

PAGE: 1

PRINT DATE: 04/07/89

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 07-18-SWS-X

SUBSYSTEM NAME: CREW STATION AND EQUIPMENT - SLIDEWIRE
REVISION : 1 01/01/87

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	EVA SLIDEWIRE ASSEMBLY (CFE)	M072-544700
■ LRU :	NASA EVA SLIDEWIRE ASSY (GFE)	SED39119279-301
■ SRU :	SLIDEWIRE END FITTING (GFE)	S0039119278-001
SRU :	EVA SLIDEWIRE-END FITTING(CFE)	V617-544721-001

■ EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

QUANTITY OF LIKE ITEMS: 4
TWO END FITTINGS PER SLIDEWIRE ASSEMBLY

CFE = CONTRACTOR FURNISHED EQUIPMENT
GFE = GOVERNMENT FURNISHED EQUIPMENT

FUNCTION:
END FITTING PROVIDES MECHANICAL ATTACHMENT INTERFACE BETWEEN EVA
SLIDEWIRE CORD (EPOXY BONDED TO END FITTING) AND SLIDEWIRE DEPLOYMENT
MECHANISM

EXPEDITE
PROCESSING

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 07-1B-SW6-X

SUMMARY

SUBSYSTEM NAME: CREW STATION AND EQUIPMENT - SLIDEWIRE
LRU :EVA SLIDEWIRE ASSEMBLY (CFE)
ITEM NAME: EVA SLIDEWIRE-END FITTING(CFE)

FMEA NUMBER	ABBREVIATED FAILURE MODE DESCRIPTION	C I C R I T F L G	H Z D F L G
07-1B-SW6-01	BROKEN END FITTING OR ADHESIVE BOND FAILURE	X	IR2

PAGE: 3

PRINT DATE: 04/07/89

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 07-1B-SM6-01

SUBSYSTEM: CREW STATION AND EQUIPMENT - SLIDEWIRE REVISION: 5 01/01/87
LRU :EVA SLIDEWIRE ASSEMBLY (CFE)
ITEM NAME: EVA SLIDEWIRE-END FITTING(CFE) CRITICALITY OF THIS FAILURE MODE:1R2

FAILURE MODE:
BROKEN END FITTING OR ADHESIVE BOND FAILURE

MISSION PHASE:
00 ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA
: 103 DISCOVERY
: 104 ATLANTIS

CAUSE:
EXCESSIVE LOAD APPLIED BY CREWMEMBER TO THE SYSTEM, MANUFACTURING DEFECT

CRITICALITY 1/1 DURING INTACT ASCRT ONLY? NO

REDUNDANCY SCREEN A) PASS
B) PASS
C) PASS

PASS/FAIL RATIONALE:

A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
ONE END OF SLIDEWIRE UNRESTRAINED.

(B) INTERFACING SUBSYSTEM(S):
POSSIBLE DAMAGE TO EQUIPMENT IN PAYLOAD BAY.

(C) MISSION:
POSSIBLE DEGRADATION OF MISSION OBJECTIVE. RECYCLING OF PAYLOAD BAY DOORS OR CONTINGENCY EVA MAY BE REQUIRED TO CLEAR SLIDEWIRE FROM PAYLOAD BAY DOORS.

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 07-1B-SW6-01

(D) CREW, VEHICLE, AND ELEMENT(S):
LOSS OF CREWMEMBER RESTRAINT. POSSIBLE LOSS OF CREWMEMBER WITH SECOND ASSOCIATED FAILURE.

(E) FUNCTIONAL CRITICALITY EFFECTS

- DISPOSITION RATIONALE -

■ (A) DESIGN:

1.4 MINIMUM SAFETY FACTOR (2.3 BY TEST FOR THE CFE SLIDEWIRE & 3.8 FOR THE GFE SLIDEWIRE) FOR SINGLE CREWMEMBER INDUCED LOADS CREATED BY MANEUVERING MAXIMUM OF 4 FPS PARALLEL TO SLIDEWIRE (FOR THE CFE SLIDEWIRE) AND 4 FPS IN ANY DIRECTION (FOR THE GFE SLIDEWIRE). THE SLIDEWIRE END FITTINGS HAVE MINIMUM TENSILE LOAD CAPABILITY OF 1452 LBS FOR THE CFE SLIDEWIRE ASSEMBLY AND 2350 LBS FOR THE GFE SLIDEWIRE ASSEMBLY (WHICH EXCEEDS RATE BREAKING STRENGTH OF KEVLAR CORD).

■ (B) TEST:

QUALIFICATION TESTS: 100 LOAD CYCLES PERPENDICULAR AND 100 LOAD CYCLES PARALLEL TO THE SLIDEWIRE AT AMBIENT TEMPERATURE, -210 DEG F AND +210 DEG F. ADDITIONAL TESTING OF THE GFE SLIDEWIRE ASSEMBLY INCLUDED: DYNAMIC LOAD TESTING - OF SLIDEWIRE ASSEMBLY AT MAXIMUM CREWMEMBER INDUCED LOADS (550 LBS TRANSLATING 4 FPS PERPENDICULAR TO SLIDEWIRE MIDPOINT - RESULTS IN 800 LBS TENSILE LOAD IN SLIDEWIRE); ULTIMATE TENSILE LOAD TEST - OF SLIDEWIRE CORD/END FITTING/STOP BONDS (2350 LBS) SUBSEQUENT TO DYNAMIC LOAD TESTING.

CERTIFICATION TESTS: ROCKWELL DOES NOT ASSUME RESPONSIBILITY FOR CERTIFICATION OF THE GFE SLIDEWIRE ASSEMBLY.

