NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		104FM33		
PRESSURE BOOT ASSEMBLY, ITEM 104 (1) LEFT (1) RIGHT --- 0104-210895-25/26/29/30; 0104-210895-33/34/35/36 (2)	2/1R	Loss of primary axial restraint bracket, heel. Defective Material: Bracket, helicoil or thread lock adhesive. Loose screw.	END ITEM: Loss of primary axial restraint. GFE INTERFACE: Axial load will be transferred to secondary restraint. Axial load will be transferred to secondary restraint webbing. MISSION: Terminate EVA. CREW/VEHICLE: Loss of boot sole and ability to interface with foot restraint. Loss of crewman with loss of secondary restraint webbing. TIME TO EFFECT /ACTIONS: Minutes. TIME AVAILABLE: Days. TIME REQUIRED: Hours. REDUNDANCY SCREENS: A-PASS B-N/A C-PASS	A. Design - The Enhanced Boot heel primary bracket is fabricated from 17-4 stainless steel. The brackets are machined, ultrasonic cleaned, passivated and either electropolished or dry hone finished. A stress analysis of the Enhanced Boot primary restraint bracket revealed a minimum safety factor of 16.2 over yield strength and 18.0 over ultimate strength against a S/AD limit load of 838 lbs. The required S/AD safety factor at 4.4 psid is 2.0 over ultimate strength and 1.5 over yield strength. The heel primary bracket attachment screws are fabricated from A-286 stainless steel and are procured to MS or NAS specifications. Loss of the heel bracket screw is precluded in design by adherence to standard engineering torque requirements for screw installation and the use of thread lock adhesive. Analysis has shown that the primary bracket screws have a minimum ultimate safety factor of 3.2 at 4.4 psid (max normal operating pressure). At 5.5 psid (max failure pressure) and at 8.8 psid (max BTA operating pressure) the minimum safety factors are 3.1 and 6.7 respectively. Design requirements for proper installation of helicoils are specified in the assembly procedures when the helicoils are installed in the heel. B. Test - Acceptance: Component - See Inspection. PDA: The following test is conducted at the boot level in accordance with ILC Document 0111-710112: Proof pressure test at 8.0 + 0.2 - 0.0 psig for a minimum of 5 minutes conducted with the TMG removed. Certification: The Enhanced Boot heel restraint was successfully tested (manned) during certification to duplicate operational life (Ref. ILC Doc. 0111-711330). The following usage, reflecting requirements of significance to the boot heel restraint, was documented during certification: Requirement / S/AD / Actual Pressurized Hours: 458 / 916 Pressurized Cycles: 300 / 600 Ankle Flexion/Extension: 11614 / 24000 Walking Steps: 4320 / 77760 The Enhanced Boot Heel restraint was successfully subjected to a BTA ultimate pressure of 13.2 psig (1.5 times max BTA operating pressure based on 8.8 psig). (Ref. ILC Doc. 0111-711330). C. Inspection -

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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 MIP's are performed during the boot assembly manufacturing process to assure that the failure causes are precluded from the fabricated item:
1. Verification of presence of screws during torquing and thread locking assembly operations of the boot heel bracket.
2. Helicoil installation is verified during manufacturing at the supplier.

During PDA, the following inspection points are performed per ILC Document 0111-710112:
1. Visual inspection for material degradation.
2. Visual inspection for damage after proof pressure test.

D. Failure History -
B-EMU-104-A062 (6/19/99)
Reddish-brown surface discoloration on inboard heel restraint bracket (left boot). Scans of the discoloration suggest the coloration is consistent with varnish or other wood finishing product. The substance and source could not be identified. No corrective action required. Pre-flight visual inspections per FEMU-R-001 exist to identify such anomalies.

E. Ground Turnaround -
Every four years or 229 hours of manned pressurized time screw torque and loctite application are verified.

F. Operational Use -
Crew Response -
Pre/post-EVA : When detected terminate EVA prep. If detected audibly or tactily, troubleshoot problem. If no success, use spare LTA if available or terminate EVA prep.
EVA : When detected terminate EVA.
Special Training -
No training specifically covers this failure mode.
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

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