NAME P/N QTY	CRIT	FAILURE MODE & CAUSE	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
O2 PRESSURE REGULATOR, 2ND STAGE ITEM 213D SV/778478- 31 (1) FC178-1 *	2/1R	FAILURE MODE: INTERNAL GAS LEAKAGE, FAILS OPEN. CAUSE: CONTAMINATION, SEAL FAILURE, BALL RETURN PLUNGER OR ACTUATOR PLUNGER JAMS, STATIC SEAL LEAKAGE AT DEMAND VALVE LIP SEALS OR BALANCE STEM O-RING, BELLOWS FAILURE, LEAKAGE FROM THE SENSING CAVITY TO AMBIENT.	END ITEM: CONTINUOUS SOP OXYGEN FLOW TO SUIT. GFE INTERFACE: PREMATURE DEPLETION OF EMERGENCY O2 SUPPLY. ALSO, MAY INCREASE SUIT PRESSURE ABOVE 4.7 PSID (ITEM 144 CRACKS), UP TO 5.5 PSID MAX. POSITIVE PRESSURE RELIEF VALVE ITEM 144 PREVENTS SUIT OVERPRESSURIZA- TION. MISSION: TERMINATE EVA. LOSS OF USE OF ONE EMU. CREW/VEHICLE: NONE FOR SINGLE FAILURE. POSSIBLE LOSS OF CREWMAN WITH LOSS OF PLSS.	A. DESIGN - IF THE ACTUATOR PLUNGER JAMS, THE ACTUATOR CANNOT BE MOVED TO EV WHICH MEANS THE SECOND STAGE COULD NOT BE BROUGHT ON LINE. THE DEMAND VALVE AREA IS PROTECTED WITH A 25 MICRON FILTER. SLIDING PARTS ARE HARDER THAN THEIR MATING BORES TO PREVENT GALLING. THE LIP-SEALS HAVE METAL TO METAL FIT ON BOTH SIDES AND THE PRESSURE INCREASES THE LOAD ON THE SEALING LIP. THE BALANCE STEM SEAL IS SIZED TO PROVIDE SQUEEZE UNDER ALL LOAD CONDITIONS. THE BALANCE STEM SEAL HAS A BACK-UP RING ON BOTH SIDES. THE SENSING CHAMBER IS SEALED BY A RADIAL SILICONE O-SEAL. THE DIMENSIONAL CONTROL AND INHERENT RIGIDITY OF THE RADIAL CONFIGURATION ASSURE SEALING. THE BELLOWS STRUCTURAL INTEGRITY IS ASSURED BY A 25 PSID PROOF TEST WHICH GIVES A MARGIN OF 6 OVER THE NORMAL OPERATING PRESSURE OF 4.3 PSID. THE BELLOWS AND SPRING ARE DESIGNED SUCH THAT INTERFERENCE WILL NOT OCCUR TO IMPEDE VALVE CLOSING. B. TEST - VENDOR COMPONENT ACCEPTANCE TEST - THE VENDOR, CTE, PERFORMS THE FOLLOWING TESTS TO ASSURE THE SECOND STAGE REGULATOR DOES NOT INTERNALLY LEAK: 1) CONTAMINATION IS REDUCED/MINIMIZED BY CLEANING ALL THE REGULATOR INTERNAL DETAILS AND OXYGEN PASSAGEWAYS TO HS 3150 EM 50A. THE TEST FACILITY HARDWARE AND GASES ALSO MEET THIS REQUIREMENT. 2) THE REGULATOR INTERNAL LEAKAGE IS TESTED DURING ACCEPTANCE TEST AT 7500 PSI INLET. PDA TESTING - THIS ITEM IS INTERNAL LEAKAGE TESTED ON THE SOP. WITH THE SOP BOTTLES PRESSURIZED TO 6000-6200 PSIG AND THE SOP SHUTOFF ACTUATOR ACTIVATED TO THE ON POSITION, THE OUTLET PRESSURE ON THE REGULATOR IS SET TO 4.65-5.20 PSIG. THE MAXIMUM ALLOWABLE LEAKAGE IS 10 SCC/MIN O2 AS MEASURED WITH A LAMINAR FLOWMETER FROM THE REGULATOR OUTLET. ALL TEST FIXTURES, INTERFACING MODELS, AND TEST RIGS THAT CONNECT TO EITHER HIGH OR LOW PRESSURE CIRCUITS ARE CLEANED TO HS 3150 LEVEL 50A. THE ITEM IS PROTECTED FROM CONTAMINATION BY PLACING 15 MICRON ABSOLUTE INLET FILTERS UPSTREAM OF THE TEST ITEM.

