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SPACE SHUTTLE PROGRAM
Space Shuttle Flight Operations and Integration Office
NASA Johnson Space Center, Houston, Texas



STS-121 Flight Operations and Integration
Space Shuttle Program
Flight Readiness Review
June 16, 2006

MO3/Ladonna Miller



<h1>Agenda</h1>	Presenter	MO3/Ladonna Miller	
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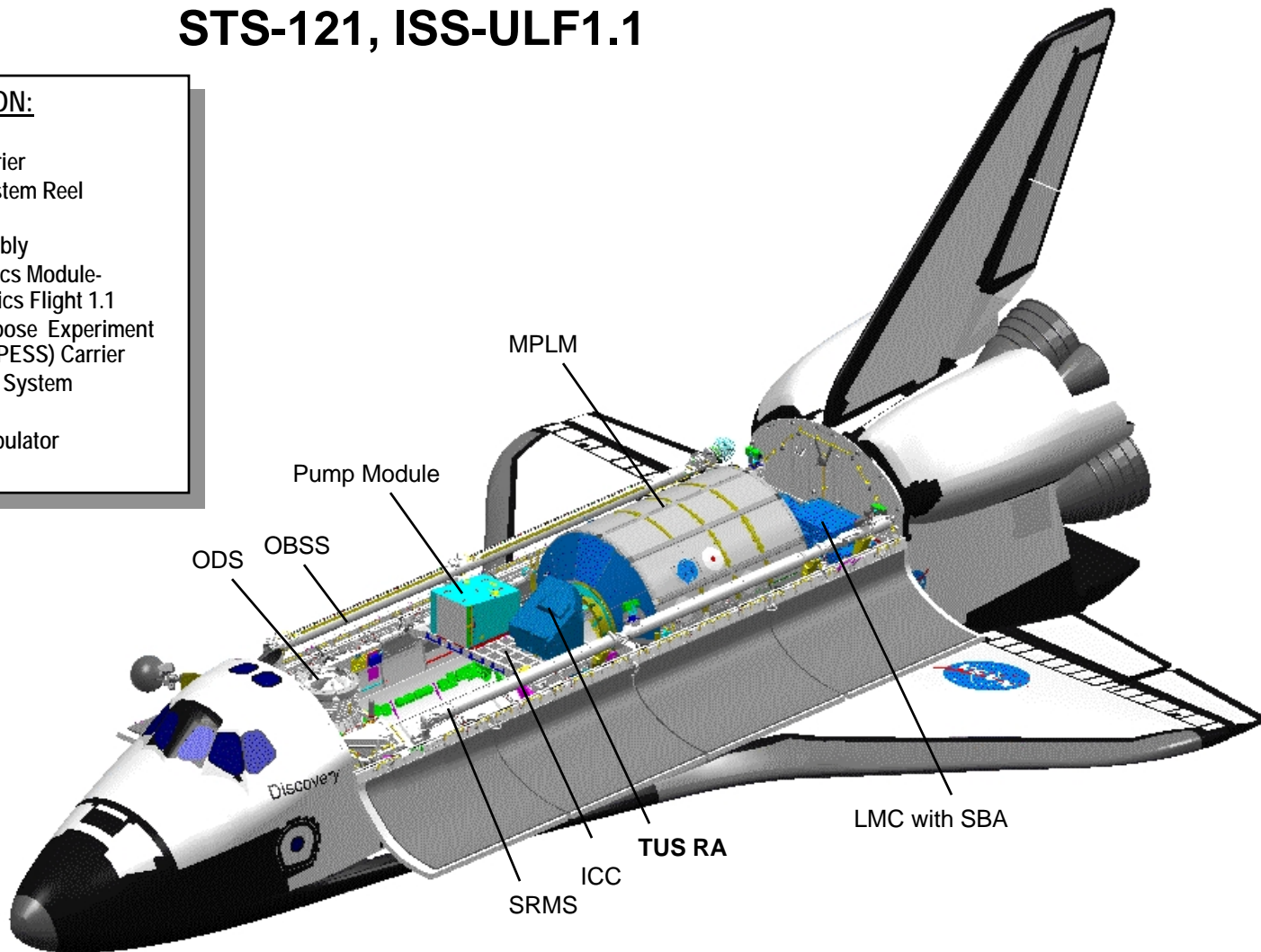


<h1>Payload Bay Arrangement for Flight</h1>		Presenter	MO3/Ladonna Miller
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STS-121, ISS-ULF1.1

PAYLOAD BAY CONFIGURATION:

ODS	Orbiter Docking
ICC	Integrated Cargo Carrier
TUS RA	Trailing Umbilical System Reel Assembly
SBA	Sample Board Assembly
MPLM-ULF1.1	Multi-Purpose Logistics Module-Utilization and Logistics Flight 1.1
LMC	Lightweight Multipurpose Experiment Support Structure (MPESS) Carrier
OBSS	Orbiter Boom Sensor System Starboard Sill
SRMS	Shuttle Remote Manipulator Port Sill





