| NAME P/N QTY | CRIT | FAILURE MODE & CAUSES | FAILURE EFFECT | RATIONALE FOR ACCEPTANCE |
|---|---|---|---|---|
| | | 104FM17 | | |
| BRIEF/WAIST ASSEMBLY, ITEM 104<br>----------<br>0104-210605-<br>07/08/09/10/11/12<br>(1) | 2/1R | Loss of primary axial restraint bracket pin, rear.<br><br>Defective Material: Bracket, missing or loose pin retainer screw. Broken pin. | END ITEM: Loss of primary axial restraint portion of the primary/secondary restraint bracket.<br><br>GFE INTERFACE: Axial load will be transferred to secondary restraint portion of the primary/secondary bracket.<br><br>MISSION: None.<br><br>CREW/VEHICLE: None with loss of primary portion of bracket. Loss of crewman with loss of primary/secondary bracket.<br><br>TIME TO EFFECT /ACTIONS: Minutes.<br><br>TIME AVAILABLE: Days.<br><br>TIME REQUIRED: Hours.<br><br>REDUNDANCY SCREENS:<br>A-PASS<br>B-N/A<br>C-PASS | A. Design -<br>The waist bearing rear primary bracket is fabricated from 17-4 stainless steel casting or bar stock. The brackets are machined or cast/machined, ultrasonic cleaned, passivated and either electropolished or dry hone finished.<br><br>The pin is fabricated from 17-4 stainless steel. The pin is machined, ultrasonic cleaned, passivated and either electropolished or dry hone finished.<br><br>During tensile testing of the waist bearing, the rear primary restraint bracket, which included the pin, exhibited a minimum strength of 2000 lbs., demonstrating a minimum safety factor of 2.9 against a S/AD limit load of 677 lbs. The required S/AD minimum safety factor for waist hardware is 2.0.<br><br>The pin retainer set screw is fabricated from stainless steel and is procured to NAS specifications. A nyloc thread insert is specified for the pin retainer screw to prevent the screw from backing out.<br><br>B. Test -<br>Acceptance:<br>Component - See Inspection.<br><br>PDA:<br>The following tests are conducted at the Brief/Waist assembly level in accordance with ILC Document 0111-710112:<br>Proof pressure test at 8.0 + 0.2 - 0.0 psig for a minimum of 5 minutes conducted with the TMG removed.<br><br>Certification:<br>The waist bearing restraint bracket was successfully tested (manned) during SSA certification to duplicate operational life (Ref. ILC Engineering Memorandum EM-83-1083).<br>The following usage, reflecting requirements of significance to the waist bearing restraints was documented during certification:<br><br>Requirement — S/AD — Actual<br>Waist Cycles — 1234 — 22176<br>Waist Rotations — 2466 — 12236<br>Pressure Cycles — 300 — 2045<br>Don/Doff Cycles — 98 — 445<br>Pressure Hours — 458 — 1646<br>Walking Steps — 4320 — 77760<br><br>C. Inspection -<br>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.<br><br>The bracket castings are radiographically inspected to detect the presence of flaws prior to machining and magnetic particle inspected after machining. The |

| NAME P/N QTY | CRIT | FAILURE MODE & CAUSES | FAILURE EFFECT | RATIONALE FOR ACCEPTANCE |
|---|---|---|---|---|
| | | 104FM17 | | brackets that are machined from plate stock are magnetic particle inspected to detect the presence of flaws.<br><br>The following MIP's are performed during the LTA assembly manufacturing process to assure the failure cause is precluded from the fabricated item:<br>1. Verification of presence of pin retainer screw during torquing operations and primary restraint webbing attachment to bracket.<br><br>The following inspection points are performed at the Brief/Waist assembly level in accordance with ILC Document 0111-710112:<br>1. Visual inspection for material degradation.<br>2. Visual inspection for structural damage following proof pressure test.<br><br>D. Failure History -<br>None.<br><br>E. Ground Turnaround -<br>None, for every component within its limited life requirements.<br><br>Every four years or 229 hours of manned pressurized time, during waist bearing maintenance the primary and secondary axial restraint brackets are removed and reinstalled during which time screw torque and loctite application are verified.<br><br>F. Operational Use -<br>Crew Response -<br>Pre/post-EVA : If not detected, no response. If detected audibly or tactily, troubleshoot problem. If no success, use spare LTA if available or terminate EVA prep.<br>EVA : Single failure not detectable, no response.<br>Special Training -<br>No training specifically covers this failure mode.<br>Operational Considerations -<br>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: 3/27/02
HS - Project Engineering

M. Snyder
HS - Reliability

Alan Blough for Rowe
HS - Engineering Manager

Approved by:
NASA - SSA/SSM

5/14/02
NASA - EMU/SSM

5/17/02
NASA - S&MA

5/23/02
NASA - MOD

6/04/02
NASA - C&W

6/3/02
NASA - Program Manager