

MISSION OPERATIONS DIRECTORATE FLIGHT DIRECTOR OFFICE



STS-107 MISSION OPERATIONS

FLIGHT READINESS REVIEW

January 9, 2003

DA8/P.L. Engelauf
DA8/K.B. Beck

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 | To Be Presented |
| • Special Topics | No Issues |
| • Open Work | No Issues |
| • Network | To Be Presented |
| • USA Flight Operations | To Be Presented |
| • Readiness Statements | Included |



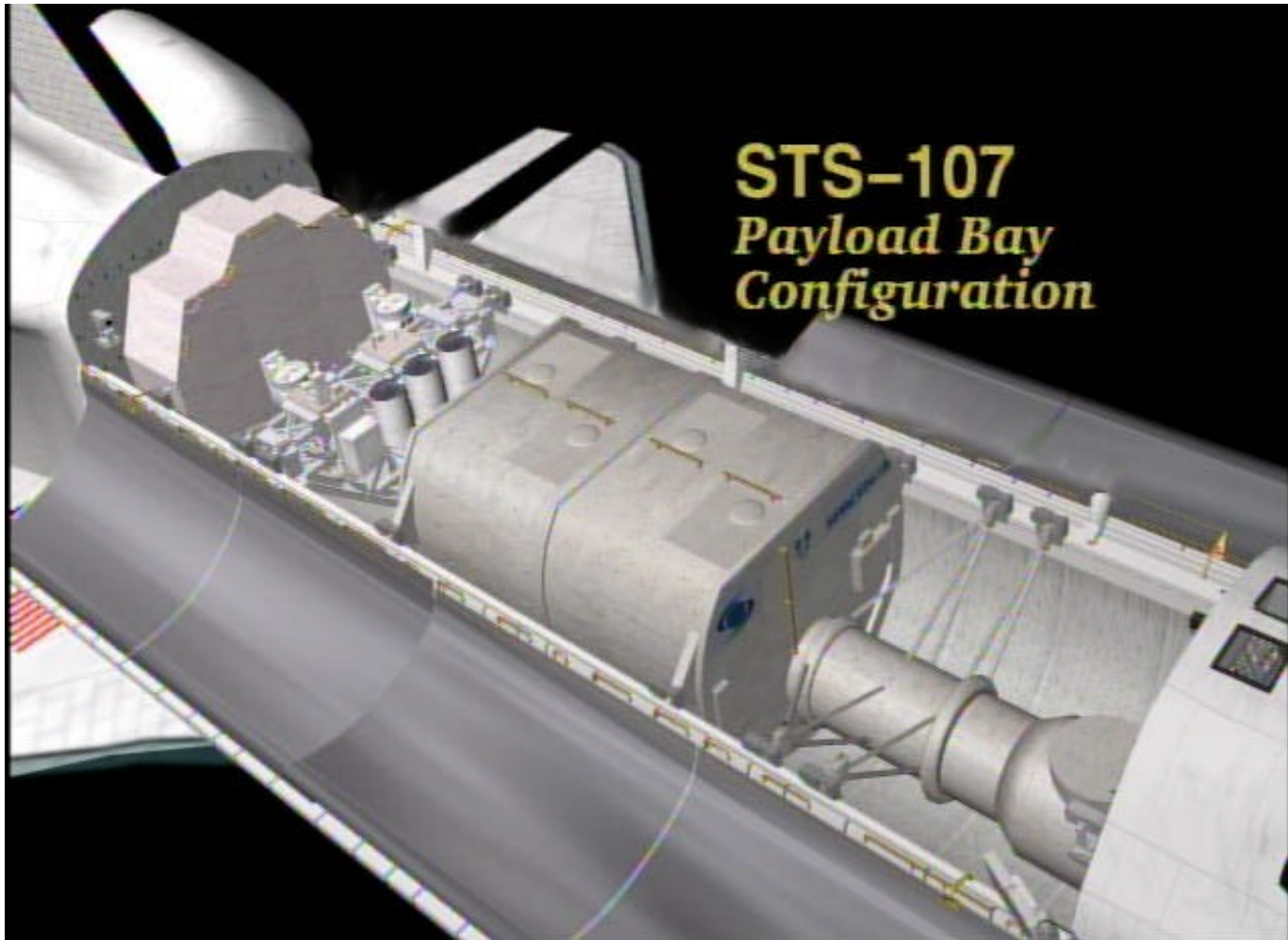
MISSION OPERATIONS DIRECTORATE
Flight Director Office
NASA Johnson Space Center, Houston, Texas

