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Marriage Tests

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MASTER ACTIVITIES PLAN

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TITLE: INTEGRATED SYSTEM MARRIAGE TESTS

RESPONSIBILITY:

- A. The Martin Company - Test Conductor
- B. Associate Contractor Support

GENERAL:

This section contains summaries of those marriage tests required for the verification of proper interfacing between TMC/GOE and the following Associate Contractor or Facility Systems:

- a. Damage Control System
- b. Propellant Loading System
- c. AMF Launcher System.

These tests shall be conducted after the completion of the sub-system checkouts and prior to the start of Activation Exercises. The marriage tests as defined herein meet the requirement as set forth in SR-59-101, Integrated Sub-system Test Plans and Procedures.



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MARRIAGE TEST SUMMARY

TITLE: MARRIAGE TEST PROCEDURE FOR DAMAGE CONTROL AND HAZARD WARNING SYSTEM

RESPONSIBILITY: The Martin Company

TEST DOCUMENT: MTP 130

TEST COMPONENTS:

CP2130 Launch Control Facilities

Console

Fire Sensors

Fuel Vapor Detectors

GOX Detectors

LOX Spillage Detector

Hazard Warning Lights and Horns

Explosion Sensors

Blast Doors and Blast Valves

Radiation Sensors

Escape Hatches

OBJECTIVE:

The objectives of this test are to:

- a. Verify that the fire, LOX, and GOX sensors function properly to activate audible and visual alarms and initiate shutdowns and/or corrective action, as required.
- b. Verify that the hazard condition and corrective action are displayed on the Missile and Facilities Console (CP 2130).

TEST DESCRIPTION:

The following tests shall be performed to verify the compatibility and operability of the installed equipment and interconnecting wiring:

- a. Missile Silo Fire Sensing System - Stimulate sensor and verify that visual and audible alarms are activated. Verify that corrective action is initiated and can be suspended. Reset alarm system.

LOCATION:

Control Center

Missile Silo, Prop. Term.

Fuel Storage Area, and Eq. Term.

Fuel Storage Area and Missile Silo

Missile Silo and Propellant Term.

Missile Silo Sump

Above Ground

Above Ground

P.T., A.T., Silo, Portals

Tunnel Junctions



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TEST DESCRIPTIONS: (Continued)

- b. Propellant Terminal Fire Sensing System - Stimulate sensor and verify that visual and audible alarms are activated. Reset the system.
- c. Equipment Terminal Fire Sensing System - Stimulate sensor and verify that visual and audible alarms are activated. Reset the system.
- d. Fuel Storage Area Fire Sensing System - Stimulate sensor and verify that proper visual and audible alarms are activated. Verify that corrective action is initiated and reset the system.
- e. Fuel Storage Area Fuel Vapor Detection System - Stimulate sensor and verify that the proper visual and audible alarms are activated. Verify that gas analyzer activates at proper fuel percentage. Reset the system.
- f. Missile Silo Fuel Vapor Detection System - Stimulate sensor and verify that the proper audible and visual alarms are activated. Verify that gas analyzer is activated at the proper fuel concentration percentage. Verify that proper corrective action is initiated. Remove sensor stimulus and reset the unit.
- g. Missile Silo GOX Detection System - Stimulate sensor and verify that the proper audible and visual alarms are activated. Verify that O₂ analyzer is activated at the proper O₂ concentration. Verify that the proper corrective actions are initiated. Remove sensor stimulus and reset the unit.
- h. Propellant Terminal GOX Detection System - Stimulate sensor and verify that the proper audible and visual alarms are activated. Verify that O₂ analyzer is activated at the proper O₂ concentration. Remove sensor stimulus and reset the unit.
- i. Missile LOX Spillage Detection System - Activate the sensor and verify that visual and audible alarms are activated. Remove stimulus used to activate the system and verify that system returns to a readiness condition.
- j. Fuel Sump - Stimulate sensor and verify that proper audible and visual alarms are activated. Verify that the proper corrective action is initiated and is displayed. Remove stimulus and reset the system.



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TEST DESCRIPTIONS: (Continued)

