UPGRADE PRECISION RUNWAY MONITOR (PRM) OPERATIONAL TEST AND EVALUATION (OT&E) INTEGRATION AND OT&E OPERATIONAL TEST PROCEDURES

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TABLE OF CONTENTS

Abstract

This document defines the Test Procedures and corresponding Verification Requirements Traceability Matrix (VRTM) that will be used to conduct the Upgrade Precision Runway Monitor (Upgrade PRM) Operational Test and Evaluation (OT&E) Integration and OT&E Operational tests. These tests will be conducted at the Raleigh-Durham Airport (RDU) following the Contractor Site Acceptance Test. The Upgrade PRM test configuration is addressed in conjunction with the associated interfaces. The OT&E Operational Test will be conducted in two stages. The first stage will consist of tests with Air Traffic (AT) and the second stage will consist of tests with Airway Facility (AF).

The OT&E Integration tests will consist of an analysis of the results of the Development Test and Evaluation (DT&E) as well as tests of the PRM interfaces.

The AT OT&E Operational tests will be conducted as a multi step strategy starting with simple tests using targets of opportunity, progressing through tests dealing with PRM target alert and system alarm presentation using simulators, leading to full flight tests. All flight tests will be conducted during visual flight rules (VFR) conditions.

The AF OT&E Operational tests will also be conducted as a multi step strategy starting with tests of the PRM's fault detection and isolation capabilities, progressing through PRM (lowest replaceable unit) LRU replacement, and leading to certification tests with the AF technicians.

The Test Procedures and VRTM were developed in accordance with the Upgrade PRM OT&E Test Plan. They contain steps to collect and analyze the data required to determine the operational suitability and effectiveness of the Upgrade PRM/NAS configuration at Raleigh-Durham, North Carolina.

EXECUTIVE SUMMARY

The Upgrade Precision Runway Monitor (Upgrade PRM) is designed to provide faster and more accurate surveillance of aircraft on instrument landing approaches. The system uses a phased array, electronically scanned (E-scan) beacon radar to achieve a target update rate of one second. The system includes high resolution displays with specific blunder alarms to enable a monitor controller to precisely monitor landing aircraft. A system with these capabilities will allow an increase in airport landing capacity at the Raleigh-Durham International Airport (RDU) in North Carolina by allowing simultaneous, independent approaches during instrument flight rules (IFR) conditions.

The Upgrade PRM is a one of a kind system scheduled for operational use at RDU. It is a modification of the Demonstration PRM which was used in the summer of 1990 to prove the concept of flying simultaneous, independent approaches to the parallel runways separated by 3500 feet or greater during IFR conditions through the added capabilities provided by a PRM.

This document contains the Test Procedures and corresponding Verification Requirements Traceability Matrix (VRTM) that will be used to conduct the OT&E Integration and OT&E Operational Tests. The Test Procedures and VRTM were developed in accordance with the Upgrade PRM OT&E Test Plan. They contain steps to collect and analyze the data required to determine the operational suitability and effectiveness of the Upgrade PRM/NAS configuration at Raleigh-Durham, North Carolina.

The OT&E Integration tests will consist of an analysis of the results of the Development Test and Evaluation (DT&E) as well as tests of the PRM interfaces.

The OT&E Operational tests will be conducted as a multi step strategy starting with simple tests using targets of opportunity, progressing through tests dealing with PRM target alert and system alarm resolution using simulators, leading to full flight tests. All flight tests will be conducted during visual flight rules (VFR) conditions.

The AF OT&E Operational tests will also be conducted as a multi step strategy starting with test of the PRM's fault detection and isolation capabilities, progressing through PRM instruction book validation, and leading to certification tests with the AF technicians.

1. INTRODUCTION.

Following the Upgrade PRM Factory Acceptance Testing, the contractor will deliver and install the system at the Raleigh-Durham FAA facility. The contractor will then proceed with the Site Acceptance Test (SAT) which constitutes FAA acceptance of the Upgrade PRM system. Once the Upgrade PRM is accepted, ACW-100A shall conduct the OT&E Integration and OT&E Operational Tests at Raleigh-Durham as described in these procedures. Testing is designed to insure that the Upgrade PRM is in compliance with system requirements and that the PRM/NAS system is operationally suitable and effective.

1.1 PURPOSE.

The purpose of this document is to define the test procedures that will be conducted by ACW-100A during the OT&E Integration and OT&E Operational Tests that will be performed on the Upgrade PRM/NAS system at Raleigh-Durham Airport in North Carolina.

These test procedures were developed in accordance with the Upgrade PRM OT&E Test Plan. The objectives/requirements for these tests trace back to that plan and to the Air Traffic (AT) Operational Requirements for a PRM System developed by ATR. Additional objectives/requirements have been added to the test effort to insure that the PRM/NAS system supports the local AT Procedures, that the contractor provided training (for the PRM's use at RDU) has been effective, and to test the maintainability, supportability, and security objectives. As of this date the Upgrade PRM does not have any NAS System requirements defined in NAS-SS-1000. The Verification Requirements Traceability Matrix (VRTM) in appendix A contains both the Air Traffic Operational Requirements and the additional OT&E requirements.

These test procedures contain the steps required to conduct the Upgrade PRM OT&E Integration and OT&E Operational tests. The procedures are categorized according to their high level objectives and their input sources.

1.2 SCOPE.

The scope of this test effort is strictly limited to the Upgrade PRM at Raleigh-Durham Airport (RDU), North Carolina. Any subsequent PRM procurements will require their own OT&E Integration and OT&E Operational test efforts.

This test effort does not include demonstrations for commercial airlines or the pilot union community. These types of demonstrations should be conducted only after the successful completion of this test effort. This test effort is also not intended to revalidate the concept of PRM monitored simultaneous approaches at 3400 feet. However the requirements developed by the research and development efforts that validated this concept have been included in the Air Traffic requirements and thus the VRTM.

This test program is concerned with determining whether the Upgrade PRM/NAS system (including contractor provided training and documentation) at RDU is suitable and effective for use.

2. LOCATION AND SCHEDULE.

The PRM test site is located at Raleigh-Durham International Airport (RDU), North Carolina. The data collection for the Upgrade PRM OT&E Integration will be done at RDU, Atlanta, and Benson the data collection for the OT&E Operational tests will be done in the TRACON at RDU.

The OT&E Integration data collection effort is planned to be conducted during the AF OT&E data collection.

The AT OT&E Operational data collection effort requires two weeks for the initial data collection cycle. A data collection cycle involves 4 AT controllers plus the part time effort of 1 AT supervisor. Further data collection may be required to retest any modifications made to the PRM/NAS system as a result of the first data collection cycle.

The AF OT&E Operational data collection effort requires two weeks of data collection. A data collection cycle involves 2 AF technicians plus the 2 maintenance contractor technicians.

The first week of data collection will consist of tests that use targets of opportunity and targets supplied by simulators. The schedule for these test is shown in table 2-1.

On Wednesday morning the Normal Operations Targets of Opportunity, Controller Display Commands, Controls and Features Test (6.2.1.1.1) will be conducted. The test will be conducted in the AF equipment room.

Wednesday Morning, Thursday, and Friday the Normal Operations Simulations Tests (6.2.1.2) will be conducted. This tests will be conducted in the TRACON between traffic pushes. There are 3 scenarios in this test, scenario 1 will be tested Wednesday, scenario 2 on Thursday, and scenario 3 on Friday. Scenario 2 and 3 will be executed with both pairs of Test Controllers twice, with the controllers switching runway assignments for the second data collection.

Time	Wednesday	Thursday	Friday
9:00-9:30	Test Team Meeting	Test Team Meeting	Test Team Meeting
9:30-10:00	Pretest Review	Pretest Review	Pretest Review
10:00-1:00	6.2.1.1.1	6.2.1.2 Sn2	6.2.1.2 Sn3
1:00-1:15	Post Test Review	Post Test Review	Post Test Review
1:15-2:15	Lunch	Lunch	Lunch
2:15-2:45	Pretest Review	Pretest Review	Pretest Review
2:45-5:45	6.2.1.2 Sn1	6.2.1.2 Sn2	6.2.1.2 Sn3
5:45-6:00	Post Test Review	Post Test Review	Post Test Review
6:00-6:30	Test Team Meeting	Test Team Meeting	Test Team Meeting

Table 2-1

The second week of data collection will consists of tests that use targets of opportunity and test aircraft. The schedule for these tests is shown in table 2-3. The decision to conduct flight tests during this week depends on the successful completion of the tests conducted during week one.

On Monday morning the Supervisor Display Commands, Controls and Features Test (6.2.1.1.2) will be conducted. This test will be conducted in the AF equipment room.

Starting Monday afternoon through Wednesday Morning flight tests will be conducted. Monday afternoon and Tuesday morning Normal Operations Flight Tests (6.2.1.3), will be conducted. On Tuesday afternoon the Non-Critical Modes Flight Tests (6.2.2.1.2) will be conducted. On Wednesday morning the Critical Modes Flight Tests (6.2.2.2.2) will be conducted. These test will be conducted in-between traffic pushes. If time permits the flight tests will be executed with both pairs of Test Controllers twice, with the controllers switching runway assignments for the second data collection: "TC-A'" and "TC-B'".

Wednesday afternoon the Critical Modes Targets of Opportunity Tests (6.2.2.2.1) will be conducted. On Thursday the Non-Critical Modes Targets of Opportunity Tests (6.2.2.1.2) will be conducted. Friday is held in reserve to retest any concerns raised during the data collection cycle.

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00-9:30	Test Team Meeting	Test Team Meeting	Test Team Meeting	Test Team Meeting	Test Team Meeting
9:30-10:00	Pretest Review	Pretest Review	Pre Test Review	Pretest Review	Pretest Review
10:00-1:00	6.2.1.1.2	6.2.1.3 Gp-B	6.2.2.2.2	6.2.2.1.2 Gp-A	
1:00-1:15	Post Test Review	Post Test Review	Post Test Review	Post Test Review	Post Test Review
1:15 2:15	Lunch	Lunch	Lunch	Lunch	Lunch
2:15-2:45	Pretest Review	Pretest Review	Pretest Review	Pretest Review	Pretest Review
2:45-5:45	6.2.1.3 Gp-A	6.2.2.1.2	6.2.2.2.1	6.2.2.1.2 Gp-B	
5:45-6:00	Post Test Review	Post Test Review	Post Test Review	Post Test Review	Post Test Review
6:00-6:30	Test Team Meeting	Test Team Meeting	Test Team Meeting	Test Team Meeting	Test Team Meeting

Table 2-3

3. RELATED DOCUMENTS.

A list of applicable documentation and reference materials which relate to the contents of this procedure is provided below.

1. ATC, Air Traffic Operational Requirements for a PRM System, 1991.

2. MSI and Bendix, Upgrade PRM Integration and Test Plan, PRM-OITP-F1.00, July 1, 1991.

3. MSI and Bendix, Upgrade PRM Inspection and Test Plan, PRM-OTDP-F1.00, April 1, 1991.

4. FAA ANR-120, Upgrade Precision Runway Monitor System Program Requirements Document, February 22, 1991.

5. FAA ASM-600, ASM-600 Shakedown Test Plan, STP-630-011.

6. Upgrade Precision Runway Monitor Contract, DTFA01-00-C-00000.

7. Upgrade Precision Runway Monitor System Program Requirements Document (PRD), February 22, 1991.

8. Preparation of Test and Evaluation Documentation, FAA-STD-024A.

9. FAA NAS Test and Evaluation Program, FAA Order 1810.4B.

10. Test Terms and Definitions for the National Airspace System, NAS-MD-110.

11. Upgrade Precision Runway Monitor (PRM) Operational Test and Evaluation OT&E Test Plan, DOT/FAA/CT-TN29/13.

12. Phase 3 Inspection/Checklists Test Procedures for the Escan PRM

13. Phase 3 Inspection/Test Report for the Escan PRM

14. Phase 4 Inspection/Checklists Test Procedures for the Escan PRM

15. Phase 4 Inspection/Test Report for the Escan PRM

16. Precision Runway Monitor (PRM) Reliability Demonstration Test Plan/Test Procedures, PRM-RDTP-F1.00, November 30, 1992

4. MANNING AND RESPONSIBILITIES.

Section 4 of the OT&E Test Plan contains a list of organization responsibilities during this test effort. This test effort will require support from Airway Facilities (AF) Technicians, Air Traffic (AT) Controllers, AT Supervisors, FAA Technical Center Test Pilots, Test Engineers (FAA and support contractors), and the Upgrade PRM Contractor.

The AT personnel required for this test effort will have been trained in the operation of the PRM (by the contractor) and the associated AT procedures prior to their involvement in any tests. The AT personnel will assist in both the control of test aircraft and to supply opinions to be used to evaluate the suitability and effectiveness of the Upgrade PRM/NAS system.

The AF technicians will also receive training prior to the involvement in the test effort. The AF technicians will assist with the data collection at various non-PRM radar facilities, and to supply opinions to be used to evaluate the suitability and effectiveness of the Upgrade PRM/NAS system.

The Test Engineers involved with this test effort will have become familiar with the operation of the PRM through their involvement in the DT&E test phases of the program. The Test Engineers will be used to conduct the tests and perform the required data analysis. The PRM contractor will provide various support to the Test Engineers.

5. TEST SUPPORT HARDWARE AND EQUIPMENT.

The required support hardware and equipment to conduct the Upgrade PRM OT&E Integration and OT&E Operational tests are as follows:

a. Desk Top Simulator (DTS) - An air traffic simulator which provides tracked targets directly to the PRM graphics processor. The DTS operator can interactively control the DTS tracks to respond to the controller issued commands. The DTS will be used during the Normal Operations Simulations tests.

b. PRM Antenna and Target Traffic Simulator (PATTS) - A simulator that responds to interrogations and provides reply data at the RF level to the PRM interrogator and receiver. The PATTS will be used during the Normal Operations Simulations Tests.

c. Test Aircraft Equipped with Air Traffic Control Radar Beacon Systems (ATCRBS) Transponders - Two aircraft will be used during the Normal Operations Flight Tests and the Degraded Operations Flight Tests.

d. Automated Radar Terminal System (ARTS) - The ARTS is the major ATC tracking/display system at RDU. The PRM is interfaced to the ARTS through a one-way passive interface. The PRM gets aircraft data block information from the ARTS through this interface.

e. Air Traffic Control Beacon Interrogator (ATCBI) - The ATCBI's are beacon surveillance systems. There is an ATCBI-4 at RDU and an ATCBI-5 at the Benson Enroute Facility. Interference tests will be conducted to determine if there is any discernable degradation to the performance of these systems due to addition of the PRM into the RDU Environment.

f. Surveillance Communication Interface Processor (SCIP) - The SCIP is a subsystem interface to the ASR-9 at RDU. Digitized beacon data will be collected from the SCIP using the RTADS data collection system during the interference test.

g. Airport Surveillance System (ASR-9) - The ASR-9 is the primary radar system at RDU. The ASR-9 receives digitized beacon data from the collocated ATCBI system. The ASR-9 then sends the data to the SCIP. The ASR-9 will be used during the interference test.

6. OT&E INTEGRATION AND OT&E OPERATIONAL TEST PROCEDURES.

The OT&E tests procedures are separated into two major sections:

a. OT&E INTEGRATION TESTS (6.1)
b. OT&E OPERATIONAL TESTS (6.2)

These test procedures detail:

a. The structure of the overall Upgrade PRM OT&E Integration and OT&E Operational test effort.

b. The OT&E Integration and OT&E Operational requirements to be verified by the test effort.

c. The specific test procedure that will be used to conduct the test. For each test the test procedure supplies:

1. Test Objectives.
2. Test Description.
3. Test Resources and Test Configuration.
4. Test Setup Steps and Safety Considerations.
5. Data Collection Steps.
6. Data Collection Termination/Restart.
7. Test Mission Log.
8. Questionnaires.
9. Data Reduction and Analysis Steps.
10. Success Criteria.

A dry run of each test will be conducted before using either test controllers or test aircraft. The test engineers will use the dry run to debug the test procedure and coordinate with the test pilots and the on-duty ATC supervisor.

A Pre-Test review will be held prior to the start of each test. The purpose of this review will be to accomplish the following:

a. Identify any needed changes and redline the procedures accordingly.

b. Review the hardware and software configurations of the test environment.

c. Ensure that all items in the test procedure's Test Resources are available.

A Post Test review will be held upon the completion of each test. The purpose of this review will be to accomplish the following:

a. Identify any procedure step changes or test discrepancies and their significance to the test results.

b. Identify the "as-run" hardware and software configurations.

c. Summarize the actual test conduct and determine a preliminary assessment of the test results.

6.1 OT&E INTEGRATION TESTS.

The Integration Tests will be conducted to verify the Upgrade PRM's functional performance and verify that it can be integrated into the current NAS configuration/environment at RDU. The only NAS system which the Upgrade PRM physically interfaces to is the Automated Terminal Radar System (ARTS)-IIIA. However, the Upgrade PRM must also integrate into the RDU environment. For this reason a test will be performed to verify that the addition of the PRM does not effect the performance of the current Air Traffic Control Beacon Interrogator-4 (ATCBI-4) radar system at Raleigh-Durham. The OT&E Integration Tests will be accomplished in three sections as follows:

1. PRM Performance Verification (6.1.1).
2. PRM/ARTS-IIIA Interface Tests (6.1.2).
3. ATCBI Interference Test (6.1.3).

6.1.1 PRM Performance Verification.

The PRM Performance Verification will be conducted to verify that the Upgrade PRM functionally meets the OT&E Performance requirements as listed in the VRTM. This verification will be accomplished by reviewing the Contractor's DT&E tests procedures and results. The Contractor's phase 3 DT&E was accomplished at the factory using simulators as inputs to the PRM. The Contractor's phase 4 DT&E were accomplished "on-site" in the actual NAS configuration. These tests were conducted by the PRM contractor in accordance with government approved test procedures and were fully monitored by ACW engineers. A preliminary review of the DT&E test procedures indicates that these tests will cover all the OT&E performance requirements. This verification will insure that each OT&E performance requirement was satisfactorily tested and that the result of the test was successful. Note, that these tests verify the functionality of the OT&E requirement. Many of these requirements are also tested during the OT&E Operational Tests to verify their suitability and effectiveness. I.e. this phase of tests verifies that the PRM functionally displays information accurately, the OT&E Operational Tests will verify that the PRM displays information suitably and effectively.

6.1.1.1 Test Objectives.

The objectives of the PRM Performance Verification are to:

a. Verify that the PRM meets the PRM PRD requirements for surveillance coverage (elevation, range, and azimuth).

OT&E Requirements Tested: 2, 3, 4

b. Verify that the PRM meets the PRM PRD requirements for: target accuracy, tracking capacity, display resolution, and target throughput.

OT&E Requirements Tested: 6, 9, 20, 40, 41

c. Verify that the PRM detects subsystem and operational faults, isolates faults to the LRU level, automatically switches to standby units, has an uninterruptible power source, and alerts the controller when failures occur in accordance with the PRM PRD requirements.
OT&E Requirements Tested: 13, 14, 15, 16, 17, 18, 60

d. Verify that the PRM displays target data and alarms in accordance with PRD requirements.

OT&E Requirements Tested: 42, 43, 44, 45, 46, 47, 49, 50

e. Verify that the PRM meets the PRM PRD requirements for the display: characteristics, controls and commands.

OT&E Requirements Tested: 21, 22, 23, 24, 25, 33, 34, 35, 36, 37, 39

f. Verify that the PRM meets the PRM PRD requirements for: recording, replaying, and listing target data.

OT&E Requirements Tested: 19, 51

6.1.1.2 Test Description.

This test will consist of a review and analysis of the Phase 3 In-Plant DT&E and the Phase 4 On-Site Acceptance DT&E procedures and results. The first part of the review will determine which DT&E tests should be reviewed for each test objective (set of OT&E performance requirements). These test procedures and results will then be reviewed to insure that each OT&E performance requirement functionality had been successfully verified.

6.1.1.3 Test Resources.

The equipment, facilities and personnel required to execute this test are listed in the tables below.

Equipment or Facility	Purpose	Duration
None		

#	Personnel	Responsibility
1	Test Coordinator (TC)	Determine which test procedures and results to review
1	Test Engineer (TE)	Review test procedures and results

Other resources which are required to conduct this test are the following:

a. Final Phase 3 Test Procedures and Results
b. Final Phase 4 Test Procedures and Results

6.1.1.4 Test Setup and Safety Considerations.

The TC will obtain copies of the required Phase 3 and Phase 4 Test Procedures and Results.

6.1.1.5 Data Collection.
The data for this test was collected during the Contractor DT&E (Phase 3 and Phase 4 Tests).

6.1.1.6 Data Collection Termination/Restart.

Not applicable to this test.

6.1.1.7 Test Mission Log.

Not applicable to this test.

6.1.1.8 Questionnaires.

Not applicable to this test.

6.1.1.9 Data Reduction and Analysis.

1. Enter the names of the assigned test conduct personnel:

TC:	TE:

2. For each test objective the TC should enter the Phase 3 and Phase 4 DT&E test procedures and results that should be reviewed.

Objective	Phase 3 Test #	Phase 4 Test #
A		
B		
C		
D		
E		
F		

3. For each test objective and corresponding OT&E requirement the TE should review the applicable DT&E test procedure and results. The procedure should be reviewed to verify that the test did indeed verify this test objective. The results should be reviewed to insure that the objective has been met. Enter any pertinent information in the notes field.

Did the DT&E test verify that:	YES/NO
Obj A: The PRM meets the PRM PRD requirements for surveillance coverage (elevation, range, and azimuth). Notes:	
Obj B: The PRM meets the PRM PRD requirements for: target position accuracy, tracking capacity, display resolution, and target throughput. Notes:	
Obj C: The PRM detects subsystem and operational faults, isolates faults to the LRU level, automatically switches to standby units, has an uninterruptible power source, and alerts the controller when failures occur in accordance with the PRM PRD requirements. Notes:	
Obj D: The PRM displays target data and alarms in accordance with the PRM PRD requirements. Notes:	
Obj E: The PRM meets the PRM PRD requirements for the display: characteristics, controls and commands. Notes:	
Obj F: The PRM meets the PRM PRD requirements for: recording, replaying, and listing target data. Notes:	

6.1.1.10 Success Criteria.

This test will be successful if the review of the DT&E tests concludes that the Phase 3 and Phase 4 DT&E tests performed and the results of those tests verify that:

Req. #	Success Criteria	Pass	Fail
2	The maximum elevation coverage is not be less than 31 degrees for altitudes of <= 15,000 ft. Minimum elevation coverage was <= 50 ft above the runway surface <= 2 degrees beyond runway thresholds.		
3	The PRM transmitter power receiver sensitivity and processing range provides range coverage of 32nmi's.		
4	The PRM provides azimuth coverage of 360 degrees.		
6	The PRM range and azimuth accuracy meets the PRD stated requirements.		
9	The PRM processes up to 25 targets at a 1 second update rate.		
13	The PRM has an uninterruptible power source.		
14	The PRM continuously displays targets when power sources are automatically switched.		
15	The PRM generates a visual alarm on the display when subsystem failures occur.		
16	The PRM generates an aural alarm when subsystem failures occur.		
17	The PRM generates messages on the display when subsystem failures occur.		
18	The PRM recovers from temporary failures without loss of tracked targets.		
19	The PRM is able to record, replay, and simulate tracked targets.		
20	The PRM display resolution provides visual resolution of track deviations of 100 feet or less.		
21	The PRM display is at least 18 inches diagonally.		
22	The PRM display does not exceed the size of the ARTS console.		
23	The PRM monitor position has operator controls, a keyboard, and a track ball accessible to the user.		
24	The PRM display features include full variable range and offset capability.		
25	The PRM display presentation quality recovers within 1 second following a range change/offset without affecting the targets.		
33	The PRM displays no more than 6 false targets per update period with fruit rate of 10,000 replies per second within 32 nmi coverage.		
34	The PRM display has operator selectable maps.		
35	The PRM display map's line widths and associated alphanumerics are as small as practicable.		
36	The display map has veriable intensity.		

Req. #	Success Criteria	Pass	Fail
37	The display map includes as a minimum: 1. Runway outlines of all runways within the coverage area of the PRM system. 2. A broken line in 1/2 or 1-mile increments (site selectable) representing the final approach course to each runway to be used for simultaneous approaches. 3. Final approach fix and other appropriated fixes as displayed on the ARTS display. 4. Prominent obstructions. 5. An NTZ 2,000ft wide located equidistant between the parallel runway centerlines. 6. An NOZ is that area between the runway centerline extended and the closest edge of the NTZ. 7. The NOZ shall be clearly distinguishable from the NTZ and displayed in increments of 200 feet.		
39	For a target's data block the operator has the ability to select character size, intensity, data block offset, leader line length, and field inhibit.		
40	The PRM display target symbol size is operator selectable.		
41	A unique symbol represents the most recent return for each tracked target.		
42	The history trail for each tracked target is displayed and is controller selectable from the keyboard.		
43	The history trail for each tracked target is variable from 0-16 reports.		
44	The tracked target symbols have a projected track vector generated from track history and ground speed.		
45	The projected track vector length is selectable from an operator keyboard.		
46	A track projected to enter the NTZ alerts the controller in 10 seconds.		
47	The NTZ alert time is programmable from 0-16 seconds.		
49	A voice alert sounds only at the monitor position when a track is projected to enter the NTZ.		
50	The voice alert has a controllable volume switch at each operational position.		
51	A printout can be generated for tracks that deviate into the NTZ and for system parameter changes.		
60	The PRM system is able to detect faults that effect operational capabilities and isolate them to the LRU level by providing a list of up to 3 probable LRUs.		

APMT: Date:

6.1.2 PRM/ARTS-IIIA Interface Tests.

The PRM/ARTS-IIIA interface is a passive interface. This interface obtains data block information (i.e., Aircraft ID, runway assignment, conflict alerts and low altitude warnings) from ARTS-IIIA communication messages. For redundancy the PRM contains two interface units referred to as PRM/ARTS Interface Units 1 & 2. PRM ARTS Interface Unit 1 is connected to Graphic Processor 1 (GP1). PRM ARTS Interface Unit 2 is connected to GP2. In turn the PRM/ARTS Interface Units are connected to the ARTS system through the ARTS multiplexed display buffer memory (MDBM). The PRM/ARTS-IIIA Interface Tests will be conducted to insure that the data is being passed correctly and that the addition of the PRM interface does not degrade the current ARTS performance. The individual tests that encompasses the PRM/ARTS-IIIA Interface are:

a. PRM/ARTS-IIIA Interface Data Integrity Test.
b. PRM/ARTS-IIIA Interface ARTS Degradation Test.

6.1.2.1 PRM ARTS-IIIA Interface Data Integrity Test Procedure.

6.1.2.1.1 Test Objectives.

The objective of the PRM ARTS-IIIA Interface Data Integrity Test is:

a. Verify that the PRM correctly updates discreet beacon code targets with the appropriate ARTS system information (including conflict and low altitude alerts).

OT&E Requirements Tested: 38

b. Verify that the PRM system automatically switches to the standby PRM ARTS Interface Unit when the active unit fails and the standby ARTS Interface Unit continues to update the applicable data block information correctly.

OT&E Requirements Tested: 17

6.1.2.1.2 Test Description.

This test will consist of a review and analysis of the Phase 3 In-Plant DT&E and the Phase 4 On-Site Acceptance DT&E procedures and results. These tests were conducted by the PRM contractor in accordance with government approved test procedures. These tests were fully monitored by ACW engineers and the test results obtained were approved by the government. The first part of the review will determine which DT&E tests should be reviewed for each test objective (set of OT&E performance requirements). These test procedures and results will then be reviewed to insure that each OT&E performance requirement had been successfully verified.

6.1.2.1.3 Test Resources.

The test equipment, facilities and personnel required to execute this test are listed in the tables below.

Test Equipment or Facilities	Purpose	Duration
None		

#	Personnel	Responsibility
1	Test Coordinator (TC)	Determine which test procedures and results to review
1	Test Engineer (TE)	Review test procedures and results

Other resources which are required to conduct this test are the following:

a. Final Phase 3 DT&E Test Procedures and Results
b. Final Phase 4 DT&E Test Procedures and Results

6.1.2.1.4 Test Setup and Safety Considerations.

The TC will obtain copies of the required Phase 3 and Phase 4 Test Procedures and Results.

6.1.2.1.5 Data Collection.

The data for this test was collected during the Contractor DT&E (Phase 3 and Phase 4 Tests).

6.1.2.1.6 Data Collection Termination/Restart.

Not applicable to this test.

6.1.2.1.7 Test Mission Log.

Not applicable to this test.

6.1.2.1.8 Questionnaires.

Not applicable to this test.

6.1.2.1.9 Data Reduction and Analysis.

1. Enter the names of the assigned test conduct personnel:

TC:	TE:

2. For each test objective the TC should enter the Phase 3 and Phase 4 DT&E test procedures and results that should be reviewed.

Objective	Phase 3 Test #	Phase 4 Test #
A		
B		

3. For each test objective and corresponding OT&E requirement the TE should review the applicable DT&E test procedure and results. The procedure should be reviewed to verify that the test did indeed verify this test objective. The results should be reviewed to insure that the objective has been met. Enter any pertinent information in the notes field.

Did the DT&E tests verify that:	YES/NO
The PRM/ARTS Interface correctly updates discreet beacon code targets with the appropriate ARTS system information? Notes:	
The PRM system automatically switches to the standby PRM/ARTS Interface Unit when the active PRM/ARTS Interface Unit is powered down? Notes:	
The PRM continued to update the applicable data block information correctly following a switch to standby PRM/ARTS Interface Unit? Notes:	

6.1.2.1.10 Success Criteria.

This test will be successful if the review of the DT&E tests concludes that the Phase 3 and Phase 4 DT&E tests performed and the results of those tests verify that:

Req. #	Success Criteria	Pass	Fail
38	Targets with discreet beacon codes automatically display associated ARTS data block information (when available) including: runway assignment, aircraft ID, heavy flag, aircraft type, as well as low altitude and conflict visual alerts when appropriate.		
17	When a fault is detected in the active PRM/ARTS-IIIA Interface Unit the PRM automatically switches to the standby Interface Unit without effecting any information on the PRM displays.		
APMT:		Date:	

6.1.2.2 PRM/ARTS-IIIA Interface ARTS Degradation Test Procedure.

6.1.2.2.1 Test Objectives.

The objective of the PRM/ARTS-IIIA Interface ARTS Degradation Test is to verify that the addition of the PRM/ARTS Interface Units into the current ARTS-IIIA configuration at Raleigh-Durham does not cause any discernible degradation to the ARTS-IIIA system.