Mission Summary

STS-107 Shuttle Overview

- OV-102 – Columbia
- Crew (dual shift 24 hour onboard operations)
 - Red Team
 - CDR Rick Husband MS2 Kalpana Chawla
 - MS4 Laurel Clark PS1 Ilan Ramon
 - Blue Team
 - PLT Willie McCool MS1 Dave Brown
 - MS3/PL CDR Mike Anderson
- 39° Inclination, Launch Date 1/16/03
 - Launch Window Open 15:39 GMT, 10:39 EST
 - Launch Window Close 18:09 GMT, 13:09 EST (2 ½ hour crew on backs)
- Mission Duration 16+2
- Orbiter Software OI-29
- Landing 2/1/03, 13:49 GMT, 8:49 EST (15/22:10 MET)
- Lighting Launch, RTLS, EOM, TAL (early in window) – Light
TAL (late in window) – Dark

STS-107 Cargo Overview



STS-107 FRR/MOD

STS-107 Mission Priorities

- SPACEHAB
 - Commercial Payloads (10)
 - ESA/NASA Sponsored Payloads (4)
 - NASA/ISS Sponsored Payloads (1)
 - NASA/Code U Sponsored Payloads (13)
- FREESTAR (6)
 - MEIDEX, SOLCON, SOLSE, CVX, LPT, SEM
- RAMBO (no in-flight requirements)
- DTO 700-14 MAGR GPS
- DSOs (no in-flight requirements)

Note: SIMPLEX deletion from Flight Rules
Annex Priorities via Pen & Ink

STS-107 Mission Overview

- FD1 – Launch, post-insertion
 - Blue Team sleep at 4hrs MET
 - Red Team SHAB Activation and Setups, ARMS
- Blue FD2 – SHAB Setup completion
- FD2 through FD15 – Science
 - FD7, 13 off-duty
- FD16 – Exp. deact, cabin stow, FCS C/O, RCS Hot Fire
- FD17 – SH Teardown and Entry Prep, Deorbit/landing

STS-107 New or Unique Operations

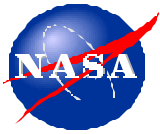
- Unique Multi-discipline international research mission
 - Highly integrated timeline with dual shift operations
 - Simo execute and replan
 - Interactive SPACEHAB POCC
 - ~250 attitude maneuvers to satisfy FREESTAR and SPACEHAB rooftop payloads
 - ~300 Science critical periods driven by command, data, and video requirements
- 1st flight of SPACEHAB Research Double Module
 - New/enhanced systems capability to support science activities
 - Significant use of Ku-band system for return and *forward* link
 - Experiment commanding – 1st time use of this link
 - Data
 - Video
 - Condensate collection requires Orbiter CWC dumps
 - Rooftop payloads – attitude and pointing constraints

STS-107 New or Unique Operations (cont)

- 1st use of Digital TV for Payload Science Objectives
 - Used to record and downlink MEIDEX Xybion radiometric camera
 - DTV ground equipment on loan to Goddard to obtain MEIDEX digital video in real-time
- TDRS Scheduling and Conflict Resolution
 - ~300 critical periods for science critical cmd/data/video, ~70% of the mission falls in the “Critical” category for network scheduling priorities
 - Agreement with Network to attempt to resolve TDRS conflicts internally at JSC before requesting time from other network users

