NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		104FM05		
BODY SEAL CLOSURE, ITEM 104 --- A/L 9787-07 (1)	3/1RB	Fails to remain locked. Contamination or foreign matter in lock, cam or latch. Defective lock/spring. Missing or loose BSC cover screw.	END ITEM: Loss of BSC primary locking mechanism. GFE INTERFACE: None for single primary lock failure. There are three redundant locking mechanisms. MISSION: None for single or double lock failures. CREW/VEHICLE: None with single failure. Loss of crewman with loss of secondary lock followed by rotation far enough to allow retraction of the locking latches which hold the (HUT and LTA) BSC halves together. TIME TO EFFECT /ACTIONS: Immediate. TIME AVAILABLE: N/A TIME REQUIRED: N/A REDUNDANCY	A. Design - The disconnect operates by direct mechanical actuation of the locking latches through the external lock assembly. The design specifies tight tolerances at the disconnect interface to reduce the possibility of foreign material getting into the mated interface. The LTA is stowed in the orbiter mated to the HUT, reducing the possibility of contamination prior to EVA. The design of the BSC disconnect requires simultaneous manual actuation in three planes in order to effect a separation of the HUT and LTA sides: Downward depression of the locking button, pulling the lock subassembly forward, and pushing the subassembly to the crewman's left to release the latches. No single failure of the lock subassembly operation would cause the BSC to unlatch. The BSC housing is machined from 7075-T73 Aluminum. The latch and latch pin are machined from 17-4 PH stainless steel, heat treated to the 1050 condition. Springs are stainless steel. High strength material and heat treated condition of the latch and latch pin preclude wear and breakage. Incidence of loose screws in the BSC is precluded in design by adherence to standard engineering torque requirements for screw installation. The SST alignment button screw uses loctite thread locking adhesive and is torqued to 5-7 in.-lb. A stress analysis has been performed to verify the structural integrity of the BSC. The analysis identifies the most likely failure modes and locations. Maximum bending stress occurs at the restraint bracket. Maximum torsional stress occurs at approximately 40 degree from the bracket. The safety factor over ultimate bending and torsion are 14.4 and 14.1, respectively, compared to a S/AD requirement of 2.0. Location / Failure Mode / Maximum Stress (psi) / Safety Factor / S/AD Safety Factor Restraint Bracket — Bending — 4712 — 14.4 — 2.0 Interface Front — Bending — 3820 — 17.8 — 2.0 40 degrees from Bracket — Torsion — 2920 — 14.1 — 2.0 Latch Interface — Bearing — 4180 — 16.3 — 2.0 B. Test - Acceptance: The body seal closure is subjected to engagement testing per Airlock ATP 9787-05 prior to acceptance by ILC to verify proper assembly and operation. PDA: The body seal closure is subjected to engagement cycling at the LTA level in accordance with ILC Document 0111-70028J to verify proper assembly and operation.

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			SCREENS: A-PASS B-FAIL C-PASS	Certification: The body seal closure was successfully tested (manned) during SSA certification to duplicate operational life (Ref. ILC Engineering Memorandum EM 83-1083). The following usage, reflecting requirements of significance to the body seal closure, was documented during certification. Requirement / S/AD / Actual BSC Actuation Cycles: 300 / 1,080 The BSC disconnect successfully passed the shock, vibration and acceleration tests without loss of screw torque. Ref. ILC EM 84-1097. During shock, vibration acceleration certification testing, the BSC, while pressurized as part of the SSA, was struck by a 2 inch diameter spherical ball moving at a rate of 2 ft./s. No visible or performance degradation was observed. During bench shock testing, the LTA was dropped from a height of 4" on to a wooden surface without visible degradation. 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 have been received which provide traceability information. The following MIP's are performed during the LTA manufactruing process to assure the failure cause is precluded from the fabricated item: 1. Inspection for cleanliness to VC level. 2. Verify presence of screws during torque operations. 3. Inspection after proof and leakage testing for deformation, defects or damage. 4. Application of loctite to the SST alignment button screw. During PDA, the following inspection points are performed at the LTA assembly level in accordance with ILC Document 0111-70028J: 1. Inspection for VC level cleanliness. 2. Inspection for damage, wear or material degradation. 3. Verification of proper BSC engagement and operation. D. Failure History - None. E. Ground Turnaround - Inspected for non-EET processing per FEMU-R-001, verify proper function of BSC. FEMU-R-001 Para 8.2 EMU Preflight KSC Checkout for EET processing. Every 4 years, or 229 hours of manned pressurized time, the BSC is removed from

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		104FM05		the LTA and disassembled, cleaned, inspected, lubricated, and reassembled. Proper operation, and LTA level structural and leakage tests are also accomplished. F. Operational Use - Operational Use 1. Crew Response Pre/post-EVA : No response, single failure not detectable. EVA : No response, single failure not detectable. 2. Special Training No training specifically covers this failure mode. 3. Operational Considerations Not applicable.

EXTRAVEHICULAR MOBILITY UNIT

SYSTEMS SAFETY REVIEW PANEL REVIEW

FOR THE

I-104 LOWER TORSO ASSEMBLY (LTA)

CRITICAL ITEM LIST (CIL)

EMU CONTRACT NO. NAS 9-97150

Prepared by: _____
HS - Project Engineering

_____
HS - Reliability

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HS - Engineering Manager

Approved by: _____ 21 MAY 02
NASA – SSA/SSM

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NASA – EMU SSM

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NASA – MOD

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NASA – CTOW

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