OT&E Requirements Tested: 52

6.1.2.2.2 Test Description.

Test Coordinator (TC) will monitor the ARTS-IIIA DEDS displays while the TE turns the PRM/ARTS Interface Units "off" and "on" several times. The TC will record any unusual anomalies observed on the DEDS display in a Test Data Log. This test will be conducted after the TC has coordinated with both the AT Supervisor and the AF Supervisor. An AF Technician will be present to resolve any problems induced onto the ARTS.

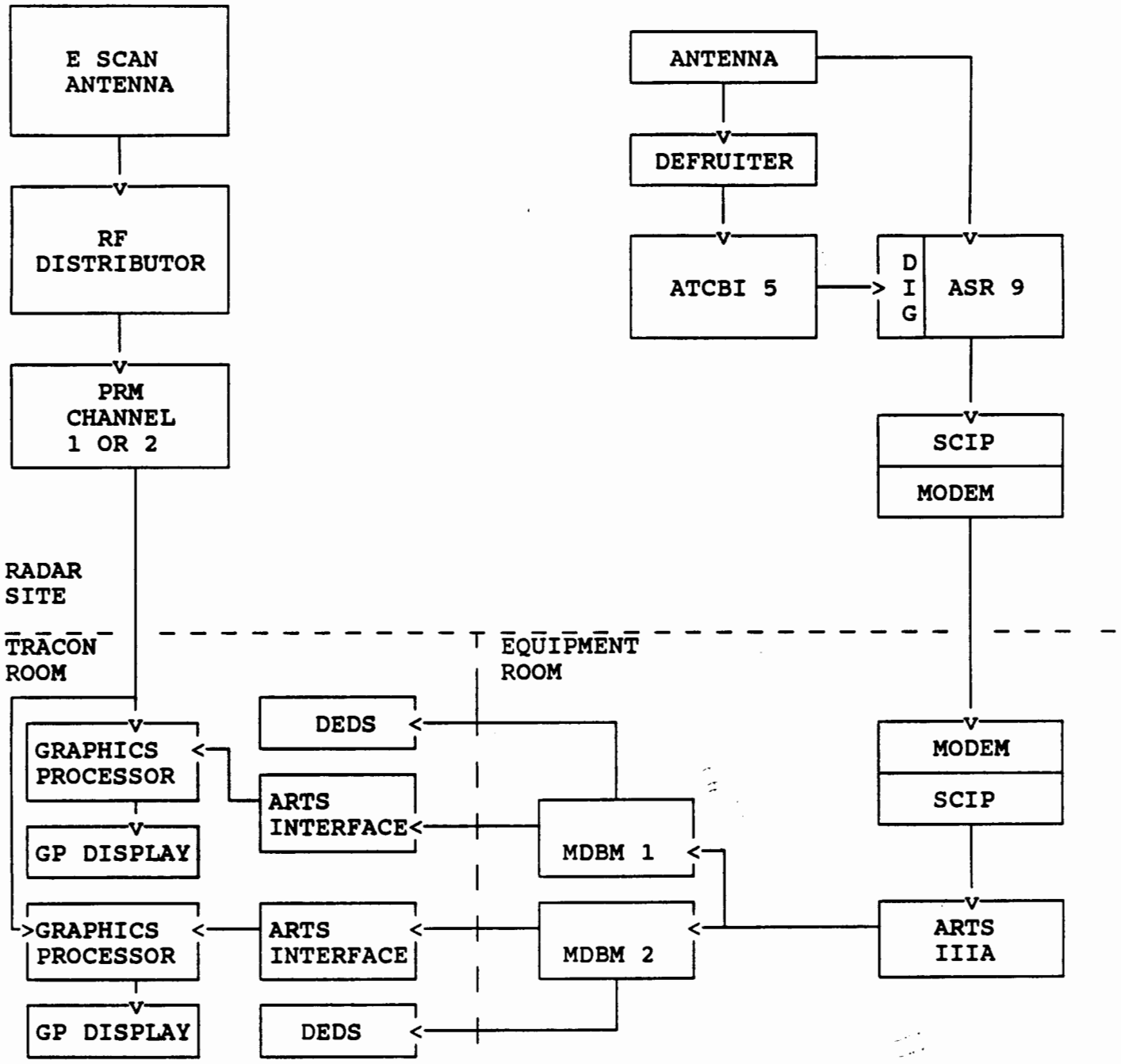
The Test Data Log collected from the TC will be analyzed to determine if there is any discernable degradation to the present ARTS system caused by the addition of the PRM/ARTS Interface Units.

6.1.2.2.3 Test Resources.

The test equipment, facilities and personnel required to conduct this test are listed in the tables below. The test configuration is shown in figure 6.1.2.2.3-1.

Test Equipment or Facilities	Purpose	Duration
ARTS Facility	Monitor surveillance data	1 hour

#	Personnel	Responsibility
1	Test Coordinator (TC)	Coordinate with TE, monitor DEDS display and collect data
1	Test Engineer (TE)	TE1- Control PRM, coordinate with AF Technician
1	AF Technician	Monitor ARTS performance



6.1.2.2.3-1 ARTS-IIIA/PRM INTEGRATION TEST CONFIGURATION

6.1.2.2.4 Test Setup and Safety Considerations.

1. TC- coordinate with the AT and AF Supervisors to determine when to conduct the ARTS degradation test. It should be noted that this test may affect the operations of the present ARTS system at the RDU site. An ARTS qualified AF Technician should be available in case the test does cause an ARTS problem.

2. TE- enable the PRM with both PRM/ARTS Interface Units turned on and insure proper operation.

3. TC- turn off the wall alarms of GP1 and GP2.

4. TC- coordinate the exact test start time with the TE.

5. TE- enter the time on the Data Log.

6.1.2.2.5 Data Collection.

1. TC- begin observing the DEDS displays and to record any unusual anomalies onto the Test Data Log.

2. TE- follow the time schedule on the Test Data Log turning the PRM/ARTS Interface Units power switches to the appropriate positions "off" and "on".

3. TE- when the events on the Test Data Log have been completed notify the TC that the data collection is over.

4. TC- notify the Test Controllers and insure that the Questionnaires have been filled out appropriately.

6.1.2.2.6 Data Collection Termination/Restart.

The data collection can be terminated at any time. Data collected up to that point can be used. The data collection can be restarted following coordination with the AT and AF supervisors.

6.1.2.2.7 Test Mission Log.

6.1.2.2.7.1 Pretest Section.

1. Date: __/__/__ Scheduled Start Time: __:__.

2. Note any open items or test procedure discrepancies.

3. Enter the names of the assigned test conduct personnel:

Test Coordinator	Test Engineer
AF Supervisor	AF Technician
AT Supervisor	

4. Enter the PRM System Configuration Number _____.

5. Note any discrepancies from the defined test configuration.

6.1.2.2.7.2 Test Data Log.

6.1.2.2.7.2.1 TC (RDU) Test Data Log

ACTION	TIME
Enter the time that the Test Coordinator began observing the DEDS displays.	: : (hh) (mm) (ss)
Enter any unusual event that occurred during the data collection	
	: : (hh) (mm) (ss)
	: : (hh) (mm) (ss)
	: : (hh) (mm) (ss)
	: : (hh) (mm) (ss)
	: : (hh) (mm) (ss)
	: : (hh) (mm) (ss)
Enter the time that the Test Coordinator stopped observing the DEDS displays.	: : (hh) (mm) (ss)

6.1.2.2.7.2.2 TE (PRM) Test Data Log

ACTION	TIME
Enter Test Start Time.	____:____:____ (hh) (mm) (ss)
Wait 10 minutes, turn PRM/ARTS Interface **Unit 2 OFF.**	____:____:____ (hh) (mm) (ss)
Wait 5 minutes, turn **Unit 2 ON.**	____:____:____ (hh) (mm) (ss)
Wait 5 minutes, turn **Unit 1 OFF.**	____:____:____ (hh) (mm) (ss)
Wait 5 minutes, turn **Unit 1 ON-OFF-ON.**	____:____:____ (hh) (mm) (ss)
Wait 5 minutes, turn **Unit 1 & 2 OFF.**	____:____:____ (hh) (mm) (ss)
Wait 5 minutes, turn **Unit 1 & 2 ON.**	____:____:____ (hh) (mm) (ss)
Wait 10 minutes, call TC to end test, enter time.	____:____:____ (hh) (mm) (ss)

6.1.2.2.7.3 Post Test Section.

1. Note any test procedure discrepancies encountered during the test conduct.

2. Enter a summary of the data collection.

3. Enter a preliminary assessment of the test results.

6.1.2.2.9 Data Reduction and Analysis.

1. Review the Test Data Logs and assign a number to each recorded unusual event.

2. For each recorded unusual event determine:

a. The status of the PRM/ARTS Interface Units at the time the event occurred, (OFF/ON/Being Switched ON/Being Switched OFF)

b. For events that correlated to when the PRM/ARTS Interface Units were either on, being switched on, or being switched off determine the effect that the event has on the ARTS system:

Event #	PRM/ARTS Interface Status		Effect on Controller Ability to use ARTS
	Unit #1	Unit #2	

6.1.2.2.10 Success Criteria.

This test will be successful if the review of the Data Logs collected verifies:

Req. #	Success Criteria	Pass	Fail
52	That the addition of the PRM/ARTS Interface Units to the RDU ARTS-IIIA configuration does not cause any discernable degradation to that system.		
	That the normal operation of the PRM/ARTS Interface Units do not cause any discernable degradation to that system.		
	That the switching of the PRM/ARTS Interface Units do not cause any discernable degradation to that system.		
APMT:		Date:	

6.1.3 ATCBI Interference Test Procedure.

While there is no direct interface between the Upgrade PRM and the RDU ATCBI-4 system, there is a possibility that the PRM could interfere with this system through the generation of synchronous replies. This test procedure is to determine if the operation of the PRM system at RDU causes any discernable degradation to the adjacent ATCRBS systems. The test procedure contains sections for data collection at RDU.

6.1.3.1 Test Objectives.

The objective of the interference testing is to determine that the addition of the PRM into the RDU environment does not cause any discernable degradation to the existing NAS ATCRBS systems at the RDU airport.

OT&E Requirements Tested: 53

6.1.3.2 Test Description.

This test will collect data from Test Engineers by having them monitor the radar displays at RDU as the PRM is being cycled on and off. The test will be conducted during heavy traffic loads (pushes). The AF Technician at RDU will collect ATCBI digitized data from the ARTS-IIIA. An analysis of the Test Data Log recorded by the Test Engineers will be conducted. This analysis will determine if there is any discernable degradation to the current beacon surveillance caused by the addition of the PRM into the RDU environment. The TEs will also perform data analysis on the collected DRAM radar data. The quality of the ATCBI surveillance data with the PRM on will be compared against the quality of ATCBI surveillance data with the PRM off. This comparison will also be made with the PRM mode-0 phase shifter disabled.

6.1.3.3 Test Resources.

The test equipment, facilities and personnel required to conduct this test is listed in the tables below. Diagrams of the test configurations are shown in figure 6.1.3.3-1.

Test Equipment or Facilities	Purpose	Duration
Radar Displays @ RDU & Atlanta	Monitor Surveillance Data	1 Hour
ARTS-IIIA	Run DRAM Program	1 Hour

#	Personnel	Responsibility
1	Test Coordinator (TC)	observe ARTS display
2	Test Engineer (TE)	TE1 at RDU-ARTS, TE2 at PRM
1 @ RDU ARTS	AF Technician	Assist TE in data collection

Other resources which are required to conduct this test are the following:

a. DRAM User's Manual

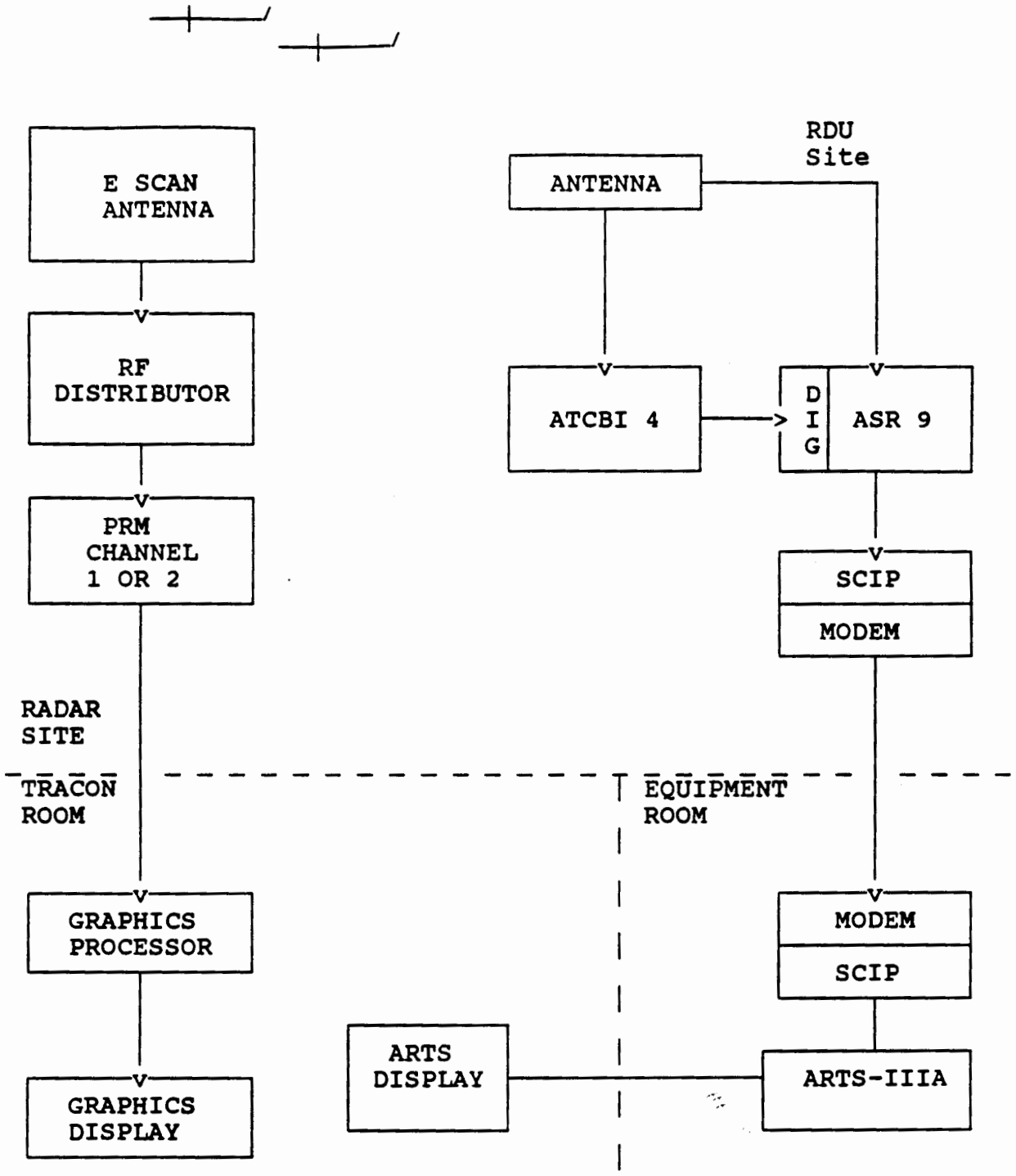


FIGURE 6.1.3.3-1 ATCBI-4/PRM INTERFERENCE TEST CONFIGURATION

6.1.3.4 Test Setup and Safety Considerations.

There are no special safety considerations for this test.

TE2- enable the PRM. Insure that it is operating properly then cycle it "off" by entering STOP. Inform the TC when the PRM is ready.

6.1.3.5 Data Collection.

Test #1:

1. TC- synchronize the times between TEs and inform them to start the data collection.

a. TE1 (ARTS) - inform the AF Technician to begin collecting data with the DRAM program. TE1 should record any unusual events noted and record the Test Start Time on the Test Data Logs.

b. TC - note the Test Start Time on the Test Data Logs the test has begun and TC monitors the ARTS displays for any unusual events.

c. TE2 (PRM)- note the Test Start Time on the PRM Test Data Log and turn the PRM "on" by entering GO on the PRM and then follow the steps on the PRM Test Data Log .

2. TC - when notified by TE2 that the data collection has finished, notify the other TEs.

a. TC - end ARTS display observations.

b. TE1 - Inform the AF Technician to terminate the DRAM data collection program at the end of the data collection.

Test #2:

3. Re-run steps 1 and 2 in Test #1. This time TE2 will unplug the mode-0 phase shifter in the PRM RF Distribution Cabinet.

4. After step 3, TE2 should replace the mode-0 phase shifter in the PRM RF Distribution Cabinet.

5. TE1 - have the AF Technician complete Questionnaire-IF1.

6.1.3.6 Data Collection Termination/Restart.

The tests can be terminated at any time without affecting collected data. Conversely, the tests can be resumed at any time.

6.1.3.7 Test Mission Log.
6.1.3.7.1 Pretest Section.

1. Date: __/__/__ Scheduled Start Time: __:__.

2. Note any open items or test procedure discrepancies.

_____

_____

_____

_____

3. Enter the names of the assigned test conduct personnel:

Test Coordinator	
Test Engineer-1 (ARTS)	Test Engineer-2 (PRM)
AT Supervisor (RDU)	AF Technician

4. Enter the PRM System Configuration Number _____.

5. Note any discrepancies from the test configurations.

_____

_____

_____

_____

_____

_____

_____

6.1.3.7.2 Test Data Log.

The test data log will be used by the TC and TE's to record specific test events as noted in the test procedure.

6.1.3.2.7.2.1a TC Data Log - Test #1

EVENT	TIME
Enter the time that the TC began observing the DEDS displays.	____ : ____ : ____ (hh) (mm) (ss)
Enter any unusual event that occurred during the data collection	
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
Enter the time that the TC stopped observing the DEDS displays.	____ : ____ : ____ (hh) (mm) (ss)

6.1.3.2.7.2.1b TC Data Log - Test #2

EVENT	TIME
Enter the time that the TC began observing the DEDS displays.	____ : ____ : ____ (hh) (mm) (ss)
Enter any unusual event that occurred during the data collection	
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
Enter the time that the TC stopped observing the DEDS displays.	____ : ____ : ____ (hh) (mm) (ss)

6.1.3.2.7.2.2a TE1 (ARTS) Data Log - Test #1

EVENT	TIME
Enter the time that the AF Technician began the ARTS DRAM program.	____ : ____ : ____ (hh) (mm) (ss)
Enter any unusual events that where found by the data reduction and analysis	
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
Enter the time that the AF Technician stopped the ARTS DRAM program.	____ : ____ : ____ (hh) (mm) (ss)

6.1.3.2.7.2.2b TE1 (ARTS) Data Log - Test #2

EVENT	TIME
Enter the time that the AF Technician began the ARTS DRAM program.	____ : ____ : ____ (hh) (mm) (ss)
Enter any unusual events that where found by the data reduction and analysis	
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
	____ : ____ : ____ (hh) (mm) (ss)
Enter the time that the AF Technician stopped the ARTS DRAM program.	____ : ____ : ____ (hh) (mm) (ss)

6.1.3.2.7.2.3a TE2 (PRM) Test Data Log - Test #1

ACTION	TIME
Enter the time the PRM was initially turned **ON**.	____ : ____ : ____ (hh) (mm) (ss)
Wait 1/2 hour, turn the **PRM OFF**.	____ : ____ : ____ (hh) (mm) (ss)
Wait 1/2 hour, call the TC to end test, enter time.	____ : ____ : ____ (hh) (mm) (ss)

6.1.3.2.7.2.3b TE2 (PRM) Test Data Log - Test #2

ACTION	TIME
Enter the time the PRM was initially turned **ON**.	____ : ____ : ____ (hh) (mm) (ss)
Wait 1/2 hour, turn the **PRM OFF**.	____ : ____ : ____ (hh) (mm) (ss)
Wait 1/2 hour, call the TC to end test, enter time.	____ : ____ : ____ (hh) (mm) (ss)

6.1.3.2.7.2.4 AF Questionnaires.

6.1.3.2.7.2.4 Questionnaire-IT1. Name: Date / /

ATCBI Interference Test	YES	NO	The problem is....
Did the DRAM Analysis provide a successful summary listing?			
Did the DRAM Analysis provide a successful summary listing with the PRM RFD mode-0 phase shifter disabled?			
Would you suspect no trouble with the adjacent ATCBI systems when the PRM is operational?			

6.1.3.7.3 Post Test Section.

1. Note any test procedure discrepancies encountered during the test conduct.

2. Enter a summary of the data collection.

3. Enter a preliminary assessment of the test results.

6.1.3.9 Data Reduction and Analysis.

1. Review the Questionnaires and Test Logs and assign a number to each recorded unusual event.

2. For each recorded unusual event determine:

a. The status of the PRM at the time when the event occurred, (OFF/ON/Being Switched ON/Being Switched OFF)

b. What the effect on an AT controller's ability to use the surveillance data might be.

c. Whether the problem was caused by the addition of the PRM system into the environment.

EVENT #	PRM STATUS	Effect on Controller Ability to use ARTS

3. The DRAM program will be used as part of the data analysis. The DRAM program provides a summary of false target information as PRF interference is identified from the ARTS-IIIA digitized beacon data.

6.1.3.10 Success Criteria.

This test will be successful if the analysis of the Questionnaires and Data Logs collected and the analysis of the digital beacon data collected verifies:

Req. #	Success Criteria	Pass	Fail
53	That the addition of the PRM interrogator into the RDU environment does not cause any discernable degradation to the existing NAS ATCRBS systems at the RDU airport.		
APMT:	Date:		

6.2 AT OPERATIONAL TEST PROCEDURES.

This OT&E Operational Test is an evaluation of the Upgrade PRM/NAS system and the associated contractor provided documentation and training. The Upgrade PRM/NAS system will be evaluated by AT controllers, AT supervisors, and FAA test engineers. Tests will be conducted while the Upgrade PRM/NAS system is operating under normal conditions, and while operating under various degrees of degraded operation. Tests will use targets of opportunity, simulators, and FAA test aircraft. The AT OT&E Operational Test Procedures are subdivided into two major categories as follows:

1. Normal Operations Tests (6.2.1).
2. Degraded Operations Tests (6.2.2).

6.2.1 Normal Operations Tests.

The Normal Operations tests will evaluate the suitability and effectiveness of the Upgrade PRM/NAS system to be used to conduct simultaneous parallel landings at RDU during IFR conditions. The Normal Operations tests have been subdivided into three sections as follows:

1. Normal Operations Targets of Opportunity Tests (6.2.1.1).
2. Normal Operations Simulation Tests (6.2.1.2).
3. Normal Operations Flight Tests (6.2.1.3).

This division was done to minimize the amount of test time that would require test aircraft and to provide a building approach to the test effort.

The Normal Operations Targets of Opportunity Tests will determine the suitability of the PRM Display Commands, Controls, and Features. These tests do not require the actual control of aircraft, but use what ever traffic is available simply as a display feature.

The Normal Operations Simulation Tests will determine the suitability and effectiveness of the PRM display system to be used by Monitor controllers to identify and resolve PRM alert events. These tests do not require any communication between the Monitor (PRM) controllers and any other controllers. The tests do require the control of the targets and the simulated targets can be interactively controlled to respond to controller direction.

The Normal Operations Flight Tests will determine the suitability and effectiveness of whole PRM/NAS system to be used to monitor simultaneous ILS approaches at RDU. These test do require both the control of the aircraft and full communication between the Monitor controllers and other AT controllers. These tests exercise the full NAS/PRM system.

6.2.1.1 Normal Operations Targets of Opportunity Tests.

The Normal Operations Targets of Opportunity Tests will be conducted to determine operational suitability of the Upgrade PRM display's commands, controls and features including data recording, data listing, and display quality. These Tests will also determine the operational effectiveness of the contractor provided training on these commands, controls and features provided to the Air Traffic controllers.

The individual tests that make up the Normal Operations Targets of Opportunity Tests are:

a. Controller Display Commands, Controls and Features Test.
b. Supervisor Display Commands, Controls and Features Test.

6.2.1.1.1 Controller Display Commands, Controls and Features Test Procedure.

6.2.1.1.1.1 Test Objectives.

The objectives of the Controller Display Commands, Controls and Features Test are to:

a. Determine whether the PRM's Controller Display Commands and Controls required for use by Air Traffic are available and suitable .

QVM Requirements Tested: 23, 24, 36, 39, 42, 43, 50

b. Determine whether the support documentation for the PRM's Controller Commands and Controls (i.e., Operator's Reference Card, Operator's Manual) are available and operationally effective.

QVM Requirements Tested: 55, 56

c. Determine whether the contractor provided training on the PRM's Controller Commands and Controls is operationally suitable and effective.

QVM Requirements Tested: 54

d. Determine whether the PRM display quality and features required for use by Air Traffic are available and suitable.

QVM Requirements Tested: 25, 26, 27, 28, 29, 30, 31, 32, 35

6.2.1.1.1.2 Test Description.

This test will collect opinions from Test Controllers by having them use the PRM Controller Commands and Controls while monitoring targets of opportunity on a PRM display. The Test Controllers will be given a set of Questionnaires which will lead them through the test and collect their opinions. Using the directions in Questionnaires NT1-NT6 the Test Controllers will use the PRM Controller Commands and Controls while monitoring the display and answering the associated questions. These questions investigate the suitability and effectiveness of the commands and controls used, and the contractor provided documentation and training. The Test Controllers will then fill out Questionnaire NT7. These questions investigate the suitability and effectiveness of the Display presentation.

6.2.1.1.1.3 Test Resources.

The test equipment, facilities and personnel required to execute this test are listed in the tables below. The test configuration is shown in figure 6.2.1.1.1.3-1.

Test Equipment or Facilities	Purpose	Duration
PRM Displays	Data Collection	3 hours

#	Personnel	Responsibility
1	Test Coordinator (TC)	Coordinate with AT Controllers
1	Test Engineer (TE)	Assist TC
4	Test Controllers	Use PRM displays, supply opinions

Other resources which are required to conduct this test are the following:

a. PRM Operator's Reference Cards (6)
b. PRM Operator's Manuals (6)

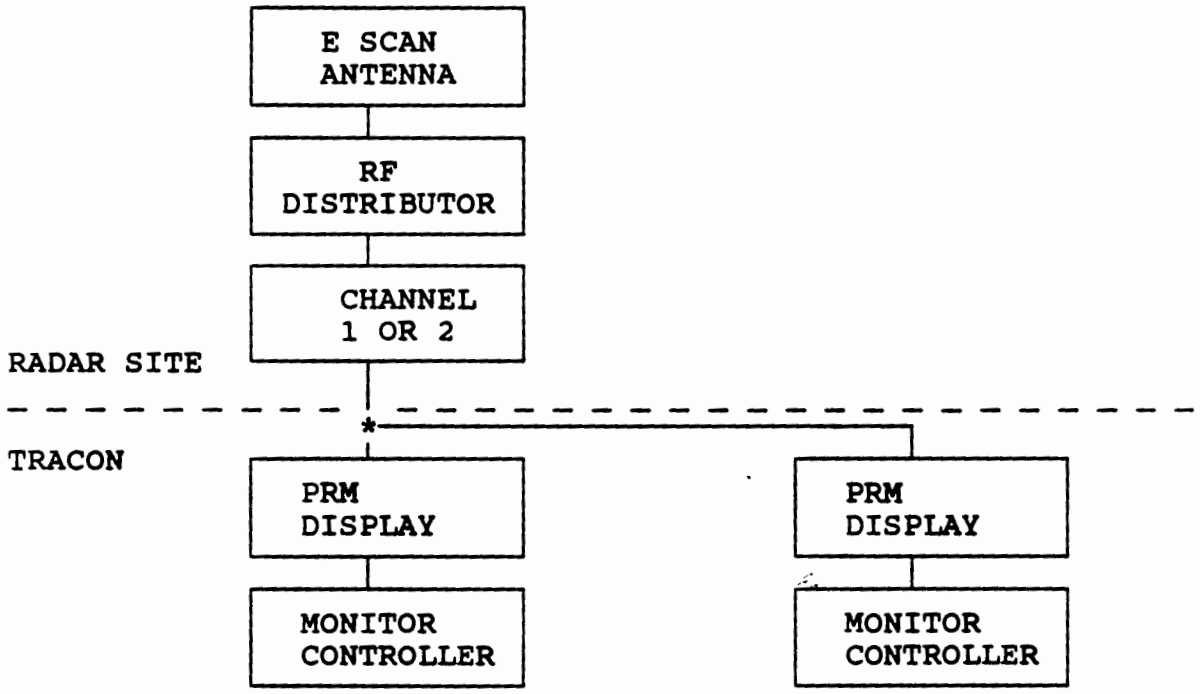


FIGURE 6.2.1.1.1.3-1 NORMAL OPERATIONS TARGETS OF OPPORTUNITY TEST CONFIGURATION

6.2.1.1.1.4 Test Setup and Safety Considerations.

The TE should start the PRM and insure it's proper operation. The TE should set the PRM Displays to the normal default configuration. The TC should distribute the PRM Operator's Reference Cards and the PRM Operator's Manuals to the Test Controllers.

6.2.1.1.1.5 Data Collection.

1. The TC should distribute Questionnaire-NT1 to the Test Controllers and instruct them to use the listed commands to **set the Intensities** of the PRM Display features to their preference and answer the associated questions. Once the Test Controllers have finished the TE should collect the Questionnaires and fill out the appropriate sections of the Test Data Log.

