Failure Modes and Effects Analysis/Critical Items List

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Title: Risk Assessment Executive Summary Report (RAESR) for the USA SAFER

Item Name: Pyrotechnic Isolation Valve Qty: 1 FMEA Number: US-SFR-050

Item Part Number: 2-502030-1 ORU Name: SAFER

Subsystem Name: Propulsion ORU Part Number: SED33105900-311

Function: Provides isolation of GN₂ supply from remaining propulsion system for long term stowage on-orbit.

Item Type Designator: C PG/IP Identifier: N/A

Reference Designator/Find No.: N/A Drawing Number: SLD33105973

Logistics Control Number: N/A

End Item Name: SAFER

End Item Capability: Six degrees of freedom through 24 thrusters, each rated at 0.8 ± 0.08 lbs. force in vacuum.

End Item Function: Provides emergency EVA self-rescue for separated crewmember.

ISS Zone: EVA Shuttle Zone: EVA

Criticality

Critical Item: Yes: No: X Criticality Category: 1R 1R/3

Success Paths Remaining:

Paths:

Failure (Mode, Cause, Detection, Corrective Action)

Failure Mode: Pyrotechnic Isolation Valve fails to fire/release GN₂.

Failure Mode Code:

Failure Cause: Avionics EEE part failure, open circuit, contamination/corrosion, piece-part failure

Failure Detection:

Flight: IVA – None. Pyrotechnic isolation valve and NASA Standard Initiator are closed/intact during IVA checkout.

EVA - No commanded motion.

Ground: Functional Test.

Time To Detect Quantity: 10 Time To Detect Units: Seconds

Correcting Action: IVA – If a fault is detected in the Pyro circuit during the IVA Checkout, the back-up SAFER (if

available) will be used.

EVA - Cycle Power switch to "Off" and then to "On." If unsuccessful, then no other corrective action.

Remarks: "NSI Failure" message is displayed if, after 8 ms, the NSI sense signal is low.

Failure Effect Phase: EVA Operations Affected Stage(S): EVA Operations

Failure Effect

On ORU/Assembly:

<u>First/Second Failure:</u> Inadvertent EVA crewmember separation.

Third (this) Failure: GN₂ supply not released from tank. Crewmember unable to perform self-rescue.

On Subsystem/Next Assembly: None.

On End Item/Segment: Loss of mission objectives if SAFER is required for EVA.

On Crew/ISS: Possible loss of EVA crewmember.

Time To Effect Quantity: 1 Time To Effect Units: Minutes

Redundancy Screen

ISS (Shuttle)

Checkout Pre-Launch (A): Pass Checkout On-Orbit (B): N/A

Detection Flight Crew: Pass Or Detection Ground Crew: Fail

Loss Of Redundancy

From A Single Cause (C): N/A