

MISSION OPERATIONS DIRECTORATE FLIGHT DIRECTOR OFFICE



STS-112/9A MISSION OPERATIONS

FLIGHT READINESS REVIEW

September 17, 2002

**DA8/R. E. Castle
DA8/A. Algate**

Agenda

| | |
|--|------------------------|
| • Mission Summary | To Be Presented |
| • Shuttle Flight Software | No Issues |
| • Flight Design & Ascent Overview | No Issues |
| • Flight Procedures | No Issues |
| • Joint Operations Integrated Procedures | No Issues |
| • Crew Training | No Issues |
| • Flight Controller Training | No Issues |
| • Significant Flight Rules | No Issues |
| • Special Topics | No Issues |
| • Open Work | No Issues |
| • Network | To Be Presented |
| • USA Flight Operations | To Be Presented |
| • Readiness Statements | Included |



MISSION OPERATIONS DIRECTORATE
Flight Director Office
NASA Johnson Space Center, Houston, Texas



Mission Summary

STS-112/9A Shuttle Overview

OV-104 – Atlantis

Crew

– Shuttle:

- CDR – Jeff Ashby
- MS1/EV1 – Dave Wolf
- MS3/EV2 – Piers Sellers
- PLT – Pam Melroy
- MS2 – Sandy Magnus
- MS4 - Fyodor Yurchikhin

– ISS Crew:

- CDR – Valeri Korzun
- FE2 – Sergei Treschev
- FE1 – Peggy Whitson

Mission Duration 11+1+2

Three planned EVAs, one unscheduled EVA.

6 N2 tanks

5 Cryo Tanks sets: ≥ 72 hr pad hold time.

Propellant acceptable

- Acceptable
- Margin for 1 hour 40 minutes of Config 3 reboost

STS-112/9A Mission Priorities

Primary objectives for STS-112, in priority order:

- Transfer critical water
- Install S1 truss, connect zenith and nadir tray umbilicals, and activate S1 survival power
- Deploy S1 S-Band, connect umbilical, and activate heater power
- Perform transfer
- Perform Treadmill chassis R&R
- Install Spool Positioning Devices (SPD's) on wet ammonia QD's (6 on 9A)
- Perform thermal radiator rotary joint checkout
- Deploy S1 central radiator
- Perform Mobile Transporter Interface Umbilical Assembly (IUA) remove and replace
- Connect S1 fluid umbilicals
- Install dry SPD's (25 on 9A)
- Remove and stow inboard keel pin/drag link and release Crew Equipment and Translation Aid (CETA) cart
- Installation of two external camera groups

EVA Strategy

- All EVA tasks required for S1 installation and survival, including S1 S-Band string are performed on EVA 1

