



STS-114 Flight Operations and Integration Space Shuttle Program Flight Readiness Review June 29, 2005

MO/Robert Galvez



Agenda

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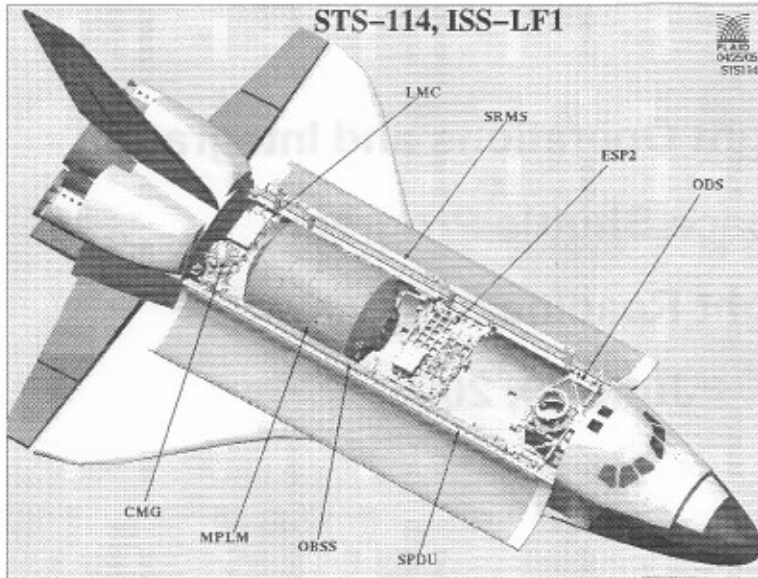
- Payload Bay Arrangement
- Flight Overview
- Requirements/Documentation Status/Open Work
 - Cargo Integration Structures – Special Topic
 - CIPA/Ethanol Production Issue – Information Item
- Backup Charts
 - Launch Window
 - Digital Launch Window
 - DTO Detailed Description
 - Stowage Plan for No CIPAA's
 - Summary of Open Work





Payload Bay Arrangement for Flight

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PAYLOAD BAY PAYLOADS:	
ODS	Orbiter Docking System
ESP-2	External Stowage Platform-2
MPLM-ULF1	Multi-Purpose Logistics Module-Utilization and Logistics Flight 1
LMC	Lightweight Multipurpose Experiment Support Structure (MPESS) Carrier
OBSS	Orbiter Boom Sensor System Starboard Sill
SRMS	Shuttle Remote Manipulator Port Sill



Flight Overview

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ACTIVITY FLT DATE	STS-114 07-13-05
CONFIGURATION	
-ORB (FLT NO)	OV-103(31)
-ET	ET-121
-SRBS	BI-125
-RSRM	RSRM-92
-SSME SETTING	104.5/104.5%
-POSITION 1	2057 ^(a)
-POSITION 2	2054 ^(a)
-POSITION 3	2056 ^(a)
-SOFTWARE REL	OI-30
-CRYO TANK SETS	5
-GN2 TANKS	6
-MISC RQMTS	RMS, ODS, OBSS

P/L MANIFEST -PAYLOAD BAY	ISS LF-1 (MPLM,ESP2, LMC)
-MID-DECK	ISS LF-1, RAMBO ^(b)
OPERATIONS	
-PAD/MLP	B/3
-INCLINATION	51.6 DEG
-INSERTION ALT	122 NM
-MECO TGT	DIR INSERTION
-TAL SITE	ZARAGOZA
-FLT DURATION	12 + 0 DAYS
-EVAs	3 + 0
-CREW SIZE	7
-LANDING SITE	KSC
INSTRUMENTATION	
REMARKS	(a) BLOCK II CLUSTER (b) PAYLOAD OF OPPORTUNITY. DEDICATED BURN NOT REQUIRED





Requirements/Documentation	Presenter	MO3/Robert Galvez	
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- There are no open or pending STS-114 CR's for the following Program documents:
 - Logistics Flight 1 (LF1) MIP (NSTS 21497)
 - Multi Purpose Logistics Module (MPLM) PIP (NSTS 21449)
 - Lightweight MPES Carrier (LMC) CIP Addendum for STS-114 (NSTS 21494)
 - Ram Burn Observation (RAMBO) PIP (NSTS 21508)
 - Flight Requirements Document



