

MISSION OPERATIONS DIRECTORATE FLIGHT DIRECTOR OFFICE



STS-100/STAGE 6A/ISS INCREMENT OPERATIONS

FLIGHT READINESS REVIEW

April 5, 2001

DA8/J. M. Heflin

STS-100/Stage 6A/Increment Operations

- STS-100 Mission Operations
 - Mission Operations – Mission Firsts
 - Network
 - USA Flight Operations
 - MOD
- Flight Rules
- Standard Special Topics
 - STS-100/6A Ascent Performance
- Open Issues/Work
- Certification
- Readiness Statement

STS-100/6A MOD Mission Firsts

- Priorities:
 - Twenty-seven items prioritized in the flight rules
 - Primary emphasis is on getting SSRMS up and running and leaving behind critical systems, maintenance and crew-related cargo
- Flight Firsts Include
 - Using Lab Cradle Assembly as temporary attach point for the Spacelab Pallet (SLP) containing the SSRMS
 - Hardware hand-off (SLP) between SSRMS and SRMS
 - Delivery of Express Racks 1 and 2
 - Decommission Early Comm System (served us well!)
 - Participation of several new Payload Operations and Integration Center (POIC) remote sites (10 total for this mission)



STS-100 ISS 6A Flight Readiness Review

Networks



6A

Multi-Purpose
Logistics Module
"Raffaello";
SSRMS; ECS
Removal; EVA UHF

Agenda

- Integrated Network Activity
- Other SN Supported Launches
- STS-102/5A.1 Anomalies
- Significant Changes
- Configuration Management

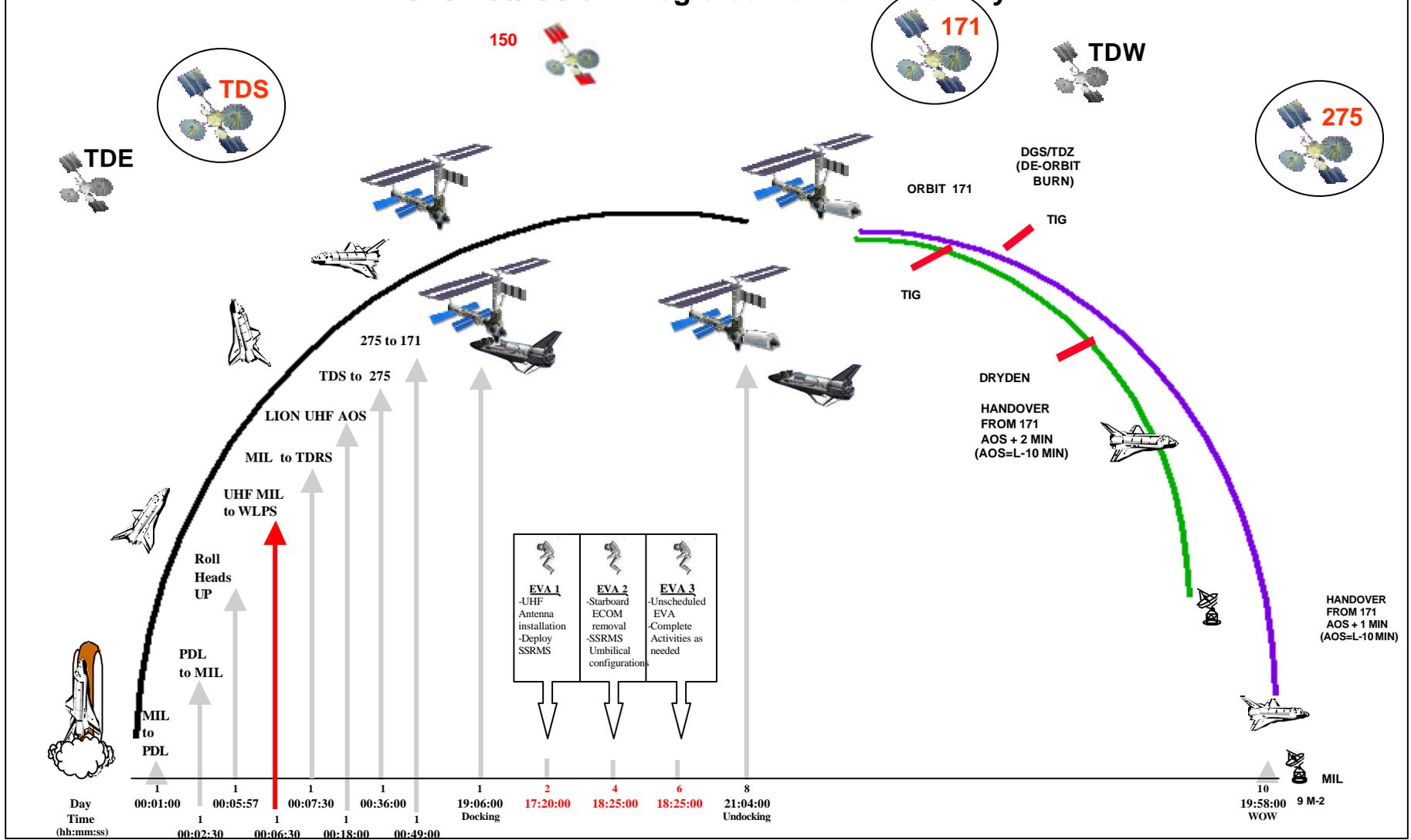
Ted Sobchak
Network Director
GSFC Code 450
April 5, 2001