Flight Rules: TAL Rain Shower Update

- Availability of new Spanish radar data makes it possible to consider similar rain shower exceptions for TAL as allowed for RTLS
 - Previous Spanish radar data was only at a single altitude and not sufficient to implement rain shower exception rule
 - New source of radar data can be used but at a lower frequency and potentially less reliability than the CONUS radar data used for RTLS
 - Sufficient confidence to implement rule for STS-107 with caveats since experience base is not yet fully developed.
- A flight rule will be added to the STS-107 Flight Rules Annex to allow TAL exceptions if the new source of radar data is available
 - Rain showers acceptable if coverage is small, movement is consistent and no additional convective development forecast, light intensity and no lightning potential along the approach corridor
 - Must still meet ceiling/visibility and landing/rollout criteria
 - If launch day conditions results in insufficient confidence in ensuring the rain shower exception criteria are met, this portion of the rule will not be exercised.



STS-107 SPACEHAB/FREESTAR


Flight Readiness Review

Networks


Agenda

- Other Network Supported Launches
- Significant Changes
- Unique Network Support

Ted Sobchak
Network Director
GSFC/Code 450
January 2003




SPACEHAB
FAST REACTION EXPERIMENTS ENABLING SCIENCE, TECHNOLOGY, APPLICATIONS AND RESEARCH



Science Mission

- Spacehab
 - Research Double Module (RDM)
- FREESTAR Hitch Hiker
 - GSFC Communications And Navigations Demonstrations On Shuttle (CANDOS)





STS-107 SPACEHAB/FREESTAR



Other Network Supported Launches

- **The following launches are currently planned during the STS-107 mission time frame. Network loading will be heavy.**
 - **DELTA II ICESAT/CHIPSAT launch scheduled for 1/11/03.**
 - **WR launch using P3 aircraft and SN.**
 - **TITAN IV/B-35 launch scheduled for 1/21/03 (Window DOY 021/2125Z to 022/0135Z)**
 - **ER launch using SN.**
 - **PEGASUS/SORCE launch scheduled for NET 1/25/03**
 - **SN supports SORCE spacecraft.**
 - **SEALAUNCH/SL-10 scheduled for NET 2/01/03 (STS landing day)**
 - **SN launch support from Pacific Ocean.**



STS-107 SPACEHAB/FREESTAR



Significant Changes

- **Space Network**
 - Delivery of firmware upgrade to the WSC Modulator/Doppler Predictor (MDP) and Test Modem (TM) to support TDRSS experiment configurations. Non-Shuttle.
 - The Boeing TDRS-9 (I) and TDRS-10 (J) are not available for operational support.
 - On Dec. 8 the Super Typhoon Pongsona impacted Guam with maximum sustained winds of ~150 Mph. Commercial power and Navy provided auxiliary power were impacted. Station was red for TDRS-ZOE support until Dec. 18. Station is operational.
- **MIL & PDL**
 - Software delivery to close 13 open discrepancies on several subsystems.
- **NISN**
 - The carrier's analog modems that support the Statistical Mux (Stat Mux) interface have been replaced with digital modems at the operational sites. Stat Mux supports Shuttle Ch-3 high rate data.
 - Stat Mux reinstalled at GSFC in mid-October to support new requirement for 48 Mbps DTV data for FREESTAR/MEIDEX payload.



STS-107 SPACEHAB/FREESTAR



Unique Network Support for FREESTAR

- **The FREESTAR payload includes an experiment that has an independent communication link supported by the Network.**
 - **CANDOS (Communications and Navigation Demonstration on Shuttle) is a communication technology and GPS navigation experiment.**
- **The CANDOS is a separate communication system and will interface directly with the Space Network (Multiple Access and Single Access services) and the Dryden, MIL, and Wallops ground stations.**
- **CANDOS-unique equipment has been installed and tested at each station.**
 - **WSC, DFRC, MIL, WPS**



