PRINT DATE: 09/28/00

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 07-2D-ES1 -X

SUBSYSTEM NAME: CREW ESCAPE - EMERGENCY EGRESS SLIDE
REVISION: 0 09/28/00

PART DATA

	PART NAME **VENDOR NAME**	**PART NUMBER** **VENDOR NUMBER**
LRU	: SLIDE ASSEMBLY	MC623-0015-0023
SRU	: INFLATABLE SLIDE	MC623-0015-0022

QUANTITY OF LIKE ITEMS: 1

FUNCTION:
INFLATABLE SLIDE CONSISTS OF INFLATABLE STRUCTURE AND GIRT. FABRIC STRUCTURE PROVIDES SLIDING SURFACE FOR CREWMEMBERS DURING POST LANDING EGRESS FROM SIDE HATCH OPENING 10.5 FEET ABOVE GROUND. SLIDE CAN BE USED FOR CONTINGENCY EGRESS WITH HATCH OPENED OR FOR RAPID EMERGENCY EGRESS WITH HATCH JETTISONED.

REFERENCE DOCUMENTS: D102910 ISI

- APPROVALS -

SAFETY & RELIABILITY ENGR : E. SHVARTZ — E. Shvartz 9-28-00
DESIGN ENGINEERING : S. SHARP — Steven Sharp 9-28-00
USA orbiter Element — Suzanne Little 9/28/00

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE
NUMBER: 07-2D-ES1-01

REVISION#: 1 09/02/98

SUBSYSTEM NAME: CREW ESCAPE - EMERGENCY EGRESS SLIDE
LRU: SLIDE ASSEMBLY **CRITICALITY OF THIS**
ITEM NAME: INFLATABLE SLIDE **FAILURE MODE:** 1R2

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

FAILURE MODE:
FAILS TO ACHIEVE AND/OR MAINTAIN PROPER INFLATION (RUPTURE/LEAKAGE/ PACKAGING)

MISSION PHASE: LS LANDING/SAFING

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102	COLUMBIA
103	DISCOVERY
104	ATLANTIS
105	ENDEAVOUR

CAUSE:
SLIDE FABRIC POROUS, PUNCTURED, CHAFED, TORN, SPLIT OR CUT; SEAM OPENED; FAILURE OF FLUSH VALVE, SHEAR PIN, GIRT ASSEMBLY, LANYARD OR ASPIRATOR; IMPROPER PACKAGING OR INSTALLATION, RESERVOIR LEAKAGE, BROKEN FIRING LANYARD, HOSE DISCONNECTED OR KINKED, UNCHARGED RESERVOIR, CLOGGED REGULATOR.

CRITICALITY 1/1 DURING INTACT ABORT ONLY? YES

LS LANDING SEQUENCE

REDUNDANCY SCREEN
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)

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METHOD OF FAULT DETECTION:
CREW OBSERVATION

CORRECTING ACTION: MANUAL

CORRECTING ACTION DESCRIPTION:
IF SLIDE FAILS TO INFLATE, USE DESCENT DEVICE (SKY GENIE) THROUGH SIDE HATCH OPENING, OR FIRST TWO CREW SAFELY ON GROUND CAN HOLD SLIDE FOR REMAINING CREW, OR EGRESS THROUGH OVERHEAD WINDOW ON FLIGHT DECK.

REMARKS/RECOMMENDATIONS:
HAND HELD SLIDE USED AS CHUTE REQUIRES TWO CREWMEMBERS ON GROUND.

- FAILURE EFFECTS -

(A) SUBSYSTEM:
INCOMPLETE OR NO INFLATION OF SLIDE.

(B) INTERFACING SUBSYSTEM(S):
NONE

(C) MISSION:
NONE

(D) CREW, VEHICLE, AND ELEMENT(S):
OTHER SUBSYSTEM FAILURES MUST OCCUR BEFORE USE OF THE EMERGENCY SYSTEM IS REQUIRED. POSSIBLE INJURY TO CREWMEMBER IF SLIDE BUCKLES WITH CREWMAN ON IT. POSSIBLE LOSS OF REMAINING CREWMEMBERS 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 INFLATABLE SLIDE CAN RESULT IN POSSIBLE INJURY/LOSS OF CREW.

