

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE**NUMBER: 03-1-0303 -X****SUBSYSTEM NAME:** MAIN PROPULSION**REVISION:** 2 08/16/00**PART DATA**

PART NAME	PART NUMBER
VENDOR NAME	VENDOR NUMBER
LRU : DISCONNECT, FILL/DRAIN (ORB LO2)	MC276-0005-0032
UNITED SPACE ALLIANCE - NSLD	574006-108
LRU : DISCONNECT, FILL/DRAIN (ORB LH2)	MC276-0005-0041
UNITED SPACE ALLIANCE - NSLD	5740006-109
LRU : DISCONNECT, FILL/DRAIN (GND)	MC276-0005-0063
UNITED SPACE ALLIANCE - NSLD	5740005-108

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

FILL AND DRAIN DISCONNECT, LO2 AND LH2, GROUND AND AIRBORNE HALF, 8 INCH (PD11-LH2, PD12-LO2).

VALVE WAS ORIGINALLY DESIGNED AND MANUFACTURED BY PARKER-HANNIFIN. THE UNITED SPACE ALLIANCE-NSLD IS A CERTIFIED REPAIR DEPOT BUT HAS NOT YET BEEN CERTIFIED AS AN ALTERNATE PRODUCTION AGENCY.

REFERENCE DESIGNATORS: PD11
PD12

QUANTITY OF LIKE ITEMS: 4
1 MATED PAIR (ORB & GND) FOR LH2 & LO2

FUNCTION:

GROUND HALF INTERFACES WITH AIRBORNE HALF OF THE DISCONNECT TO TRANSFER PROPELLANTS THROUGH THE T-0 UMBILICALS TO THE FILL AND DRAIN LINE FOR ET LOADING AND DRAIN. GROUND HALF INCORPORATES A SPRING LOADED CLOSURE DEVICE WHICH IS HELD OPEN WHEN MATED TO THE AIRBORNE HALF BY A PUSH ROD THAT ENGAGES A SOCKET IN THE AIRBORNE REPLACEABLE INSERT ASSEMBLY. DISCONNECT ACTS AS A STRUCTURAL ATTACHMENT POINT FOR BOTH THE OUTBOARD FILL & DRAIN VALVE AND LINE.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 03-1-0303-01

REVISION#: 2 08/16/00

SUBSYSTEM NAME: MAIN PROPULSION

LRU: 8" FILL/DRAIN DISC (ORB/GND LH2/LO2, PD11,12)

CRITICALITY OF THIS

ITEM NAME: 8" FILL/DRAIN DISC (ORB/GND LH2/LO2, PD11,12)

FAILURE MODE: 1/1

FAILURE MODE:

EXTERNAL LEAKAGE AT THE T-0 UMBILICAL DURING FILL, TOPPING, REPLENISH, AND DETANKING

MISSION PHASE: PL PRE-LAUNCH

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

CAUSE:

DAMAGED AIRBORNE DISCONNECT INTERFACE MATING SEAL, DAMAGED AIRBORNE INSERT STATIC SEAL, GROUND DISCONNECT BELLOWS ASSEMBLY RUPTURE/LEAKAGE, MISALIGNED MATED DISCONNECT, CONTAMINATION, INSUFFICIENT BELLOWS PRELOAD ON INTERFACE SEAL

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:

RESULTS IN EXTERNAL LEAKAGE OF EITHER LO2 OR LH2. GN2 (LO2) AND GHE (LH2) PURGES AT THE T-0 AND MLP HOOD WILL DISSIPATE SOME OF THE PROPELLANT. HAZARDOUS GAS DETECTION SYSTEM (HGDS) AT THE LH2 TSM/T-0 UMBILICAL WILL DETECT

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 03-1-0303-01**

THE PRESENCE OF HYDROGEN. THERE IS NO HGDS ON THE LO2 TSM/T-0 UMBILICAL. GROSS LH2 LEAKAGE MAY RESULT IN FIRE/EXPLOSION HAZARD AT THE VEHICLE EXTERIOR. POSSIBLE DAMAGE TO TPS AND SURROUNDING STRUCTURE FOR BOTH LH2 AND LO2 LEAKAGE.

