FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 03-1-0262 -X

SUBSYSTEM NAME: MAIN PROPULSION

REVISION: 2 07/25/00

PART DATA

	PART NAME / **VENDOR NAME**	**PART NUMBER** / **VENDOR NUMBER**
LRU	: HIGH PRESSURE TWO WAY SOLENOID VALVE, NC TYPE 1	MC284-0403-0021
	UNITED SPACE ALLIANCE - NSLD	12199-5

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
TWO WAY, PILOTED SOLENOID VALVE, HELIUM SUPPLY INTERCONNECT "OUT", NORMALLY CLOSED, 0.375 INCH DIAMETER.

VALVE WAS ORIGINALLY DESIGNED AND MANUFACTURED BY WRIGHT COMPONENTS (NOW PERKIN ELMER) BUT IS NOW MANUFACTURED BY UNITED SPACE ALLIANCE-NSLD AS AN ALTERNATE PRODUCTION AGENCY.

REFERENCE DESIGNATORS: LV60
LV62
LV64

QUANTITY OF LIKE ITEMS: 3
ONE PER ENGINE HE SUPPLY

FUNCTION:
PROVIDES CONTROL OF THE FLOW PATH OF HELIUM FROM A PARTICULAR ENGINE HELIUM SUPPLY SYSTEM TO EITHER THE PNEUMATIC HELIUM SYSTEM OR ANOTHER ENGINE HELIUM SUPPLY SYSTEM. THE ENGINE 1 AND 3 VALVES ARE OPENED AT MECO PLUS 20 SECONDS TO ALLOW THEIR HELIUM SUPPLIES TO SUPPLEMENT THE PNEUMATIC AND ENGINE 2 HELIUM SUPPLIES DURING THE MPS DUMP SEQUENCES. THE SAME VALVES ARE ALSO OPENED DURING ENTRY TO SUPPLEMENT THE ENGINE 2 AND PNEUMATIC HELIUM SUPPLIES FOR MPS ENTRY REPRESSURIZATION AND AFT COMPARTMENT/OMS POD PURGE.

FAILURE MODES EFFECTS ANALYSIS FMEA -- NON-CIL FAILURE MODE

NUMBER: 03-1-0262-02

REVISION#: 2 07/25/00

SUBSYSTEM NAME: MAIN PROPULSION
LRU: VALVE SOLENOID, NC 2W **CRITICALITY OF THIS**
ITEM NAME: SSME GHE SUPPLY I/C OUT VALVE (LV60, 62, 64) **FAILURE MODE:** 1R3

FAILURE MODE:
FAILS TO CLOSE/REMAIN CLOSED, INTERNAL LEAKAGE

MISSION PHASE: LO LIFT-OFF

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102	COLUMBIA
103	DISCOVERY
104	ATLANTIS
105	ENDEAVOUR

CAUSE:
BINDING, CONTAMINATION, PIECE PART STRUCTURAL FAILURE.

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN

A) PASS
B) N/A
C) PASS

PASS/FAIL RATIONALE:
A)

B)
INTERCONNECT OUT VALVE IS STANDBY REDUNDANT TO HELIUM SYSTEM LEAK.

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF ISOLATION BETWEEN THE ENGINE AND PNEUMATIC SYSTEMS.

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

(C) MISSION:
NO EFFECT.

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

(E) FUNCTIONAL CRITICALITY EFFECTS:
1R/3 3 SUCCESS PATHS. TIME FRAME - ASCENT.

1) INTERCONNECT OUT VALVE FAILS TO CLOSE/REMAIN CLOSED/INTERNAL LEAKAGE.
2) INTERCONNECT LINE LEAKAGE BETWEEN OUT VALVE AND ASSOCIATED CHECK VALVE CAUSING RESPECTIVE ENGINE REDLINE SHUTDOWN. REMAINING ENGINES ARE LIMIT SHUTDOWN INHIBITED BY VEHICLE SOFTWARE.
3) ANOTHER SSME EXCEEDS REDLINE BEFORE CREW CAN RE-ENABLE SSME REDLINE LIMITS.

RESULTS IN UNCONTAINED ENGINE DAMAGE DUE TO REDLINE EXCEEDANCE WHILE LIMIT SHUTDOWN IS INHIBITED. POSSIBLE LOSS OF CREW/VEHICLE.

