

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - GIL HARDWARE  
NUMBER: 07-2D-ES5 -X**

**SUBSYSTEM NAME: CREW ESCAPE - EMERGENCY EGRESS SLIDE  
REVISION: 0 08/01/88**

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**PART DATA**

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|     | <b>PART NAME<br/>VENDOR NAME</b> | <b>PART NUMBER<br/>VENDOR NUMBER</b> |
|-----|----------------------------------|--------------------------------------|
| LRU | : SLIDE ASSEMBLY                 | MC623-0015-0007                      |
| SRU | : RESERVOIR                      | ALT 409 SCI                          |

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**QUANTITY OF LIKE ITEMS: 1**

**FUNCTION:**

RESERVOIR STORES COMPRESSED ARGON GAS AT 3000 +/- 100 PSI FOR INFLATING SLIDE WHEN LANYARD IS PULLED, REGULATOR/VALVE RELEASES PRESSURANT THROUGH INTERCONNECT HOSE TO ASPIRATOR ON INFLATABLE STRUCTURE. PRESSURE GAUGE ON CYLINDER INDICATES CHARGE PRESSURE. RESERVOIR IS STOWED IN POCKET ATTACHED TO UPPER END OF SLIDE TUBE. KEVLAR WRAPPED ALUMINUM CYLINDER IS 5.36 IN. O.D. X 12.6 IN. LONG. VOLUME IS APPROXIMATELY 155 CU. INS., TOTAL WEIGHT IS APPROXIMATELY 4.5 LB AND WEIGHT OF ARGON GAS IS APPROXIMATELY 1.75 LB.

**REFERENCE DOCUMENTS: D103030 ISI**

**FAILURE MODES EFFECTS ANALYSIS FMEA – CIL FAILURE MODE**

NUMBER: 07-2D-E95-01

REVISION#: 1 09/02/98

SUBSYSTEM NAME: CREW ESCAPE - EMERGENCY EGRESS SLIDE

LRU: SLIDE ASSEMBLY

CRITICALITY OF THIS

ITEM NAME: RESERVOIR

FAILURE MODE: 1R2

**FUNCTIONAL CRITICALITY/**

REQUIRED FAULT TOLERANCE/ACHIEVED FAULT TOLERANCE: 1R/2/1

**FAILURE MODE:**

EXTERNAL LEAKAGE/RUPTURE

**MISSION PHASE:**

LS LANDING SEQUENCE

|                                         |     |           |
|-----------------------------------------|-----|-----------|
| <b>VEHICLE/PAYLOAD/KIT EFFECTIVITY:</b> | 102 | COLUMBIA  |
|                                         | 103 | DISCOVERY |
|                                         | 104 | ATLANTIS  |
|                                         | 105 | ENDEAVOUR |

**CAUSE:**

CRACKED CYLINDER, DEFECTIVE REGULATOR, FAILED CHARGING VALVE, DEFECTIVE PRESSURE GAUGE OR SEAL.

CRITICALITY 1/1 DURING INTACT ABORT ONLY? YES

LS LANDING SEQUENCE

|                          |         |
|--------------------------|---------|
| <b>REDUNDANCY SCREEN</b> | A) PASS |
|                          | B) FAIL |
|                          | C) PASS |

**PASS/FAIL RATIONALE:**

A)

B)

"B" SCREEN FAILS BECAUSE THERE IS NO TEST AVAILABLE TO DETECT FOR THIS FAILURE IN FLIGHT.

C)

**METHOD OF FAULT DETECTION:**

VISUAL CHECK OF PRESSURE GAUGE.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE  
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**CORRECTING ACTION: MANUAL**

**CORRECTING ACTION DESCRIPTION:**

USE DESCENT DEVICE (SKY GENIE) THROUGH SIDE HATCH OPENING OR OVERHEAD WINDOW. FOR PARTIAL INFLATION DUE TO SLOW LEAKAGE OF RESERVOIR, FIRST TWO CREWMEMBERS TO EGRESS COULD HOLD SLIDE FOR REMAINING CREWMEMBERS.

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**- FAILURE EFFECTS -**

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**(A) SUBSYSTEM:**

LOSS OF PRESSURANT, INCOMPLETE OR NO INFLATION OF SLIDE, LOSS OF SLIDE CAPABILITY FOR EGRESS.

**(B) INTERFACING SUBSYSTEM(S):**

NONE. ESCAPE OF ARGON GAS INTO CREW MODULE WOULD HAVE NEGLIGIBLE EFFECT ON CABIN PRESSURE OR OXYGEN PARTIAL PRESSURE. INCREASE IN CABIN PRESSURE WOULD BE INSUFFICIENT TO OPEN POSITIVE PRESSURE RELIEF VALVES. LEAKAGE OF ALL THE ARGON INTO THE CABIN IS WITHIN SPECIFIED LIMITS FOR CABIN AIR. ARGON WOULD HAVE NO EFFECT ON REMOVAL OF CO2 BY LIQH.

**(C) MISSION:**

NONE

**(D) CREW, VEHICLE, AND ELEMENT(S):**

OTHER SUBSYSTEM FAILURES MUST OCCUR BEFORE USE OF THE EMERGENCY SYSTEM IS REQUIRED. POSSIBLE LOSS OF CREW IF RAPID EMERGENCY EGRESS IS REQUIRED.

