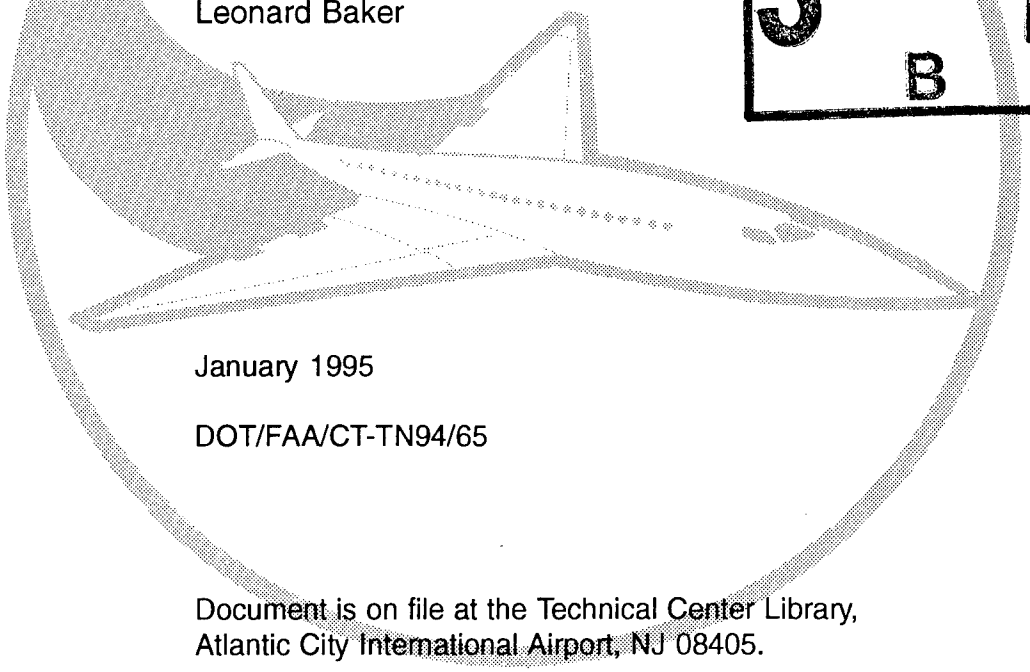
technical note technical note

# Operational Test and Evaluation (OT&E) Integration and Operational Test Procedures for Fixed Ground Antenna Radome (FGAR)



Leonard Baker



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16. Abstract

This document defines the Fixed Ground Antenna Radome (FGAR) integration and and operational test procedures that will be performed at the Federal Aviation Administration (FAA) Technical Center's En Route Beacon Test Facility (ERBTF) and field operational facilities. These test procedures will be performed following the Contractor's Acceptance Inspection (CAI).

The test configurations and their associated interfaces will be required to operate in as near an operational environment as possible. The testing includes the use of a specially equipped Radio Frequency Interference Monitoring (RFIM) van to measure primary and secondary radar electromagnetic performance parameters and the En Route Mode Select Beacon System (Mode S) installed at the Technical Center's Elwood ERBTF. In addition, the FGAR operational characteristics will be evaluated from a user's standpoint.



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## 1. INTRODUCTION.

Operational Test and Evaluation (OT&E) Integration and Operational testing of the Fixed Ground Antenna Radome (FGAR) will be performed at the Federal Aviation Administration (FAA) Technical Center's Elwood En Route Beacon Test Facility (ERBTF). Testing at the Elwood ERBTF will include electromagnetic performance testing using the Mode Select Beacon System (Mode S) sensors and the Air Route Surveillance Radar (ARSR). Additional testing will be conducted at the Northwest Mountain Regions Trinidad, Colorado (CO) en route radar facility (TAD). The Northwest Mountain Region's Spectrum Engineering Group, ANM-464, and the Albuquerque (ZAB) and Denver (ZDV) Air Traffic Control Centers (ARTCC) will support the Trinidad facility testing.

The objectives of OT&E testing are to verify the FGAR does not degrade the electromagnetic performance of the en route radar, Mode S, or the Air Traffic Control Radar Beacon System (ATCRBS) antenna(s); that it meets the other criteria specified in the OT&E Test Plan and the Test Verification Requirements Traceability Matrix (TVRTM).

OT&E Integration and Operational testing includes:

a. Electromagnetic performance

b. Physical characteristics

c. Human engineering

d. Physical Performance (transient protection)

## 2. REFERENCE DOCUMENTS.

### 2.1 FAA ORDERS.

| | |
|---|---|
| Order 1814.4B | FAA NAS Test and Evaluation Policy |
| Order 6050.32 | Spectrum Management Regulations and Procedures Manual |

### 2.2 FAA STANDARDS.

| | |
|---|---|
| FAA-STD-019b | Lightning Protection, Grounding, Bonding and Shielding Requirements for Facilities |
| FAA-STD-020a | Transient Protection, Grounding, Bonding and Shielding Requirements for Equipment |
| FAA-STD-024b | Content and Format Requirements for the Preparation of Test and Evaluation Documentation |

### 2.3 FAA SPECIFICATIONS.

| | |
|---|---|
| FAA-E-2773b | Specification for Fixed Ground Antenna Radome (Mode S Compatible) |
| FAA-G-2100e | Electronic Equipment, General Requirements |

### 2.4 OTHER FAA DOCUMENTS.

| | |
|---|---|
| DTFA01-93-C-0085 | Fixed Ground Antenna Radome (FGAR) Contract |

| | |
|---|---|
| DOT/FAA/CT-TN93/17 | Fixed Ground Antenna Radome (FGAR) Master Test and Evaluation Plan (TEMP) |
| DOT/FAA/CT-TN94/63 | Operational Test and Evaluation (OT&E) Integration and Operational Test Plan for Fixed Ground Antenna Radome (FGAR) |
| FAA-4306N-6H | National Airspace System - En Route - User's Manual, Quick Analysis of Radar Sites (QARS) Program |

2.5 DEPARTMENT OF DEFENSE (DOD) DOCUMENTS.

| | |
|---|---|
| MIL-STD-1472D | Human Engineering Design Criteria for Military Systems, Equipment, and Facilities |

## 3. SYSTEM DESCRIPTION.

### 3.1 SYSTEM OVERVIEW.

The FGAR supplies optimal protection from the outside environment while providing minimal degradation to the electromagnetic performance characteristics of the enclosed antenna(s). The hardware required for installation, i.e., cables, wiring, support equipment, radome mounted/supported equipment, radome base ring (Type II only), and spare parts are part of the FGAR procurement. There are five types of radomes (no Type IV radomes are being procured). They are the following:

a. Type I Radome.

