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PRINT DATE: 09/14/88

FAILURE MODES EFFECTS ANALYSIS (FMEA) NUMBER: 07-2B-CRW1-X

SUBSYSTEM NAME: CREW ESCAPE - SIDE HATCH JETTISON

REVISION : 09/14/88

CLASSIFICATION	NAME	PART NUMBER
SUB. ASSEM:	VENT SEVERANCE INSTALLATION	V070-553413
SRU :	VENT CHECK VALVE	ME284-0547

QUANTITY OF LIKE ITEMS: 2

DESCRIPTION/FUNCTION:

AFTER THE VENTING PLATE IS SEVERED, THE CREW MODULE ATMOSPHERE IS VENTED INTO THE MID FUSELAGE VIA TWO BUTTERFLY VALVES, ME284-0547-0002, -0003. (THE -0002 VALVE HAS A VENTING DIAMETER OF 2.47 INCHES AND -0003 VALVE HAS A VENTING DIAMETER OF 3.47 INCHES, BOTH CRACK BETWEEN 0.10 AND 0.15 PSID. THE DIFFERENT SIZES ARE NEEDED TO OBTAIN A GIVEN FLOW RATE WHILE ACCOMMODATING GIVEN CLEARANCES.) THE PRIMARY FUNCTION OF THESE CHECK VALVES IS TO PROVIDE ISOLATION BETWEEN THE CREW MODULE AND THE MID FUSELAGE, AFTER THE CREW MODULE PRESSURE IS EQUALIZED TO THE PAYLOAD BAY PRESSURE. THIS PRECLUDES THE BACKFLOW OF HAZARDOUS GASES INTO THE CREW MODULE, SHOULD THE DECISION BE MADE FOR A NORMAL LANDING SEQUENCE AFTER THE VENT HAS BEEN SEVERED.

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FAILURE MODES EFFECTS ANALYSIS (FMEA) NUMBER: 07-2B-CRW1-02

SUBSYSTEM: CREW ESCAPE - SIDE HATCH JETTISON
ITEM NAME: VENT CHECK VALVE

REVISION: 09/14/88

FAILURE MODE: 1R2

FAILURE MODE:
FAILS TO CLOSE

MISSION PHASE:

RTLS RETURN TO LAUNCH SITE
TAL TRANS ATLANTIC ABORT
AOA ABORT ONCE AROUND
DO DE-ORBIT

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

CAUSE:

JAMMED/BENT SPRING MECHANISM, DEBRIS, STRUCTURAL FAILURE DUE TO PYRO SHOCK/SHRAPNEL

CRITICALITY 1/1 DURING ANY MISSION PHASE OR ABORT? N

REDUNDANCY SCREEN A) FAIL
B) FAIL
C) PASS

PASS/FAIL RATIONALE:

A)
REVERSE LEAKAGE OF VALVE CANNOT BE DETECTED DURING GROUND CHECKOUT.

B)
VALVE CANNOT BE CHECKED OUT DURING FLIGHT.

C)
NO SINGLE FAILURE CAN DISABLE BOTH THE VALVE AND THE LAUNCH ENTRY SUIT.

METHOD OF FAULT DETECTION:
NONE

CORRECTING ACTION: NONE
LIMITED ACCESS AREA PRECLUDES ANY CORRECTIVE ACTION BY CREW.

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(A) SUBSYSTEM:

IF, AFTER THE PYRO VENT IS SEVERED, IT IS DETERMINED THAT AN EMERGENCY EGRESS IS NOT NECESSARY THEN DURING NORMAL LANDING SEQUENCE THE MID-FUSELAGE MAY REPRESSURIZE FASTER THAN THE CREW CABIN. IF HAZARDOUS/TOXIC GAS IS PRESENT IN THE MID-FUSELAGE DUE TO A PAYLOAD LEAK THEN FAILURE OF A VALVE TO CLOSE WOULD RESULT IN A FLOW OF HAZARDOUS/TOXIC GAS INTO THE CREW CABIN.

(B) INTERFACING SUBSYSTEM(S):

SEE (D)

(C) MISSION:

SEE (D)

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

THE PRESENCE OF TOXIC GASSES COULD EFFECT THE ABILITY OF THE CREW TO FUNCTION RESULTING IN LOSS OF CREW/VEHICLE DURING NORMAL LANDING SEQUENCE. THIS EFFECT REQUIRES THE PREVIOUS LOSS OF THE LES.