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

(C) MISSION:
ON GROUND, POSSIBLE VIOLATION OF HGDS LCC WILL RESULT IN LAUNCH SCRUB (LH2 ONLY). FOR LO2 LEAKAGE, POSSIBLE LAUNCH SCRUB IF LO2 IS VISUALLY DETECTED.

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

(E) FUNCTIONAL CRITICALITY EFFECTS:
NONE.

-DISPOSITION RATIONALE-

(A) DESIGN:
THE AIRBORNE HALF INCLUDING REPLACEABLE INSERT IS MADE OF 356-T6 AND 6061-T6 ALUMINUM ALLOY. THE AIRBORNE HALF AND GROUND HALF BELLOWS ASSEMBLY ARE DESIGNED TO A MINIMUM FACTOR OF SAFETY OF 1.3 PROOF, 1.5 BURST FOR INTERNAL PRESSURE. THE GROUND DISCONNECT BELLOWS IS OF 4-PLY INCONEL 718 CONSTRUCTION AND IS PROOF PRESSURE TESTED AT 260 PSIG. THE GROUND HALF DISCONNECT BODY IS MADE OF ALUMINUM ALLOY 356-T6 CASTING AND DESIGNED TO A MINIMUM FACTOR OF SAFETY OF 2.0 PROOF AND 4.0 BURST FOR INTERNAL PRESSURE. FRACTURE AND FATIGUE ANALYSIS SHOW THAT ALL CRITICAL PARTS ARE SATISFACTORY FOR 4 TIMES EXPECTED LIFE.

IMPROPER MATING OF THE 8-INCH FILL AND DRAIN DISCONNECT IS NOT LIKELY SINCE THE MATED DISCONNECT IS DESIGNED FOR LIMITED MISALIGNMENT. ALSO THE GROUND HALF DISCONNECT IN THE T-0 UMBILICAL CARRIER AND THE AIRBORNE HALF DISCONNECT IN THE AIRBORNE UMBILICAL PANEL WERE MANUFACTURED UTILIZING THE SAME TOOLING FIXTURE. WHEN THE T-0 UMBILICAL CARRIER IS MATED TO THE AIRBORNE PANEL, CORRESPONDING ALIGNMENT TOOLING HOLES ARE USED TO VERIFY EXACT ALIGNMENT.

THE GROUND HALF DISCONNECT BELLOWS ASSEMBLY PROVIDES A PRELOAD OF 313 POUNDS AT THE AIRBORNE INTERFACE SEAL. THE GROUND HALF DISCONNECT IS

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 03-1-0303-01**

SHIMMED TO A PRESET DIMENSION TO PROVIDE A NOMINAL BELLOWS COMPRESSION OF 0.670 INCHES. THE MATED DISCONNECT IS DESIGNED FOR A 0.060 INCH RADIAL MISALIGNMENT AND A 22.5 MINUTE ANGULAR MISALIGNMENT.

THE AIRBORNE REPLACEABLE INSERT CONTAINS A PREFORMED TEFLON INTERFACE SEAL AND A SPRING LOADED TEFLON COVERED STATIC SEAL, WHICH IS LOCATED IN A GROOVE BETWEEN THE INSERT ASSEMBLY AND THE AIRBORNE HOUSING.

BOTH T-0 UMBILICAL ASSEMBLIES HAVE DEDICATED REMOTE TV MONITORING FOR CONTINUOUS OBSERVATION OF LEAKS THROUGHOUT FILL, TOPPING AND REPLENISH. THE LH2 DISCONNECT IS MONITORED FOR LH2 LEAKAGE BY A HAZARDOUS GAS DETECTION SYSTEM AND IS OBSERVED WITH ULTRAVIOLET/INFRARED DETECTORS FOR FIRE DETECTION. THE LH2 T-0 UMBILICAL GHE PURGE IS SUFFICIENT TO DILUTE LEAKS UP TO 5800 SCIM BELOW THE 3.6% HYDROGEN CONCENTRATION LCC. THE LO2 T-0 UMBILICAL IS PURGED WITH GN2 DURING LOADING OPERATIONS. THE AIRBORNE HALF INTERFACE SEAL IS INSPECTED PRIOR TO MATING AND IS LEAK CHECKED FOLLOWING MATING.