-DISPOSITION RATIONALE-

(A) DESIGN:
THE VALVE IS A PILOT OPERATED SOLENOID VALVE CONTROLLING THE APPLICATION OF VALVE INLET PRESSURE TO THE POPPET. THE POPPET IS PART OF A RING ASSEMBLY (PISTON) THAT IS SPRING LOADED TO THE CLOSED POSITION. THE VALVE INLET PRESSURE IS ALWAYS EXERTING AN OPENING FORCE ON THE PISTON. WHEN THE SOLENOID IS DEENERGIZED, THE PILOT VALVE DIRECTS THE INLET PRESSURE TO THE CLOSING SIDE OF THE POPPET, UNBALANCING THE FORCE FROM THE INLET SIDE. THIS ALLOWS THE SPRING FORCE PLUS THE PRESSURE-AREA DIFFERENTIAL FORCE TO HOLD THE VALVE CLOSED. WHEN THE SOLENOID IS ENERGIZED, THE PILOT VALVE VENTS THE PRESSURE AT THE CLOSING SIDE OF THE PISTON TO AMBIENT. THIS ALLOWS THE INLET PRESSURE TO OVERCOME THE VALVE SPRING FORCE AND OPEN THE VALVE.

THE PILOT VALVE UTILIZES A 430 CRES BALL AS A CLOSURE DEVICE SEALING AGAINST EITHER OF TWO 17-4PH CRES SEATS. IN THE DEENERGIZED STATE, THE BALL IS HELD AGAINST THE CLOSING SEAT BY A SPRING ACTIVATED PUSHROD. WHEN ENERGIZED THE SOLENOID FORCE OVERCOMES THE SPRING FORCE AND TRANSLATES THE PUSHROD AND BALL AND HOLDS THE BALL AGAINST THE OPENING SEAT. TOTAL BALL MOVEMENT (STROKE) IS LESS THAN 0.05 INCH.

FAILURE OF THE VALVE TO CLOSE MAY BE CAUSED BY (1) EXCESSIVE BINDING OF THE PISTON ASSEMBLY, (2) FAILURE OF THE MAIN POPPET SPRING OR INSUFFICIENT PRESSURE APPLIED TO THE TOP OF THE PISTON. LOW PRESSURE MAY BE CAUSED BY (3) BINDING OF ANY OF THE PARTS IN THE FORCE TRAIN CARRYING THE SOLENOID FORCE TO THE PILOT BALL OR STRUCTURAL FAILURE OF THAT (4) BALL OR (5) PILOT SPRING.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL **FAILURE MODE NUMBER: 03-1-0262-02**

FAILURE TO REMAIN CLOSED MAY BE CAUSED BY (2) STRUCTURAL FAILURE OF THE MAIN VALVE SPRING OR LOSS OF SUFFICIENT PRESSURE TO THE TOP OF THE PISTON TO UNBALANCE THE LOADS AND CAUSE THE VALVE POPPET TO LEAVE ITS SEAT. LOSS OF PRESSURE MAY BE CAUSED BY (8) CONTAMINATION BETWEEN THE BALL AND SEAT OR BY STRUCTURAL FAILURE OF THE (4) PILOT BALL, THE (5) PILOT SPRING, THE LOWER (6) PILOT PUSHROD, OR THE (7) INTERNAL SEALS.

(1) BINDING BETWEEN THE PISTON ASSEMBLY AND THE VALVE BODY IS PRECLUDED BY MANUFACTURING THEM AS A "MATCHED SET." THE RING ASSEMBLY OD IS FINAL MACHINED TO BE 0.0001-0.0003 INCH LESS THAN THE BODY ID. THE BODY BORE IS POLISHED TO A 16 MICROINCH FINISH.

(2) THE MAIN VALVE SPRING IS MANUFACTURED FROM 0.035 INCH DIAMETER 17- 4PH CRES WIRE. THE SPRING HAS A RATE OF 30 POUNDS PER INCH AND, IN THE INSTALLED CONDITION, EXERTS A FORCE OF 6.5 POUNDS. THE SPRING IS HEAT TREATED FOLLOWING FORMING.

