CIL
CRITICAL ITEMS LIST
FILE: CIL3/1

4/6/88 SUPERSEDES 6/4/1986

NAME P/N QTY	CRIT	FAILURE MODE & CAUSE	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
O2 PRESSURE REGULATOR 1ST STAGE ITEM 111A SV778475-13 (1) FC174-1	2/1R	111AFM02B: RESTRICTED FLOW, FAILS CLOSED. CAUSE: CONTAMINATION, CLOGGING OF THE INLET FILTER, BALL ACTUATOR OR RETURN PLUNGER JAMS, DIAPHRAGM RETURN SPRING RELAXES OR FRACTURES. STIFFENER PLATE SEPARATES FROM DIAPHRAGM.	END ITEM: UNABLE TO PLACE THE SOP ON-LINE. GFE INTERFACE: UNABLE TO SUPPLY EMERGENCY OXYGEN WHEN REQUIRED. MISSION: NO EFFECT UNLESS THERE IS ANOTHER FAILURE WHICH REQUIRES SOP OPERATION. CREW/VEHICLE: NONE FOR SINGLE FAILURE. POSSIBLE LOSS OF CREWMAN WITH LOSS OF PLSS.	A. DESIGN - JAMMING POTENTIAL IS MINIMIZED BECAUSE THE DIAPHRAGM FORCE OUTPUT WILL INCREASE 10.6 LBS. FOR EVERY 10 PSI DROP IN SENSED PRESSURE. NORMAL FORCE REQUIRED TO UNSEAT THE BALL IS 6.2 POUNDS. THE FIRST STAGE REGULATOR IS PROTECTED BY A 25 MICRON ABSOLUTE NICKEL FILTER TO MINIMIZE THE CHANCE OF JAMMING. THE NOMINAL RATING OF THE FILTER IS 18 MICRON WHICH IS EQUIVALENT TO A PARTICLE SIZE OF 0.0007 INS. DIAMETRICAL CLEARANCE BETWEEN SLIDING PARTS IS SMALL TO MINIMIZE COCKING AND IS 0.001 - 0.0015 BETWEEN THE VALVE STEM AND HOUSING AND 0.0008 - 0.0026 BETWEEN THE SPRING SEAT AND HOUSING. THE HOUSING IS MADE OF STRESS RELIEVED MONEL 400 AND THE VALVE STEM AND SPRING SEAT ARE MADE OF AGE HARDENED MONEL K500, TO MINIMIZE THE POTENTIAL FOR GALLING. ALL SLIDING SURFACES ARE 16 OR 32 MICROINCH FINISH. TO MINIMIZE THE POTENTIAL FOR COCKING, THE L/D RATIO FOR THE VALVE STEM/HOUSING COMBINATION IS 7 AND FOR THE SPRING SEAT/HOUSING COMBINATION IS 1.6. ALL EDGES ARE EITHER RADIUSED OR CHAMFERED. THE HELICAL COMPRESSION SPRING OPERATING STRESS AT THE SET POINT IS 60,000 PSI. THIS WILL GIVE A CYCLIC LIFE OF OVER 70,000 CYCLES ASSUMING THE SPRING HAS CYCLED BETWEEN NO LOAD TO OPERATING LOAD. VARIOUS ANALYSES HAVE BEEN MADE OF THE SOLDER JOINT BETWEEN THE STIFFENER PLATE AND DIAPHRAGM, FAILURE OF WHICH WOULD PREVENT THE FIRST STAGE REGULATOR FROM OPENING. THESE ANALYSES, INCLUDING G LOADING, TRAPPED PRESSURE LIFTING, AND BENDING, ALL INDICATE THE SOLDER JOINT WILL NOT FAIL. THE INLET PLEATED NICKEL WIRE FILTER HAS A CLEAN EFFECTIVE AREA OF 0.088 IN2. THE SPEC LIMITS THE DELTA P TO 0.4 PSID AT A FLOW OF 6.24 LB/HR AT AN INLET PRESSURE OF 388 PSIA WHICH REQUIRES AN EQUIVALENT AREA OF 0.0034 SQ.IN. THIS IS 4% OF THE FILTER EFFECTIVE AREA. IN ADDITION, THE SYSTEM IS CLEANED TO 1S1150 LEVEL 050A BEFORE OPERATION WHICH MINIMIZES THE AMOUNT OF PARTICLES THAT THE FILTER MUST CAPTURE.

