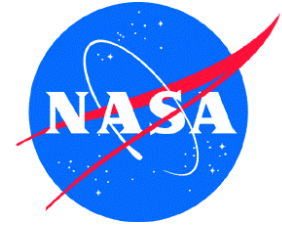


# NASA News

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## SPACE SHUTTLE AND CONSTELLATION PROGRAM ACTIONS RESULTING FROM SCSIT RECOMMENDATIONS

### Suit and Seat

- Space Shuttle program has replaced outdated inertial reels with new MA-16 reels which will lock with absolute load AND differential acceleration, and allows it to lock in any direction.
- Lessons learned on inertia reels and their proper implementation, along with associated risks, has led Orion to eliminate them from the baseline design. Since all operations are performed in a recumbent position, the need for inertia reels is further reduced.
- Detailed feasibility assessments are being finalized to determine final SSP implementation plan for improved seatbelt sizing and positioning as well as improved limb control/retention straps.
- Orion seats are being outfitted with the latest innovations in seat and restraint systems for enhanced occupant protection. Cx has implemented limb flail requirements. Additional protections are being implemented to ensure proper arm positioning to maintain control of the vehicle under high acceleration events. Suit and seat are being designed in an integrated fashion with the entire spacecraft.
- The AN/PRC-112 has been upgraded to the AN/PRC-112G, which includes GPS tracking. First flight STS-119. This radio is being evaluated for direct implementation into the Orion Crew Survival Kits carried aboard the vehicle for use in post landing contingency situations.
- Final concept for implementation of the smallest reliable GPS Personal Locator Beacon (PLB) that autonomously activates itself if/when the crew liberates from the crew module (whether intentionally or unintentionally) is being briefed to engineering and SSP mgmt in DEC 2008 and JAN 2009.
- Similar Personal Locator Beacons (PLBs) are being evaluated for use on the launch and entry suits of the Orion crew. This small size and light mass of this hardware may allow for personal tracking of all crewmembers in the case of a separation event at sea.
- Impact studies were performed to better understand the head protection levels of existing system and those of potential upgrades. Detailed feasibility assessments are being finalized to determine final SSP implementation plan.
- Helmet and head impact lessons learned are being used to drive Orion helmet, suit to helmet, and helmet to seat designs. Significantly improved from Shuttle – has incorporated Brinkley criteria for minimizing injuries.

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- Trade study on supplemental portable O2 found a potential candidate that would offer more O2 than the existing system, which would greatly increase survivability for multiple Shuttle emergency launch pad and post landing emergency scenarios. Detailed feasibility assessments are being finalized to determine final SSP implementation plan.
- A supplemental breathing air supply shall be crew worn for emergency pad based operations during Orion launch sequences. Post-landing the emergency breathing air may protect the crew from contingency contaminants such as smoke or ammonia vapor during vehicle egress.
- NASA's prime Personal Parachute Assembly contactor (China Lake, USN), developed a prototype custom design that offer optimal fail-safe capability, which would greatly increase survivability for any emergency scenario that finds the crew ejected or liberated from the crew module unintentionally. Detailed feasibility assessments are being finalized to determine final SSP implementation plan. Orion has no scenarios requiring personal parachutes.
- Special serialization requirements (logging and implementation) are being added to the smallest piece part we can. We have also significantly enhanced our photodocumentation requirements prior to flight.

### **Shuttle training**

- Loss of Control training has been modified. It now includes emphasis on the transition between problem solving and survival, the fact that the Shuttle is unlikely to trim, and the concept that the crew should lock inertial reels, close visors, and pull the green apple (personal O2 system) at first sight of a serious problem. Additionally, Shuttle unusual attitude training has been incorporated by putting the mockups in Building 9 into a nose-down configuration to encourage crews to develop egress paths when in an off-nominal attitude.

### **Graceful degradation**

- Orion design incorporates graceful degradation of guidance, navigation and control modes on entry from nominal, to loads-managed, to a ballistic entry.

### **Other**

- Crashworthy data recorder is in the requirements for Orion.

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