2. The TC should distribute Questionnaire-NT2 to the Test Controllers and instruct them to use the listed commands to **set the Character Sizes** of the PRM Display features to their preference and answer the associated questions. Once the Test Controllers have finished the TE should collect the Questionnaires and fill out the appropriate sections of the Test Data Log.

3. The TC should distribute Questionnaire-NT3 to the Test Controllers and instruct them to use the listed commands to **manipulate the Target Data Blocks** on the PRM Display to their preference and answer the associated questions. Once the Test Controllers have finished the TE should collect the Questionnaires and fill out the appropriate sections of the Test Data Log.

4. The TC should distribute Questionnaire-NT4 to the Test Controllers and instruct them to use the listed commands to **manipulate the Map and View and move the text areas** on the PRM Display to their preference and answer the associated questions. Once the Test Controllers have finished the TE should collect the Questionnaires and fill out the appropriate sections of the Test Data Log.

5. The TC should distribute Questionnaire-NT5 to the Test Controllers and instruct them to use the listed commands to **manipulate the alarms and alerts** of the PRM and set the alarm volumes to levels of their preference and answer the associated questions. Once the Test Controllers have finished the TE should collect the Questionnaires and fill out the appropriate sections of the Test Data Log.

6. The TC should distribute Questionnaire-NT6 to the Test Controllers and instruct them to use the listed commands to **save and recall the display Set Ups** to their preference and answer the associated questions. Once the Test Controllers have finished the TE should collect the Questionnaires and fill out the appropriate sections of the Test Data Log.

7. The TC should distribute Questionnaire-NT7 to the Test Controllers and instruct them to **view the PRM display** and answer the associated questions. Once the Test Controllers have finished the TE should collect the Questionnaires and fill out the appropriate sections of the Test Data Log.

6.2.1.1.1.6 Data Collection Termination/Restart.

Data collection can be terminated following the completion of a data collection step i.e., a completed Questionnaire.

6.2.1.1.1.7 Test Mission Log.

6.2.1.1.1.7.1 Pretest Section.

1. Date: ___/___/___ Scheduled Start Time: ___:___.

2. Note any open items or test procedure discrepancies.

3. Enter the names of the assigned test conduct personnel:

Test Coordinator	Test Engineer
Test Controller	Test Controller
Test Controller	Test Controller

4. Enter the PRM System Configuration Number _____.

5. Note any discrepancies from the test configurations.

6.2.1.1.1.7.2 Test Data Log.

ACTION	START TIME
Enter notes during Questionnaire-NT1 data collection.	____:____ (hh) (mm)
Enter notes during Questionnaire-NT2 data collection.	____:____ (hh) (mm)
Enter notes during Questionnaire-NT3 data collection.	____:____ (hh) (mm)
Enter notes during Questionnaire-NT4 data collection.	____:____ (hh) (mm)
Enter notes during Questionnaire-NT5 data collection.	____:____ (hh) (mm)
Enter notes during Questionnaire-NT6 data collection.	____:____ (hh) (mm)
Enter notes during Questionnaire-NT7 data collection.	____:____ (hh) (mm)
Enter the time that the data collection was finished.	____:____ (hh) (mm)

6.2.1.1.1.7.3 Post Test Section.

1. Note any test procedure discrepancies encountered during the test conduct.

2. Enter a summary of the data collection.

3. Enter a preliminary assessment of the test results.

6.2.1.1.1.8 Questionnaires.

6.2.1.1.1.8.1 Questionnaire-NT1. Name: Date / /

Intensity Commands	if0-if3	it0-it3	im0-im3	in0-in3	io0-io3	ir0-ir3
Q1-Found in Ref Card Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q2-Ref Card Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q3-Found in Ops Manual Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q4-Ops Manual Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q5-Keystrokes Are the command's keystrokes acceptable?	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable
Q6-Feedback Was the command's feedback acceptable?	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed
Q7-Training Was the training provided for the command acceptable?	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered
Q8-CMD Selection Does the command allow you to set the intensity level you require or prefer?	Yes No:Level____ required /preferred	Yes No:Level____ required /preferred	Yes No:Level____ required /preferred	Yes No:Level____ required /preferred	Yes No:Level____ required /preferred	Yes No:Level___ required /preferred
Q9-CMD needed Is this command required, nice to have or not needed at all?	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed
****** Comments ****** Place in the appropriate command column the Q# before each comment.						
Are there any items on the display that do not have an intensity adjustment command/control that you require/prefer one for?						

6.2.1.1.1.8.2 Questionnaire-NT2. Name: Date / /

Size Commands	cs1-cs3	ll1-ll8	rr	ss1-ss8	hlen	zi,zo
Q1-Found in Ref Card Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q2-Ref Card Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q3-Found in Ops Manual Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q4-Ops Manual Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q5-Keystrokes Are the command's keystrokes acceptable?	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable
Q6-Feedback Was the command's feedback acceptable?	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed
Q7-Training Was the training provided for the command acceptable?	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered
Q8-CMD Selection Does the command allow you to set the sizes you require or prefer?	Yes No:size____ required /preferred	Yes No:size____ required /preferred	Yes No:size____ required /preferred	Yes No:size____ required /preferred	Yes No:size____ required /preferred	Yes No:size____ required /preferred
Q9-CMD needed Is this command required, nice to have or not needed at all?	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed
****** Comments ****** Place in the appropriate command column the Q# before each comment.						
Are there any items on the display that do not have a size adjustment command/control that you require/prefer one for?						

6.2.1.1.1.8.3 Questionnaire-NT3. Name: Date / /

Data Block Commands	qual	tdb	tht	para	trr	l, arrow keys
Q1-Found in Ref Card Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q2-Ref Card Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q3-Found in Ops Manual Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q4-Ops Manual Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q5-Keystrokes Are the command's keystrokes acceptable?	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable
Q6-Feedback Was the command's feedback acceptable?	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed
Q7-Training Was the training provided for the command acceptable?	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered
Q8-CMD Selection Does the command work as you require/prefer	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments
Q9-CMD needed Is this command required, nice to have or not needed at all?	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed
****** Comments ****** Place in the appropriate command column the Q# before each comment.						
Are there any additional commands or controls that you require/prefer to manipulate the data blocks with?						

6.2.1.1.1.8.4 Questionnaire-NT4. Name: Date / /

Move/View Commands	oa,oc	mstat	multi func, tc	multi func, p	multi func, da
Q1-Found in Ref Card Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q2-Ref Card Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q3-Found in Ops Manual Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q4-Ops Manual Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q5-Keystrokes Are the command's keystrokes acceptable?	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable
Q6-Feedback Was the command's feedback acceptable?	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed
Q7-Training Was the training provided for the command acceptable	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered
Q8-CMD Selection Does the command work as you require/prefer	Yes No see comments	Yes No see comments	Yes No see comments	Yes No see comments	Yes No see comments
Q9-CMD needed Is this command required, nice to have or not needed at all	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed
****** Comments ****** Place in the appropriate command column the Q# before each comment.					
Are there any additional commands or controls that you require/prefer to set the move/view you need?					

6.2.1.1.1.8.5 Questionnaire-NT5. Name: Date / /

Alarm Commands/Controls Other Commands	sat	AlarmControl	AlertControl	multi func, s	talk
Q1-Found in Ref Card Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q2-Ref Card Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q3-Found in Ops Man Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q4-Ops Manual Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q5-Keystrokes Are the command's keystrokes acceptable?	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable
Q6-Feedback Was the command's feedback acceptable?	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed
Q7-Training Was the training provided for the command acceptable	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered
Q8-CMD Selection Does the command/control work as you require/prefer	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments
Q9-CMD needed Is this command or control required, nice to have or not needed at all	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed
****** Comments ****** Place in the appropriate command column the Q# before each comment.					
Are there any additional alarm commands or controls that you require/prefer					

6.2.1.1.1.8.6 Questionnaire-NT6. Name: Date / /

Setup Commands	cdef	csav	lcs	cres	dcs
Q1-Found in Ref Card Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q2-Ref Card Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q3-Found in Ops Manual Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q4-Ops Manual Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q5-Keystrokes Are the command's keystrokes acceptable?	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable
Q6-Feedback Was the command's feedback acceptable?	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed
Q7-Training Was the training provided for the command acceptable	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered
Q8-CMD Selection Does the command work as you require/prefer	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments
Q9-CMD needed Is this command required, nice to have or not needed at all	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed
****** Comments ****** Place in the appropriate command column the Q# before each comment.					
Are there additional items that you require/ prefer to have saved in a setup? Are these setups useful enough?					

6.2.1.1.1.8.7 Questionnaire-NT7. Name: Date / /

Display Presentation Quality	YES	NO	The problem is....
Is the display presentation suitably free of reflections and glare?			
Is the display presentation suitably consistent?			
Is the display presentation suitably clear of clutter?			
Is the display presentation suitably flicker free?			
Does the display presentation provide sufficient contrast and brightness?			
Is the display presentation of uniform brightness?			
Is the display presentation suitably well defined with no blooming?			
Does the display presentation quality suitably recover after a view command (with 1 sec)?			
Are the display map lines and alphanumerics small enough but not too small?			
Is the presentation of the Map complete and suitable?			

6.2.1.1.1.9 Test Data Reduction and Analysis.

The TC will first analyze each test's Test Mission Log to determine whether the data collection was conducted acceptably. The data from data collection phases which were not concluded acceptably will not be included in any further analysis. The Questionnaires will then be analyzed. This analysis will attempt to determine a consensus of controller opinions for each question. In cases where the answers point to a difference of controller opinions the TC may review the questions with the controllers to determine the consensus opinion.

6.2.1.1.1.10 Success Criteria.

This test will be successful if the analysis of the Questionnaires collected lead to a consensus of controller opinions that verifies that:

Req #	Success Criteria	Pass	Fail
23	Each monitor position has the required operator controls and keypack units and that they are immediately accessible to the user.		
24	The display has full variable range and offset capability. I.e., that the controllers can adjust the display to view the required areas.		
36	Commands or controls are available to modify the intensity of the display map to controller required levels.		
39	Commands and controls are available to modify target data block's; character size, intensity, offset, leader line length, and field inhibits as controllers require.		
42	Commands and controls are available to enable/disable the display of the track history.		
43	Commands and controls are available to modify the track history length (from 0-16 hits) and its intensity to controller required levels.		
45	Commands and controls are available to modify the target's projected track vector length.		
50	Controls are available to the adjust the volume of the NTZ penetration voice alert voice alert (and the system alarms) as controllers require.		
55	The Operator's Reference Cards list the display commands and keystrokes in a clear and concise manner.		
56	The Operations Manuals provide full detail on the operation of the display commands, controls, and features in a clear and comprehensive manner.		
54	The contractor provided training is suitable so that the controllers fully understands the PRM display features and controls.		
25	The display presentation recovers within 1 second after changing display area.		
26	The display presentation provides sufficient contrast and brightness under normal TRACON ambient lighting conditions.		
27	The display presentation is free of reflection and glare.		
28	The display presentation is consistent throughout the display area.		
29	The display presentation is clear of clutter.		
30	The display presentation is flicker free.		
31	The display presentation is of uniform brightness.		
32	The display presentation is well defined with no blooming.		
35	The display map line widths and alphanumerics are as small as practicable (but as large as required).		

APMT: Date:

6.2.1.1.2 Supervisor Display Commands, Controls and Features Test Procedure.

6.2.1.1.2.1 Test Objectives.

The objectives of the Supervisor Display Commands, Controls and Features Test are to:

a. Determine whether the PRM Supervisor Display Commands and Controls required for use by Air Traffic Supervisors are available and suitable.

QVM Requirements Tested: 45, 47

b. Determine whether the PRM Supervisor Display Features required for use by Air Traffic Supervisors are available and suitable.

QVM Requirements Tested: 34

c. Determine whether the support documentation (i.e., Operator's Reference Manuals, Operator's Manuals) provided to the Air Traffic Supervisors is suitable and effective.

QVM Requirements Tested: 55, 56

d. Determine whether the contractor provided training for the Air Traffic Supervisors on the PRM system's display commands, controls and features is operationally suitable and effective.

QVM Requirements Tested: 54

e. Determine whether the PRM "supervisor" data recording and listing Commands, Controls and Features are suitable for use by the Air Traffic Supervisors.

QVM Requirements Tested: 19, 51

6.2.1.1.2.2 Test Description.

This test will collect opinions from Test Supervisors by having them use the PRM Supervisor Commands and Controls while monitoring the PRM displays. The Test Supervisors will be given a set of Questionnaires which will lead them through the test and collect their opinions. Using the directions in Questionnaires-NT8-NT10 the Test Supervisors will use the PRM Supervisor Commands and Controls while monitoring the display and answering the associated questions. These questions investigate the suitability and effectiveness of the commands and controls used, and the documentation and training that was provided for those commands and controls. The Test Supervisors will then fill out Questionnaire-NT11. These questions investigate the effectiveness of the Supervisor command structure. The Test Supervisors will then use the directions in Questionnaires-NT12&NT13 to record and list PRM target data and answer the associated questions. The questions investigate the suitability and effectiveness of the commands and controls used and the training that was provided to the AT supervisor. The Test AT Supervisor will then answer the questions in Questionnaire-NT14. These questions pertain to the effectiveness of the PRM Data Recording and Listing capabilities.

6.2.1.1.2.3 Test Resources.

The test equipment, facilities and personnel required to execute this test are listed in the tables below. A diagram of the test configuration is shown in figure 6.2.1.1-1.

Test Equipment or Facilities	Purpose	Duration
PRM Displays	Data Collection	2 hours

#	Personnel	Responsibility
1	Test Coordinator (TC)	Coordinate with AT Controllers
1	Test Engineer (TE)	Assist TC
1 - 2	Test Supervisors	Use PRM displays, supply opinions

Other resources which are required to conduct this test are the following:

a. PRM Operator's Reference Cards (4)
b. PRM Operator's Manuals (4)

6.2.1.1.2.4 Test Setup and Safety Considerations.

The TE should start the PRM and insure it's proper operation. The TE should set the PRM Displays to the normal default configuration. The TC should distribute the PRM Operator's Reference Cards and the PRM Operator's Manuals to the Test Controllers.

6.2.1.1.2.5 Data Collection.

1. The TC should distribute Questionnaire-NT8 to the Test Supervisors and instruct them to use the listed commands to **control the System** to their preference and then answer the associated questions. Once the Test Supervisors have finished the TE should collect the Questionnaires and fill out the appropriate sections of the Test Data Log.

2. The TC should distribute Questionnaire-NT9 to the Test Supervisors and instruct them to use the listed commands to **save the Supervisor System Setups** to his preference and then answer the associated questions. Once the Test Supervisors have finished the TE should collect the Questionnaires and fill out the appropriate sections of the Test Data Log.

3. The TC should distribute Questionnaire-NT10 to the Test Supervisors and instruct them to use the listed commands to **toggle the Alerts and Status** of the PRM System to his preference and then answer the associated questions. Once the Test Supervisors have finished the TE should collect the Questionnaires and fill out the appropriate sections of the Test Data Log.

4. The TC should distribute Questionnaire-NT11 to the Test Supervisors and instruct them to **view the PRM display** and then answer the associated questions. Once the Test Supervisors have finished the TE should collect the Questionnaire and fill out the appropriate sections of the Test Data Log.

5. The TC should distribute Questionnaire-NT12 to the Test Supervisors and instruct them to use the listed commands to **use the tape commands** to record data and then answer the associated questions. Once the Test Supervisors have finished the TE should collect the Questionnaires and fill out the appropriate sections of the Test Data Log.

6. The TC should distribute Questionnaire-NT13 to the Test Supervisors and instruct them to use the listed commands to **list the recorded data** as they require and answer the associated questions. Once the Test Supervisors have finished the TE should collect the Questionnaires and fill out the appropriate sections of the Test Data Log.

7. The TC should distribute Questionnaire-NT14 to the Test Supervisors and instruct them to answer the questions. Once the Test Supervisors have finished the TE should collect the Questionnaires and fill out the appropriate sections of the Test Data Log.

6.2.1.1.2.6 Data Collection Termination/Restart.

Data collection can be terminated following the completion of a data collection step i.e., a completed Questionnaire.

76.2.1.1.2.7 Test Mission Log.

6.2.1.1.2.7.1 Pretest Section.

1. Date: __/__/__ Scheduled Start Time: __:__.

2. Note any open items or test procedure discrepancies.

3. Enter the names of the assigned test conduct personnel:

Test Coordinator	Test Engineer
Test AT Supervisor	Test AT Supervisor

4. Enter the PRM System Configuration Number _____.

5. Note any discrepancies from the test configurations.

6.2.1.1.2.7.2 Test Data Log.

ACTION	START TIME
Enter notes during Questionnaire-NT8 data collection.	_____ : _____ (hh) (mm)
Enter notes during Questionnaire-NT9 data collection.	_____ : _____ (hh) (mm)
Enter notes during Questionnaire-NT10 data collection.	_____ : _____ (hh) (mm)
Enter notes during Questionnaire-NT11 data collection.	_____ : _____ (hh) (mm)
Enter notes during Questionnaire-NT12 data collection.	_____ : _____ (hh) (mm)
Enter notes during Questionnaire-NT13 data collection.	_____ : _____ (hh) (mm)
Enter notes during Questionnaire-NT14 data collection.	_____ : _____ (hh) (mm)
Enter the time that the data collection was finished.	_____ : _____ (hh) (mm)

6.2.1.1.2.7.3 Post Test Section.

1. Note any test procedure discrepancies encountered during the test conduct.

2. Enter a summary of the data collection.

3. Enter a preliminary assessment of the test results.

6.2.1.1.2.8 Questionnaires.

6.2.1.1.2.8.1 Questionnaire-NT8. Name: Date / /

System Commands	ch1,ch2	gm,dm	go,stop	date,time	spass	05a, 05b, 23a, 23b
Q1-Found in Ref Card Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q2-Ref Card Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q3-Found in Ops Manual Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q4-Ops Manual Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q5-Keystrokes Are the command's keystrokes acceptable?	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable
Q6-Feedback Was the command's feedback acceptable?	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed
Q7-Training Was the training provided for the command acceptable?	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered
Q8-CMD Selection Does the command work as you require?	Yes No: See Notes	Yes No: See Notes	Yes No: See Notes	Yes No: See Notes	Yes No: See Notes	Yes No: See Notes
Q9-CMD needed Is this command required, nice to have, not needed, or should it be a controller cmd?	Required Nice Not Needed Ctrl CMD	Required Nice Not Needed Ctrl CMD	Required Nice Not Needed Ctrl CMD	Required Nice Not Needed Ctrl CMD	Required Nice Not Needed Ctrl CMD	Required Nice Not Needed Ctrl CMD
****** Comments ****** Place in the appropriate command column the Q# before each comment.						
Are there additional commands required/ preferred to set the system controls?						

6.2.1.1.2.8.2 Questionnaire-NT9. Name: Date / /

Setup Commands	sdef	ssav	lss	sres	dss	login/ logoff
Q1-Found in Ref Card Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q2-Ref Card Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q3-Found in Ops Manual Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q4-Ops Manual Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q5-Keystrokes Are the command's keystrokes acceptable?	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable
Q6-Feedback Was the command's feedback acceptable?	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed
Q7-Training Was the training provided for the command acceptable?	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered
Q8-CMD Selection Does the command allow you to enter the setups you require or prefer?	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments
Q9-CMD needed Is this command required, nice to have or not needed at all?	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed
****** Comments ****** Place in the appropriate command column the Q# before each comment.						
Are there any additional commands or controls you require or prefer to save or setup supervisory settings?						

6.2.1.1.2.8.3 Questionnaire-NT10. Name: Date / /

Toggle Alert/Status Commands	tca	tla	stat	test	ssys
Q1-Found in Ref Card Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q2-Ref Card Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q3-Found in Ops Manual Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q4-Ops Manual Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q5-Keystrokes Are the command's keystrokes acceptable?	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable
Q6-Feedback Was the command's feedback acceptable?	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed
Q7-Training Was the training provided for the command acceptable?	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered
Q8-CMD Selection Does the command work as you require/prefer?	Yes No: See Comments	Yes No: See Comments	Yes No: See Comments	Yes No: See Comments	Yes No: See Comments
Q9-CMD needed Is this command required, nice to have, not needed, or should it be a ctrl cmd?	Required Nice Not Needed Ctrl CMD	Required Nice Not Needed Ctrl CMD	Required Nice Not Needed Ctrl CMD	Required Nice Not Needed Ctrl CMD	Required Nice Not Needed Ctrl CMD
****** Comments ****** Place in the appropriate command column the Q# before each comment.					
Are there any additional alerts that you require/prefer to toggle on and off?					

6.2.1.1.2.8.4 Questionnaire-NT11. Name: Date / /

Supervisory Display Features and Commands	YES	NO	The problem is....
Is there a suitable PRM coverage configuration for each approach?			
Given the number and type of system parameters that are changeable using "Supervisor" commands is the password protection sufficient?			
Is there a command to set each system parameter that you require to modify?			
Is there a command or control to turn off any aural alarm or alert procedure to define which alarms should be enabled or disabled (tla, tca, etc...)?			
Is the changing of the PRM channels a suitable AT Supervisor feature?			
Should the granting of maintenance be a required AT function?			
Is the start/stop of the PRM interrogation control a suitable AT Supervisor feature?			
Is the Supervisor Setup function a usable feature?			
Are there any other issues about "Supervisor command and controls that need to be addressed?			

6.2.1.1.2.8.5 Questionnaire-NT12. Name: Date / /

Tape Control Commands	rec,stpt	rew,adv	tld,tun	tape	init
Q1-Found in Ref Card Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q2-Ref Card Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q3-Found in Ops Manual Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q4-Ops Manual Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q5-Keystrokes Are the command's keystrokes acceptable?	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable
Q6-Feedback Was the command's feedback acceptable?	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed
Q7-Training Was the training provided for the command acceptable?	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered
Q8-CMD Selection Does the command allow you to control the tape as you require/prefer?	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments
Q9-CMD needed Is this command required, nice to have or not needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed
Q10-Responsibility Should this be a controller command or a Maintenance command	Controller CMD Maintenance CMD	Controller CMD Maintenance CMD	Controller CMD Maintenance CMD	Controller CMD Maintenance CMD	Controller CMD Maintenance CMD
****** Comments ****** Place in the appropriate command column the Q# before each comment.					
Are there any additional commands or controls that you require/prefer to control the tape?					

6.2.1.1.2.8.6 Questionnaire-NT13. Name: Date / /

Tape Data Commands	text	print	pom	srch	pfs,nfs	bfs
Q1-Found in Ref Card Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q2-Ref Card Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q3-Found in Ops Manual Was the command found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q4-Ops Manual Entry Was the command's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q5-Keystrokes Are the command's keystrokes acceptable?	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable	Good Usable Unacceptable
Q6-Feedback Was the command's feedback acceptable?	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed	Ok Not Useful Not Needed
Q7-Training Was the training provided for the command acceptable?	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered
Q8-CMD Selection Does the command allow you to control the tape as you require or prefer?	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments
Q9-CMD needed Is this command required, nice to have, or not needed?	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed
Q10-Responsibility Should this be a controller command or a Maintenance command	Controller CMD Maintenance CMD	Controller CMD Maintenance CMD	Controller CMD Maintenance CMD	Controller CMD Maintenance CMD	Controller CMD Maintenance CMD	Controller CMD Maintenance CMD
****** Comments ****** Place in the appropriate command column the Q# before each comment.						
Are there any additional commands or controls that you require/prefer to control the tape data?						

6.2.1.1.2.8.7 Questionnaire-NT14. Name: Date / /

Data Recording and Listing Features and Commands	YES	NO	The problem is....
Q1-PRM Data Recording Suitability? Do you feel that the PRM data recording capabilities suitably and effectively supports Air Traffic's requirements?			
Q2-Data Recording Status? Is the status screen suitable for providing tape status?			
Q3-Status Screen Training? Was the training provided to you sufficient to understand the tape status screen information to the level you require? Should all monitor controllers take this training? If yes, is the training suitable to provide them with the level of information they require?			
Q3-Data Recording Training? Was the training provided to you sufficient to understand what data is being recorded to the level you require? Should all monitor controllers take this training?			
Q4-PRM Data Listing Suitability? Do you feel that the PRM data listing capabilities suitably and effectively supports Air Traffic's requirements?			
Q5-Data Listing Off-Line? Is it acceptable that one of the PRM displays must be off-line when running the PRM Listing program?			
Q6-Data Listing Training? Was the training provided to you sufficient to understand how to run the PRM data listing program? Should all monitor controllers take this training?			
Q7-Data Playback Suitability? The data playback function was removed from the Upgrade PRM is this acceptable?			
Q8-Do you have any other concerns on the data recording features of the PRM?			

6.2.1.1.2.9 Test Data Reduction and Analysis.

The TC will first analyze each test's Test Mission Log to determine whether the data collection was conducted acceptably. The data from data collection phases which were not concluded acceptably will not be included in any further analysis.

The Questionnaires will then be analyzed to determine a consensus of controller opinions for each question. In cases where the answers point to a difference of controller opinions the TC may review the questions with the controllers to determine the consensus opinion or may determine that there are multiple opinions.

6.2.1.1.2.10 Success Criteria.

This test will be successful if the analysis of the Questionnaires and Test Data Logs collected lead to a consensus of controller opinions that verifies:

Req. #	Success Criteria	Pass	Fail
34	That suitable commands and controls are available to manage the PRM's display mapping capability - (i.e., runway configuration)		
45	That suitable commands and controls are available to set the length of the displayed projected track vector.		
47	That suitable commands and controls are available to set the value of the projected track vector alarm from 0-16 seconds.		
54	That the contractor provided training is suitable so that the AT Supervisors fully understands the PRM system Controls, Commands and Features.		
55	That the Operator's Reference Cards list the "Supervisor" commands and keystrokes in a clear and concise manner.		
56	That the Operator's Manuals provides full details on the operation of the system commands, controls, and features in a clear and comprehensive manner.		
19	That the PRM has a suitable capability for recording target data and playing it back as a simulation on the PRM displays.		
51	That the PRM has a suitable capability to record and printout necessary data (track deviations, target data, system parameter changes, etc...).		

APMT: Date:

6.2.1.2 Normal Operations Simulation Tests.

The Normal Operations Simulation Tests will be conducted to determine the suitability and effectiveness of the PRM display system to be used by Monitor controllers to identify and resolve PRM alert events.

The Normal Operations Simulation Tests use the PRM Antenna and Target Traffic Simulator (PATTS) and the Desktop Simulator (DTS) to supply targets to the Upgrade PRM controller displays. The PATTS will be used to demonstrate each of the PRM Alerts to the Test Controllers. The DTS will be used to provide alert events for the Test Controllers to resolve. The DTS is an interactive simulator where the simulator operator can act as a pseudo pilot who will communicate verbally to the Test Controllers over their headsets and control the flight paths of the simulated targets. The Normal Operations Simulation Tests will present to the Test Controllers nearly all the types of alert events that the PRM system can present. The remaining types of alert events will be tested during the Normal Operations Flight Test.

6.2.1.2.1 Test Objectives.

The objectives of the Normal Operations Simulation Test are to:

a. Determine the suitability of the Upgrade PRM alert presentation.

QVM Requirements Tested: 38, 46, 48, 49

b. Determine whether the contractor provided training on the PRM's alert features.

QVM Requirements Tested: 54

c. Determine the effectiveness of the Upgrade PRM alert presentation when used to conduct simultaneous parallel approaches.

QVM Requirements Tested: 57

6.2.1.2.2 Test Description.

The Normal Operations Simulation Test will first use the PATTS to provide targets that will present to the Test Controllers the various PRM target alerts (i.e. NTZ alerts, emergency codes, transponder failure, LA, CA, etc). The Test Controllers will then fill out Questionnaires-NS1&2 on the suitability of the PRM Alert Presentation, the documentation provided with the PRM on the alert presentation and the contractor provided training they received on the PRM alerts.

The remaining tests will use the DTS to investigate the effectiveness of the PRM display system and alerts when used by the Test Controllers to monitor simultaneous parallel approaches. Following the conclusion of each DTS scenario the Test Controllers will fill out a Questionnaire which will examine, for each alert event, the effectiveness of the PRM display and PRM alerts for resolving the event.

The data analysis will consist of analyzing the Controller Questionnaires to determine the suitability of the PRM alert presentations and the effectiveness of the PRM display, alert, documentation and contractor provided training.

6.2.1.2.3 Test Resources.

The test equipment, facilities and personnel required to execute this test are listed in the tables below. The Normal Operations Simulation Test will use the scenarios shoen in figures 6.2.1.2.3-1, 6.2.1.2.3-2, & 6.2.1.2.3-3. The test configurations are shown in figures 6.2.1.2.3-4 & 6.2.1.2.3-5.