(3) THE FORCE TRAIN CONSISTS OF THE SOLENOID PLUNGER, THE SOLENOID STOP, AND TWO PUSHRODS. THE PLUNGER AND STOP ARE BOTH OF 430 CRES AND THE PLUNGER IS TREATED WITH A DRY LUBRICANT TO PREVENT ITS BINDING WHILE TRANSLATING WITHIN THE 304L CORE OF THE SPOOL ASSEMBLY. THE PUSHRODS ARE ALIGNED IN SERIES WITHIN THE BORE OF THE STOP, ARE MADE OF 17-4PH CRES AND CARRY ONLY AXIAL LOADS. BINDING BETWEEN THE PUSHRODS AND THE STOP IS NOT EXPECTED BECAUSE THE ROD OD IS 0.125 INCH AND THE STOP ID IS 0.126 INCH.

(4) THE PILOT BALL IS A STANDARD MS PART MANUFACTURED FROM 430 CRES.

(5) THE PILOT SPRING IS MANUFACTURED FROM 0.026 INCH DIAMETER 17-4PH CRES WIRE. THE SPRING HAS A RATE OF 50 POUNDS PER INCH AND, IN THE INSTALLED CONDITION, EXERTS A FORCE OF 6.5 POUNDS. THE SPRING IS HEAT TREATED FOLLOWING FORMING. IF THE SPRING WERE TO FAIL STRUCTURALLY (OTHER THAN DISINTEGRATION) IT WOULD CONTINUE TO EXERT FORCE ON THE BALL BECAUSE IT IS 100% CONTAINED IN THE PILOT SLEEVE (THE SPRING OD IS 0.126 INCH AND THE SLEEVE ID IS 0.128 INCH).

(6) THE PUSHROD, WHICH CARRIES ONLY AXIAL LOADS, IS MACHINED FROM 17- 4PH CRES AND IS HEAT TREATED AND PASSIVATED FOLLOWING MACHINING. IF THE ROD WERE TO FAIL STRUCTURALLY (PARTICULARLY IN THE FULL-DIAMETER PORTION OF THE SHAFT), IT WOULD CONTINUE TO PERFORM ITS FUNCTION BECAUSE IT IS 75% CONTAINED IN THE PILOT SLEEVE (THE ROD OD IS 0.126 INCH AND THE SLEEVE ID IS 0.128 INCH). WITHIN THE REMAINING 25%, THE ROD TAPERS TO A DIAMETER OF 0.030 INCH. THIS PORTION OF THE ROD PASSES THROUGH THE LOWER SEAT (WHICH GUIDES IT) TO MAKE CONTACT WITH THE BALL.

(7) THE HIGH PRESSURE AND VENTED PORTIONS OF THE VALVE ARE SEALED FROM ONE ANOTHER BY USE OF SOFT SILVER PLATED, INCONEL "V" SEALS.

(8) CONTAMINATION UNDER THE PILOT BALL IS A DESIGN CONCERN. THEREFORE, ALL HELIUM ENTERING THE PILOT AREA OF THE VALVE MUST FIRST PASS THROUGH A 15 MICRON NOMINAL (25 MICRON ABSOLUTE) RATED FILTER INTERNAL TO THE SOLENOID VALVE.

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INTERNAL LEAKAGE MAY BE CAUSED BY CONTAMINATION AT THE MAIN POPPET SEAT. CONTAMINATION IS MINIMIZED BY THE USE OF MULTI-FILTERED HELIUM IN THE ORBITER HELIUM SYSTEMS. GROUND SUPPLIED HELIUM (EITHER THROUGH THE T-0 UMBILICAL OR TEST POINT COUPLINGS) IS FILTERED TO 25 MICRONS ABSOLUTE. VEHICLE FILTERS (25 MICRONS ABSOLUTE) ARE LOCATED UPSTREAM OF THE ISOLATION VALVE.

THE VENT PORT CHECK VALVE WAS REDESIGNED TO PREVENT THE POPPET FROM BEING EJECTED DUE TO SHEARING OF THE RETAINING NUT THREAD. A PIN WAS ADDED TO THE CHECK VALVE HOUSING, WHICH RETAINS THE POPPET WITHIN THE CHECK VALVE HOUSING. A NEW ALUMINUM NUT, WHICH PROVIDE A MINIMUM ENGAGEMENT OF THREE THREADS, WAS UTILIZED TO INCREASE RELIABILITY.

