NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		103FM03		
DUAL SEAL SCYE BEARING ASSY, ITEM 103 (1) LEFT (1) RIGHT --- A/L 10085-03/04 (2) OR --- A/L 10134-01/02 (2) OR --- A/L 10135-01/02 (2)	2/1RB	Loss of primary and secondary axial restraint bracket screw. Defective material: Screws, helicoils, or thread lock adhesive.	END ITEM: One of two screws missing on one side of bracket. GFE INTERFACE: Load is transferred to second screw. MISSION: None for single failure. CREW/VEHICLE: None with loss of one screw. Loss of crewman with loss of second screw on same side of bracket, causing loss of the restraint brackets. TIME TO EFFECT /ACTIONS: Seconds. TIME AVAILABLE: Days. TIME REQUIRED: Days. REDUNDANCY SCREENS: A-PASS B-FAIL C-PASS	A. Design - The primary and secondary axial restraint brackets are installed with a single set of four screws fabricated from A-286 stainless steel and are procured to MS or NAS specifications. Loss of bracket screws is precluded in design by adherence to standard engineering torque requirements for screw installation and the use of thread lock adhesive. Design requirements for proper installation of helicoils are specified in the assembly procedures when the helicoils are installed in the scye bearing. With one of four screws missing, testing has demonstrated that the bracket system exhibits a minimum strength of 1100 lbs. At 4.4 psid (normal operating pressure), this load results in a minimum ultimate safety factor of 3.8 against a S/AD load of 288 lbs. At 5.5 psid (max failure pressure) and 8.8 psid (max BTA operating pressure), the minimum ultimate safety factors are 3.8 and 3.7 respectively. The S/AD minimum ultimate safety factor requirement for hardware is 2.0 at 4.4 psid, 1.5 at both 5.5 psid and 8.8 psid. B. Test - Acceptance - The scye bearing assembly is acceptance tested per A/L ATP 10085, ATP 10134, or ATP 10135. PDA: The following test is conducted at the scye bearing 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 scye bearing primary and secondary axial restraint brackets were successfully tested (manned) during SSA certification to duplicate 458 hours operational life (Ref. ILC Report 0111-711330). The following usage, reflecting requirements of significance to the scye bearing primary and secondary brackets, was documented during certification: Requirement / S/AD / Actual Add/Abd: 8484 / 18000 Lateral/Medial: 4092 / 10000 Flex/Extension: 7430 / 16000 Don/Doff Cycles: 98 / 400 Pressure Hours: 458 / 916 The scye bearing primary and secondary axial restraint brackets were successfully subjected to an ultimate pressure of 13.2 psid during SSA certification (Ref. ILC Report 0111-711330). This is 1.5 times maximum BTA operating pressure based on 8.8 psid. The baseline arm assembly has passed shock, vibration and acceleration tests without loss of screw torque (Ref. Hamilton Standard Test Reports, LTER 3067, 3048, 3043 and 3076). The Enhanced Arm Assembly is certified by similarity to the baseline arm. C. Inspection -

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		103FM03		

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 hardware received is 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 arm assembly manufacturing process to assure that the failure causes are precluded from the fabricated item:
1. Verification of loctite application.
2. Verification of presence of screws during torquing operations.
3. Helicoil installation is verified during source inspection at the supplier.
4. Verification of minimum engagement of 4 1/2 screw threads during screw thread engagement procedures.

During PDA, the following inspection points are performed at the scye bearing level in accordance with ILC Document 0111-710112:
1. Inspection for cleanliness to VC level, damage, wear and material degradation.
2. Verify, by visual inspection, no structural damage following proof pressure test.

D. Failure History -
None.

E. Ground Turnaround -
Tested per FEMU-R-001, Pre-flight Inspections and Final Structural and Leakage, Bearing Torque. Every 4 years or 229 hours of manned pressurized time the bearing is disassembled, cleaned, inspected, lubricated and reassembled. Following reinstallation to the arm, the bearing is subjected to structural and leakage tests and quantitative torque measurement.

F. Operational Use -
Operational Use:

1. Crew Response.
Pre EVA: No response. Single failure not detectable.
EVA: No respsonse. Single failure not detectable.
2. Training.
No EMU training specifically covers this failure mode.
3. Operational Considerations.
Not applicable.

EXTRAVEHICULAR MOBILITY UNIT

SYSTEMS SAFETY REVIEW PANEL REVIEW

FOR THE

I-103 ARM ASSEMBLY

CRITICAL ITEM LIST (CIL)

EMU CONTRACT NO. NAS 9-97150

Prepared by: _____
HS - Project Engineering

Approved by: _____
NASA - SSA/SSM

_____
HS - Reliability

_____
NASA - EMU/SSM

_____ 4/24/02
HS - Engineering Manager

_____ 6/26/02
NASA - S&MA

_____ 6/27/02
NASA - MOD

_____ 7/1/02
NASA - Crew

_____ 7-1-02
NASA - Program Manager