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Flight Overview		Presenter	MO3/Ladonna Miller
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ACTIVITY	STS-121
FLT DATE	07-1-06
CONFIGURATION	
-ORB (FLT NO)	OV-103(32)
-ET	ET-119
-SRB	BI-126
-RSRM	RSRM-93
-SSME	
-POSITION 1	2045
-POSITION 2	2051
-POSITION 3	2056
-SOFTWARE REL	OI-30
-CRYO TANK SETS	5
-GN2 TANKS	6
-MISC RQMTS	RMS, ODS, OBSS

P/L MANIFEST	ISS ULF-1.1 (MPLM, LMC, ICC)
-PAYLOAD BAY	
-MID-DECK	ISS ULF-1.1, RAMBO (b), MAUI (b)
OPERATIONS	
-PAD/MLP	B/1
-INCLINATION	51.6 DEG
-INSERTION ALT	122 NM
-MECO TGT	DIR INSERTION
-TAL SITE	ZARAGOZA
-FLT DURATION	12 + (1) DAYS
-EVAs	2 + 1
-CREW SIZE	7 UP/6 DOWN (a)
-LANDING SITE	KSC
REMARKS	(a) CREW AUGMENTATION (b) PAYLOAD OF OPPORTUNITY. DEDICATED BURN NOT REQUIRED.



Requirements/Documentation

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- **There are no open or pending STS-121 CR's for the following Program documents:**
 - **Multi Purpose Logistics Module (MPLM) Payload Integration Plan (PIP) (NSTS 21499)**
 - **Flight Requirements Document (NSTS 17462-121)**
 - **Utilization Logistics Flight (ULF) 1.1 Mission Integration Plan (NSTS 21520)**
 - **Integrated Cargo Carrier (ICC) CIP Addendum for STS-121 (NSTS 21448)**
 - **Lightweight MPESS Carrier (LMC) CIP Addendum for STS-121 (NSTS 21494)**
 - **RMS Sideview Camera (RSC) Integration Plan (NSTS 21418)**
 - **DTO 848 Orbiter TPS Repair Techniques Integration Plan (NSTS 21517)**
 - **Ram Burn Observation (RAMBO) PIP (NSTS 21508)**
 - **MAUI PIP (NSTS 21530)**



<h2>Flight Integration</h2>	Presenter	MO3/Ladonna Miller	
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- **Launch window summary**
7/1 to 7/19 with requirements for daylight launch and ET umbilical well camera photography, crew handheld photography is highly desired
- **Late Inspection added for MMOD risk mitigation**
- **Middeck loaded full volumetrically**
 - **Late TPS hardware delivery (6/28/06) and middeck installation at L-2 days (6/29/06)**
 - **Tile Repair Ablator Dispenser (TRAD) (1 MLE)**
 - **Dual C CCD engineering released to protect for no TRAD hardware delivery**
- **8 DTO's and 8 DSO's manifested**
 - DTO 849 OBSS/SRMS Loads Characterization with EVA Crewmember (EVA1)**
 - DTO 852 SRMS On-Orbit Loads, Heavy Payloads (EVA1)**
 - DTO 848 Orbiter Thermal Protection System (TPS) Repair Techniques (EVA 3)**
 - DTO 851 EVA Infrared (IR)Camera (EVA 3)**



Flight Preparation Process

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- **All of the Cargo Integration flight preparation activities have been completed except for planned open work and one significant item; TUS RA (to be discussed by ISS/Scott West)**
- **Completed tasks include:**
 - **Release of Cargo Reconfiguration Engineering**
 - **Mission specific Cargo verification analyses, cleared for all items other than specific TUS RA cases**
 - **Documentation of cargo requirements**
 - **Reconfiguration / installation of Payload Integration hardware**
 - **Payload bay clearance assessment**
- **Non-Standard Open Work:**
 - **Completion of TUS RA Structural Verification, ECD 6/19/06**
 - **Associated Core ICD exception for sink rate and factor of safety (PIRN A05234), ECD 6/20/06**



LON Summary	Presenter	MO3/Ladonna Miller	
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- **STS-115 and STS-300 (LON) have the same flow up to and including OV-104 Roll Out to the Pad (presentation by Mike Leinbach will provide Pad flow)**
 - **ET is critical path and is driving launch date**
 - **Orbiter/ET mate 7/28, Rollout to Pad 8/4**
 - **LON launch 8/21 with no contingency**

- **Current LON launch projection (NET 8/21/06) is within the ISSP provided Contingency Shuttle Crew Support (CSCS) capability.**
 - **As of 5/22/06, CSCS capability is 81 days (presentation by ISSP/Steve Huning will provide CSCS duration capability)**

Margin of time between CSCS and LON is approximately 30 days

Launch no later than September 20 to perform rescue capability



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STS-121 Flight Readiness Review Readiness Statement	Presenter	MO3/Ladonna Miller	
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This Readiness Statement Certifies That The Flight Operations and Integration Requirements For the Flight Readiness Review Have Been Met Pending Completion of TUS RA Structural Verification and the associated ICD exception (A05234), and Identified Standard Open Work or Documentation. NASA Flight Operations and Integration Is Ready To Support Flight.