Flight Preparation Process	Presenter	MO3/Robert Galvez	
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- All the Cargo Integration flight preparation activities have been completed except for planned open work – no issues identified
- Completed tasks include:
 - Release of Cargo Reconfiguration Engineering
 - Mission specific Cargo verification analyses
 - Documentation of cargo requirements
 - Reconfiguration / installation of Payload Integration hardware
 - Payload bay clearance assessment
 - KSC - ROEU to PDA Mate
- Significant Standard Open Work
 - PAD CHIT Measurements
 - P/L End-To-End Test
 - Validate the positive-static clearance based on CHIT J5821 measurement data
 - Documentation Changes to On-Orbit ICD ISS-LF1 (ICD-A-21497-OOR)
- Special Topic
 - CMG Beryllium Material





Requirements/Documentation

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SPECIAL TOPIC

Cargo Integration Structures Open Work

Open Work

- Beryllium material in the CMG was identified late ECD: 07/01/05
 - NSTS 14046 has specific requirements for Be
 - No documentation of Be review by SWG
 - Structures Verification Plan will be provided for SWG approval



Requirements/Documentation

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INFORMATION

CIPA/Ethanol Production Issue

Issue: Part B of STA 54 separates to A1100, moisture from the cabin atmosphere gets into the bag and creates a bi-product of ethanol

Open Work

- No Shuttle or Station crew or system impact, except for the Russian water processor consumables
 - Complete negotiations with the Russians on maximum contingency ethanol levels that might appear in the condensate processed by the Russian water recovery system
 - ECD: 07/01/05





**STS-114 Flight Readiness
 Review Readiness Statement**

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This Readiness Statement Certifies That The Flight Operations and Integration Requirements For the Flight Readiness Review Have Been Met, And Pending Completion of Identified Open Work or Documentation, NASA Flight Operations and Integration Is Ready To Support Flight.

Original signed by:

H. NEAL HAMMOND
 ASSOCIATE PROGRAM MANAGER
 USA PROGRAM INTEGRATION

Original signed by:

THERESE THRIFT, DEPUTY PROGRAM MANAGER
 LOCKHEED CARGO MISSION CONTRACT

Original signed by:

JOHN P. SHANNON
 MANAGER
 SSP FLIGHT OPERATIONS & INTEGRATION



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STS-300 Launch-On-Need (LON) Readiness Summary

MO3/Robert Galvez
STS-114 and STS-300 SSP Flight Manager

Presentation to STS-114 Flight Readiness Review (FRR)
June 29-30, 2005



Agenda

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- STS-300 Program Philosophy
- Cargo/Stowage Engineering
- LON Flight Hardware
- Middeck Configuration
- Flight Design/Flight Products
- Integration Issue
- LON Readiness
- Backup Charts
 - Payload Bay Configuration
 - Flight Preparation post Callup
 - CSCS/LON Timeline



STS-300 Program Philosophy

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- STS-300 has been managed within existing Space Shuttle Program processes from mission baseline at the SSP PRCB and throughout the pre-mission planning period.
 - Program documentation has been developed and managed by the STS-300 Flight IPT. These include:
 - Mission Integration Plan (MIP) including Product Integrated Schedules
 - Flight Requirements Document (FRD)
- Overall mission management philosophy has been to use as much of the STS-121/OV-104 products and schedules as possible and only deviate as required.
 - STS-300 MIP Product Schedules adjusted to coincide with STS-121 milestones.
 - STS-121 Orbiter configuration at time of OPF rollover determines the configuration for STS-300.
 - Essentially, have an empty payload bay with Latch mechanisms required for STS-121 cargo elements.
 - Includes OBSS/Sensor Package configuration



STS-300 Program Philosophy (Cont'd)

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- STS-121/OV-104 Orbiter processing schedules and milestones (e.g., OPF rollover) determine ability to support LON within CSCS capability.
 - KSC requires ~23 days from OPF rollout to launch.
 - ~5 days in the VAB and 18 days at the PAD in preparation for flight
 - PAD work does not include TCDT or Payload operations.
 - Does require/include safing Payload attachment H/W (PRLAs, cable stowage, etc.) and final configuration for flight such as CCTV camera and OBSS sensor package installation.
 - » Work done concurrently with other PAD activities.
- STS-114 launch delay beyond July 20 will cause corresponding delay of STS-300 .