STS-107 SPACEHAB/FREESTAR



Unique Space Network Scheduling

- **STS-107 has a highly integrated payload timeline that depends on comm coverage.**
- **Hundreds of independent, overlapping science critical periods for network coverage**
 - **There are ~ 300 critical periods covering ~ 70% of the mission.**
- **A unique SN scheduling process has been developed specifically for STS-107 that addresses Shuttle requirements while balancing the requirements and spacecraft safety for the other SN customers.**
- **During the forecast period, the TDRS-047 (TDS) SA2 will be blocked for only STS use.**
 - **Provides for maximum availability to Shuttle since the loading on other SN nodes (West and ZOE) causes conflicts that are harder to resolve.**
- **During the active schedule, any Shuttle conflicts that exist for services on TDRS-171 or TDRS-W that can be provided by ISS will be negotiated internally at JSC.**
- **Only the Launch & Landing critical periods will include additional staffing/engineering support.**



Space Communications and Data Systems



Certificate of Readiness

Pending completion of flight readiness preparations, remaining standard work and closure of all action items, NASA dedicated elements and all CSOC resources are ready to support the STS-107 SPACEHAB/FREESTAR Microgravity Research Mission

P. E. Liebrecht 1/3/03
P. E. Liebrecht Date
Associate Director, Program Manager for Mission Services
Goddard Space Flight Center

G. Morse 1/3/03
G. Morse Date
Manager, Space Operations Services
Johnson Space Center

(Original signed by)
K. Reightler Date
CSOC Program Manager

Presenter:

S. Q. Hartwig

Organization/Date:

Flt Ops / 1/9/03

STS-107
Flight Readiness Review
January 9, 2003

USA Flight Operations

AGENDA

Presenter:

S. Q. Hartwig

Organization/Date:

Flt Ops / 1/9/03

- Flight Operations Accountabilities
 - Flight Design & Dynamics Readiness No Issues
 - Space Flight Systems Readiness No Issues
 - Space Flight Operations Readiness No Issues
 - Space Flight Training Readiness No Issues
 - Facility Readiness No Issues
 - MCC
 - SPF
 - IPS
 - SMS
- Flight Operations COFR Statement To Be Presented

STS-107
Certification of Flight Readiness

Presenter:
S. Q. Hartwig
Organization/Date:
Flt Ops / 1/9/03

- 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.
- The 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-107 MISSION**

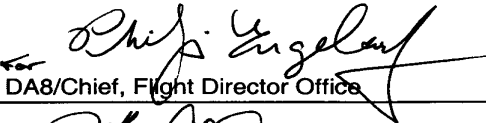
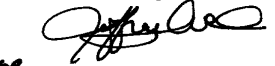
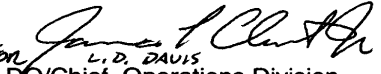





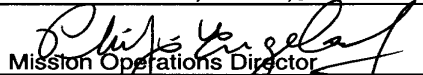


S. Q. Hartwig
Flight Operations

Summary

- STS-107 is a unique flight with highly integrated payload requirements
- Preflight planned timeline satisfies all minimum mission objectives
- The STS-107 Mission Operations team is ready for flight

MISSION OPERATIONS DIRECTORATE
SHUTTLE CERTIFICATE OF FLIGHT READINESS (CoFR)
FLIGHT: STS-107 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	<i>for</i>  DA8/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	<i>for</i>  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	R.C. Epp 12/18/02 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	<i>for</i>  12/18/02 L.D. DAVIS DO/Chief, Operations Division
EX/AI from Prior Reviews; No Constraints; Level II Actions; Mission Requirements; FPPP Requirements Met; Contractor Process Insight	 <i>for</i> DT/Chief, Space Flight Training Division
FPPP Requirements Met; Contractor Process Insight	 <i>for</i> 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	<i>for</i>  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	 <i>for</i> 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	 12/18/02 Network Director, Shuttle, NSFC
	 Mission Operations Director

