PRINT DATE: 07/29/98

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 02-6-C10 -X

SUBSYSTEM NAME: HYDRAULICS

REVISION: 1 07/24/98

PART DATA

	PART NAME / **VENDOR NAME**	**PART NUMBER** / **VENDOR NUMBER**
LRU	: VALVE, CHECK CRISSAIR	ME284-0434

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
VALVE, CHECK, UMBILICAL ACTUATOR CIRCUIT AFT FUSELAGE RETURN LINE

REFERENCE DESIGNATORS:
50V58CV35
50V58CV36
50V58CV37
50V58CV38
50V58CV39
50V58CV40

QUANTITY OF LIKE ITEMS: 6
ONE EACH RETURN LINE FROM SIX ACTUATORS

FUNCTION:
ISOLATES THE UMBILICAL RETRACT ACTUATOR FROM REVERSE FLOW AND ABNORMAL RETURN LINE PRESSURES WHICH COULD AFFECT ACTUATOR PERFORMANCE OR CAUSE ACTUATOR STRUCTURAL DAMAGE.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE
NUMBER: 02-6-C10-02

REVISION#: 1 07/24/98

SUBSYSTEM NAME: HYDRAULICS
LRU: VALVE, CHECK
ITEM NAME: VALVE, CHECK

CRITICALITY OF THIS FAILURE MODE: 1R2

FAILURE MODE:
FAILS CLOSED

MISSION PHASE:
LO LIFT-OFF
DO DE-ORBIT

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

CAUSE:
CONTAMINATION, BINDING

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN
A) PASS
B) FAIL
C) PASS

PASS/FAIL RATIONALE:
A)

B)
"B" SCREEN IS FAILED BECAUSE NO INSTRUMENTATION EXISTS DURING FLIGHT TO MONITOR INDIVIDUAL ACTUATOR RETRACTION.

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF ONE OF THREE UMBILICAL RETRACT ACTUATOR FUNCTIONS.

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(B) INTERFACING SUBSYSTEM(S):
FIRST FAILURE - NO EFFECT. FUNCTION CAN BE PERFORMED BY TWO OF THE THREE UMBILICAL RETRACT ACTUATORS. HOWEVER, SINGLE ACTUATOR RETRACT HAS NOT BEEN CERTIFIED. WITH LOSS OF SECOND ASSOCIATED ACTUATOR ORBITER TO ET UMBILICAL PLATE MAY COCK AT SEPARATION DUE TO GUIDE PIN HANGUP. GUIDE PINS ARE CLOSE TOLERANCE SO THE PLATE MUST PULL BACK STRAIGHT FOR FIRST QUARTER OF AN INCH OF TRAVEL. DAMAGE OF THE 17 INCH QD FLAPPER/LINKAGE COULD RESULT AND PREVENT QD CLOSURE. SHOULD ET SIDE FLAPPER FAIL TO CLOSE, ET AND VEHICLE CONTACT COULD OCCUR (CRITICALITY 1). SHOULD VEHICLE SIDE FLAPPER FAIL TO CLOSE, SYSTEM WOULD GO TO DELAYED ET SEPARATION, RESULTING IN TILE DEBONDING AND ET UMBILICAL DOOR SEAL DAMAGE (CRITICALITY 1). ADDITIONALLY, LOSS OF SECOND ASSOCIATED ACTUATOR COULD CAUSE EXCEEDANCE OF MAXIMUM ALLOWABLE PLATE RETRACT VELOCITY OF 1.1 IN/SEC. THIS COULD LEAD TO DAMAGED OR BROKEN REDUNDANT VALVE CLOSURE LINKAGE AND INTERFERENCE WITH ET UMBILICAL DOOR CLOSURE. IMPROPER DOOR CLOSURE WOULD RESULT IN CRITICAL HEATING DURING REENTRY (CRITICALITY 1).

(C) MISSION:
FIRST FAILURE - NO EFFECT POSSIBLE LOSS OF CREW/VEHICLE WITH LOSS OF SECOND ASSOCIATED ACTUATOR

(D) CREW, VEHICLE, AND ELEMENT(S):
SAME AS (C)

(E) FUNCTIONAL CRITICALITY EFFECTS:
POSSIBLE LOSS OF CREW/VEHICLE WITH TWO FAILURES: CHECK VALVE FAILS CLOSED, PLUS LOSS OF UNASSOCIATED HYDRAULIC SYSTEM OR SECOND ACTUATOR DURING ASCENT, RESULTING IN IMPROPER RETRACTION OF ET UMBILICAL PLATE.