Test Equipment or Facilities	Purpose	Duration
PRM Displays	Data Collection	4 hours
PATTS		
Desk Top Simulator	Provide targets	4 hours

#	Personnel	Responsibility
1	Test Coordinator (TC)	Coordinate with AT Controllers
1	Test Engineer (TE1)	Assist TC
1	Test Engineer (TE2)	Assist DTS Operator
1	DTS Operator	Simulator Operator, Pseudo Pilot
2	Test Controllers	Use PRM displays, supply opinions

Other resources which are required to conduct this test are the following:

a. PRM Operator's Manuals (4)
b. PRM Operator's Reference Cards (4)
c. Test Scenarios

No	Scenario #1 Events
1	Emergency Alert
2	Radio Failure Alert
3	Hijack Alert
4	NTZ Projection
5	NTZ Penetration
6	NTZ Popup
7	Conflict Alert
8	Low Altitude Alert
9	Single and Multiple Coast
10	Coast Drop
11	Time Alert

FIGURE 6.2.1.2.3-1 SCENARIO #1 (PATTS)

No	Scenario #2 Events	EVENT TRACK
1	Aircraft 1 blunders 15 deg at FAF on 23L	3
2	Aircraft 1 deviates 400 ft to right on 23L	9
3	Aircraft 2 deviates 600 ft to left on 23R	14
4	Aircraft 2 blunders 30 deg at 2 MRE on 23R	22
5	Aircraft 2 blunders 15 deg at 8 MRE on 23R	26
6	Aircraft 1 blunders 30 deg at FAF on 23L	33
7	Aircraft 1 blunders 30 deg at 9 MRE on 23L	49
8	Both aircraft converge 15 deg at MA	57&58
9	Aircraft 2 makes bad turn-on 23R	68
10	Aircraft 2 overtakes aircraft 1 on 23R	74&76

FIGURE 6.2.1.2.3-2 SCENARIO #2 (DTS)

No	Scenario #3 Events	EVENT TRACK
1	AC1 overtakes preceding aircraft on 23L.	5&7
2	AC2 blunders 15 deg at FAF on 23R.	12
3	AC1 blunders 30 deg at 2 MRE on 23L. AC2 poor ILS tracking w/600ft shifts.	21&22
4	AC2 NTZ proj 30 deg at FAF on 23R.	32
5	AC1 penetrates NTZ 20 deg at FAF on 23L.	35
6	AC2 NTZ proj 30 deg at MA on 23R.	46
7	AC1 NTZ pop-up at departure end on 23L.	53
8	AC2 poor ILS tracking w/600ft shifts on 23R.	56
9	AC1 poor ILS tracking w/400ft shifts on 23L. AC2 NTZ proj 30 deg at FAF on 23R.	61&62
10	AC2 blunders 30 deg at 2 MRE on 23R.	70
11	AC1 blunders 15 deg at 8 MRE on 23L.	71
12	AC2 blunders 30 deg at 9 MRE on 23R.	76

FIGURE 6.2.1.2.3-3 SCENRAIO #3 (DTS)

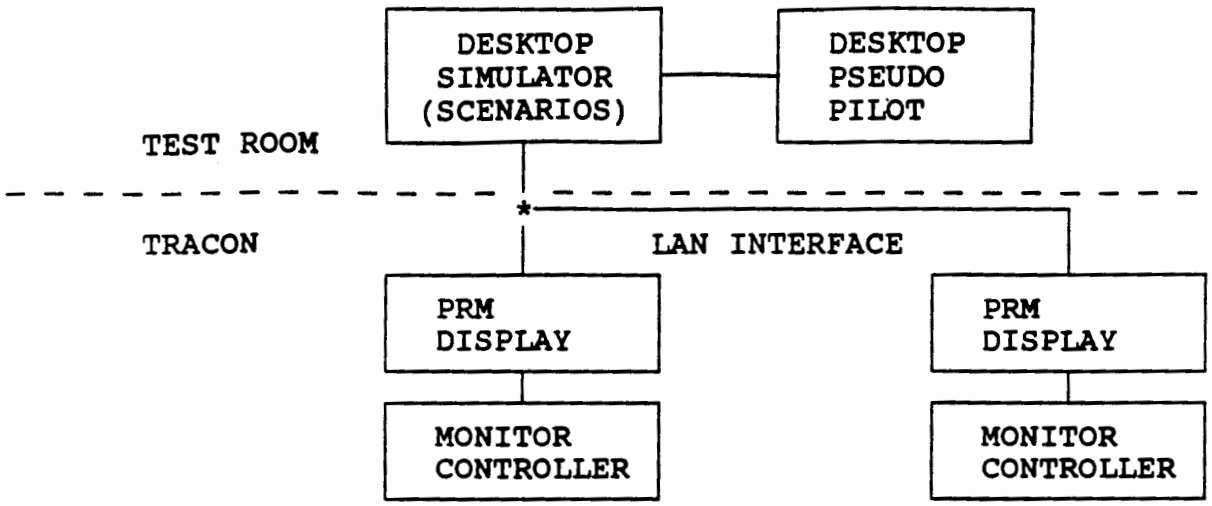


FIGURE 6.2.1.2.3-4 DTS TEST CONFIGURATION

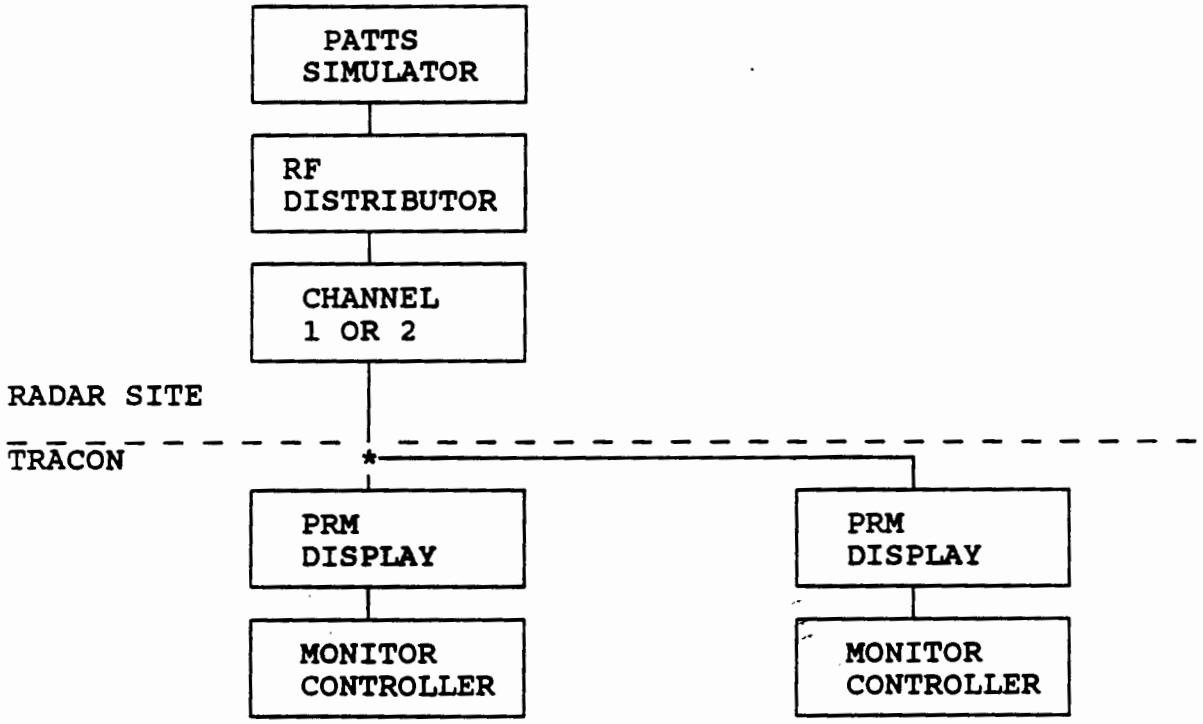


FIGURE 6.2.1.2.3-5 PATTS TEST CONFIGURATION

6.2.1.2.4 Test Setup and Safety Considerations.

There are no safety considerations for this test.

1. TE1 should connect the PATTS to the PRM, boot the PATTS and insure it's proper operation. TE1 should start the PRM, insure it's proper operation and set PRM Displays 1 and 2 to the normal default configuration, with the PRM status screen on the displays.

2. The TC should distribute the PRM Operators Manuals to the Test Controllers and have the Test Controllers set the PRM display features (i.e., intensity, view, etc) to their preferences.

6.2.1.2.5 Data Collection.

1. For Scenario 1:

a. TC- distribute Questionnaires-NS1&2 to the Test Controllers and instruct them to: monitor the PRM displays for the presentation of each PRM alert and fill out the Questionnaires.

b. TE1- begin PATTS scenario 1.

c. TC- fill out the appropriate sections of the Test Data Log.

d. TC- collect the Questionnaires.

E. TE1- stop the PATTS scenario.

2. For scenarios 2 & 3.

a. The DTS operator should start the DTS and insure it's proper operation.

b. TE2 should check the operator headsets and give them to the monitor controllers and the DTS operator.

c. TC-instruct the Test Controllers to monitor the displays as they would for normal PRM monitored simultaneous approaches and to respond to the simulated events as they would to a real world event.

d. DTS Operator- begin the scenario and act as a pseudo pilot to control the simulated targets to respond to the Test Controllers instructions.

e. TC- at the conclusion of the scenario the distribute the associated Questionnaire and instruct the Test Controllers to fill them out.

f. TC- collect the Questionnaires, repeat step a - f for scenario 3.

6.2.1.2.6 Data Collection Termination/Restart.

Data collection can be terminated following the completion of a data collection step i.e., a completed scenario and Controller Questionnaire.

6.2.1.2.7 Test Mission Log.
6.2.1.2.7.1 Pretest Section.

1. Date:___/___/___ Scheduled Start Time: ___:___.

2. Note any open items or test procedure discrepancies.

3. Enter the names of the assigned test conduct personnel:

Test Coordinator	Test Engineer - 1
DTS Operator	Test Engineer - 2
Test Controller	Test Controller

4. Enter the PRM System Configuration Number _____.

5. Note any discrepancies from the test configurations.

6.2.1.2.7.2 Test Data Logs.

6.2.1.2.7.2.1 (TC) Test Data Log

ACTION	START TIME
Enter notes during Scenario 1 data collection.	: (hh) (mm)
Enter notes during Scenario 2 data collection.	: (hh) (mm)
Enter notes during Scenario 3 data collection.	: (hh) (mm)
Enter the time that the data collection was finished.	: (hh) (mm)

6.2.1.2.7.3 Post Test Section.

1. Note any test procedure discrepancies encountered during the test conduct.

2. Enter a summary of the data collection.

3. Enter a preliminary assessment of the test results.

6.2.1.2.8 Questionnaires.
6.2.1.2.8.1 Questionnaire-NS1a. Name: Date / /

Scenario 1 PRM Alert Presentation (a) NTZ, ARTS Alerts	NTZ Projection	Projection Voice Alert	NTZ Penetration	NTZ Voice Alert	ARTS CA Alert	ARTS LA Alert
Q1-Ops Manual Entry. Was the Alert found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q2-Ops Manual Entry Suitability. Was the Alert's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q3-Training. Was the training provided for the alert presentation acceptable? i.e., did it cover what the Alert means?	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered
Q4-Alert Presentation. Was the visual/aural presentation of the Alert acceptable? (color, data tag swap, voice msg, etc)	Ok Distracting Not Unique	Ok Distracting Not Unique	Ok Distracting Not Unique	Ok Distracting Not Unique	Ok Distracting Not Unique	Ok Distracting Not Unique
Q5-Alert Suitability. Does the Alert work as you require/prefer?	Yes No: See Comments	Yes No: See Comments	Yes No: See Comments	Yes No: See Comments	Yes No: See Comments	Yes No: See Comments
Q6-Alert Requirement. Is this Alert required, nice to have or not needed at all?	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed
****** Comments ****** Place in the appropriate command column the Q# before each comment.						
Are there additional alerts that you require/prefer?						

6.2.1.2.8.1.1 Questionnaire-NS1b. Name: Date / /

Scenario 1 PRM Alert Presentation (b) Transponder Alerts	Emergency Code	Radio Failure	Hijack	Transponder Coast	Transponder Failure	Time Alert
Q1-Ops Manual Entry. Was the Alert found easily enough?	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found	OK Too Hard Not Found
Q2-Ops Manual Entry Suitability. Was the Alert's entry useful/complete enough?	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete	OK Too Cryptic Incomplete
Q3-Training. Was the training provided for the alert presentation acceptable? i.e., did it cover what the Alert means?	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered	OK Too Little Too Cryptic Not Covered
Q4-Alert Presentation. Was the visual/aural presentation of the Alert acceptable? (color, data tag swap, voice msg, etc)	Ok Distracting Not Unique	Ok Distracting Not Unique	Ok Distracting Not Unique	Ok Distracting Not Unique	Ok Distracting Not Unique	Ok Distracting Not Unique
Q5-Alert Suitability. Does the Alert work as you require/prefer?	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments	Yes No See Comments
Q6-Alert Requirement. Is this Alert required, nice to have or not needed at all?	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed	Required Nice Not Needed
****** Comments ****** Place in the appropriate command column the Q# before each comment.						
Are there additional alerts that you require/prefer?						

6.2.1.2.8.2 Questionnaire-NS2. Name: Date / /

Scenario 2 & 3: NTZ Projection/Penetration Alerts	YES	NO	The Problem is...
Q1-PRM/NAS System Suitability? Do you feel that the PRM/NAS system suitably and effectively supports your monitor responsibilities for resolving each of the alert events tested?			
Q2-Voice Alert? Do you feel that the PRM voice alert suitably and effectively supports your monitor responsibilities for resolving each of the alert events tested?			
Q3-Data Block Locations? Do you feel that the default Data Block Locations assigned by the PRM are suitable and effective?			
Q4-Map Features? Do you feel that the Map features displayed by the PRM are suitable and effective?			
Q5-Map Features Training? Was the training provided to you on the map features suitable and comprehensive?			
Q6-LA/CA Alert Training? Was the training provided to you on LA and CA alerts (what, from where, why) suitable and comprehensive?			
Q7-Aspect Ratio Training? Was the training provided to you on the effects that the 4:1 aspect ratio have on the displayed targets suitable and comprehensive?			
Q8-Other Training Concerns? Was the training provided to you suitable and comprehensive so that you can use the PRM/NAS system to effectively support your monitoring responsibilities?			

6.2.1.2.9 Data Reduction and Analysis.

The TC will first analyze each test's Test Mission Log to determine whether the data collection was conducted acceptably. The data from data collection phases which were not concluded acceptably will not be included in any further analysis.

The Questionnaires will then be analyzed to determine a consensus of controller opinions for each question. In cases where the answers point to a difference of controller opinions the TC may review the questions with the controllers to determine the consensus opinion or may determine that there are multiple opinions.

6.2.1.2.10 Success Criteria.

This test will be successful if the analysis of the Questionnaires Controller Response Times and Data Logs collected lead to a consensus of controller opinions that verifies:

Req. #	Success Criteria	Pass	Fail
38	ARTS low altitude and conflict alerts are suitably presented to the controller.		
46	That a track projected to enter the NTZ in 10 seconds suitably changes to alert the controller.		
48	Transponder emergency codes, transponder failures, and transponder non-returns are suitably displayed to alert the controller.		
49	That a suitably distinctive voice alert sounds at the monitor position when a track is projected to enter the NTZ.		
54	That the contractor provided training for the PRM's alert features is suitable.		
57	That the PRM display and alerts are suitable and effective when used to conduct simultaneous parallel approaches.		
APMT:		Date:	

6.2.1.3 Normal Operations Flight Tests.

The Normal Operations Flight Tests will use FAA test aircraft to supply targets for Test Controllers to monitor and control. The test aircraft will fly side by side simultaneous ILS approaches that will include: NTZ blunders, transponder alerts, and missed approaches. Questionnaires will be collected from the Test Controllers to determine the suitability and effectiveness of the PRM/NAS system to support simultaneous approaches st RDU. All flights will be conducted under visual flight rules (VFR).

6.2.1.3.1 Test Objectives.

The objectives of the Normal Operations Flight Tests are to determine the following:

a. Whether the PRM coverage area is suitable for monitoring simultaneous approaches and missed approaches.

QVM Requirements Tested: 1, 5

b. Whether the PRM surveillance presentation is suitably free of false targets for monitoring simultaneous approaches.

QVM Requirements Tested: 33

c. Whether the PRM/NAS system is suitable and effective to support simultaneous ILS approaches at RDU..

QVM Requirements Tested: 57

6.2.1.3.2 Test Description.

The Normal Operations Flight test will use two FAA test aircraft while the Test Controllers monitor the PRM displays. The FAA test aircraft will be flown by FAA test pilots. The flight profiles will include: NTZ blunders along the approach path (including a missed approach), transponder failures, intermittent transponders, wrong runway choice, lack of frequency changes, and pilot request for staggered approach. A full list of flight profiles is given in table 6.2.1.3.3-1.

The main objective of the Normal Operations Flight Test is to determine whether the PRM system operating in conjunction with the RDU NAS system is suitable and effective for monitoring simultaneous ILS approaches. All flights tests will be conducted under visual flight rules (VFR).

6.2.1.3.3 Test Resources.

The test equipment, facilities and personnel required to execute this test are listed in the tables below. The Normal Operations Flight Test will use the configuration as shown in figure 6.2.1.3.3-1. and the flight profiles in figure 6.2.1.3.3-2.

Test Equipment or Facilities	Purpose	Duration
PRM Displays	Data Collection	4 hours
2 Test Aircraft (with pilots)	Provide targets	4 hours

#	Personnel	Responsibility
1	Test Coordinator (TC)	Coordinate with AT and Pilots
1	Test Engineer (TE1)	Assist TC
1	Test Engineer (TE2)	Assist Pilots
1	Test Engineer (TE3)	Assist Pilots
1	Test AT Supervisor	supply opinions
2	Test Controllers	Use PRM displays, supply opnions

Other resources which are required to conduct this test are the following:

a. PRM Operator's Reference Cards (4)

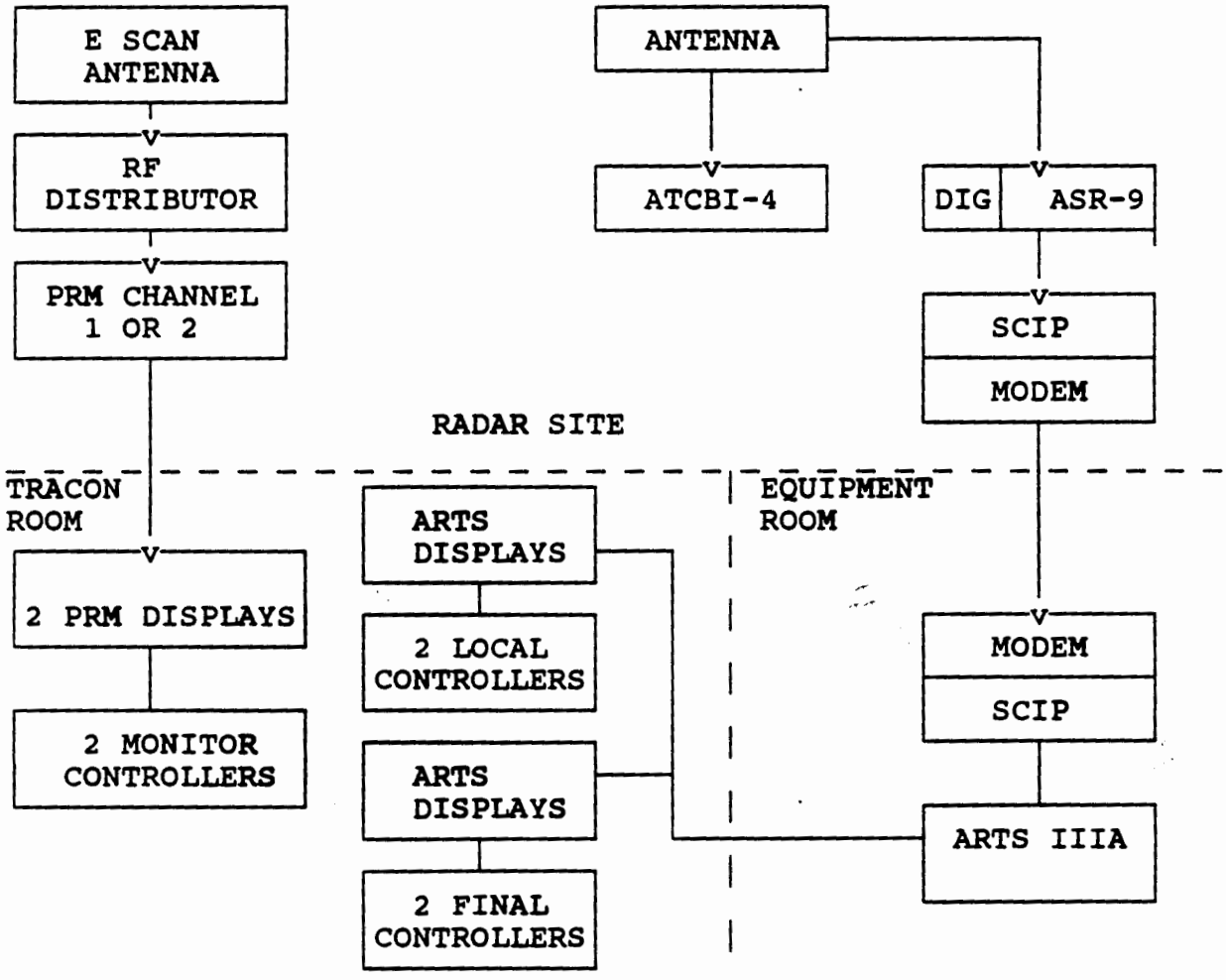


FIGURE 6.2.1.3.3-1 NORMAL OPERATIONS FLIGHT TEST CONFIGURATION

APP #	23L	23R
	Aircraft Action	Aircraft Action
1	Arrive at RDU Approach Control	Arrive at RDU Approach Control
2	30 NTZ Blunder @ 12MRE	Simultaneous Approach
3	Simultaneous Approach	15 NTZ Blunder at Turn on
4	Wrong Turn After Missed Approach	Missed Approach
5	Simultaneous Approach	30 NTZ Blunder @ 1MRE
6	Simultaneous Approach	Transponder Failure @ 5 MRE
7	No Initial Frequency Changeover	Simultaneous Approach
8	30 NTZ Blunder @ 2MRE	Simultaneous Approach
9	Simultaneous Approach	30 NTZ Blunder @ 5MRE
10	Radio Failure @ 10MRE	Simultaneous Approach
11	Simultaneous Approach	Simulate Poor Transponder Beginning on Downleg
12	30 NTZ Blunder @ 5MRE	Simultaneous Approach
13	Simultaneous Approach, 250' Inside Center Line, Then Missed Approach	Missed Approach
14	Simultaneous Approach	Transponder Emergency @ 12MRE
15	Overshoot Turn On, Then Simultaneous Approach	30 NTZ Blunder @ 2MRE
16	30 NTZ Blunder @ 5MRE	Simultaneous Approach
17	Simultaneous Approach	30 NTZ Blunder @ 5MRE
18	Poor (Weaving) Simultaneous Approach	Simultaneous Approach, 250' Inside Runway Center Line

TABLE 6.2.1.3.3-1 FLIGHT PROFILES

6.2.1.3.4 Test Setup and Safety Considerations.

The following are the steps to be completed before beginning the data collection:

1. The TC should coordinate with the AT Supervisor for the appropriate time of the day to conduct the live test flights as a safety consideration. The AT Supervisor should be informed that the flight test requires simultaneous ILS approaches. All flights must be conducted in VFR conditions. These tests will affect other controllers than the monitor "Test" controllers. The TC should coordinate with the AT Supervisor so that all affected controllers are aware of the test. The TC should ensure that the test pilots have been fully briefed on the flight profiles and the objectives of the test.

2. TE1 should start the PRM, insure it's proper operation and set PRM Displays 1 and 2 to the normal default configuration.

3. The TC should distribute the PRM Operators Reference Cards to the Test Controllers.

4. The Test Controllers should set the PRM display to their preferences and perform any RDU procedural required set ups, i.e. a communications test.

5. The TC should give the appropriate Test Data Log to TE1, TE2, and TE3.

6.2.1.3.5 Data Collection.

1. The TC should inform the test pilots, TE2, and TE3 to follow procedures with the AT Supervisor and Airport Planning and Management for readiness of actual flight test.

2. The TC should instruct the Test Controllers to monitor the displays as they would for normal PRM monitored simultaneous ILS approaches and to respond to the tests as they would to a real world event.

3. TE1 should observe and note on the Test Data Log any abnormal events.

4. At the conclusion of the flight test the TC should distribute the associated Questionnaire and instruct the Test Controllers to fill them out.

5. The TC should then collect all of the Questionnaires.

6.2.1.3.6 Data Collection Termination/Restart.

Data collection can be terminated following the completion of a flight test scenario.

6.2.1.3.7 Test Mission Log.

6.2.1.3.7.1 Pretest Section.

1. Date: __/__/__ Scheduled Start Time: __:__.

2. Note any open items or test procedure discrepancies.

3. Enter the names of the assigned test conduct personnel:

Test Coordinator	Test Engineer - 1
Test Engineer - 2	Test Engineer - 3
	Test AT Supervisor
Test Controller	Test Controller

4. Enter the PRM System Configuration Number _____.

5. Note any discrepancies from the test configurations.

6.2.1.3.7.2.1 Test Data Log page 1.

ACTION	START TIME
Enter notes during Flight Profile 1 data collection.	: (hh) (mm)
Enter notes during Flight Profile 2 data collection.	: (hh) (mm)
Enter notes during Flight Profile 3 data collection.	: (hh) (mm)
Enter notes during Flight Profile 4 data collection.	: (hh) (mm)
Enter notes during Flight Profile 5 data collection.	: (hh) (mm)
Enter notes during Flight Profile 6 data collection.	: (hh) (mm)
Enter notes during Flight Profile 7 data collection.	: (hh) (mm)
Enter notes during Flight Profile 8 data collection.	: (hh) (mm)
Enter notes during Flight Profile 9 data collection.	: (hh) (mm)

6.2.1.3.7.2.1 Test Data Log page 2.

ACTION	START TIME
Enter notes during Flight Profile 10 data collection.	: (hh) (mm)
Enter notes during Flight Profile 11 data collection.	: (hh) (mm)
Enter notes during Flight Profile 12 data collection.	: (hh) (mm)
Enter notes during Flight Profile 13 data collection.	: (hh) (mm)
Enter notes during Flight Profile 14 data collection.	: (hh) (mm)
Enter notes during Flight Profile 15 data collection.	: (hh) (mm)
Enter notes during Flight Profile 16 data collection.	: (hh) (mm)
Enter notes during Flight Profile 17 data collection.	: (hh) (mm)
Enter notes during Flight Profile 18 data collection.	: (hh) (mm)
Enter the time that the test concluded	: (hh) (mm)

6.2.1.3.7.3 Post Test Section.

1. Note any test procedure discrepancies encountered during the test conduct.

2. Enter a summary of the data collection.

3. Enter a preliminary assessment of the test results.

6.2.1.3.8 Controller Questionnaires.

6.2.1.3.8.1 Questionnaire-NF1

Monitor Controller Questionnaire	YES	NO	The Problem is...
Q1-Monitor Coverage Area Does the PRM effectively display the areas that you are responsible for (including altitude)?			
Q2-Missed Approach Coverage Does the PRM effectively display the missed approach region to support your monitor responsibilities?			
Q3-No-Coverage Areas Do the no-coverage areas (i.e. tower wedge) not effect your capability to perform your monitor responsibilities?			
Q4-False Targets Is the display presentation suitably free of false targets or spurious returns?			
Q5-Ground Speed Is the ground speed of the aircraft displayed by the PRM suitable for your monitor responsibilities?			
Q6-Coasts Presentation Is the presentation of track coasts and track drops suitable for your monitor responsibilities?			
Q7-Coast Frequency Is the frequency of track coasts suitable?			
Q8-PRM/NAS System Suitability? Do you feel that the PRM/NAS system suitably and effectively supports your monitor responsibilities for resolving each of the alert events tested?			
Q9-PRM/NAS System Suitability? Do you feel that the PRM/NAS system suitably and effectively supports the monitoring of simultaneous ILS approaches?			

6.2.1.3.9 Data Reduction and Analysis.

The TC will first analyze each test's Test Mission Log to determine whether the data collection was conducted acceptably. The data from data collection phases which were not concluded acceptably will not be included in any further analysis.

The Questionnaires will then be analyzed. This analysis will attempt to determine a consensus of controller opinions for each question. In cases where the answers point to a difference of controller opinions the TC may review the questions with the controllers to determine the consensus opinion.

6.2.1.3.10 Success Criteria.

This test will be successful if the analysis of the Questionnaires Flight Test Results and Data Logs collected lead to a consensus of controller opinions that verifies:

Req. #	Success Criteria	Pass	Fail
1	That the PRM coverage area is suitable for monitoring simultaneous approaches and missed approaches at RDU.		
5	That the areas of non-return does not adversely affect the controller's capability to monitor simultaneous approaches and missed approaches at RDU.		
33	That the display presentation is relatively free of false targets or other spurious returns.		
57	That the PRM/NAS system is suitable and effective when used to conduct simultaneous parallel approaches.		
APMT:	Date:		

6.2.2 Degraded Operations Tests.

The Degraded Operations tests will be conducted to determine the suitability and effectiveness of the Upgrade PRM/NAS system to support either the continuation of simultaneous ILS approaches or to reversion to staggered ILS approaches when physical failures of the PRM/NAS system occur. The Degraded Operations tests have been subdivided into two sections; Non-Critical Degraded Operations and Critical Degraded Operations. A Non-Critical Degraded State is one in which PRM monitored simultaneous ILS approaches can be continued. A Critical Degraded State is one in which simultaneous ILS approaches can not be conducted and thus a reversion to staggered approaches would be required.

The degraded operations tests will cover the following degraded states:

a. Non-Critical Degraded Operations Tests (6.2.2.1).

   Planned PRM Channel Changes.

   Automatic PRM Channel Changes: due to subsystem failures.

   Standby Channel Failures.

   Automatic Local Area Network (LAN) Switch.

   Tape Failures (single and double).

   Keyboard Failures.

   Dectalk Failures.

   PRM/ARTSIIIA Interface failures (single and double).

   Single Display Failures.

b. Critical Degraded Operations Tests (6.2.2.2).

   PRM System Failures.

   Overflow/Overload Conditions.

6.2.2.1 Non-Critical Degraded Operations Tests.

A Non-Critical Degraded State is one where the PRM/NAS system is in a degraded state it can still be used effectively to support simultaneous ILS approaches. The Non-Critical Degraded Operations Tests have been subdivided into two sections as follows:

1. Non-Critical States Targets of Opportunity Tests (6.2.2.1.1).
2. Non-Critical States Flight Tests (6.2.2.1.2).

This division was done to minimize the amount of test time that would require test aircraft without compromising the quality of the tests. The Non-Critical States Targets of Opportunity Tests do not require that actual control of aircraft. The Non-Critical States Flight Tests do require both the control of the aircraft and full communications between the Monitor controllers and other AT controllers.