This type of radome will provide an environmental enclosure for a collocated L-band surveillance radar parabolic reflector and top-mounted dual-faced L-band beacon phased array antenna. The radome will be capable of withstanding wind velocities of 150 miles per hour (MPH). They will have an inside diameter of 59 feet at their widest point, and will fit a base ring diameter equal to the present CW-396A radome. The enclosed antennas will rotate at a speed of either 5 or 6 revolutions per minute (RPM).

b. Type II Radome.

This type of radome will provide an environmental enclosure for a dual-faced L-band beacon phased array antenna consisting of two identical rectangular back-to-back antennas approximately 6 feet high by 27 feet wide, rotating at speeds up to 5 RPM. The radome will be capable of withstanding wind velocities of 150 MPH and have an inside diameter of 35 feet at its widest point. It will fit the standard beacon-only antenna platform.

c. Type III Radome.

This type of radome will be identical to the Type I in all respects, except that it will be capable of withstanding wind velocities of 100 MPH maximum.

d. Type V Radome.

This type of radome will provide an environmental enclosure for a collocated L-band radar reflector and top-mounted dual-faced L-band beacon phased array antenna. The radome will be capable of withstanding wind velocities of 150 MPH. They will have an inside

diameter of 57.5 feet at their widest point, and will fit a base ring diameter equal to the present ARSR-3 radome.

e. Type VI Radome.

This type of radome will be identical to the Type V in all respects, except that it will be capable of withstanding wind velocities of 100 MPH maximum.

## 3.2 INTERFACES OVERVIEW.

### 3.2.1 Mechanical Interface.

The Type I, III, V, and VI FGARs will interface mechanically with the existing antenna tower radome base ring. The Type II FGAR radome base ring is part of the procurement and will interface with the antenna tower.

### 3.2.2 Electrical Interface.

All types of FGARs interface electrically with the antenna tower /facility:

a. Electrical system

b. Lightning protection system

c. Remote Maintenance Monitoring System (RMMS)/Environmental Remote Monitoring Subsystem (ERMS)

A block diagram of the electrical interfaces is shown in figure 3.2.2-1.

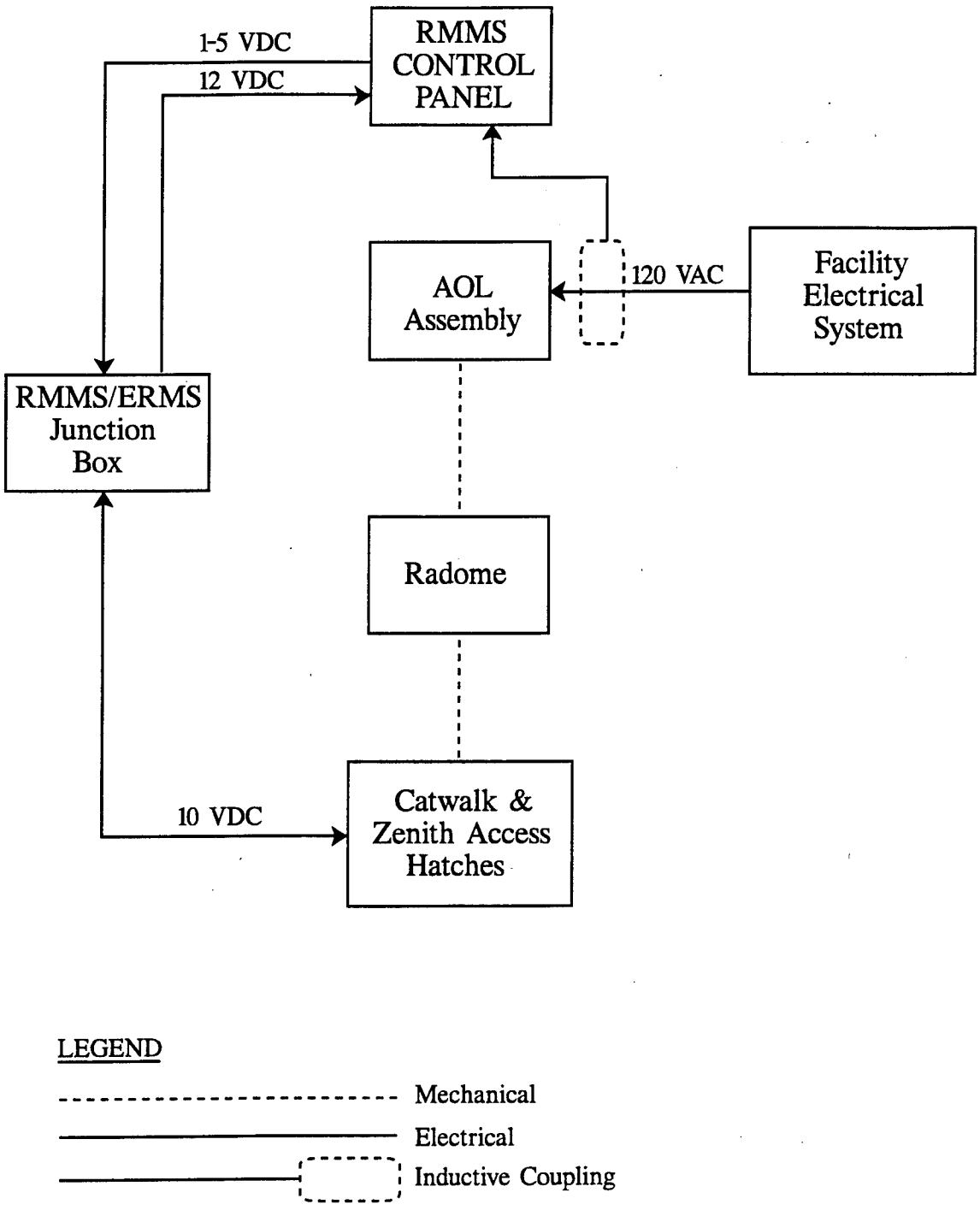


FIGURE 3.2.2-1 ELECTRICAL INTERFACES BLOCK DIAGRAM

## 4. TEST MANAGEMENT.

### 4.1 TEST DIRECTOR.

A Test Director (TD) will be appointed to supervise the testing. The TDs duties include:

a. Scheduling the required test facilities (see appendix A).

b. Assigning test team member duties.

c. Conducting pretest and post-test reviews.

d. Supervising conduct of the test.

e. Collection of test data, e.g., test team log sheets, computer printouts, automated test equipment printouts, plotter data, etc.

f. Analysis of test data and documentation.

### 4.2 COORDINATION.

The Technical On-Site Representative (TOR) will be responsible for coordinating all activities, e.g., shutdowns, etc., with Air Traffic Control (ATC) and Airway Facilities (AF) at the ARTCCs using the radars data, local AF personnel, and DOD air defense sites.

