



Space Life Sciences Directorate

STS-114 Space Shuttle Program Flight Readiness Review (FRR)

June 28-29, 2005



SPACE LIFE SCIENCES DIRECTORATE

STS-114 Flight Readiness Review

ORGANIZATION SA

PRESENTER

SA/J. R. Davis

DATE

June 28-29, 2005

SPACE SHUTTLE STATUS

Crew Health

- Crew members are in good health and have been certified for flight
- Medical Operations is ready to support STS-114 operations

Crew Radiation Exposure

- Crew radiation exposure for Shuttle crew projected to be within acceptable limits

Water & Air Quality Assessments

- OPF Post-Service Water Sample is within specifications.
- MPLM Air Quality is projected to be well within limits for crew respiration upon module entry.

Life Sciences Human Research - Detailed Supplemental Objectives (DSOs)

- Pre-, Post-, and In-Flight activities are planned and scheduled.



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SPACE SHUTTLE STATUS - *(continued)*

Nominal Forward Work of Note

- L-15 and L-3 day water samples and analysis are planned.
- L-1 day Shuttle Air Sample
- L-1 day Shuttle Microbial Surface Sampling

Special Discussion Topics

- None



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ISS STATUS

ISS Crew Radiation Exposure

Crew radiation exposure for Increment 11 is projected to be within acceptable limits

Water and Air Quality Assessments

- All required samples (per 9S Exceptions) returned.
- Preliminary analysis of all water samples showed that water was of sufficient quality for consumption at the time of sample acquisition:
- One slightly elevated nickel result in an SRV-K sample - not confirmed by Russian sample analysis.
 - No impact for continued operations.
- Preliminary analysis of Grab Sample Container (GSC) shows nominal atmospheric profile at the time of sample acquisition.
- Dual Sorbent Tubes (DSTs) have been de-sorbed. Analysis is in work
 - Analysis delayed due to MPLM sample analysis. ECD 07/08/05

Exceptions

- Air, E10SSORR-003, and Water, E10SSORR-004, are opened and will remain open contingent upon joint US/Russian post-flight analysis.



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EVA STATUS

STS-114 EVA Assessment

- STS-114 EVA Certificate of Flight Readiness (CoFR2) and LF1 Certificate of EVA Readiness (CoER1) were completed on 4/12/05
- STS-114 EVA Delta-CoFR2 and LF1 Delta-CoER1 were completed on 6/21/05
- Continued participation in Cure In-Place Ablator Applicator (CIPAA) contingency tile-repair assessment
- No constraints for planned STS-114 EVA activities

LF1 Stage - Increment 11 EVA Assessment

- Medical and Radiation Assessments to be performed in advance of applicable XA CoER.



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Process Changes

The Engineering Directorate and Space Life Sciences Directorate conduct a joint EA/SA Flight Readiness Assessment (FRA) prior to each flight to provide a comprehensive review of the directorate's systems that support medical operations and/or impact crew health.

SLSD Facilities and Laboratories

SLSD facilities and laboratories are ready to support launch, flight, on-orbit operations, and post-flight activities.



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Risks

ISSP Risks Top Program Risks (TPR):

TPR 4706, ISS Re-plan Environmental Health System - Water Quality Monitoring (Watch Item)

Status: Revised Total Organic Carbon Analyzer-2 (TOCA-2) required prior to Regenerative Life Support System

TPR 4707, ISS Re-plan Environmental Health System - Air Quality Monitoring

Status: The diagnostic In-flight Maintenance (IFM) executed 4/4/05 was successful and confirmed the suspected Volatile Organic Analyzer (VOA) hardware faults. VOA Repair parts were delivered on 18P. IFM not currently in the timeline. SA is working with OA for crew time to be made available to effect the repairs prior to STS-114/LF-1 launch.

SSP Risks:

None



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Contingency Shuttle Crew Support (CSCS) - STS-300

SLSD is prepared to support CSCS and the launch of STS-300 45 days after CSCS declaration.

Dissenting Opinions - None

SLSD Flight Activities Control Board (FACB) members along with the SLSD Discipline Technical Warrant Holders were polled to ensure each team member agreed with the SLSD CoFR statement. All team members unanimously concurred with the conclusions and proposed recommendations. There were no dissenting opinions. This agreement is reflected on the endorsed SLSD CoFR certificates herein.