STS-100/ISS 6A FRR Mission Services



STS-100/ISS 6A Integrated Networks Activity



STS-100/6A FRR/MOD



STS-100/ISS 6A FRR Mission Services



Other SN Supported Launches

- **At present, there are no SN supported launches during the STS-100 mission**
 - DELTA/MARS ODYSSEY (TDRSS/P-3) **07 APRIL**
 - SEALAUNCH-6/XM-1R **03 MAY**
- **No conflict with Network resources.**



STS-100/ISS 6A FRR Mission Services



STS-102/5A.1 Anomalies

- **Launch Support - PDL**
 - PDL lost 1 minute and 30 seconds of S-Band forward and return data during powered ascent
 - PDL S-Band antenna stopped moving 30 seconds after launch at 3 degrees elevation due to the PDL Tracking Acquisition Processor (TAP) software halting. Reinitializing software takes ~ 4 mins.
 - Both commands and telemetry with the orbiter were impacted. PDL carrier was not directed to drop. Communication cleared with handover back to MIL. UHF not impacted.
 - TAP software anomaly was identified in May 1999. Problem is intermittent and not repeatable. Preventative measure has been to reboot system during launch count.
- **Corrective Action**
 - Improved procedures developed to manually configure antenna system to autotrack mode at Shuttle intercept point in event of TAP failure after liftoff.
 - TAP software and configuration modified to enhance stability.
 - Increased Training on Failure Scenarios During Ascent Sims
 - Pre-Launch Briefing on Failure Scenarios
- NASA & CSOC are evaluating all MIL/PDL operational workaround procedures for critical support



STS-100/ISS 6A FRR Mission Services



Significant Changes

- **Ground Network**
 - **PDL**
 - **Modified operational procedures for site contingency failure cases.**
 - **Wallops is prime for UHF Handover from MIL.**
 - **BDA will be deactivated post STS-100**
- **NISN**
 - **Prime GN Command path will use new software for data blocking. Old software used on alternate path.**
 - **Six new voice loops to Houston Support Group (HSG), Russia**



STS-100/ISS 6A FRR Mission Services



Configuration Management

- **Integrated Network freezes are imposed prelaunch**
 - Freeze Exemptions must be approved prior to implementation
- **Critical Periods are identified premission by JSC and documented in a “Mission Critical Periods Interim Support Instruction (ISI)”**
 - Maintenance and testing restrictions are imposed during Critical Periods
- **Standard Critical Periods include:**
 - Launch
 - Dock
 - EVA
 - Reboost
 - Landing
 - Undock
 - Assembly Tasks



Space Operations Management Office



Certificate of Space Operations Management Office Readiness

**Pending completion of flight readiness preparations, remaining standard work and closure of all action items, SOMO dedicated elements and all CSOC resources are ready to support the
STS-100/ISS-6A/Raffaello/SSRMS**

(Original signed by)

S. C. Newberry **Date**
Director, Space Operations Management Office
Johnson Space Center

(Original signed by)

G. Morse **Date**
Manager, Space Operations Services
Johnson Space Center

(Original signed by)

D. Tighe **Date**
CSOC Program Manager

Presenter:

L. Bourgeois

Organization/Date:

Flt Ops/Date:04/05/01

**STS 100/ISS 6A
Flight Readiness Readiness Review
4/05/01**

USA Flight Operations

AGENDA

Presenter:

L. Bourgeois

Organization/Date:

Flt Ops/Date:04/05/01

- Requirements Compliance
- Facilities Readiness
- Flight Design Readiness
- Flight Preparation Product Readiness
- Training & Certification
- Flight Control Readiness
- Out of Family - None
- Special Topics - None
- CoFR Statement

REQUIREMENTS COMPLIANCE

Presenter:

L. Bourgeois

Organization/Date:

Flt Ops/Date:04/05/01

- Requirements
 - SSP Requirements Documentation Summary
 - Flight Preparation Requirements Book (FPRB),
 - Generic - CI
 - Flight Specific - 100MEBASE-Z
 - ISS Requirements Documentation Summary
 - IIDP, 2-FIN-D
 - Waivers & Exceptions - none
 - Significant non standard open work - none

FACILITIES READINESS

Presenter:

L. Bourgeois

Organization/Date:

Flt Ops/Date:04/05/01

- Mission Control Center (MCC)
 - Software changes since STS 102
 - MCC platform system software release – Io 2.1
 - Released 3/6/01
 - Continuous Operations 04/06/01
 - Dependant on successful Mission Configuration Test on 04/05/01
 - MOC Software version –100A1S
 - MIDDS Application S/W version – 13.4
 - Significant Hardware Changes - none
 - Significant Anomalies – none

FACILITIES READINESS

Presenter:

L. Bourgeois

Organization/Date:

