

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL HARDWARE

NUMBER: 04-2-PP11A-IM -X

SUBSYSTEM NAME: AUXILIARY POWER UNIT (APU)

REVISION: 1

03/10/00

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	: AUXILIARY POWER UNIT (APU)	MC201-0001-0491
	SUNDSTRAND	742211E
LRU	: AUXILIARY POWER UNIT (APU)	MC201-0001-0481
	SUNDSTRAND	742211D
LRU	: AUXILIARY POWER UNIT (APU)	MC201-0001-0501
	SUNDSTRAND	742211F
LRU	:AUXILIARY POWER UNIT (APU)	MC201-0001-06XX
	SUNDSTRAND	09167

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

THERMAL ISOLATION SLEEVE (761017) AND O-RINGS BETWEEN THE GEAR BOX AND FUEL PUMP (EPR E515-80)

FUEL REFERENCE LINE:

RELIEF VALVE (741042 OR 739966A), VALVE HOUSING (741036), PREFORMED PACKING (5905447-10 AND 5905447-8), RELIEF VALVE END CAP (741039), ELBOW FITTING (59167), WELDED TUBE ASSEMBLIES (741947 AND 743498), FITTING TEE (DYNATUBE TEE 57953), FITTING INTERFACES WITH FUEL PUMP COVER AT A FLUID CONNECTION ADAPTER (57386-8)

FUEL PUMP FLANGED INTERFACE 1:

SEAL ASSEMBLY (5903019), INTERNAL "RING" (5905446-136), EXTERNAL "RING" (5905446-142), BOLTS (MS21280-08)

FUEL PUMP FLANGED INTERFACE 2:

ALUMINUM NAME PLATE, FILTER COVER (50001071), O-RINGS (5905446-126), BOLTS (MS21278-08)

FUEL PUMP INLET PRESSURE TRANSDUCER:

FUEL PUMP PRESSURE TRANSDUCER (5908455), TOROID SHAPED PREFORMED PACKING PARTS (5905446-16 AND 5905447-4)

GGVM SUPPLY LINE AND INTERFACES:

FLUID CONNECTION ADAPTER (57386-8), 90° ELBOW FITTING FROM FUEL PUMP (58195), 90° ELBOW FITTING INTERFACES DOWNSTREAM WITH INSEPARABLE TUBE ASSEMBLY (741948)

BYPASS LINE AND INTERFACES:

"TEE" FITTING (5905110), TUBE ASSEMBLY (741946)

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FUEL PUMP DISCHARGE TEMPERATURE TRANSDUCER:
TEMPERATURE SENSOR (58741), .551" ID PREFORMED PACKING (5905446-15), .239" ID
PREFORMED PACKING (5905447-2)

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 3
ONE SET PER APU

FUNCTION:

THERMAL ISOLATION SLEEVE AND O-RINGS:
THE THERMAL ISOLATION SLEEVE PROVIDES THERMAL ISOLATION TO PREVENT FUEL
PUMP OVERHEATING POST-ASCENT SHUTDOWN. ALSO, THE THERMAL SLEEVE AND O-
RINGS PROVIDE A BARRIER FOR FUEL WHICH LEAKS PAST THE FUEL PUMP CARBON
SEAL.

FUEL REFERENCE LINE:

THE FUEL REFERENCE LINE PROVIDES A REFERENCE PRESSURE FOR THE FUEL PUMP
RELIEF VALVE. THE FUEL PUMP SEAL CAVITY PURGE COUPLING (TPX6) IS LOCATED ON
THIS LINE.

FUEL PUMP FLANGED INTERFACE 1:

THE FUEL PUMP COVER/HOUSING INTERFACE IS LOCATED ON THE "UNDERSIDE" OF
THE FUEL PUMP WHERE THE FUEL PUMP JOINS THE GEAR BOX. IT ENABLES THE
INSTALLATION OF THE PUMP GEARS AND BEARINGS DURING MANUFACTURE OF THE
FUEL PUMP.

FUEL PUMP FLANGED INTERFACE 2:

THE FUEL PUMP FILTER COVER/PUMP HOUSING INTERFACE ENABLES INSTALLATION
OF THE FILTER DURING ASSEMBLY OF THE FUEL PUMP.

FUEL PUMP INLET PRESSURE TRANSDUCER:

THE FUEL PUMP PRESSURE TRANSDUCER INDICATES THE PRESSURE OF THE FUEL ON
THE LOW PRESSURE SIDE OF THE PUMP.