### 4.3 DEVIATIONS.

Not applicable.

### 4.4 DATA ELEMENTS.

Not applicable.

### 4.5 DATA BASE DESIGN AND STRUCTURE.

Not applicable.

### 4.6 INITIAL SETUP/CONFIGURATION.

The FGAR will be in the fully erected configuration, except for Phase 1 and 2 electromagnetic performance testing. Phase 1 and 2 electromagnetic performance testing will be accomplished prior to and during the installation. These phases are:

a. Phase 1 - Before removal of the existing radome.

b. Phase 2 - After the contractor has removed the existing radome, including any work scaffolding, crane booms, etc., required for its removal.

The remainder of the testing will be performed after the Contractor Acceptance Inspection (CAI) is completed.

### 4.7 TEST PERSONNEL REQUIREMENTS.

The personnel required for each phase of the testing are:

a. Elwood ERBTF.

This phase will be supported by electrical/electronic engineering and technicians assigned to ACW-100 and the Elwood ERBTF.

b. Trinidad En Route Radar Facility.

This phase will be supported by personnel from several organizations, specifically:

1. Electronic engineers from ACW-100.

2. Electronic engineers from ANM-464.

3. AF System Performance Specialists (SPS) and computer operators at the Albuquerque (ZAB) and Denver (ZDV) ARTCCs

4. ATC Specialists (ATCS) at the Albuquerque (ZAB) and Denver (ZDV) ARTCCs.

## 4.8 TEST SUPPORT HARDWARE, SOFTWARE, AND DOCUMENTATION.

The test support hardware and software required to support the testing are:

a. Elwood ERBTF.

1. Data reduction and analysis software programs used by ACW-100 for Mode S and primary radar testing (see appendix B).

2. Operational Mode S Sensors and Calibration Performance and Monitoring Equipment (CPME) sites.

3. Water tank truck with the capability of dispensing a stream of water into the air under high pressure, e.g., fire department pumper truck. (This will be used in the event it does not rain during the test period.)

4. Oscilloscope and/or spectrum analyzer and probes.

5. Digital multimeter (DMM).

6. Power supply capable of supplying 12V DC or a 12V battery.

b. Trinidad En Route Radar Facility.

1. Northwest Mountain Regions Spectrum Analysis and Interference Locator (SAIL) van. (Same as a Radio Frequency [RF] Interference Monitoring [RFIM] van.)

2. Albuquerque (ZAB) and Denver (ZDV) ARTCC HOST computers and the QARS program (see appendix B).

3. Albuquerque (ZAB) and Denver (ZDV) ARTCCs ATCS Plan View Displays (PVD).

## 4.9 DATA COLLECTION, RECORDING, AND REDUCTION.

The data collection, recording, and reduction will be accomplished as follows:

a. Elwood ERBTF.

1. Electromagnetic Performance.

The ACW-100 engineers supporting the testing will record and reduce the primary radar and Mode S data, using the programs listed in appendix B.

2. Physical Characteristics.

The physical characteristics test results will be recorded on the FGAR-1 form (see appendix C). Upon completion of the test the FGAR-1(s) form will be given to the TD for analysis.

3. Physical Performance.

The physical performance test results will be recorded on the FGAR-5 form (see appendix C). Upon completion of the test the FGAR-5 form(s) will be given to the TD for analysis.

b. Trinidad En Route Radar Facility.

1. Electromagnetic Performance.

(a) The ANM-464 engineers operating the SAIL van will record and reduce the primary and ATCRBS/Mode S data, using the specialized equipment and programs available used with the SAIL van.

(b) The Albuquerque (ZAB) and Denver (ZDV) ARTCC AF Sector (AFS) SPS staffs will run the QARS program on their HOST computers, using data from the Trinidad facility. (The QARS program analyzes the Common Digitizer (CD) data received from the radar site and evaluates the performance of the primary and secondary radars.)

(c) ATCSs at the Albuquerque (ZAB) and Denver (ZDV) ARTCCs will evaluate the video data displayed on their PVDs and record the results on FGAR-2 forms (see appendix C). When the testing is completed, the forms will be forwarded to the TD.

2. Physical Characteristics.

The physical characteristics test results will be recorded on the FGAR-1 form (see appendix C). Upon completion of the test the FGAR-1 form(s) will be given to the TD for analysis.

3. Physical Performance.

The physical performance test results will be recorded on the FGAR-5 form (see appendix C). Upon completion of the test the FGAR-5 form(s) will be given to the TD for analysis.

4. Human Engineering.

The human engineering test results will be recorded on the FGAR-3 and -4 forms (see appendix C). Upon completion of the test the FGAR-3 and -4 forms will be given to the TD for analysis.

## 4.10 ANALYSIS METHODS.

The data analysis will be accomplished as follows:

a. Elwood ERBTF.

1. Electromagnetic Performance.

The ACW-100 engineers supporting the test will analyze the data recorded, utilizing the data reduction programs described in appendix B. When the analysis has been completed, they will prepare a report and forward it, together with any printouts, strip charts, etc., to the TD.

2. Physical Characteristics.

The TD will analyze the FGAR-1 form(s) to verify all of the required nameplates, labels, etc., are installed and meet all of the requirements.

3. Physical Performance.

The TD will analyze the FGAR-5 form(s) to verify there are no transients on the Zenith and Catwalk Access Hatches cable, the Aircraft Obstruction Light (AOL) cable, or the output of the AOL Adjustable Linear Current Sensor.

b. Trinidad En Route Radar Facility.

1. Electromagnetic Performance.

(a) The ANM-464 engineers supporting the test will analyze the data recorded by their SAIL van. When the analysis has been completed, they will prepare a report and forward it, together with any printouts, strip charts, etc., to the TD.

(b) The Albuquerque (ZAB) and Denver (ZDV) ARTCCs SPS staff supporting the test will analyze the data supplied by the QARS program. When the analysis has been completed, they will prepare a report and forward it, together with copies of the QARS data summary sheets, to the TD.

(c) The TD will analyze the FGAR-2 forms completed by the Albuquerque (ZAB) and Denver (ZDV) ATCSs.

2. Physical Characteristics.

The TD will analyze the FGAR-1 form(s).

3. Physical Performance.

The TD will analyze the FGAR-5 form(s).

4. Human Engineering.

The TD will analyze the FGAR-3 and -4 forms.