6.2.2.1.1 Non-Critical States Targets of Opportunity Tests.

The Non-Critical States Targets of Opportunity Tests will use the configuration as shown in figure 6.2.2.1.1-1. The Non-Critical States Targets of Opportunity Tests will be conducted to determine operational suitability of using the PRM to monitor simultaneous ILS approaches during the following PRM failures:

a. Planned PRM Channel Changes.
b. Automatic PRM Channel Changes: resulting from subsystem failures.
c. Standby channel failures.
d. Automatic PRM LAN changes: resulting from a single LAN failure.
e. Tape Failures.
f. Keyboard Failure.
g. Dectalk Failure.
h. PRM/ARTSIIIA Interface failures (single and double).

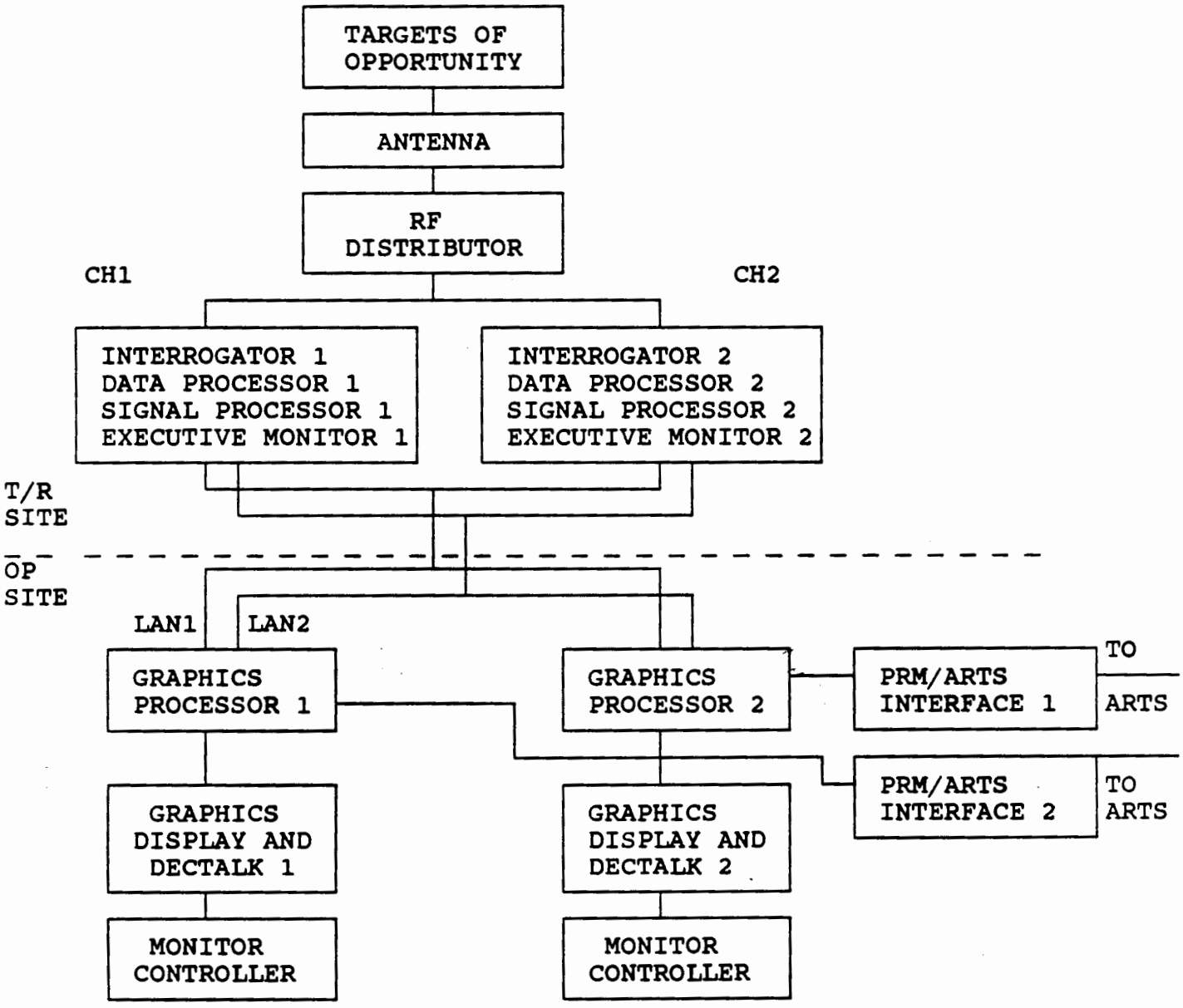


FIGURE 6.2.2.1.1-1 NON-CRITICAL DEGRADED TARGETS OF OPPORTUNITY TEST CONFIGURATION

6.2.2.1.1.1 Test Objectives.

The objectives of the Non-Critical States Targets of Opportunity Test are to determine (for each of the tested PRM failures and the resultant Degraded State) the following:

a. Whether the PRM/NAS system is suitable and effective to monitor simultaneous ILS approaches when in a Non-Critical degradation state.

QVM Requirements Tested: 18, 58

b. The suitability of the Upgrade PRM/NAS system status reporting.

QVM Requirements Tested: 15, 16, 17

6.2.2.1.1.2 Test Description.

This test will collect opinions from Test Controllers by having them monitor targets of opportunity on the PRM displays as each PRM failure and it's resultant Non-Critical Degraded State is demonstrated. The Test Controllers will then fill out a Questionnaire for each degraded state. These questions investigate the suitability and effectiveness of the PRM status reporting, the contractor provided training, and the suitability and effectiveness of the PRM system while in the degraded state.

6.2.2.1.1.3 Test Resources.

The test equipment, facilities and personnel required to execute this test are listed in the tables below.

Test Equipment or Facilities	Purpose	Duration
PRM Displays	Data Collection	2 hours

#	Type	Responsibility
1	Test Coordinator (TC)	Coordinate with AT Controllers
1	Test Engineer (TE)	Assist TC
1	Test ATC Supervisor	Use PRM displays, supply opinions
4	Test Controllers	Use PRM displays, supply opinions

Other resources which are required to conduct this test are the following:

a. PRM Operator's Reference Cards (6)
b. PRM Operator's Manuals (6)

6.2.2.1.1.4 Test Setup and Safety Considerations.

The AT Supervisor should be informed that the test requires aircraft to be conducting simultaneous ILS approaches. The TE should start the PRM and insure it's proper operation. The TE should set the PRM Displays to the normal default configuration, with the PRM status screen on the displays, the tape recording and the system using channel 1. The TC should distribute the PRM Reference Cards and the PRM Operator's Manuals to the Test Controllers and have them setup their display to their preference.

6.2.2.1.1.5 Data Collection

1. **Controlled Channel Change.**

a. TC- instruct the Test Controllers/Supervisor to change the system to Channel 2, to notice the status changes/alarms, continue to monitor the targets of opportunity. Have them change channels as many times as they want to, so that they get a good feeling for the channel change effects. Enter notes in the test data log as appropriate.

b. TC- distribute Questionnaire-NCT1 to the Test Controllers/Supervisor and have them fill it out. If the Test Controllers/Supervisor wants to let them change the channels again. Collect the Questionnaires when the Test Controllers/Supervisor have filled them out.

2. **Automatic Channel Change.**

a. TE- insure that the complete PRM is operating correctly and that Channel 1 is in use.

b. TC- have the Test Controllers/Supervisors monitor the PRM displays.

c. TE- 1st fault Channel 1 by turning the IPA to "off".
2nd fault Channel 2 by depressing the data processor reset.
3rd fault Channel 1 by depressing the signal processor reset.

d. TC- enter notes in the test data log as appropriate.

e. Repeat steps a-c, for the 2nd and 3rd listed failures.

f. TC- distribute Questionnaire-NCT2 to the Test Controllers/Supervisor and have them fill it out. Collect the Questionnaires when the Test Controllers/Supervisor have filled them out.

3. **Standby Channel Failure.**

a. TE- insure that the complete PRM is operating correctly and that Channel 1 is in use.

b. TC- have the Test Controllers/Supervisors monitor the PRM displays.

c. TE- 1st fault Channel 2 by depressing the signal processor reset.
2nd fault Channel 2 by placing it in Maintenance State.
3rd fault Channel 2 by depressing the data processor reset.

d. TC- enter notes in the test data log as appropriate.

e. Repeat steps a-c, for the 2nd and 3rd listed events.

f. TC- distribute Questionnaire-NCT3 to the Test Controllers/Supervisor and have them fill it out. Collect the Questionnaires when the Test Controllers/Supervisor have filled them out.

4. **Single Lan Failure.**

a. TE- insure that the complete PRM is operating correctly and that LAN 1 is in use.

b. TC- have the Test Controllers/Supervisors monitor the PRM displays.

c. TE- insert fault into LAN 1 by turning the power off at the LAN1 driver unit located in the auxiliary equipment cabinet.

d. TE- turn power back on at the LAN 1 driver.

e. TE- insert fault into LAN 1 by turning the power off at the LAN1 driver unit located in the auxiliary equipment cabinet.

f. TE- turn power back on at the LAN 1 driver.

g. TC- enter notes in the test data log as appropriate.

h. TC- distribute Questionnaire-NCT4 to the Test Controllers/Supervisor and have them fill it out. Collect the Questionnaires when the Test Controllers/Supervisor have filled them out.

5. **Tape Failures.**

a. TE- insure that the complete PRM is operating correctly using tape drive 1.

b. TC- have the Test Controllers/Supervisors monitor the PRM displays.

c. TE- place tape drive 1 off-line.

d. TE- wait 5 minutes and put tape drive 2 off-line.

e. TC- enter notes in the test data log as appropriate.

f. TC- distribute Questionnaire-NCT5 to the Test Controllers/Supervisor and have them fill it out. Collect the Questionnaires when the Test Controllers/Supervisor have filled them out.

6. **Keyboard Failure.**

a. TE- insure that the complete PRM is operating correctly.

b. TC- have the Test Controllers/Supervisors monitor the PRM displays.

c. TC- unplug the keyboard on display 1.

d. TC- unplug the keyboard on display 2.

e. TC- enter notes in the test data log as appropriate.

f. TC- distribute Questionnaire-NCT6 to the Test Controllers/Supervisor and have them fill it out. Collect the Questionnaires when the Test Controllers/Supervisor have filled them out.

6. **Dectalk Failure.**

a. TE- insure that the complete PRM is operating correctly.

b. TC- have the Test Controllers/Supervisors monitor the PRM displays.

c. TC- unplug the dectalk unit on display 1.

d. TC- unplug the dectalk unit on display 2.

e. TC- enter notes in the test data log as appropriate.

f. TC- distribute Questionnaire-NCT7 to the Test Controllers/Supervisor and have them fill it out. Collect the Questionnaires when the Test Controllers/Supervisor have filled them out.

7. **PRM/ARTSIIIA Interface failures (single and double).**

a. TE- insure that the complete PRM is operating correctly, that both PRM/ARTS Interface Units are available, and that unit #1 is active.

a. TC- instruct the Test Controllers to monitor the targets of opportunity. Instruct the TE to fail the active PRM/ARTS Interface Unit (#1). Wait 2 minutes then, instruct the TE to fail the active PRM/ARTS Interface Unit (#2). Instruct the Test Controllers to monitor the target as they would in real life following the AT procedures.

b. TC- enter notes in the test data log as appropriate.

c. TC- distribute Questionnaire-NCT8 to the Test Controllers/Supervisor and have them fill it out. Collect the Questionnaires when the Test Controllers/Supervisor have filled them out.

6.2.2.1.1.6 Data Collection Termination/Restart.

Data collection can be terminated following the completion of a data collection step i.e., a completed degradation state test.

6.2.2.1.1.7 Test Mission Log.
6.2.2.1.1.7.1 Pretest Section.

1. Date:__/__/__ Scheduled Start Time: ___:___.

2. Note any open items or test procedure discrepancies.

3. Enter the names of the assigned test conduct personnel:

Test Coordinator	Test Engineer - 1
Test ATC Supervisor	
Test Controller	Test Controller
Test Controller	Test Controller

4. Enter the PRM System Configuration Number _____.

5. Note any discrepancies from the test configurations.

6.2.2.1.1.7.2 Test Data Logs.

ACTION	START TIME
Enter notes during the Controlled Channel Change data collection.	____:____ (hh) (mm)
Enter notes during the Automatic Channel Change data collection.	____:____ (hh) (mm)
Enter notes during the Standby Channel Failures data collection.	____:____ (hh) (mm)
Enter notes during the Single LAN Failure data collection.	____:____ (hh) (mm)
Enter notes during the Tape Failure data collection.	____:____ (hh) (mm)
Enter notes during the Keyboard Failure data collection.	____:____ (hh) (mm)
Enter notes during the Dectalk Failure data collection.	____:____ (hh) (mm)
Enter notes during the PRM/ARTS Interface Units Failure data collection.	____:____ (hh) (mm)
Enter the time that the data collection was finished.	____:____ (hh) (mm)

6.2.2.1.1.7.3 Post Test Section.

1. Note any test procedure discrepancies encountered during the test conduct.

2. Enter a summary of the data collection.

3. Enter a preliminary assessment of the test results.

6.2.2.1.1.8 Questionnaires.

6.2.2.1.1.8.1 Questionnaire-NCT1. Name: Date / /

Controlled Channel Changes	YES	NO	The problem is....
Q1-Lost Data? Is the channel change quick enough?			
Q2-Data Integrity? Is the display presentation suitable following the channel change?			
Q3-Feedback? Is the command feedback from the channel change suitable?			
Q4-Status Screen? Is the status screen suitable for knowing channel status?			
Q5-Channel Status Training? Was the training provided to you sufficient to understand the channel status screen information to the level you require to fulfil your monitor responsibilities?			
Q6-Aural Alarm? Is the aural alarm for "controlled" channel changes suitable?			
Q7-Training? Was the training provided to you for changing PRM channels comprehensive enough?			
Q8-Critical? Is this event properly classified as Non-Critical? I.e., is it safe to continue to use the system for its monitoring purpose through a channel change?			

6.2.2.1.1.8.2 Questionnaire-NCT2. Name: Date / /

Automatic Channel Changes	YES	NO	The problem is....
Q1-Lost Data? Is the channel change quick enough?			
Q2-Data Integrity? Is the display presentation suitable following the channel change?			
Q3-Status Screen? Is the status screen suitable for knowing the channel status?			
Q4-Subsystem Status Training? Was the training provided to you sufficient to understand the subsystem status screen information to the level you require to fulfil your monitor responsibilities?			
Q5-Aural Alarm? Is the aural alarm for "automatic" channel changes suitable?			
Q6-Reset Channel? Is the status suitable for when the channel is brought back on-line?			
Q7-Alarm Shutoff? Is there a suitable way to turn off the alarms?			
Q8-Training? Was the training provided to you on the effects that an auto channel change (single channel failure) means to the capability of the PRM to support your monitoring responsibilities suitable?			
Q9-Critical? Is this event properly classified as Non-Critical? I.e., is it safe to continue to use the system for its monitoring purpose after an auto channel changes/single channel failure?			

6.2.2.1.1.8.3 Questionnaire-NCT3. Name: Date / /

Standby Channel Failures	YES	NO	The problem is....
Q1-Display Presentation Is the display presentation suitable following the standby channel failure?			
Q2-Status Screen? Is the status screen suitable for knowing the standby channel status?			
Q3-Standby Channel Status Training? Was the training provided to you sufficient to understand the standby channel status screen information to the level you require to fulfil your monitor responsibilities?			
Q4-Aural Alarm? Is the aural alarm for "standby" channel changes suitable?			
Q5-Training? Was the training provided to you on the effects that a standby channel failure means to the capability of the PRM to support your monitoring responsibilities suitable?			
Q6-Critical? Is this event properly classified as Non-Critical? I.e., is it safe to continue to use the system for its monitoring purpose after a standby channel status change?			

6.2.2.1.1.8.4 Questionnaire-NCT4. Name: Date / /

Single LAN Failures	YES	NO	The problem is....
Q1-Lost Data? Is the LAN failure/change quick enough, is the amount of data loss acceptable?			
Q2-Display Presentation Is the display presentation suitable following the LAN failure/change?			
Q3-Status Screen? Is the status screen suitable for knowing the LAN status?			
Q4-LAN Status Screen Training? Was the training provided to you sufficient to understand the subsystem status screen information to the level you require to fulfil your monitor responsibilities?			
Q5-Aural Alarm? Is the aural alarm for LAN failures/changes suitable?			
Q6-Training? Was the training provided to you on the effects that an auto channel change (single LAN failure) means to the capability of the PRM to support your monitoring responsibilities suitable?			
Q7-Critical? Is this event properly classified as Non-Critical? I.e., is it safe to continue to use the system for its monitoring purpose after a LAN failure/change?			

6.2.2.1.1.8.5 Questionnaire-NCT5. Name: Date / /

Tape Failures	YES	NO	The problem is....
Q1-Tape Status? Is the status screen suitable for knowing the Tape drive status?			
Q2-Tape Failures? Is the status screen suitable for displaying tape drive failure info?			
Q3-Tape Status Training? Was the training provided to you sufficient to understand the Tape status screen information to the level you require to fulfil your monitor responsibilities?			
Q4-Aural Alarm? Is the aural alarm for a tape drive failure suitable? Both tape drives?			
Q5-Training? Was the training provided to you on the effects that tape failures mean to the capability of the PRM to support your monitoring responsibilities suitable?			
Q6-Critical? Is this event properly classified as Non-Critical? I.e., is it safe to continue to use the system for its monitoring purpose after a tape drive has failed or filled up? Both drives failed/full?			

6.2.2.1.1.8.6 Questionnaire-NCT6. Name: Date / /

Keyboard Failures	YES	NO	The problem is....
Q1-Keyboard Monitoring? The keyboard is not monitored by the system, is this acceptable?			
Q2-Critical? Is this event properly classified as Non-Critical? I.e., is it safe to continue to use the system for its monitoring purpose after a keyboard has failed? Both keyboards failed?			

6.2.2.1.1.8.7 Questionnaire-NCT7. Name: Date / /

Dectalk Failures	YES	NO	The problem is....
Q1-Status Screen? Is the status screen suitable for knowing the Dectalk status?			
Q2-Dectalk Status Training? Was the training provided to you sufficient to understand the dectalk status screen information to the level you require to fulfil your monitor responsibilities?			
Q3-Aural Alarm? Is the an aural alarm for the dectalk failure suitable?			
Q4-Dectalk Test? Does the "TALK" command and the system monitoring give you enough confidence that the DecTalk will work when it should?			
Q5-Training? Was the training provided to you on the effects that a dectalk failure means to the capability of the PRM to support your monitoring responsibilities suitable?			
Q6-Critical? Is this event properly classified as Non-Critical? I.e., is it safe to continue to use the system for its monitoring purpose after a dectalk has failed? Both dectalks failed?			

6.2.2.1.1.8.8 Questionnaire-NCT8. Name: Date / /

PRM/ARTS Interface Unit Failures	YES	NO	The problem is....
Q1-Data Integrity? Is the PRM/ARTS Interface Unit change quick enough, is the amount of data loss acceptable?			
Q2-Display Presentation? Is the display presentation suitable following the PRM/ARTS Interface Unit change?			
Q3-Status Screen? Is the status screen suitable for knowing the PRM/ARTS Interface Unit(s) status?			
Q4-PRM/ARTS I/F Status Training? Was the training provided to you sufficient to understand the PRM/ARTS I/F status screen information to the level you require to fulfil your monitor responsibilities?			
Q5-Aural Alarm? Is the aural alarm for PRM/ARTS Interface Unit failure(s) suitable?			
Q6-Training? Was the training provided to you on the effects that a PRM/ARTS I/F failure(s) means to the capability of the PRM to support your monitoring responsibilities suitable?			
Q9-Critical? Is this event properly classified as Non-Critical? I.e., is it safe to continue to use the system for its monitoring purpose after a PRM/ARTS I/F Unit has failed? Both I/F Units failed?			

6.2.2.1.1.9 Data Reduction and Analysis.

The TC will first analyze each test's Test Mission Log to determine whether the data collection was conducted acceptably. The data from data collection phases which were not concluded acceptably will not be included in any further analysis.

The Questionnaires will then be analyzed. This analysis will attempt to determine a consensus of controller opinions for each question. In cases where the answers point to a difference of controller opinions the TC may review the questions with the controllers to determine the consensus opinion.

6.2.2.1.1.10 Success Criteria.

This test will be successful if the analysis of the Questionnaires and Data Logs collected lead to a consensus of controller opinions that verifies:

Req. #	Success Criteria	Pass	Fail
15	That System failures which compromise the safety of the PRM generate a suitable visual alarm on the display.		
16	That System failures which compromise the safety of the PRM generate a suitable aural signal.		
17	In the event of a system overload or partial failure, an appropriate message is generated and displayed for the controller.		
18	The PRM system does not "bomb out" in a Non-Critical degradation state, but will drop data based on its relative importance, temporarily reduce range, or otherwise allow the system to recover. Tracked targets are not be affected.		
58	Whether the PRM/NAS system is still suitable and effective to monitor simultaneous ILS approaches when in any of it's Non-Critical degradation states.		
APMT:		Date:	

6.2.2.1.2 Non-Critical States Flight Tests.

The Non-Critical States Flight Tests will be conducted to determine the operational suitability of using the PRM to monitor parallel landing during A single Display failure.

6.2.2.1.2.1 Test Objectives.

The objectives of the Non-Critical States Flight Test are to determine whether the monitoring of simultaneous approaches can be safely continued while using the Upgrade PRM/NAS system with only one display.

QVM Requirements Tested: 7, 8, 58

6.2.2.1.1.2 Test Description.

This test will collect opinions from Test Controllers by having them monitor Test Aircraft on the PRM system as one of the PRM displays is faulted. The Test Controllers will then fill out a Questionnaire. The questions investigate the suitability and effectiveness of using the PRM with only one display to monitor simultaneous ILS approaches.

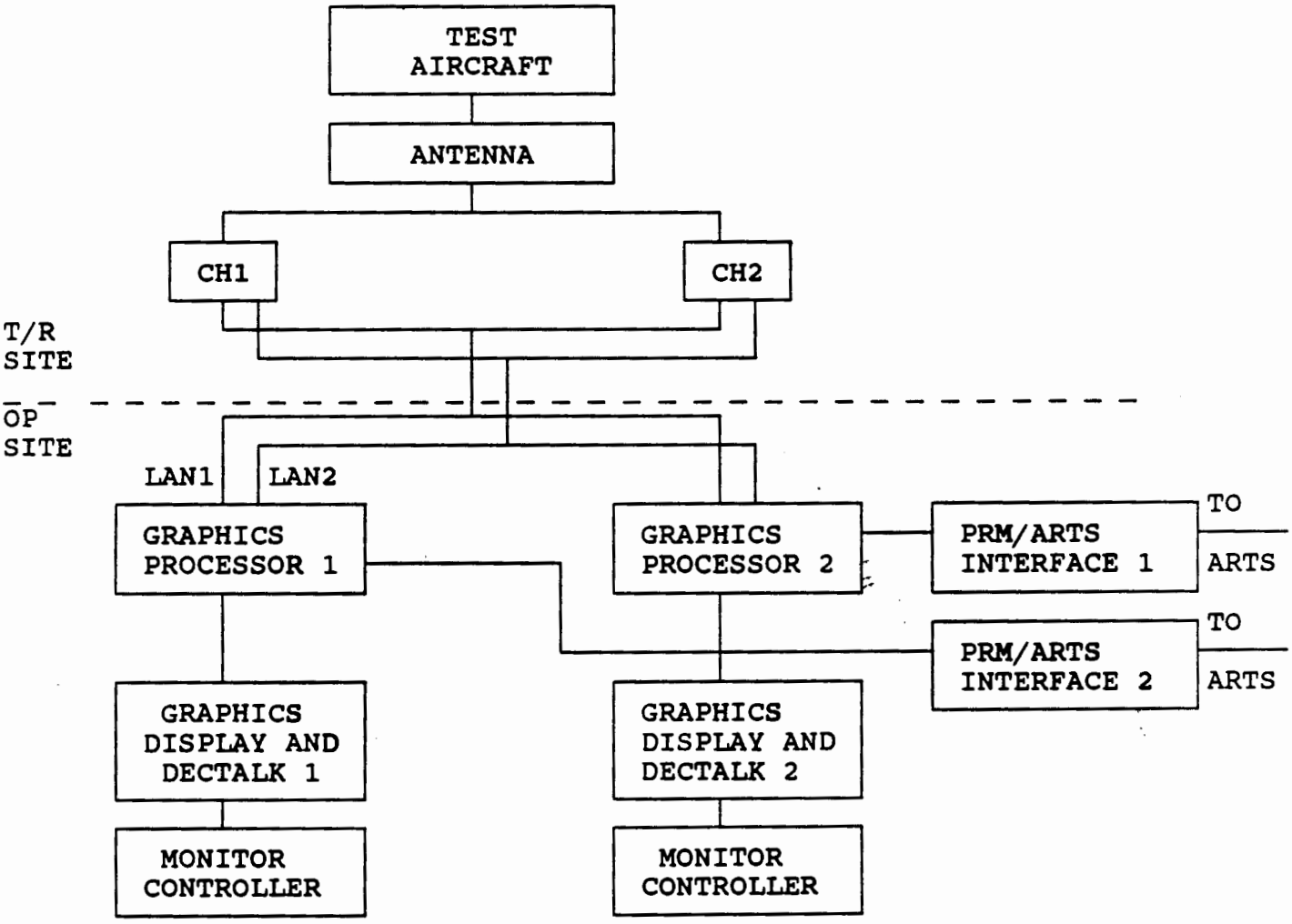


FIGURE 6.2.2.1.2-1 NON-CRITICAL FLIGHT TEST CONFIGURATION

6.2.2.1.2.3 Test Resources.

The test equipment, facilities and personnel required to execute this test are listed in the tables below. A diagram of the test configuration is shown in figure 6.2.2.1.2-1.

Test Equipment or Facilities	Purpose	Duration
PRM Displays	Data Collection	3 hours
2- Test Aircraft/pilots	Provide data	3 hours

#	Type	Responsibility
1	Test Coordinator (TC)	Coordinate with AT Controllers
1	Test Engineer (TE1)	Assist TC
1	Test Engineer (TE2)	Take notes in test aircraft #1
4	Test Controllers	Use PRM displays, supply opinions

Other resources which are required to conduct this test are the following:

a. PRM Operator's Reference Cards (4)
b. Flight Profiles

APP#	23L	23R
1	30 NTZ Blunder @ 12MRE	Simultaneous Approach
2	Simultaneous Approach	15 NTZ Blunder at Turn on
3	Wrong Turn After Missed Approach	Simultaneous Approach
4	Simultaneous Approach	Simultaneous Approach
5	Simultaneous Approach	Transponder Failure @ 5 MRE
6	Simultaneous Approach	Simultaneous Approach
7	Simultaneous Approach	30 NTZ Blunder @ 2MRE
8	30 NTZ Blunder @ 5MRE	Simultaneous Approach
9	Simultaneous Approach	Simultaneous Approach
10	Simultaneous Approach	Simulate Poor Transponder Beginning on Downleg

6.2.2.1.2.4 Test Setup and Safety Considerations.

The AT Supervisor should be informed that the test requires aircraft to be conducting simultaneous ILS approaches. This test should be conducted during light traffic times. The flight plans should be coordinated with the test pilots and the active At supervisor prior to beginning the test. The Test Controllers should be briefed.

TE1 should start the PRM and insure it's proper operation. TE1 should set the PRM Displays to the normal default configuration, with the PRM status screen on the displays. The TC should distribute the PRM Operator's Reference Cards to the Test Controllers and have them setup their display to their preference.

6.2.2.1.2.5 Data Collection

1. **Single Display Failure.**

a. TC- instruct the Test Controllers to set up the displays to their preference.

b. TC- instruct TE2 to have the test aircraft take off and follow the flight plan.

c. TC- instruct the Test Controllers to monitor the aircraft as they normally would.

d. TC- enter notes in the test data log as appropriate.

e. TE1- after the first approach has been successfully completed turn off the power to display #1.

f. TE1- after 3 more approaches have been completed reboot display #1.

g. TE1- after another approach has been successfully completed turn off the power to display #2.

h. TE1- after 3 more approaches have been completed reboot display #2.

i. TC- after 3 more approaches have been completed end the test and distribute Questionnaires-NCF1 to the Test Controllers and have them fill it out. Collect the Questionnaires when the Test Controllers have completed them.

j. TE2- after the last simultaneous approach has been completed distribute Questionnaire-NCF2 to the Test Pilots and have them fill it out. Collect the Questionnaire when the Test Pilots have completed them.

6.2.2.1.2.6 Data Collection Termination/Restart.

Data collection can be terminated following the completion of a data collection step i.e., a completed degradation state test.