GGVM SUPPLY LINE AND INTERFACES:

THE GGVM SUPPLY LINE ROUTES FUEL FROM THE FUEL PUMP TO THE GGVM.

BYPASS LINE AND INTERFACES:

THE FUEL BYPASS LINE ROUTES FUEL FROM GGVM BYPASS PORTS TO THE FUEL PUMP
INLET.

FUEL PUMP DISCHARGE TEMPERATURE TRANSDUCER:

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THE FUEL PUMP DISCHARGE TEMPERATURE TRANSDUCER INDICATES THE TEMPERATURE ON THE FUEL PUMP DISCHARGE.

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SUBSYSTEM NAME: AUXILIARY POWER UNIT (APU)

LRU: AUXILIARY POWER UNIT (APU)

CRITICALITY OF THIS

ITEM NAME: AUXILIARY POWER UNIT (APU)

FAILURE MODE: 1/1

FAILURE MODE:

EXTERNAL LEAKAGE

MISSION PHASE:

PL PRE-LAUNCH
LO LIFT-OFF
OO ON-ORBIT
DO DE-ORBIT
LS LANDING/SAFING

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102 COLUMBIA
103 DISCOVERY
104 ATLANTIS
105 ENDEAVOUR

*INNER O-RING RETAINING WALL AND
POLYSULFIDE LUBRICANT AT SPLITLINE,
ONLY*

CAUSE:

FUEL TUBE SEALING SURFACE FLAWS, FUEL PUMP SEALING SURFACE FLAW, O-RING
FAILURE(S), PREFORMED PACKING FLAWS, STRUCTURAL FAILURE, CORROSION, OR
LOSS OF FASTENER TORQUE

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 -

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(A) SUBSYSTEM:

POSSIBLE LOSS OF ONE APU SYSTEM BEFORE MISSION COMPLETION IF LEAKING FUEL IS NOT IGNITED. POSSIBLE LOSS OF ADJACENT AND/OR REDUNDANT APU HARDWARE DUE TO FIRE OR CHEMICAL ATTACK.

(B) INTERFACING SUBSYSTEM(S):

POSSIBLE LOSS OF SHAFT POWER TO ONE HYDRAULIC PUMP. POSSIBLE LOSS OF ADJACENT AND/OR REDUNDANT HARDWARE DUE TO FIRE OR CHEMICAL ATTACK

(C) MISSION:

ABORT DECISION REQUIRED IF FAILURE OCCURS DURING ASCENT. EARLY MISSION TERMINATION IS REQUIRED IF LEAK OCCURS ON ORBIT.

(D) CREW, VEHICLE, AND ELEMENT(S):

POSSIBLE LOSS OF CREW/VEHICLE IF LEAKING FUEL IS IGNITED OR IF ADJACENT AND/OR REDUNDANT HARDWARE IS LOST DUE TO FIRE OR CHEMICAL ATTACK.

(E) FUNCTIONAL CRITICALITY EFFECTS:

-DISPOSITION RATIONALE-

(A) DESIGN:

THERMAL ISOLATOR SLEEVE AND O-RING:

RE-DESIGN OF THE THERMAL ISOLATION SLEEVE INCLUDED A CHANGE OF MATERIAL FROM A MYKROY/MYCALEX (CERAMIC MATERIAL) GRADE 371 TO TITANIUM THAT HAS A PROVEN COMPATIBILITY WITH HYDRAZINE. ANALYSIS INDICATES THERE IS ACCEPTABLE/MINIMAL IMPACT ON POST-ASCENT FUEL PUMP HEAT SOAK BACK. EPR PARKER E515-80 O-RINGS REPLACE KALREZ O-RINGS IN:

- 1) FUEL PUMP OIL SEAL CAVITY DRAIN QD (ONE INSIDE THE QD AND ANOTHER IN THE CAP).
- 2) OIL SEAL CAVITY PURGE QD (ONE INSIDE THE QD AND ANOTHER IN THE QD CAP).
- 3) TITANIUM THERMAL ISOLATION SLEEVE. AND
- 4) LIP SEAL CARRIER SEAL.

THE USE OF EPR PARKER E515-80 O-RINGS ELIMINATES PROBLEM WITH COMPRESSION SET EXPERIENCED WITH KALREZ O-RINGS. THE SLEEVE IMPROVEMENT SIGNIFICANTLY REDUCED THE PROBABILITY OF MATERIAL DETERIORATION THAT COULD RESULT IN EXTERNAL HYDRAZINE FUEL LEAKAGE BETWEEN THE GEAR BOX AND FUEL PUMP. THE CHANGE TO EPR O-RINGS FURTHER REDUCE THE PROBABILITY OF THIS EXTERNAL FUEL LEAKAGE.

