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TEST INSTRUMENTATION SUBSYSTEM (TIS)
INTEGRATION TEST PROGRAM PLAN. MODEL
NUMBER X-20

Boeing Company
Seattle, Washington

18 March 1963

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References

- A. D2-80507 "System Integration Lab Bench Test Support Facility Requirements"
- B. D2-80743 "Test Console - Test Instrumentation Subsystem, Airborne, Specification"
- C. MIL-E-6051C "Electrical and Electronic Interference Requirements"
- D. X-20 Testing Working Agreement (See TBC Letter 2-6112-3-198, dated 11 January 1963)

1.0 INTRODUCTION

This document specifies the facilities, services and equipment required to support Data Systems Lab (DSL) integration testing of the airborne Test Instrumentation Subsystem (TIS) with an electrically simulated glider, the PCM and FM ground station and the Test Instrumentation Checkout Set (TICS).

General requirements for performance of the tests will define most of the facilities, services and equipment required. These items are covered in the first section without reference being made to specific tests. Those items which are of a "self help" nature or are otherwise unaccountable are not included in this report.

Additional requirements are listed under a short description of each test to be performed in the DSL. Except where noted, all requirements apply to the contractor (TBC) or the TIS subcontractors.

The provisions of the Testing Working Agreement (Reference D) apply only to the TIS accuracy evaluation tests (Paragraph 3.5) and the TIS/CTS compatibility test (Paragraph 3.6). These tests are the only ones designated as PFRT and documentation of test requirements and test procedures will be prepared accordingly.

A summary schedule of testing and support requirements is contained in the final section of this report.

2.0 GENERAL REQUIREMENTS, TIS INTEGRATION TESTING

In order to perform the integration testing, certain provisions of a general nature are required as follows:

- (1) An environmentally controlled area in which to perform the tests must be provided and maintained.
- (2) Suitable electrical power for operation of the equipment must be provided.
- (3) Testing equipment must be provided, maintained and periodically calibrated.
- (4) Equipment under test must be maintained.

These items are required to support all DSL testing and may be broken down into facility, service and equipment requirements as follows.

2.1 Facility Requirements, General

2.1.1 Laboratory area, basic furniture and electrical power as described in reference A (D2-80507).

2.1.2 Test equipment maintenance and calibration facility as currently existing in Building 2.01.

2.2 Service Requirements, General

2.2.1 Laboratory area general maintenance.

2.2.2 Maintenance and calibration, under a standard Cal/Cert schedule, for test equipment listed in paragraph 2.3.

2.3 Equipment Requirements, General

2.3.1 Test Instrumentation Subsystem Test Console as described in reference B (D2-80743).

2.3.2 Electronic test and maintenance instruments and supporting equipment as listed on the following page.

2.3.2 (Continued)

<u>Item</u>	<u>Description</u>	<u>Mfr.</u>	<u>Mfr. Desig.</u>	<u>Qty.</u>
1	Bridge, Impedance	ESI	250 DA	1
2	Bridge, Wheatstone	LAN	4735	1
3	Cart, Instrumentation	Technibilt	MC-1	2
4	Degausser, Bulk Tape	Ampex	111	1
5	Degausser, Head	"	704-01	1
6	Galvanometer	LAN	2430C	1
7	Megohmmeter, Electrometer	Gen. Radio	1230A	1
8	Multimeter	Triplet	630A	4
9	Oscillator, Wide Range	H-P	200cD	1
10	Oscilloscope, General Purpose	Tektronix	545A	1
11	Preamplifier, Dual Trace	"	Type C-A	1
12	Preamplifier, Low Gain	"	Type E	1
13	Preamplifier, Wide Band	"	Type H	1
14	Camera	"	C-12	1
15	Adapter, Clip Lead	"	013-003	2
16	Adapter, Post & Guard	"	013-009	2
17	Probe, Attenuator	"	P510A	2
18	Table, Mobile	"	500-53A	1
19	Potentiometer	LAN	7553 (K-3)	1
20	Voltmeter, Digital	NIS	V64B/125B	1
21	Voltmeter, Vacuum Tube	H-P	200H	1
22	Volt-Ohm-Ammeter, Precision DC	"	412A	1

3.0 SPECIFIC CHECKOUT AND INTEGRATION TESTS

The following tests are to be performed in the Data Systems Lab and will require facilities, services and equipment additional to that listed in section 2.0 as noted following a description of each test.

3.1 Ground Station Post Installation Test (Non-PFRT)

This test will assure the adequacy of all equipment interconnecting wiring and electrical power sources. The procedure will consist of continuity and voltage checks per wiring installation drawings.

3.1.1 Facilities Required

None Additional

3.1.2 Services Required

None Additional

3.1.3 Equipment Required

None in addition to that listed in paragraph 2.3.2.

3.2 Ground Station Operational Test (Non-PFRT)

This test will be functional in nature and will be performed to subcontractor or design specification procedures. Its purpose is to assure adequate operation of the equipment as installed and to acquaint test personnel with the equipment.