6.2.2.1.2.7 Test Mission Log.
6.2.2.1.2.7.1 Pretest Section.

1. Date: __/__/__ Scheduled Start Time: __:__.

2. Note any open items or test procedure discrepancies.

3. Enter the names of the assigned test conduct personnel:

Test Coordinator	Test Engineer - 1
Test ATC Supervisor	Test Engineer - 2
Test Controller	Test Controller
Test Controller	Test Controller

4. Enter the PRM System Configuration Number _____.

5. Note any discrepancies from the test configurations.

6.2.2.1.2.7.2 Test Data Logs (TC).

ACTION (TC)	START TIME
Enter notes during the Single Display Failure data collection.	_____ : _____ (hh) (mm)
	_____ : _____ (hh) (mm)
Enter the time that the data collection was finished.	_____ : _____ (hh) (mm)

6.2.2.1.2.7.3 Test Data Logs (TE2).

ACTION (TE2)	START TIME
Enter notes during the Non-Critical Flight Tests.	_____ : _____ (hh) (mm)
	_____ : _____ (hh) (mm)
	_____ : _____ (hh) (mm)
	_____ : _____ (hh) (mm)
	_____ : _____ (hh) (mm)
	_____ : _____ (hh) (mm)
Enter the time that the data collection was finished.	_____ : _____ (hh) (mm)

6.2.2.1.2.7.3 Post Test Section.

1. Note any test procedure discrepancies encountered during the test conduct.

2. Enter a summary of the data collection.

3. Enter a preliminary assessment of the test results.

6.2.2.1.2.8.1 Questionnaire-NCF1. Name: Date / /

Single Display Failure	YES	NO	The problem is....
Q1-Display Presentation? Is the display presentation suitable for sharing 1 display between two stations?			
Q2-Status Screen? Is the status screen suitable for knowing the Display status?			
Q3-Display Status Training? Was the training provided to you sufficient to understand the display status screen information to the level you require to fulfil your monitor responsibilities?			
Q4-Display Failure Training? Was the training provided to you sufficient to understand the consequences of a PRM display failure, the red border, etc?			
Q5-Aural Alarm? Is the aural alarm for Display Failures suitable?			
Q6-Display Resetting? Is the resetting of the failed display non-distracting enough to be done while you are monitoring active targets?			
Q7-Critical? Is this event properly classified as Non-Critical? I.e., is it safe to continue to use the system for its monitoring purpose after a display failure?			

6.2.2.1.1.9 Data Reduction and Analysis.

The TC will first analyze each test's Test Mission Log to determine whether the data collection was conducted acceptably. The data from data collection phases which were not concluded acceptably will not be included in any further analysis.

The Questionnaires will then be analyzed. This analysis will attempt to determine a consensus of controller opinions for each question. In cases where the answers point to a difference of controller opinions the TC may review the questions with the controllers to determine the consensus opinion.

6.2.2.1.1.10 Success Criteria.

This test will be successful if the analysis of the Questionnaires and Data Logs collected lead to a consensus of controller opinions that verifies:

Req. #	Success Criteria	Pass	Fail
7	Whether the PRM/NAS system is still suitable and effective to monitor simultaneous ILS approaches when using only one display.		
8	Whether the PRM/NAS system is still suitable and effective to monitor simultaneous ILS approaches when using only one display.		
58	Whether the PRM/NAS system is still suitable and effective to monitor simultaneous ILS approaches when in any of it's Non-Critical degradation states.		
APMT:		Date:	

6.2.2.2 Critical Degraded Operatio[illegible]sts.

A Critical Degraded State is one in [illegible]ch a the PRM/NAS system can no longer support simultaneous ILS app[illegible]aches. The Critical Degraded States Tests have been subdivided into two [illegible]ections as follows:

1. Critical States Targets of Opportunity Tests (6.2.2.2.1).
2. Critical States Flight Tests (6.2.2.2.2).

This division was done to minimize the amount of test time that would require test aircraft. The Critical States Targets of Opportunity Tests do not require that actual control of aircraft, but use what ever traffic is available simply as a display feature. The Critical States Flight Tests do require both the control of the aircraft and full communication between the Monitor controllers and other AT controllers.

Note: that PRM System Failures will be tested in both the Critical States Targets of Opportunity Tests as well as the Critical States Flight Tests. The Targets of Opportunity Tests will be conducted during heavy traffic conditions, however, the targets will not actually be affected (pulled out). The Flight tests will be conducted during light traffic conditions with test aircraft.

6.2.2.2.1 Critical States Targets of Opportunity Tests.

The Critical States Targets of Opportunity Tests will use the configuration as shown in figure 6.2.2.2.1-1. The Critical States Targets of Opportunity Tests will be conducted to determine operational suitability and effectiveness of the PRM Status reporting and the suitability and effectiveness of PRM/NAS system to support a reversion to staggered approaches during each of the following failures:

a. Overflow/Overload Conditions.
b. PRM System Failures.

PRM System failures are those failures where the PRM service is not available due to an antenna failure, dual channel failure, dual display failure, or a dual LAN failure. These failures all create the same degraded state; i.e. a total loss of data. Thus only the dual channel failure will be tested.

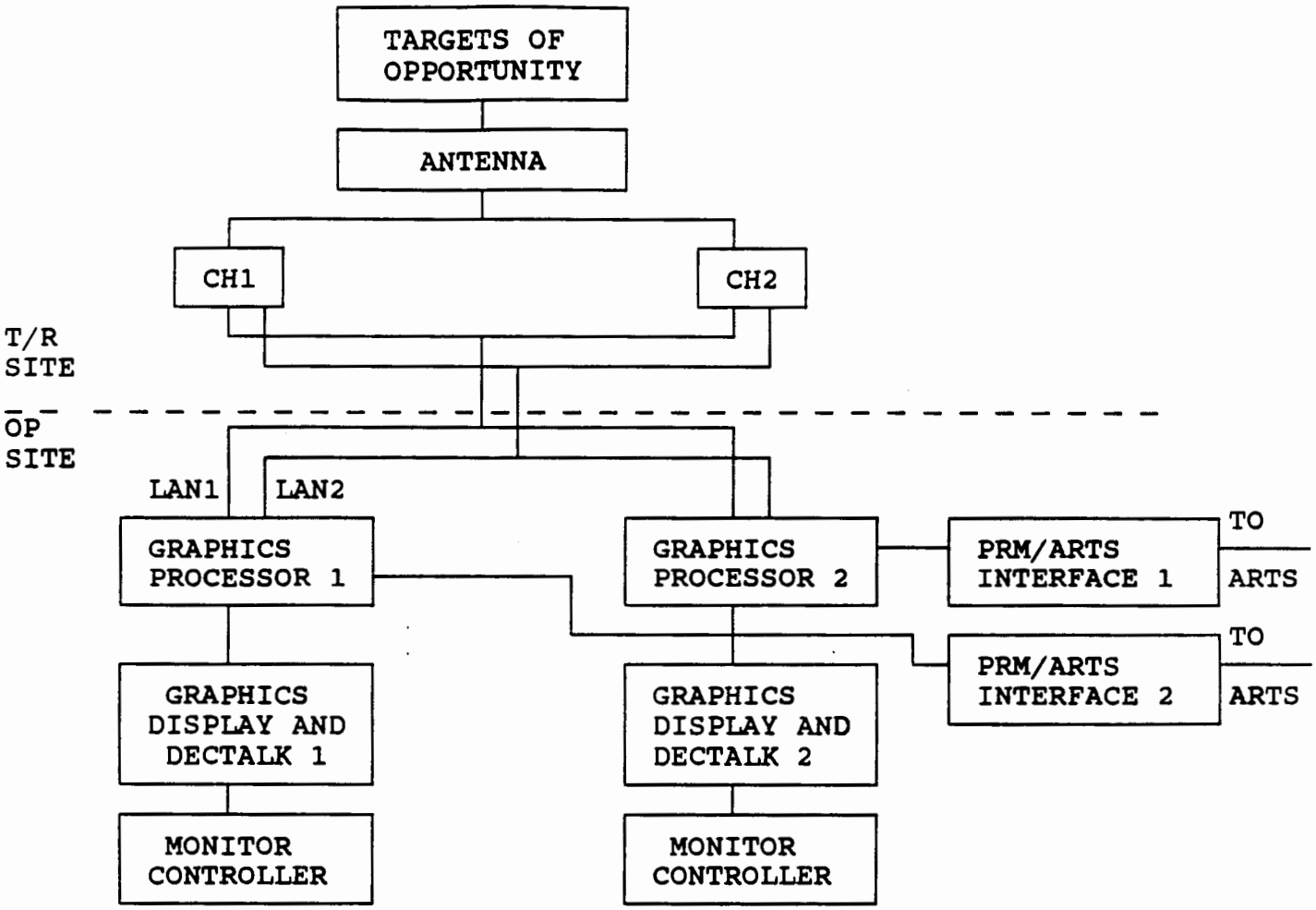


FIGURE 6.2.2.2.1-1 CRITICAL DEGRADED TARGETS OF OPPORTUNITY TEST CONFIGURATION

6.2.2.2.1.1 Test Objectives.

The objectives of the Critical States Targets of Opportunity Test are to determine (for each of the tested PRM failures and the resultant Degraded State) the following:

a. The suitability of the Upgrade PRM/NAS system status reporting.

QVM Requirements Tested: 15, 16, 17

b. Whether the critical degradation states of the PRM provides a graceful failure.

QVM Requirements Tested: 18

c. Whether the PRM/NAS system is suitable and effective to support the reversion to staggered approaches following a critical PRM failure.

QVM Requirements Tested: 59

6.2.2.2.1.2 Test Description.

This test will collect opinions from Test Controllers by having them monitor targets of opportunity on the PRM displays as each PRM failure and it's resultant Critical Degraded State is demonstrated. The Test Controllers will then use the remaining NAS components to revert to staggered approaches. For these target of opportunity tests this reversion will be done without keying the microphone, i.e. without actually pulling any planes off the approach. The Test Controllers will then fill out a Questionnaire. These questions investigate the suitability and effectiveness of the PRM status reporting and the NAS system to support the reversion to staggered approaches.

For the Overflow/Overload Condition Test the geographic filters on the PRM will be opened up so that more than 25 targets will be in the PRM coverage area. This will cause an overflow and then an overload condition.

For the PRM System Failure both PRM channels will be faulted. The active PRM channel will be faulted forcing an automatic channel change to the standby channel. Next, the newly active channel will be faulted. This time the PRM cannot change channels because the backup channel is fault latched "off-line". The PRM is thus in a total System Failure critical degradation state. Once again the Test Controllers will be asked to only simulate a reversion to staggered approaches.

6.2.2.2.1.3 Test Resources.

The test equipment, facilities and personnel required to execute this test are listed in the tables below.

Test Equipment or Facilities	Purpose	Duration
PRM Displays	Data Collection	2 hours

#	Type	Responsibility
1	Test Coordinator (TC)	Coordinate with AT Controllers
1	Test Engineer (TE)	Assist TC
1	Test AT Supervisor	Use PRM displays, supply opinions
4 (2 @ a time)	Test Controllers	Use PRM displays, supply opinions

Other resources which are required to conduct this test are the following:

a. PRM Operator's Reference Cards (4)
b. PRM Operator's Manuals (4)

6.2.2.2.1.4 Test Setup and Safety Considerations.

The AT Supervisor should be informed that the test requires aircraft to be conducting simultaneous ILS approaches. All the controllers who may be affected by this test should be briefed by the AT supervisor. This test will only simulate the reversion to staggered approaches and no aircraft should be effected. The test should be conducted in a heavy traffic environment while VFR simultaneous approaches are being conducted. The TE should start the PRM and insure it's proper operation. The TE should set the PRM Displays to the normal default configuration. The TC should distribute the PRM Operator's Reference Cards and the PRM Operator's Manuals to the Test Controllers.

6.2.2.2.1.5 Data Collection

1. **Overflow/Overload Conditions.**

a. TC- Instruct the Test Controllers to monitor the PRM displays as they would during simultaneous ILS approaches. After 5 minutes instruct the TE open the geographic filters on the PRM to the point where the PRM goes into overflow/overload (more than 25 targets are in the PRM coverage area.)

b. TC- Take notes while the Test Controllers simulate a reversion to staggered approaches.

c. TC- After the simulated reversion has been completed. Distribute Questionnaire CT1 to the Test Controllers and have them fill them out.

2. **PRM System Failure.**

a. TE- re-start the PRM and insure it's proper operation, set the PRM Displays to the normal default configuration and the system using channel 1.

b. TC- Instruct the Test Controllers to monitor the PRM displays as they would during simultaneous ILS approaches. After 5 minutes instruct the TE to put channel 1 off-line. After another 5 minutes instruct the TE to put channel 2 off-line. This will cause a critical system failure.

c. TC- Take notes while the Test Controllers simulate a reversion to staggered approaches.

d. TC- After the simulated reversion has been completed. Distribute Questionnaires CT2&CT3 to the Test Controllers/Supervisor and have them fill them out.

6.2.2.2.1.6 Data Collection Termination/Restart.

Data collection can be terminated following the completion of a data collection step i.e., a completed degradation state test.

6.2.2.2.1.7 Test Mission Log.
6.2.2.2.1.7.1 Pretest Section.

1. Date: __/__/__ Scheduled Start Time: __:__.

2. Note any open items or test procedure discrepancies.

_____

_____

_____

_____

_____

_____

3. Enter the names of the assigned test conduct personnel:

Test Coordinator	Test Engineer - 1
Test ATC Supervisor	
Test Controller	Test Controller
Test Controller	Test Controller

4. Enter the PRM System Configuration Number _____.

5. Note any discrepancies from the test configurations.

_____

_____

_____

_____

_____

6.2.2.2.1.7.2 Test Data Logs.

ACTION	START TIME
Enter notes during the Overflow/Overload Condition.	: (hh) (mm)
Enter notes during the PRM System Failure.	: (hh) (mm)
Enter the time that the data collection was finished.	: (hh) (mm)

6.2.2.2.1.7.3 Post Test Section.

1. Note any test procedure discrepancies encountered during the test conduct.

2. Enter a summary of the data collection.

3. Enter a preliminary assessment of the test results.

6.2.2.2.1.8 Questionnaires.

6.2.2.2.1.8.1 Questionnaire-CT1. Name: Date / /

Overflow/Overload Condition. Monitor Controller	YES	NO	The problem is....
Q1- Status Screen? Is the status screen suitable for recognizing PRM overflow and overload events?			
Q2-Overflow/Overload Status Training? Was the training provided to you sufficient to understand the overflow and overload status screen information to the level you require to fulfil your monitor responsibilities?			
Q3-PRM/NAS System Suitability? Do you feel that the PRM/NAS system (while in an overflow or overload state) suitably and effectively supports your responsibilities during the reversion to staggered approaches?			
Q4- Aural Alarm? Is the aural alarm for an overflow or overload event suitable?			
Q5-Training? Was the training provided to you on the effects that an overflow or overload condition means to the capability of the PRM to support your monitoring responsibilities suitable?			
Q6-Critical Failure? Is this event properly classified as Critical? I.e., it is not safe to continue to use the system for its monitoring purpose while the system is in an overflow or overload condition?			

6.2.2.2.1.8.2 Questionnaire-CT2. Name: Date / /

PRM System Failure. Monitor Controller	YES	NO	The problem is....
Q1- Status Screen? Is the status screen suitable for recognizing PRM overflow and overload events?			
Q2-System Failure Status Training? Was the training provided to you sufficient to understand the PRM System Failure status screen information to the level you require to fulfil your monitor responsibilities?			
Q3-PRM/NAS System Suitability? Do you feel that the PRM/NAS system (during a PRM system failure) suitably and effectively supports your responsibilities during the reversion to staggered approaches?			
Q4- Aural Alarm? Is the aural alarm for PRM System Failure suitable?			
Q5-Training Was the training provided to you on the effects that a PRM System Failure means to the capability of the PRM to support your monitoring responsibilities suitable?			
Q6-Critical Failure Is this event properly classified as Critical? I.e., it is not safe to continue to use the system for its monitoring purpose while the system is in an overflow or overload condition?			

6.2.2.2.1.8.3 Questionnaire-CT3. Name: Date / /

PRM System Failures. AT Supervisor.	YES	NO	The problem is....
Q1-PRM/NAS System Suitability? Do you feel that the PRM/NAS system (during a PRM system failure) suitably and effectively supports the reversion to staggered approaches?			
Q2-Initial System Configuration Given the consequences of a total PRM system failure, do you feel that it is acceptable to begin using the PRM without a stand-by channel available?			
Q3-Fault Latching? Given the consequences of a total PRM system failure, do you feel that the PRM's current fault latching scheme is suitable? I.e., any detected fault, even a fault that might be resolved by an automatic reset, is latched into the NOGO state leaving the associated channel off-line until a technician manually resets it. If No, would a fault latch after a single automatic reset attempt failed be suitable?			
Q4-Fault Notification? Given the consequences of a total PRM system failure, do you feel that the current fault determination scheme is suitable? I.e., the loss of both parrots, or a single antenna monitor strip will cause the antenna to be latched NOGO resulting in a complete system failure, even if the antenna is OK. If No, would notification of the event without a system fault be suitable? I.e., tell you that the antenna monitor failed but not fault the system, as is done in the overflow and overload cases. Should the PRM system ever designate a fault as a "system fault" (stopping the system) if it could continue to provide some level of service?			
Q5-Any Other Concerns? Do you have any other concerns with the PRM/NAS critical degradation states?			

6.2.2.1.1.9 Data Reduction and Analysis.

The TC will first analyze each test's Test Mission Log to determine whether the data collection was conducted acceptably. The data from data collection phases which were not concluded acceptably will not be included in any further analysis.

The Questionnaires will then be analyzed. This analysis will attempt to determine a consensus of controller opinions for each question. In cases where the answers point to a difference of controller opinions the TC may review the questions with the controllers to determine the consensus opinion.

6.2.2.1.1.10 Success Criteria.

This test will be successful if the analysis of the Questionnaires and Data Logs collected lead to a consensus of controller opinions that verifies:

Req. #	Success Criteria	Pass	Fail
15	That System failures which compromise the safety of the PRM generate a suitable visual alarm on the display.		
16	That the System failures which compromise the safety of the PRM generate a suitable aural signal.		
17	In the event of a system overload or partial failure, an appropriate message is generated and displayed for the controller.		
18	The PRM system does not "bomb out" but provides a graceful degradation, by dropping data based on its relative importance, temporarily reduce range, or otherwise allowing the system to recover. Tracked targets shall not be affected.		
59	Whether the PRM/NAS system is suitable and effective to support the reversion to staggered approaches following a critical PRM failure.		
APMT:		Date:	

6.2.2.2.2 Critical States Flight Tests.

The Critical States Flight Tests will use the configuration as shown in figure 6.2.2.2.2-1. The Critical States Flight Tests will be conducted to determine operational suitability and effectiveness of the PRM Status reporting and the suitability and effectiveness of PRM/NAS system to support a reversion to staggered approaches during a PRM System Failures. PRM System failures are those failures where the PRM service is not available due to an antenna failure, dual channel failure, dual display failure, or a dual LAN failure. These failures all create the same degraded state; i.e. a total loss of data. Thus only the dual channel failure will be tested.

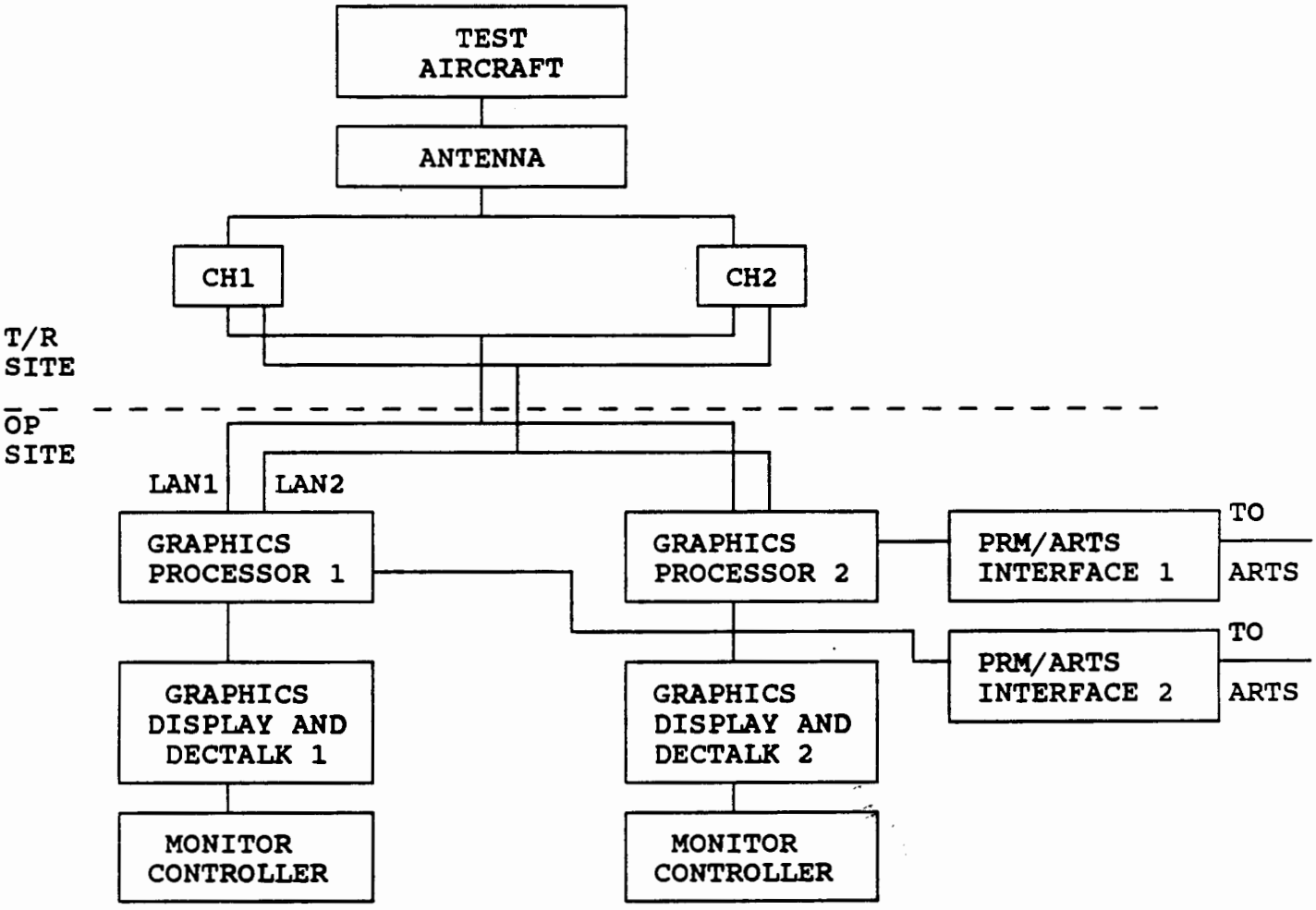


FIGURE 6.2.2.2.2-1 CRITICAL STATES FLIGHT TEST CONFIGURATION

6.2.2.2.2.1 Test Objectives.

The objectives of the Critical States Flight Test are to determine whether the PRM/NAS system is suitable and effective to support the reversion to staggered approaches following a critical PRM failure

QVM Requirements Tested: 59

6.2.2.2.2.2 Test Description.

This test will collect opinions from Test Controllers by having them monitor test aircraft on the PRM displays as the PRM System is put into a Critical System Failure. The Test Controllers will then use the remaining NAS components to revert to staggered approaches. The Test Controllers will then fill out a Questionnaire. These questions investigate the suitability and effectiveness of the PRM status reporting and the NAS system to support the reversion to staggered approaches.

6.2.2.2.2.3 Test Resources.

The test equipment, facilities and personnel required to execute this test are listed in the tables below.

Test Equipment or Facilities	Purpose	Duration
PRM Displays	Data Collection	2 hours

#	Type	Responsibility
1	Test Coordinator (TC)	Coordinate with AT Controllers
1	Test Engineer (TE)	Assist TC
1	Test ATC Supervisor	Use PRM displays, supply opinions
4 2 @ a time	Test Controllers	Use PRM displays, supply opinions
4	Test Pilots	Conduct flight tests

Other resources which are required to conduct this test are the following:

a. PRM Operator's Reference Cards (4)
b. Flight Profiles

APP #	23L	23R
	Aircraft Action	Aircraft Action
1	Simultaneous Approach	Simultaneous Approach
2	Simultaneous Approach	Simultaneous Approach
3	Simultaneous Approach	Simultaneous Approach
4	Simultaneous Approach	Simultaneous Approach
5	Simultaneous Approach	Simultaneous Approach

6.2.2.2.2.4 Test Setup and Safety Considerations.

The AT Supervisor should be informed that the test requires aircraft to be conducting simultaneous ILS approaches. The flight plans should be coordinated with the test pilots and the AT Supervisor. All the controllers who may be affected by this test should be briefed by the AT Supervisor. The TE should start the PRM and insure it's proper operation. The TE should set the PRM Displays to the normal default configuration with the system using channel 1. The TC should distribute the PRM Operator's Reference Cards to the Test Controllers.

6.2.2.2.2.5 Data Collection

1. **PRM System Failure.**

a. TC- instruct the Test Controllers to set up the displays to their preference.

b. TC- instruct TE2 to have the test aircraft take off and follow the flight plan.

c. TC- instruct the Test Controllers to monitor the PRM displays as they would during VFR PRM approaches.

d. TE1 - after 5 minutes and the first test aircraft approach put channel 1 off-line.

e. TE1 - after another 5 minutes and the second test aircraft approach put channel 2 off-line. This will cause a critical system failure.

f. TC- Take notes while the Test Controllers revert to staggered approaches.

g. TC- After the reversion has been completed. Distribute the Questionnaires - CF1-CF2 to the Test Controllers and have them fill them out.

6.2.2.2.2.6 Data Collection Termination/Restart.

Data collection can be terminated following the completion of a data collection step i.e., a completed degradation state test.

6.2.2.2.2.7 Test Mission Log.
6.2.2.2.2.7.1 Pretest Section.

1. Date: ___/___/___ Scheduled Start Time: ___:___.

2. Note any open items or test procedure discrepancies.

3. Enter the names of the assigned test conduct personnel:

Test Coordinator	Test Engineer - 1
Test ATC Supervisor	Test Engineer - 2
Test Controller	Test Controller
Test Controller	Test Controller

4. Enter the PRM System Configuration Number _____.

5. Note any discrepancies from the test configurations.

6.2.2.2.2.7.2 Test Data Logs.

ACTION (TC)	START TIME
Enter notes during the PRM System Failure.	: (hh) (mm)
Enter the time that the data collection was finished.	: (hh) (mm)

6.2.2.2.2.7.3 Test Data Logs.

ACTION (TE2)	START TIME
Enter notes during the Critical Flight Tests.	_____ : _____ (hh) (mm)
	_____ : _____ (hh) (mm)
	_____ : _____ (hh) (mm)
	_____ : _____ (hh) (mm)
	_____ : _____ (hh) (mm)
Enter the time that the data collection was finished.	_____ : _____ (hh) (mm)

6.2.2.2.2.7.4 Post Test Section.

1. Note any test procedure discrepancies encountered during the test conduct.

2. Enter a summary of the data collection.

3. Enter a preliminary assessment of the test results.

6.2.2.2.2.8 Questionnaires.

6.2.2.2.2.8.1 Questionnaire-CF1. N: Date / /

PRM System Failure. Monitor Controller	YES		The problem is....
Q1- Status Screen? Is the status screen suitable for recognizing PRM System Failures?			
Q2-System Failure Status Training? Was the training provided to you sufficient to understand the PRM System Failure status screen information to the level you require to fulfil your monitor responsibilities?			
Q3-PRM/NAS System Suitability? Do you feel that the PRM/NAS system (during a PRM system failure) suitably and effectively supports your responsibilities during the reversion to staggered approaches?			
Q4- Aural Alarm? Is the aural alarm for PRM System Failure suitable?			
Q5-Training Was the training provided to you on the effects that a PRM System Failure means to the capability of the PRM to support your monitoring responsibilities suitable?			
Q6-Critical Failure Is this event properly classified as Critical? I.e., it is not safe to continue to use the system for its monitoring purpose while the system is in an overflow or overload condition?			

6.2.2.2.2.8.2 Questionnaire-CF2. Name: Date / /

PRM System Failures. AT Supervisor.	YES	NO	The problem is....
Q1-PRM/NAS System Suitability? Do you feel that the PRM/NAS system (during a PRM system failure) suitably and effectively supports the reversion to staggered approaches?			
Q2-Initial System Configuration Given the consequences of a total PRM system failure, do you feel that it is acceptable to begin using the PRM without a stand-by channel available?			
Q3-Fault Latching? Given the consequences of a total PRM system failure, do you feel that the PRM's current fault latching scheme is suitable? I.e., any detected fault, even a fault that might be resolved by an automatic reset, is latched into the NOGO state leaving the associated channel off-line until a technician manually resets it. If No, would a fault latch after a single automatic reset attempt failed be suitable?			
Q4-Fault Notification? Given the consequences of a total PRM system failure, do you feel that the current fault determination scheme is suitable? I.e., the loss of both parrots, or a single antenna monitor strip will cause the antenna to be latched NOGO resulting in a complete system failure, even if the antenna is OK. If No, would notification of the event without a system fault be suitable? I.e., tell you that the antenna monitor failed but not fault the system, as is done in the overflow and overload cases. Should the PRM system ever designate a fault as a "system fault" (stopping the system) if it could continue to provide some level of service?			
Q5-Any Other Concerns? Do you have any other concerns with the PRM/NAS critical degradation states?			

6.2.2.2.2.9 Data Reduction and Analysis.

The TC will first analyze each test's Test Mission Log to determine whether the data collection was conducted acceptably. The data from data collection phases which were not concluded acceptably will not be included in any further analysis.

The Questionnaires will then be analyzed. This analysis will attempt to determine a consensus of controller opinions for each question. In cases where the answers point to a difference of controller opinions the TC may review the questions with the controllers to determine the consensus opinion.