-DISPOSITION RATIONALE-

(A) DESIGN:
VALVE IS DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF MIL-V-25675, GENERAL REQUIREMENTS FOR CHECK VALVE, MINIATURE, HYDRAULIC, AIRCRAFT AND MISSILE. HIGH SYSTEM DELTA PRESSURE ACROSS THE VALVE WILL TEND TO OVERCOME ANY INCREASED CRACKING PRESSURE DUE TO CONTAMINATION AND MAINTAIN VALVE IN OPEN POSITION DURING ASCENT. SPRING DESIGN WILL CAUSE BROKEN SPRING TO NEST AND VALVE WILL TEND TO FAIL IN OPEN POSITION HYDRAULIC SYSTEM FILTER IS 5 MICRON NOMINAL, 15 MICRON ABSOLUTE. A PARTICLE

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AT LEAST 0.17 INCH LONG AND 0.0357 INCH DIAMETER WOULD BE REQUIRED TO HOLD THE CHECK VALVE CLOSED.

(B) TEST:
QUALIFICATION:

- RANDOM VIBRATION - WITH 5 GPM FLUID FLOW. PERFORM VIBRATION TEST FOR 48 MINUTES IN EACH AXIS (LEVEL A). REPEAT FOR 12.5 HOURS IN EACH AXIS (LEVEL B). PASS/FAIL CRITERIA: UNIT MUST PASS SUBSEQUENT LEAKAGE, CHECKING TIME, AND CRACKING TEST

ACCEPTANCE.
EXAMINATION OF PRODUCT - WEIGHT, WORKMANSHIP, FINISH, DIMENSIONS, AND CONSTRUCTION.

- PROOF PRESSURE - TESTED AT 4,500 PSIG IN BOTH DIRECTIONS. PASS/FAIL CRITERIA: NO INTERNAL OR EXTERNAL LEAKAGE.
- CHECKING TIME TEST - WITH VALVE IN VERTICAL POSITION, UNSEAT POPPET TO FULL OPEN AND ALLOW TO CHECK, THEN DROP HEAD PRESSURE FROM 5 TO 1 PSIG. PASS/FAIL CRITERIA: 1.5 SECONDS OR LESS AFTER RELEASE OF POPPET TO FLOW CESSATION.
- CRACKING PRESSURE TEST - INCREASE PRESSURE STARTING AT 0 PSI. PASS/FAIL CRITERIA: PRESSURE AT FLOW GREATER THAN 2 CC/MIN SHALL BE 5+/-3 PSIG.
- PRESSURE DROP TEST - ESTABLISH FLUID FLOW THROUGH VALVE OF 0-94 5 GPM. PASS/FAIL CRITERIA: PRESSURE DROP SHALL EXCEED 23 PSID
- VALVE CLEANLINESS TEST - LEVEL 190 PER MAO110-301.

GROUND TURNAROUND TEST
ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:
RECEIVING INSPECTION
RECEIVING INSPECTION VERIFIES MATERIAL AND PROCESSES CERTIFICATION.

CONTAMINATION CONTROL
CLEANLINESS CONTROLS AT CRISSAIR ARE PER NAS1638 AS IMPOSED BY THE BUYER. WHEN THE HARDWARE IS DELIVERED, CONTAMINATION IS CLOSELY CONTROLLED PER MAO110-301 LEVEL 190. THE HARDWARE IS VAPOR DEGREASED AND ULTRASONICALLY CLEANED PRIOR TO INSTALLATION.

CRITICAL PROCESSES
PASSIVATION AND HEAT TREATING ARE VERIFIED BY INSPECTION.

NDE
PENETRANT INSPECTION OF POPPET IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
MANUFACTURING/ASSEMBLY PROCESSES ARE VERIFIED BY INSPECTION.

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TESTING
ATP (PROOF, LEAKAGE. CRACKING PRESSURE EXAMINATION OF PRODUCT) IS VERIFIED BY RI INSPECTION.

HANDLING/PACKAGING
HARDWARE SHIPMENT IS IN A HEAT SEALED POLYETHYLENE BAG INSIDE A SHIPPING BOX.

(D) FAILURE HISTORY:
CURRENT DATA ON TEST FAILURES, FLIGHT FAILURES. UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE FOUND IN THE PRACA DATA BASE.

(E) OPERATIONAL USE:
NONE

- APPROVALS -

EDITORIALLY APPROVED	: BNA	: J. Kimura 7-30-98
TECHNICAL APPROVAL	: VIA APPROVAL FORM	: 95-CIL-009_02-6