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- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: SECONDS

TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS

TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: N/A

IS TIME REQUIRED TO IMPLEMENT CORRECTING ACTION LESS THAN TIME TO EFFECT?
NO

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

-DISPOSITION RATIONALE-

(A) DESIGN:
TECHNOLOGY BASE ESTABLISHED IN COMMERCIAL AIRLINE HARDWARE. PROVEN COMPONENTS IN INFLATION SYSTEM. FACTOR OF SAFETY 1.4 MINIMUM WITH POSITIVE MARGINS ON ALL COMPONENTS. SLIDE MATERIALS CONFORM TO MIL SPEC. REQUIREMENTS.

(B) TEST:
ACCEPTANCE TESTS INCLUDE TWO DEPLOYMENT CYCLES (ONE IN EACH MODE), PROOF PRESSURE TEST TO 1.5 TIMES NOMINAL OPERATING PRESSURE, AND LEAK TEST FOR SIX HOURS WITH 0.25 PSI MAXIMUM ALLOWABLE PRESSURE DROP. COUPON SAMPLES OF SEAMS ARE VERIFIED BY PULL TEST.

QUALIFICATION TESTS INCLUDE A TOTAL OF 40 DEPLOYMENT CYCLES FROM SIMULATED ORBITER SIDE HATCH IN HATCH OPEN AND HATCH JETTISONED MODES; ALSO LEAK TEST AND A BURST TEST TO 2.0 TIMES NOMINAL OPERATING PRESSURE.

CERTIFICATION IS BASED ON QUALIFICATION TESTS OF SLIDE SYSTEM AND SLIDE MATERIALS SUPPORTED BY ANALYSIS OF DESIGN DRAWINGS, AND ANALYSIS FOR SHOCK AND VIBRATION ENVIRONMENTS.

A COUPON SAMPLE OF A TYPICAL BONDED SEAM IS SUPPLIED WITH EACH SLIDE FOR TESTING WHEN USEFUL LIFE OF SLIDE IS CLOSE TO EXPIRATION DATE.

GROUND TURNAROUND TEST
ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

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(C) INSPECTION:
RECEIVING INSPECTION
CERTIFICATION OF PROCESSES AND MATERIALS INCLUDING STRENGTH, COMPOSITION, HEAT TREAT, ANODIZING AND PASSIVATION ARE VERIFIED BY INSPECTION.

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

ASSEMBLY/INSTALLATION
TORQUE REQUIREMENTS AT HOSE CONNECTIONS VERIFIED. LANYARD HANDLE/CABLE CONNECTOR VERIFIED AT FINAL INSPECTION. HOSE ROUTING IN SLIDE PACK VERIFIED AT FINAL INSPECTION. REGULATOR OPERATION VERIFIED. SEAMS ARE VISUALLY INSPECTED AND VERIFIED WITH LEAK DETECTOR. LEAKS ARE REPAIRED IN ACCORDANCE WITH PROCEDURE NO. 4004.

CONFORMANCE OF DETAIL PARTS AND ASSEMBLIES TO DRAWING REQUIREMENTS ARE VERIFIED BY INSPECTION. PARTS PROTECTION AND HANDLING PROVISIONS ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES
THE MIXING AND APPLICATION OF ADHESIVES, BONDING OF SUBASSEMBLIES, ASSEMBLIES AND PANELS ARE VERIFIED BY INSPECTION. BONDING PROCESS CONTROL SAMPLE TESTS ARE VERIFIED BY INSPECTION.

TESTING
ASPIRATOR DOOR SEAL VERIFIED. REGULATOR OPERATION VERIFIED. RELIEF VALVE AND FLUSH VALVE OPERATION VERIFIED.

RESISTANCE OF ELECTRICAL BONDING FOR CONFORMANCE TO MIL-B-50878 IS VERIFIED BY INSPECTION. ATP IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING
PROPER LOCATION AND ATTACHMENT OF ALL COMPONENTS, CYLINDER CHARGED TO NORMAL PRESSURE AND PROPER PACKAGING TO LEVEL A OF MIL-STD-794 ARE 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 100 FAILURES TO INFLATE PROPERLY IN APPROXIMATELY 3000 DEPLOYMENTS.

(E) OPERATIONAL USE:
OPERATIONAL EFFECT OF FAILURE: POSSIBLE LOSS OF LIFE.

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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.

INFLIGHT CHECKOUT: NONE.

- APPROVALS -

EDITORIALLY APPROVED	: BNA	: J. Kimura 9-3-98
TECHNICAL APPROVAL	: VIA APPROVAL FORM	: 96-CIL-032_07-2D