Flt Ops/Date:04/05/01

- Integrated Planning System (IPS)
 - Significant platform software changes since last FRR
 - IPS Release 10.2
 - Significant Hardware Changes - none
 - Significant Anomalies - none
 - Significant non standard open work - none

FLIGHT DESIGN READINESS

Presenter:

L. Bourgeois

Organization/Date:

Flt Ops/Date:04/05/01

- Design meets all NASA requirements (FDRD, FRD, etc.)
 - Limit Exceedances - none
 - Entry thermal analysis complete - no violations
- Significant Anomaly Reports - none
- Significant mission firsts - none
- Significant non standard open work - none

FLIGHT PREP PRODUCT READINESS

Presenter:

L. Bourgeois

Organization/Date:

Flt Ops/Date:04/05/01

- Products
 - Shuttle Flight Design I-load patches:
 - Updates primarily due to Launch date change, mass properties updates and landing site table redefinition
 - Shuttle consumables products - delivered or on schedule
 - Significant non standard open work - none
- Procedures
 - FDF and ODF Status – standard open work remains
 - Crew review on 4/5 and ship 4/13

TRAINING & CERTIFICATION

Presenter:

L. Bourgeois

Organization/Date:

Flt Ops/Date:04/05/01

- Crew Training
 - Flight specific Shuttle Crew Training Plan: All training has been or is scheduled to be completed prior to launch
- Integrated Training - on schedule
- All Shuttle instructor and SMTF facility operations personnel are trained and certified

FLIGHT CONTROL READINESS

Presenter:

L. Bourgeois

Organization/Date:

Flt Ops/Date:04/05/01

- Real-time support software status
 - All user applications that support real-time Ops are certified and incorporated into the Ops baseline
 - Significant Anomaly Reports - none
 - Significant non standard open work - none
- Personnel
 - All USA accountable flight controllers are certified for flight
 - Significant non-standard open work - none

STS-100/ISS-6A

Certification of Flight Readiness

Presenter:

L. Bourgeois

Organization/Date:

Flt Ops/Date:04/05/01

- The USA Flight Operations FRR, NASA MOD FRR, and USA SFOC Pre-FRR have been completed
- All Contractor Accountable Functions (CAF) have been completed, or are scheduled for completion, in accordance with NASA requirements and the applicable portions of the Space Flight Operations contract Flight Preparation Process Plan (NSTS 08117, section 8.5.18 and appendix “R”).
- All required products have been or are scheduled to be delivered per requirements.
- All Facilities have been configured and are ready for mission support.
- All CAF personnel are trained and certified or will be trained and certified prior to flight.
- Flight crew has been trained.
- There are no open issues.
- Pending completion of the defined open work.

**USA FLIGHT OPERATIONS IS READY
TO SUPPORT THE STS 100/ISS 6A MISSION**

/S/ L. S. Bourgeois

L. S. Bourgeois
Director Mission Operations, Flight Operations

STS-100/Stage 6A Mission Operations

Significant Items

- Shuttle Flight Software
 - No significant changes (3rd flight of OI-28)
- Station Flight Software
 - Update to allow for graceful time sync between U.S. and Russian segment
 - Update to allow use of 7A type displays for SSRMS and Airlock dry runs
 - Correction to SSRMS Latching End Effector controlling software to ensure proper latching mechanism release
 - Update to SSRMS robotics advisories (Caution & Warning) providing improved message headers consistent with malfunction procedures
- Portable Computer System (PCS)
 - Robotics and Emergency, Caution & Warning Updates
- Station Support Computer (SSC)
 - Upgrades to following applications: Onboard Short Term Plan Viewer (OSTPV = the “flight plan”), Manual Procedures Viewer (MPV = “checklists”) and Crew Squawk (ops related questions/comments)

STS-100/Stage 6A Mission Operations

Significant Items

- Flight Design
 - ISS Flight Mechanics Design is complete and meets all requirements
 - Proper definition, insight, and review of shuttle flight design confirms ready for flight
 - Mission objectives have been scheduled reflecting FD 3 rendezvous
 - Prop and non-prop consumables support the mission (11+1+2)
 - Prop margins: Aft: ~3000 lb; Fwd: ~700 lbs

STS-100/Stage 6A Mission Operations

Significant Items

- Procedures: FDF and SODF
 - Shuttle – No significant open work (PV Records Review completed March 30, 2001)
 - Station (PV Records Review completed April 3, 2001)
 - No significant open work for 6A
 - MSFC Payload Operations Data File ready for flight
 - RODF – None being launched on 6A
 - Work continues with the Russians related to timeliness of Emergency Procedure updates and payload procedure content
- Joint Operations Integrated Procedures (JOIP)
 - US only flight specific completed dated January 9, 2001
 - Joint US/Russian – 6A flight specific ready April 6, 2001
 - Planning Process updates
 - Payload Interface procedures

STS-100/Stage 6A Mission Operations – Houston and Moscow Support Groups

- FGB Data Book, SM Data Book, Soyuz/Progress Data Book, and HSG Ops Handbook are ready to support (no changes from 5A.1)
- Russian Display Reference Guides – FGB and SM ready to support (no changes from 5A.1)
- HSG staffing plan similar to previous missions with ops and consultant team.
- MCC Consultant Group
 - Staff of seven due to be changed out on April 21, 2001
- Transition of MCC-H to lead control center, including Onboard Short Term Planning process, continues in a positive manner.