- k. Silo Doors - Activate the Silo Door position switch and verify that the proper status indication is observed on the Facilities console (CP2130). Return the switch to normal position.
- l. Explosion Sensing System - Stimulate the Explosion sensor and verify that the proper audible and visual alarms are activated on the Facilities Console (CP2130). Reset the system.
- m. Personnel Tunnel Blast Doors - Activate the Blast Door position switch and verify that proper visual and audible alarms are activated. Return the switch to normal position.
- n. Above Ground Hazard Lights and Klaxon Horns - On the LCFC activate the Above Ground Hazard Warning Light switch-light and verify that proper visual and/or audible alarms are actuated.
- o. Portal Wind - Activate the Excessive Wind Sensor and verify that proper visual and/or audible alarms are activated.
- p. Portal Doors - Actuate the Portal Doors position switches and verify the proper visual and audible alarms are activated.
- q. Antenna Terminal 1 and 2 Silo and Blast Doors - Actuate the Antenna Silo Doors open position switches and Blast Valve position switches and verify that proper visual and/or audible alarms are activated. Return the switches to normal position.
- r. Radiation Sensing System. Launcher, Control Center, Power House, and Above Ground - Stimulate each of the aforementioned sensors and verify that each of the respective audible and visual alarms are initiated. Reset the system after each verification.
- s. Power House Emergency - Simulate the power house emergency condition and verify that the proper audible and visual alarms are initiated. Remove the simulation and reset the system.
- t. Power House Generators Status Indicators - Stimulate each of the four generator status sensors and verify that the proper visual indication is observed. Remove the source of stimulus and leave the system in operation.



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TEST DESCRIPTIONS: (Continued)

- u. Air Intake Blast Valves - On the LCFC, actuate the **Blast Valves** switch-light to open or close the Blast Valves and verify the proper visual and/or audible alarms are actuated.
- v. Tunnel Junction Escape Hatch - Actuate **Escape Hatch Limit** switch and verify the proper visual and/or audible alarms are activated. Reset the limit switches.

REFERENCE DOCUMENTS:

SR-59-101 Test Plan 13.1

327P 2040 004 Wiring Diagram

327P 2130 001 Schematic Diagram

327P 3702 001 Schematic Diagram

327P 3703 001 Schematic Diagram

All D.M.J.M. & A Facility Drawing for Damage Control System

PREREQUISITES:

All TMC Ground System Test Procedures and the **Facilities Test Plan** must be completed prior to this test.

SUPPORT EQUIPMENT:

Infra-red heat lamp

Gas cylinder - gas equal to 40% of the lower explosive limit of RP-1 in air

Electronic recording time - one millisecond accuracy

Gas Cylinder - 25% by volume O₂

Gas cylinder - 75 lbs. CO₂

Radioactive material, gamma ray intensity of .15 Roentgens per hour at 12 in. and 100 Roentgens per hour at 2 inches.

Crushed ice - 20 lbs.

Limit switch SPST N.O.

3-point electronic strip chart recorder - Range 0-1200°F

Thermocouple with 750 ft. of lead wire

Multimeter - Simpson 260



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SUPPORT EQUIPMENT: (Continued)

Thermometer - 0° -150°F

Fire extinguisher - CO₂

Polyethelyne bags - 2ft. 3 - 20 each

1½ volt battery

RECOMMENDED MANPOWER:

2 Engineers

6 Technicians

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MARRIAGE TEST SUMMARY

TITLE: PROPELLANT LOADING SYSTEM MARRIAGE TEST

RESPONSIBILITY:

- A. The Martin Company - Test Conductor
- B. COE - Technical support on PLS facility
- C. AFM - Technical support on crib mounted PLS

TEST DOCUMENT: MTP-X31

COMPONENTS:

CP 2500 PLPS GOE Controller
All facility remotely controlled
or monitored valves
ADL terminal panels
Fuel transfer panel

LOCATION:

Equipment Terminal
Missile Silo, Propellant Terminal
Propellant Terminal
Silo Junction of the Personnel
Tunnel

OBJECTIVE:

The purpose of this test is to:

- a. To verify that the facility propellant loading and pressurization system is capable of loading and unloading propellants and gasses through manual and/or automatic signals and is capable of indicating status of components in the system by performing various checkouts with the system dry;
- b. To verify that all remote facility valves are capable of satisfactory operation;
- c. To verify that all limit switches operate satisfactorily.

TEST DESCRIPTION:

The following tests shall be performed to verify the compatibility and operability of the installed equipment and interconnecting wiring:

- a. Operate LOX loading system from CP 2500 in the manual checkout position, using missile portion (only) if simulator.
- b. Operate Helium loading and gas system from CP 2500 in the manual checkout position, using missile portion (only) of simulator.



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TEST DESCRIPTION: (Continued)

- c. Operate the LOX and gas loading systems from CP 2500 in the automatic position, using missile portion (only) of simulator.
- d. Operate fuel system from the fuel transfer panel and the missile silo fuel loading stations.
- e. Operate CP 2500 and initiate a normal automatic loading operation using the missile portion of simulator and the "liquid oxygen present" functions (only) of the facility portion of simulator. During the fast fill portion, interrupt power and verify that all components "Fail Safe".
- f. Operate CP 2500 and initiate a normal unloading operation, using the missile portion of simulator and the "liquid oxygen present" functions (only) of the facility portion of the simulator. During the unloading of Stage I, interrupt power and verify all components "Fail-Safe".
- g. Perform tests to verify proper corrective action or shutdown resulting from malfunctions indicated by pressure transducers and liquid oxygen sensors.