5. ACRONYMS.

| | |
|---|---|
| AC | Alternating Current |
| ACP | Azimuth Change Pulse (QARS program) |
| AF | Airway Facilities |
| AFS | Airway Facilities Sector |
| ALT | Altitude (QARS program) |
| AOL | Aircraft Obstruction Light(s) |
| APG | Azimuth Pulse Generator |
| ARSR | Air Route Surveillance Radar |
| ARTCC | Air Route Traffic Control Center |
| ASPLT | Azimuth Split (QARS program) |
| ATC | Air Traffic Control |
| ATCBI | Air Traffic Control Beacon Interrogator |
| ATCRBS | Air Traffic Control Radar Beacon System |
| ATCS | Air Traffic Control Specialist |
| AUX | Auxiliary |
| AZ | Azimuth (QARS program) |
| BCN | Beacon (QARS program) |
| CAI | Contract Acceptance Inspection |
| CB | Circuit Breaker |
| CD | Common Digitizer |
| CH | Channel |
| CO | Colorado |
| COLL | Collimation (QARS program) |
| CONV | Convertor |
| CPME | Calibration Performance and Monitoring Equipment |
| CW | Radomes (military designation) |
| dB | Decibel |

| | |
|---|---|
| DC | Direct Current |
| DEV | Deviation (QARS program) |
| DMM | Digital Multimeter |
| DOD | Department of Defense |
| ERBTF | En Route Beacon Test Facility |
| ERMS | Environmental Remote Monitoring Subsystem |
| FAA | Federal Aviation Administration |
| FGAR | Fixed Ground Antenna Radome |
| GPS | Global Positioning System |
| HOST | Air Traffic Control HOST Computer (not an acronym) |
| M3REL | Mode 3/A Reliability Percentage (QARS program) |
| M3VAL | Mode 3/A Validity Percentage (QARS program) |
| MARDE | Mode S Analysis Recording Display Equipment (computer program) |
| MCREL | Mode C Relability Percentage (QARS program) |
| MCVAL | Mode C Validity (QARS program) |
| Mode S | Mode Select Beacon System |
| MOE | Measure of Effectiveness |
| MOP | Measure of Performance |
| MPH | Miles Per Hour |
| MTI | Moving Target Indicator (QARS program) |
| NADIF | National Aviation Facilities Experimental Center Dipole Feed |
| NAS | National Airspace System |
| NML | Normal (QARS program) |
| OT&E | Operational Test and Evaluation |
| PE | Permanent Echo (QARS program) |
| PVD | Plan View Display |
| QARS | Quick Analysis of Radar Sites (computer program) |
| R/R | Radar Reinforced (QARS program) |
| RAR | Ring-A-Round (QARS program) |
| REF | Reflections (QARS program) |
| RF | Radio Frequency |

| | |
|---|---|
| RFIM | Radio Frequency Interference Monitoring |
| RIT | Radar Intelligent Tool |
| RMMS | Remote Maintenance Monitoring System |
| RMS | Root Mean Square |
| RPM | Revolutions Per Minute |
| RSPLT | Range Split (QARS program) |
| RTADS | Real-Time Analysis Display System (computer program) |
| SAIL | Spectrum Analysis and Interference Locator |
| SCH | Combined Moving Target Indicator and Normal Video (QARS program) |
| SPS | Systems Performance Specialist |
| SUP | Suppressor |
| TAD | Trinidad En Route Radar Facility (identifier) |
| TB | Terminal Board |
| TD | Test Director |
| TDR | Test Discrepancy Report |
| TEMP | Test and Evaluation Master Plan |
| TOR | Technical On-Site Representative |
| TVRTM | Test Verification Requirements Traceability Matrix |
| V | Volt(s) |
| VAC | Volts Alternating Current |
| VDC | Volts Direct Current |
| XFER | Transfer |
| ZAB | Albuquerque Air Route Traffic Control Center (identifier) |
| ZDV | Denver Air Route Traffic Control Center (identifier) |
| ZER | Code Zero Percentage (QARS program) |

# APPENDIX A

# TEST PROCEDURES

TEST PROCEDURES

1. TEST TITLE.

EPEL-1A/B/C Elwood Primary (ARSR) Radar Electromagnetic Performance Tests

1.1 TEST OBJECTIVE.

The objective is to collect primary (ARSR) radar data with the existing inflatable radome, without a radome, and with the FGAR installed. The data will be analyzed and compared to verify the FGAR is not degrading the performance of the primary (ARSR) radar system.

1.2 MEASURE OF EFFECTIVENESS (MOE).

The FGAR does not degrade the performance of the primary (ARSR) radar antenna pattern.

1.3 MEASURE OF PERFORMANCE (MOP).

The difference between the following antenna pattern electromagnetic parameters, when measured without a radome and with the FGAR installed, are within specified limits:

a. Main beam width change.

b. Boresight error change.

c. Sidelobe level error change.

1.4 EVALUATION CRITERIA.

The following antenna pattern electromagnetic performance parameters when measured with the FGAR installed, as compared to no radome installed do not change more than:

a. Main beam width change of ±0.05° maximum.

b. Boresight error of 0.0085° root-mean-square (RMS) and 0.0255° maximum, in either the elevation or azimuth plane.

c. Sidelobe level error change of ±1 decibel (dB), using a sidelobe that is -25 dB from the main lobe of reference, for all frontal and back lobes.

1.5 PROCEDURES.

a. EPEL-1A, Inflatable Radome - Elwood Primary (ARSR) Radar Electromagnetic Performance Test.

1. This test will be conducted prior to the delivery of the FGAR. The data recording will be made with the radome both wet and dry. In the event there are no rain showers during the testing period, the radome will be wet down using an Atlantic City International Airport Fire Department pumper truck.

2. Electronic/electrical engineers assigned to ACW-100 will record primary (ARSR) radar data at the output of the CD-2 (see figure A1.5-1).

3. When the data has been collected, the ACW-100 engineers will analyze it using the Real-Time Analysis Display System (RTADS) and other software programs available at the Technical Center (see appendix B).

b. EPEL-1B, No Radome Installed - Elwood Primary (ARSR) Radar Electromagnetic Performance Test.

1. This test will be conducted after the contractor has removed the inflatable radome and any scaffolding, cranes, etc., required for its removal.

2. Electronic/electrical engineers assigned to ACW-100 will record primary (ARSR) radar data at the output of the CD-2 (see figure A1.5-1).

3. When the data has been collected, the ACW-100 engineers will analyze it using the RTADS and other software programs available at the Technical Center (see appendix B).

c. EPEL-1C, FGAR Installed - Elwood Primary (ARSR) Radar Electromagnetic Performance Test.

1. This test will be conducted after the FGAR is installed and the contractor has removed any scaffolding, cranes, etc., required for its installation. The data recording will be made with the radome both wet and dry. In the event there are no rain showers during the testing period, the radome will be wet down using an Atlantic City International Airport Fire Department pumper truck.

2. Electronic/electrical engineers assigned to ACW-100 will record primary (ARSR) radar data at the output of the CD-2 (see figure A1.5-1).