STS-100/Stage 6A Mission Operations Crew and Flight Controller Training

- All shuttle crew training is on schedule to be complete
- EVA NBL training is scheduled to be complete (April 5, 2001)
- Remaining STS-100 integrated team training
 - A/E: two ascent sims and one entry (4/6, 4/13, 4/12)
 - Orbit: Undocking/Sep (4/6)
- ISS Expedition 2 Crew Training
 - On-Board Training (OBT) has been identified
 - Most significant related to SSRMS and readiness for 7A and Airlock installation
 - Training will utilize RoBOT simulator, actual use of SSRMS, video conferencing, and review of procedures and reference material

STS-100/Stage 6A Mission Operations Crew and Flight Controller Training

- Shuttle - All Flight Controller certifications are scheduled to be complete prior to launch
- ISS Flight Controller Staffing
 - Three Robotics teams will be certified
 - All other ISS disciplines have 7-10 teams certified

STS-100/6A Significant Flight Rules

- Mission Priorities
 - Primarily SSRMS installation and checkout and transfer of critical logistics from MPLM
- SSRMS
 - 50 checkout items prioritized as mandatory, highly desirable and desirable broken down by flight days
 - Defined launch to activation thermal constraints (48 hours between SLP transfer to apply keep-alive power and defines time to achieve operational thermal state once power applied)
 - Defined criteria for simultaneous operation of SRMS and SSRMS (clearance, communication, vision, verified trajectories)
 - Defined when ok to use SSRMS for failed SRMS for SLP re-birth and MPLM ops
 - Defined SSRMS return or, not ok to return criteria
- Incorporated lessons learned from 5A.1 for MPLM

STS-100/6A Significant Flight Rules

- PDRS (SRMS)
 - Two flight specific exceptions to All Flights book relative to SRMS orbiter proximity constraints
 - Coarse rates permitted within 10 feet of structure for EVA tasks where EVA crew can provide clearance information (“GCA”)
 - Allow rate hold within 10 feet of structure with translations parallel to structure, verification of proper travel, and camera views and EVA crew providing monitoring of clearances
- Updates to power transfer rules between U.S. and Russian segment based on mission phase

STS-100/6A Significant Flight Rules

- Significant Generic ISS Only (Vol. B Rules)
 - Power down response in event loss of attitude control
 - Defined consumable reserve requirement for H₂O, O₂, LiOH
 - Prop priority management
 - Process/rationale for verifying Commands From Scratch prior to uplink
 - Defined MDM R&R priorities and rationale
 - Conducting operations in a module without C&W
 - Constraints on routing cables, hoses, ducts, etc.
 - Time allowed in module without ventilation
 - Fire/smoke response management
 - EVA pre-breath protocol defined (three)
 - EVA safety tether protocol defined