FUEL REFERENCE LINE:

THE FUEL REFERENCE LINE EXITS THE FUEL PUMP AT THE RELIEF VALVE. THERE ARE TWO DESIGNS FOR THE RELIEF VALVE: THE BASIC RELIEF VALVE ASSEMBLY (741042) AND THE "OPTIONAL BUILD" ASSEMBLY (739966A). THE RELIEF VALVE IS THREADED INTO

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THE FUEL PUMP HOUSING. THE VALVE HOUSING IS MADE OF MAS 5616 AND HAS A 63 FINISH WHERE THE VALVE HOUSING/PUMP HOUSING INTERFACE IS. THERE IS A PERFORMED PACKING PART (5905447-10) BETWEEN THE PARTS. THE TORQUE ON THE VALVE HOUSING/PUMP HOUSING INTERFACE IS 95-125 IN/LB. THE RELIEF VALVE END CAP THREADS INTO THE RELIEF VALVE HOUSING. THE RELIEF VALVE END CAP IS MADE OF MAS 5643, ALTERNATIVELY, MAS 5622. THE FINISH OF THE CAP/VALVE HOUSING INTERFACE IS 63. THERE IS A PREFORMED PACKING PART (5905447-8) BETWEEN THE PARTS. THE TORQUE ON THE END CAP/VALVE HOUSING INTERFACE IS 25 ± 2.5 FT/LB.

A 90° ELBOW FITTING IS PROCURED AS AN OFF-THE-SHELF ITEM AT TWO APPROVED SOURCES OF SUPPLY AIR-DRONE PARTS CO. AND RESISTOFLEX CORP. THE PART IS MADE OF TITANIUM PER MAS 4965 (ELBOW AND NUT). THE MALE END OF THE ELBOW THREADS INTO THE TUBE AND THE FEMALE END THREADS INTO THE RELIEF VALVE. THE FITTINGS ASSOCIATED WITH THE ELBOW ARE TORQUED TO 120-188 IN/LB.

UPSTREAM OF THE FITTING TEE IS AN INSEPARABLE WELDED TUBE ASSEMBLY. THE I.D. OF THE TUBE IS INSPECTED WITH BORESCOPE TO INSURE 100% WELD PENETRATION. ADDITIONALLY, METALLURGICAL SECTIONING OF WELD SAMPLES IS PERFORMED TO CONFIRM NONDESTRUCTIVE TESTING. THE WELDS ARE ALSO RADIOGRAPHICALLY INSPECTED. THE ASSEMBLY IS PROOF PRESSURE TESTED AT 2200 PSIG AT AMBIENT TEMPERATURE FOR FIVE MINUTES. SUBSEQUENT TO LEAK TEST, 100% PENETRANT INSPECTION IS PERFORMED. THE WELDED JOINTS ARE LEAK CHECKED WITH A MASS SPECTROMETER AND HELIUM PRESSURIZED TO 1750 PSIG. THE TUBE MATERIAL IS MIL-T-8806, TYPE I, COMP. 304L QUARTER INCH TUBE WITH A $.035 \pm .005$ WALL THICKNESS.

THE FITTING TEE ACCOMMODATES TWO FITTING ENDS AND A DISCONNECT USED FOR PURGING THE FUEL PUMP SEAL CAVITY. THE SHOULDERED TEE AND NUT ARE MADE OF TI-6AL-4V.

DOWNSTREAM OF THE FITTING TEE IS ANOTHER INSEPARABLE TUBE ASSEMBLY. THE TUBE IS WELDED TO ACCOMMODATE THE FITTINGS. THE I.D. OF THE TUBE IS INSPECTED WITH BORESCOPE TO INSURE 100% WELD PENETRATION. ADDITIONALLY, METALLURGICAL SECTIONING OF WELD SAMPLES IS PERFORMED TO CONFIRM NONDESTRUCTIVE TESTING. THE WELDS ARE ALSO RADIOGRAPHICALLY INSPECTED. THE ASSEMBLY IS PROOF PRESSURE TESTED AT 2200 PSIG AT AMBIENT TEMPERATURE FOR FIVE MINUTES. SUBSEQUENT TO LEAK TEST, 100% PENETRANT INSPECTION IS PERFORMED. THE WELD JOINTS ARE LEAK CHECKED WITH A MASS SPECTROMETER AND HELIUM PRESSURIZED TO 1750 PSIG.