STS-112/9A Mission Overview

FD 1

- Launch

FD 2

- Checkout EMU's
- Checkout RMS
- Checkout OSVS

FD 3

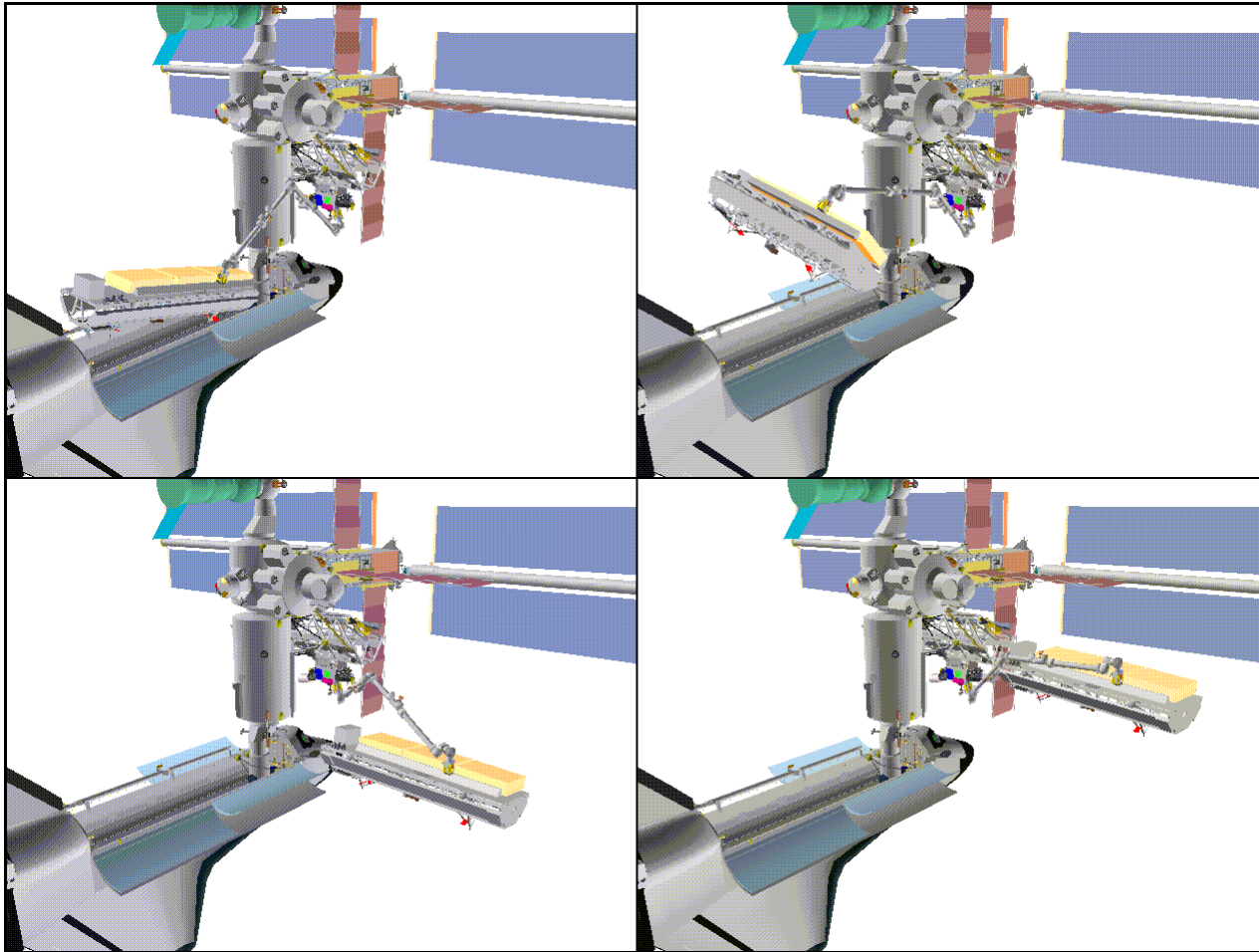
- +Vbar ISS rendezvous, docking to PMA2
- Shuttle crew ingress
- EVA Prep
- SSRMS to pre-grapple position