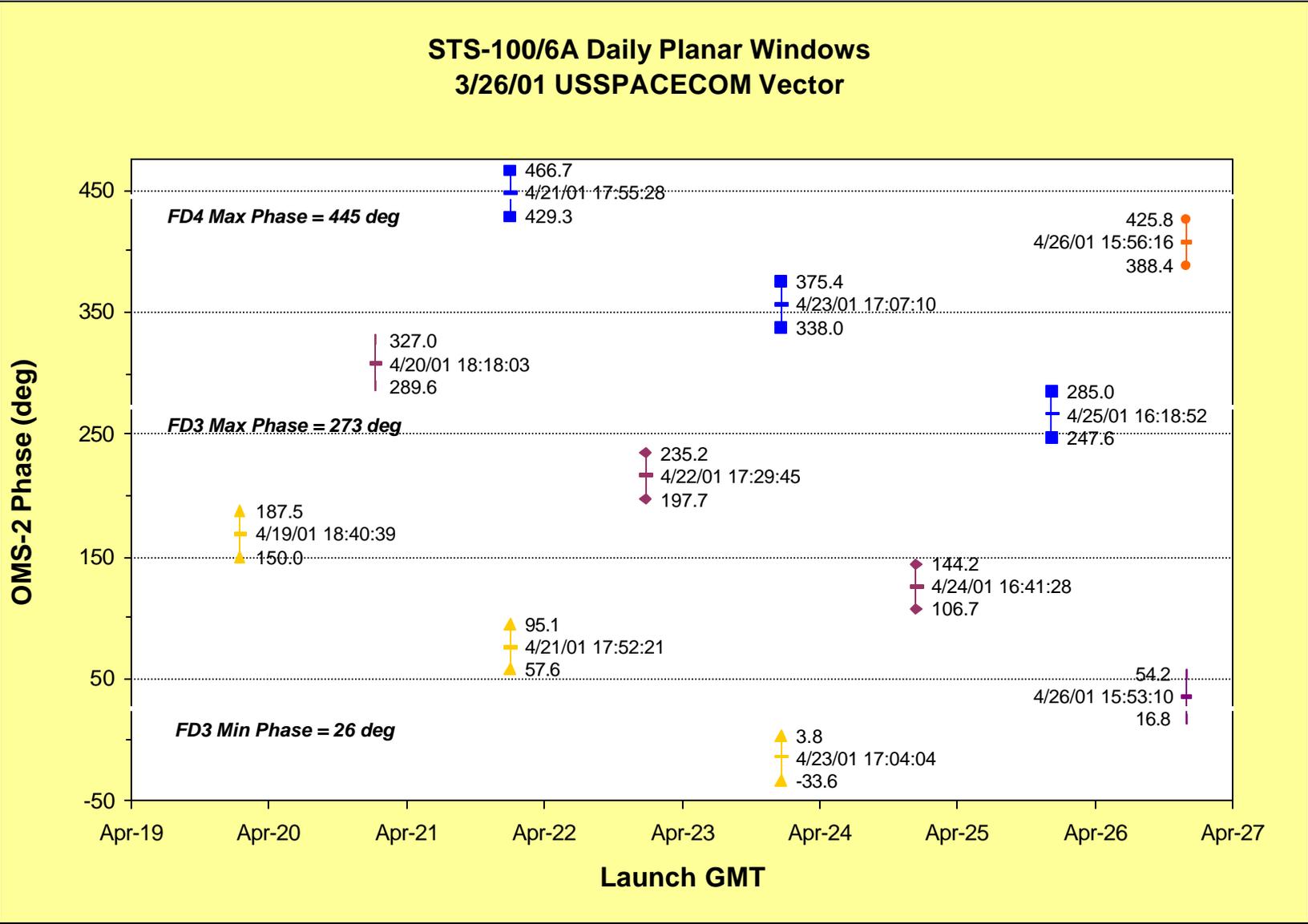
STS-100/6A Ascent Performance

- INSERTION ALTITUDE/INCLINATION 173 NM / 51.6 DEG
- FIRST STAGE DESIGN CRITERIA DOLILU II / OPS HIGH Q
- LAUNCH WINDOW OPEN (10 MIN) April 19, 2001, ~18:35:39 GMT
~14:35:39 EDT
- LAUNCH WINDOW CLOSE (10 MIN) April 19, 2001, ~18:45:39 GMT
~14:45:39 EDT
- LANDING TIME (KSC) April 30, 2001, ~13:34 GMT
~9:34 EDT
- I-LOAD DESIGN APM 2951 LBS *
- FRR ASSESSMENT APM 2340 LBS *