ACCEPTANCE TESTS: PROOF LOADING THE CFE SLIDEWIRE ASSEMBLY TO 800 LBS & THE GFE SLIDEWIRE ASSEMBLY TO 820 LBS, WHICH IS 130% OF THE INDUCED LOAD OF ONE CREWMEMBER TRANSLATING PARALLEL TO SLIDEWIRE AT 4 FPS AT AMBIENT TEMPERATURE.

OMRSD: SLIDEWIRE PRETENSION TEST CONDUCTED PRIOR TO ORBITER PROCESSING FACILITY (OPF) PAYLOAD BAY DOOR CLOSURE. VISUAL INSPECTION OF END FITTINGS PRIOR TO OPF PAYLOAD BAY DOOR CLOSURE.

■ (C) INSPECTION:

RECEIVING INSPECTION
RAW MATERIALS AND PROCESS CERTIFICATIONS VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 07-1B-SW6-01

PART CLEANLINESS VISUALLY VERIFIED BY INSPECTION PRIOR TO INSTALLATION.
CORROSION PROTECTION OF THE CFE SLIDEWIRE ASSEMBLY VERIFIED BY
INSPECTION.

ASSEMBLY/INSTALLATION

ASSEMBLY OF ALL DETAIL PARTS VERIFIED BY INSPECTION. INSTALLATION OF
ASSEMBLY VERIFIED BY INSPECTION. INSTALLATION OF COMPLETE
SLIDEWIRE ASSEMBLY VERIFIED BY QUALITY AND CUSTOMER. DETAIL PARTS,
FITTINGS, SLIDEWIRE MATERIALS AND MANUFACTURING VERIFIED BY VISUAL
INSPECTION OF THE GFE SLIDEWIRE ASSEMBLY.

CRITICAL PROCESSES

HEAT TREATING OF THE SLIDEWIRE ASSEMBLY VERIFIED BY INSPECTION.
BONDING OF THE SLIDEWIRE ASSEMBLY VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

PENETRANT INSPECTION OF THE CFE SLIDEWIRE END FITTING VERIFIED BY
INSPECTION. PROOF TEST OF THE GFE SLIDEWIRE ASSEMBLY TO 820 LBS
VERIFIED BY INSPECTION.

TESTING

PROOF LOADING OF THE CFE SLIDEWIRE ASSEMBLY VERIFIED BY QUALITY.
ATP OF THE GFE SLIDEWIRE ASSEMBLY VERIFIED BY INSPECTION.

HANDLING/PACKAGING

HANDLING AND PACKAGING REQUIREMENTS VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:
NO FAILURE HISTORY.

(E) OPERATIONAL USE:

OPERATIONAL EFFECTS OF FAILURE

A SLIDEWIRE WITH A BROKEN END FITTING WILL NO LONGER BE USABLE.
HOWEVER, THIS FAILURE BY ITSELF WILL NOT LEAVE THE CREWMEMBER
SEPARATED FROM THE ORBITER. THIS WILL BE A LOSS OF REDUNDANCY IN THE
SLIDEWIRE RESTRAINT SYSTEM. THE NEXT FAILURE WILL CAUSE THE
CREWMEMBER TO BECOME SEPARATED FROM THE ORBITER. OVERALL LENGTH OF
THE EVA WILL BE INCREASED DUE TO LESS FLEXIBILITY CAUSED BY ALTERNATE
CONFIGURATION OF THE EVA TETHERS AND THE TIME REQUIRED TO SAFE THE
SLIDEWIRE SAFE FOR PAYLOAD BAY DOOR CLOSING.

CREW ACTION

THE CREWMEMBER ON THE FAILED SLIDEWIRE WOULD HOOK HIS SAFETY TETHER TO
THE OTHER SLIDEWIRE RECOGNIZING THAT TWO CREWMAN USE OF A SLIDEWIRE
EXCEEDS THE DESIGN ENVELOPE. HE WOULD ALSO BE REQUIRED TO ROLL UP THE
SLIDEWIRE CORD, AND TO SECURE IT TO PREVENT INTERFERENCE WITH THE
CLOSING OF PAYLOAD BAY DOORS.

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 07-1B-SM6-01

CREW TRAINING

THE ABOVE ACTIONS ARE INCLUDED IN THE STANDARD EVA CREW TRAINING. THIS TRAINING ALSO TEACHES THE CREW TO MOVE UNDER COMPLETE CONTROL AT ALL TIMES DURING EVA. FREE-FLOATING IS NOT SUGGESTED OR PRACTICED. THIS MINIMIZES THE CHANCE OF THE CREWMEMBER GAINING ENOUGH MOMENTUM TO OVERLOAD THE SLIDEWIRE TO BECOME SEPARATED FROM THE ORBITER.

MISSION CONSTRAINTS

EVA TASKS AND HARDWARE WILL BE DESIGNED SO THAT POSITIVE CREWMEMBER RESTRAINT AIDS WILL BE PROVIDED AT ALL WORKSITES AND EVA TRANSLATION PATHS.

INFLIGHT CHECKOUT

THE EVA CREWMEMBERS WILL INSPECT THE EVA SLIDEWIRE AT THE TIME OF ITS USE. THIS WILL MINIMIZE THE EFFECT OF FAILURES WHICH HAPPEN DURING ASCENT OR PRE-EVA ON ORBIT ACTIVITY.

- APPROVALS -

RELIABILITY ENGINEERING: M. B. MOSKOWITZ : *[Signature]*
DESIGN ENGINEERING : J. M. HAMADA : *[Signature]*
QUALITY ENGINEERING : M. SAVALA : *[Signature]*
NASA RELIABILITY : : *[Signature]*
NASA SUBSYSTEM MANAGER : : *[Signature]*
NASA QUALITY ASSURANCE : : *[Signature]*