



Spaceflight Operational Radiological Support Process Overview

**NCRP Review of NASA Space Radiation
Operations and Protection Methods
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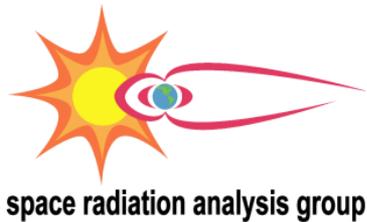
Spaceflight Operational Radiological Support—Process Flow Overview

Mission Specific Support

- **Preflight**
 - ★ Assess EVA crew exposures
 - ★ Assess IVA crew mission exposures
 - ★ Evaluate radiological safety of manifested radioisotopes and radiation producing equipment
 - ★ Assemble and deliver operational dosimeters
 - ★ Brief crew and management on mission radiation risk
- **In-Flight**
 - ★ Nominal daily mission support
 - ★ Nominal and contingency EVA support
 - ★ Environment contingency support
 - ★ Radiation hardware operations
- **Postflight**
 - ★ Analyze passive dosimeters
 - ★ Download data (if appropriate) from radiation instruments
 - ★ Submit dosimetry report to Space Radiation Health Officer and Crew Surgeon

Ongoing Support

- **Training**
 - ★ General astronaut, flight surgeon, and SRAG training
- **Programmatic**
 - ★ Develop funding proposals and task agreements with NASA programs
 - ★ Develop/modify radiation-related requirements in programmatic documents
- **Radiological Support**
 - ★ Maintain flight rules, groundrules and constraints, and operational procedures
 - ★ “Look-ahead” crew exposure projections
 - ★ Maintain radiation instrument calibration facilities
 - ★ Participate in dosimetry intercomparisons
- **Development and Research**
 - ★ Develop space weather monitoring, alarm, and analysis systems
 - ★ Perform detailed comparisons between dosimeter measurements and models



Spaceflight Operational Radiological Support—On-going Process Overview

- **Training**

- ★ General astronaut space radiation training (ASCANs)
- ★ General flight surgeon space radiation training
- ★ SRAG preflight exposure analysis process training
- ★ Astronaut radiation hardware procedures development

- **Programmatic**

- ★ Develop funding proposals and task agreements with major NASA programs
- ★ Develop and modify radiation-related requirements in programmatic documents
- ★ Coordinate requirements, exposure limits, and procedures with international partners (ISS)

- **Radiological Support**

- ★ Develop and modify flight rules and groundrules and constraints
- ★ Provide 6-month “look ahead” crew exposure projections (updated quarterly)
- ★ Calibrate dosimetry laboratory and calibration range equipment
- ★ Participate in national-level dosimetry intercomparisons
- ★ Develop nominal and contingency procedures for crew and ground controllers

- **Development and Research**

- ★ Develop new space weather monitoring, alarm, and analysis systems
- ★ Perform detailed comparisons between measurements and results from radiation environment models and radiation and radiation transport codes



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Spaceflight Operational Radiological Support—Preflight Process Overview

- ~L- 1-2 yrs -- L-3 months:
 - ★ Evaluate safety and exposures from manifested radioisotopes and radiation producing equipment
- L- 4-6 months:
 - ★ Perform preliminary assessments of EVA crew exposures
- L- 2-3 months:
 - ★ Calibrate TLDs for operational dosimeters
- L- 45 days:
 - ★ Perform final assessments of EVA crew exposures
- L- 40 days
 - ★ Perform crew mission exposure assessments
- L- 30 days:
 - ★ Begin assembling operational dosimeters
 - ★ Process (Shuttle) TEPC for flight
- ~L- 30 days:
 - ★ Review projected crew exposures and readiness for flight with management at flight readiness reviews
 - ★ Provide SRHO and Crew Surgeon with crew and EVA exposure projections and EVA exposure planning chart
- L- 14 days:
 - ★ Complete assembly of operational dosimeters and turn in for shipment
 - ★ Complete processing of (Shuttle) TEPC and turn in for shipment
- L- 10 days:
 - ★ Receive space weather review and forecast from NOAA Space Environment Center (SEC)
 - ★ Final radiation briefing to crew
- L- 3 days:
 - ★ Receive updated space weather review and forecast from NOAA SEC



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Spaceflight Operational Radiological Support—In-flight Process Overview

- L- 2.5 hours -- deorbit burn:
 - ★ Nominal daily mission support in Mission Control Center—Houston (MCC-H)
 - 8:30 a.m. – 12:30 p.m. local time
- EVA egress- 1 hour – ingress:
 - ★ Nominal and contingency EVA support
- On-call:
 - ★ Space weather contingency support
 - ★ Radiation hardware anomaly assessment
 - ★ Radiation instrument data downloads (ISS only)
- Nominal Mission Support
 - ★ Review previous SRAG log entries for any problems/issues
 - ★ Review previous SRAG flight notes for any problems/issues
 - ★ Review alerts issued by NOAA SWO during off-console period
 - ★ Review mission status reports for any information about radiation hardware problems
 - ★ Review update mission plans/schedules for changes to EVA timelines and/or changes to radiation hardware usage
 - ★ Review NOAA SWO daily space weather reports and forecasts for anticipated space weather activity
 - ★ Review and monitor available near real-time space weather data
 - ★ Conduct daily space weather review and forecast with NOAA SWO
 - ★ Issue radiation exposure and space weather status report to Flight Director and Flight Surgeon





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Spaceflight Operational Radiological Support—Postflight Process Overview

- ~R+ 48 hours
 - ★ Return operational dosimeters from mission
 - ★ Return (Shuttle) TEPC from mission
- ~R+ 48 hours – 30 days
 - ★ Evaluate TLDs
 - ★ Download data from (Shuttle) TEPC and process
- R+ 30 days
 - ★ Issue dosimetry report
 - ★ Update dosimetry and mission archives
- R+ 40 days
 - ★ Forward dosimetry report to SRHO, Crew Surgeon, and Astronaut Office