LAUNCH HOLD INSIDE OF DRAINBACK LIMITED BY SSME TEMPERATURE
START BOX LIMIT, NOT LIMITED BY ASCENT PERFORMANCE

* 5 minute window, no DOL dispersion reduction

STS-100/6A Daily Planar Windows



STS-100/6A Abort Regions Chart

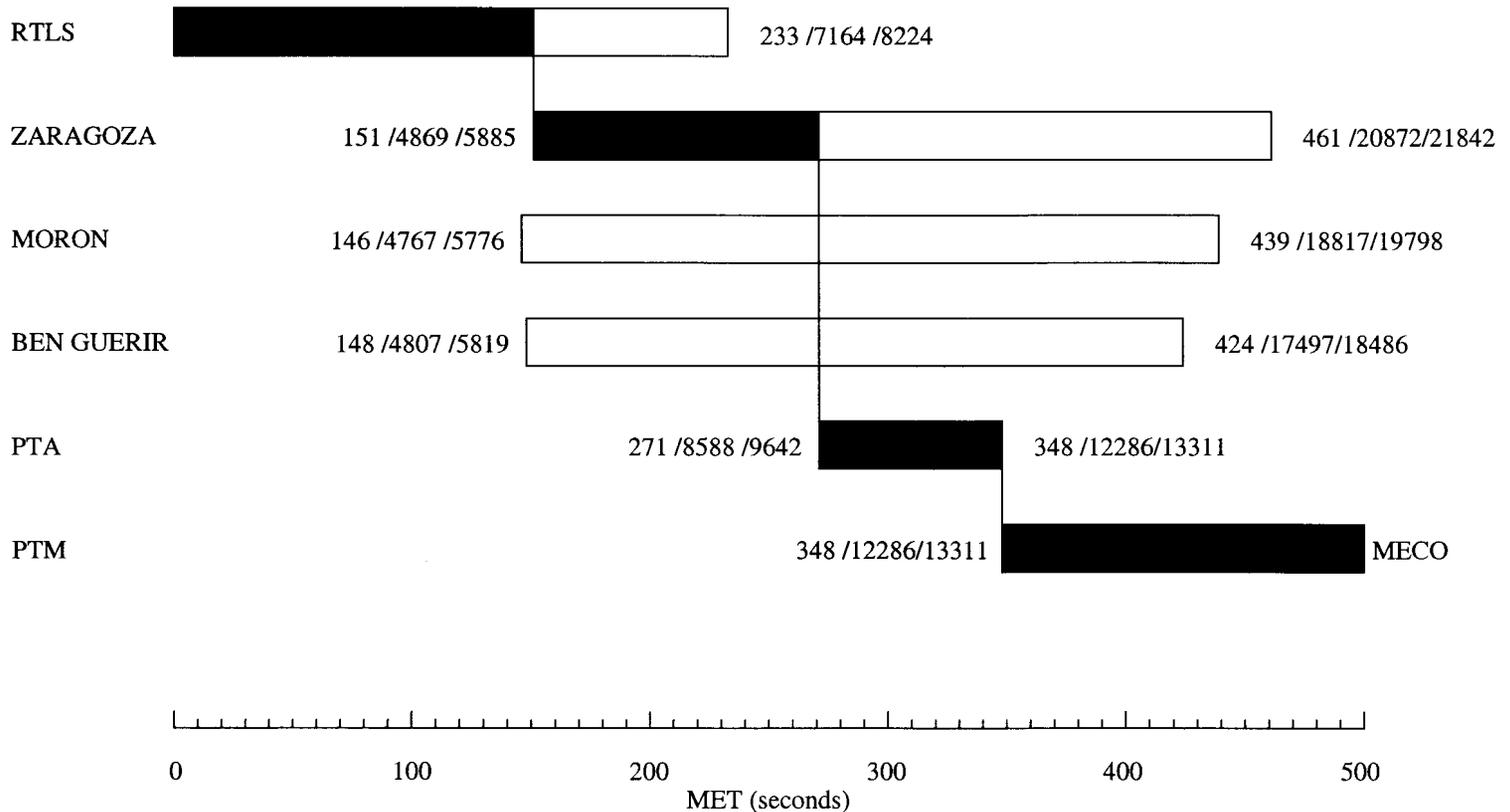
Abort Regions Chart

STS-100 FRR

TDDP: FRRAF100(005)
 Ascent Performance Margin: 2479.0 lbs
 Ascent Intact Engineer: K. Butler
 Date: Thu Mar 8 12:41:54 CST 2001

LEGEND
 E.O. Time (sec)/Rel. Velocity (fps)/Inert. Velocity (fps)

All data presented on this chart is at the opening of a 5 minute window.



Last RTLS boundary based on third peak heating. Last RTLS performance boundary: 234 / 7199 / 8259.

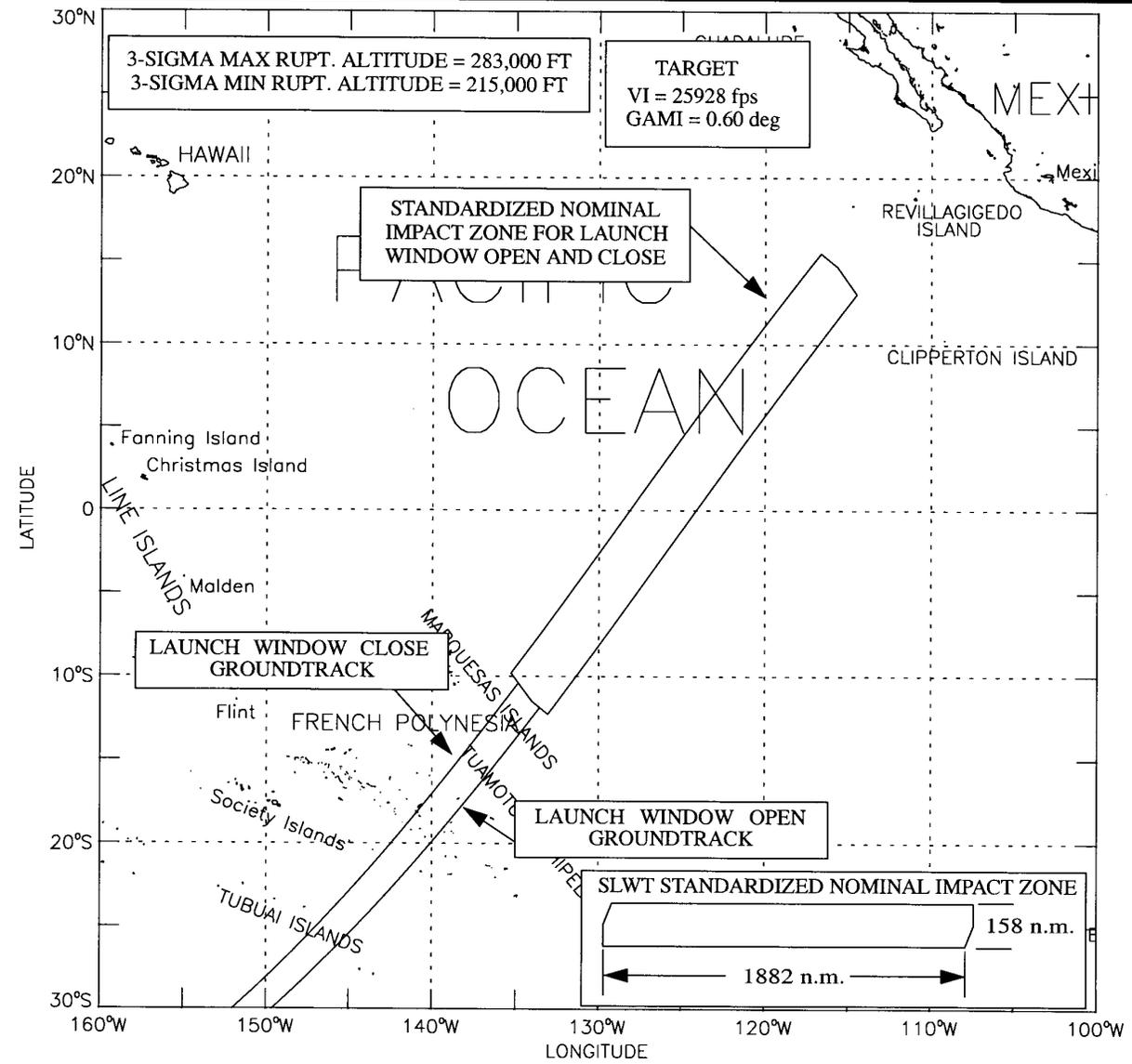
The negative MRN boundary is based on the 50 deg BETA constraint. The negative ZZA boundary is based on the 23 kfps VI constraint.