3. When the data has been collected, the ACW-100 engineers will analyze it using the RTADS and other software programs available at the Technical Center (see appendix B).

d. Data Analysis.

Upon completion of testing, the ACW-100 engineers will compare the existing radome measurements, to no radome installed measurements, to the FGAR installed measurements. They will submit a report, including any data sheets, strip charts, etc., to the TD. The report will compare the electromagnetic performance of the FGAR to the inflatable radome, and to no radome installed.

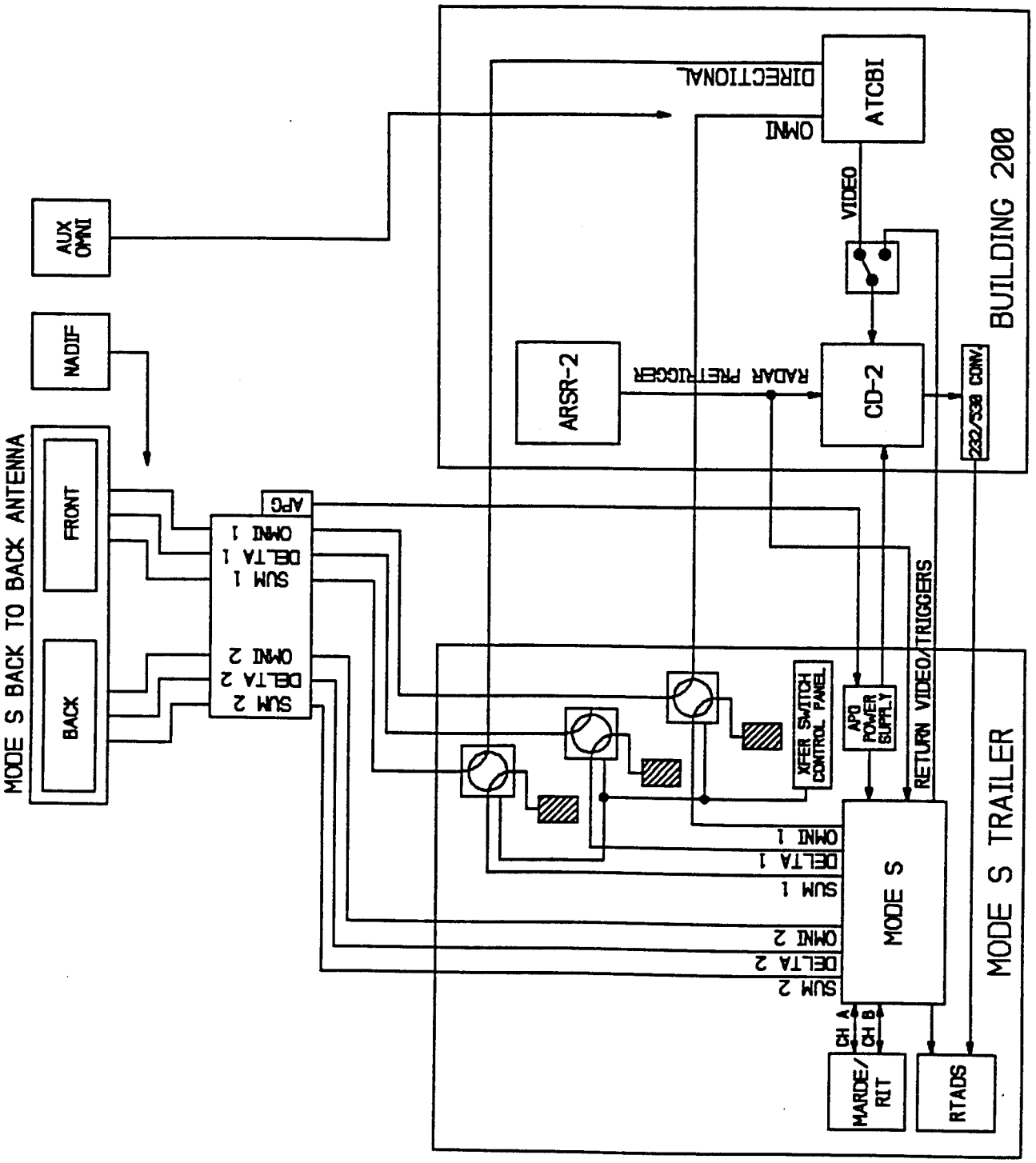


FIGURE A1.5-1 ELWOOD MODE S RF CONFIGURATION

2. TEST TITLE.

EPEL-2A/B/C Elwood Mode S Electromagnetic Performance Tests

2.1 TEST OBJECTIVE.

The objective is to collect Mode S data, using the CPMEs and the output of the CD-2, with the existing inflatable radome, without a radome, and with the FGAR installed. The data will be analyzed and compared to verify the FGAR is not degrading the performance of the Mode S system.

2.2 MOE.

The FGAR does not degrade the performance of the Mode S system.

2.3 MOP.

The difference between the following antenna pattern electromagnetic parameters, when measured without a radome and with the FGAR installed, are within specified limits:

a. Main beam width change.

b. Boresight error change.

c. Sidelobe level error change.

d. Azimuth pointing accuracy of the Mode S antenna is not degraded by the FGAR.

2.4 EVALUATION CRITERIA.

The following antenna pattern electromagnetic performance parameters, when measured with the FGAR installed, as compared to no radome, do not change more than:

a. Main beam width change of ±0.05° maximum.

b. Boresight error of 0.0085° root-mean-square (RMS) and 0.0255° maximum, in either elevation or azimuth.

c. Sidelobe level error change of ±1 decibel (dB), using a sidelobe that is -25 dB from the main lobe of reference, for all frontal and back lobes.

2.5 PROCEDURES.

a. EPEL-2A, Inflatable Radome - Elwood Mode S Electromagnetic Performance Test.

1. This test will be conducted prior to the delivery of the FGAR. The data recording will be made with the radome both wet and dry. In the event there are no rain showers during the testing period, the radome will be wet down using an Atlantic City International Airport Fire Department pumper truck.

2. Electronic/electrical engineers assigned to ACW-100 will record Mode S data at the output of the Mode S Data Extraction Port (see figure A1.5-1).

3. When the data has been collected, the ACW-100 engineers will analyze it using the Mode S Analysis Recording Display Equipment (MARDE) and other software programs available at the Technical Center (see appendix B).

b. EPEL-2B, No Radome Installed - Elwood Mode S Electromagnetic Performance Test.

1. This test will be conducted after the contractor has removed the inflatable radome and any scaffolding, cranes, etc., required for its removal.

2. Electronic/electrical engineers assigned to ACW-100 will record Mode S data at the output of the Mode S Data Extraction Port (see figure A1.5-1).