(B) TEST:
ATP

EXAMINATION OF PRODUCT

AMBIENT TEMPERATURE TESTS:

PROOF PRESSURE (9000 PSIG)
EXTERNAL LEAKAGE (4500 PSIG)
INTERNAL LEAKAGE (4500 PSID, ENERGIZED AND DEENERGIZED)
CHECK VALVE LEAKAGE (15 PSID)
ELECTRICAL CHARACTERISTICS
(PULL-IN/DROPOUT VOLTAGE, CURRENT SIGNATURE)
VALVE RESPONSE TIMES (4500 PSIG)

REDUCED TEMPERATURE TESTS (-160 DEG F):

INTERNAL LEAKAGE (4500 PSID, ENERGIZED AND DEENERGIZED)
ELECTRICAL CHARACTERISTICS (PULL-IN/DROPOUT VOLTAGE)
VALVE RESPONSE TIMES (4500 PSIG)

ELECTRICAL TESTS:

ELECTRICAL BONDING
DIELECTRIC WITHSTANDING VOLTAGE
INSULATION RESISTANCE

SOLENOID SUBASSEMBLY TESTS:

ELECTRICAL CHARACTERISTICS
ENCLOSURE LEAKAGE (1 ATMOSPHERE DIFFERENTIAL)

CERTIFICATION

SALT FOG TEST (1 UNIT)

PER MIL-STD-810
AMBIENT PERFORMANCE TEST

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ELECTRICAL CHARACTERISTIC
VALVE RESPONSE

SHOCK (1 UNIT)

PER MIL-STD-810
BENCH HANDLING
DESIGN

CONTINUOUS CURRENT TEST (2 UNITS)

50 HOURS WITH SOLENOID ENERGIZED
TEMPERATURE: +130 DEG F SURROUNDING ENVIRONMENT
INSULATION RESISTANCE TEST (+130 DEG F MAINTAINED)
INSULATION RESISTANCE TEST (AMBIENT TEMPERATURE)

VIBRATION (2 UNITS)

TRANSIENT: 5 TO 35 HZ

RANDOM (AMBIENT HELIUM):
INLET PRESSURE: 4500 PSIG
108 MINUTES FOR EACH OF 2 AXES
15 MINUTES ENERGIZED
15 MINUTES VALVE CYCLE (1 CYCLE/MINUTE)
78 MINUTES DEENERGIZED

ELECTRICAL CHARACTERISTICS, VALVE RESPONSE, AND INTERNAL LEAKAGE TESTS AFTER EACH AXIS

THERMAL VACUUM AND ENDURANCE TEST (2 UNITS) .

9000 CYCLES: 4500 PSIG, AMBIENT HELIUM
500 CYCLES: 4500 PSIG, +130 DEG F HELIUM
500 CYCLES: 4500 PSIG, -160 DEG F HELIUM

OPERATIONAL CYCLE TEST
3 CYCLES PERFORMED DURING EXPOSURE TO FOLLOWING CONDITIONS:
VALVE ENERGIZED/DEENERGIZED
INLET PRESSURE: 4000 TO 200 PSIG
TEMPERATURE: +130 TO +250 DEG F HELIUM
SURROUNDING TEMPERATURE: AMBIENT TO +275 DEG F
SURROUNDING ENVIRONMENT: AMBIENT TO VACUUM

ELECTRICAL CHARACTERISTICS AND INTERNAL LEAKAGE AFTER EACH SET OF CYCLES AT APPROPRIATE TEMPERATURE CONDITIONS

FLOW TEST (1 UNIT)

DIFFERENTIAL PRESSURE TEST
INLET PRESSURE: 950 PSIG

FLOW RATES: 0.06 TO 0.10 LBS/SEC
PRESSURE DROP NOT TO EXCEED 50 PSID

HIGH FLOW CLOSURE TEST
3 CYCLES:
INLET PRESSURE: 4500 PSIG
FLOW RATE: 1 LBS/SEC
CYCLE VALVE CLOSED AND VERIFY CLOSURE BY LEAKAGE TEST

BURST TEST (1 UNITS)
18,000 PSIG

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

(C) INSPECTION:
RECEIVING INSPECTION
RAW MATERIALS ARE VERIFIED BY INSPECTION FOR MATERIAL AND PROCESSES CERTIFICATION. BODY HOUSING BAR STOCK IS ULTRASONICALLY INSPECTED.