(B) TEST:

ATP

EXAMINATION OF PRODUCT

PROOF PRESSURE: (AMBIENT)

AIRBORNE HALF DISCONNECT - 91 PSIG LH2, 260 PSIG LO2

AIRBORNE REPLACEABLE INSERT - 260 PSIG (LH2 AND LO2)

GROUND HALF DISCONNECT ASSEMBLY - 260 PSIG (LO2 AND LH2)

GROUND HALF CLOSURE DEVICE - 400 PSIG (LH2 AND LO2)

AMBIENT OPERATIONAL TESTS- SIX CYCLES (ENGAGE AND DISENGAGE) AT 5 PSIG

AIRBORNE HALF LEAKAGE (MATED):

MATING SEAL LEAKAGE (LO2 UNIT) - PERFORMED WITH LN2 (CRYO) AND GHE (AMBIENT) AT 130 PSIG

MATING SEAL LEAKAGE (LH2 UNIT) - PERFORMED WITH LH2 (CRYO) AND GHE (AMBIENT) AT 30 PSIG

GROUND HALF DISCONNECT LEAKAGE (MATED):

MATING SEAL LEAKAGE (LH2/LO2) - PERFORMED WITH LN2 (CRYO) AT 30 PSIG AND 130 PSIG

EXTERNAL LEAKAGE (LH2/LO2) - PERFORMED WITH GN2 (AMBIENT) AT 130 PSIG

GROUND HALF DISCONNECT LEAKAGE (UNMATED):

EXTERNAL LEAKAGE (LH2/LO2) - PERFORMED WITH GN2 (AMBIENT) AT 130 PSIG

EXTERNAL LEAKAGE (CLOSURE DEVICE) - PERFORMED WITH LN2 (CRYO) AND GN2 (170 DEG F) AT 90 PSIG

CERTIFICATION

COMPONENT CERTIFICATION

SAND, DUST, AND SALT FOG

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 03-1-0303-01**

RANDOM VIBRATION - IN ALL THREE AXES (SEPARATE AND MATED)
MATED - LN2 40 MINUTES PER AXIS
GROUND HALF - LN2 5 MINUTES PER AXIS
AIRBORNE HALF - AMBIENT TEMP 52 MINUTES PER AXIS.

OPERATIONAL TESTS (ENGAGE AND DISENGAGE):
AMBIENT - 40 CYCLES
CRYO - 400 CYCLES

14 HOUR HOLD TEST (MATED) - AT LN2 AND LH2 TEMPS

EXTERNAL AND MATING SEAL LEAKAGE - AT AMBIENT AND CRYO CONDITIONS

CLOSURE DEVICE LEAKAGE - AT CRYO AND 160 DEG F

ELECTRICAL BONDING

BURST TEST
LH2 AIRBORNE HALF - 105 PSIG
LO2 AIRBORNE HALF - 300 PSIG
GROUND HALF (OPEN) - 300 PSIG
GROUND HALF (CLOSED) - 800 PSIG APPLIED TO FACILITY SIDE

LO2 T-0 UMBILICAL ASSEMBLY

MATED DISCONNECT PRESSURE DECAY TEST - 130 PSIG HELD FOR 30 MINUTES AT AMBIENT TEMPERATURE.

SEPARATION AT LN2 TEMPERATURE - PERFORM AMBIENT LEAK TESTS AND PRESSURE DECAY AT 130 PSIG FILL WITH LN2 AND STABILIZE TEMPERATURE, PERFORM LEAK TEST AT 10 PSIG DURING CHILLDOWN. PURGE DISCONNECTS AND DEPRESSURIZE TO 5 PSIG. PERFORM NOMINAL SEPARATION.

RANDOM VIBRATION TESTS - PERFORM TWO TIMES IN EACH AXIS

FILL WITH LN2 AND STABILIZE FOR 30 MINUTES.