3. When the data has been collected, the ACW-100 engineers will analyze it using the MARDE and other software programs available at the Technical Center (see appendix B).

c. EPEL-2C, FGAR Installed - Elwood Mode S Electromagnetic Performance Test.

1. This test will be conducted after the FGAR is installed and the contractor has removed any scaffolding, cranes, etc., required for its installation. The data recording will be made with the radome both wet and dry. In the event there are no rain showers during the testing period, the radome will be wet down using an Atlantic City International Airport Fire Department pumper truck.

2. Electronic/electrical engineers assigned to ACW-100 will record Mode S data at the output of the Mode S Data Extraction Port (see figure A1.5-1).

3. When the data has been collected, the ACW-100 engineers will analyze it using the MARDE and other software programs available at the Technical Center (see appendix B).

d. Data Analysis.

Upon completion of testing, the ACW-100 engineers will compare the existing radome measurements, to no radome installed measurements, to the FGAR installed measurements. They will submit a report, including any data sheets, strip charts, etc., to the TD. The report will compare the electromagnetic performance of the FGAR to the inflatable radome, and to no radome installed.

## 3. TEST TITLE.

EPTD-1A/B/C/D/E Trinidad (TAD) Primary (ARSR) Radar Electromagnetic Performance Tests

## 3.1 TEST OBJECTIVE.

The objective is to collect primary (ARSR) radar electromagnetic performance data with the existing radome, without a radome, and with the FGAR installed. The measurements will be made with the Northwest Mountain Region's SAIL van. The data will be analyzed and compared to verify the FGAR is not degrading the performance of the primary (ARSR) radar system.

3.2 MOP.

The FGAR does not degrade the performance of the primary (ARSR) radar antenna pattern.

3.3 MOE.

The difference between the following antenna pattern electromagnetic parameters, when measured without a radome and with the FGAR installed, are within specified limits:

a. Main beam width change.

b. Boresight error change.

c. Sidelobe level error change.

3.4 EVALUATION CRITERIA.

The antenna pattern does not change without a radome and with the FGAR installed, more than:

a. Main beam width change of ±0.05° maximum.

b. Boresight error of 0.0085° root-mean-square (RMS) and 0.0255° maximum, in either elevation or azimuth.

c. Sidelobe level error change of ±1 decibel (dB), using a sidelobe that is -25 dB from the main lobe of reference, for all frontal and back lobes.

3.5 PROCEDURES.

These measurements will be made by Northwest Mountain Region Spectrum Engineering group, ANM-464, engineers using their SAIL van.

a. Electromagnetic Performance Tests.

1. The electromagnetic performance measurements will be made from at least three points, located approximately 120° apart, around the antenna tower. The locations from which the measurements are made will be marked by stakes and/or located by use of a Global Positioning System (GPS) receiver, so the SAIL van can be located in the exact same place, for all of the tests.

2. All measurements will be made during the same time of the day, if possible, to ensure humidity, temperature differences, etc., do not effect the measurements.

3. The electromagnetic performance tests are:

(a) EPTD-1A, Existing Radome - Trinidad (TAD) Primary (ARSR) Radar Electromagnetic Performance Test.

(1) This test will be conducted prior to the removal of the existing radome.

(2) Northwest Mountain Regions Spectrum Engineering group, ANM-464, engineers will measure the following electromagnetic performance parameters of the primary (ARSR) radar:

a. Main beam width

b. Boresight angle

c. Sidelobe level

(3) When the measurements have been completed, the ANM-464 engineers will analyze the data.

(b) EPTD-1B, No Radome Installed - Trinidad (TAD) Primary (ARSR) Radar Electromagnetic Performance Test.

(1) This test will be conducted after the contractor has removed the existing radome and any scaffolding, cranes, etc., required for its removal.

(2) Northwest Mountain Regions Spectrum Engineering group, ANM-464, engineers will measure the following electromagnetic performance parameters of the primary (ARSR) radar:

a. Main beam width

b. Boresight angle

c. Sidelobe level

(3) When the measurements have been completed, the ANM-464 engineers will analyze the data.

(c) EPTD-1C, FGAR Installed - Trinidad (TAD) Primary (ARSR) Radar Electromagnetic Performance Test.

(1) This test will be conducted after the FGAR is installed and the contractor has removed any scaffolding, cranes, etc., required for its installation.

(2) Northwest Mountain Regions Spectrum Engineering group, ANM-464, engineers will measure the following electromagnetic performance parameters of the primary (ARSR) radar.

a. Main beam width

b. Boresight angle

c. Sidelobe level

(3) When the measurements have been completed, the ANM-464 engineers will analyze the data.

b. Solar-Based Antenna Pattern Measurements.

1. The solar-based antenna pattern measurements will be made from one of the three points used for the electromagnetic performance tests. The locations from which the measurements are made will be marked by stakes and/or by use of a GPS receiver, so the SAIL van can be located in the exact same place, for all of the tests.

2. All measurements will be made during the same time of the day, if possible, to ensure humidity, temperature differences, etc., do not effect the measurements.

(a) EPTD-1D, No Radome Installed - Trinidad (TAD) Primary (ARSR) Radar Solar-Based Antenna Pattern Measurement Test.

(1) This test will be completed after the contractor has removed the existing radome and any scaffolding, cranes, etc., required for its removal.

(2) Northwest Mountain Regions Spectrum Engineering group, ANM-464, engineers will perform horizontal and vertical solar-based primary (ARSR) radar antenna measurements, using their SAIL van.

(3) When the measurements have been completed, the ANM-464 engineers will analyze the data.

(b) EPTD-1E, FGAR Installed - Trinidad (TAD) Primary (ARSR) Radar Solar-Based Antenna Pattern Measurement Test.

(1) This test will be conducted after the FGAR is installed and the contractor has removed any scaffolding, cranes, etc., required for its installation.

(2) Northwest Mountain Regions Spectrum Engineering group, ANM-464, engineers will perform horizontal and vertical solar-based primary (ARSR) radar antenna measurements, using their SAIL van.

(3) When the measurements have been completed, the ANM-464 engineers will analyze the data.

c. Data Analysis.

When all of the measurements have been completed, the ANM-464 engineers will compare the existing radome measurements, to no radome installed measurements, to the FGAR installed measurements. They will submit a report, including any data sheets, strip charts, etc., to the TD. The report will compare the electromagnetic performance of the FGAR to the existing radome, and to no radome installed.

4. TEST TITLE.

EPTD-2A/B/C/D/E Trinidad (TAD) ATCRBS/Mode S Electromagnetic Performance Tests

4.1 TEST OBJECTIVE.

The objective is to collect ATCRBS/Mode S electromagnetic performance data with the existing radome, without a radome, and with the FGAR installed. The measurements will be made with the Northwest Mountain Region's SAIL van. The

data will be analyzed and compared to verify the FGAR is not degrading the performance of the ATCRBS/Mode S.