STS-112/9A Mission Overview

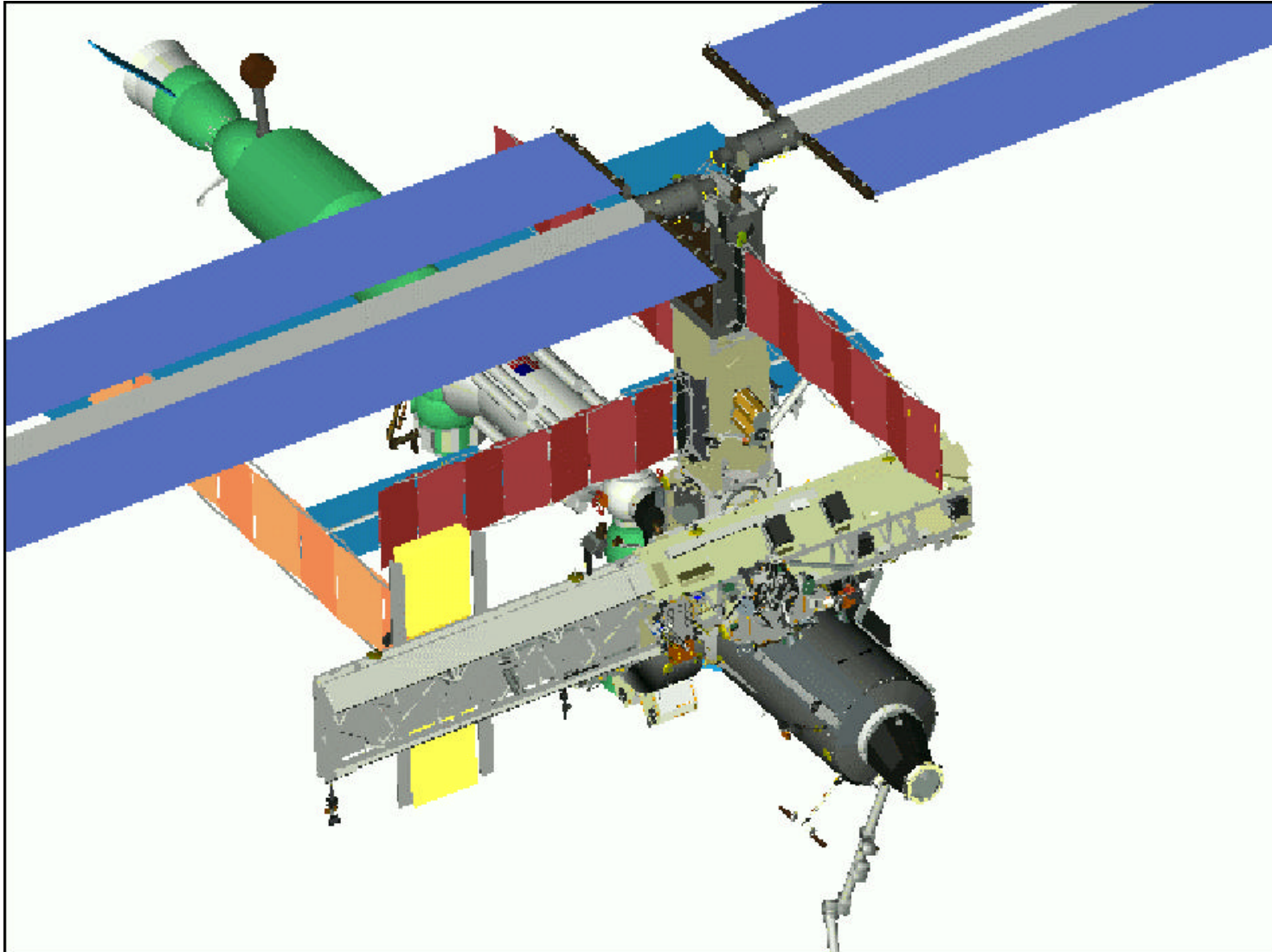
FD 4

- SSRMS maneuvers S1 to S0 install position
- Segment to Segment Attachment System (SSAS) latch and bolting operations to attach S1
- EVA 1
 - Zenith S1/S0 power and data umbilicals
 - Ground activates one string of S1 ORU's
 - Radiator Beam launch locks release (partial)
 - Install S-Band antenna
 - CETA cart launch locks release (partial)
 - S1 outboard nadir camera install
 - Nadir S1/S0 power and data umbilicals
 - Ground activates second string of S1 ORU's
 - S1 safe configuration

9A - S1 Truss Installation



S1 Truss Installed



STS-112/9A FRR/MOD

STS-112/9A Mission Overview

FD 5

- Off duty
- Transfer
- EVA prep

FD 6

- Reboost
- EVA 2
 - Install Spool Positioning Devices (SPD's)
 - CETA cart launch locks (complete)
 - Ammonia Tank Assembly (ATA) umbilicals
 - Lab camera install
 - Radiator Beam launch locks release (complete)

STS-112/9A Mission Overview

FD 7

- Transfer
- TVIS repair
- EVA prep
- Ground Command
 - Thermal Radiator Rotary Joint rotation checkout
 - Center radiator panel deploy

FD8

- Reboost
- EVA 3
 - Interface Umbilical Assembly (IUA) R&R
 - S1/S0 fluid jumper install
 - Port and starboard drag links and keel pin remove and stow
 - SPD installations
 - SFU reconfiguration
 - S1/S3 line clamps
 - S1/ S3 SSAS RTL Test

STS-112/9A Mission Overview

FD9

- Off duty
- Transfer
- EMU reconfiguration

FD10

- Shuttle crew egress
- Undock
- SHIMMER (Spatial Heterodyne Imager for Mesospheric Radicals) - data takes