NAME P/N QTY	CRET	FAILURE MODE # CAUSE	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
O2 PRESSURE REGULATOR 1ST STAGE ITEM 213B SV770475- 11 (1)	2/1R	213BFM02b: RESTRICTED FLOW, FAILS CLOSED.		B: TEST - VENDOR TEST THE VENDOR, CTI, PERFORMS THE FOLLOWING OPERATIONS OR TESTS TO ASSURE THE FIRST STAGE REGULATOR DOES NOT FAIL CLOSED OR REDUCE FLOW: 1. CONTAMINATION OR CLOGGING OF THE INLET FILTER IS REDUCED/MINIMIZED BY CLEANING ALL OF THE REGULATOR INTERNAL DETAILS AND OXYGEN PASSAGEWAYS TO MIL-STD-1330A LEVEL. THE TEST FACILITY HARDWARE AND GASES ARE ALSO REQUIRED TO MEET THIS REQUIREMENT. 2. THE REGULATOR FLOW CAPABILITY IS VERIFIED DURING ACCEPTANCE TEST BY PERFORMANCE TESTS AT SEA LEVEL WITH AN INLET PRESSURE OF 7400 PSI AND A VARYING FLOW RATE FROM 0.04 TO 5.3 TO 0.04 PPH. THE PERFORMANCE TEST IS ALSO PERFORMED AT VACUUM CONDITIONS WITH INLET PRESSURES OF 7400, 5865, 2710 AND 350 PSI AND A VARYING FLOW RATE FROM 0.04 TO 5.3 TO 0.04 PPH. 3. THE MAXIMUM FLOW RATE IS VERIFIED DURING ACCEPTANCE TEST AT INLET PRESSURES OF 7400 AND 350 PSI. PDA TESTING - CONTAMINATION OR CLOGGING OF THE INLET FILTER IS REDUCED/MINIMIZED BY CLEANING ALL INTERFACING INLET TEST FIXTURES AND HOSES TO MIL-STD-1330A LEVEL. TEST GASES ARE ALSO REQUIRED TO MEET THIS REQUIREMENT. PROPER REGULATOR PERFORMANCE IS VERIFIED IN A SERIES OF PERFORMANCE AND ENDURANCE TESTS. THE REGULATOR IS PERFORMANCE TESTED INITIALLY AT SEA LEVEL AMBIENT AT 7400 PSIG AND 350 PSIG INLET PRESSURES. AT EACH INLET PRESSURE THE OUTLET PRESSURE IS MONITORED OVER THE FLOW RANGES OF 0-0.2 LBS/HR O2 (MAX) AND 0.2 (MAX) -5 LBS/HR O2. INITIALLY THE END ITEM (SOP) IS ALLOWED TO BLOWDOWN FROM 7400 PSIG TO 350 PSIG, WHILE VERIFYING PROPER REGULATOR FUNCTION. WITH THE INLET AT 7400 PSIG, THE ITEM IS ENDURANCE FLOWED AT 4.5-5.25 LBS/HR O2 FOR 5 HOURS MINIMUM AND AT 0.5-2.0 LBS/HR O2 FOR 2.5 HOURS MINIMUM. AGAIN, THE END ITEM (SOP) IS ALLOWED TO BLOWDOWN FROM 7400 TO 350 PSIG. WITH THE INLET PRESSURE AT 350 PSIG, THE ITEM IS ENDURANCE FLOWED AT 4.5-5.25 LBS/HR O2 FOR 5 HOURS MINIMUM, AND AT 0.5-2.0 LBS/HR O2 FOR 2.5 HOURS MINIMUM.
FC174-2				

CIL
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FILE: CILS/1

NAME P/N QTY	CRIT	FAILURE MODE & CAUSE	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
02 PRESSURE REGULATOR 1ST STAGE ITEM 2138 SV778475-11 (1) FC174-5 A	2/BR	2158FM02B: RESTRICTED FLOW, FAILS CLOSED.		B. TEST CEI PDA TESTING (CONTINUED) - AFTER THE BLOWDOWN AND ENDURANCE TESTING, THE ITEM IS PERFORMANCE TESTED AT SEA LEVEL AND VACUUM AMBIENT WITH INLET PRESSURES OF 7400 PSIG AND 350 PSIG. FOR EACH CONFIGURATION, THE OUTLET PRESSURE IS MONITORED OVER THE FLOW RANGES OF 0-0.2 LBS/HR OR (MAX) AND 0.2 (MIN) -0 LBS/HR 02. AN ADDITIONAL BLOWDOWN IS PERFORMED PRIOR TO VACUUM AMBIENT TESTING. CERTIFICATION TEST - THE ITEM COMPLETED THE FOLLOWING CYCLE TEST DURING 5/85: ON/OFF ACTUAL 8025, SPEC 8011; NO FLOW HOURS ACTUAL 984, SPEC 36; BLOWDOWN ACTUAL 112, SPEC 35. NO CLASS I ENGINEERING CHANGES HAVE BEEN INCORPORATED SINCE THIS CONFIGURATION WAS CERTIFIED. C. INSPECTION - DETAILS ARE 100% INSPECTED PER DRAWING DIMENSIONS AND SURFACE FINISH CHARACTERISTICS. DETAILS ARE MANUFACTURED FROM MATERIAL WITH CERTIFIED PHYSICAL AND CHEMICAL PROPERTIES. THE STRIKER PLATE/DIAPHRAGM SOLDER JOINT IS X-RAY INSPECTED TO ASSURE 40% COVERAGE TO PREVENT SEPARATION. ALL DETAILS, CASES AND TEST FACILITIES ARE CLEANED AND INSPECTED TO MSSIBG EHSOA TO PRECLUDE CONTAMINATION CLOGGING. THE RUNNING AND FINAL TORQUE OF ALL THREADED CONNECTIONS ARE VERIFIED BY INSPECTION. A TRIAL ASSEMBLY IS RUN ON ALL DETAILS AND THEN THEY ARE VISUALLY INSPECTED. THE DEMAND VALVE POPPET IS MANUALLY DEPRESSED DURING ASSEMBLY TO ASSURE FREE MOTION. D. FAILURE HISTORY - NONE. E. GROUND TURNAROUND - TESTED FOR PERFORMANCE PER FEMU-R-001. SOP SERVICING FOR FLIGHT. F. OPERATIONAL USE - CREW RESPONSE - EVA: SINCE EVA TERMINATION IS REQUIRED AS SOON AS SOP IS FLOWING, CREW WOULD ABORT EVA WHEN INSUFFICIENT SOP OPERATION IS DETECTED. 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.