4.2 MOP.

The FGAR does not degrade the performance of the ATCRBS/Mode S antenna pattern.

4.3 MOE.

The difference between the following antenna pattern electromagnetic parameters, when measured without a radome and with the FGAR installed, are within specified limits:

a. Main beam width change.

b. Boresight error change.

c. Sidelobe level error change.

4.4 EVALUATION CRITERIA.

The following antenna pattern electromagnetic performance parameters when measured with the FGAR installed, as compared to no radome installed do not change more than:

a. Main beam width change of ±0.05° maximum.

b. Boresight error of 0.0085° root-mean-square (RMS) and 0.0255° maximum, in either elevation or azimuth.

c. Sidelobe level error change of ±1 decibel (dB), using a sidelobe that is -25 dB from the main lobe of reference, for all frontal and back lobes.

4.5 PROCEDURES.

These measurements will be made by Northwest Mountain Regions Spectrum Engineering group, ANM-464, engineers using their SAIL van.

a. Electromagnetic Performance Tests.

1. The electromagnetic performance measurements will be made from at least three points, located approximately 120° apart, around the antenna tower. The locations from which the measurements are made will be marked by stakes and/or use of a GPS receiver, so the SAIL van can be located in the exact same place, for all of the tests.

2. All measurements will be made during the same time of the day, if possible, to ensure humidity, temperature differences, etc., do not effect the measurements.

3. The electromagnetic performance tests are:

(a) EPTD-2A, Existing Radome - Trinidad (TAD) ATCRBS/Mode S Electromagnetic Performance Test.

(1) This test will be conducted prior to the removal of the existing radome.

(2) Northwest Mountain Regions Spectrum Engineering group, ANM-464, engineers will measure the following electromagnetic performance parameters of the ATCRBS/Mode S:

a. Main beam width

b. Boresight angle

c. Sidelobe level

(3) When the measurements have been completed, the ANM-464 engineers will analyze the data.

(b) EPTD-2B, No Radome Installed - Trinidad (TAD) ATCRBS/Mode S Electromagnetic Performance Test.

(1) This test will be conducted after the contractor has removed the existing radome and any scaffolding, cranes, etc., required for its removal.

(2) Northwest Mountain Regions Spectrum Engineering group, ANM-464, engineers will measure the following electromagnetic performance parameters of the ATCRBS/Mode S:

a. Main beam width

b. Boresight angle

c. Sidelobe level

(3) When the measurements have been completed, the ANM-464 engineers will analyze the data.

(c) EPTD-2C, FGAR Installed - Trinidad (TAD) ATCRBS/Mode S Electromagnetic Performance Test.

(1) This test will be conducted after the FGAR is installed and the contractor has removed any scaffolding, cranes, etc., required for its installation.

(2) Northwest Mountain Regions Spectrum Engineering group, ANM-464, engineers will measure the following electromagnetic performance parameters of the ATCRBS/Mode S:

a. Main beam width

b. Boresight angle

c. Sidelobe level

(3) When the measurements have been completed, the ANM-464 engineers will analyze the data.

b. Solar-Based Antenna Pattern Measurements.

1. The solar-based antenna pattern measurements will be made from one of the three points used for the electromagnetic performance tests. The locations from which the measurements are made will be marked by stakes and/or use of a GPS receiver, so the SAIL van can be located in the exact same place, for all of the tests.

2. All measurements will be made during the same time of the day, if possible, to ensure humidity, temperature differences, etc., do not effect the measurements.

(a) EPTD-1D, No Radome Installed - Trinidad (TAD) ATCRBS/Mode S Solar-Based Antenna Pattern Measurement Test.

(1) This test will be completed after the contractor has removed the existing radome and any scaffolding, cranes, etc., required for its removal.

(2) Northwest Mountain Regions Spectrum Engineering group, ANM-464, engineers will perform horizontal and vertical solar-based ATCRBS/Mode S antenna measurements, using their SAIL van.

(3) When the measurements have been completed, the ANM-464 engineers will analyze the data.

(b) EPTD-1E, FGAR Installed - Trinidad (TAD) ATCRBS/Mode S Solar-Based Antenna Pattern Measurement Test.

(1) This test will be conducted after the FGAR is installed and the contractor has removed any scaffolding, cranes, etc., required for its installation.

(2) Northwest Mountain Regions Spectrum Engineering group, ANM-464, engineers will perform horizontal and vertical solar-based ATCRBS/Mode S antenna measurements, using their SAIL van.

(3) When the measurements have been completed, the ANM-464 engineers will analyze the data.

c. Data Analysis.

When all of the measurements have been completed, the ANM-464 engineers will compare the existing radome measurements, to no radome installed measurements, to the FGAR installed measurements. They will submit a report, including any data sheets, strip charts, etc., to the TD. The report will compare the electromagnetic performance of the FGAR to the existing radome, and to no radome installed.

5. TEST TITLE.

EPDV-1/2/3 Denver ARTCC (ZDV) QARS Program Test

5.1 TEST OBJECTIVE.

The objective is to determine if there are any differences in the accuracy in the primary (ARSR) and secondary (ATCRBS/Mode S) radar data being received from the Trinidad en route radar facility (TAD). A comparison will be made between the data received with the existing radome, without a radome, and with the FGAR installed.

5.2 MOE.

The FGAR does not effect the accuracy of the data received from the primary (ARSR) or secondary (ATCRBS/Mode S) radars.

5.3 MOP.

The accuracy of the primary (ARSR) and secondary (ATCRBS/Mode S) radars data being received by the ARTCC is the same, before and after the FGAR is installed.

5.4 EVALUATION CRITERIA.

There is no change in the accuracy of the data received from the primary (ARSR) or secondary (ATCRBS/Mode S) radars, without a radome or with the FGAR installed.

5.5 PROCEDURES.

a. EPDV-1, Existing Radome - Denver ARTCC (ZDV) QARS Program Test.

1. The ARTCC HOST computer operators will run the QARS program on data being received from the Trinidad en route radar facility (TAD), with the existing radome installed.

2. The QARS program printouts will be given to the AF SPS staff for analysis.

b. EPDV-2, No Radome Installed - Denver ARTCC (ZDV) QARS Program Test.

1. The ARTCC HOST computer operators will run the QARS program on data being received from the Trinidad en route radar facility (TAD), after the contractor has removed the existing radome and any scaffolding, cranes, etc., required for its removal.

2. The QARS program printouts will be given to the AF SPS staff for analysis.

c. EPDV-3, FGAR Installed - Denver ARTCC (ZDV) QARS Program Test.

