FAILURE MODES EFFECTS ANALYSIS (FMEA) – CRITICAL HARDWARE
NUMBER: 03-1-0431 -X

SUBSYSTEM NAME: MAIN PROPULSION

REVISION: 1 09/23/94

		PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:	VALVE, BALL (TYPE 3) EATON CONSOLIDATED CONTROLS	MC284-0395-0053 1440-511

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
VALVE, LH2 HIGH POINT BLEED 1.5 INCH. NORMALLY CLOSED, PNEUMATICALLY ACTUATED OPEN. INCORPORATES RELIEF VALVE.

REFERENCE DESIGNATORS: PV22

QUANTITY OF LIKE ITEMS: 1
ONE

FUNCTION:
THIS VALVE CONTROLS THE FLOW OF GH2 BLEED FROM THE LH2 17-INCH DISCONNECT (WHICH IS THE HIGH POINT IN THE ENGINE FEED SYSTEM) OVERBOARD THROUGH THE HIGH POINT BLEED DISCONNECT (PD17) INTO THE GROUND VENT SYSTEM. THE VALVE IS ACTUATED OPEN AT THE START OF SLOW FILL TO BLEED OFF ANY GH2 ACCUMULATED IN THE FEEDLINE DURING LOADING OPERATIONS. VALVE IS CLOSED APPROXIMATELY TWENTY SIX SECONDS PRIOR TO LIFTOFF. THE VALVE INCORPORATES A RELIEF FEATURE WHICH RELIEVES THE LINE BETWEEN THE HIGH POINT BLEED DISCONNECT AND THE BLEED VALVE BACK INTO THE FEEDLINE. THE BLEED DISCONNECT ACTS AS A REDUNDANT INHIBIT AGAINST OVERBOARD FLOW AFTER LH2 TSM UMBILICAL SEPARATION.

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NONCRITICAL FAILURE MODE
NUMBER: 03-1-0431 - 01

REVISION# 05/01/95

SUBSYSTEM NAME: MAIN PROPULSION
LRU: VALVE, BALL (TYPE 3)
ITEM NAME: VALVE, BALL (TYPE 3)

CRITICALITY OF THIS FAILURE MODE: 1R3

FAILURE MODE:
FAILS TO OPEN/REMAIN OPEN DURING TERMINAL COUNT

MISSION PHASE:
PL PRELAUNCH

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

CAUSE:
FAILS TO OPEN - PIECE PART STRUCTURAL FAILURE, ACTUATOR LEAKAGE, BINDING, ACTUATOR FILTER CLOGGING.

FAILS TO REMAIN OPEN - PIECE PART STRUCTURAL FAILURE, ACTUATOR LEAKAGE.

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN
A) PASS
B) PASS
C) PASS

PASS/FAIL RATIONALE:
A)

B)
PASSES B SCREEN - FOR THIS FAILURE MODE, POSITION INDICATION SWITCHES CORRECTLY INDICATE VALVE CLOSURE DEVICE POSITION.

C)

CORRECTING ACTION:
FLIGHT: N/A

GROUND: OMI S1004 (LH2 SYSTEM) SEQUENCE TITLED "EMERGENCY PROCEDURE FOR MAJOR LEAK OR FIRE..." CONTAINS SAFING SEQUENCE OF EVENTS FOR MAJOR LEAKS IN THE PROPELLANT SYSTEMS.

REMARKS/RECOMMENDATIONS:
NONE

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NUMBER: 03-1-0431 - 01

- FAILURE EFFECTS -

(A) SUBSYSTEM:
GH2 WILL ACCUMULATE IN LH2 17-INCH MANIFOLD PRIOR TO ENGINE START.

LCC MONITORS LH2 17-INCH MANIFOLD DISCONNECT AND HIGH POINT BLEED TEMPERATURE TRANSDUCERS UP TO T-31 SECONDS TO VERIFY BY THE ABSENCE OF GH2 THAT THE HIGH POINT BLEED VALVE REMAINS OPEN. ADDITIONALLY, BLEED VALVE CLOSE POSITION SWITCH IS VERIFIED OFF BETWEEN START OF SLOW FILL (APPROXIMATELY T-6 HOURS) AND T-31 SECONDS (ENGINEERING REQUIREMENT).

THIS FMEA WAS REVISED TO REFLECT UPDATED LCC TEMPERATURE MONITORING REQUIREMENTS FROM DISCRETE TO CONTINUOUS MONITORING UP TO T-31 SECONDS AND TO ADD THE CLOSE INDICATION MONITORING.

(B) INTERFACING SUBSYSTEM(S):
GH2 WILL ACCUMULATE IN LH2 17-INCH MANIFOLD PRIOR TO ENGINE START.

LCC MONITORS LH2 17-INCH MANIFOLD DISCONNECT AND HIGH POINT BLEED TEMPERATURE TRANSDUCERS UP TO T-31 SECONDS TO VERIFY BY THE ABSENCE OF GH2 THAT THE HIGH POINT BLEED VALVE REMAINS OPEN. ADDITIONALLY, BLEED VALVE CLOSE POSITION SWITCH IS VERIFIED OFF BETWEEN START OF SLOW FILL (APPROXIMATELY T-6 HOURS) AND T-31 SECONDS (ENGINEERING REQUIREMENT).

(C) MISSION:
LAUNCH SCRUB DUE TO LCC VIOLATION.

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT - FIRST FAILURE

(E) FUNCTIONAL CRITICALITY EFFECTS:
1R/3, 4 PATH SCENARIO. TIME FRAME - PRELAUNCH.

1) HIGH POINT BLEED VALVE (PV22) FAILS TO REMAIN OPEN.
2) HIGH POINT BLEED VALVE (PV22) CLOSE INDICATION FAILS OFF.
3) LH2 17-INCH MANIFOLD DISCONNECT TEMPERATURE TRANSDUCER ERRONEOUSLY INDICATES WITHIN LCC LIMITS.
4) FACILITY HIGH POINT BLEED TEMPERATURE TRANSDUCER ERRONEOUSLY INDICATES WITHIN LCC LIMITS.

ACCUMULATED GH2 WILL BE INGESTED INTO THE ENGINES AT START, RESULTING IN POSSIBLE UNCONTAINED ENGINE DAMAGE DUE TO PUMP CAVITATION. POSSIBLE LOSS OF CREW/VEHICLE.

PRINT DATE: 05/11/95

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- APPROVALS -

PRODUCT ASSURANCE ENGR	: T. K. KIMURA	: T Kimura 5/11/95
DESIGN ENGINEERING	: H. WOLFSON	: H. Wolfson 5/11/95