REVISED 5-7-87

FMEA NO. W 7.1	SHUTTLE CCTV CRITICAL ITEMS LIST	UNIT Cable
CRITICALITY 2/3R		OMB NO. 2293290-501,502
		ISSUED 10-14-86
		SHEET 1 OF 5

FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RATIONALE FOR ACCEPTANCE
oss of camera ON CMD (RMS) pen/Short to GND	1) No wrist TVC video 2) No elbow TVC video 3) No elbow PTU control Worst Case: No PTU control of elbow camera which prevents arm stowage.	DESIGN FEATURES The W7 RVS/RMS cable is a 20-inch long assembly, 35-wire assembly. The cable is terminated on each end with a 37-pin connector (P1, KJG6E14N35SN16). The video and sync wires are shielded #24 Twinax twisted-pair wires. The W7 cable provides power and commands from the RVS to the RMS wrist or elbow camera stack and returns video signals to the RVS. The cable design is taken from the successfully flown Apollo program. The design is a cable-connector assembly in which the wire terminations are protected from excessive flexture at the joint between the wire and the connector terminal. The load concentration is moved away from the conductor connection and distributed axially along the length of the conductors encapsulated in a potted-taper profile. This technique also protects the assembly from dirt and entrapped moisture which could cause problems in space. The cable and its components meet the applicable requirements of NASA, Military and RCA specifications. These requirements include: • General/Mechanical/Electrical Features • Design and Construction • Materials • Terminal Solderability • Environmental • Qualification • Marking and Serialization • Traceability and Documentation

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FMEA NO. N 7.1 CRITICALITY 2/1R	SHUTTLE CCTV CRITICAL ITEMS LIST	UNIT Cable DWG NO. 2293290-501,502 ISSUED 10-14-86 SHEET 2 OF 5

FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RATIONALE FOR ACCEPTANCE
oss of camera ON CMD (RMS)	1) No wrist TVC video 2) No elbow TVC video 3) No elbow PTU control Worst Case: No PTU control of elbow camera which prevents arm stowage.	QUALIFICATION TEST Qualified by 1.) similarity to previous successful space programs and 2.) by use during qualification tests of CCTV LRUs. ACCEPTANCE TEST The cable acceptance test consists of an ohmmeter check to assure that each wire connection is present and intact. Results are recorded on data sheets. OPERATIONAL TEST The following tests verify that CCTV components are operable and that the commands from the PHS (A7A1) panel switch, through the RCU, through the sync lines to the Camera/PTU, to the Camera/PTU command decoder are proper. The tests also verify the camera's ability to produce video, the VSU's ability to route video and the monitor's ability to display video. A similar test verifies the MDM command path. Pre-Launch on Orbiter Test/In-Flight Test 1. Power CCTV System. 2. Select a monitor via the PHS panel, as destination and the camera under test as source. 3. Send "Camera Power On" command from PHS panel. 4. Select "External Sync" on monitor. 5. Observe video displayed on monitor. If video on monitor is synchronized (i.e., stable raster), then this indicates that the camera is receiving composite sync from the RCU and that the camera is producing synchronized video. 6. Send Pan, Tilt, Focus, Zoom, ALC, and Gamma commands and visually (either via the monitor or direct observation) verify proper operation. 7. Select Downlink as destination and camera under test as source. 8. Observe video routed to downlink. 9. Send "Camera Power Off" command via PHS panel. 10. Repeat Steps 3 through 9 except issue commands via the MDM command path. This proves that the CCTV equipment is operational if video is satisfactory.

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FMEA NO. M 7.1 CRITICALITY 2/1R	SHUTTLE CCTV CRITICAL ITEMS LIST	UNIT Cable DWG NO. 2293290-501,502 ISSUED 10-14-86 SHEET 3 OF 5

FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RATIONALE FOR ACCEPTANCE
oss of camera ON CMD (RMS)	1) No wrist TVC video 2) No elbow TVC video 3) No elbow PTU control Worst Case: No PTU control of elbow camera which prevents arm stowage.	QA/INSPECTION Procurement Control - Wire, connectors, solder, etc. are procured from approved vendors and suppliers which meet the requirements set forth in the CCTV contract and Quality Plan Work Statement (WS-2593176). Incoming Inspection & Storage - Incoming Quality inspections are made on all received materials and parts. Results are recorded by lot and retained in file by drawing and control numbers for future reference and traceability. Accepted items are delivered to Material Controlled Stores and retained under specified conditions until cable fabrication is required. Non-conforming materials are held for Material Review Board (MRB) disposition. (PAI-307, PAI IQC-53). Assembly & Test - Prior to the start of assembly, all items are verified to be correct by stock room personnel as the items are accumulated to form a kit. The items are verified again by the operator who assembles the kit by checking against the as-built-parts-list (ABPL). Specific instructions are given in assembly drawing notes and applicable documents called out in the Fabrication Procedure and Record (FPR-229329D). These are 2280800 - Process Standard crimping flight connector contacts, 2280801 - Process Standard in-line splicing of standard interconnecting wire using Raychem solder sleeves, 2280876 - Process Standard marking of parts or assemblies with epoxy colors, 2280876. Potting material and test procedure (TP-AT-2293290). Quality and DCAS Inspections are performed at the completion of key operations. Preparation for Shipment - When fabrication and test is complete, the cable assembly is packaged according to 2280746, Process Standard for Packaging and Handling Guidelines. All related documentation including assembly drawings, Parts List, ABPL, Test Data, etc. is gathered and held in a documentation folder assigned specifically to each cable assembly. This folder is retained for reference.

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FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RATIONALE FOR ACCEPTANCE
ɔss of camera ON CMD (RMS)	1) No wrist TVC video 2) No elbow TVC video 3) No elbow PTU control Worst Case: No PTU control of elbow camera which prevents arm stowage.	FAILURE HISTORY There have been no reported failures during RCA testing, pre-flight or flight.

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FAILURE MODE AND CAUSE	FAILURE EFFECT ON END ITEM	RATIONALE FOR ACCEPTANCE
.oss of camera ON CMD (RMS) lpen/Short to GND	1) No wrist TVC video 2) No elbow TVC video 3) No elbow PTU control Worst Case: No PTU control of elbow camera which prevents arm stowage.	OPERATIONAL EFFECTS Loss of ability to position the Elbow camera. Possible inability to stow the RMS if the elbow camera physically interferes with a payload. If RMS cannot be stowed the port payload bay door cannot be closed. Loss of crew and vehicle. CREW ACTIONS Perform EVA to reposition the elbow camera, use RMS motion to reposition the camera, or jettison the RMS. CREW TRAINING Crew should be trained in contingency EVA and RMS operations procedures. MISSION CONSTRAINT Do not manifest Elbow camera for any flight where the payload and the elbow camera can interfere with each other (for any pan or tilt angle). If the camera must be flown do not change the camera position until the interfering payload is deployed.