FD11

- SHIMMER data takes
- End of mission cabin stow

FD12

- Landing

STS-112/9A New or Unique Operations

First Flight for SSAS Operations

Docking and undocking are supported by:

- 3 of 4 bolts SSAS bolts
- SSAS motorized bolts have backup EVA drive, and there are contingency bolt kits which may be installed instead of a failed MBA bolt

Undocking loads can also be supported with the S1 on the SSRMS, and SSAS bolt 3 and any other bolt and the latch

Second String of S-Band installed and activated

- Second string will be checked out during low activity periods

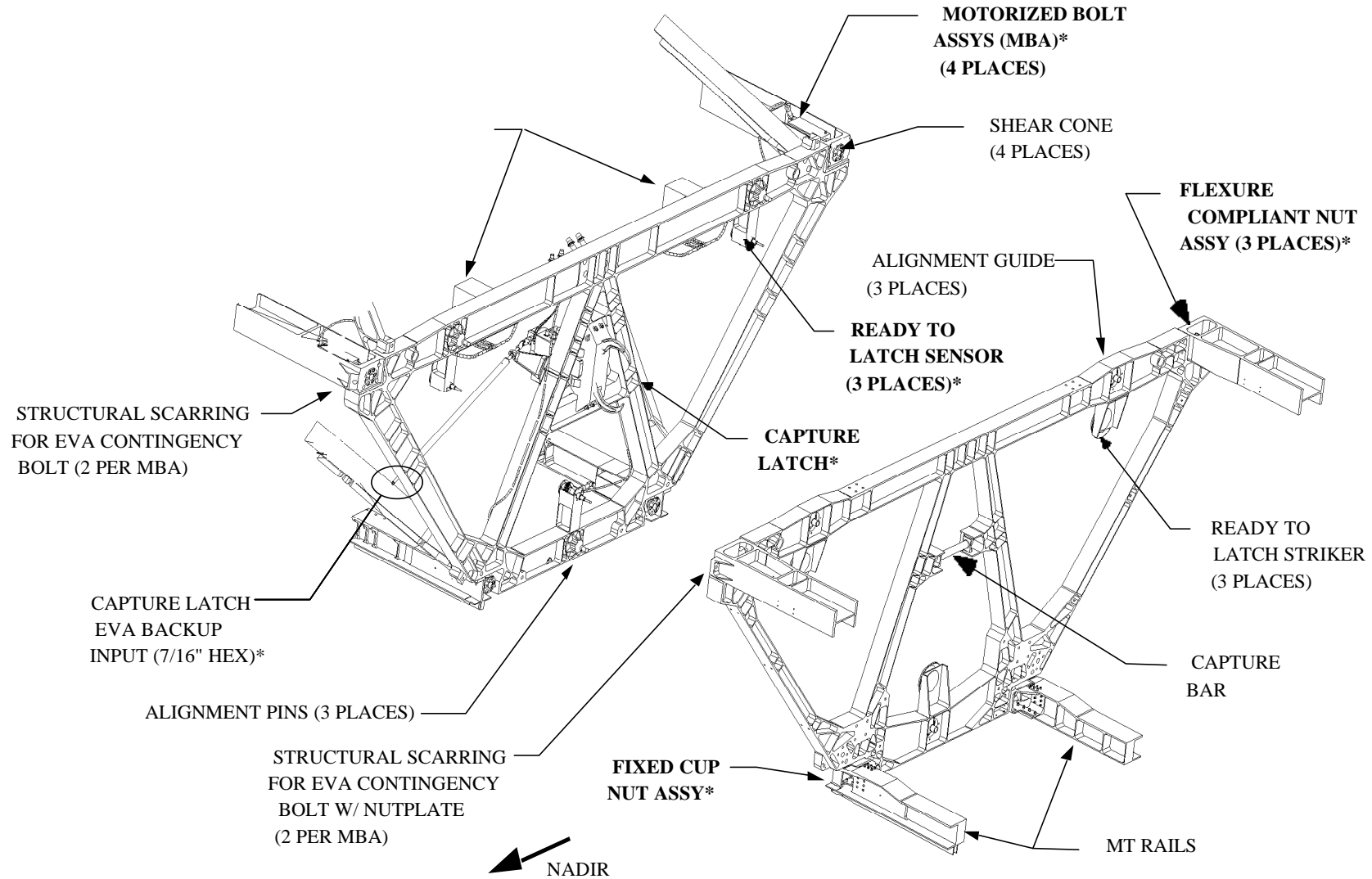
EVA Durations

All 3 EVA's are full and planned to 6:30 hr PET

EVA's may be extended based on suit consumables to preclude hardware damage

EVA's may be extended to 7 hr PET for category 1 and 2 objectives

Segment to Segment Attach System (SSAS)