CONTAMINATION CONTROL
CLEANLINESS LEVEL IS VERIFIED TO 100A. CORROSION PROTECTION IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
ALL DETAIL PARTS AND ASSEMBLIES ARE EXAMINED FOR BURRS, DAMAGE AND CORROSION (AT 10X MAGNIFICATION) AND INSPECTED FOR CORRECT DIMENSIONS PRIOR TO ASSEMBLY. CRITICAL SURFACE FINISHES ARE INSPECTED USING A COMPARATOR AT 10X MAGNIFICATION. OTHER SURFACE FINISHES ARE INSPECTED AND VERIFIED WITH A PROFILOMETER. TORQUES ARE VERIFIED TO BE IN ACCORDANCE WITH DRAWING REQUIREMENTS. BELLOWS ASSEMBLY IS PROOF PRESSURE TESTED AND LEAK CHECKED. MANDATORY INSPECTION POINTS ARE INCLUDED IN THE ASSEMBLY PROCEDURE.

CRITICAL PROCESS
THE FOLLOWING ARE VERIFIED BY INSPECTION:

WELDING
HEAT TREATMENT
PARTS PASSIVATION
POTTING OF SOLDER CUPS
ELECTRICAL WIRE STRIPPING
DRY FILM LUBRICATION
CHROME PLATING

NONDESTRUCTIVE EVALUATION
ALL WELDS ARE VISUALLY EXAMINED AND VERIFIED BY X-RAY OR DYE PENETRANT INSPECTIONS. THE SOLENOID ASSEMBLY IS SUBJECTED TO LEAKAGE VERIFICATION USING RADIOACTIVE TRACER TECHNIQUES. SOME VALVE BODIES WERE SUBJECTED TO 10X MAGNIFICATION INSPECTION ONLY. OTHER VALVE BODIES WERE SUBJECTED TO EDDY

CURRENT INSPECTION, IN ADDITION TO 10X MAGNIFICATION. REFURBISHED VALVE BODIES ARE SUBJECTED TO 40X MAGNIFICATION INSPECTION.

TESTING
ATP VERIFIED BY INSPECTION.

HANDLING/PACKAGING
HANDLING, PACKAGING, STORAGE AND SHIPPING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:
DURING ATP AT -160 DEG F, A SLIGHT INTERFERENCE FIT (0.0001 INCH UNDER LIMIT BETWEEN THE POPPET VESPEL SPLIT SEALS AND BORE DIAMETER), CAUSED THE POPPET TO BECOME JAMMED IN THE OPEN POSITION (REFERENCE CAR AB7128). THE VALVE FIT WAS CORRECTED, AND RESPONSIBLE PERSONNEL WERE CAUTIONED. AFTER REWORK, THE UNIT PASSED ATP AND PRODUCTION VALVES HAVE ALSO PASSED ATP.

AT SUPPLIER'S ATP, THE VALVES FAILED TO CLOSE WHEN DE-ENERGIZED (REFERENCE CARS AB8424, AB8429). THE MAIN POPPET HAD JAMMED IN OPEN POSITION DUE TO A DEFORMED VESPEL SLEEVE CAUSED BY THE SLEEVE ABSORBING FULL IMPACT OF STOPPING THE POPPET TRAVEL. THE IMPACT CAUSED COLD FLOW OF THE VESPEL WHICH EXTRUDED INTO THE MATING SLEEVE ASSEMBLY. THE SUBSEQUENT WEDGING CAUSED THE POPPET ASSEMBLY TO STICK IN THE OPEN POSITION. PROCEDURES AND DRAWINGS WERE CHANGED TO CONTROL THE STROKE AND POPPET IMPACT. PRE-OPERATING THE VALVES DURING ASSEMBLY AND DISASSEMBLY WAS INITIATED TO DETERMINE IF VESPEL EXTRUSION HAS TAKEN PLACE. ANY EXTRUSION (COLD FLOW) IS BEING TRIMMED TO PRECLUDE JAMMING.

