NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		104FM10Z		
WAIST RESTRAINT AND BLADDER, ITEM 104 --- 0104-82347-131 (1) --- 0104-84811-05/10 (1) WAIST RESTRAINT AND BLADDER, ADJUSTABLE, ITEM 104 --- 0104-812355-01 (1)	2/2	Loss of primary/secondary axial restraint attachment to bladder restraint fabric. Defective thread. Thread broken, worn or abraded.	END ITEM: Primary and secondary axial restraint separate from bladder fabric restraint. GFE INTERFACE: Waist fabric restraint would become unstable and result in reduction of waist bending (flex/ext) mobility. MISSION: Terminate EVA. CREW/VEHICLE: None. TIME TO EFFECT /ACTIONS: Minutes. TIME AVAILABLE: N/A TIME REQUIRED: N/A REDUNDANCY SCREENS: A-N/A B-N/A C-N/A	A. Design - Some of the management and control of the waist restraint and bladder assembly is accomplished by attaching the bladder restraint to the primary and secondary axial restraint webbings on each side of the assembly. This provides stability to the assembly and facilitates waist bending when the assembly is pressurized. This attachment is made by stitching a "t" patch to the primary webbing/"t" patch assembly to the waist restraint and bladder assembly by stitching through the "t" patch, secondary axial webbing, bladder restraint fabric, and restraint fabric reinforcement. For Waist Restraint and Bladder assemblies, size "FF" polyester thread meeting requirements of v-t-285d, type II, class I is used to join the assembly together using type 301 lock stitch 8-10 stitches per inch per fed-std-751a. For the Adjustable Waist Restraint and Bladder assembly, P/N 0104-812355 size 375/3 Spectra thread is used to join the assembly together using type 301 lock stitch, 8 to 10 stitches per inch per FED-STD-751A. Stitching is terminated and secured by backtracking and searing the thread ends to prevent loosening. The presence of abrasion layers in known areas of high wear, restraint, and TMG, along with the physical properties of the bladder, make inadvertent puncture or abrasion unlikely. B. Test - Acceptance: See inspection - paragraph C. PDA: The following tests are conducted at the Lower Torso Assembly level in accordance with ILC Document 0111-70028J(ILC Document 0111-710112 for Adjustable waist). Testing is conducted with the tmg removed to verify the joint does not fail during testing. 1. Proof pressure test at 8.0 + 0.2 - 0.0 to verify no structural damage. When delivered as a separable component of the LTA, the following tests are conducted at the Waist Restraint/Bladder assembly level in accordance with ILC Document 0111-70028J (ILC Document 0111-710112 for Adjustable Waist): 1. Proof pressure test at 8.0 + 0.2 - 0.0 psig to verify no structural damage. Certification: The waist bladder assembly was successfully tested (manned) during SSA certification to duplicate operational life (Ref: Cert. Test Report for the SSA, ILC Document 0111-70027). The following usage, reflecting requirements of significance to the waist bladder assembly, was documented during certification: Requirement — S/AD — Actual Waist Cycles — 1234 — 2800 Waist Rotations — 2466 — 6000

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		104FM10Z		

Pressure Cycles 300 600
Don/Doff Cycles 98 400
Pressure Hours 458 916

The waist bladder assembly was successfully subjected to an ultimate pressure of 10.6 psig during SSA certification testing (Ref. Document 0111-700270. This is two times maximum operating pressure based on 5.3 psi.
Recertification to 5.5 psi was by test and analysis (ref. ILC EM 84-1108).

Certification:
(P/N 0104-812355)
The adjustable waist assembly was successfully tested (manned) to duplicate operational life (Ref ILC Document 0111-712381). The following use, reflecting requirements of significance to the waist assembly, was documented during certification:

Requirements	S/AD	Actual
Flexion/Extension	1234	2600
Rotations	2466	5000
Walking Steps	4320	8640
Don/Doff Cycles	98	204

The waist assembly was successfully subjected to a BTA ultimate pressure of 13.2 psid during certification testing (Ref. ILC Doc. 0111-712381). This is 1.5 times the maximum BTA operating pressure of 8.8 psid.

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 MIP's are performed during the LTA manufacturing process to assure that the failure causes are precluded from the fabricated item:

1. Visual inspection of pattern pieces for compliance to pattern size shape.
2. Visual thread verification to assure proper thread size.

During PDA, the following inspection points are performed at the lower torso assembly level in accordance with ILC Document 0111-70028J:

1. Inspection for damage or fabric or material degradation.
2. Visual inspection for broken or frayed thread.
3. Visual inspection for structural damage following proof pressure test.

D. Failure History -
None.

E. Ground Turnaround -
None.

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		104FM10Z		
				Every 4 years or 229 hrs. of manned pressurized time the waist restraint and bladder is removed from the LTA and completely inspected for signs of degradation or damage. F. Operational Use - Crew Response - Pre/Post EVA: no response, single failure not readily detectable. If detected, consider use of spare LTA if available. Otherwise EMU go for EVA. EVA: No response, single failure not readily detectable. Training - No training specifically covers this failure mode. Operational Considerations - flight rules define EMU go/no-go criteria related to EVA pressure integrity.

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

_____ 4/24/02
HS - Engineering Manager

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

_____ 5/24/02
NASA – EMU SSM

_____ 5.29.02
NASA – S&MA

_____ 5-30-02
NASA – MOD

_____ 6/04/02
NASA – CTOW

_____ 6/3/02
NASA – Program Manager