CIL

EMU CRITICAL ITEMS LIST

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NAME P/N		FAILURE MODE &		
QTY	CRIT	CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		113CFM01A		
SHUTOFF VALVE, ITEM 113C	2/2	Internal gas leakage, fails open. Contamination, spring relaxes or breaks, ball return plunger jams or actuator plunger jams, static seal leakage.	END ITEM: Unable to isolate the primary 02	A. Design - The valve seat and stem are protected from contamination by a 25 micron absolu filter made of commercially pure nickel per HSTM B160-75 (UNS No. 2200). The lower valve stem, fabricated of Inconel 718, has a 16 microinch surface finish
SV778873-15 (1)			bottles from the primary regulators. GFE INTERFACE: Unable to recharge water reservoir. Unable to prevent 02 pressurization of gas side of bladders.	 and a length to diameter ratio of approximately 3 to prevent jamming. The middle valve stem, fabricated of Ni-Cu-Al alloy per QQ-N-286 Class A, also has a 16 microinch surface finish. Its length to diameter ratio is 3.8. The upper valve stem made of Ni-Cu-Al alloy per QQ-N-286 Class A, has 16 and 32 microinch surface and slide through a seal lubricated with Braycote Micronic 3L-38RP. The spring can withstand over 100,000 maximum stroke cycles. B. Test - Vendor Component Acceptance Test - The manufacturer, CTI, cycles the on/off valve 10 times during Acceptance Test. All performance and stability tests require oxygen flow through the on/off valve. Subsequent internal leakage test which requires 1cc/hr maximum at 1000 psid verifies that the on/off valve has not failed open.
			MISSION: Loss of use of one EMU.	PDA Test - Shutoff valve leakage is tested per AT-E-115 Para. 9.1 which allows 0.06 scc/hr He max at 900 psid, verifing the valve has not failed open.
			CREW/VEHICLE: None.	Certification Test - Certified for a useful life of 20 years (Ref. EMUM-0083).
			TIME TO EFFECT /ACTIONS: Minutes. TIME AVAILABLE: N/A	C. Inspection - Details are 100% inspected per drawing dimensions and surface finish characteristics. Details are manufactured from material with certified physical and chemical properties. All details, gases and test facilities are cleaned and inspected to HS3150 EM50A to preclude contamination clogging. The running and final torque of the threaded connector is verified by Vendor and DCAS inspection. A trial assembly is run on all details and then they are visually inspected for contamination. The actuator is manually depressed to assure freedom of motion.
			TIME REQUIRED: N/A REDUNDANCY SCREENS: A-N/A B-N/A C-N/A	 D. Failure History - H-EMU-113-D014 (09/05/97) - Shutoff valve failed internal seat leak test. Damaged area on coined surface of valve seat due to solder joint particles breaking off during vibration testing. Op sheets updated to provide 30x inspection of solder joints to verify removal of excess joint solder. H-EMU-113-C014 (12/23/98) - Item failed internal leakage test during post cycling Shut off Valve leakage test following completion of 15-year operational cycles. Particles produced by abrasion of O-Ring against upper valve stem migrated throughout II13C Shutoff Valve and became trapped in seat by sapphire ball, affecting seal and resulting in leakage. Test rig automation, along with other factors, allowed for accelerated cycle rate. Over cycled Silicone O-Rings degrade prematurely. Proof cycles appear to be most damaging. New cycle model developed for Item 113C which divides proof cycle requirements into high and low proof. Total number of operational and proof cycles reduced. Major difference is reduction

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		113CFM01A			·
				H-EMU-113-C015 (3/22/00) - During shut off valve leakage t completion of 5-year operational cycles, Item failed leaka caused by failure of valve sapphire ball to completely seal on the seat due to contamination. Contam flaking off copper plated spring in shutoff valve. Suppli Technologies) used copper plated wire for valve spring. O effect on function or life of spring. Plating did not fla 35,000 cycles (11 times actual worst case number of 20-yea to flake off in flight units. ECS 182135-409 and 182135-4 create new Monel spring configuration for PLSS and SOP rece platings or coatings on springs.	age. Valve leakage mination from copper ier (Carelton Copper plating has no ake off until after ar cycles). Unlikely 409-01 per CCBD H7054
				E. Ground Turnaround - Tested for non-EET processing per FEMU-R-001, High Pressur EET processing.	e O2 Leakage. None for
				F. Operational Use - Crew Response - PostEVA: If water tanks cannot be refilled on orbit, termi EMU go for SCU ops on subsequent EVA. Training - No training specifically covers this failure mo	2

Operational Considerations -Flight rules define EMU go to remain on SCU available for rescue if required. EVA checklist procedures verify hardware integrity and operational status prior to EVA. Real Time Data System allows ground monitoring of EMU systems.

EXTRAVEHICULAR MOBILITY UNIT

SYSTEMS SAFETY REVIEW PANEL REVIEW

FOR THE

I-113 PRIMARY PRESSURE CONTROL MODULE

CRITICAL ITEM LIST (CIL)

EMU CONTRACT NO. NAS 9-97150

Prepared by: AIS - Project Engineering Approved by: APR Approved by: APR Approved by: APR ASA

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Ula Plough for foru HS - Engineering Manager

6/25/02

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