

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE

NUMBER: 03-1-0258 -X

SUBSYSTEM NAME: MAIN PROPULSION

REVISION: 2 08/10/00

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	:SSME GHE INLET SUPPLY CHECK VALVE CIRCLE SEAL	ME284-0472-0012 P69-180

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

HELIUM SUPPLY CHECK VALVE, 0.38 INCH.

REFERENCE DESIGNATORS:

- CV25
- CV26
- CV36
- CV37
- CV41
- CV42

QUANTITY OF LIKE ITEMS: 6
TWO PER ENGINE

FUNCTION:

PREVENTS BACK FLOW OF HELIUM FROM PNEUMATIC SUPPLY TANK INTO THE ENGINE SUPPLY TANKS (3 DEDICATED PER ENGINE) WHEN THE INTERCONNECT "IN" SOLENOID VALVES ARE OPEN. PARALLEL REDUNDANT CHECK VALVES ARE PROVIDED IN EACH ENGINE SUPPLY.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 03-1-0258-04

REVISION#: 2 08/10/00

SUBSYSTEM NAME: MAIN PROPULSION

LRU: SSME GHE INLET SUPPLY CHECK VALVE

ITEM NAME: SSME GHE INLET SUPPLY CHECK VALVE

CRITICALITY OF THIS

FAILURE MODE: 1/1

FAILURE MODE:

RUPTURE/LEAKAGE

MISSION PHASE:

PL PRE-LAUNCH
LO LIFT-OFF
DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102 COLUMBIA
103 DISCOVERY
104 ATLANTIS
105 ENDEAVOUR

CAUSE:

MATERIAL DEFECT, FATIGUE

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN

A) N/A
B) N/A
C) N/A

PASS/FAIL RATIONALE:

A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

DURING ASCENT, HELIUM SUPPLY TO ONE ENGINE WILL BE LOST. ESCAPING HELIUM MAY OVERPRESSURIZE THE AFT COMPARTMENT.

DURING ENTRY, VENT DOORS ARE CLOSED TO PREVENT INGESTION OF RCS AND APU GASES. RUPTURE DURING THE TIME PERIOD THAT THE VENT DOORS ARE CLOSED MAY

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 03-1-0258-04**

RESULT IN OVERPRESSURIZATION OF THE AFT COMPARTMENT. VENT DOORS ARE OPENED WHEN VEHICLE VELOCITY DROPS BELOW 2400 FT/SEC.

EXCESSIVE HELIUM LEAKAGE WILL BE DETECTABLE USING HAZARDOUS GAS DETECTION SYSTEM (HGDS).

(B) INTERFACING SUBSYSTEM(S):
SAME AS A.

(C) MISSION:
ON GROUND, POSSIBLE LAUNCH SCRUB DUE TO LCC VIOLATION.

(D) CREW, VEHICLE, AND ELEMENT(S):
POSSIBLE LOSS OF CREW/VEHICLE.

(E) FUNCTIONAL CRITICALITY EFFECTS:
NONE.

-DISPOSITION RATIONALE-

(A) DESIGN:
THE CHECK VALVE IS A POPPET TYPE, SPRING LOADED AND PRESSURE ASSISTED TO THE CLOSED POSITION. THE POPPET AND SPRING ARE CONTAINED IN A THREADED HOUSING AND END CAP. THE SEAL IS A SELF-CENTERING TEFLON O- RING. THE VALVE BODY PROVIDES A GUIDE FOR THE POPPET TRAVEL. THE VALVE BODY IS DESIGNED TO A FACTOR OF SAFETY OF 2.0 PROOF AND 4.0 BURST.

THE THREADED HOUSING AND END CAP ARE MANUFACTURED FROM 21-6-9 CRES. THE END CAP IS THREADED INTO THE HOUSING (TORQUED TO 22 FT-LBS) AND EB WELDED TO SEAL THE JOINT.