REFERENCE DRAWINGS:

- A. SR-59-101 Test Plan
- B. 327P9200116
- C. 327N2500001
- D. 327N2500008
- E. 327P2020101
- F. 327P9202123
- G. 327P9202133
- H. 327P9202143
- I. 327P9202153
- J. 327P9202163
- K. Corps of Engineers Wire Termination Data
- L. Arthur D. Little Technical Report #5.



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PREREQUISITES:

Tests - All TMC sub-system test procedures and those portions of the CCE validation tests which pertain to the PLS must be completed.

SUPPORT EQUIPMENT:

A commercial Test Equipment

Two volt-ohmmeters, Simpson Model 260 or equivalent

Two milliamperemeters (0-25⁺ma), Simpson Model #9 (DC) or equivalent

RECOMMENDED MANPOWER:

The minimum number of personnel needed to satisfactorily perform this MTP is considered to be as follows:

LOCATION:

Propellant Terminal

Missile Silo (launcher platform)

Equipment Terminal

PERSONNEL:

One "A" electrical technician

One "B" electrical technician

One "B" mechanical technician

One "A" electrical technician

One "B" electrical technician

One engineer

One "A" electrical technician

One "B" electrical technician



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MARRIAGE TEST SUMMARY

TITLE: LAUNCHER CONTROL SYSTEM AND LAUNCH SEQUENCER SYSTEM MARRIAGE TEST

RESPONSIBILITY:

- A. The Martin Company
- B. American Machine and Foundry Company - Support

TEST DOCUMENT: MTP-X32

TEST COMPONENTS:

LOCATION:

CP2110	Launch Control Console	Control Center, upper level
CP2130	Launch Complex Facilities Console	Control Center, upper level
CP2300	Launch Sequencer	Equipment Terminal, Level III
CP3700	Control Center Circuits	Control Center, upper level
CP4001	Target Card Reader and Logic Assemblies	Control Center, upper level
CP4100	Control Center Power Supply	Control Center, upper level
CP4905	Time Display Board	Control Center, upper level
	AMF Launcher Systems	Equipment Terminal and Missile Silo

OBJECTIVE:

The purpose of this test is to raise and lower the launcher as an automatic function of the Launch Sequencer System.

TEST DESCRIPTION:

The following test shall be performed to verify the compatibility and operability of the installed equipment and interconnecting wiring:

- a. Perform one or more simulated Launch Mode sequences, as necessary to verify that the Launch Control and Sequencer System GOE will initiate, control and monitor the raising and lowering operation of the launcher platform.
- b. Perform one or more simulated Launch Exercise sequences as necessary to verify that the Launch Control and Sequencer System GOE will initiate, control and monitor the raising and lowering of the launcher platform.



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REFERENCE DOCUMENTS:

327P2110000 Launch Control Console
327M4101000 Power Control Chassis
327N4102000 Power Supply, 28VDC
327N4103000 Battery-Standby 28VDC
327N4115000 Power Distribution Panel
327N4905000 Time Display Board
327P2130000 Launch Complex Facilities Console
327P3707000 Above Ground Hazard Warning Control Assembly
327P3702000 Control Center Circuits, Common
327N2301000 Sequential Launch Timer
327N4001000 Target Card Reader and Log Chassis Assembly
327P3703000 Control Center Circuits, Launcher
AMF Launcher Control System Logic Diagrams
SR-59-101 Test Plan 24.0

PREREQUISITES:

Tests

All AMF and TMC sub-system test procedures must be satisfactorily completed.

SUPPORT EQUIPMENT:

FCS Interface Simulator (Panel 3561)
GGS Interface Simulator (Panel 3562)
ECS Interface Simulator (Panel 3563)
PLPS Interface Simulator (Panel 3571)
RVS Interface Simulator (Panel 3572)
ASS Interface Simulator (Panel 3581)
RIME Checkout System (Panel 3582)
Events Recorder (Panel 3541 in 3560 Cart)
Signal Conditioner Assembly (Panel 3542 in 3560 Cart)
Test Tools TO-900510, Rev. A
Resistor, 1600 Ohm + 5%, 1/2 Watt, 1 each



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PREREQUISITES: (Continued)

Target Cards

Three "unpunched" cards

Three "0" bit cards (1 each for Card Readers, A, B, and C.)

Three "40" bit cards (1 each for Card Readers, A, B, and C.)

Commercial Test Equipment

The following commercial test equipment is required to perform this test procedure:

Multimeter, Simpson, Model 260 1 each

Stopwatch, Hamilton Chronometer 2 each

Oscilloscope, Tektronics, Model 531A 1 each

RECOMMENDED MANPOWER:

It is suggested that a minimum of 6 men be required for this procedure, to be assigned as shown below:

1 Test Conductor	TMC	
4 Engineers	(2) TMC	(2) AMF
4 Technicians	(2) TMC	(2) AMF