3.2.1 Facilities Required

None Additional

3.2.2 Services Required

None Additional

3.2.3 Equipment Required

None Additional

3.3 Ground Station PCM Accuracy Verification Test (Non-PPRT)

This test will confirm the accuracy of the PCM ground station. The test will consist of processing data from a command word generator, with the PCM station. The processed data will appear on a magnetic tape in a standard IBM format and will be analyzed using a general purpose digital computer.

3.3.1 Facilities Required

IBM 7090 data processing facility, Computer Center. EAM and keypunch facility, 2.01 Building.

3.3.2 Services Required

IBM 7090 data processing system operation
IBM keypunch service
7090 Computer Programming
Wiring installation and hookup,
DSL ground station to computer input tape preparation equipment

3.3.3 Equipment Required

Computer input tape preparation equipment (general purpose) as located in Building 2.01, Test Technology Lab
IBM 7090 Computer and peripheral supporting equipment as located in Computer Center

3.4 Ground Station FM Accuracy Verification Test (Non-PPRT)

This test will use the FM ground station to process and record the contents of a test PCM and FM data tape. The station output consists of recording (wet bath) oscillograph records which will be developed and then visually analyzed to assess the system accuracy.

3.4.1 Facilities Required

Oscillograph processing darkroom located in Building 2.01

3.4.2 Services Required

Oscillogram processing

3.4.3 Equipment Required

12 inch wet bath oscillogram processor
Oscillograph record display and reduction equipment

3.5 Airborne TIS Accuracy Evaluation Tests (PFRT)

These tests will verify compatibility and accuracy of the airborne TIS equipment and will establish a reference level for follow-on testing at the launch sites.

Quality Control Department support will be required in these tests to verify the test configuration and test equipment calibration as required by paragraph III D of the Testing Working Agreement (Reference D).

Two types of tests will be performed:

1. A conversion and storage equipment test will evaluate the accuracy of the C&SE using the test console to introduce simulated data and noise into the equipment. The resultant airborne recorder test tape will be processed by the DSL ground station. The data will be analyzed in a manner similar to that used for the ground station tests.
2. An airborne TIS reference test will evaluate end to end accuracy of the system using the test console to simulate glider transducers and wiring. This test will be performed on the prototype and all production units. The test will establish a reference to be used when performing similar tests on the equipment at different locations. Data from these tests will be reduced and analyzed as in the ground station tests.

3.5.1 Facilities Required

None Additional

3.5.2 Services Required

IBM 7090 Computer Programming
Quality Control Department Support

3.5.3 Equipment Required

Glider Intercom Set (GPE)

3.6 TIS/CTS Compatibility Test (PFRT)

This test will determine the optimum pre-emphasis network characteristics for the Conversion and Storage Equipment when connected to the prototype C&TS transmitter.

3.6.1 Facilities Required

C&TS lab as described in Reference A

3.6.2 Services Required

C&TS operation and maintenance (RCA)

3.6.3 Equipment Required

Variable pre-emphasis network

C&TS and GCOE (RCA)

SHF amplifier and down-converter (RCA)

VHF receiver (GFE)

3.7 TIS Radio Frequency Interference Test (Non-PFRT)

This test will establish compliance or variance with RFI requirements of Reference C. No additional facilities, services or equipment are required for this test.

4.0 EQUIPMENT, TEST AND DOCUMENTATION SCHEDULES

Test equipment need dates, documentation release dates and test schedules as required to support the tests outlined in this report are shown in Figure 4.0-1.

1963

1964

	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
SIL GROUND STATION TESTS															
Installation and Checkout (non-PFRT)															
Accuracy and Reference Level Tests (non-PFRT) (Ref. Paragraphs 3.1, 3.2, 3.3, 3.4)															
PROTOTYPE C & SE TESTS															
Installation and Checkout (non-PFRT)															
Accuracy and Reference Level Tests, Para 3.5(1) (PFRT)															
TIS/CTS Integration Tests, Para 3.6 (PFRT)															
Total TIS Integration Reference Test, Para 3.5(2) (PFRT)															
TIS E-I Check, Para 3.7 (non-PFRT)															
PFRT DOCUMENTATION/TIS INTEGRATION															
D2-80102-5 Test Plan															
D2-80102-1 Test Requirements															
D2-80102-2 Test Procedures															
D2-80102-3 Test Report															
D2-80102-4 Test Log															

NOTE: Non-PFRT activities
are documented in
D2-80122

LEGEND:

- a Hardware on Dock
- b " " required by Engr
- c Test Facility required
- d Test Equip/Console req'd
- e Test Equip Cal/Cert Req'd
- f Computer Service and Format Converter Req'd

- g Subcontractor Support req'd
(Procedures, etc)
- h Assoc Contractor Support req'd
(Procedures, Maint, etc)
- i GFE Equip Req'd
- j Outside Design Group Support req'd
- k Oscillogram Processing Facility req'd

- l QC Witness req'd
- △ Doc Released to Engr/
SPO/AFPR
- ▼ Doc Approved per Testing
Working Agreement

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FIGURE 4.0-1
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