STS-107 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-107

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

Phil Engelauf
MISSION OPERATIONS DIRECTOR

Backup Charts

- Propulsive Consumables Summary
 - OMS/ARCS load (margin) 17,500/4970 lbm (*150 lbm)
 - *deletion of SIMPLEX burn will increase margin by ~400 lbs
 - FRCS load (margin) 2175 lbm (440 lbm)
 - ~250 attitude maneuvers to support payload requirements
- Non-Propulsive Consumables Summary
 - Cryo H2 (9 tanks) Margin / Padhold
61 lbm / 95 hrs
 - Cryo O2 (9 tanks with 350 lb offload) 260 lbm / 136 hrs
 - N2 (5 tanks offloaded to equivalent of 4) 45 lbm
- LiOH Consumables Summary
 - 66 cans (covers EOM +3)

Flight Readiness – Flight Design

Presenter:

S. Q. Hartwig

Organization/Date:

Flt Ops / 1/9/03

Flight Design Accountabilities	Significant Changes	Readiness Issues	To Be Presented
Ascent Trajectory Design and Production	No	No	No
ILOADS (Nominal / Aborts)	No	No	No
Day of Launch ILOAD Update Process (DOLILU)	No	No	No
Orbit Design and Production	No	No	No
Launch Window	No	No	No
Trajectory Sequence of Events	No	No	No
Rendezvous and Proximity Operations (N/A for STS-107)	No	No	No
Clearance Analyses (N/A for STS-107)	No	No	No
Entry and Descent Trajectory Design and Production	No	No	No
ILOADS	No	No	No
Entry, RTLS, TAEM, Landing / Roll-Out Analysis	No	No	No
Commit to Flight Process	No	No	No

There are no readiness issues associated with the listed Flight Operations accountabilities

Facility Readiness – Space Flight Systems

Presenter:
S. Q. Hartwig
Organization/Date:
Flt Ops / 1/9/03

Space Flight Systems Accountabilities	Significant Changes	Readiness Issues	To Be Presented
Propulsive Consumables Analysis and Production	No	No	No
Non-Propulsive Consumables Analysis and Production	No	No	No
Mass Properties / CG Analysis and Products	No	No	No
Photo TV	No	No	No
IFM	No	No	No
Crew Systems Training (Crew Habitability & Crew Escape)	No	No	No
Robotics Analysis	No	No	No

There are no readiness issues associated with the listed Flight Operations accountabilities

Flight Readiness – Space Flight Operations

Presenter:

S. Q. Hartwig

Organization/Date:

Flt Ops / 1/9/03

Space Flight Operations Accountabilities	Significant Changes	Readiness Issues	To Be Presented
Flight Data File	No	No	No
Flight Activity Timeline Analysis / Development	No	No	No
Cargo Operations Analysis and Products	No	No	No
Orbiter Communications Adapter (OCA)	No	No	No

There are no readiness issues associated with the listed Flight Operations accountabilities

Flight Readiness – Space Flight Training

Presenter:
S. Q. Hartwig
Organization/Date:
Flt Ops / 1/9/03

Space Flight Training Accountabilities	Significant Changes	Readiness Issues	To Be Presented
Crew Training Plan	No	No	No
Crew Flight Training	No	No	No
Simulations Completed	No	No	No
Simulations Remaining	No	No	No
Robotics Training	No	No	No
Payload Training	No	No	No
PGSC / Network Training	No	No	No

There are no readiness issues associated with the listed Flight Operations accountabilities

Facility Readiness

Presenter:
 S. Q. Hartwig
 Organization/Date:
 Flt Ops / 1/9/03

Facility Accountabilities	Significant Changes	Readiness Issues	To Be Presented	MCC	SPF	IPS	SMS
Critical Processors and Applications	No	No	No				
Non-Critical Processors and Applications	No	No	No				
Recon / Platform Version	No	No	No				
Significant SR's (Changes)	No	No	No				
Significant AR's (Issues)	No	No	No				
Standard Open Work	No	No	No				
Non-Standard Open Work	No	No	No				
Operator Training and Certification Status	No	No	No				
Real-Time Call Up Readiness	No	No	No				

There are no readiness issues associated with the listed Flight Operations accountabilities