

C31
EMU CRITICAL ITEMS LIST

12/26/91 SUPERSEDES 00/31/90

ANALYST:

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NAME P/N QTY	CNT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
O2 PRESSURE REGULATOR 2ND STAGE, ITEM 2130 BY799042-3 (1)	1/1	<p>2130FN05A: Drifts below regulation band limits.</p> <p>CAUSE: Contamination. Component shafts stick or spring retains or fractures. Inlet filter clogs.</p>	<p>EMR ITEM: Emergency oxygen delivered to suit at pressure below 3.3 psi.</p> <p>CPE INTERFACE: Unable to maintain emergency suit pressure level when required.</p> <p>MISSION: Abort EVA.</p> <p>CREW/VEHICLE: Possible loss of crewman. Insufficient pressure to maintain life.</p>	<p>A. Design - The second stage springs operate at a stress below yield point. The helical regulating spring has a cycle life of 200,000 cycles. A cycle is defined as stressing the spring from zero to operating load and back. The specification requires the regulator to survive 1525 pressurization cycles. The second stage inlet pleated nickel wire filter has a clean effective area of 0.082 sq. in. The equivalent orifice area to limit the Delta P across the filter to 0.4 psid at Pin = 180 psi and a flow of 5.26 lb/hr of O2 is 0.0049 sq. in. The ratio of available area to the required area for the filter is 16. The system is cleaned to MS3150 level EMSOA before operation which minimizes the initial amount of contamination in the system. Particle generation during operation is minimized by material selection and surface finishes. The second stage regulator is protected by a 25 micron absolute nickel filter to minimize the chance of jamming. Nominal rating of the filter is 10 micron which is equivalent to a particle size of .0007 inches. Diametrical clearance between sliding parts is small to minimize cocking. It is 0.0010-0.0015 inch between the demand valve pin and housing, 0.0005-0.0025 inch between the return plunger and housing, and 0.0005-0.0025 inch between the stem guide and pressure balance stem. The filter reduces the probability of a particle jamming these details. The housing and stem guide are made of stress relieved Monel 400 and the valve stem, spring seat, and pressure balance stem are made of age hardened Monel K500 to minimize the chance of galling. All sliding surfaces have either a 16 or 32 microinch finish. All edges are either radiused or chamfered. The L/D ratio for the valve stem - housing combination is 7; for the spring seat - housing combination is 1.6; and for the pressure balance stem - stem guide is 7.</p> <p>B. Test - Component Acceptance Test - The vendor, C31, performs the following tests to assure the second stage regulator does not drift below 3.3 psi. Contamination is reduced/minimized by cleaning all of the regulator internal details and oxygen passageways to MS3150 EMSOA. The test facility hardware and gases also meet this requirement. The regulation band is verified during Acceptance test by</p>

CIL
EMU CRITICAL ITEMS LIST

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NAME P/N OFF	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
	1/1	2930FAB5A:		<p>performance tests at sea level with an inlet pressure of 7400 psig and a varying flow rate from 0.06 to 5.3 to 0.06 pph. The performance test is also performed at vacuum conditions with inlet pressure of 7400, 5855, 2730 and 350 psig and a varying flow rate from 0.06 to 5.3 to 0.06 pph.</p> <p>PBA Test - Contamination or clogging of the inlet filter is reduced/minimized by cleaning all interfacing inlet test fixtures and hoses to MS3158 EMSBA. Test gases also 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 0-8.2 lbs/hr O2 (max) and 8.2 (min) -0 lbs/hr O2. Initially, the end item (SOI) 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.</p> <p>Again, the end item (SOI) is allowed to blowdown from 7400-350 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. 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 4-8.2 lbs/hr O2 (max) and 8.2 (min) -0 lbs/hr O2. An additional blowdown is performed prior to vacuum ambient testing.</p> <p>Certification Test - The item completed the following cycle tests during 5/85: ON/OFF Actual 1025, Spec 9011; No Flow Hours Actual 906, Spec 10; Blowdown Actual 112, Spec 35. No class I Engineering Changes have been incorporated since this configuration was certified.</p> <p>C. Inspection - Details are 100% inspected per drawings dimensions and</p>

NAME P/N BY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
	1/1	Z130/H03A:		<p>surface finish characteristics. Details are manufactured from material with certified physical and chemical properties. All details, gages, and test facilities are cleaned and inspected to MS3150 EMSOA to preclude contamination clogging. 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 pinrite and balance stem are manually depressed during assembly to ensure free motion.</p> <p>D. Failure History - W-EMA-213-C003 (1/10/81) low outlet pressure due to rig contamination and high filter pressure drop. The rig was changed to trap any pump oil spillage, the outlet filter was removed and the system was cleaned to MS3150 EMSOA. J-EMA-213--007 (5/16/84) Corrosion observed in the second stage regulator sense cavity and outlet fitting from water collected due to substandard sublimator performance. A drain was attached to Drain Port H during all manned chamber testing.</p> <p>E. Ground Turnaround - Tested per FEMA-R-007, SOP servicing for flight, Sea Level Regulator Performance and Flow Limiting Check.</p> <p>F. Operational Use - Crew Response - EVA: Since EVA termination is required as soon as SOP is flowing, crew would abort EVA when insufficient SOP regulation 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.</p>