Note: Due to inherent assumptions made in its creation, this chart may not accurately depict DOL conditions and intact abort boundary times.

STS-100/6A Nominal ET Impact Area

Nominal ET Impact Area

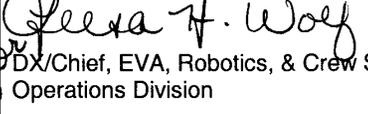
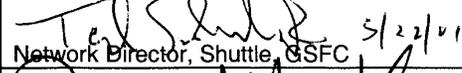
STS-100 FRR



STS-100/6A Significant Open Issues/Work

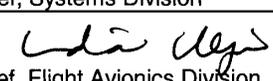
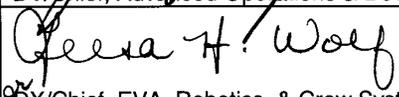
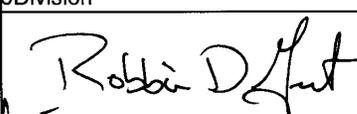
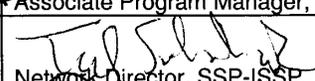
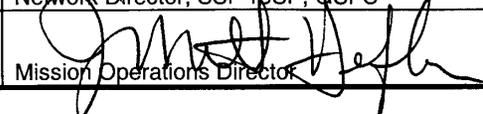
- Completion of Mission Configuration Test with 6A ISS software updates (April 5)
- Incorporating MPLM packing lessons learned
- Completing on-orbit Ku-band functional checkout
- Continuing CDRA on-orbit troubleshooting
- Update stage (post undocking) mission priorities
- Incorporate solar array pin-lock requirement for docking/undocking
- Lab thermal loop/condensate management
- Continuing ISS water vent system troubleshooting
- Floating potential probe EVA task decision
- Reboost/joint trajectory plan with Russians

MISSION OPERATIONS DIRECTORATE
SHUTTLE CERTIFICATE OF FLIGHT READINESS (CoFR)
FLIGHT: STS-100/6A REQUIREMENTS

Critical Processors/Applications, Non-Crit Processors/Applications; Flight Rules: EMCC: Trng-MCC /POCC; FTP-New Operations; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Level II Actions; Mission Requirements; Exception Resolution; CMD Proc; FPPP Requirements Met; Contractor Process Insight	 DAs/Chief, Flight Director Office
Crit Processors/Applications; Non-Crit Processors/Applications; FDF; EMCC; TRNG-MCC/POCC; LCC; FTP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Level II Actions; Mission Requirements; Engineering Drawings; CMD Proc; FPPP Requirements Met; Contractor Process Insight	 3/22/01 DF/Chief, Systems Division
Crit Processors/Applications; Non-Crit Processors/Applications; FDF; EMCC; RECON-Flight S/W (MMU); TRNG-MCC/POCC; FTP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; No Constraints; Level II Actions; Mission Requirements; CMD Proc; FPPP Requirements Met; Contractor Process Insight	 3/22/01 DM/Chief, Flight Design and Dynamics Division
Crit Processors/Applications; Non-Crit Processors/Applications; FDF; FDF Manage; EMCC; PGSC; TRNG-MCC/POCC; FTP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Level II Actions; Mission Requirements; Engineering Drawings; CMD Proc; FPPP Requirements Met; Contractor Process Insight	 3/22/01 DO/Chief, Operations Division
EX/AI from Prior Reviews; No Constraints; Level II Actions; Mission Requirements; FPPP Requirements Met; Contractor Process Insight	 DT/Chief, Space Flight Training Division
FPPP Requirements Met; Contractor Process Insight	 DAs/Chief, Advanced Operations & Development Division
FAC-NBL; FAC-SVMF; FDF; TRNG-Crew Trng; TRNG-MCC/POCC; TRNG-EVA/MARS; LCC; FTP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Level II Actions; Mission Requirements; Engineering Drawings; CMD Proc; EVA Hardware Integration; Contractor Process Insight	 PDX/Chief, EVA, Robotics, & Crew Systems Operations Division
FAC-MCC; FAC-Network Interface; FAC-SMS; FAC-SPF; FAC-IPS ; Crit Processors/Applications; Non-Crit Processors/Applications; FD-Trajectory; FD-Consumables; FD-PDRS; FD-Analyst Cert; FD-CTF; FDF Manage; EMCC; RECON-STAR/MASTII/CD ROM Products; RECON-MCC; TRNG - Crew Trng; TRNG-MCC/POCC; TRNG-SMS; FTP-New Ops; Flight Anomaly Res; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Level II Actions; Mission Requirements; Engineering Drawings; Exception Resolution; CMD Proc; FPPP Requirements Met	 Associate Program Manager, Flight Operations, SFOC
EMCC; NETWORK; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; No Constraints; Level II Actions; FPPP Requirements Met	 3/22/01 Network Director, Shuttle, GSFC
	 Mission Operations Director

