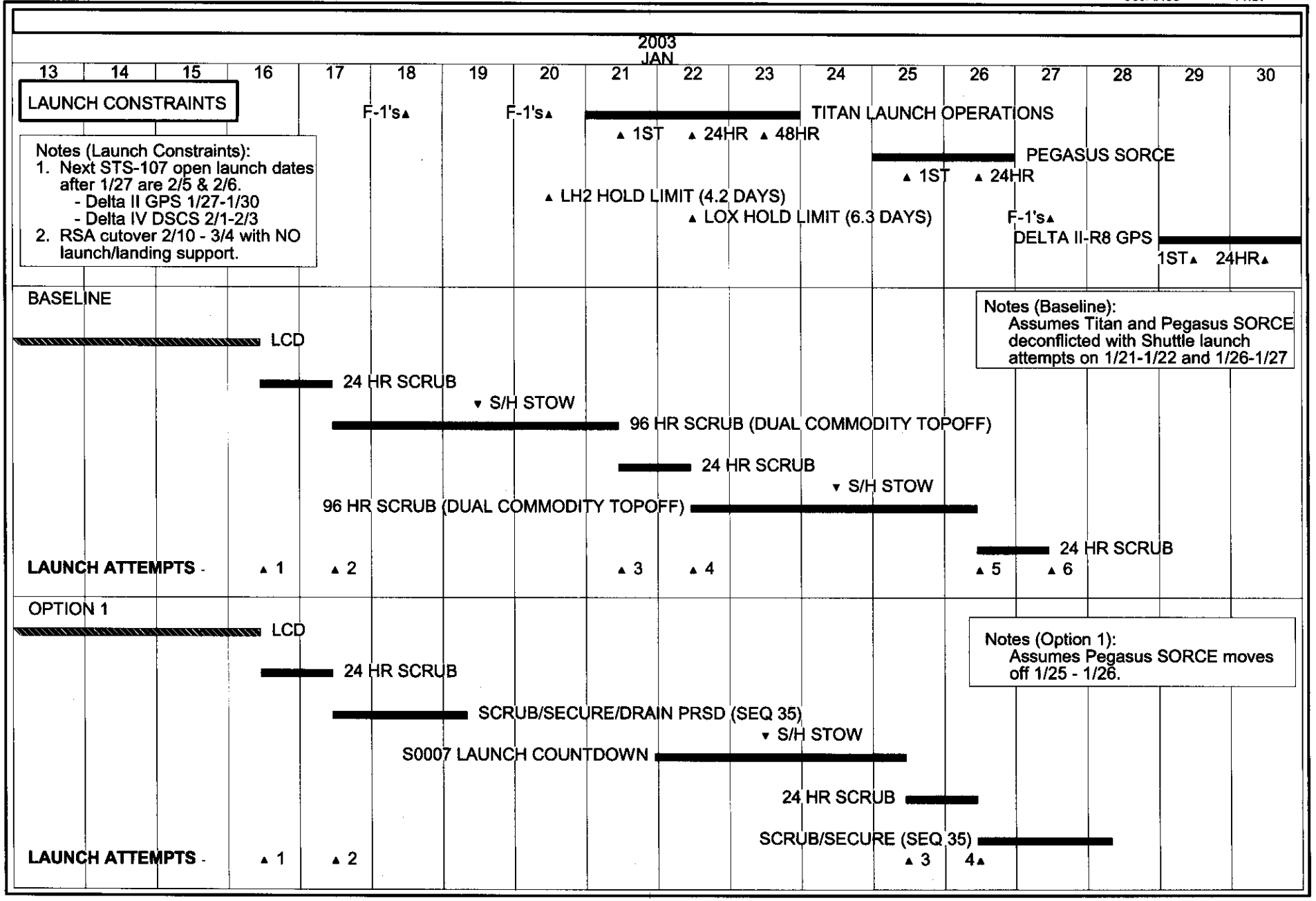


LANDING OPERATIONS STATUS

Presenter: Mike Leinbach

Organization/Date: Launch & Landing/01-09-03

- Launch Support
  - **RTLS**: KSC
  - **TAL**:
    - Moron (Prime) — Deploy at L-6 days, Jan 10, 2002
    - Zaragoza (Alt) — Deploy at L-6 days, Jan 10, 2002
  - **AOA**:
    - DFRC/EDW (Prime)
    - KSC/WSSH (Alt) — Deploy at L-2 days, Jan 14, 2002
- Mission Support
  - KSC (Prime EOM)
  - DFRC/EDW — Deploy at L-2 days, Jan 14, 2002
  - WSSH
- Site Status
  - Ben Guerir will not be manned for STS-107