THE FITTING FURTHER DOWNSTREAM INTERFACES WITH THE FUEL PUMP COVER AT A FLUID CONNECTION THAT HAS A PREFORMED PACKING SEAL. THIS SEAL IS MADE OF COMPOUND E515-80 BY PARKER SEAL CO. THE FLUID CONNECTION ADAPTER IS INSTALLED INTO THE FUEL PUMP COVER WITH AN 85 - 120 IN/LB TORQUE. AFTER IT IS TORQUED, EPOXY PRIMER/SEALANT IS APPLIED AROUND THE FITTING AND THE LOCK RING IS ENGAGED. THE FUEL PUMP ASSEMBLY COVER IS MADE OF TITANIUM (TI-6AL-4V, ANNEALED).

THE TUBE FITTINGS ARE MODIFIED OFF-THE-SHELF ITEMS. THE SHOULDER AND NUT MATERIALS ARE MADE OF HEAT TREATED 17-4 PH. THE APPROVED SOURCES SUPPLYING THE FITTINGS ARE RESISTOFLEX CORP AND AIR-DRONE PARTS SUPPLY.

FUEL PUMP FLANGED INTERFACE 1:

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THE PRIMARY SEALS FOR THE FUEL PUMP GEARS IS A SEAL ASSEMBLY MADE OF A TFE JACKET WITH A CRES 304 SPRING. THIS MODIFIED OFF-THE-SHELF ITEM PURCHASED FROM FLUOROCARBON MECHANICAL SEAL DIVISION.

ENCOMPASSING THE FLANGE/HOUSING LEAK PATH FROM BOTH OF THE FUEL PUMP GEARS ARE TWO CONCENTRIC PREFORMED PACKING PARTS MADE OF COMPOUND E515-80. THE SMALLER INTERNAL "RING" PART IS INTENDED TO PREVENT LEAKAGE FROM THE FUEL PUMP GEAR BEARING/HOUSING/PUMP COVER INTERFACE. THE EXTERNAL "RING" PROVIDES A SECONDARY SEAL BETWEEN THE HOUSING AND THE COVER. BOTH PARTS ARE OFF-THE-SHELF ITEMS FROM PARKER SEAL CO.

THE FIVE BOLTS THAT SECURE THE COVER TO THE PUMP HOUSING ARE TORQUED TO 51-56 IN/LB.

FUEL PUMP FLANGED INTERFACE 2:

FOUR MS21279-12 BOLTS HOLD TWO CRES 304L HEATERS AND A CRES 347 FILTER COVER. USING A TORQUE OF 51-56 IN/LB, THE BOLTS ANCHOR ALL PARTS INTO THE FUEL PUMP HOUSING. TO PRECLUDE EXTERNAL HYDRAZINE LEAKAGE, TWO EPR O-RINGS, IN SERIES BETWEEN THE FUEL PUMP COVER AND THE HOUSING, SEAL THE CHAMBER THAT CONTAINS THE FILTER.

THE INNER O-RING OF THE DUAL/REDUNDANTLY SEALED FUEL PUMP HAS A REDESIGNED RETAINING WALL TO KEEP THE INNER O-RING IN PLACE. THIS REDESIGN PREVENTS THE INNER O-RING FROM BEING KINKED DURING INSTALLATION/OPERATION WITH SUBSEQUENT LOSS OF SEAL REDUNDANCY. ALSO, BY REDESIGN, THE EXTERIOR OF THE FUEL PUMP AT THE FACEPLATE SPLITLINE IS NOW COATED WITH POLYSULFIDE TO PREVENT THE INGRESS OF ANY MOISTURE THAT CAN CAUSE CORROSION BETWEEN THE FUEL PUMP BODY AND THE FUEL PUMP COVER LEADING TO EVENTUAL LEAKAGE.

FUEL PUMP INLET PRESSURE TRANSDUCER:

THE FUEL PUMP PRESSURE TRANSDUCER THREADS INTO THE CAST FUEL PUMP HOUSING WITH A MS FITTING (MS33855E4). PRIOR TO INSTALLATION, EPOXY PRIMER AND RTV ARE APPLIED TO THE INTERFACES. TWO TOROID SHAPED PREFORMED PACKING PARTS THAT CONCENTRICALLY PROVIDE ADDITIONAL SEAL TO THE INTERFACE. THE SURFACE FINISH TO THE SEALING INTERFACE OF THE TRANSDUCER IS 32.