(B) TEST:
ATP

EXAMINATION OF PRODUCT
AMBIENT TEMPERATURE TESTS
BODY PROOF PRESSURE (9090 PSIG)
CLOSURE DEVICE PROOF PRESSURE (9090 PSIG)
EXTERNAL LEAKAGE (4500 PSIG)
INTERNAL LEAKAGE (5, 50, 300, 4500 PSIG)

LOW TEMPERATURE TESTS (-160 DEG F)

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 03-1-0258-04**

CRACKING AND RESEAT PRESSURE: 3 CYCLES
CRACKING PRESSURE 5 PSID MAX
RESEAT PRESSURE 2 PSID MIN
INTERNAL LEAKAGE (5, 50, 300, 4500 PSIG)

CERTIFICATION

FLOW TEST (0.05 LB/SEC HE)
MAX INLET PRESSURE 4200 PSIG
PRESSURE DROP (10 PSID MAX)

CHATTER TEST (4200 TO 0 PSIG)
RECORD FLOW RATE WHEN CHATTER OCCURS

CRACKING AND RESEAT PRESSURE
AMBIENT AND LOW TEMPERATURE (-160 DEG F): 3 CYCLES EACH
CRACKING PRESSURE 5 PSID MAX
RESEAT PRESSURE 2 PSID MIN

INTERNAL LEAKAGE
AMBIENT (0 TO 4500 PSIG)
LOW TEMPERATURE (-160 DEG F, 0 TO 4500 PSIG)

LIFE CYCLE TEST

ONE CYCLE CONSISTS OF INLET PRESSURE OF 4200 PSIG FOLLOWED BY CHECKING
PRESSURE OF 4500 PSIG

AMBIENT
4000 CYCLES FOLLOWED BY CRACKING, RESEATING, AND LEAKAGE TESTS

LOW TEMPERATURE (-160 DEG F)
1000 CYCLES FOLLOWED BY CRACKING, RESEATING, INTERNAL LEAKAGE, FLOW,
PRESSURE DROP, AND EXTERNAL LEAK TESTS

EXTERNAL LEAKAGE TEST (1 SCCH MAXIMUM AT 4500 PSIG)

VIBRATION AND SHOCK (AMBIENT TEMPERATURE AND PRESSURE)
BY SIMILARITY TO VALVE TYPES III, IVR, AND V (RI DASH NUMBERS -0003, - 0005, AND -0014
RESPECTIVELY). THESE UNITS WERE TESTED IN EACH OF TWO AXIS 48 MINUTES FOR
RANDOM VIBRATIONS AND SUBJECTED TO A SWEEP CYCLE TO COVER SHOCK
REQUIREMENTS.

BURST PRESSURE (18,000 PSIG)

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

(C) INSPECTION:
RECEIVING INSPECTION

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 03-1-0258-04**

ALL RAW MATERIALS ARE VERIFIED FOR MATERIAL AND PROCESS CERTIFICATION. RECEIVING INSPECTION VERIFIES CERTIFICATION OF SPRING HEAT TREATMENT AND PERFORMS LOAD TEST OF SPRINGS.

CONTAMINATION CONTROL

ALL PARTS AND ASSEMBLIES ARE MAINTAINED TO CLEANLINESS LEVEL OF 100A.

ASSEMBLY/INSTALLATION

DIMENSIONS AND SURFACE FINISHES ARE VERIFIED BY INSPECTION. REQUIRED TORQUES ARE VERIFIED PRIOR TO WELDING. INSPECTION POINTS ARE ESTABLISHED TO VERIFY ASSEMBLY PROCESS. WELDS ARE VISUALLY VERIFIED BY 10X MAGNIFICATION.

CRITICAL PROCESSES

ALL WELDING, ELECTROPOLISHING AND PARTS PASSIVATION ARE VERIFIED BY INSPECTION. DRY FILM LUBRICANT COATED THREADS ARE VERIFIED PER DRAWING REQUIREMENT.

NONDESTRUCTIVE EVALUATION

HELIUM LEAKAGE DETECTION IS PERFORMED.

TESTING

ATP IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PACKAGING FOR SHIPMENT IS VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:

CURRENT DATA ON TEST FAILURE, FLIGHT FAILURE, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE FOUND IN THE PRACA DATABASE.

(E) OPERATIONAL USE:

NO CREW ACTION CAN BE TAKEN.

- APPROVALS -

S&R ENGINEERING	: W.P. MUSTY	:/S/ W. P. MUSTY
S&R ENGINEERING ITM	: P. A. STENGER-NGUYEN	:/S/ P. A. STENGER-NGUYEN
DESIGN ENGINEERING	: MIKE FISCHER	:/S/ MIKE FISCHER
MPS SUBSYSTEM MGR.	: TIM REITH	:/S/ TIM REITH
MOD	: BILL LANE	:/S/ BILL LANE
USA SAM	: MIKE SNYDER	:/S/ MIKE SNYDER
USA ORBITER ELEMENT	: SUZANNE LITTLE	:/S/ SUZANNE LITTLE
NASA SR&QA	: ERICH BASS	:/S/ ERICH BASS