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

NUMBER: M4-1BG-VP035-X

SUBSYSTEM NAME: ELECTRICAL POWER GENERATION - CRYO, GENERIC

REVISION: 1 11/12/91

|         | PART NAME<br>VENDOR NAME | PART NUMBER<br>VENDOR NUMBER |
|---------|--------------------------|------------------------------|
| ■ LRU : | VENT. H2 NO. 1           | V070-454721-001              |

## PART DATA

■ ~~EXTENDED~~ DESCRIPTION OF PART UNDER ANALYSIS:  
VENT. PORT, H2

■ ~~REFERENCE~~ DESIGNATORS: 40V45VP035

■ ~~QUANTITY~~ OF LIKE ITEMS: 1  
ONE PER VEHICLE

■ ~~FUNCTION~~:  
PROVIDES VENTING CAPABILITY FOR H2 TANK ASSEMBLIES 1, 2 AND 4 AS PART  
OF THE PRESSURE RELIEF SYSTEM.

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FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE  
NUMBER: M4-1BG-VP035-01

SUBSYSTEM: ELECTRICAL POWER GENERATION - CRYO, GENERIC  
LRU : VENT. H2 NO. 1  
ITEM NAME: VENT. H2 NO. 1

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

- FAILURE MODE:  
PLUGGED OR RESTRICTED

## MISSION PHASE:

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

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

- CAUSE:  
CONTAMINATION

- CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

- REDUNDANCY SCREEN A) PASS
- B) N/A
- C) FAIL

## PASS/FAIL RATIONALE:

- A)
- B)  
REDUNDANCY SCREEN B - N/A SINCE PORT PROVIDES RELIEF PATH FOR TANK  
RELIEF VALVES WHICH ARE STANDBY REDUNDANT.
- C)  
REDUNDANCY SCREEN C - FAILS SINCE PORT PROVIDES RELIEF PATH FOR H2 TANK  
ASSEMBLIES 1, 2 AND 4.

## - FAILURE EFFECTS -

- (A) SUBSYSTEM:  
SUBSYSTEM DEGRADATION - LOSS OF H2 TANK RELIEF CAPABILITY.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE  
NUMBER: M4-18G-VPO35-01

- (B) INTERFACING SUBSYSTEM(S):  
NO EFFECT AFTER FIRST FAILURE
- (C) MISSION:  
NO EFFECT AFTER FIRST FAILURE
- (D) CREW, VEHICLE, AND ELEMENT(S):  
NO EFFECT AFTER FIRST FAILURE
- (E) FUNCTIONAL CRITICALITY EFFECTS:  
POSSIBLE LOSS OF CREW/VEHICLE DUE TO H2 TANK RUPTURE IF AN ADDITIONAL FAILURE RESULTS IN TANK OVERPRESSURIZATION.

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- DISPOSITION RATIONALE -  
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- (A) DESIGN:  
45 MICRON FILTER SCREEN IN RELIEF VALVE. VENT PORT IS A 3/4 INCH FITTING WHICH CONNECTS TO A DYNATUBE FITTING AND THEN THROUGH SEVERAL FEET OF 5/8 INCH TUBING TO THE RELIEF VALVE. ALL CRES CONSTRUCTION. CAP IS INSTALLED DURING FERRY FLIGHT. RELIEF LINE IS ANGLED DOWNWARD TO THE PORT IN VERTICAL AND HORIZONTAL VEHICLE ORIENTATIONS TO PREVENT COLLECTION OF RAINWATER.
- (B) TEST:  
PLUMBING ASSEMBLY QUALIFICATION TEST INCLUDED; VIBRATION - RANDOM (0.01 G SQ/HZ MAXIMUM), SINUSOIDAL (+/- 0.25 G PEAK) AND ACOUSTIC (25 TO 8000 HZ, 130-148 DB) FOR 175 MISSION EQUIVALENT. 100 THERMAL CYCLES (AMBIENT/CRYO/+200 DEG F/AMBIENT/CRYO/AMBIENT).  
  
CRYO PLUMBING CLEANED AND VERIFIED TO LEVEL 200A BY PARTICLE COUNT AND NON-VOLATILE RESIDUE AFTER INSTALLATION. PREFLIGHT AND POST FLIGHT VISUAL CHECKS VERIFIED THAT VENT PORT IS OPEN.  
  
{ CMRSO: DURING TURNAROUND, PERFORM VISUAL INSPECTION. MONITOR RELIEF VALVE CRACK TEST FOR FLOW DURING EVERY ORBITER MAINTENANCE DOWN PERIOD (OMDP) OR IF FLOW WAS REQUIRED DURING THE PREVIOUS FLIGHT.
- (C) INSPECTION:  
CONTAMINATION CONTROL  
CLEANED TO LEVEL 200A, OF CLEANING SPECIFICATION, AND MAINTAINED DURING ASSEMBLY. VERIFIED BY INSPECTION ON MANUFACTURING ORDERS.
- (D) FAILURE HISTORY:  
THERE HAVE BEEN NO ACCEPTANCE TEST, QUALIFICATION TEST, FIELD OR FLIGHT FAILURES ASSOCIATED WITH THIS FAILURE MODE.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE

NUMBER: M4-1BG-VPO35-01

■ (E) OPERATIONAL USE:

NO CREW ACTION AFTER FIRST FAILURE. AFTER SECOND FAILURE, CREW WILL DEACTIVATE ASSOCIATED TANK HEATERS IN RESPONSE TO HIGH PRESSURE FAULT ANNUNCIATION.

- APPROVALS -

RELIABILITY ENGINEERING: M. D. WEST  
 DESIGN ENGINEERING : M. M. SCHEIERN  
 QUALITY MANAGER : O. J. BLTNER  
 NASA RELIABILITY :  
 NASA SUBSYSTEM MANAGER :  
 NASA QUALITY ASSURANCE :

: M D West E. J. O'Leary  
 : M M Scheiern  
 : O J Bltner  
 : M M Scheiern  
 : Approved West 4/19/92  
 : O J Bltner 4/19/92