GGVM SUPPLY LINE AND INTERFACES:

A FLUID CONNECTION ADAPTER IS MADE OF TI-6AL-4V (TITANIUM) WITH AN A286 LOCK RING. EPOXY PRIMER IS APPLIED AROUND THE FITTING AND THE LOCK RING AFTER ADAPTER IS TORQUED. THE ADAPTER IS AN OFF-THE-SHELF ITEM AVAILABLE FROM ROSAN, INC.

THE 90° ELBOW FITTING FROM FUEL PUMP IS MADE OF TITANIUM TI-6AL-4V. THE MALE END OF THE ELBOW THREADS INTO THE TUBE, AND THE FEMALE END THREADS INTO THE FUEL FLUID ADAPTER. THE ELBOW IS AN OFF-THE-SHELF ITEM FROM RESISTOFLEX CORP.

THE 90° ELBOW FITTING INTERFACES DOWNSTREAM WITH THE INSEPARABLE TUBE ASSEMBLY, CONSISTING OF A TUBE WITH TWO TUBE FITTINGS. THE FITTINGS ARE MODIFIED OFF-THE-SHELF ITEM. THE SHOULDER AND NUT MATERIALS ARE MADE OF HEAT TREATED 17-4 PH. THE APPROVED SUPPLIERS OF THE FITTINGS ARE RESISTOFLEX CORP. AND AIR DRONE PARTS SUPPLY.

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BYPASS LINE AND INTERFACES:

THE "TEE" FITTING THAT INTERFACES WITH THE GGVM IS AN OFF-THE-SHELF ITEM WITH TWO APPROVED SOURCES OF SUPPLY: RESISTOFLEX DEFENSE SYSTEMS AND AIR-DRONE PARTS CO. THE TEE IS TO BE MADE FROM A FORGING. THE MATERIALS OF THE SHOULDERED TEE AND NUT ARE TI-6AL-4V. THE FITTING END THAT INTERFACES WITH THE GGVM IS INTENDED TO MATE WITH PARTS IN ACCORDANCE WITH R-44053-04 AND HAS .4375-24 UNJS-3B THREAD. THE FITTING END THAT INTERFACES WITH HIGH POINT BLEED IS INTENDED TO MATE WITH PARTS IN ACCORDANCE WITH R-44053-06 WITH .5625-20 UNJS-3B THREAD. THE MALE END THAT INTERFACES WITH THE LINE ASSEMBLY IS INTENDED TO MATE WITH PARTS IN ACCORDANCE WITH R-4409-04 TYPE A WITH A .4375-24 UNJS-3A THREAD.

THE TUBE ASSEMBLY, SUPPLIED BY SUNDSTRAND, IS MADE OF CRES 304L. THE TUBE IS WELDED TO ACCOMMODATE THE FITTING SLEEVES. THE I.D. OF THE TUBE IS INSPECTED WITH A BORESCOPE TO INSURE 100% WELD PENETRATION. ADDITIONALLY, METALLURGICAL SECTIONING OF WELD SAMPLES IS PERFORMED TO CONFIRM NONDESTRUCTIVE TESTING. THE WELDS ARE ALSO RADIOGRAPHICALLY INSPECTED. THE ASSEMBLY IS PROOF PRESSURE TESTED AT 2200 PSIG AT AMBIENT CONDITIONS FOR FIVE MINUTES. SUBSEQUENT TO LEAK CHECK, 100% PENETRANT INSPECTION IS PERFORMED. THE WELD JOINTS ARE LEAK CHECKED WITH A MASS SPECTROMETER AND HELIUM PRESSURIZED TO 1750 PSIG TWICE: ONCE AFTER BENDING AND ONCE AFTER PROOF PRESSURE TEST.

FUEL PUMP DISCHARGE TEMPERATURE TRANSDUCER:

THE FUEL PUMP DISCHARGE TRANSDUCER IS A MODIFIED OFF-THE-SHELF ITEM. THE APPROVED SOURCE OF THIS TRANSDUCER IS ROSEMONT ENGINEERING CO. PRIOR TO INSTALLATION OF THE SENSOR, EPOXY PRIMER IS APPLIED TO THE INTERFACING SURFACES. ONE HOUR AFTER THE PRIMER APPLICATION, RTV IS APPLIED TO THE PERIMETER OF THE INTERFACES. ACCOMPANYING THIS PART ARE TWO PREFORMED PACKING CONSISTED OF E515-80. THEY ARE OFF-THE-SHELF ITEMS AVAILABLE FROM PARKER SEAL CO.