Kennedy Space Center
Shuttle Processing Team

STS-107 Readiness Statement

This is to certify that appropriate CoFR items from NSTS-08117 Appendices H and Q, Flight Preparation Process Plan, have been reviewed and dispositioned. Subject to completion of planned work and resolution of any identified constraints, KSC Shuttle Processing and Supporting Organizations are ready to support Launch Operations.

S/Charles J. Fontana
Charles J. Fontana
APM, Integrated Logistics,
USA

S/Andrew A. Allen
Andrew A. Allen
APM, Ground Operations,
USA

S/Michael E. Wetmore
Michael E. Wetmore
Director of Shuttle Processing,
NASA

STS-107

FLIGHT READINESS REVIEW

BACKUP

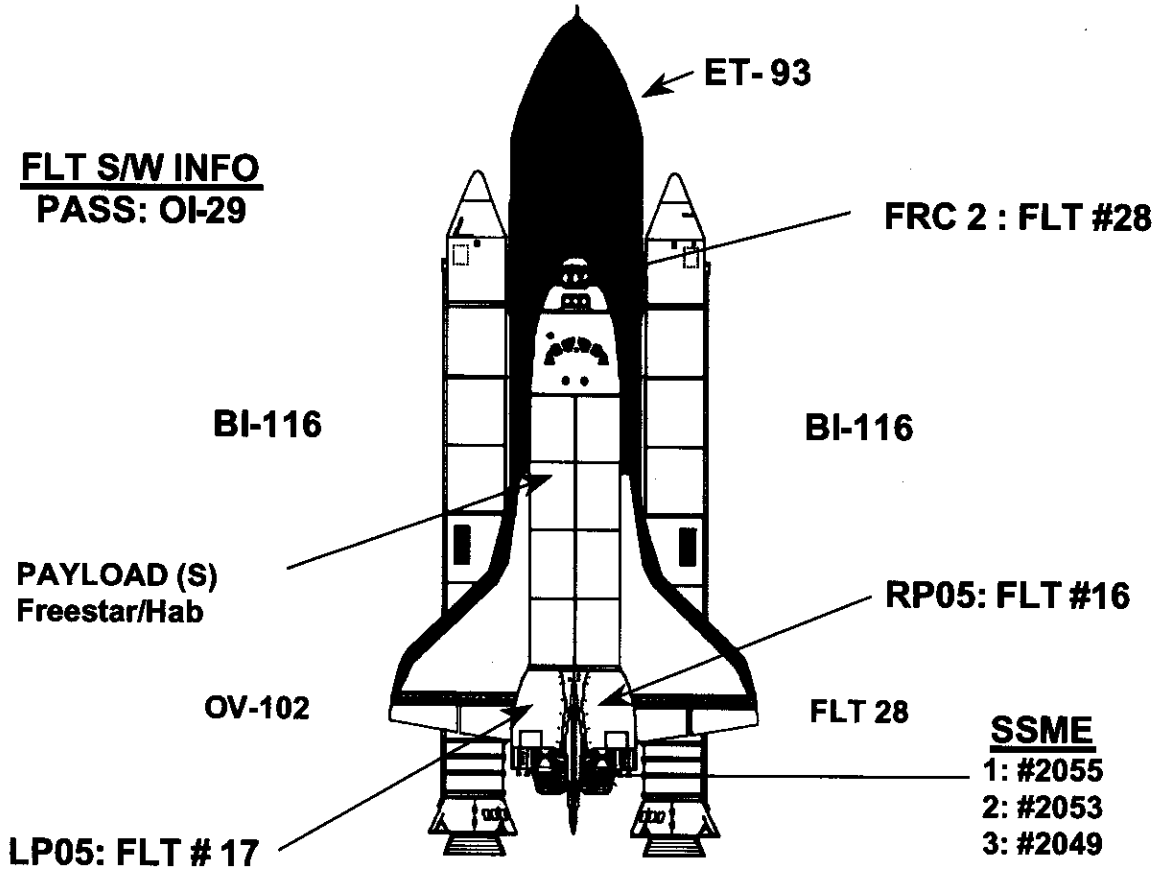
January 9, 2003

Ground Operations

STS-107 INTEGRATED STACK CONFIGURATION: HARDWARE/ SOFTWARE

Presenter: Mike Young

Organization/Date: Ground Ops/01-09-03



United Space Alliance

GROUND LAUNCH SEQUENCER

Presenter: Mike Young

Organization/Date: Ground Ops/01-09-03

Ground Launch Sequencer Configuration for STS-107

- GLSDD (KLO-82-0071A) Rev 9, Change E, November 2002

SSID / OMRS	Description and Remarks
• Mask	
ECL-40	FCL 1&2 Payload Heat Exchanger flow rate
Pay-02	Payload Auxiliary RPC A&B – On
Pay-03	Payload Aft Main B&C Power – On
CT-01	TACAN 1, 2 & 3 Range Built in Status Word & Range Suppression Pulse Present (Gould)

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SSID / OMRS	Description and Remarks
• Bypass	
SSME2	Engines 1,2,3 Block II ME MFV Downstream Temps 1 and 2
None	Photo Camera Sequencer Start Not Required
None	B/P of GCU 1 Sel Ind not req for 1203 GCU's
None	B/P of timer #4 (GCDKTIM4E). Timer #4 is no longer required by NTD

LOST ITEM PROBLEM REPORTS

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Lost Items Not Found (18 Total)

Summary/Conclusion for all LAF PR's

- A thorough search of each area was unsuccessful in finding/retrieving the lost items
- System Engineering evaluations have concluded no adverse effect on Orbiter system operations

