NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
BODY SEAL CLOSURE, ITEM 104 --- A/L 9787-07 (1)	2/2	104FM03: Physical jamming in mated position. CAUSE: Contamination or foreign matter in latch. Defective lock/spring, ring. Latch spring bent or broken latch pin. Loose alignment button screw. Impact. Missing or loose BSC cover screw.	END ITEM: Unable to unlock BSC. GFE INTERFACE: Unable to separate HUT from LTA. Unable to doff EMU. MISSION: Loss of use of one EMU. Terminate EVA. CREW/VEHICLE: None.	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 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. 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. During shock, vibration, and acceleration certification testing, the BSC, while pressurized as a part of the BSA, was struck by a 2 inch diameter spherical ball moving at a rate of 2 feet/second. 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 with out visible degradation. Incidence of loose screws in the BSC is precluded by adherence to standard engineering torque requirements for screw installation. The stainless steel 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 factors over ultimate bending and torsion are 14.4 and 14.1, respectively, compared to a S/RD requirement of 2.0.

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Location	Failure Mode	Maximum Stress(psi)	Safety Factor	S/AD Safety Factor Req'd
Restraint Bracket ...	Bending	4712	14.4	2.0
Interface Front	Bending	3820	17.8	2.0
40 Deg From Bracket ...	Torsion	2920	14.1	2.0
Latch Interface ..	Bearing	4180	16.3	2.0

Thirteen (13) screws retain the BSC cover. Two of these screws also anchor the doffing aid. The BSC cover is an elliptical ring with an "L" shaped cross section, the horizontal surface of which faces the flat surface of the mating HUT BSC.
The two doffing aid screws are torqued to 7 to 9 in.-lb. The 11 cover screws are torqued to 3 in.-lb. Loss of more than one screw would be required to allow the BSC cover to move enough to cause an interference or latch malfunction that would prevent BSC locking.

B. Test -
Acceptance:
The body seal closure is subjected to engagement testing per Airlock AIP 9787-05 prior to acceptance by ILC, to verify proper assembly and operation.
The body seal closure is subjected to engagement cycling at the LTA level in accordance with ILC Document 8111-70028J, to verify proper assembly and operation.

Certification:
The body seal closure was successfully tested (manned) during SSA certification to duplicate 15 years 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	Equiv Life (yrs)
BSC Actuation Cycles	1080	1088	15.1

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The BSC disconnect successfully passed the shock, vibration and acceleration tests without loss of screw torque. Ref. ILC EN 84-1097.

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 certifications have been received which provide traceability information.

The following HIP's are performed during the LTA manufacturing process to assure the failure causes are precluded from the fabrication process.

1. Inspection of cleanliness to VC level.
2. Verify presence of screws during torquing operations.
3. Inspection after proof and leakage testing for deformation, defects or damage.

During POA, the following inspection points are performed at the LTA assembly level in accordance with ILC Document 0111-74028J:
Inspection for cleanliness to VC level.
Verification of proper engagement and operation.

D. Failure History -
B-EMU-104-A031 (9/10/90) - The Vespel BSC alignment button was free to spin when its capture screw backed out, due to lack of loctite to secure the capture screw in place. Changed Airlock procedures to verify loctite application to the BSC button screw prior to assembly. Field experience indicates that the button will loosen even when loctite is used. Therefore, the button will also be bonded to the BSC housing with Hysol EA934 to increase button break-away torque from 6 in-lbs to 47 in-lbs.

B-EMU-104-A032 (12/2/91) - The Hysol-bonded Vespel BSC button fractured in several locations due to an externally induced load which exceeded the Vespel's strength during

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	2/2	104FM03:		donning or doffing of the LTA. The button material was changed to stainless steel and bonded to the BSC housing with Loctite instead of Hysol.

E. Ground Turnaround -
During ground turnaround, in accordance with FEMU-R-001, the BSC is visually inspected for material damage, loose or missing screws, and structural integrity.
Additionally, the BSC is subjected to subjective engagement evaluations at EMU and LTA level. Also, the EMU pre-flight section has a specific line entry to verify proper operation of the primary and secondary lock function.
Every 2 years, or 56 hours of manned pressurized time, the BSC is removed from the LTA and disassembled, cleaned, inspected, lubricated, and reassembled. Proper operation, and LTA level structural and leakage tests are also accomplished.

F. Operational Use -
Crew Response -
Pre-EVA : Troubleshoot problem, if no success, consider using third LTA if available. Otherwise terminate EVA operations.
Special Training -
Standard training covers this failure mode.
Operational Considerations -
EVA checklist procedures verify hardware integrity and systems operational status prior to EVA.