(B) TEST:

FUEL PUMP LEAK TEST:

AFTER ASSEMBLY OF THE FUEL PUMP, A LEAK TEST IS PERFORMED. HELIUM, AT 28 ± 3 PSIG, IS APPLIED AT THE FUEL INLET BOSS. THE ENTIRE FUEL PUMP IS THEN SUBMERGED IN STODDARD SOLVENT FOR 2 MINUTES ± 10 SECONDS. NO LEAKAGE IS ALLOWED AT ANY SOURCE IN THE FILTER ASSEMBLY EXCEPT FOR THE INPUT SHAFT WHERE 2.0 CC IS ALLOWED.

FUEL SYSTEM LEAK CHECK:

A POST F & D (FLUSH AND DECONTAMINATE) FUEL SYSTEM LEAK CHECK IS PERFORMED AT THE MANUFACTURER PRIOR TO APU DELIVERY. THE FUEL INLET PORT IS PRESSURIZED WITH HELIUM TO 400 ± 10 PSIG.

THE FOLLOWING LOCATIONS ON THE APU FUEL LINES ARE INSPECTED WITH A HELIUM MASS SPECTROMETER TO COMPLY WITH A 1×10^{-6} SCCS LEAKAGE LIMIT:

- 1) UNCAPPED SEAL CAVITY DRAIN PORTS,
- 2) HIGH POINT VENT COUPLING WITH CAP ON,
- 3) HIGH POINT VENT COUPLING AT THE "TEE" FITTING,
- 4) BY-PASS "TEE" FITTING AT THE GGVM,

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- 5) BY-PASS FUEL LINE AT THE "TEE" ON THE GGVM
- 6) DISCHARGE ELBOW AT THE GGVM,
- 7) DISCHARGE FUEL LINE AT THE ELBOW ,
- 8) BY-PASS FUEL LINE AT THE ELBOW,
- 9) DISCHARGE ELBOW AT THE FUEL PUMP,
- 10) DISCHARGE FUEL LINE AT ELBOW ON THE FUEL PUMP
- 11) RELIEF VALVE ON THE FUEL PUMP
- 12) TEMPERATURE SENSOR AT THE FUEL PUMP,
- 13) PRESSURE TRANSDUCER AT THE FUEL PUMP.

THE LEAKAGE LIMIT FOR THE FOLLOWING APU FUEL SYSTEM LOCATIONS IS 1×10^{-5} SCCS:

- 14) HIGH POINT VENT QD WITH THE CAP REMOVED, AND
- 15) FUEL PUMP FILTER BOWL QD WITH THE CAP REMOVED.

GROUND TURNAROUND TEST:

MASS SPEC LEAK CHECKS ARE PERFORMED ON THE APU FUEL SYSTEM AFTER INSTALLATION. TOXIC VAPOR CHECKS AND SYSTEM INSPECTIONS ARE PERFORMED EVERY FLOW.

(C) INSPECTION:

THE FOLLOWING HARDWARE AND PROCESSES ARE VERIFIED BY INSPECTION:

- 1) RECEIVING INSPECTION MATERIALS AND PROCESSES CERTIFICATIONS
- 2) CONTAMINATION CONTROL CLEANLINESS TO LEVEL 100
- 3) CORROSION PROTECTION PROVISIONS
- 4) ASSEMBLY/INSTALLATION MANUFACTURING, ASSEMBLY, AND INSTALLATION PROCEDURES
- 5) CRITICAL DIMENSIONS AND SURFACE FINISHES
- 6) TEST EQUIPMENT AND TOOL CALIBRATION
- 7) ATP
- 8) PROOF AND LEAK TESTS
- 9) HANDLING, PACKAGING, STORAGE, AND SHIPPING PROCEDURES

(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 DATABASE.

(E) OPERATIONAL USE:

CLOSE ISOLATION VALVES TO ISOLATE DOWNSTREAM LEAKS.

- APPROVALS -

S&RE ENGINEERING
S&RE MANAGER
DESIGN ENGINEER

: O. HOLT
: P. STENGER-NGUYEN
: B. KIM

O. Holt 3/15/00
P. Stenger-Nguyen 3/15/00
B. Kim 3/15/00

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SUBSYSTEM MGR
NASA MOD
USA SAM
USA ORBITER

: K. SMITH
: J. P. JASON
: M. S. SNYDER
: S. LITTLE

J. Kenneth Smith 3/16/00
M. S. Snyder 3/21/00
M. S. Snyder 3/21/00
Stephen L. Little 3/20/00