CRYO LEAK CHECK AT 50-115 PSIG.

TWO MINUTE GN2 PURGE.

60 SECOND RANDOM VIBRATION.

LN2 CHILLDOWN AND STABILIZE FOR 30 MINUTES.

CRYO LEAK TEST AT 50-115 PSIG.

TWO MINUTE GN2 PURGE THEN HOT GAS PURGE AND AMBIENT LEAK TEST AT 130 PSIG.

LN2 CHILLDOWN AND STABILIZE FOR 30 MINUTES.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 03-1-0303-01**

CRYO LEAK TEST AT 50-115 PSIG.

TWO MINUTE HE PURGE.

20 SECOND RANDOM VIBRATION. PERFORM SEPARATION DURING LAST SECOND OF RANDOM VIBRATION.

LH2 T-0 UMBILICAL ASSEMBLY

MATED DISCONNECT PRESSURE DECAY TEST - 70 PSIG HELD FOR 30 MINUTES AT AMBIENT TEMPERATURE.

SEPARATION AT LH2 TEMPERATURE (24 HOUR HOLD) - PERFORM PRESSURE DECAY AND AMBIENT LEAK TESTS. FILL WITH LH2 AND STABILIZE TEMPERATURE. PERFORMED LEAK CHECK AT 10 PSIG DURING CHILLDOWN AND AT 40-65 PSIG DURING TEMPERATURE STABILIZATION. PURGE DISCONNECT, PRESSURIZE TO 5 PSIG AND PERFORM NORMAL SEPARATION.

SEPARATION WITH ICING CONDITIONS AT LH2 TEMPERATURE - FILL WITH LH2 AND STABILIZE TEMPERATURE TO -423 DEG F. INITIATE RAIN MIST FOR 10 MINUTES, PURGE DISCONNECTS. PERFORM SEPARATION TEST. TEST WAS PERFORMED TWICE.

SALT FOG AT LH2 TEMPERATURE - MIXED A SALT SOLUTION (1% BY WEIGHT) AND SPRAYED EXPOSED SURFACES OF CARRIER. MAINTAINED TEMPERATURE AT 95 DEG F AND RELATIVE HUMIDITY OF 90%. AFTER 24 HOURS REPEATED SALT SPRAY AND MAINTAINED TEMPERATURE AND RELATIVE HUMIDITY FOR ANOTHER 24 HOURS. FILLED DISCONNECT WITH LH2 AND ALLOWED TEMPERATURE TO STABILIZE. PURGE DISCONNECT AND PERFORM NORMAL SEPARATION.

RANDOM VIBRATION TESTS - PERFORMED TWO TIMES IN EACH AXIS

FILL WITH LH2 AND DRAIN AND GHE PURGE

60 SECOND RANDOM VIBRATION.

LH2 CHILLDOWN AND STABILIZE FOR 30 MINUTES.

TWO MINUTE GHE PURGE THEN HOT GAS PURGE AND AMBIENT LEAK TEST AT 30 PSIG.

LH2 CHILLDOWN AND STABILIZE FOR 30 MINUTES.

CRYO LEAK TEST AT 10-35 PSIG.

TWO MINUTE HE PURGE.

20 SECOND RANDOM VIBRATION. PERFORM SEPARATION DURING LAST SECOND OF RANDOM VIBRATION.

GROUND TURNAROUND TEST

ANY TURNAROUND CHECKOUT IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 03-1-0303-01**

(C) INSPECTION:

RECEIVING INSPECTION

RAW MATERIALS ARE VERIFIED BY INSPECTION FOR MATERIAL AND PROCESS CERTIFICATION. MACHINED ITEMS ARE DIMENSIONALLY CHECKED. BOTH CHEMICAL AND MECHANICAL PROPERTIES ARE TESTED AND RECORDS ARE RETAINED FOR VERIFICATION. BODY FORGING VERIFIED BY ULTRASONIC AND PENETRANT INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL PROVISIONS ARE VERIFIED. CLEANLINESS LEVEL (400 FOR LH2 AIRBORNE HALF, 400A FOR EACH GROUND HALF, AND 800A FOR LO2 AIRBORNE HALF) VIA FREON FLUSH AND SAMPLE ARE TESTED.

