

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE

102FM01				
NECK RING ASSEMBLY & VENT SEAL ASSEMBLY, ITEM 102	2/2	Fails to unlock, Helmet from Neck Ring.	END ITEM: Neck Ring cannot be rotated to retract eight latching pins which secure helmet to HUT.	A. Design - The disconnect operates by direct mechanical actuation of the locking latches through the external lock assembly. The design specifies tight neck ring clearances to reduce the possibility of foreign material getting into the locking mechanism. The spring and latches are lubricated using Krytox 240AC and the cam surfaces are coated with a dry film lubricant (Dow Corning 321). The Helmet is stowed in the Orbiter mated to the Neck Ring or HHF following final pre-flight inspections to preclude contamination by foreign matter prior to EVA. The materials used to make the screws (A-286 stainless steel), the latch pin (17-4 stainless steel), the lock-lock pin (303 stainless steel), and the spring (302 or 304 stainless steel) are designed for strength and corrosion resistance. The neck ring was designed and used throughout the Apollo Program.
----- A/L 9357-11 (1)		Contamination or foreign material causing obstruction.	GFE INTERFACE: Unable to separate helmet from HUT, to don and doff SSA.	Loose or missing lock subassembly screws and locking ring retainer screws are precluded in design by adherence to standard engineering torque requirements for screw installation and the use of thread locking material.
----- A/L 9715-03 (1)		Bent or broken latch pin. Impact. Missing or loose screws. Defective material, lock- lock, pin or spring.	MISSION: Terminate EVA prep. Loss of use of one EMU.	The position of the neck ring in relation to the DCM and PLSS significantly reduces the possibility of impact directly at the neck ring, thus minimizing failure due to impact. Additionally, the Helmet/EVVA provides a barrier to micrometeoroid impact.
			CREW/VEHICLE: None.	B. Test - Acceptance: An engagement force verification test is performed on each Neck Ring per Airlock ATP 9357-10 prior to acceptance by ILC.
			TIME TO EFFECT /ACTIONS: Seconds.	PDA: Five neck ring plug engagements, actuations and disengagements are performed prior to the PDA pressure tests.
			TIME AVAILABLE: N/A	Certification: The neck ring was successfully tested (manned) during SSA certification to duplicate operational life. (Ref. EM 83-1083, EM 98-0008 and ILC Report 0111-711330). The following usage reflecting requirements fo significance to the neck ring was documented during certification:
			TIME REQUIRED: N/A	
			REDUNDANCY	
			SCREENS:	
			A-N/A	Requirement S/AD Actual
			B-N/A	-----
			C-N/A	Actuation Cycles 300 1080
				Pressure Hours 458 916
				Pressure Cycles 300 600
				The pivoted HUT neck ring successfully subjected to an ultimate pressure of 13.2 psid during SSA certification testing (Ref. ILC Report 0111-79405). This is 1.5 times the maximum BTA operating pressure based on 8.8 psid. The Neck Ring also passed shock, vibration, and acceleration testing to S/AD limits, Ref. Hamilton Standard TER's 3043, 3048, 3067, and 3076.
				The Planar-HUT neck ring was successfully subjected to an ultimate pressure of 17.6 psid during Ssa certification testing (Ref. ILC Report 0102-711982). This is 2.0 times the maximum BTA operating pressure based on 8.8 psid. The neck ring also passed shock, vibration, and acceleration testing to S/AD limits, Ref.

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		102FM01		<p>Hamilton Standard TER's 3807 and 3808.</p> <p>C. Inspection - Components and material manufactured to ILC requirements at an Approved Supplier are documented from procurement through shipping by the supplier. ILC incoming receiving inspection verifies that the materials received are as identified in the procurement documents, that no damage has occurred during shipment and that supplier certification has been received which provides traceability information.</p> <p>The following MIP's are performed during the neck ring assembly manufacturing process to assure the failure causes are precluded from the fabricated item:</p> <p>Verify operation sheet completion. Verify engage and disengage five times. Verify engagement force (20 lbs max.) Verify for conformance of all dimensions to drawing. Verify presence of screws, screw torquing and thread lock adhesive.</p> <p>During PDA, the neck ring is inspected for VC level cleanliness per ILC Document 0111-70028J (Pivoted HUT) or 0111-710112 (Planar HUT).</p> <p>D. Failure History - None.</p> <p>E. Ground Turnaround - Inspected for non-EET processing per FEMU-R-001, Pre-Flight Inspections and Final Structural and Leakage. Inspected per FEMU-R-001 Para 8.2 EMU Preflight KSC Checkout for EET processing. Verify HUT Helmet-to-Suit Disconnect Lock Function. Additionally, for Planar HUT's every 4 years or 229 hours of manned pressurized time the neck ring is disassembled, inspected, cleaned, lubricated and reassembled. Following reassembly proper operation is verified and a subjective engagement test performed.</p> <p>F. Operational Use - Crew Response - PreEVA: Trouble shoot problem. If no success, terminate EVA prep. Consider EMU 3 if available. EMU no go for EVA. PostEVA: Trouble shoot problem and assist crewman in doffing EMU as required. Training - No training specifically covers this failure mode. Operational Considerations - EVA c/l and FDF procedures verify hardware integrity and system operational status prior to EVA.</p>

EXTRAVEHICULAR MOBILITY UNIT
SYSTEMS SAFETY REVIEW PANEL REVIEW
FOR THE
I-102 HARD UPPER TORSO (HUT)
CRITICAL ITEM LIST (CIL)
EMU CONTRACT NO. NAS 9-97150

Prepared by: J. Chumley 3/27/02
HS - Project Engineering

Approved by: [Signature]
NASA - SSFVSSM

M. Snyder
HS - Reliability

[Signature] 5/14/02
[Redacted]

[Signature] for RTR
HS - Engineering Manager

[Signature] 5/23/02
[Redacted]

[Signature] 5/23/02
[Redacted]

[Signature] 6/04/02
[Redacted]

[Signature] 6/14/02
[Redacted]