

Space and Life Sciences Directorate
Flight Readiness Review
STS-113/ISS-11A

C. L. Fischer

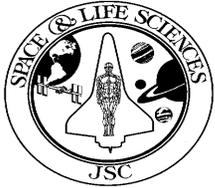
Date: October 31, 2002

STS-113/ISS-11A

Flight Readiness Review

Space and Life Sciences Directorate





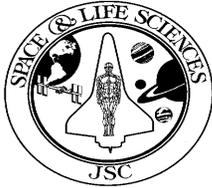
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Space and Life Sciences Mission Activities

- **Crew Health**
- **Open Items and In-flight Anomalies (IFAs)**
- **Radiation and Dosimetry Support**
 - **STS-113 Radiation Prediction**
 - **Increment 6 Radiation Prediction**
- **Increment 5/6 Status**
- **Readiness Statement**



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Crew Health

- **All Crew Physicals will be completed prior to flight**
 - **Applicable flight rules are in place**

STS-113 Crew Surgeon

STS-113 Deputy Crew Surgeon

Russian Surgeon

Increment 5 Crew Surgeon

Increment 6 Crew Surgeon

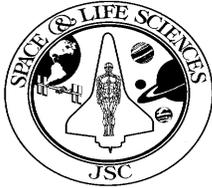
Phil Stepaniak, M.D.

Richard McCluskey, M.D.

Alexander Vasin, M.D.

Jeff Jones, M.D.

Mike Duncan, M.D.



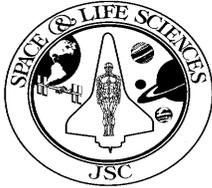
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STS-113 Open Items and In-flight Anomalies (IFAs)

- **All remaining open work is planned and scheduled**
 - **Open items for STS-113**
 - **Crew Physicals**
 - **L-3 day Space Weather Analysis**
- **Exercise Countermeasures are in place**
- **Shuttle Water Quality: L-15 day sample met specifications, however, at 55 hours, mold and bacteria were observed**
 - **Another sample, was obtained on 10/28 (results pending)**
- **Space Radiation: STS-113 Flight Specific Prediction:**
 - **Within Acceptable Limits**
- **No open SSP, IFAs or constraints**



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Increment 5/6 Status

SLSD Issues/Concerns for 11A ISS Stage Increment from SORR

- **Some limitations exist for countermeasures hardware**
 - **Crew exercise requirements for Increment 6 will be met**
- **Toxicology: Cardiolog batteries are a potential leak hazard**
- **Acoustic Levels in the Service Module (SM) exceed specifications**
 - **A mission-by-mission waiver process is in place**
 - **Plans and procedures for reducing acoustic noise are in place**
- **Acoustic Levels in FGB and Docking Compartment have been accepted**
 - **Rationale: limited stay times**
- **Radiation: Predicted radiation exposures are within acceptable limits**



Certification of Flight Readiness Statement

The activities required to support Flight 11A/STS-113 have been accomplished except open work identified (Attachment 1). Space and Life Sciences Directorate (SLSD) is ready to support Flight 11A/STS-113.

There are no constraints to proceeding with the planned Flight 11A/STS-113 pending completion of scheduled open work.

Handwritten signature of L. Fischer in black ink, written over a horizontal line.

for SD/C. L. Fischer, M.D., Chief
Space Medicine and Health
Care System Office

Handwritten signature of A. Langdoc in black ink, written over a horizontal line.

SF/W. A. Langdoc, Chief
Habitability and Environmental
Factors Office

Handwritten signature of M. Anderson in black ink, written over a horizontal line.

SJ/M. Anderson, Chief
Biological Systems Office

Handwritten signature of S. Paloski in black ink, written over a horizontal line.

SK/W. Paloski, Ph.D., Chief
Human Adaptation and
Countermeasures Office

Handwritten signature of J. Byrne in black ink, written over a horizontal line.

SX/G. J. Byrne, Ph.D., Assistant Mgr,
Office of Human Exploration Science

Handwritten signature of J. Robinson in black ink, written over a horizontal line.

for SL/J. Robinson, Ph.D., Chief,
Program Integration Office

Handwritten signature of C. B. Lau in black ink, written over a horizontal line.

SM/C. B. Lau, Chief, Mission and Project
Management Office

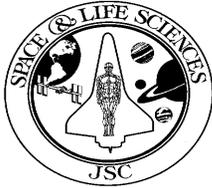
Handwritten signature of M. Stegemoeller in black ink, written over a horizontal line.

SA/C. M. Stegemoeller
Associate Director, Technical

Concurrence:

Handwritten signature of J.R. Davis in black ink, written over a horizontal line.