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Certification of Flight Readiness Statement

SLSD is ready to proceed with STS 114 Launch and Stage LF1. The applicable SSP and ISS CoFR endorsements, associated waivers, deviations, and two (2) exceptions noted herein have been assessed and no constraints to launch or readiness of flight STS-114 have been identified. SLSD will continue to assess the decision for continued Increment 11 operations.

Concurrence by: _____

A handwritten signature in cursive script, appearing to read "J.R. Davis", written over a horizontal line.

SA/J.R. Davis, M.D. Director, Space Life Sciences Directorate/
Warrant Holder: independent Health and Medical Authority (IHMA)



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Back - Up Material



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Discipline Technical Warrant Holder (DTWH) Certificate of Flight Readiness Statement

The analysis, training, and operational products required to support STS-114/LF1 Launch, Increment 11 activities, and STS-114 Undocking/Landing activities have been reviewed by Space Life Sciences Directorate (SLSD). The applicable ISSP CoFR endorsements, associated waivers, deviations and two exceptions noted herein have been assessed. SLSD is ready to proceed with STS-114/LF1 Launch/Stage, Increment 11 activities, and STS-114 Undocking/Landing. SLSD will continue to assess the decision for continued Increment 11 operations.

The SLSD FACB unanimously agreed to proceed with STS-114/LF1 Launch/Stage, STS-114 Undocking/Landing, and Increment 11. There were no dissenting opinions.

The SLSD FACB did not unanimously agree to proceed with STS-114/LF1 Launch/Stage, STS-114 Undocking/Landing, and Increment 11. There are dissenting opinions on the readiness to launch/continue operations. The concerns are:

 6/8/05

J. M. Duncan
DTWH, Crew Health Management



W. Langdoc
DTWH, Habitability

 06/02/05

F. Carpenter
DTWH, Behavioral Health & Performance

 6/8/05

N. Packham
DTWH, Spacecraft & Habitat Environment Management

Concurrence via teleconference, 6/14/05

 6/8/2005

M. Van Baalen
DTWH, Radiation

C. Sawin
DTWH, Microgravity Countermeasures



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Note: The SLSD FACB unanimously agreed to proceed with STS-114/LF1 Launch, Increment 11 activities, and STS-114 Undocking/Landing activities. There were no dissenting opinions.

M. Duncan, SD/Chief
Space Medicine & Health Care Systems Office

W. Langdoc, SF/Chief
Habitability & Environmental Factors Office

C. Lundquist, SK/Chief
Human Adaptation & Countermeasures Office

C. Stencil, SA3/Associate. Director
Bioastronautics, Operations
Chairman/SLSD FACB

C. Stegemoeller, SA2/ Associate Director
Bioastronautics, Exploration Research & Technology



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Shuttle Crew Radiation Exposure

Shuttle Crew radiation exposure is projected to be within acceptable limits:

Nominal IVA Mission Total Exposure: 212.7 mrad (435.1 mrem)

Daily Average IVA Exposure: 18.0 mrad (36.9 mrem)

EVA 1 Additional Exposure (e-) 4.0 mrad (4.9 mrem)

EVA 2 Additional Exposure (e-) 3.7 mrad (4.3 mrem)

EVA 3 Additional Exposure (e-) 3.4 mrad (3.4 mrem)

ISS Crew Radiation Exposure

Crew radiation exposure for Increment 11 is projected to be within acceptable limits:

- Nominal Mission Projections (180 days): 2610 mrad - 3510 mrad
- Daily Average Exposure: 14.5 - 19.5 mrad/day



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SOMS Kit - Resuscitator

- SOMS Kits in Shuttle Middeck locker
- Resuscitator - de-manifested
- Ambu bag valve mask flown in place of resuscitator.
- Crew trained, cue card created and procedure validated. Cue card to be placed with Ambu in Medical Accessory Kit and located in the cue card section of the Medical Checklist.