Cargo/Stowage Engineering

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- After callup, STS-300 payload cargo engineering plan is to EOTF (Engineering Order To Follow) the STS-121 products, as required, to show the STS-300 configuration for launch
 - Some reconfiguration drawings will require updates to reflect STS-300 flight configuration.
 - 10 day total time required to update drawings to support a rescue mission reconfiguration.
- Crew Compartment Configuration Drawings (CCCD) are complete
 - Reflect additional H/W to support return of 11 crewmembers.
 - Plan to fly same stowage configuration as STS-121 within stowage capability, minimizing CCCD changes.
 - Includes all EVA tools required for TPS repair (CIPAA, EWA, RCC and Tile Overlay H/W)



LON Flight Hardware

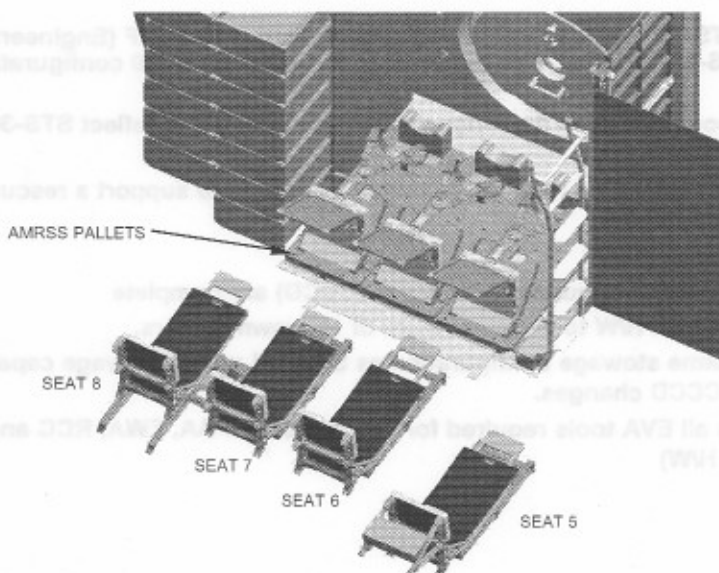
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- The LON flight hardware is built and consists of the following:
 - Recumbent seats capability located in the aft middeck (ditch area) – 3 seats
 - Handholds (2) located on the starboard wall of the ditch area
 - Individual Cooling Units (ICU) (3) mounting provisions
 - Seat 5 modification to properly secure in a recumbent position
 - Sky genie mounting provisions for four (4) additional sky genies
 - Escape Pole mounting provisions for three (3) additional lanyards
- Installation Engineering is released
- Hardware Certification (QSA) complete planned for 7/7/05
- Transfer Hardware to USA planned for 7/8/05
- H/W was successfully fit checked on OV-104 on April 9, 2005.
- JSC, Building 9 Trainer hardware in place for Crew Equipment Interface Test/Training available for STS-301 and subs.



Middeck Configuration

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ORIENTATION VIEW OF AMRSS IN MIDDECK



Flight Design / Flight Products	Presenter MO3/Robert Galvez	
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- STS-300 flight specific Flight Design I-Load patch has been delivered
 - Used to assess ascent profile/constraints due to empty cargo bay.
 - Completed all LON scheduled flight S/W pre-callup and some post-callup (S/W Processing Facility (SPF)/SAIL Testing) activities
- Mission Control Center and Simulator Training loads for STS-300 LON are released
 - Training performed using LON load to characterize ascent profile/constraints.
- Preliminary Crew Procedures in place.
- Completion of flight products to be performed post callup within the 23-26 day constraints for orbiter processing.
 - Attached schedules show high level generic timeline for completion of products.
 - Schedule will be revised depending on LON callup and CSCS capability



Integration Open Work	Presenter MO3/Robert Galvez	
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- OBSS Loads Analysis for STS-300 Payload Bay Configuration
 - MDA has not completed OBSS stress analysis without the Keel Yoke Assembly (KYA) configuration
 - Analysis initially performed with KYA installed.
 - OPF installation no longer possible due to clearance constraints with OBSS.
 - Boeing analysis shows positive margin
 - OBSS NASA loads personnel feel H/W will be safe to fly
 - Analysis completion not expected until after STS-114 launch due to higher priority task in support of STS-114.



STS-300 LON Readiness	Presenter MO3/Robert Galvez	
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- Preparations for STS-300 are proceeding as planned.
 - All required H/W to support a returning crew complement of 11 are complete and available.
 - Schedules and processes in place to respond to LON callup.
 - Engineering changes required to reconfigure the orbiter from STS-121 to STS-300 are well defined.
 - LON implementation can be performed within the time constraints required to prepare the orbiter for flight and within ISS CSCS capability.