STS-112/9A New or Unique Operations

High Negative Solar Beta Considerations (launch dates between 10/15 and 10/19)

S1 thermal constraints require +XVV attitude until S1 activated

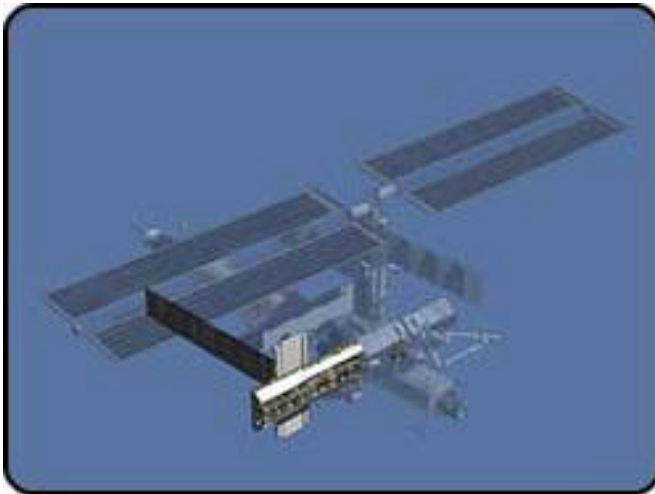
- This attitude constraint results in power challenges at high betas
- To improve power margins, a roll bias CMG controller is used
- S1 install activities on FD4 will require a powerdown
 - Powerdown can be accomplished

An additional CMG failure would require more significant powerdowns because roll bias attitude could not be used for S1 install

- Acceptable powerdown has been found, with agreed to reduced power transfer to Russian segment (flight rule)



STS-112/ISS 9A S1 Truss Flight Readiness Review Networks



9A

- Install the S1 Truss
- External cooling system for ISS (Radiators)

Agenda

- Significant STS-111 Item
- Significant Changes

Ted Sobchak
Network Director
GSFC/Code 450
September 2002



STS-112/ISS 9A Mission and Data Services



Significant STS-111 Item

- **PDL Signal Compression**

- Orbiter antenna management program was adjusted for STS-111 for the proper location of the PDL site.
- This resulted in a higher than expected downlink signal strength at PDL that caused signal compression in the down converter which appears to have marginally affected the telemetry.
- **Corrective action: Adjusted the RF gain network to remove impacting signal compression and increase the system dynamic range.**
 - Testing with simulated signals demonstrated no significant impact to thresholds. No impact to mission support.



STS-112/ISS 9A Mission and Data Services



Significant Changes

- **Space Network (SN)**
 - **White Sands Complex (WSC)**
 - Software delivered on August 8 and August 15 addressed a number of open DR's and enhancements. The delivery did not address any specific ISS or STS support issues.
 - A problem was identified that impacted TDRS pointing in the launch support configuration.
 - Problem root cause was identified and the enhancement from the delivery package was inhibited on August 30.
 - **Data Services Management Center (DSMC)**
 - On June 25, 2002 the SN successfully completed the transition of the operational functions from the NCC at GSFC to the DSMC at WSC.
 - Includes SN scheduling and control of active TDRS events.
- **Ground Network**
 - **Dryden (DFRC)**
 - One of two S-band tracking sites (ATF-2) has a planned overhaul 10/16 – 10/27. No impact, ATF-1 will be prime.



STS-112/ISS 9A Mission and Data Services



Significant Changes

- **DOD Radars**
 - One ER radar (CMTC) is being relocated from CCAFS to Merritt Island (08/12/02 to 02/13/03). No impact.
 - Edwards Radar (EFFC) will be placed in caretaker status for 6 months starting October 1st and then deactivated. No impact.