LOST ITEM PROBLEM REPORTS

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WAD Number	Loc.	Description	L&F Log ID#	Search Time (Hours)	Weight and Size
LAF-2-28-0629 (LAF-2-A0020)	FWD	Nut plate (MD114-5004-0004) lost in FRCS cavity. Approx. size .95" x .42" x .25", material - A286 cress.	716	0	1.8 gram - 0.25 in. X 0.95 in X 0.42 in
LAF-2-28-0624	FWD	Strap V519-634106-004 was detected missing from an ECL duct in the airlock during V5050.001	707	8	14.5 grams - 0.5 in. X 14.5 in. long
LAF-2-28-0628	FWD	After installation of angle bracket V070-316138-011 at attach point 11, two rivet tails were unavoidably dropped into the FRCS cavity.	715	0	0.05 gram - 0.094 in. dia X 0.318 in long
LAF-2-28-0617	MID	Backshell tang on connector 40V7752P9344 (L/H bay 1 BWT) was broken and lost while working ECL-2-28-1514.	702	8	2 grams - 0.5 in. long X 0.4 in.
LAF-2-28-0618	MID	While working in the Payload Bay, it was noticed that a metal plate was missing from a SuperSabre flashlight (Model # 2000C). Unknown how long the parts have been missing.	699	11	0.1 grams - 0.24 in. dia X 0.02 in. thick
LAF-2-28-0618	MID	While working in the Payload Bay, it was noticed that a spring was missing from a SuperSabre flashlight (Model # 2000C). Unknown how long the parts have been missing.	700	11	0 grams - 0.2 in. dia X 0.2 in. long
LAF-2-28-0618	MID	While working in the Payload Bay, it was noticed that a vent cap was missing from a SuperSabre flashlight (Model # 2000C). Unknown how long the parts have been missing.	701	11	0.06 grams - 0.25 in. dia X 0.03 in. thick
LAF-2-28-0619	MID	Pin broke off inspection mirror (GA51AP) and fell in bay 2 R/H side at Xo 636, while working ECL-1525. Initial 30 min search did not locate the pin.	703	8	0.2 grams - 0.1 in. dia X 0.2 in. long
LAF-2-28-0620	MID	TCS blankets buttons missing mid-body blankets. Buttons are missing throughout, from bay 1 to the AFT bulkhead.	708	11	0.5 grams - 0.9 in. dia