CIL
CRITICAL ITEMS LIST
FILE: CIL3/B

NAME P/N QTY	CRIT	FAILURE MODE & CAUSE	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
02 PRESSURE REGULATOR, 2ND STAGE ITEM 2130 SV710475-15 (1) FC170-2 *	2/1R	2150FM01B: INTERNAL GAS LEAKAGE, FAILS OPEN.		CERTIFICATION TEST - ITEM COMPLETED THE FOLLOWING CYCLE TESTS DURING S/65; ON/OFF ACTUAL 1025, SPEC 3081; HD FLOW HOURS ACTUAL 904, SPEC 10; BLOWDOWN ACTUAL 112, SPEC 35. NO CLASS I ENGINEERING CHANGES HAVE BEEN INCORPORATED SINCE THIS CONFIGURATION WAS CERTIFIED. C. INSPECTION - ALL DETAILS, GASES AND TEST FACILITIES ARE CLEANED AND INSPECTED TO MSFC-SPEC-164A TO PRECLUDE CONTAMINATION CLOGGING. THE O-RING AND LIP SEALS ARE 100% INSPECTED FOR SURFACE CHARACTERISTICS BY THE REGULATOR VENDOR. DETAILS, INCLUDING THE O-RING GROOVES AND SEALING SURFACES, ARE 100% INSPECTED PER DRAWING DIMENSIONS AND SURFACE FINISH CHARACTERISTICS. DETAILS ARE MANUFACTURED FROM MATERIAL WITH CERTIFIED PHYSICAL AND CHEMICAL PROPERTIES. THE RUNNING AND FINAL TORQUE OF ALL THREADED CONNECTIONS ARE VERIFIED BY VENDOR AND DCAS INSPECTORS. A TRIAL ASSEMBLY IS RUN ON ALL DETAILS AND THEN THEY ARE VISUALLY INSPECTED. THE DEMAND VALVE PINTLE AND BALANCE STEM ARE MANUALLY DEPRESSED DURING ASSEMBLY TO ASSURE FREE MOTION. D. FAILURE HISTORY - MEMU-215-A001 (7-11-80) INTERNAL LEAKAGE DUE TO MISMACHINED BALANCE STEM BORE. ASSEMBLY PROCEDURES WERE CHANGED TO INCLUDE A TRIAL ASSEMBLY. A-EMU-215-A004 (2-12-81) INTERNAL LEAKAGE DUE TO INCORRECT BACKUP RING MATERIAL. UNIT WAS FURTHER DAMAGED BY OVER PRESSURE DUE TO LACK OF RELIEF VALVES IN THE TEST FACILITY. THE REGULATOR DRAWINGS AND PROCEDURES WERE CHANGED TO INCORPORATE THE PROPER BACKUP RING. THE TEST FACILITY WAS CHANGED TO INCORPORATE RELIEF VALVES. MEMU-215-A005 (2-24-81) INTERNAL LEAKAGE DUE TO ROUGH DEMAND VALVE BORE SEAL AND SURFACE FINISH. ALL CRITICAL BLEEDING AND SEALING SURFACES ARE INSPECTED AT 2X MAGNIFICATION. J-EMU-215-005 (10-8-82) INTERNAL LEAKAGE DUE TO FLASHING ON THE BALANCE STEM O-RING. O-RING AND SEAL GOLD WERE REPLACED. E. GROUND TURNAROUND - TESTED PER FEMU-R-001, SOP SERVICING FOR FLIGHT, SHUTOFF VALVE INTERNAL LEAKAGE.

SCIL-44.DOC
Page 1156

NAME P/N QTY	CRIT	FAILURE MODE & CAUSE	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
O2 PRESSURE REGULATOR, 2ND STAGE ITEM 213D SV778675-15 (1) FC178-3	2/1R	213DFM01B: INTERNAL GAS LEAKAGE, FAILS OPEN.		F. OPERATIONAL USE - CREW RESPONSE - EVA: SINCE EVA TERMINATION IS REQUIRED AS SOON AS SOP IS FLOWING, CREW WOULD ABORT EVA WHEN EXCESSIVE SOP RATE IS DETECTED. SPECIAL TRAINING - STANDARD EMU TRAINING COVERS THIS FAILURE MODE. OPERATIONAL CONSIDERATIONS - EVA CHECKLIST PROCEDURES VERIFY HARDWARE INTEGRITY AND SYSTEMS OPERATIONAL STATUS PRIOR TO EVA. FLIGHT RULES DEFINE GO/NO GO CRITERIA RELATED TO EMU PRESSURE INTEGRITY AND REGULATION. FLIGHT RULES DEFINE EMU AS LOST FOR LOSS OF OPERATIONAL SOP. REAL TIME DATA SYSTEM ALLOWS GROUND MONITORING OF EMU SYSTEMS.