SA/J.R. Davis, M.D., Director
Space and Life Sciences
Directorate

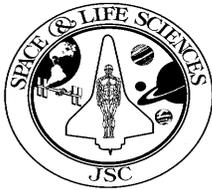


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Backup Charts



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Radiation Analysis and Dosimetry Support Backup Charts

STS-113 Flight Specific Predictions – Within Acceptable Limits

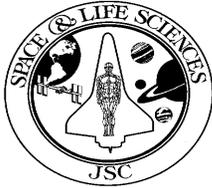
- **Nominal mission (10 d 19 hr 10 m) IV crew exposure projection**
 - **Mission Exposure** 153 mrad (293 mrem)
 - **Daily Average Exposure:** 15.2 mrad/day (29.1 mrem/day)

EVA EXPOSURES (additional skin exposure):

| | <u>1 Hour early</u> | <u>Nominal</u> | <u>1 Hour late</u> |
|----------------------------|---------------------|-----------------|--------------------|
| EVA1 (start MET 002/19:55) | 51 mrad/51 mrem | 64 mrad/64 mrem | 80 mrad/80 mrem |
| EVA2 (start MET 004/18:55) | 36 mrad/37 mrem | 61 mrad/61 mrem | 71 mrad/71 mrem |
| EVA3 (start MET 006/18:55) | 41 mrad/41 mrem | 62 mrad/62 mrem | 80 mrad/80 mrem |

Worst case EVA additional skin exposure:

- **4 hr EVA** 409 mrad/493 mrem
- **6.5 hr EVA** 446 mrad/550 mrem



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Radiation Analysis and Dosimetry Support Backup Charts

STS-113 Flight Specific Information

- **Onboard Radioactivity (experiment name (# sources) – isotope – activity)**
 - **Fire detectors (all flights) -- orbiter (9) -- Am-241 ==> 6.12 μ Ci**
 - **Operational TEPC (1) -- Cm-244 ==> 1.0 μ Ci**

SPACE WEATHER FORECAST

- **Risk of additional exposure from solar particle events and trapped outer electron belt enhancements. Space Radiation Analysis Group will provide an updated forecast at L-7 days**