ASSEMBLY/INSTALLATION

PARTS PROTECTION FROM DAMAGE AND CONTAMINATION ARE VERIFIED. SEALING SURFACES, ROSAN INSERT CONDITION, CRITICAL DIMENSIONS AND REWORK/REPAIR ITEMS ARE VERIFIED BY INSPECTION. LOG OF CLEAN ROOM AND TOOL CALIBRATION ARE VERIFIED BY INSPECTION. THREADED FASTENER TORQUE VERIFICATION IS CERTIFIED BY INSPECTION. CORROSION PROTECTION OF EXPOSED PARTS VERIFIED BY INSPECTION. TRACEABILITY ALSO VERIFIED.

NONDESTRUCTIVE EVALUATION

FRACTURE CRITICAL PARTS ARE RADIOGRAPHICALLY AND DYE PENETRANT INSPECTED.

CRITICAL PROCESSES

PARTS PASSIVATION, CHEM FILM, AND ANODIZE VERIFIED BY INSPECTION.

TESTING

TEST AND MEASUREMENT EQUIPMENT CALIBRATION CONDITION AND ATP VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PACKAGING FOR SHIPMENT VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:

DURING AN ENGINEERING TEST AT KSC THE DISCONNECT LEAKED (CAR AB3768, AB3832) AT THE MATING INTERFACE SEAL. SEALS WERE DETERMINED TO BE IMPROPERLY FORMED. IN ADDITION, SEVERAL SLIGHT SCRATCHES WERE OBSERVED. ALL REPLACEABLE INSERT ASSEMBLIES WERE REWORKED TO INCORPORATE A PREFORMED INTERFACE SEAL, AND THE ATP WAS MODIFIED TO INCORPORATE CRYOGENIC LEAK TEST.

EXCESSIVE LEAKAGE ORIGINATED FROM THE ORBITER SECTION AT KSC (CAR AB4295) FROM THE REPLACEABLE INSERT STATIC SEAL. THE LEAKAGE WAS ATTRIBUTED TO AN OUT OF TOLERANCE OF THE SEAL. THE SEAL WAS REPLACED WITH AN IMPROVED SEAL WHICH FEATURES A RETENTION LIP TO PREVENT SEAL SPRING PROTRUSION AND/OR SLIPPAGE.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 03-1-0303-01**

THE QUALIFICATION UNIT EXPERIENCED EXCESSIVE MATED LEAKAGE DUE TO AN INTERFERENCE BETWEEN THE REPLACEABLE INSERT ASSEMBLY (CAR AB3924) AND THE HOUSING. THE PROBLEM WAS CORRECTED BY A REDESIGN OF THE REPLACEABLE INSERT. THE REDESIGN ELIMINATED THE INTERFERENCE AND IMPROVED THE SEALING CAPABILITY.

AT KSC, EXCESSIVE LH2 CONCENTRATION (ABOVE LCC LIMIT OF 3.6%) WAS NOTED (CAR AC0740). SUBSEQUENT INVESTIGATION DISCLOSED THAT THE INSERT WAS NOT INSTALLED PROPERLY DUE TO TORQUE RELAXATION OF THE INSERT RETENTION SCREWS. TO CORRECT THE PROBLEM, THE PURGE FLOW WAS INCREASED, NEW REPLACEABLE INSERTS AND STATIC SEALS WERE INSTALLED, AND A NEW INSERT INSTALLATION PROCEDURE (WHICH INCLUDES SPECIFIC TORQUE SEQUENCE AND A RETORQUE VERIFICATION REQUIREMENT) WAS DEVELOPED.