Original signed by:

WILLIAM D. REEVES
ASSOCIATE PROGRAM MANAGER
USA PROGRAM INTEGRATION

Original signed by:

THERESE THRIFT, DEPUTY PROGRAM MANAGER
LOCKHEED CARGO MISSION CONTRACT

Original signed by:

RANDALL W. ADAMS
MANAGER
SSP FLIGHT OPERATIONS & INTEGRATION



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CoFR Exception	Presenter MO3/Ladonna Miller	
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CoFR EXCEPTION FORM			
EXCEPTION NUMBER:	ELEMENT: Flight Ops. & Integration SERIAL NUMBER:	STS FLT NUMBER:	121
REQUIREMENT/DESCRIPTION OF EXCEPTION: Reference: NSTS 08117, Paragraph 8.5.13.1, code d (Flight specific compatibility analysis), and Paragraph 8.5.13.1, code i (PIRN approval), and Paragraph 8.5.13.1 code j (Approval of deviations to payload unique ICDs). Exception: Flight rationale documentation for TUS-RA component on ICC Cargo Element to ICD-A-21520-SS6, Paragraph 4.1.1.3.2.2.2 and Paragraph 4.1.1.3.4 has not been completed.			
INITIATOR/TITLE: K. Bollweg NASA/JSC/MO2 Manager, FO&I Cargo Integration Office		DATE: 6/14/06	
CONCURRENCE/TITLE: R. Adams NASA/JSC/MO Manager, FO&I		DATE: 6/14/06	
ACTION/ACTIONEE: J. Sills NASA/JSC/MO2 Technical Discipline Manager, FO&I Structures		DUE DATE: L-2 Day Review 6/29/06	
REVIEW BOARD CHAIR:		DATE:	
RESOLUTION OF EXCEPTION:			DATE RESOLVED:
CONTRACTOR MANAGER:	DATE:	NASA PROJECT MANAGER:	DATE:
SPACE SHUTTLE PROGRAM			DATE:



Flight Operations and Integration

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Backup Charts



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LON Summary	Presenter	MO3/Ladonna Miller	
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- **STS-300 has been managed within existing Space Shuttle Program processes from mission baseline at the SSP PRCB.**
 - **Utilized existing documentation developed for the STS-300 LON mission for STS-114.**
 - **Requirements and Orbiter configuration have not changed. STS-115 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-115 cargo element (truss module).**
 - **Includes OBSS/Sensor Package configuration**
- **STS-300, if flown, will be crewed by 4 STS-115 crewmembers**
- **Crew Compartment Configuration Drawings (CCCD) are complete**
 - **Reflect additional H/W to support return of 11 crewmembers.**
- **The LON Flight Hardware has been built, engineering released and delivered to USA.**
 - **Hardware was successfully fit checked on OV-104 on April 9, 2005.**
- **STS-300 flight specific Flight Design I-Load patch has been delivered.**
- **Mission Control Center and Simulator Training loads for STS-300 are released.**
- **Preliminary Crew Procedures are in place.**



Development Test Objectives (DTO's)

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New DTO's or New Objectives

DTO 702 MADS PCMU to SSR Telemetry

MADS interim data capture modification allows recording, storage and downlink of MADS PCM data during a mission, launch and descent

DTO 848 Orbiter Thermal Protection System (TPS) Repair Techniques

Characterize porosity/void size/distribution of NOAX-D and evaluate working life/workability for RCC crack repair, if energy dependent day achieved, EVA3

DTO 849 OBSS/SRMS Loads Characterization with EVA Crewmember

Characterize the loads and boom motion/deflection that are caused by 1 and 2 EV crewmembers located at the end of the OBSS/SRMS, EVA1

DTO 851 EVA Infrared (IR) Camera

Measure the surface temperature profile of WLE RCC in on-orbit solar heating and compare on-orbit imagery to ground imagery of known RCC damage, EVA3

DTO 852 SRMS On-Orbit Loads, Heavy Payloads

Measure bending, torsion and axial forces at each SRMS joint to provide insight into the internal loads of the SRMS, EVA1



Development Test Objectives (DTO's)