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The following SLSD Detailed Supplemental Objectives (DSO's) have been manifested for STS-114:

In-Flight

DSO 490B - Bioavailability and Performance Effects of Promethazine During Space Flight, Protocol B

DSO 493 - Monitoring Latent Virus Reactivation and Shedding in Astronauts

DSO 499 - Eye Movements and Motion Perception Induced by Off-Vertical Axis Rotation (OVAR)

DSO 634 - Sleep-Wake Actigraphy and Light Exposure During Spaceflight

Pre/Post-Flight

DSO 206 - Effect of Space Flight on Bone, Muscle and Immune Function

DSO 498 - Space Flight and Immune Function

DSO 500 - Space Flight-Induced Reactivation of Latent Epstein-Barr Virus

DSO 504 - Microgravity Induce Changes in the Control of Muscles

DSO 637 - Chromosomal Aberrations in Blood Lymphocytes of Astronauts



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SDTO 12004-U Shuttle Booster Fan Bypass

Description:

The Booster Fan is located in the tunnel between the Mid-deck and airlock. The SDTO will use a duct to bypass the Booster Fan in providing airflow between the Orbiter and ISS.

Turning off the Booster Fan will provide Orbiter cryo savings that could be applied toward additional time on orbit or transfer to the ISS High Pressure Gas Tanks.

Risk: Potential elevated CO₂ levels in the Orbiter.

Mitigation:

During normal docked operations, the Booster Fan provides airflow that no shuttle LiOH is required.

The SDTO requires a waiver, has been approved, to allow the use of expired LiOH canisters from the ISS on the Orbiter during crew sleep. Engineering analysis indicates the LiOH cans will still be effective for CO₂ removal.

National Aeronautics and
Space Administration
Lyndon B. Johnson Space Center
2101 NASA Parkway
Houston, Texas 77058-3696



June 24, 2005

Reply to Attn of:

SA-05-069

TO: NASA Headquarters
Attn: Manager, Human Health and Performance Office

FROM: SA/Associate Director, Bioastronautics Office

SUBJECT: Certification of Flight Readiness (CoFR) for Flight STS-114 (LF1)

The Bioastronautics Office at the Johnson Space Center has assessed the flight readiness of the payloads manifested on flight LF1 and operating in that stage. The enclosed complete flight manifest serves to augment the on-orbit Human Research Facility (HRF) with a second facility rack and associated facility hardware, and to support Increment 11 activities continuing during the LF1 stage.

The items manifested for launch in the Multi Purpose Logistics Module (MPLM) include:

HRF Rack 2 and subrack payloads including:

- Pulmonary Function Module/Photoacoustic Analyzer Module (PFM/PAM)
- Gas Delivery System (GDS)
- Space Linear Acceleration Mass Measurement Device (SLAMMD)
- Workstation 2

HRF LF1 Media Kit
Renal Stone Inc. 11 resupply hardware
Sleep Experiment hardware

The following hardware is currently operating on board the International Space Station:

HRF Rack 1
Foot Experiment hardware

The following investigations are continuing operations on Increment 11:

Principal Investigator, Dr. Peggy Whitson, titled, "Renal Stone Risk During Space Flight: Assessment and Countermeasure Validation" (96-OLMSA-01-057)

Principal Investigator, Dr. Duane Pierson, titled, "A Comprehensive Characterization of Microorganisms and Allergens in Spacecraft Environment." (99-HEDS-03/04-049)

Principal Investigator, Dr. Peter Cavanagh, titled, "Foot Reaction Forces During Space Flight." (96-HEDS-04/05-318)

Principal Investigator, Dr. Scott Dulchavsky, titled, "Advanced Diagnostic Ultrasound in Microgravity." (ILSRA-2001-083)

Principal Investigator, Dr. Jack Stuster, titled, "Behavioral Issues Associated with Isolation and Confinement: Review and Analysis of Astronaut Journals." (ILSRA-01-104)

Principal Investigator, Dr. Gunter Obe, titled, "Chromosomal Aberrations in Blood Lymphocytes of Astronauts." (99-HEDS-03/04-010) (pre/post)

Principal Investigator, Dr. Jacob Bloomberg, titled, "Promoting Sensorimotor Response Generalizability: A Countermeasure to Mitigate Locomotor Dysfunction After Long-Duration Space Flight." (98-HEDS-02/03-120) (pre/post)

Principal Investigator, Dr. Robert Fitts, titled, "Effect of Prolonged Spaceflight on Human Skeletal Muscle." (96-HEDS-04/05-400) (pre/post)