- Only open work pending is the resolution of the OBSS stress analysis with the empty orbiter payload bay.

		Integration Open Work
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- OBSS Load Analysis for STS-300 Payload Bay Configuration
- MOA has not completed OBSS stress analysis without the Key Yoke Assembly (KYA) configuration
- Analysis initially performed with KYA installed
- KYA installation no longer possible due to clearance constraints with OBSS
- Boeing analysis shows positive margin
- OBSS NASA loads personnel feel HW will be safe to fly
- Analysis completion not expected until after STS-114 launch due to higher priority task in support of STS-114



STS-114 (LF1) ISS Contingency Shuttle Crew Support (CSCS) Capability

Flight Readiness Review

June 29-30, 2005

Steve Huning/OC
Dave Williams/EC6

Oxygen Status

- Elektron is having problems (primary device for supplying oxygen to ISS)
 - Liquid Unit #5
 - Unable to maintain pressure in the pressurized part of the Elektron – unit is considered FAILED
 - Liquid Unit #6
 - Unit indicated high cell stack current – unit is considered FAILED
 - Liquid Unit #7
 - Potassium Hydroxide (KOH) contamination found in the Hydrogen (H2) vent line
 - Liquid Unit #7 is suspected cause of contamination – unit recovery is being attempted
- Recovery Plan for Liquid Unit #7:
 - Russians launched hardware and aerosol filters on 15P to route Elektron H2 vent to the BMP (Russian trace contaminant control subsystem) overboard vent since Elektron vent was blocked by KOH
 - Russians launched additional KOH and aerosol filters on 18P
 - The additional aerosol filters were installed to protect the BMP vent from KOH contamination
 - Russians were able to transfer some KOH from Liquid Unit #5 to #7
 - Unit #7 did also exhibit a small nitrogen leak. But, at the last operation, it was acceptable.
 - More troubleshooting in work by RSC-E

Oxygen Status (Cont'd)

- **Progress**
 - 18P was modified to carry 110 kg (242 lbm) of oxygen (O2)
 - As of 27 June – 101 kg (223 lbm) of O2 left
- **TGK/SFOG:**
 - As of 27-June
 - 40 old design candles. Using the older candles first
 - 15 of 66 candles attempted have failed which is a 22.7% failure rate
 - Russians predicted a 20% failure rate
 - 72 new design candles onboard
 - New design is yellow tagged. Hazard Report and CIL needs to be updated to remove the yellow tag.

CDRA Status

- Carbon Dioxide Removal Assembly (CDRA) has operated successfully in at least single bed mode and sometimes in dual bed mode (except for the two stage pump failure and the two Air Selector Valve (ASV) failures which were corrected)
- Most of the CDRA failures to date are due to a poor desiccant/adsorbent material containment design
 - Air sock filters have been installed to protect the two stage pump, the blower/precooler, and 5 of the 6 CDRA ASVs
 - Four spare ASVs are on-orbit to protect CDRA operation
 - Have removed the CDRA material from the CDRA bed check valves by running in single bed mode
 - Have a draft plan on how to remove a check valve and have the crew clean it on-orbit
- Launching on LF1 the following CDRA spares to support Contingency Shuttle Crew Support (CSCS):
 - Blower/Precooler Orbital Replacement Unit (ORU)
 - Heater Controller
 - Pump/Motor Controller
 - Two Stage Pump ORU
- CDRA precooler has a similar corrosion/design issue as the Extravehicular Activity (EVA) Service and Performance Checkout Unit (SPCU) Heat Exchanger
 - Plan is in place to replace the precooler with the spare launched on LF1 prior to predicted end of life
- The CDRA Blower Shutdown on GMT 111 (April '05)
 - The Command and Data Handling (C&DH) team has traced the last failure to a check sum failure due to a timing issue between the Multiplexer/Demultiplexer (MDM) and the CDRA Controllers as commands are issued by the LA3 MDM on the local 1553 bus
 - Timing issue can be cleared by rebooting the LA3 MDM

CSCS Duration Capability General Assumptions

- July 13 LF1 launch date
- ISS actual consumables on 6/3 were utilized as starting point for this report
- 19 Progress assumed unavailable during CSCS duration
- Shuttle will remain docked to ISS for 17 days and will provide:
 - Water and waste management for its 7 crew
 - Oxygen for all 9 crew
 - ISS and Shuttle (expired US LiOH on ISS) will provide CO2 removal during this time
- All needed Orbiter consumables (water, food, etc) will be transferred, as well as all hardware launched in the MPLM
- EVAs
 - One nominal EVA from Orbiter A/L
 - One tile repair EVA from ISS A/L [Shuttle undocked for 48 hours, with 3 crew on-board]
 - One inspection EVA from ISS A/L [Orbiter remains docked to ISS]
- Total CSCS crew is nine (two female, seven male). No crew will return in the Soyuz.
- ISS resources are run to zero