LOST ITEM PROBLEM REPORTS

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WAD Number	Loc.	Description	L&F Log ID#	Search Time (Hours)	Weight and Size
LAF-2-28-0625	AFT	While attempting to mate connector 50V77V31P765 to solenoid valve on LH2 2" line, found ground wire for connector not attached to backshell. The hardware required is 1 (MD112-1003-020) screw.	709	9	1 gram - 0.25 in. head dia X 0.4 0.4 . long
LAF-2-28-0625	AFT	While attempting to mate connector 50V77V31P765 to solenoid valve on LH2 2" line, found ground wire for connector not attached to backshell. The hardware required is 1 (NAS620C6) flat washer.	710	9	0.3 grams - 0.25 in. dia X 0.02 in. thick
LAF-2-28-0625	AFT	While attempting to mate connector 50V77V31P765 to solenoid valve on LH2 2" line, found ground wire for connector not attached to backshell. The hardware required is 1 (MS35338-136) split lock washer.	711	9	0.3 grams - 0.25 in. dia X 0.03 in. thick
LAF-2-28-0625	AFT	While attempting to mate connector 50V77V31P765 to solenoid valve on LH2 2" line, found ground wire for connector not attached to backshell. The hardware required is 1 (MS35649-264) nut. Hardware not found in surrounding area.	712	9	1 gram - 0.3 in. dia X 0.1 in. thick
LAF-2-28-0626	AFT	While attempting to mate connector 50V77W13P511 to solenoid valve on LH2 2" line, found ground wire for connector not attached to backshell. The hardware required is 1 (MD112-1003-0210) screw.	713	8	1 gram - 0.25 in. head dia X 0.4 0.4 in long
LAF-2-28-0626	AFT	While attempting to mate connector 50V77W13P511 to solenoid valve on LH2 2" line, found ground wire for connector not attached to backshell. The hardware required is 1 (NAS620C6) flat washer.	713	8	0.3 grams - 0.25 in. dia X 0.02 in. thick
LAF-2-28-0626	AFT	While attempting to mate connector 50V77W13P511 to solenoid valve on LH2 2" line, found ground wire for connector not attached to backshell. The hardware required is 1 (MS35338-136) split lock washer.	713	8	0.3 grams - 0.25 in. dia X 0.03 in. thick
LAF-2-28-0626	AFT	While attempting to mate connector 50V77W13P511 to solenoid valve on LH2 2" line, found ground wire for connector not attached to backshell. The hardware required is 1 (MS35649-264) nut. Hardware not found in surrounding area.	713	8	1 gram - 0.3 in. dia X 0.1 in. thick
LAF-2-28-0627	AFT	During removal of 50-1 threshold assy., nut was dislodged from cage and entered into AFT interior along L/H sidewall.	714	8	0.5 gram - 0.38 in. dia X 0.38 in X 0.19 in. thick

UNEXPLAINED ANOMALIES ENGINE #1 PREVALVE INDICATION DROP OUT

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- Observation
  - During STS-109 ascent the Engine #1 LH2 Prevalve open 'A' indication experienced a drop out after SSME shut down
    - Drop out occurred 14 minutes after valve was opened for LH2 dump
    - The open 'B' indication operated nominally (remained ON)
  - No data dropout occurrences during troubleshooting

- Concerns
  - A repeat of the anomaly coupled with a failure of the redundant open 'B' indication at T-7 seconds (s) would cause a countdown hold
    - No concerns after engine start through remainder of mission

UNEXPLAINED ANOMALIES ENGINE #1 PREVALVE INDICATION DROP OUT (CONT'D)

