NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		103FM21		
WRIST DISCONNECT, ITEM 103 (1) LEFT (1) RIGHT --- A/L 9813-05/9814-05 (2)	2/2	Physical jamming, in open position. Foreign matter in lock/latch. Contamination or defective lock/spring/ring latch pin; defective material. Impact.	END ITEM: Unable to lock disconnect. GFE INTERFACE: Unable to use EMU. MISSION: Terminate EVA prep. 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 - The disconnect operates by direct mechanical actuation of the locking latches through the external lock assembly. The design specifies tight clearances at the glove wrist disconnect interface to reduce the possibility of foreign material getting into the mated interface. The arm-side disconnect is stowed in the orbiter mated to the glove-side disconnect following preflight inspections reducing contamination of foreign material prior to EVA. The design of the wrist disconnect requires simultaneous manual actuation in three planes in order to effect a separation of the arm and glove: rotation of the locking ring, withdrawal of two independent primary locks and depression of one secondary lock (lock/lock). Since the primary locks require independent actuation, each of the three locks (primary and secondary) is provided with double redundancy by the other two. Actuation of the secondary lock button depresses a spring-loaded retainer into its slot in the wrist disconnect housing; clearing the locking ring for rotary motion. The design of the secondary lock is such that the spring is totally encapsulated by the housing. The spring is commercial, industrial standard stainless steel spring material. The wrist disconnect 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. Lubrication with Krytox grease and a dry film lubricant (Dow Corning 321) assure smooth operation and prevent jamming. Stress analysis was performed on the wrist disconnect with the following results: Location: Restraint Bracket — Failure Mode: Bending — Max. Stress (psi): 5670 — Safety Factor: 12.0 — S/AD Safety Factor: 2.0 Location: 39.5 degree Restraint Bracket — Failure Mode: Torsion — Max. Stress (psi): 440 — Safety Factor: 95.0 — S/AD Safety Factor: 2.0 B. Test - Acceptance: The wrist disconnect is subjected to engagement/ disengagement testing per Airlock ATP 9813-02/9814-02 prior to acceptance by ILC. PDA: The following tests, are conducted at the arm assembly level in accordance with ILC Document 0111-70028J: 1. Five wrist disconnect/test plug engagement cycles to actuate and release the primary and secondary locks. 2. A functional test to ensure that the secondary lock is not capable of being bypassed by actuation of the primary locks only. Certification:

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		103FM21		

The wrist disconnect was successfully tested (manned) during SSA certification to duplicate operational life. The following usage, reflecting requirements of significance to the arm assembly, was documented during certification (Reference ILC document EM 83-1083).

Requirement	S/AD	Actual
Pressure Hours	458	1190
Pressure Cycles	300	1080
Disconnect Cycles	300	1080

Wrist Disconnect has successfully passed shock, vibration and acceleration testing (Ref HSD TER 3067, TER 3048, TER 3043 and TER 3076).

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 provides traceability information.

The following MIP is performed during the arm assembly manufacturing process to assure the failure cause is precluded from the fabricated item:

1. Verification of dimensional compliance to the wrist disconnect component drawings.
2. Verification of lock function.
3. Verification of cleanliness to VC level.
4. Inspection after proof and leakage testing for deformation, defects or damage.

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

1. Verification of cleanliness to VC level and no material degradation.
2. Verification of engagement/disengagement force.
3. Verification of smooth engagement and proper operation of locking dogs.

D. Failure History -
None.

E. Ground Turnaround -
Tested for non-EET processing per FEMU-R-001, Pre-Flight Inspections and Final Structural and Leakage, SSA Connector Verification. None for EET processing. Additionally, every 4 years or 229 hours of manned pressurized time the disconnect is disassembled, inspected, cleaned, lubricated and reassembled. Following reassembly and installation the disconnect is subjected to structural and leakage tests, engagement evaluation and primary and secondary lock operational tests.

F. Operational Use -

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		103FM21		Crew Response - Pre EVA/Post EVA: Trouble shoot problem. If no success, consider use of third EMU if available. Otherwise, terminate EVA prep. Training - Standard training covers this failure mode. Operational Considerations - EVA checklist procedures verify hardware integrity and systems operational status prior to EVA. Flight rules define go/no go criteria related to EMU pressure integrity and regulation.

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: _____ 5/27/02
HS - Project Engineering

Approved by: _____
NASA - SSA/SSM

_____
HS - Reliability

_____ 5/14/02
NASA - EMU/SSM

_____
HS - Engineering Manager

_____ 6/17/02
NASA - S&MA

_____ 5/23/02
NASA - MOD

_____ 6/04/02
NASA - Crew

_____ 6/04/02
NASA - Program Manager