- **NISN**
 - Mission Support Backbone Migration (Big Optical Pipe) replaced the ATM “cloud” services provided by Sprint with dedicated circuits and NISN managed ATM switches.
 - **ISS Services**
 - Payload data between MSFC HOSC and TSCs (JSC, ARC and GRC)
 - Payload voice loops and data between MSFC HOSC and RPIs
 - ISS video from JSC to MSFC, CSA, RPIs, and TSC
 - ASI voice and data services between KSC and JSC

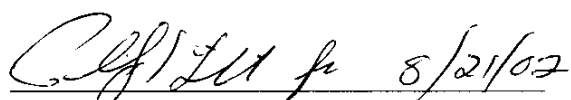


Certificate of Flight Projects Directorate Networks Readiness

This is to certify that with successful completion of flight readiness preparations and closure of associated action items, all integrated networks and CSOC elements are ready to support the STS-112 15th ISS Flight (9A) - BA, ITS SI


T. Sobchak/NASA
Human Spaceflight Network Director
Date 8/21/02


S. Norman/NASA
NISN Representative
Date 8/21/02


J. Walker/NASA
GSFC Center Customer Commitment
Manager
Date 8/21/02


C. Griffith/NFRC
NFRC Chief Range Operations
Date 8-21-02


D. Wagner/CSOC
GSFC CSOC Deputy Associate
Program Manager
Date 8/21/2002

| | |
|--|----------------------|
| | Presenter: |
| | L. S. Bourgeois |
| | Organization/Date: |
| | Flt Ops/Date:9/17/02 |

**STS 112/9A
Flight Readiness Review
9/17/02**

USA Flight Operations

AGENDA

Presenter:

L. S. Bourgeois

Organization/Date:

Flt Ops/Date:9/17/02

- Facilities Readiness
- Out of Family - None
- Special Topics - None
- CoFR Statement

MCC Significant First

Presenter:

L. S. Bourgeois

Organization/Date:

Flt Ops/Date:9/17/02

- First flight of Trajectory Server (TRS) without Mission Operations Computer (MOC) as backup
 - MOC decommissioned in August, 2002
 - Concurrence from MOD
 - Approval from Space Shuttle Program Office
- All major objectives necessary to utilize TRS in “solo” mode (no MOC backup) have been met
 - System reliability
 - Software reliability and shelf life
 - Hardware reliability and shelf life
 - Flight Controller training
 - Platform stability

MOC Decommissioning

Presenter:

L. S. Bourgeois

Organization/Date:

Flt Ops/Date:9/17/02

- **Activities leading up to MOC decommissioning:**
 - Thorough testing demonstrated
 - Operational Readiness Testing successfully completed by MOD user community prior to 10/01/01.
 - Flight critical certifications obtained for applicable processors
 - Sufficient “shelf life” demonstrated
 - Completed over 1000 hours of simulations since 10/05/01
 - 113 generic sims (624 hours)
 - 57 flight specific sims (404 hours)
 - Successfully demonstrated ability to support missions
 - Flight followed in CDE five flights (STS-98, -102, -100, -104, -105)
 - Flight followed in OPS for two flights (STS-108, STS-109)
 - TRS prime for STS-110 (orbit/entry phases)
 - TRS prime for STS-111 (all phases)
- **TRS is ready to support STS-112/9A**

STS 111 ARD Mass Error

Presenter:

L. S. Bourgeois

Organization/Date:

Flt Ops/Date:9/17/02

- An Abort Region Determinator (ARD) velocity error was observed during STS-111 Ascent.
 - An ARD trend of +23 fps/minute was seen
 - The Flight Dynamics Officer performed a thrust update to the ARD resulting in reduced error
 - Maximum Abort region error was approximately 4 seconds
 - A post launch investigation determined the trend was actually caused by an ARD weight error.
- Source of the problem
 - The ARD failed to account for the ET propellant consumed between SSME start and liftoff
 - Resulted in a 12,000 lb. mass error
 - Primary cause was Trajectory Server selectover made prior to liftoff
 - ARD overwrote the preliftoff SSME propellant mass computations with external data
 - Problem will not occur if selectover is executed after liftoff

STS 111 ARD Mass Error (cont.)