A NUMBER OF INTERNAL LEAKAGE FAILURES HAVE OCCURRED AT KSC (REFERENCE CARS AC3788, AD0474, AC9271). THESE WERE CAUSED BY CONTAMINATION, SCRATCHES ON THE MAIN POPPET/SEAT, OR BURRS FROM EXTERNAL SOURCES. PERSONNEL WAS INSTRUCTED AND IMPROVED CLEANLINESS PROCEDURES IMPLEMENTED TO LOCALLY BLOWDOWN THE SYSTEM IMMEDIATELY PRIOR TO RE- INSTALLING A COMPONENT IF CONTAMINATION COULD POSSIBLY BE A CAUSE OF A PREVIOUS FAILURE.

A NUMBER OF INTERNAL LEAKAGE FAILURES HAVE OCCURRED AT THE SUPPLIER (REFERENCE CARS AD0640, AC6123, AD1457). THE FAILURES WERE ATTRIBUTED TO CONTAMINATION ON THE MAIN POPPET AND SEAT FROM THE TEST FIXTURE OR EXTERNAL SOURCES. PERSONNEL WERE INSTRUCTED AND CLEANLINESS PROCEDURES WERE IMPROVED, INCLUDING A PURGE TO THE TEST FIXTURE PRIOR TO CONNECTING THE VALVE.

SEVERAL CASES OF INTERNAL LEAKAGE FAILURES HAVE OCCURRED AT THE SUPPLIER (REFERENCE CARS AC0413, AC3448, AB7129). FAILURES WERE ATTRIBUTED TO SCRATCHED/DAMAGED SEALS DUE TO MISHANDLING OR DEFECTIVE SEALS. PERSONNEL AT THE SUPPLIER WERE WARNED ABOUT HANDLING SEALS. ATP IS CONSIDERED SUFFICIENT TO DETECT DAMAGED/DEFECTIVE SEALS.

DURING CHECKOUT OF 0V-104 AT PALMDALE, THE VALVE LV64 EXHIBITED INTERNAL LEAKAGE AT 200 PSIG (REFERENCE CAR AD2094). UPON DISASSEMBLY, THE VALVE POPPET SLEEVE WAS FOUND TO HAVE A LONGITUDINAL FRACTURE, ALLOWING LEAKAGE

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PAST THE UPPER SEAL. THE FRACTURE INITIATED FROM THE SCRATCHED CONDITION OF THE VESPEL SLEEVE. SCRATCHES WERE ATTRIBUTED TO CONTAMINATION FROM THE LAPPING OPERATION. ALL DETAIL PARTS WERE RE-EXAMINED AND CLEANED PRIOR TO REASSEMBLY AND RETESTING. THIS WAS CONSIDERED TO BE AN ISOLATED OCCURRENCE. PERSONNEL WERE CAUTIONED AS TO THE SIGNIFICANCE OF THE SLEEVE INSPECTION OPERATION. APPROPRIATE PROCEDURES AND CHECKS WERE ALREADY IN PLACE.

ON OV-104 AT PALMDALE, THE VALVE LV64 FAILED IN THE OPEN POSITION (REFERENCE CAR AD2316). A PIECE OF GOLD BRAZE PREFORM MATERIAL WAS FOUND ON THE MAIN SEAT OF THE VALVE FROM AN UPSTREAM BRAZED TUBE INSTALLATION. FINAL BRAZE INSTALLATION ACCEPTANCE IS BASED ON X-RAY AND PROOF PRESSURE. THE VALVE WAS REWORKED AND RETESTED.

POST FLIGHT DATA REVIEW OF SSME NO. 3 HELIUM PANEL PRESSURE INDICATED INTERNAL LEAKAGE ON VALVE LV5 (REFERENCE CAR 11F019). AFTER REMOVAL, THE FAILURE COULD NOT BE REPEATED. THE CONDITION WAS CONSIDERED TO BE AN ISOLATED CASE. THE UNIT WAS REFURBISHED, CLEANED AND SUBSEQUENTLY PASSED ATP.

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	: DAVE NEARY	: /S/ DAVE NEARY
MPS SUBSYSTEM MGR.	: TIM REITH	: /S/ TIM REITH
MOD	: JEFF MUSLER	: /S/ JEFF MUSLER
USA SAM	: MIKE SNYDER	: /S/ MIKE SNYDER
USA ORBITER ELEMENT	: SUZANNE LITTLE	: /S/ SUZANNE LITTLE
NASA SR&QA	: ERICH BASS	: /S/ ERICH BASS