Principal Investigator, Dr. Alan Barrett, titled, "Space flight-induced Reactivation of Latent Epstein-Barr Virus." (98-HEDS-02/03-129) (pre/post)

The following items are manifested for launch and return in the Shuttle mid-deck to support short duration bioastronautics investigations:*

Promethazine/Sleep Hardware
Latent Virus Kits
Renal Stone pill kits

The following short duration Bioastronautics investigations will be conducted on the LFl flight:*

Principal Investigator, Dr. Lakshmi Putha, titled, "Bioavailability and Performance Effects of Promethazine During Spaceflight, Protocol B" (96-OLMSA-01-389)

Principal Investigator, Dr. Duane Pierson, titled "Incidence of Latent Virus Shedding During Spaceflight" (96-OLMSA-01-409)

Principal Investigator, Dr. Charles Czeisler, titled "Sleep-Wake Actigraphy and Light Exposure during Spaceflight" (98-HEDS-02/03-394)

Principal Investigator, Dr. Duane Pierson, titled, "Flight Induced Changes in Immune Defenses." (96-OLMSA-10-210) (pre/post)

Principal Investigator, Dr. Gilles Clément (ESA/CNES), titled, "Eye Movements and Motion Perception Induced by Off-Vertical Axis Rotation (OVAR) at Small Angles of Tilt after Spaceflight" (96-OLMSA-01-007) (pre/post)

Principal Investigator, Dr. Alan D.T. Barrett, titled, "Spaceflight Induced Reactivation of Latent Epstein-Barr Virus" (98-HEDS-02/03-129) (pre/post)

Principal Investigator, Dr. Carlo J. De Luca, titled, "Microgravity Induced Changes in the Control of Muscles" (99-HEDS-03/04-192) (pre/post)

Principal Investigator, Dr. Günter Obe (ESA/DLR), titled, "Chromosomal Aberrations in Blood Lymphocytes of Astronauts" (99-HEDS-03/04-010) (pre/post)

Principal Investigator, Dr. Hiroshi Ohshima (JAXA), titled, "Effects of Spaceflight on Bone, Muscle and Immune Function" (pre/post)

* Short Duration Bioastronautics Investigations and associated hardware will be endorsed by JSC/Space Life Sciences directly to the Space Shuttle Program for LF1 CoFR.

All payloads planned for the LF1 flight and stage operations, and continuing through the remainder of Increment 11 have been assessed for compliance with functional, performance, and science requirements as well as Reliability, Maintainability, and Quality Assurance as defined in the HRF Program Requirements Document, LS-71000, and the respective Experiment Documents, Hardware Requirements Documents, and Systems Requirements Documents.

The Bioastronautics Office has identified planned open work to the JSC ISS Payloads Office as part of the standard CoFR process. A closure plan for all open work is in place and completion dates have been identified. Additionally current US payload crew time allocations do not support completion of all bioastronautics objectives for Increment 11. Emphasis will be placed on completing high priority science objectives however this could result in the delay of some HRF subrack facility checkouts to a future increment. Neither the planned open work nor the crew time allocation issues are a constraint to launch; therefore, the Bioastronautics Office certifies that the aforementioned payloads meet the Level I requirements and are ready for the intended mission.


Charles M. Stegemoeller

Enclosure

cc:
EB/E. O. Castro
SA2/D. J. Grounds
SA23/C. P. Haven
SA23/S. G. McCollum

SA23/C. C. Maender
OZ/D. W. Hartman
HQ/2P39-A/ G. J. Allen
HQ/2P39-A/A. M. Lee
LMSO/S03/S. Johnston



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Readiness Statement for Each Endorsement

(Compiled from the SLSD STS-114/LF1 SORR CoFR Web Application inputs)