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Reflown DTO's

- DTO 805** **Crosswind Landing Performance (DTO of Opportunity)**
- Demonstrate the capability to perform a manually controlled landing in the presence of a crosswind component of 10 to 15 knots steady state.
- DTO 850** **Water Spray Boiler Cooling with Water/PGME Antifreeze**
- Demonstrate if a mixture of 53% water and 47% propylene glycol monomethyl ether will freeze after the auxiliary power units are shut down. For STS-121, only WSB number 3 tank will be filled with the mixture.
- SDTO 1200-U** **Shuttle Booster Fan Bypass**
- Optimize cryogenic oxygen savings by operating the booster fan differently with the context of the flight rules and expenditure of other resources (crew time, LiOH, etc). On-orbit operations will demonstrate that intervehicle air circulation and specifically PPCO₂ levels can be maintained by using the U.S. Lab IMV fan to draw air from the Shuttle to the ISS without the assistance of the Shuttle Booster fan (airlock fan).



Detailed Supplementary Objectives (DSO's)	Presenter MO3/Ladonna Miller
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DSO's

- DSO 490B Bioavailability and Performance Effects of Promethazine During Space Flight (Protocol B)**

- DSO 493 Monitoring Latent Virus Reactivation and Shedding in Astronauts**

- DSO 498 Space Flight and Immune Function (Pre/Post Flight Only)**

- DSO 499 Eye Movements and Motion Perception Induced by Off-Vertical Axis Rotation (OVAR) at Small Angles of Tilt After Spaceflight (Pre/Post Flight Only)**

- DSO 500 Space Flight-Induced Reactivation of Latent Epstein-Barr Virus (Pre/Post Flight Only)**

- DSO 634 Sleep-Wake Actigraphy and Light Exposure During Space Flight**

- DSO 635 Spatial Reorientation Following Spaceflight (Pre/Post Flight Only)**

- DSO 637 Chromosomal Aberrations in Blood Lymphocytes of Astronauts (Pre/Post Flight Only)**



<h1>Summary of Open Work</h1>		Presenter	MO3/Ladonna Miller
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Open Work	Standard Open Work	Estimated Completion Date	Actionee
<u><i>Flight Management & Integration</i></u>			
Payload ICDs - Approval of PIRN A05234, TUS-RA Violation of Abort Landing Loads for Non-Returnable Payloads	No	06/20/06	M. Iqbal (Boeing)
Flight Rules - Assessment of late FR/FDF CRs	Yes	06/30/06	M. Gerlach (USA) L. Reichert (Boeing)
<u><i>KSC Cargo Processing</i></u>			
- Payload bay walkdown at Pad	Yes	06/14/06	C. Davignon (Boeing)
- Mission unique PCE configuration photos	Yes	06/14/06	C. Davignon (Boeing)
- WAD technical reviews (S08121 Dev & S0007.400 Ascent checklist review)	Yes	06/14/06	C. Davignon (Boeing)
- Closed WAD technical reviews	Yes	06/14/06	C. Davignon (Boeing))
<u><i>Payload / Cargo Loads, Dynamics & Stress</i></u>			
- On-orbit loads (L-1 month) report addendum for flight rule update	Yes	06/14/06	P. Lee (Boeing)
- TUS-RA forward work			
- SSP/USA TUS-RA review of analyses	No	06/19/06	E. Bruno
- TUS-RA assessment	No	06/19/06	E. Bruno
- TUS-RA action item closure	No	06/20/06	E. Bruno
<u><i>Payload / Cargo Safety</i></u>			
- Verification Tracking Log items	Yes	06/15/06	R. Cook (Boeing)



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Acronym List	Presenter	MO3/Ladonna Miller	
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- **EMCS- European Modular Cultivation System**
- **FGB – Fixed Grapple Bar**
- **FIT - Fungal Pathogenesis, Tumorigenesis, and Effects of Host Immunity in Space Infections, Immunity, Tumors**
- **HRF – Renal Stone - Human Research facility (HRF) Potassium Citrate Placebo Kit**
- **INCO – Integrated Communications Officer**
- **IR – Infrared**
- **MADS- Modular Auxiliary Data System**
- **MAUI – Maui Analysis of Upper-Atmospheric Injections**
- **MMU – Mass Memory Unit**
- **NOAX - Non-Oxide Adhesive Experimental**
- **PAD – Portable Foot Restraint (PFR) Attachment Device**
- **PCMU – Pulse Code Modulation Unit**
- **PFRAM – Passive Flight Releasable Attachment Mechanism**
- **PGME – Propylene Glycol Monomethyl Ether**
- **PM – Pump Module**
- **POEMS - Passive Observatories for Experimental Microbial Systems**
- **RAMBO – Ram Burn Observation**
- **SSR – Solid State Recorder**
- **TROPI - Phototropism**
- **TUS RA – Trailing Umbilical System Reel Assembly**