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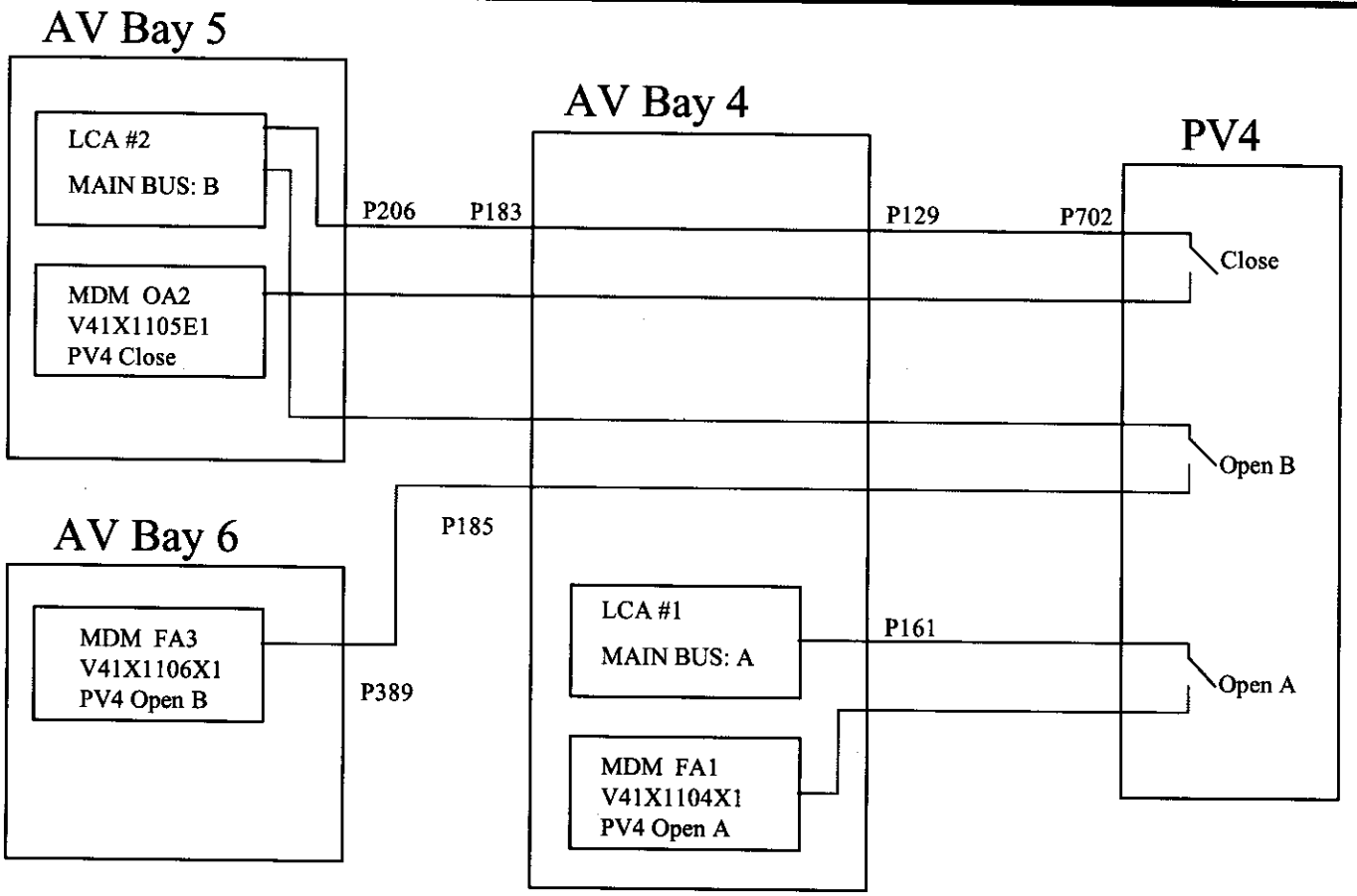

UNEXPLAINED ANOMALIES ENGINE #1 PREVALVE INDICATION DROP OUT (CONT'D)

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- Discussion
  - 5 prior Unexplained Anomaly (UA) occurrences of Prevalve open indication signal drop outs
    - 2 on OV-102 Engine #3 LH2 (during STS-035 processing)
    - 3 on OV-104 Engine #1 LH2 (2 during STS-044/079 processing and 1 on STS-104 ascent)
    - No occurrences during cryogenic loading or launch count
  - Most probable cause for all 5 UA's was an intermittent short or open in the indicator electrical circuit
    - All occurred during times of heavy work traffic, or on ascent
  - Launch Commit Criteria requirement is for 1 of 2 open indications at T-7 s - valve opening
    - Indications not used for remainder of mission

UNEXPLAINED ANOMALIES ENGINE #1 PREVALVE INDICATION DROP OUT (CONT'D)

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- Actions Taken
  - A tap check was performed on the Prevalve actuator
    - No drop outs
  - Valve electrical connector was de-mated and inspected
    - No anomalies noted
  - Isolated valve from vehicle wiring
    - Micro switch was tested – no anomalies
    - Vehicle wiring wiggled while monitoring voltage – no signal noise
  - Convoluted tubing removed and wire harness inspected near valve connector
    - No damage
  - Open 'A' indication monitored during daily power-up
    - No drop outs