		Endorsement Complete? *Y/N/NA	Remarks
a	The design of the flight articles (hardware/software) has been verified to meet the functional and performance requirements in the design-to specifications and will support ISS buildup to Assembly Complete configuration. Any waivers, deviations and exceptions from the requirements have been approved.	Y	
b	The as-built flight articles (hardware/software) have been built to the applicable specifications and drawings. Any waivers, deviations and exceptions from the requirements have been approved.	Y	
c	All ground processing required for the integration of payload/experiment hardware/software into the ISS launch package has been completed.	Y	
d	Test, checkout, servicing, and ground processing of the LP/CE have been completed, or are planned to be performed.	Y	
e	Limited-life hardware (time, cycle) has been identified and the logistics and maintenance planning has been accomplished that will support the on-orbit operations.	Y	
f	All open items and actions from design, integration, and operations reviews that constrain launch package integration into the launch vehicle have been closed, completed, or planned for completion.	Y	
g	All reported HW/SW problems and non-conformances have been dispositioned and pose no constraint to flight.	Y	
h	The safety review process, mission assurance analysis, and assessments have been completed and identified risks have been accepted. Hazard control verification has been completed.	Y	
i	All risk management activities associated with this launch package have been completed and documented as acceptable.	Y	
j	The manifest supports the flight and on-orbit operations.	N	Unable to verify this endorsement has been met until joint US/Russian post-flight analysis has been completed per joint US/RSC-E protocol agreement. Exception to Air and Water opened for LF1 Stage and Increment 11.
k	Requirements, design, and configuration changes have been dispositioned, and the resulting HW/SW is ready to support the flight and on-orbit operations.	Y	
l	All sites, facilities, personnel, and procedures are ready to support launch, flight, and on-orbit operations.	Y	
m	Flight rules and crew procedures have been defined and approved.	Y	
n	The mission support team and crew have completed training and are ready to support launch, flight, and on-orbit operations.	Y	
o	Final flight software loads have been verified and are acceptable.	Y	
p	All operations requirements necessary for successful on-orbit operations have been defined, and the planning for implementation has been accomplished.	N	Unable to verify this endorsement has been met until joint US/Russian post-flight analysis has been completed per joint US/RSC-E protocol agreement. Exception to Air and Water opened for LF1 Stage and Increment 11.
q	Launch Commit Criteria (LCC) have been defined and approved.	Y	
r	Pending planned operations, the on-orbit ISS is ready to accept the Launch Package/Cargo Element (LP/CE) and the orbital transport vehicle.	NA	
s	The induced environment during proximity operations, berthing, docking, mated operations, and departure has been reviewed and is acceptable.	NA	
	*Y = Action has been completed for the flight/stage/increment		
	N = Action has not been completed for the flight/stage/increment		
	NA = Endorsement does not apply to this organization or there are no actions required for this flight/stage/increment		



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Compiled from the SLSD STS-114/LF1 SORR CoFR Web Application inputs and NSTS 08117, Appendix O.

SLSD CoFR Sub-Endorsements for Space Shuttle Program	NSTS 08117 Appendix O Applicable Sections	Completed? Y/N/NA	Remarks
1 Preflight Activities	4.1.3, 4.1.5, 4.8	N	L-10 day crew physicals are planned and scheduled.
2 Flight Crew Equipment (FCE)	4.1.3	Y	
3 Flight Rules	4.1.2, 4.4.5	Y	
4 Crew Procedures	4.4.6	Y	
5 Crew Training	4.4.6	Y	
6 Radiation Exposure Assessment	4.4.2, 4.4.4	Y	
7 Water Quality Assessment	4.1.8	N	Planned forward work. Current sample bags limit ability to collect in-flight galley water samples; new sample bag/adaptor are in work. L-15 day and L-3 day water samples and analysis are planned.
8 Air Quality Assessment	4.1.7	N	Planned forward work. L-1 day Shuttle Air sample is planned.
9 Microbiology Assessment	4.1.9	N	L-1 day Shuttle Microbial Surface Sample is planned.
10 Toxicological Assessment	4.1.6	Y	
11 Human Factors	4.9	Y	
12 Food Systems & Nutrition	4.1.11	Y	
13 Biomedical DSO/DTO	4.2, 4.2.1, 4.2.2	Y	
14 Micrometeoroid Orbital Debris (MMOD)	4.6, 4.6.1 – 4.6.4		KA Responsibility
15 Image Analysis	4.7, 4.7.1, 4.7.2		KA Responsibility
16 Earth Observations	4.5, 4.5.1 - 4.5.4		KA Responsibility
17 SLSD Personnel Readiness	4.1.10, 4.4.6	Y	
18 Medical Facilities & Laboratories	4.1.10	Y	

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