

## FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: 06-2F-330001-X

SUBSYSTEM NAME: LIFE SUPPORT

REVISION : 2 06/18/90

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	CBRF3 FIRE SUPPRESSION SUBSYS	MC282-0065-0001 APCO 819201-1
LRU :	FIRE EXTINGUISHER	ST-20425-1 APCO 819201-1

## PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:  
AVIONICS BAY FIRE EXTINGUISHER.

QUANTITY OF LIKE ITEMS: 3  
ONE IN EACH FWD AV BAY

FUNCTION:  
TO PROVIDE FIRE SUPPRESSANT CAPABILITY IN THREE FORWARD AVIONICS BAYS.  
EXTINGUISHER IS DUMPED REMOTELY BY ACTIVATING PYRO DEVICE FROM THE  
FLIGHT DECK.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE  
NUMBER: 06-2F-330001-02

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SUBSYSTEM: LIFE SUPPORT  
LRU :CBRF3 FIRE SUPPRESSION SUBSYS  
ITEM NAME: FIRE EXTINGUISHER

CRITICALITY OF THIS  
FAILURE MODE:1/1

FAILURE MODE:  
EXTERNAL LEAKAGE

MISSION PHASE:  
LD LIFT-OFF  
DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA  
: 103 DISCOVERY  
: 104 ATLANTIS

CAUSE:  
MECHANICAL SHOCK, VIBRATION, CORROSION, STRUCTURAL FAILURE.

■ CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN A) N/A  
B) N/A  
C) N/A

PASS/FAIL RATIONALE:  
A)  
B)  
C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:  
LOSS OF FIRE EXTINGUISHER IN ONE AVIONICS BAY.

(B) INTERFACING SUBSYSTEM(S):  
INABILITY TO EXTINGUISH FIRE IN AVIONICS BAY FROM FLIGHT DECK DURING  
LAUNCH AND DEORBIT PHASES WHEN CREW IS RESTRAINED IN THEIR SEATS.

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(C) MISSION:  
NO EFFECT.

(D) CREW, VEHICLE, AND ELEMENT(S):  
LOSS OF CREW/VEHICLE IF COMBUSTION IS SUPPORTED. SINGLE STRING EMERGENCY SYSTEM DURING LAUNCH AND DEORBIT. EXTERNAL LEAKAGE OF EXTINGUISHER IS DETECTABLE BY PRESSURE SWITCH ONLY. SWITCH WILL NOT DETECT LEAKAGE UNTIL EXTINGUISHER IS EMPTY.

(E) FUNCTIONAL CRITICALITY EFFECTS:

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- DISPOSITION RATIONALE -  
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(A) DESIGN:  
STAINLESS STEEL WELDED CONTAINER. ALL MATERIALS (METALLIC AND NON-METALLIC) USED ARE COMPATIBLE WITH HALON 1301. FILLER PLUG WITH FUSIBLE ALLOY SEAL. FUSIBLE DIAPHRAGM SEAL. SINGLE STATIC "O"-RING SEAL ON THE PRESSURE SWITCH. TORQUED ITEMS LOCKWIRED.

■ (B) TEST:  
QUALIFICATION TEST - QUALIFIED FOR 100 MISSION LIFE; 20G SHOCK/AXIS; 5-24 HOUR TEMPERATURE CYCLES (60 TO 125 DEG. F); VIBRATION 0.09G SQ/HZ FOR 48 MIN/AXIS; 24 HRS AT 135 DEG F; SALT FOG TEST. BURST TEST AT 2500 PSIG. ACCEPTANCE TEST - PROOF AT 1000 PSIG, LEAK CHECK AT 500 PSIG, LEAK TESTED AFTER CHARGING (NTE  $1 \times 10^{**6}$  CC/SEC AT 130 TO 150 DEG F) CHARGED WITH EXTRA 0.25 LB OF HALON 1301 WHICH IS EQUAL TO A 10 YEAR ALLOWABLE LEAK RATE. PRESSURE SWITCH IS CHECKED FOR PROPER OPERATION PRIOR TO CHARGING. AFTER CHARGING, EXTINGUISHER'S WEIGHT IS RECORDED FOR FUTURE LEAK CHECK HISTORY. TESTED TO SAFETY FACTOR EQUAL TO OR GREATER THAN 4. HYDROSTATIC PROOF TEST PRIOR HYDROSTATIC PROOF TEST PRIOR TO RECHARGING AT 1050 PSIA.

| TURNAROUND - VERIFY LIQUID CONTENT EVERY TWO FLIGHTS AND ALSO AFTER EXTENDED PERIODS EXCEEDING SIX MONTHS.

(C) INSPECTION:  
RECEIVING INSPECTION  
RAW MATERIAL AND PURCHASED COMPONENTS VERIFIED BY RECEIVING INSPECTION.

CONTAMINATION CONTROL  
CORROSION PROTECTION PROVISIONS AND CONTAMINATION CONTROL PLAN ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES

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COATING AND PLATING PROCESSES VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION  
TORQUE AND LOCKWIRE ARE VERIFIED BY INSPECTION. INSTALLATION AND  
ASSEMBLY ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION  
WELDING IS VERIFIED BY RADIOGRAPHIC INSPECTION.

TESTING  
INSPECTION VERIFIES NO EXTERNAL LEAK DURING ACCEPTANCE TESTING.  
VIBRATION TEST IS VERIFIED BY INSPECTION.

- (D) FAILURE HISTORY:  
NONE. NO DETECTABLE LEAKAGE OF ANY CONTAINER FOR OVER 12 YEARS.

(E) OPERATIONAL USE:  
FOR LAUNCH AND DEORBIT PHASES, POWER DOWN AFFECTED AVIONICS BAY IF  
FIRE OCCURS. PRIOR TO ENTRY, DUMP A PORTABLE FIRE EXTINGUISHER INTO  
AFFECTED BAY.

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- APPROVALS -  
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RELIABILITY ENGINEERING:	D. R. RISING	:	<i>[Signature]</i>
DESIGN ENGINEERING	: D. WADA	:	<i>[Signature]</i>
QUALITY ENGINEERING	: W. J. SMITH	:	<i>[Signature]</i>
NASA RELIABILITY	:	:	<i>[Signature]</i>
NASA SUBSYSTEM MANAGER	:	:	<i>[Signature]</i>
NASA QUALITY ASSURANCE	:	:	<i>[Signature]</i>

*CSA 4/22/90*  
*DRB 7/17/90*  
*7/17/90*  
*1-9-90*