MISSION OPERATIONS DIRECTORATE
ISS CERTIFICATE OF FLIGHT READINESS (CoFR)
FLIGHT/INCREMENT: STS-100/6A AND SUBSEQUENT INCREMENT OPERATIONS

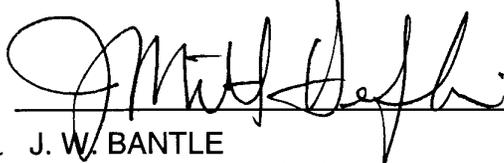
ISS REQUIREMENTS

Critical Processors/Applications; Non-Crit Processors/Applications; Flight Rules; EMCC; Trng-MCC /POIC/POCC; JOP-New Operations; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Program Actions; Mission Requirements; Exception Resolution; CMD Proc; Contractor Process Insight	 DA8/Chief, Flight Director Office
Crit Processors/Applications; Non-Crit Processors/Applications; ODF/SODF; EMCC; TRNG-MCC/POIC/POCC; LCC; JOP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Program Actions; Mission Requirements; CMD Proc; EVA Hdwr; Contractor Process Insight	 3/22/01 DF/Chief, Systems Division
EX/AI from Prior Reviews; No Constraints; Program Actions; Mission Requirements; Contractor Process Insight	 3/23/01 DL/Chief, Flight Avionics Division
Crit Processors/Applications; Non-Crit Processors/Applications; TRNG-MCC/POIC/POCC; JOP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; No Constraints; Program Actions; Mission Requirements; CMD Proc; FD-Flight Mechanics, FD-Analyst Cert. FD-CTF	 3/22/01 DM/Chief, Flight Design and Dynamics Division
Crit Processors/Applications; Non-Crit Processors/Applications; ODF/SODF; ODF/SODF Manage; EMCC; TRNG-MCC/POIC/POCC; JOP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Program Actions; Mission Requirements; CMD Proc; Contractor Process Insight	 3/22/01 DO/Chief, Operations Division
EX/AI from Prior Reviews; No Constraints; Program Actions; Mission Requirements; Contractor Process Insight	 DT/Chief, Space Flight Training Division
The SSTF maintains a training load consistent with the last training environment for the increments in progress which can, on demand be loaded and updated to the required onboard configuration for any necessary procedure development; contractor process insight.	 DV/Chief, Advanced Operations & Development Division
FAC-NBL; FAC-SVMF; FDF; TRNG-Crew Trng; TRNG-MCC/POCC; TRNG-EVA/MARS; LCC; FTP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Level II Actions; Mission Requirements; Engineering Drawings; CMD Proc; EVA Hardware Integration; Contractor Process Insight	 EDX/Chief, EVA, Robotics, & Crew Systems Operations Division
FAC-MCC; FAC-Network Interface; FAC-IPS; Crit Processors/Applications; Non-Crit Processors/Applications; ODF/SODF Fabrication; Flight Anomaly Res; Anomaly-Proc; Ex/AI from Prior Reviews; No Constraints; Program Actions; Mission Requirements; Exception Resolution; CMD Proc	 Associate Program Manager, Flight Operations, SFOC
NETWORK; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; No Constraints; Program Actions	 3/22/01 Network Director, SSP-ISSP, GSFC
	 Mission Operations Director

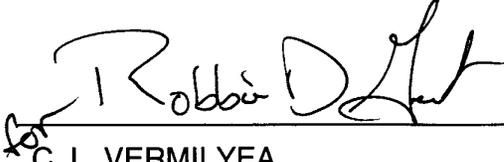
STS-100/6A FLIGHT READINESS STATEMENT



THE MISSION OPERATIONS FLIGHT PREPARATION PROCESS PLAN DOCUMENTED IN NSTS 08117, REQUIREMENTS AND PROCEDURES FOR CERTIFICATION OF FLIGHT READINESS, HAVE BEEN SATISFIED. REQUIRED PRODUCTS AND OTHER RESPONSIBILITIES FOR MISSION OPERATIONS (NSTS 08117, SECTION 8, PARAGRAPH 8.5.7) HAVE BEEN OR WILL BE PRODUCED OR COMPLETED. ALL AREAS ARE READY. MISSION OPERATIONS IS PREPARED TO SIGN THE CERTIFICATE OF FLIGHT READINESS FOR STS-100/6A.

for 

J. W. BANTLE
MISSION OPERATIONS DIRECTOR

for 

C. L. VERMILYEA
VICE PRESIDENT AND ASSOCIATE
PROGRAM MANAGER, FLIGHT
OPERATIONS, SPACE FLIGHT OPERATIONS
CONTRACT