EXCESSIVE LEAKAGE WAS NOTED AFTER THE QUALIFICATION VIBRATION TEST DUE TO INTERFERENCE BETWEEN MATING SEAL AND LINER OF THE REPLACEABLE INSERT ASSEMBLY (CAR AB4886, AB5319, AB5219). THE SEAL WAS REDESIGNED TO ELIMINATE INTERFERENCE. ALSO, ALLOWABLE LEAK RATE WAS RELAXED FROM 150 SCIM MAX TO 300 SCIM NOMINAL CONDITION AND 1000 SCIM MAX OFFSET CONDITION OF GH2.

DURING ATP CRYOGENIC TESTING (CAR AB7712, AB7623, AB5398, AB5651, AC1252, AC1755, AC0728) EXCESSIVE LEAKAGE DUE TO DEFECTIVE REPLACEABLE INSERT MATING SEALS WAS DETECTED. THE SEALS EXHIBITED MINOR SCRATCHES AND GOUGES. THESE WERE CAUSED BY IMPROPER HANDLING. PERSONNEL WERE WARNED TO ADHERE STRICTLY TO THE ESTABLISHED SEAL INSPECTION PROCEDURE.

EXCESSIVE LEAKAGE OCCURRED AT ROCKWELL DOWNEY L&T (CAR AC3532) DUE TO AN UNDERSIZE GROUND HALF REAR FLANGE. THIS THIN FLANGE IS UNIQUE AND WAS APPROVED BY MRB ACTION. BECAUSE OF THE FLANGE THINNESS, THE GRIP OF THE ATTACHMENT BOLTS WAS TOO LONG AND THE INTERFACE SEAL WAS NOT PROPERLY COMPRESSED, ALLOWING EXCESSIVE LEAKAGE. CORRECTIVE ACTION WAS TO INSERT A WASHER IN ORDER TO SHORTEN THE GRIP LENGTH. ALL FLANGES IN THE FIELD HAVE THE STANDARD THICKNESS AND WERE NOT AFFECTED BY THIS FAILURE.

DURING QUALIFICATION TESTING (CAR AC0061) A DIMENSIONALLY OUT OF PRINT, OVERSIZE, INSERT PREVENTED THE STATIC SEAL FROM BEING PROPERLY SEATED. ALL INSERTS WERE CHECKED AND, IF NECESSARY, REWORKED TO DRAWING SPECIFICATIONS.

AT KSC DURING STS-1 LH2 LOADING, EXCESSIVE LEAKAGE OCCURRED FROM THE MATED DISCONNECT DUE TO INSUFFICIENT GROUND HALF DISCONNECT BELLOWS PRESSURE AGAINST THE INTERFACE SEAL (CAR 01F067). THE BELLOWS DESIGN WAS SLIGHTLY SHORT, ALLOWING AN INSUFFICIENT LOAD AGAINST THE SEAL. CORRECTIVE ACTION WAS TO RE-SHIM THE BELLOWS, INCREASING THE BELLOWS LOAD.

SEVERAL WITHIN-SPECIFICATION LEAKAGE SPIKES OCCURRED DURING STS-9 (CAR 09F003) LH2 LOADING DUE TO THE SAME SHORT BELLOWS DESIGN AS DESCRIBED IN CAR 01F067. ALL PRIOR CONFIGURATIONS HAVE BEEN REPLACED BY A NEW CONFIGURATION (-0053) WHICH LENGTHENED THE BELLOWS, INCREASING THE PRELOAD FROM 185.5 TO 234.5 POUNDS (REFERENCE MCR 9713).

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 03-1-0303-01**

THE DISCONNECT STATIC SEAL WAS FOUND TO BE INCORRECTLY INSTALLED AT KSC CAUSING SEAL EXTRUSION, MISALIGNMENT AND LEAKAGE (CAR AC6892). THE SEAL WAS ROLLED/CURLED DUE TO IMPROPER SEAL/INSERT REPLACEMENT AND INSTALLATION PROCEDURE. INSTALLATION SPECIFICATION ML0310-0019 WAS REVISED TO ASSURE PROPER INSTALLATION.

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:

GROUND OPERATIONS SAFING PROCEDURES CONTAIN SAFING SEQUENCE OF EVENTS FOR MAJOR LEAKS IN THE HYDROGEN OR OXYGEN SYSTEMS.

- APPROVALS -

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