Failure Modes and Effects Analysis/Critical Items List

Document Number: JSC-38378 **Document Rev. No.:** C **Document Date:** 8/26/97
Title: Risk Assessment Executive Summary Report (RAESR) for the USA SAFER

Item Name:	Inertial Reference Unit (IRU)	**Qty:** 1	**FMEA Number:**	US-SFR-280	
Item Part Number:	LN-200		**ORU Name:**	SAFER	
Subsystem Name:	Avionics		**ORU Part Number:**	SED33105900-311	

Function: Provides angular rate sensing capability to SAFER avionics.

Item Type Designator: C **PG/IP Identifier:** N/A
Reference Designator/Find No.: N/A **Drawing Number:** SED33105904
Logistics Control Number: N/A

End Item Name: SAFER
End Item Capability: Six degrees of freedom through 24 thrusters, each rated at 0.8 $\pm$ 0.08 lbs. force in vacuum.
End Item Function: Provides emergency EVA self-rescue for separated crewmember.
ISS Zone: EVA **Shuttle Zone:** EVA

Criticality

					ISS	Shuttle
Critical Item:	**Yes:** ____	**No:** __X__		**Criticality Category:**	1R	1R/3
Success Paths:				**Success Paths Remaining:**		

Failure (Mode, Cause, Detection, Corrective Action)

Failure Mode: IRU sends no angular rate data to CEA processor.
Failure Mode Code:
Failure Cause: EEE part failure, short/open circuit, contamination, software error, radiation event, EMI.
Failure Detection:
Flight: IVA – IVA checkout.
EVA – SAFER does not perform automatic attitude hold function. LCD displays "Rate Sensor Fail" message. AAH light is not illuminated.
Ground: Functional Test.
Time To Detect Quantity: 10 **Time To Detect Units:** Seconds
Correcting Action: IVA – If the IVA checkout detects a failure, the backup SAFER (if available) will be used.
EVA – 1) Crewmember assumes manual control. Attempt to manually stop rotation.
2) Crew training may allow recovery from unwanted rotational rates.
3) Cycling power may allow recovery.
Remarks: The avionics software disables AAH when data from the IRU is not being received. During the IVA checkout, if software does not receive data from the IRU, a "Rate Check" message is displayed until the display proceed switch is toggled in either direction. After toggling the display proceed switch, a "Fail: Rate XXX" message is displayed.
Failure Effect Phase: EVA Operations **Affected Stage(S):** EVA Operations

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Failure Effect

On ORU/Assembly:
First/Second Failure: Inadvertent EVA crewmember separation.
Third (this) Failure: Software deactivates AAH.
On Subsystem/Next Assembly: No rate data sent to avionics.
On End Item/Segment: SAFER does not automatically stop rotation rates. Possible loss of mission objectives if SAFER 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			