6.2.2.2.2.10 Success Criteria.

This test will be successful if the analysis of the Questionnaires and Data Logs collected lead to a consensus of controller opinions that verifies:

Req. #	Success Criteria	Pass	Fail
15	That System failures which compromise the safety of the PRM generate a suitable visual alarm on the display.		
16	That the System failures which compromise the safety of the PRM generate a suitable aural signal.		
17	In the event of a system overload or partial failure, an appropriate message is generated and displayed for the controller.		
18	The PRM system does not "bomb out" but provides a graceful degradation, by dropping data based on its relative importance, temporarily reduce range, or otherwise allowing the system to recover. Tracked targets are not be affected.		
59	Whether the PRM/NAS system is suitable and effective to support the reversion to staggered approaches following a critical PRM failure.		
APMT:	Date:		

6.3 AF OPERATIONAL TEST PROCEDURES.

This AF OT&E Operational Test is an evaluation of the maintainability of the Upgrade PRM/NAS system including the associated contractor provided documentation and training. It should be noted that the maintenance plan for the Upgrade PRM calls for the use of contractor maintenance. The Upgrade PRM/NAS system will be evaluated by AF Technicians, AF Supervisors, and FAA Test Engineers. Tests will be conducted as a multi step strategy starting with tests of the PRM's fault detection and isolation capabilities, progressing through LRU (lowest replaceable unit) replacement, and leading to tests to insure that the FAA technicians (using the contractor provided training, documentation and the FAA Maintenance Handbook) can successfully certify the Upgrade PRM system. All tests will use targets of opportunity. The AF OT&E Operational Test Procedures are subdivided into two major categories as follows:

1. System Maintainability and Reliability (6.3.1).
2. FAA Certification Tests (6.3.2).

6.3.1 System Maintainability and Reliability .

The System Maintainability tests will evaluate the suitability of the PRM Status Display (PSD), the PRM Instruction Book, and the contractor provided training. These tests will also evaluate the operational effectiveness of these issues to enable a technician to determine when the PRM has a fault, the isolate the fault to the LRU level, and the replace the LRU. The System Reliability will be determined through an analysis of the reliability data collected on the system beginning during the On-site DT&E through the OT&E test period. The System Maintainability and Reliability tests have been subdivided into three sections as follows:

1. PSD Fault Detection and Isolation Tests (6.3.1.1).
2. LRU Replacement Tests and Analysis (6.3.1.2).
3. System Reliability (6.3.1.3)

The PSD Fault Detection and Isolation Tests will determine the suitability of the fault detection and isolation capabilities provided by the PRM PSD and the operational effectiveness of the associated sections of the PRM Instruction Book and contractor provided training.

The LRU Replacement Tests and Analysis will determine the suitability and effectiveness of the contractor provided training and the PRM Instruction book to enable a technician to replace LRUs in the PRM system.

The System Reliability will be determined through an analysis of the reliability data collected on the system beginning during the On-site DT&E through the OT&E test period.

6.3.1.1 PSD Fault Detection and Isolation Tests.

The PSD and Instruction Book Tests will be conducted to determine the suitability of the fault detection and isolation capabilities provided by the PRM PSD. These Tests will also determine the operational effectiveness of the associated sections of the PRM Instruction Book and the contractor provided training. Note that the effectiveness of the PSD fault detection and isolation capabilities is determined as part of 6.1.1 (PRM Performance Verification). This test will consist of a few selected failures to demonstrate the capabilities of the PSD to the test Technicians.

6.3.1.1.1 Test Objectives.

The objectives of PSD Fault Detection and Isolation Tests are to determine (for each of the tested PRM faults) the following:

a. The suitability of the Upgrade PRM PSD fault detection and isolation capabilities.

OT&E Requirements Tested: 60

b. Whether the PRM Instruction Book is detailed and comprehensive enough to assist a qualified technician to run the PRM fault detection and isolation programs.

OT&E Requirements Tested: 61

c. The suitability and effectiveness of the training provided to the FAA technician to run the PRM PSD fault detection and isolation programs .

OT&E Requirements Tested: 65

d. The suitability and effectiveness of the training provided to the FAA technician on the functionality of the PRM system.

OT&E Requirements Tested: 66

6.3.1.1.2 Test Description.

This test will collect opinions from Test Technicians by having them respond to selected failures. In response to the failures, the Test Technicians will troubleshoot the system by using the PRM display, the PSD, and the PRM Instruction Book. The Test Technicians will then fill out a Questionnaire for each failure type. These questions investigate the suitability of the PRM PSD fault detection and isolation capabilities and the suitability and effectiveness of the associated sections of the contractor provided training and PRM Instruction Book.

The selected failures that make up the PSD Fault Detection and Isolation Tests are:

a. Single LAN failure.

b. Tape Drive Failures (single and double).

c. Automatic PRM Channel changes (Failed PRM LRUs)

1. IPA off
2. DP failure

d. Standby Channel failures

1. Interrogator power supply A or B
2. SP failure

e. UPS Failures

f. GP Failures
1. Metheus Graphics Engine
2. GP Dectalk Unit

6.3.1.1.3 Test Resources.

The test equipment, facilities and personnel required to execute this test are listed in the tables below. A functional block diagram of the PRM test configuration is shown in figure 6.3.1.1.3-1

Test Equipment or Facilities	Purpose	Duration
PRM, Displays, PSD Monitor	Data Collection	2 hours

#	Type	Responsibility
1	Test Coordinator (TC)	Coordinate with AT, AF, TE
1	Test Engineer (TE)	Assist TC
2	FAA Test Technicians	Use PRM displays, PSD monitors

Other resources which are required to conduct this test are the following:

a. FAA PRM Maintenance Handbook
b. PRM Instruction Book
c. Two 9 inch tapes with End of Tape marks close to the beginning of the tape.

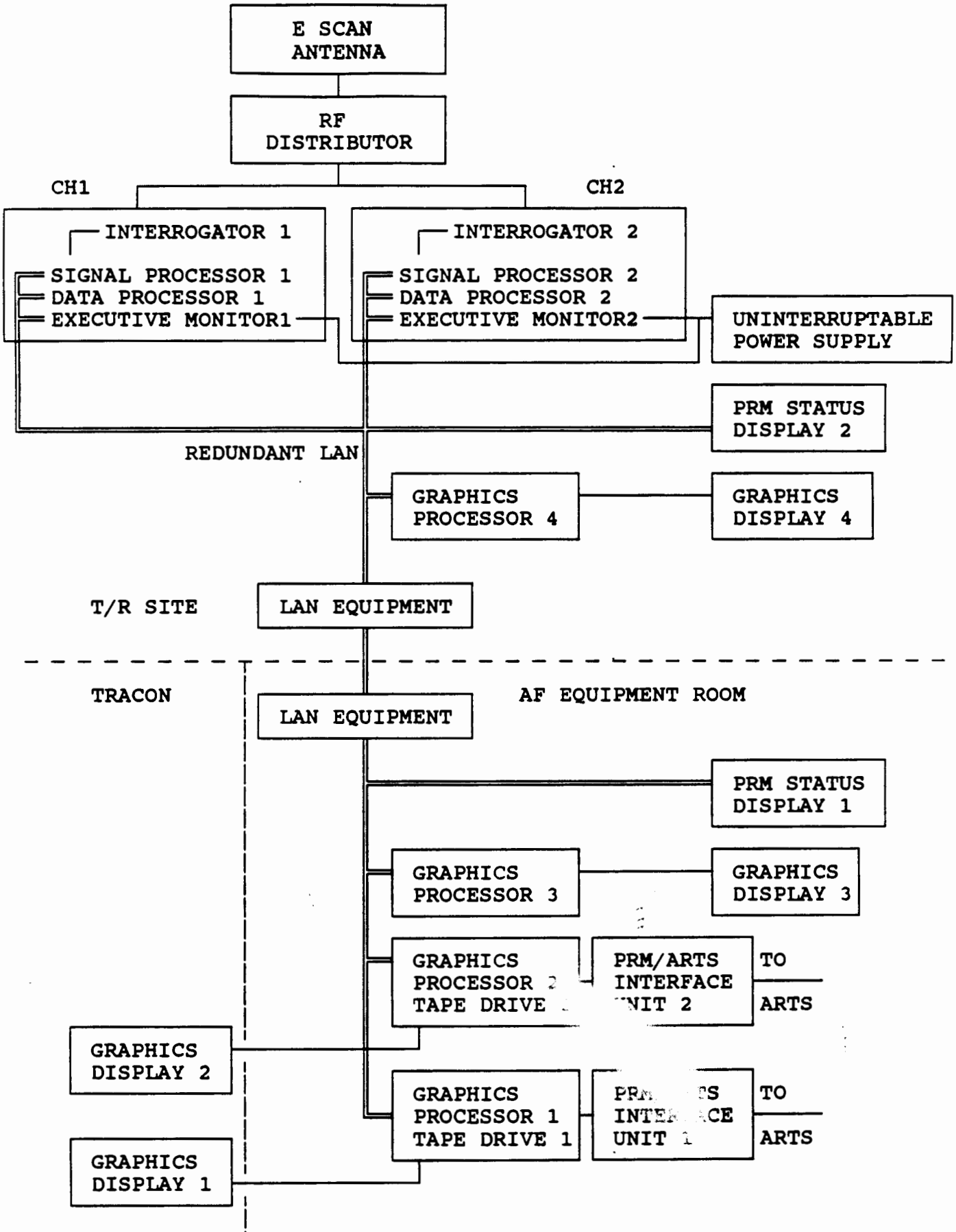


FIGURE 6.3.1.1.3-1 PSD OPERATIONAL TEST CONFIGURATION

6.3.1.1.4 Test Setup and Safety Considerations.

TC - Configure GP3 as the supervisory display.

TE - Insure that the alarm switches on the GP1 and GP2 displays are in the "off" position .

6.3.1.1.5 Data Collection (test procedures).

TC - Hand out the PRM Instruction Books to the Test Technicians to be used as an aid in troubleshooting and understanding the PRM functions. Begin the test procedures as follows:

1. **Single Lan Failure.**

a. TE - Insure that the complete PRM is operating correctly and that LAN 1 is in use.

b. TC - Have the Test Technicians monitor the PSD.

c. TE - Turn the power off at the LAN1 driver unit located in the auxiliary equipment cabinet.

d. Test Technicians - Use the PSD and the PRM Instruction Book to pinpoint the trouble source and location.

e. Test Technicians - Reset the faulted subsystem using the PRM Instruction Book.

f. TC - Enter notes in the test data log as appropriate.

g. TC - After the failure analysis, distribute Questionnaire-PSD1 to the Test Technicians and have them fill it out for the LAN failure.

2. **Tape Drive Failures.**

a. TE - Insure that the complete PRM is operating correctly using tape drive 1. To save time, shorten tape drive 1 and 2 by placing EOT marks neat BOT.

b. TC - Have the Test Technicians monitor the PSD.

c. TE - Place tape drive 1 off-line.

d. TE - Wait 2 minutes and put tape drive 2 off-line.

e. Test Technicians - Use the PSD and the PRM Instruction Book to pinpoint the trouble source and location.

f. Test Technicians - Reset the faulted subsystem using the PRM Instruction Book.

g. TC - Enter notes in the test data log as appropriate.

h. TC - After failure analysis, have the Test Technicians fill out Questionnaire PSD2 - Tape failures.

3. **Automatic Channel Change.**

a. TE - Insure that the complete PRM is operating correctly and that Channel 1 is in use.

b. TC - Have the Test Technicians monitor the PSD Monitor. Perform one fault at a time. Allow time for fault analysis for each fault.

c. TE - Fault Channel 1 by turning the IPA to "off".

d. TC - Enter notes in the test data log as appropriate.

e. Test Technicians - Use the PSD and the PRM Instruction Book to pinpoint the trouble source and location.

f. Test Technicians - Reset the faulted subsystem using the PRM Instruction Book.

g. TE - Fault channel 2 by depressing the data processor reset.

h. Repeat steps d - f for the 2nd listed failure (step g).

i. TC - After analysis of both faults, have the Test Technicians fill out Questionnaire PSD3 - Automatic channel changes.

4. **Standby Channel Failure.**

a. TE - Insure that the complete PRM is operating correctly and that Channel 1 is in use. Perform faults one at a time. Allow time for the Test Technicians to complete fault analysis for each fault.

b. TC - Have the Test Technicians monitor the PSD.

c. TE - Fault Channel 2 by turning off power supply A of interrogator

d. TC - Observe the Test Technicians and enter notes in the test data log as to their use of reference manuals and skills exhibited.

e. Test Technicians - Use the PSD and the PRM Instruction Book to pinpoint the trouble source and location.

f. Test Technicians - Reset the faulted subsystem using the PRM Instruction Book.

g. TE - Fault Channel 2 by depressing the SP reset.

h. Repeat steps d - f for the 2nd listed failure (step g).

i. TC - Have the Test Technicians fill out Questionnaire PSD4 under Standby Channel Faults.

5. **UPS Failure.**

a. TE - Insure that the complete PRM is operating correctly and that Channel 1 is in use. Two UPS failure modes will be induced.

b. TC - Have the Test Technicians monitor the PSD.

c. TE - Create a UPS failure status by turning off the commercial power supply to the UPS. Switch circuit breakers 25, 27, and 29 in power panel A to off.

d. Test Technicians - Use the PSD and the PRM Instruction Book to pinpoint the trouble source and location.

e. Test Technicians - Perform procedures in the UPS reference manuals to prepare the UPS prior to restoring power.

f. TE - Restore the commercial power to the UPS.

g. TC - Enter notes in the test data log as appropriate.

h. TC - Turn the manual By-pass switch to Bypass. This connects the PRM directly to the AC source at the power panel and will cause a failure alarm.

i. Test Technicians - Perform procedures in the UPS reference manual to prepare the UPS prior to restoring power.

j. TE - Restore the commercial power to the UPS.

k. TC - After the failure analysis, distribute Questionnaire PSD5 to the Test Technicians and have them fill it out for the UPS failure.

6. **GP Failures.**

a. **Metheus Driver Failure.**

1. TE - Insure that the complete PRM is operating correctly and that Channel 1 is in use.

2. TC - Have the Test Technicians monitor GP3.

3. TE - Turn the power off at the Metheus driver unit located in the auxiliary equipment cabinet.

4. Test Technicians - Use the PSD and the PRM Instruction Book to pinpoint the trouble source and location.

5. Test Technicians - Reset the faulted subsystem using the PRM Instruction Book.

6. TC - Enter notes in the test data log as appropriate.

b. **GP Dectalk Failure.**

1. TE - Insure that the complete PRM is operating correctly and that Channel 1 is in use.

2. TC - Have the Test Technicians monitor GP3.

3. TE - Disable the dectalk for GP1 by turning the unit off.

4. Test Technicians - Use the PSD and the PRM Instruction Book to pinpoint the trouble source and location.

5. Test Technicians - Reset the faulted subsystem using the PRM Instruction Book.

6. TC - Enter notes in the test data log as appropriate.

7. TC - After the failure analysis, distribute Questionnaire PSD6 to the Test Technicians and have them fill it out for the GP failures.

6. **Other LRU Failures.**

TC - Distribute Questionnaire PSD7 to the Test Technicians and have them fill it out.

6.3.1.1.6 Data Collection termination/Restart

Data collection can be terminated and restarted following the completion of a data collection "Fault Detection and Isolation" step.

6.3.1.1.7 Test Mission Log.
6.3.1.1.7.1 Pretest Section.

1. Date:___/___/___ Scheduled Start Time: ___:___.

2. Note any open items or test procedure discrepancies.

3. Enter the names of the assigned test conduct personnel:

Test Coordinator	Test Engineer - 1
Test Technician	Test Technician

4. Enter the PRM System Configuration Number _____.

5. Note any discrepancies from the test configurations.

6.3.1.1.7.2 Test Data Logs.

ACTION	START TIME
Enter notes during the Single LAN failure data collection.	____:____ (hh) (mm)
Enter notes during the Tape failure data collection.	____:____ (hh) (mm)
Enter notes during the Automatic Channel Change data collection.	____:____ (hh) (mm)
Enter notes during the Standby Channel Failure data collection.	____:____ (hh) (mm)
Enter notes during the UPS Failure data collection.	____:____ (hh) (mm)
Enter notes during the GP Failure data collection.	____:____ (hh) (mm)
Enter the time that the data collection was finished.	____:____ (hh) (mm)

6.3.1.1.7.3 Post Test Section.

1. Note any test procedure discrepancies encountered during the test conduct.

2. Enter a summary of the data collection.

3. Enter a preliminary assessment of the test results.

6.3.1.1.8 Questionnaires.

6.3.1.1.8.1 Questionnaire-PSD1. Name: Date / /

Single LAN Failure	YES	NO	The problem is....
Q1- PSD Status Reporting Suitable? Is the PSD Status Reporting (aural and visual) suitable in alerting you and reporting status for this failure?			
Q2- Fault Detection Training Effective? Was the training provided to you sufficient to understand the PSD status and run the PSD fault detection programs?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in running the PSD to detect this fault?			
Q4- PSD Fault Isolation Suitable? Is the PSD Fault Isolation Program suitable to isolate this fault?			
Q5- Fault Isolation Training Effective? Was the training provided to you sufficient to understand and run the PSD fault isolation programs for this fault?			
Q6- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in running the PSD to isolate this fault?			
Q7- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in physically locating the failed LRU?			
Q8- Subsystem Reset Training Effective? Was the training provided to you sufficient to perform a reset on this subsystem?			
Q9- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in resetting this subsystem?			
Q10- LAN Function Training? Was the training provided to you sufficient to understand the LAN's functions?			

6.3.1.1.8.2 Questionnaire-PSD2. Name: Date / /

Tape Drive Failures	YES	NO	The problem is....
Q1- PSD Status Reporting Suitable? Is the PSD Status Reporting (aural and visual) suitable in alerting you and reporting status for tape failures?			
Q1a- PSD Status Reporting Suitable? Is the PSD Status Reporting (aural and visual) suitable in alerting you and reporting status for tape full conditions?			
Q2- Fault Detection Training Effective? Was the training provided to you sufficient to understand the PSD status and run the PSD fault detection programs?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in running the PSD to detect these faults?			
Q4- PSD Fault Isolation? Is the PSD Fault Isolation Program suitable to isolate these faults?			
Q5- Fault Isolation Training? Was the training provided to you sufficient to understand and run the PSD fault isolation programs for these faults?			
Q6- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in running the PSD to isolate these faults?			
Q7- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in physically locating the failed LRU?			
Q8- Subsystem Reset Training Effective? Was the training provided to you sufficient to perform a reset on this subsystem?			
Q9- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in resetting this subsystem?			
Q10- Functional Training? Was the training provided to you sufficient to understand the Tape Drive's functions?			

6.3.1.1.8.3 Questionnaire-PSD3. Name: Date / /

Automatic Channel Change Failures	YES	NO	The problem is....
Q1- PSD Status Reporting Suitable? Is the PSD Status Reporting (aural and visual) suitable in alerting you and reporting status for these failures?			
Q2- Fault Detection Training Effective? Was the training provided to you sufficient to understand the PSD status and run the PSD fault detection programs?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in running the PSD to detect these faults?			
Q4- PSD Fault Isolation Suitable? Is the PSD Fault Isolation Program suitable to isolate these faults?			
Q5- Fault Isolation Training Effective? Was the training provided to you sufficient to understand and run the PSD fault isolation programs for these faults?			
Q6- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in running the PSD to isolate these faults?			
Q7- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in physically locating the failed LRUs?			
Q8- Subsystem Reset Training Effective? Was the training provided to you sufficient to perform a reset on this subsystem?			
Q9- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in resetting this subsystem?			
Q10- Functional Training? Was the training provided to you sufficient to understand the subsystem's functions?			

6.3.1.1.8.4 Questionnaire-PSD4. Name: Date / /

Standby Channel Failures	YES	NO	The problem is....
Q1- PSD Status Reporting Suitable? Is the PSD Status Reporting (aural and visual) suitable in alerting you and reporting status for these failures?			
Q2- Fault Detection Training Effective? Was the training provided to you sufficient to understand the PSD status and run the PSD fault detection programs?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in running the PSD to detect these faults?			
Q4- PSD Fault Isolation Suitable? Is the PSD Fault Isolation Program suitable to isolate these faults?			
Q5- Fault Isolation Training Effective? Was the training provided to you sufficient to understand and run the PSD fault isolation programs for these faults?			
Q6- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in running the PSD to isolate these faults?			
Q7- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in physically locating the failed LRUs?			
Q8- Subsystem Reset Training Effective? Was the training provided to you sufficient to perform a reset on this subsystem?			
Q9- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in resetting this subsystem?			
Q10- Functional Training? Was the training provided to you sufficient to understand the subsystem's functions?			

6.3.1.1.8.5 Questionnaire-PSD5. Name: Date / /

UPS Failures	YES	NO	oblem is....
Q1- PSD Status Reporting Suitable? Is the PSD Status Reporting (aural and visual) suitable in alerting you and reporting status for these failures?			
Q2- Fault Detection Training Effective? Was the training provided to you sufficient to understand the PSD status and run the PSD fault detection programs?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in running the PSD to detect these faults?			
Q4- PSD Fault Isolation Suitable? Is the PSD Fault Isolation Program suitable to isolate these faults?			
Q5- Fault Isolation Training Effective? Was the training provided to you sufficient to understand and run the PSD fault isolation programs for these faults?			
Q6- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in running the PSD to isolate these faults?			
Q7- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in physically locating the failed LRUs?			
Q8- Subsystem Reset Training Effective? Was the training provided to you sufficient to perform a reset on this subsystem?			
Q9- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in resetting this subsystem?			
Q10- Functional Training? Was the training provided to you sufficient to understand the UPS' functions?			

6.3.1.1.8.6 Questionnaire-PSD6. Name: Date / /

GP Failures	YES	NO	The problem is....
Q1- PSD Status Reporting Suitable? Is the PSD Status Reporting (aural and visual) suitable in alerting you and reporting status for these failures?			
Q2- Fault Detection Training Effective? Was the training provided to you sufficient to understand the PSD status and run the PSD fault detection programs?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in running the PSD to detect these faults?			
Q4- PSD Fault Isolation Suitable? Is the PSD Fault Isolation Program suitable to isolate these faults?			
Q5- Fault Isolation Training Effective? Was the training provided to you sufficient to understand and run the PSD fault isolation programs for these faults?			
Q6- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in running the PSD to isolate these faults?			
Q7- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in physically locating the failed LRUs?			
Q8- Subsystem Reset Training Effective? Was the training provided to you sufficient to perform a reset on this subsystem?			
Q9- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in resetting this subsystem?			
Q10- Functional Training? Was the training provided to you sufficient to understand the GP's functions?			

6.3.1.1.8.7 Questionnaire-PSD7. Name: Date / /

Other Failures Use the knowledge and experience you gained on the system during the PRM training to answer the following questions.	YES	NO	The problem is....
Q1- PSD Status Reporting Suitable? Is the PSD Status Reporting (aural and visual) suitable in alerting you and reporting status for other relevant PRM failures?			
Q2- Fault Detection Training Effective? Was the training provided to you sufficient to understand the PSD status and run the PSD fault detection programs?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in running the PSD to detect all relevant faults?			
Q4- PSD Fault Isolation Suitable? Is the PSD Fault Isolation Program suitable to isolate all relevant faults?			
Q5- Fault Isolation Training Effective? Was the training provided to you sufficient to understand and run the PSD fault isolation programs for all relevant faults?			
Q6- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in running the PSD to isolate all relevant faults?			
Q7- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in physically locating the all LRUs?			
Q8- Subsystem Reset Training Effective? Was the training provided to you sufficient to perform a all resets on the PRM?			
Q9- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in resetting the PRM?			
Q10- Functional Training? Was the training provided to you sufficient to understand the all the subsystem and relevant LRU's functions?			

6.3.1.1.9 Data Reduction and Analysis.

The TC will first analyze each test's Test Mission Log to determine whether the data collection was conducted acceptably. The data from data collection phases which were not concluded acceptably will not be included in any further analysis.

The Questionnaires will then be analyzed. This analysis will attempt to determine a consensus of Test Technician opinions for each question. In cases where the answers point to a difference of opinions the TC may review the questions with the Test Technicians to determine the consensus opinion.

6.3.1.1.10 Success Criteria.

This test will be successful if the analysis of the Questionnaires and Data Logs collected lead to a consensus of Test Technician opinions that verifies:

Req. #	Success Criteria	Pass	Fail
60	That the PRM PSD fault detection and isolation capabilities are suitable.		
61	That the PRM Instruction Book is detailed and comprehensive enough to assist a qualified technician to run the PRM fault detection and isolation programs.		
65	That the training provided enables the FAA Technicians to run the PRM fault detection and isolation programs.		
66	That the training provided enables the FAA Technicians to understand the functionality of the PRM system.		
APMT:		Date:	

6.3.1.2 LRU Replacement Tests.

The LRU Replacement Tests will be conducted to determine the suitability of the contractor provided training and the PRM Instruction book to enable a technician to replace LRUs in the PRM system. This test will consist of a few selected LRU replacements and Instruction Book walk-thrus. Note that the effectiveness of the Instruction Book's LRU replacement sections was determined during the Instruction Book validation and is reviewed as part of 6.1.1 (PRM Performance Verification).

6.3.1.2.1 Test Objectives.

The objectives of the LRU Replacement Tests are to determine (for each of the LRU replacement) the following:

a. Whether the PRM Instruction Book is detailed and comprehensive enough to assist a qualified technician to replace LRUs in the PRM system.

OT&E Requirements Tested: 62

b. The suitability and effectiveness of the training provided to the FAA technician on the functionality of the PRM system.

OT&E Requirements Tested: 66

6.3.1.2.2 Test Description.

This test will collect opinions from Test Technicians by having them replace selected LRUs in the PRM system. The Test Technicians will then fill out a Questionnaire for each LRU replacement. These questions investigate the suitability of the PRM Instruction Book and the effectiveness of the associated contractor provided training.

A sample group of LRUs is selected for replacement; another group is selected for a "procedural walk-thru", but not to make an actual replacement. The Test Technician will refer to the PRM Instruction Book step by step procedures to replace the designated LRUs. The Test Technician will refer to the theory of operation to gain an overall understanding of the LRU functionality. An overall system block diagram is referenced to locate the LRU placement area. The selected LRUs that make up the LRU Replacement Tests are:

a. LRUs to be Changed.

1. Auxiliary Cabinet Blower Assembly.
2. Interrogator IPA assembly.
3. Interrogator Power Supply A.

b. LRUs to be reviewed.

1. Sony CRT.
2. Metheus Graphics Engine.
3. RFD Phase shifter.

6.3.1.2.3 Test Resources.

The test equipment, facilities and personnel required to execute this test are listed in the tables below. A functional block diagram of the PRM test configuration is shown in figure 6.3.1.1.3-1

Test Equipment or Facilities	Purpose	Duration
PRM, Displays, PSD Monitor	Data Collection	2 hours

#	Type	Responsibility
1	Test Coordinator (TC)	Coordinate with AT, AF, TE
1	Test Engineer (TE)	Assist TC
2	FAA Test Technicians	Use PRM displays, PSD monitors

Other resources which are required to conduct this test are the following:

a. 4 - FAA PRM Maintenance Handbook.
b. 4 - PRM Instruction Books.
c. Handtools, including screwdriver.
d. Spare LRUs.
   Auxiliary Cabinet Blower Assembly.
   Interrogator IPA assembly.
   Interrogator Power Supply A.

6.3.1.2.4 Test Setup and Safety Considerations

TC - Configure GP4 as the supervisory display.

TE - Insure that the alarm switches on the GP1 and GP2 displays are in the "off" position .

TE - Insure that the directions in the PRM Instruction Book are followed carefully, i.e. remove power when necessary, use wrist straps where required, etc.

6.3.1.2.5 Data Collection

TC - Hand out the PRM Instruction Book to the Test Technicians to be used as an aid in replacing the selected LRU and understanding the LRU's functions.

Begin the test procedures as follows:

1. **Auxiliary Cabinet Blower Assembly.**

a. TE - Insure that the complete PRM is operating correctly.

b. TC - Have the Test Technicians look up the Auxiliary Cabinet Blower Assembly in the PRM Instruction Book and follow the directions for it's replacement.

c. TC - Enter notes in the test data log as appropriate.

d. TC - After the Test Technicians have completed the LRU replacement and reset the sub-system successfully distribute Questionnaire LRU1 to the Test Technicians and have them fill it out.

2. **Interrogator IPA Assembly.**

a. TE - Insure that the complete PRM is operating correctly.

b. TC - Have the Test Technicians look up the Interrogator IPA Assembly in the PRM Instruction Book and follow the directions for it's replacement.

c. TC - Enter notes in the test data log as appropriate.

d. TC - After the Test Technicians have completed the LRU replacement and reset the sub-system successfully distribute Questionnaire LRU2 to the Test Technicians and have them fill it out.

3. **Interrogator Power Supply A.**

a. TE - Insure that the complete PRM is operating correctly.

b. TC - Have the Test Technicians look up the Interrogator Power Supply A in the PRM Instruction Book and follow the directions for it's replacement.

c. TC - Enter notes in the test data log as appropriate.

d. TC - After the Test Technicians have completed the LRU replacement and reset the sub-system successfully distribute Questionnaire LRU3 to the Test Technicians and have them fill it out.

4. **Sony CRT.**

a. TC - Have the Test Technicians look up the Sony CRT in the PRM Instruction Book and walk-through the directions for it's replacement.

b. TC - Enter notes in the test data log as appropriate.

c. TC - After the Test Technicians have completed the LRU replacement walk-through distribute Questionnaire LRU4 to the Test Technicians and have them fill it out.

5. **Metheus Graphic Engine.**

a. TC - Have the Test Technicians look up the Metheus Graphics Engine in the PRM Instruction Book and walk-through the directions for it's replacement.

b. TC - Enter notes in the test data log as appropriate.

c. TC - After the Test Technicians have completed the LRU replacement walk-through distribute Questionnaire LRU5 to the Test Technicians and have them fill it out.

6. **RFD Phase Shifter.**

a. TC - Have the Test Technicians look up the RFD Phase Shifter in the PRM Instruction Book and walk-through the directions for it's replacement.

b. TC - Enter notes in the test data log as appropriate.

c. TC - After the Test Technicians have completed the LRU replacement walk-through distribute Questionnaire LRU6 to the Test Technicians and have them fill it out.

6. **Other LRU Changes.**

a. TC - Distribute Questionnaire LRU7 to the Test Technicians and have them fill it out.

6.3.1.2.7 Data Collection Termination/Restart.

Data collection can be terminated and restarted following the completion of a data collection "LRU Replacement" step.