Criticality/

Required Fault Tolerance/Achieved Fault Tolerance: 1R/1/1

RATIONALE FOR CRITICALITY:

FAILURE OF ONE VALVE TO CLOSE TOGETHER WITH AN LES FAILURE COULD RESULT IN LOSS OF A CREW MEMBER (S).

TIME FROM FAILURE TO CRITICAL EFFECT: SECONDS

TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS

TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: N/A

TIME REQUIRED TO IMPLEMENT CORRECTIVE ACTION LESS THAN TIME TO EFFECT? N/A

- DISPOSITION RATIONALE -

(A) DESIGN:

THE CHECK VALVE SUDDEN ACTUATION TEST PROGRAM IS STRUCTURED TO DEMONSTRATE THE ABILITY OF THE CHECK VALVE TO ACTUATE WHEN EXPOSED TO 13 PSI DIFFERENTIAL PRESSURE AND STILL SATISFY REVERSE LEAKAGE CRITERIA. THE REVERSE LEAKAGE REQUIREMENTS ENSURE THAT THE FLOW OF HAZARDOUS/TOXIC GASES FROM THE MID-FUSELAGE WILL NOT RESULT IN A CONCENTRATION THAT WOULD BE HARMFUL TO THE CREW.

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THE VALVES CONSIST OF A CIRCULAR RING AL ALLOY 356-T6 BODY WITH A CENTRAL CROSSBAR. THE CRES 302 STEEL HINGE IS LOCATED ABOVE THE CROSSBAR AND IS SUPPORTED BY CRES 303 STEEL POSTS AT EITHER END. THE AL ALLOY 356-T6 FLAPPER DOORS ARE "HALF-MOON" SHAPED AND ARE ATTACHED TO THE HINGE VIA TWO UPSTANDING LEGS. THE VALVE ROTATION IS ASSURED BY BEARINGS LOCATED IN THE END POSTS AND FLAPPER UPSTANDING LEGS.

(B) TEST:

QUALIFICATION TEST: THE CHECK VALVE SHALL BE CERTIFIED THROUGH THE CHECKVALVE SUDDEN ACTUATION TEST PROGRAM TR S114020. OPERATION AT 13 PSI PLUS OR MINUS 0.5 PSI DIFFERENTIAL PRESSURE SHALL BE VERIFIED. REVERSE LEAKAGE IS VERIFIED AFTER ACTUATION. THE RESULTS OF VENT TEST #5 AT EXPLOSIVE TECHNOLOGY, WHICH INCLUDED THE VENT VALVE CONTAINER STRUCTURE WITH TWO CHECK VALVES HAD NO VISIBLE EFFECT ON THE VALVES. THE VALVES WERE INTACT AND FUNCTIONAL AFTER SEVERING THE VENT PLATE. THE PYRO-VENT TESTS CONDUCTED ALL SHOWED DEBRIS FLYING FORWARD AWAY FROM THE VALVES.

ACCEPTANCE TEST: ACCEPTANCE TESTS AND INSPECTIONS SHALL BE PERFORMED ON ALL DELIVERABLE HARDWARE. ACCEPTANCE REQUIREMENTS INCLUDE: EXAMINATION OF PRODUCT, PROOF PRESSURE, LEAKAGE, AND CRACKING PRESSURE

OMRSD: VISUAL/MANUAL INSPECTION AFTER EVERY FLIGHT.

(C) INSPECTION:

RECEIVING INSPECTION
SUPPLIER CERTIFICATIONS OF PROCESSOR AND MATERIALS ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CLEANLINESS TO LEVEL VISIBLY CLEAN PER MA0110-301 IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

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

CRITICAL PROCESSES

ADHESIVE BONDING PROCESS IS VERIFIED BY INSPECTION. CORROSION PROTECTION PROCESSING SUCH AS PASSIVATION & ANODIZING OF MATERIAL AND ALODINE/EPOXY PRIMER OF THE BODY ARE VERIFIED BY INSPECTION.

TESTING

THE ATP IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PRESERVATION, PACKAGING AND PACKING TO NAS 3408 REQUIREMENTS ARE

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VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:
NO FAILURE HISTORY.

(E) OPERATIONAL USE:
NONE

REMARKS:

- APPROVALS -

RELIABILITY ENGINEERING: C. FERRARELLA
DESIGN ENGINEERING : H. SMITH
QUALITY ENGINEERING : E. GUTIERREZ
NASA RELIABILITY :
NASA DESIGN :
NASA QUALITY ASSURANCE :

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