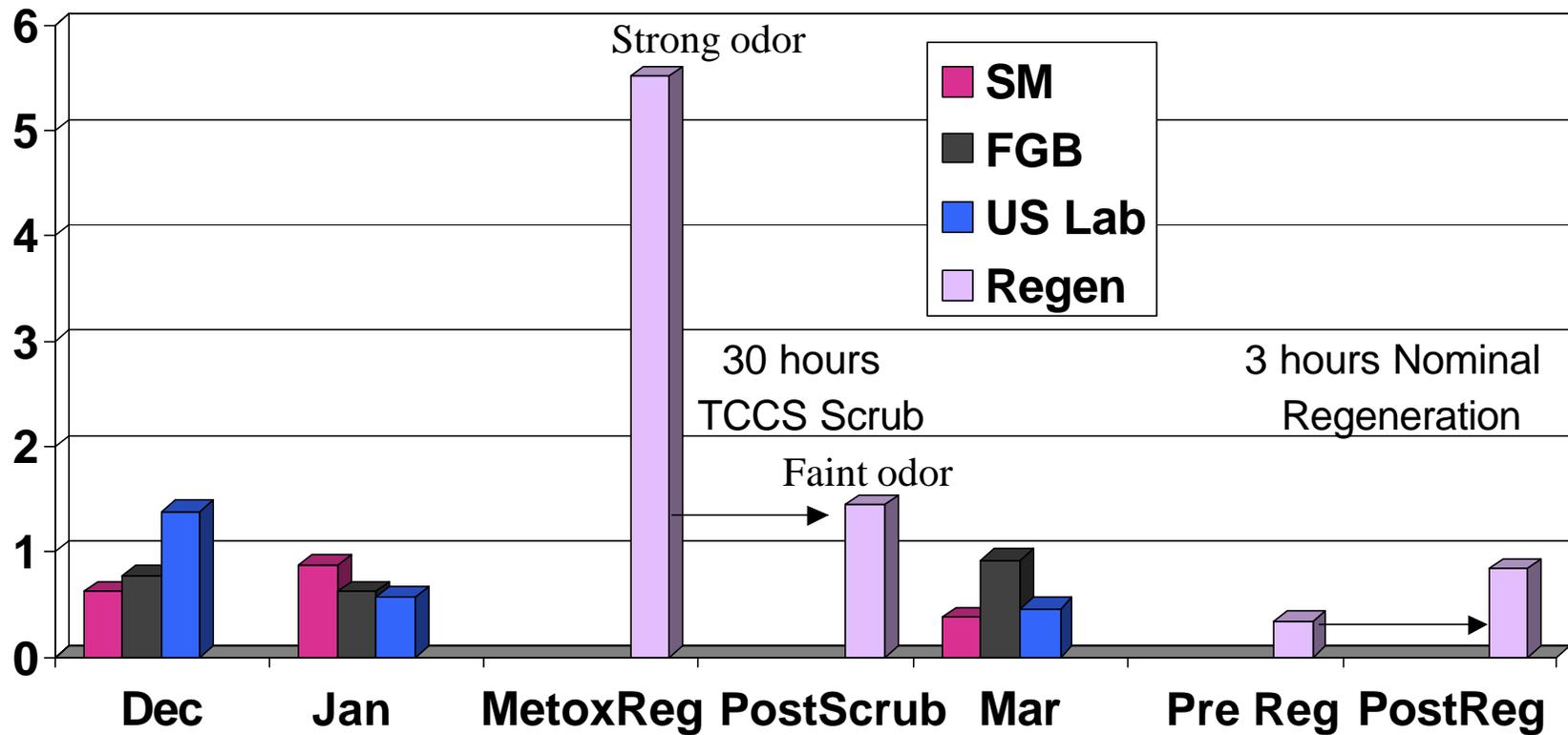
Increment 6 Radiation Prediction

- **Nominal Mission (122 days)**
 - **1952 mrad – 5075 mrem**
- **Daily Average exposure**
 - **15-17 mrad/day**

Metox Regenerations Done in February and April 2002

- A pair of canisters were not regenerated after EVAs during 7A (July 2001), but had been left in the regeneration apparatus
- 2.75 hours into the regeneration in February 2002, the crew reported strong odors, stopped the regeneration, took a grab air sample, and took refuge in the Russian segment for 30 hours while the Lab TCCS scrubbed the air in the US segment (see reduced T values on next plot)
- Crew reported faint odor upon reentry to the US segment
- Key observation: during the 6 months since the canisters were used they were exposed to a low flow of cabin air
- A subsequent regeneration of freshly used canisters in April produced no odors and caused only a slight increase in T values (see next graph)

Impact of Metox Regeneration on T Values



Recommendation

- **NASA thoroughly understands what caused the air pollution problem during the February, 2002, off-nominal regeneration of the Metox canisters.**
- **NASA has assessed the pollutants discharged during nominal regeneration in April 2002, and found no risk to crew health.**
- **A subsequent Metox regeneration caused no air quality problems.**
- **From a medical and environmental health perspective, NASA recommends that nominal Metox regeneration can proceed without operational constraints.**

CHeCS Exercise Countermeasure Hardware

- **Treadmill with Vibration Isolation System (TVIS):**
 - **Roller Bearing Assemblies**
 - **Conservative Analysis shows 3-month life under full loading (180 lb)**
 - **Periodic Inspection Required**
 - **On Orbit Spares Available**
 - **Replacement by crew requires 4 hrs x 2 crewmembers**
 - **Subject Loading Devices (SLD)**
 - **Current Design has known flaws, 120 day life estimate**
 - **On-Board SLDs will be managed to last through Expedition 8**
 - **Redesign in work with planned delivery of flight units 7/31/03**
 - **Operational constraint to use bungee configuration until the last 30 days of each Expedition**
 - **Motor Box**
 - **Internal circuit breaker can trip at higher motorized speeds**
 - **Replacement scheduled for ULF-1**
 - **Operational Constraints**
 - **Speed limited to 6 mph until sufficient data is analyzed for each crewmember**
 - **Speed restriction will only be lifted for crewmembers who exhibit low current draw (<12 A) during motorized mode**

CHeCS Exercise Countermeasure Hardware

- **Treadmill with Vibration Isolation System (TVIS) (cont.):**
 - **Gyroscope**
 - **Damaged wire ropes found 10/13**
 - **Temporary fix leaves 2 of 4 wire ropes**
 - **Spares manifested on 11A**
 - **Operational constraint: periodic inspections being considered**
- **Interim Resistive Exercise Device (IRED):**
 - **Expedition 5 cans have exceeded certification cycle life limits, however, certification has been extended until failure**
 - **New aft can (s/n 1010) has misaligned internal components which degrades performance**
 - **Manifested new set of 2 cans on 11A**
 - **New cans will be installed and checked out during docked ops**
 - **Expedition 5 cans will be returned on 11A**
 - **Aft can (s/n 1010) will be repaired by Expedition 6 crew with invasive IFM during the stage**
- **Cycle Ergometer with Vibration Isolation System (CEVIS):**
 - **Ergometer tower locked in deployed configuration. No impact to operations.**
 - **Replacement forward frame planned for ISS 13A.1**
 - **Seat back needs replacement for hygiene reasons – manifest TBD**
 - **Isolators: currently 3 isolators (fwd right, aft right and left) have severed ropes**
 - **Spare set of isolators onboard, 2 additional sets planned for 13A.1**