6.3.1.2.7 Test Mission Log.
6.3.1.2.7.1 Pretest Section.

1. Date: __/__/__ Scheduled Start Time: __:__.

2. Note any open items or test procedure discrepancies.

3. Enter the names of the assigned test conduct personnel:

Test Coordinator	Test Engineer - 1
Test Technician	Test Technician

4. Enter the PRM System Configuration Number _____.

5. Note any discrepancies from the test configurations.

6.3.1.2.7.2 Test Data Logs.

ACTION	START TIME
Enter notes during the Auxiliary Cabinet Blower Assembly replacement.	: (hh) (mm)
Enter notes during the Interrogator IPA Assembly replacement.	: (hh) (mm)
Enter notes during the Interrogator Power Supply A replacement.	: (hh) (mm)
Enter notes during the Sony CRT replacement "walk-thru".	: (hh) (mm)
Enter notes during the Metheus Graphics Engine replacement "walk-thru".	: (hh) (mm)
Enter notes during the RFD Phase Shifter replacement "walk-thru".	: (hh) (mm)
Enter the time that the data collection was finished.	: (hh) (mm)

6.3.1.2.7.3 Post Test Section.

1. Note any test procedure discrepancies encountered during the test conduct.

2. Enter a summary of the data collection.

3. Enter a preliminary assessment of the test results.

6.3.1.2.8 Questionnaires.

6.3.1.2.8.1 Questionnaire LRU1.

Name: Date / /

Auxiliary Cabinet Blower Assembly Replacement	YES	NO	No, the problem is....
Q1- LRU Replace-ability? Was the LRU replaceable in a suitable manner?			
Q2- LRU Replacement Training Effective? Was the training provided to you sufficient to use the PRM Instruction Book and replace the LRU?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in replacing this LRU?			
Q4- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in physically locating the failed LRUs?			
Q5- Subsystem Reset Training Effective? Was the training provided to you sufficient to perform a reset on this subsystem?			
Q6- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in resetting this subsystem?			
Q7- LRU Functional Training? Was the training provided to you sufficient to understand the LRU's functions?			

6.3.1.2.8.2 Questionnaire LRU2.

Name: Date /

Interrogator IPA Assembly Replacement	YES	NO	...o, the problem is....
Q1- LRU Replace-ability? Was the LRU replaceable in a suitable manner?			
Q2- LRU Replacement Training Effective? Was the training provided to you sufficient to use the PRM Instruction Book and replace the LRU?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in replacing this LRU?			
Q4- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in physically locating the failed LRUs?			
Q5- Subsystem Reset Training Effective? Was the training provided to you sufficient to perform a reset on this subsystem?			
Q6- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in resetting this subsystem?			
Q7- LRU Functional Training? Was the training provided to you sufficient to understand the LRU's functions?			

6.3.1.2.8.3 Questionnaire LRU3.

Name: Date / /

Interrogator Power Supply A Replacement	YES	NO	No, the problem is....
Q1- LRU Replace-ability? Was the LRU replaceable in a suitable manner?			
Q2- LRU Replacement Training Effective? Was the training provided to you sufficient to use the PRM Instruction Book and replace the LRU?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in replacing this LRU?			
Q4- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in physically locating the failed LRUs?			
Q5- Subsystem Reset Training Effective? Was the training provided to you sufficient to perform a reset on this subsystem?			
Q6- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in resetting this subsystem?			
Q7- LRU Functional Training? Was the training provided to you sufficient to understand the LRU's functions?			

6.3.1.2.8.4.1 Questionnaire LRU4.

Name: Date / /

Sony CRT Replacement	YES	NO	No, the problem is....
Q1- LRU Replace-ability? Was the LRU replaceable in a suitable manner?			
Q2- LRU Replacement Training Effective? Was the training provided to you sufficient to use the PRM Instruction Book and replace the LRU?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in replacing this LRU?			
Q4- LRU Functional Training? Was the training provided to you sufficient to understand the LRU's functions?			

6.3.1.2.8.5 Questionnaire LRU5.

Name: Date / /

Metheus Graphics Engine Replacement	YES	NO	No, the problem is....
Q1- LRU Replace-ability? Was the LRU replaceable in a suitable manner?			
Q2- LRU Replacement Training Effective? Was the training provided to you sufficient to use the PRM Instruction Book and replace the LRU?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in replacing this LRU?			
Q4- LRU Functional Training? Was the training provided to you sufficient to understand the LRU's functions?			

6.3.1.2.8.6 Questionnaire LRU6.

Name: Date

RFD Phase Shifter Replacement	YES	NO, the problem is....
Q1- LRU Replace-ability? Was the LRU replaceable in a suitable manner?		
Q2- LRU Replacement Training Effective? Was the training provided to you sufficient to use the PRM Instruction Book and replace the LRU?		
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in replacing this LRU?		
Q4- LRU Functional Training? Was the training provided to you sufficient to understand the LRU's functions?		

6.3.1.2.8.7 Questionnaire LRU7.

Name: Date / /

Other LRU Replacements Use the knowledge and experience you gained on the system during the PRM training to answer the following questions.	YES	NO	No, the problem is....
Q1- LRU Replace-ability? Are the PRM's LRUs all replaceable in a suitable manner?			
Q2- LRU Replacement Training Effective? Was the training provided to you sufficient to use the PRM Instruction Book and replace all the PRM's LRUs?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in replacing all the PRM's LRUs?			
Q4- LRU Functional Training? Was the training provided to you sufficient to understand all the PRM's LRUs functions?			

6.3.1.2.9 Data Reduction and Analysi

The TC will first analyze each test's . Mission Log to determine whether the data collection was conducted ac bly. The data from data collection phases which were not con ed acceptably will not be included in any further analysis.

The Questionnaires will then be analyzed. This analysis will attempt to determine a consensus of Test Technician opinions for each question. In cases where the answers point to a difference of opinions the TC may review the questions with the Test Technicians to determine the consensus opinion.

6.3.1.2.10 Success Criteria.

This test will be successful if the analysis of the Questionnaires and Data Logs collected lead to a consensus of Test Technician opinions that verifies:

Req. #	Success Criteria	Pass	Fail
62	Whether the PRM Instruction book is suitable to assist a qualified technician in replacing any LRU in the system.		
66	Whether the training provided enables the FAA Technicians to understand the functionality of the PRM system.		
APMT:		Date:	

6.3.1.3 SYSTEM RELIABILITY ANALYSIS.

The System Reliability Analysis will be conducted to determine an estimated Mean Time Between Failure (MTBF) and Mean Time Between Critical Failure (MTCBF) for the Upgrade PRM system. A critical failure is defined as a failure of any subsystem of the PRM system which constitutes inhibition of the PRM operational mission. A non-critical failure is defined as any failure of any subsystem of the PRM which does not inhibit the PRM mission but requires a maintenance action to restore. Reliability data will be collected during the commissioning process as applicable and added to the data collected during the Contractor Site Acceptance Tests (Phase 4). The resultant data will then be analyzed and used to update and verify the contractor generated reliability analysis report.

6.3.1.3.1 Test Objectives.

The objective of the Reliability Analysis is to:

a. Determine whether the PRM System Reliability MTCBF is at least equivalent to existing Airport Surveillance Radar (ASR) monitor systems.

QVM Requirements Tested: 12

6.3.1.3.2 Test Description.

This test will consist of a review and analysis of the approved contractor final Reliability Demonstration Test Report. This report will include data collected during Phase 4 tests and data collected throughout the FAA commissioning process. The data will be collected, reviewed and analyzed as outlined in Precision Runway Monitor (PRM) Reliability Demonstration Test Plan/Test Procedures, PRM-RDTP-F1.00, November 30, 1992. The recorded results will determine whether the number of hours the PRM was operational can complete the reliability test. The planned number of hours for the PRM reliability analysis is 4000 hours. The condensed number of operational hours will be used for pass/failure criteria due to system commissioning time schedules. The PRM system availability will also be determined from the recorded data results.

6.3.1.3.3 Test Resources.

The equipment, facilities and personnel required to execute this test are listed in the tables below.

Equipment or Facility	Purpose	Duration
None		

#	Type	Responsibility
1	Test Engineer (TE)	Review reliability data and Test report

Other resources which are required to conduct this test are the following:

a. PRM Reliability Data Log
b. Final PRM Reliability Demonstration Test Report

6.3.1.3.4 Test Setup and Safety Considerations.

The TC will obtain copies of the required Reliability data and Test Report.

6.3.1.3.5 Data Collection.
The data for this test was collected by the PRM Contractor under government monitoring.

6.3.1.3.6 Data Collection Termination/Restart.

Not applicable to this test.

6.3.1.3.7 Test Mission Log.

Not applicable to this test.

6.3.1.3.8 Questionnaires.

Not applicable to this test.

6.3.1.3.9 Data Reduction and Analysis.

1. Enter the names of the assigned test conduct personnel:

TC:

2. Review the Reliability data and the Final PRM Reliability Demonstration Test Report to determine whether the PRM System Reliability MTCBF is at least 1000 hours MTCBF, and that the system's MTBF is at least 400 hours.

3. Enter the MTCBF, the MTBF, and the Availability (total hours) in the following table.

MTCBF(>1000 hrs)	
MTBF(>400 hrs)	
Availability (total hours)	

6.3.1.3.10 Success Criteria.

This test will be successful if the review of the Reliability data and the Final PRM Reliability Demonstration Test Report verify that:

OT&E Req. #	Success Criteria	Pass	Fail #
12	Whether the PRM System Reliability MTCBF is at least equivalent to existing Airport Surveillance Radar (ASR) monitor systems.		
APMT:	Date:		

6.3.2 PRM Certification Tests.

The FAA Maintenance Handbook contains the PRM certification parameters and procedures. These tests will demonstrate the capability of a FAA Technician to use the contractor provided training, the PRM Instruction Book and the FAA Maintenance Handbook to perform certifications and/or system alignments on the PRM system.

6.3.2.1 Test Objectives.

The objectives of the PRM Certification Tests are to determine (for each of the PRM Certifications) the following:

a. Whether the FAA PRM Maintenance Handbook is detailed and comprehensive enough to enable an FAA technician to perform periodic certifications.

OT&E Requirements Tested: 63

b. Whether the FAA PRM Maintenance Handbook is detailed and comprehensive enough to enable an FAA technician to perform subsystem and overall system certifications.

OT&E Requirements Tested: 64

c. The suitability and effectiveness of the training provided to the FAA technician on the functionality of the PRM system.

OT&E Requirements Tested: 66

6.3.2.2. Test Description.

This test will collect opinions from Test Technicians by having them perform certifications on the PRM system. The Test Technicians will then fill out a Questionnaire for each certification. These questions investigate the suitability of the FAA PRM Maintenance Handbook and the effectiveness of the associated contractor provided training. The selected PRM Certification are:

a. Overall System Certification.

b. Sub-system Certifications.

1. Transmitter Pulse Spacing.
2. Transmitter Frequency.

c. Periodic Certifications.

1. Receiver Bandwidth.
2. Receiver STC.

6.3.2.3 Test Resources.

The test equipment, facilities and personnel required to execute this test are listed in the tables below. A functional block diagram of the PRM test configuration is shown in figure 6.3.1.1.3-1

Test Equipment or Facilities	Purpose	Duration
PRM, Displays, PSD Monitor	Data Collection	2 hours

#	Type	Responsibility
1	Test Coordinator (TC)	Coordinate with AT, AF, TE
1	Test Engineer (TE)	Assist TC
2	FAA Test Technicians	Use PRM displays, PSD monitors

Other resources which are required to conduct this test are the following:

a. 4 - FAA PRM Maintenance Handbooks
b. 4 - PRM Instruction Books
c. Oscilloscope
d. CW Generator
e. Spectrum Analyzer

6.3.2.4 Test Setup and Safety Considerations.

TC - Configure GP3 as the supervisory display.

TE - Insure that the alarm switches on the GP1 and GP2 displays are in the "off" position .

TE - Insure that the directions in the PRM Instruction Book and FAA PRM Maintenance Handbook are followed carefully, i.e. remove power when necessary, use wrist straps where required, etc.

6.3.2.5 Data Collection.

1. **Overall System Certification.**

Overall certification can only be performed when it is known that all the PRM critical parameters have previously been verified to be within the values and time frames stated in the blue pages. If these values are known to be correct and timely, an overall certification can be performed by observing system operation on the graphic displays and checking the PSD printouts for error messages.

TC - Have the Test Technicians refer to the FAA Maintenance Handbook - Overall Certification. For test purposes, assume all transmitter and receiver critical parameters are correct and timely.

TC - Have the Test Technicians follow instructions in the FAA Maintenance Handbook and perform an overall operational certification. This should include checking the PSD for error printouts, checking the Graphic Displays for correct obstruction marks, runway alignment, parrot locations, etc.

TE - After the Test Technicians have completed the Overall System Certification successfully, distribute Questionnaire-CT1 to the Test Technicians and have them fill it out.

2. **Sub-system Certification.**

Critical subsystems such as the transmitter and receiver require recertification following any maintenance actions. Two transmitter parameters will be checked for these tests.

a. **Transmitter Pulse Spacing.**

Perform the certification per the FAA Maintenance Handbook using the PSD and the test equipment specified.

1. Locate the system parameters section in the FAA Maintenance Handbook blue pages.

2. Find Tx Pulse Spacing and note the requirements. Turn to the appropriate paragraph in the white pages and follow instructions.

3. Record the pulse spacing from the PSD and record below

P1 TO P2..... P1 TO P3 Mode C.....
P1 TO P3 Mode A.....

4. Perform the manual pulse spacing procedure and compare with the PSD readout. This test will require MBIT and the use of an oscilloscope to verify the PSD readout.

b. **Transmitter Frequency.**

1. Locate system parameters section in the FAA Maintenance Handbook blue pages.

2. Find Tx Frequency and note the requirements. Turn to the paragraph in the white pages and follow instructions.

3. Record the local oscillator frequency from the PSD below.

Frequency.....

4. Perform the manual transmitter frequency procedure and compare with the PSD readout. This test requires the use of MBIT and the spectrum analyzer to verify the PSD readout.

5. Fill out Questionnaire CT2.

3. **Periodic Certification.**

Time intervals have been established when a critical unit must be recertified. The following tests were selected to check the system against the stated blue page limits in the FAA Maintenance Handbook.

a. **Receiver Bandwidth.**

This test will require using MBIT, a CW generator, and an oscilloscope.

1. Locate the system parameters section in the FAA Maintenance Handbook blue pages.

2. Find Receiver Bandwidth and note the requirements. Turn to the paragraph in the white pages and follow instructions.

3. Perform the manual bandwidth procedure. Compare with the blue pages.

b. **Receiver STC.**

This test will require using MBIT, a CW generator, and an oscilloscope.

1. Locate the system parameters section in the FAA Maintenance Handbook blue pages.

2. Find Receiver STC and note the requirements. Turn to the paragraph in the white pages and follow instructions.

3. Perform the receiver STC procedure. Compare with the blue pages.

4. Fill out Questionnaire CT3.

6.3.2.6 Data Collection termination/Restart.

Data collection can be terminated and restarted following the completion of a data collection "Certification" step.

6.3.2.7 Test Mission Log.
6.3.2.7.1 Pretest Section.

1. Date: __/__/__ Scheduled Start Time: ___:___.

2. Note any open items or test procedure discrepancies.

3. Enter the names of the assigned test conduct personnel:

Test Coordinator	Test Engineer - 1
Test Contractor	FAA Technician
FAA Technician	

4. Enter the PRM System Configuration Number _____.

5. Note any discrepancies from the test configurations.

6.3.2.7.2 Test Data Logs.

ACTION	START TIME
Enter notes during the Overall System Certification test.	: (hh) (mm)
Enter notes during the Subsystem certification.	: (hh) (mm)
Enter notes during the Periodic certification tests.	: (hh) (mm)
Enter notes during the Questionnaire period.	: (hh) (mm)
Enter the time that the data collection (Questionnaires) was finished.	: (hh) (mm)

6.3.2.7.3 Post Test Section.

1. Note any test procedure discrepancies encountered during the test conduct.

2. Enter a summary of the Questionnaire data collection.

3. Enter a preliminary assessment of the test results.

6.3.2.7.7 Questionnaires.

6.3.2.7.7.1 Questionnaire CT1.

Name: Date / /

Overall System Certification	YES	NO	No, the problem is....
Q1- Overall System Certification? Given the PRM Instruction Book, the FAA Maintenance Handbook, and the required test equipment can you suitably perform a Overall System Certification on the PRM system?			
Q2- Training Effective? Was the training provided to you sufficient to use the PRM Instruction Book, the FAA Maintenance Handbook, and the required test equipment to perform a Overall System Certification on the PRM system?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in performing the Overall System Certification?			
Q4- FAA PRM Maintenance Handbook Suitable? Is the FAA PRM Maintenance Handbook detailed and comprehensive enough to assist you in performing the Overall System Certification?			
Q5- Certification Periodicity? Does the FAA PRM Maintenance Handbook suitably address when you must perform a Overall System Certification?			
Q6- Overall System Certification Suitable? Are test tools, documentation and procedures provided to you sufficient so that you are comfortable in making this Overall System Certification?			
Q7- Overall PRM Functional Training? Was the training provided to you sufficient to understand the full PRM's functions so that you are comfortable in making this Overall System Certification?			

6.3.2.7.7.2 Questionnaire CT2.

Name: Date /

Subsystem Certification	YES	NO	The problem is....
Q1- Subsystem Certification? Given the PRM Instruction Book, the FAA Maintenance Handbook, and the required test equipment can you suitably perform Subsystem Certifications on the PRM system?			
Q2- Training Effective? Was the training provided to you sufficient to use the PRM Instruction Book, the FAA Maintenance Handbook, and the required test equipment to perform Subsystem Certifications on the PRM system?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in performing the Subsystem Certifications?			
Q4- FAA PRM Maintenance Handbook Suitable? Is the FAA PRM Maintenance Handbook detailed and comprehensive enough to assist you in performing the Subsystem Certifications?			
Q5- Certification Periodicity? Does the FAA PRM Maintenance Handbook suitably address when you must perform Subsystem Certifications?			
Q6- Subsystem Certification Suitable? Are test tools, documentation and procedures provided to you sufficient so that you are comfortable in making these Subsystem Certifications?			
Q7- Overall PRM Functional Training? Was the training provided to you sufficient to understand the full PRM's functions so that you are comfortable in making these Subsystem Certifications?			

6.3.2.7.7.3 Questionnaire CT3.

Name: Date / /

Periodic Certification	YES	NO	No, the problem is....
Q1- Periodic Certification? Given the PRM Instruction Book, the FAA Maintenance Handbook, and the required test equipment can you suitably perform Periodic Certifications on the PRM system?			
Q2- Training Effective? Was the training provided to you sufficient to use the PRM Instruction Book, the FAA Maintenance Handbook, and the required test equipment to perform Periodic Certifications on the PRM system?			
Q3- PRM Instruction Book Suitable? Is the PRM Instruction Book detailed and comprehensive enough to assist you in performing the Periodic Certifications?			
Q4- FAA PRM Maintenance Handbook Suitable? Is the FAA PRM Maintenance Handbook detailed and comprehensive enough to assist you in performing the Periodic Certifications?			
Q5- Certification Periodicity? Does the FAA PRM Maintenance Handbook suitably address when you must perform Periodic Certifications?			
Q6- Periodic Certification Suitable? Are test tools, documentation and procedures provided to you sufficient so that you are comfortable in making these Periodic Certifications?			
Q7- Overall PRM Functional Training? Was the training provided to you sufficient to understand the full PRM's functions so that you are comfortable in making these Periodic Certifications?			

6.3.2.7.9 Data Reduction and Analysis.

The TC will analyze each test's Test Mission Log to determine whether the data collection was conducted acceptably. The data collection phases (test procedures) which were not concluded acceptably will not be included in any further analysis.

The Questionnaires will then be analyzed. This analysis will develop a consensus of opinions for each question. In cases where the answers are widely diverse, the TC may review the questions with the technicians to resolve any problem areas.

6.3.2.7.10 Success Criteria.

This test will be successful if the analysis of the Questionnaires and Data Logs collected lead to a consensus of technician opinions that verifies:

OT&E Req. #	Success Criteria	Pass	Fail #
63	That the FAA Maintenance Handbook shall enable a FAA Technician to perform periodic certifications.		
64	That the FAA PRM Maintenance Handbook shall enable a FAA Technician to perform subsystem and overall system certifications.		
66	That the training provided enables the FAA Technicians to understand the functionality of the PRM system.		
APMT:		Date:	

REQ #	OT&E REQUIREMENT	AT REQ #	OT&E INTEGRATION			AT OT&E OPERATIONAL					AF OT&E OPERATIONAL	
						NORMAL OPERATIONS			DEGRADED OPERATION		FAA	SYSTEM MAINT
			PERF	PRM-ARTS I/F	ATCBI INTER-FERE	TGT OF OPP	SIM	FLT	NON-CRIT	CRT	CERTIFY-ABILITY	REL/ AVAIL/ SUPPORT
1	The PRM shall be capable of providing coverage at the subject airport for all parallel runways which have a parallel approach application.	1						X				
2	Elevation coverage shall extend no higher than 50 feet above the airport surface to at least 1,500 feet above the highest initial approach altitude for any (ILS)/(MLS) approach used.	2	X									
3	Range coverage shall be up to 30 nmi's from runway end on the final approach course continuous to 5 nmi beyond the approach end on the departure/missed approach side of the airport.	3	X									
4	Azimuth coverage shall extend a minimum of 2 nmi to either side of the parallel runways final approach paths continuous through the missed approach courses.	4	X									
5	The area of nonreturn around the sensor shall not adversely affect the controllers capability to monitor final or initial missed approach courses.	5						X				
6	Sensor accuracy shall be verified to ensure correlation of target symbology with actual aircraft position, assuming the aircraft equipment has 0 error.	6	X									
7	Independent displays shall be provided for each monitor position.	7							X			
8	However, for availability a single display may be used for two monitor positions.	7							X			
9	System capacity shall be at least 25 tracked targets for dual operations.	8	X									
10	System capacity shall be at least 35 tracked targets for triple operations.	8										
11	System capacity shall be at least 50 tracked targets for quad operations.	8										
12	System reliability shall be at least equivalent to existing Airport Surveillance Radar (ASR) monitor systems.	9										X
13	System reliability shall consist of uninterruptable power source.	9	X									
14	System reliability includes fail safe capability (all display data retained when changing power source).	9	X									
15	System failures which compromise the safety of the PRM shall generate a visual alarm on the display.	10	X						X	X		
16	System failures which compromise the safety of the PRM shall generate an aural signal.	10	X						X	X		

REQ #	OT&E REQUIREMENT	AT REQ #	OT&E INTEGRATION			AT OT&E OPERATIONAL					AF OT&E OPERATIONAL	
						NORMAL OPERATIONS			DEGRADED OPERATION			
			PERF	PRM-ARTS I/F	ATCBI INTER-FERE	TGT OF OPP	SIM	FLT	NON-CRIT	CRT	FAA CERTIFY-ABILITY	SYSTEM MAINT REL/AVAIL/SUPPORT
17	In the event of a system overload or partial failure, an appropriate message shall be generated and displayed for the controller.	10	X	X					X	X		
18	The system shall not "bomb out," but will drop data based on its relative importance, temporarily reduce range, or otherwise allow the system to recover. Tracked targets shall not be affected.	10	X						X	X		
19	Tracked target recording, replay, and simulation shall be a capability.	11	X			X						
20	Resolution and display presentation shall enable a monitor controller to detect tracked target deviations from a course of 100 feet or less.	12	X									
21	The display shall be at least 18 inches in diameter or diagonally.	13	X									
22	The console shall not exceed the size of the current AT ARTS consoles.	13	X									
23	Each monitor position shall have operator controls and keypack units immediately accessible to the user.	14	X			X						
24	The display shall have full variable range and offset capability.	15	X			X						
25	The display presentation shall recover within 1sec after range change or offset.	15	X			X						
26	The display presentation shall provide sufficient contrast and brightness under normal TRACON ambient lighting conditions.	16				X						
27	The display presentation shall be free of reflection and glare.	16				X						
28	The display presentation shall be constant throughout the display area.	17				X						
29	The display presentation shall be clear of clutter.	17				X						
30	The display presentation shall be flicker free.	17				X						
31	The display presentation shall be of uniform brightness.	17				X						
32	The display presentation shall be well defined with no blooming.	17				X						
33	The system shall be relatively free of false targets or other spurious returns on the display.	18	X					X				
34	Display mapping shall be available for selection by the controller.	19	X			X						
35	The display map line widths and any associated alphanumerics shall be as small as practicable (but as large as required).	19	X			X						
36	The display map shall have variable intensity.	19	X			X						

REQ #	OT&E REQUIREMENT	AT REQ #	OT&E INTEGRATION			AT OT&E OPERATIONAL					AF OT&E OPERATIONAL	
			PERF	PRM-ARTS I/F	ATCBI INTER-FERE	NORMAL OPERATIONS			DEGRADED OPERATION		FAA	SYSTEM MAINT
						TGT OF OPP	SIM	FLT	NON-CRIT	CRT	CERTIFY-ABILITY	REL/ AVAIL/ SUPPORT
37	The display map shall include as a minimum: 1. Runway outlines of all runways within the coverage area of the PRM. 2. A broken line in 1/2 or 1mile increments, site selectable representing the final approach course to each runway used for simultaneous approaches. 3. Final approach fix and other appropriate fixes as displayed on ARTS. 4. Prominent obstructions. 5. An NTZ 2,000ft wide located equidistant between the runway centerlines. 6. An NOZ clearly distinguishable from the NTZ and displayed in increments of 200ft.	19	X									
38	Tracked targets shall automatically display associated ARTS data block information including LA and CA alerts when appropriate.	20		X			X					
39	(The tracked targets data block's) character size, intensity, data block offset, leader line length, and field inhibit shall be controller selectable at each display.	20	X			X						
40	Target symbology on the largest setting shall not exceed the approximate size of a large (B-757) type aircraft.	21	X									
41	The target symbol shall represent the most recent return for each track.	21	X									
42	Tracked target symbols shall have a track history displayed. The track history shall also be controllable from the keyboard or console. The use of the track history feature shall be optional on the controllers' part.	22	X			X						
43	The track history shall be variable in intensity and length from 0-16 hits.	22	X			X						
44	Tracked target symbols shall have a projected track vector generated from track history and ground speed.	23	X									
45	The projected track vector shall be displayed as a keyboard or console controlled variable length line.	23	X			X						
46	A track projected to enter the NTZ in 10 seconds shall uniquely change to alert the controller (flashing data block, color change, etc.).	24	X				X					
47	The above number of seconds shall be programmable from 0 to 16.	24	X			X						
48	Transponder emergency codes, transponder failures, and transponder non-returns shall be uniquely displayed to alert the controller.						X					
49	A distinctive voice alert shall sound only at the monitor position when a track is projected to enter the NTZ.	25	X				X					
50	The voice alert shall have a controllable volume switch at each operational position.	25	X			X						

REQ #	OT&E REQUIREMENT	AT REQ #	OT&E INTEGRATION			AT OT&E OPERATIONAL					AF OT&E OPERATIONAL	
						NORMAL OPERATIONS			DEGRADED OPERATION			
			PERF	PRM-ARTS I/F	ATCBI INTER-FERE	TGT OF OPP	SIM	FLT	NON-CRIT	CRT	FAA CERTIFY-ABILITY	SYSTEM MAINT REL/AVAIL/SUPPORT
51	Track deviations which infringe into the NTZ shall generate a printout of track data (data block information, etc.) and system parameter changes.	26	X			X						
52	The PRM system shall have a passive ARTS interface.	27		X								
53	The placement of the PRM shall not cause any degradation to the adjacent NAS ATCRB systems.				X							
54	Training shall be provided so that the controller fully understands the PRM display commands, controls and features.					X	X					
55	The Operator's Reference Card shall list the display commands and keystrokes in a clear and concise manner.					X						
56	The Operator's Manual shall detail the operation of the display commands, controls, and features in a clear and comprehensive manner.					X						
57	The PRM/NAS system shall be suitable and effective to support simultaneous ILS approaches at RDU.						X	X				
58	The Non-Critical Degradation States of the PRM/NAS system shall be suitable and effective to support simultaneous ILS approaches at RDU.								X			
59	The Critical Degradation States of the PRM/NAS system shall be suitable and effective to support reversion to staggered approaches at RDU.									X		
60	The PRM system shall be able to detect faults that effect operational capabilities and isolate them to the LRU level.		X									X
61	The PRM Instruction Book shall be detailed and comprehensive to assist a qualified technician to run the PRM fault detection and isolation programs.											X
62	The PRM Instruction Book shall be detailed and comprehensive to assist a qualified technician to replace any LRU in the system.											X
63	The FAA PRM Maintenance Handbook shall enable an FAA technician to perform periodic certifications.										X	
64	The FAA PRM Maintenance Handbook shall enable an FAA technician to perform subsystem and overall system certifications.										X	
65	Training shall be provided so that the FAA Technicians can run the PRM fault detection and isolation programs.											X
66	Training shall be provided so that the FAA Technicians understands the functionality of the PRM system.										X	X

APPENDIX B. ACRONYMS

AF Airways Facilities

ARTS Automated Radar Terminal System

AT Air Traffic

ATCBI Air Traffic Control Beacon Interrogator

CA Conflict Alert

C&PM Confidence and Performance Monitor

CSTD Coast Dropped (track)

DOT Department of Transportation

DT&E Development Test and Evaluation

ECP1 Engineering Change Proposal #1

FAA Federal Aviation Administration

GP (PRM) Graphics Processor

IB Instruction Book

IFR Instrument Flight Rules

I/F Interface

LA Low-altitude Alert

MDBM Multiplex Data Buffer Memory (ARTS device that the PRM interfaces to)

LRU Lowest Replaceable Unit

NAS National Airspace System

NC Non-deployment

NTZ No Transgression Zone

OT&E Operational Test and Evaluation

PRD Program Requirements Document

PRM Precision Runway Monitor

PSD PRM Status Display

QLR Quick Look Report

QVM Quality Verification Matrix

RDU Raleigh-Durham International Airport

SOW Statement of Work

UPS Uninterruptable Power Source

VDR Verification Discrepancy Report

VRTM Verification Requirements Traceability Matrix