LF1 CSCS Summary report (as of 6/3/05)

O2 generation is most limiting consumable resulting in 56 days capability

Dual bed CDRA fail is most limiting failure case resulting in 30 days CO2 removal capability

CSCS TPS Duration Report as of 6/3/05		
L-1 Month Report for LF-1, 9 Crew on ISS		
- Assumes STS launch date of: 7/13/2005 - Based on current projected ISS consumables and system health - Assumes CSCS TPS duration begins at STS dock - LOH Rescue Flight Must Dock to ISS by: 9-09-2005		
ISS Failure @ MECCO	Engineering Estimate	No ISS Failures
30 Days (CO2 Removal)	56 Days (O2 Generation)	71 Days (Waste Mgmt)
O2 Generation		
Total ISS O2 at dock: 314.12 kg Progress O2 tanks: 64.8 kg 80% Old SFOG: 36 cartridges New SFOG: 72 cartridges A/L tanks: 165.56 kg Electrics: FAILED since 3/05 STS O2 Xfer: 0 kg EVA O2 Used (ISS): 14.05 kg Total Days: 39+17(STS) = 56 Days	Total ISS O2 at dock: 314.12 kg Progress O2 tanks: 64.8 kg 80% Old SFOG: 36 cartridges New SFOG: 72 cartridges A/L tanks: 165.56 kg Electrics: FAILED since 3/05 STS O2 Xfer: 0 kg EVA O2 Used (ISS): 14.05 kg Total Days: 39+17(STS) = 56 Days	Total ISS O2 at dock: 357.75 kg Progress O2 tanks: 100.42 kg 80% Old SFOG: 30 cartridges New SFOG: 72 cartridges A/L tanks: 165.56 kg Electrics: ON-3 crew STS O2 Xfer: 0 kg EVA O2 Used (ISS): 14.05 kg Total Days: 68+17(STS) = 85 Days
CO2 REMOVAL		
STS LiOH: 42 cans ISS Good LiOH: 0 cans ISS Expired LiOH: 30 cans RS LiOH: 18 cans Vozdukh: ON-3 crew CDRA: FAILED Total Days: 30 Days	STS LiOH: 42 cans ISS Good LiOH: 0 cans ISS Expired LiOH: 30 cans RS LiOH: 18 cans Vozdukh: ON-3 crew CDRA: Single Bed (5 crew) Total Days: 102 Days	STS LiOH: 42 cans ISS Good LiOH: 0 cans ISS Expired LiOH: 30 cans RS LiOH: 18 cans Vozdukh: ON-3 crew CDRA: Dual Bed (8 crew) Total Days: Unlimited Days
Water		
ISS H2O: 654 L STS H2O Xfer: 1032 L Leaky CWCs: 8 CWCs CFL: ON SRV: ON Total Days: 51+17(STS) = 68 Days	ISS H2O: 654 L STS H2O Xfer: 1032 L Leaky CWCs: 0 CWCs CFL: OFF SRV: ON Total Days: 66+17(STS) = 83 Days	ISS H2O: 654 L STS H2O Xfer: 1032 L Leaky CWCs: 0 CWCs CFL: ON SRV: ON Total Days: 64+17(STS) = 81 Days
Waste Management		
Solid Waste ASU: 35.1 Days Back-Up Hardware: 19.5 Days Total Days: 54.6 + 17 (STS) = 71.6 Days	Liquid Waste ASU: 53.5 Days Back-Up Hardware: 2.3 Days Total Days: 55.8 + 17 (STS) = 72.8 Days	
Food		
Total Rations: 475 rations Caloric Intake: 2400 kcal/day Total Days: 50 Days	Total Rations: 479 rations Caloric Intake: 2050 kcal/day Total Days: 46 Days	Total Rations: 479 rations Caloric Intake: 2000 kcal/day Total Days: 108 Days

LF1 CSCS Scenario Overview

Durations from STS-114 dock:

- ISS CSCS capability 56 days (O₂ limited)
- Shuttle LON 29 days (27 days to launch + 2 days to dock)