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

AFTER OTHER SUBSYSTEM FAILURES OCCUR REQUIRING THE USE OF THE EMERGENCY SYSTEM, A SINGLE FAILURE OF THE RESERVOIR CAN RESULT IN POSSIBLE INJURY/LOSS OF CREW.

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**- TIME FRAME -**

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**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE  
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**TIME FROM FAILURE TO CRITICAL EFFECT: HOURS**

**TIME FROM FAILURE OCCURRENCE TO DETECTION: HOURS**

**TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: N/A**

**IS TIME REQUIRED TO IMPLEMENT CORRECTING ACTION LESS THAN TIME TO EFFECT?  
YES**

**RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:  
EMERGENCY EGRESS USING SKY GENIE WOULD EXCEED MAXIMUM ALLOWABLE TIME OF  
60 SECONDS.**

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**-DISPOSITION RATIONALE-**

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**(A) DESIGN:**

TECHNOLOGY BASE ESTABLISHED IN COMMERCIAL AIRLINE HARDWARE. PROVEN COMPONENTS IN INFLATION SYSTEM. RESERVOIR COMPLIES WITH NASA REQUIREMENT DOT-E-8162. PRESSURE VESSEL IS KEVLAR FILAMENT-WOUND WITH ALUMINUM LINER. DESIGN BURST PRESSURE IS 9000 PSI, NORMAL OPERATING PRESSURE IS 3000 PSI. THE BOTTLE IS INSIDE THE VALISE.

**(B) TEST:**

ACCEPTANCE TESTS OF RESERVOIR INCLUDE PROOF PRESSURE AND LEAK TESTS.

QUALIFICATION TESTS OF SLIDE ASSEMBLY INCLUDE 40 DEPLOYMENT CYCLES. LOT CERTIFICATION TEST OF RESERVOIR INCLUDES 10,000 PRESSURE CYCLES FROM 0 TO 3000 PSIG, 30 CYCLES FROM 0 TO 5000 PSIG, AND 60 SECONDS AT 9000 PSIG, WITH NO EVIDENCE OF LEAKAGE OR DISTORTION AFTER CYCLING TESTS AND NO RUPTURE AT BURST PRESSURE. CERTIFICATION OF RESERVOIR IS BASED ON QUALIFICATION TESTS, LOT CERTIFICATION TESTS AND ANALYSIS FOR VIBRATION AND SHOCK ENVIRONMENTS.

PERIODIC MAINTENANCE INCLUDES REINSPECTION AND HYDROSTATIC TEST PER DOT-E-8162 EVERY THREE YEARS.

**GROUND TURNAROUND TEST**

ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

**(C) INSPECTION:**

RECEIVING INSPECTION

CERTIFICATION OF PROCESSES AND MATERIALS INCLUDING STRENGTH, COMPOSITION, HEAT TREAT AND ANODIZING ARE VERIFIED BY INSPECTION.

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CONTAMINATION CONTROL  
CLEANLINESS OF SIGNIFICANT SURFACES TO LEVEL (GC) GENERALLY CLEAN AS PER  
MA0110-301 IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION  
REGULATOR O-RING LUBRICANT AROUND POPPET SHAFT VERIFIED BY INSPECTION.  
CONFORMANCE OF DETAIL PARTS AND ASSEMBLY TO DRAWING REQUIREMENTS ARE  
VERIFIED BY INSPECTION. PARTS PROTECTION AND HANDLING PROVISIONS ARE  
VERIFIED BY INSPECTION.

TESTING  
ATP VERIFIED BY INSPECTION.

REGULATOR O-RING LUBRICANT AROUND POPPET SHAFT VERIFIED BY ATP INSPECTION

HANDLING/PACKAGING  
PROPER PACKAGING TO LEVEL A OF MIL-STD-794 IS VERIFIED BY INSPECTION

**(D) FAILURE HISTORY:**

CURRENT DATA ON TEST FAILURES, FLIGHT FAILURES, UNEXPLAINED ANOMALIES, AND  
OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE  
FOUND IN THE PRACA DATA BASE. FAA GENERIC FAILURE DATA INDICATES  
APPROXIMATELY 5 FAILURES IN THIS FAILURE MODE PER APPROXIMATELY 3000  
DEPLOYMENTS.

**(E) OPERATIONAL USE:**

OPERATION EFFECT OF FAILURE: POSSIBLE LOSS OF LIFE.

CREW ACTION: BRING SKY GENIE DOWN FROM FLIGHT DECK AND EGRESS USING  
CARABINERS.

CREW TRAINING: CREW IS TRAINED IN ABOVE PROCEDURE.

MISSION CONSTRAINTS: NONE. MISSION WOULD BE TERMINATED PRIOR TO USE OF  
SLIDE; ON-ORBIT DISCHARGE OF ARGON RESERVOIR POSES NO HAZARD TO VEHICLE  
OR CREW EXCEPT FOR LOSS OF SLIDE.

INFLIGHT CHECKOUT: NONE.

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**- APPROVALS -**

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EDITORIALLY APPROVED : BNA : J. Kemura 9-3-98  
TECHNICAL APPROVAL : VIA APPROVAL FORM : 98-CIL-032\_07-2D