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PRINT DATE: 04/01/92

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: 44-1BG-RV010-X

SUBSYSTEM NAME: ELECTRICAL POWER GENERATION - CRYO, GENERIC

REVISION: 1 11/12/91

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
■ LRU	RELIEF VALVE, O2 TANK	MC284-0440-0401
■	PARKER HANNIFIN	5750001-102

PART DATA

■ EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
RELIEF VALVE, O2 TANK

■ REFERENCE DESIGNATORS:

	40V45RV010
:	40V45RV020
:	40V45RV410
:	40V45RV460
:	40V45RV610
:	40V45RV762
:	40V45RV772
:	40V45RV782
:	40V45RV792

■ QUANTITY OF LIKE ITEMS: 1
ONE PER TANK

■ FUNCTION:
PROVIDES OVERPRESSURIZATION PROTECTION FOR O2 TANKS.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
 NUMBER: M4-1BG-RV010-02

SUBSYSTEM: ELECTRICAL POWER GENERATION - CRYO, GENERIC
 LRU :RELIEF VALVE, O2 TANK
 ITEM NAME: RELIEF VALVE, O2 TANK

REVISION# 1 11/12/91 R
 CRITICALITY OF THIS FAILURE MODE:1R2

■ FAILURE MODE:
 FAILS CLOSED

MISSION PHASE:

PL PRELAUNCH
 LO LIFT-OFF
 OO ON-ORBIT
 DO DE-ORBIT
 LS LANDING SAFING

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

■ CAUSE:
 CORROSION, VIBRATION, PHYSICAL BINDING/JAMMING

■ CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

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

PASS/FAIL RATIONALE:

■ A)
 ■ B)
 REDUNDANCY SCREEN B - N/A SINCE RELIEF VALVE IS CONSIDERED STANDBY
 REDUNDANT.
 ■ C)

- FAILURE EFFECTS -

■ (A) SUBSYSTEM:
 NO EFFECT AFTER FIRST FAILURE.

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- (B) INTERFACING SUBSYSTEM(S):
SAME AS (A)
- (C) MISSION:
SAME AS (A)
- (D) CREW, VEHICLE, AND ELEMENT(S):
SAME AS (A)
- (E) FUNCTIONAL CRITICALITY EFFECTS:
POSSIBLE LOSS OF CREW/VEHICLE DUE TO TANK RUPTURE IF AN ADDITIONAL FAILURE RESULTS IN TANK OVERPRESSURIZATION.

- DISPOSITION RATIONALE -

- (A) DESIGN:
15 MICRON FILTER INCORPORATED IN INLET OF RELIEF VALVE. CRYO PLUMBING CLEANED TO LEVEL 200A. ALL COMPONENTS ARE COMPATIBLE WITH WORKING FLUIDS. VALVE IS MOUNTED WITH BODY AXIS PERPENDICULAR TO VEHICLE X-AXIS TO MINIMIZE VIBRATION EFFECTS. BUILT IN THERMAL COMPENSATION BY THE USE OF BELLEVILLE SPRINGS. VALVE IS CONSTRUCTED OF CRES METALS, CARBON COMPOSITES (VESPEL), AND 6061-T651 ALUMINUM WHICH IS NOT IN CONTACT WITH THE WORKING FLUID.
- (B) TEST:
QUALIFICATION TESTS INCLUDED: MECHANICAL SHOCK (20 G), SINUSOIDAL VIBRATION (+/- 0.25 G PEAK), RANDOM VIBRATION (0.05 G SQ/HZ MAXIMUM FOR 48 MINUTES), OPERATING CYCLES (1500 AT AMBIENT AND 1400 AT LO2 TEMP), AND THERMALLY CYCLED 5 TIMES (START INITIALLY AT +200 DEG F AND FLOW UNTIL INLET TEMP DROPS TO -297 DEG F).

ACCEPTANCE INCLUDES FUNCTIONAL TEST WITH THERMAL CYCLES (AMBIENT TO +220 DEG F TO AMBIENT TO -300 DEG F TO AMBIENT). VALVE IS FURTHER FUNCTIONALLY VERIFIED DURING PANEL MODULAR ASSEMBLY AND SUBSYSTEM CHECKOUT.

OMRSD: RELIEF VALVE CRACK AND RESEAT TEST PERFORMED DURING EVERY ORBITER MAINTENANCE DOWN PERIOD (OMDP) OR IF VALVE OPERATED DURING THE PREVIOUS FLIGHT OR TURNAROUND.
- (C) INSPECTION:
RECEIVING INSPECTION
TEST REPORTS AND MATERIALS CERTIFICATIONS ARE MAINTAINED CERTIFYING MATERIALS AND PHYSICAL PROPERTIES.

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CONTAMINATION CONTROL
CLEANLINESS PER SPECIFICATION TO LEVEL 200A IS VERIFIED BY INSPECTION.
ASSEMBLY/INSTALLATION
ALL PARTS ARE PROTECTED FROM DAMAGE AND CONTAMINATION. DIMENSIONAL AND SURFACE FINISH ARE VERIFIED. ALL SURFACES REQUIRING CORROSION PROTECTION ARE CERTIFIED. MANDATORY INSPECTION POINTS ARE INCLUDED IN THE ASSEMBLY PROCEDURE.

CRITICAL PROCESSES
PASSIVATION AND APPLICATION OF BRAYCOTE LUBE IS VERIFIED BY INSPECTION.
NONDESTRUCTIVE EVALUATION
ALL INTERNAL WELDS ARE VERIFIED BY THE FOLLOWING INSPECTIONS: 4X VISUAL, DIMENSIONAL, DYE PENETRANT, AND RADIOGRAPHIC EXAMINATION.

TESTING
PROOF PRESSURE TESTING DURING ATP VERIFIES STRUCTURAL INTEGRITY OF THE VALVE AND IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING
PACKAGING FOR SHIPMENT IS VERIFIED BY INSPECTION.

- (D) FAILURE HISTORY:
THERE HAVE BEEN NO ACCEPTANCE TEST, QUALIFICATION TEST, FIELD OR FLIGHT FAILURES ASSOCIATED WITH THIS FAILURE MODE.
- (E) OPERATIONAL USE:
CREW WILL RESPOND TO TANK OVERPRESSURE ANNUNCIATION BY DEACTIVATING AFFECTED TANK HEATERS.

- APPROVALS -

RELIABILITY ENGINEERING:	M. D. WEST	:	<i>M. D. West</i>
DESIGN ENGINEERING	: M. H. SCHEIERN	:	<i>M. H. Scheiern</i>
QUALITY MANAGER	: D. J. BUTTNER	:	<i>D. J. Buttner</i>
NASA RELIABILITY	:	:	<i>[Signature]</i>
NASA SUBSYSTEM MANAGER	:	:	<i>[Signature]</i>
NASA QUALITY ASSURANCE	:	:	<i>[Signature]</i> 4/19/92