Presenter:

L. S. Bourgeois

Organization/Date:

Flt Ops/Date:9/17/02

- Three workarounds are in place for STS-112
 - Option 1 - Will suspend ARD processing for selectover prior to launch, assuming sufficient time is available
 - Option 2 - Input of Liftoff Push Button Indicator (PBI) will be delayed
 - Assuming insufficient time before launch to exercise option 1
 - This avoids data overwrite problem
 - Option 3 - Bias of ET propellant weight via manual input post liftoff
- TRS software code correction will be released for STS-113
- TRS Testing Assessment
 - Team of TRS and Project Management experts formed to assess testing requirements resulting in additional test scenarios

STS-112/9A
Certification of Flight Readiness

Presenter:
L. S. Bourgeois
Organization/Date:
Flt Ops/Date:9/17/02


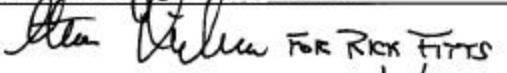
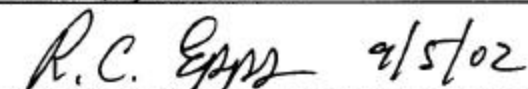
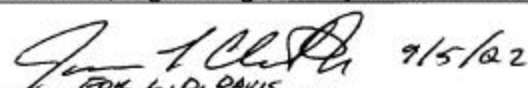
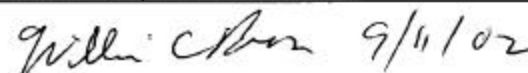
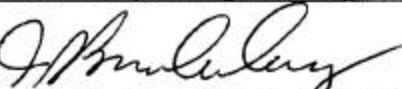
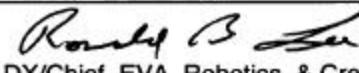

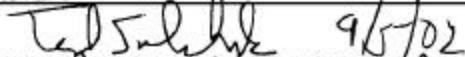

- The USA Flight Operations FRR, NASA MOD FRR, and USA SFOC Pre-FRR have been completed
- All Contractor Accountable Functions (CAF) have been completed, or are scheduled for completion, in accordance with NASA requirements and the applicable portions of the Space Flight Operations contract Flight Preparation 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 112/9A MISSION**














L. S. Bourgeois
Director, Mission Operations

MISSION OPERATIONS DIRECTORATE
SHUTTLE CERTIFICATE OF FLIGHT READINESS (CoFR)
FLIGHT: STS-112/9A 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 |  9/5/02 DAG/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 |  FOR RCR FITS 9/5/02 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 |  9/5/02 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 |  9/5/02 DO/Chief, Operations Division |
| EX/AI from Prior Reviews; No Constraints; Level II Actions; Mission Requirements; FPPP Requirements Met; Contractor Process Insight |  9/11/02 DT/Chief, Space Flight Training Division |
| FPPP Requirements Met; 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; Level II Actions; Mission Requirements; Engineering Drawings; CMD Proc; EVA Hardware Integration; Contractor Process Insight |  FOR De/10550 DX/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 |  9/5/02 Network Director, Shuttle, GSFC |
| |  Mission Operations Director |

MISSION OPERATIONS DIRECTORATE
ISS CERTIFICATE OF FLIGHT READINESS (CoFR)
STS-112/9A REQUIREMENTS

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 |  DAB/Chief, Flight Director Office 9/5/02 |
| 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 |  DF/Chief, Systems Division for B.Fitts 9/5/02 |
| EX/AI from Prior Reviews; No Constraints; Program Actions; Mission Requirements; Contractor Process Insight |  DC/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 |  DM/Chief, Flight Design and Dynamics Division 9/5/02 |
| 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 |  DO/Chief, Operations Division 9/5/02 |
| EX/AI from Prior Reviews; No Constraints; Program Actions; Mission Requirements; Contractor Process Insight |  DT/Chief, Space Flight Training Division 9/11/02 |
| 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. |  ADV/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 |  DX/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 |  Network Director, SSP-ISSP, GSFC 9/5/02 |
| |  Mission Operations Director |

STS-112/9A 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-112/9A.

A handwritten signature in black ink, appearing to read "Robert E. Castle". The signature is written in a cursive style and is positioned above a horizontal line.

Robert E. Castle
MISSION OPERATIONS DIRECTOR

Backup

STS-112/9A LAUNCH WINDOW AS OF 8/30/02