1. The ARTCC HOST computer operators will run the QARS program on data being received from the Trinidad en route radar facility (TAD), after the contractor has installed the FGAR and removed any scaffolding, cranes, etc., required for its installation.

2. The QARS program printouts will be given to the AF SPS staff for analysis.

d. Data Analysis.

When the QARS program has been run on data with the existing radome, without a radome installed, and with the FGAR, the SPS staff will compare the data to determine if there is any change(s) in the accuracy or any other anomalies. Upon completion of the analysis, the SPS staff will submit a report to the TD, with copies of the QARS summary sheets.

6. TEST TITLE.

EPAB-1/2/3 Albuquerque ARTCC (ZAB) QARS Program Test

6.1 Test Objective.

The objective is to determine if there are any differences in the accuracy in the primary (ARSR) and secondary (ATCRBS/Mode S) radar data being received from the Trinidad en route radar facility (TAD). A comparison will be made between the data received with the existing radome, without a radome, and with the FGAR installed.

6.2 MOE.

The FGAR does not effect the accuracy of the data received from the primary (ARSR) or secondary (ATCRBS/Mode S) radars.

6.3 MOP.

The accuracy of the primary (ARSR) and secondary (ATCRBS/Mode S) radars data being received by the ARTCC is the same, before and after the FGAR is installed.

6.4 EVALUATION CRITERIA.

There is no change in the accuracy of the data received from the primary (ARSR) or secondary (ATCRBS/Mode S) radars, without a radome or with the FGAR installed.

6.5 PROCEDURES.

a. EPAB-1, Existing Radome - Albuquerque ARTCC (ZAB) QARS Program Test.

1. The ARTCC HOST computer operators will run the QARS program on data being received from the Trinidad en route radar facility (TAD), with the existing radome installed.

2. The QARS program printouts will be given to the AF SPS staff for analysis.

b. EPAB-2, No Radome Installed - Albuquerque ARTCC (ZAB) QARS Program Test.

1. The ARTCC HOST computer operators will run the QARS program on data being received from the Trinidad en route radar facility (TAD), after the contractor has removed the

existing radome and any scaffolding, cranes, etc., required for its removal.

2. The QARS program printouts will be given to the AF SPS staff for analysis.

c. EPAB-3, FGAR Installed - Albuquerque ARTCC (ZAB) QARS Program Test.

1. The ARTCC HOST computer operators will run the QARS program on data being received from the Trinidad en route radar facility (TAD), after the contractor has installed the FGAR and removed any scaffolding, cranes, etc., required for its installation.

2. The QARS program printouts will be given to the AF SPS staff for analysis.

d. Data Analysis.

When the QARS program has been run on data with the existing radome, without a radome installed, and with the FGAR, the SPS staff will compare the data to determine if there is any change(s) in the accuracy or other any anomalies. Upon completion of the analysis, the SPS will submit a report to the TD, with copies of the QARS summary sheets.

7. TEST TITLE.

ATDV-1 Denver ARTCC (ZDV) Air Traffic Control Specialist (ATCS) Evaluation Test

7.1 TEST OBJECTIVE.

The objective is to determine if there is a difference in the apparent strength of targets, loss of targets, or other changes of the primary (ARSR) and secondary (ATCRBS/Mode S) video data presented to the ATCSs, between the existing radome and the FGAR. The test will use targets of opportunity.

7.2 MOE.

The FGAR does not degrade the primary (ARSR) or secondary (ATCRBS/Mode S) radar video data presented to the ATCSs.

7.3 MOP.

The primary (ARSR) and secondary (ATCRBS/Mode S) radars video data strength appears the same to the ATCSs, lost/coasting targets do not increase, etc.

7.4 EVALUATION CRITERIA.

The primary (ARSR) and secondary (ATCRBS/Mode S) video data appears the same to the ATCSs. The number of lost/coasting targets do not increase. No other anomalies appear.

7.5 PROCEDURES.

a. ATDV-1, Denver ARTCC (ZDV) ATCS Evaluation Test.

1. The ATCSs who normally use the Trinidad en radar facility (TAD) data will evaluate the presentation of targets of opportunity on their PVDs.

2. The ATCSs will complete all three parts of the ATCS EVALUATION QUESTIONNAIRE (FGAR-2DV).

b. Data Analysis.

When the FGAR-2DV forms have been completed they will be forwarded by the ARTCC Plans and Program Section to the TD.

8. TEST TITLE.

ATAB-1 Albuquerque ARTCC (ZAB) Air Traffic Control Specialist (ATCS) Evaluation Test

8.1 TEST OBJECTIVE.

The objective is to determine if there is a difference in the apparent strength of targets, loss of targets, or other changes of the primary (ARSR) and secondary (ATCRBS/Mode S) video data presented to the ATCSs, between the existing radome and the FGAR. The test will use targets of opportunity.

8.2 MOE.

The FGAR does not degrade the primary (ARSR) or secondary (ATCRBS/Mode S) radar video data presented to the ATCSs.

8.3 MOP.

The primary (ARSR) and secondary (ATCRBS/Mode S) radars video data strength appears the same to the ATCSs, lost/coasting targets do not increase, etc.

8.4 EVALUATION CRITERIA.

The primary (ARSR) and secondary (ATCRBS/Mode S) video data appears the same to the ATCSs. The number of lost/coasting targets do not increase. No other anomalies appear.

8.5 PROCEDURES.

a. ATAB-1, Albuquerque ARTCC (ZAB) ATCS Evaluation Test.

1. The ATCSs who normally use the Trinidad en route radar facility (TAD) data will evaluate the presentation of targets of opportunity on their PVDs.

2. The ATCSs will complete all three parts if the ATCS EVALUATION QUESTIONNAIRE (FGAR-2AB).

b. When the FGAR-2AB forms have been completed they will be forwarded by the ARTCC Plan and Programs Section to the TD.

9. TEST TITLE.

PCNP-1/2 Physical Characteristics - Nameplate/Labeling Tests

9.1 TEST OBJECTIVE.

The objective is to verify that assemblies, e.g., AOL assembly, etc., cables, circuit breakers (CB), etc., are correctly and permanently labeled.

9.2 MOE.

The FGAR is properly labeled.

9.3 MOP.

The radome and the assemblies are properly label.

9.4 EVALUATION CRITERIA.

All of the assemblies, cables, CBs, etc., are correctly and permanently labeled.

9.5 PROCEDURES.

a. PCNP-1, Physical Characteristics - Assembly Nameplate/Labeling Test.

1. Inspect assemblies, e.g., AOL assembly, etc., to verify they have a nameplate containing:

(a) Equipment title

(b) Designation

(c) Serial number (if applicable)

2. Verify the nameplate is permanent, legible, and marked in a manner which will be unaffected by weather, etc.

3. Verify it is permanently affixed to the assembly.

4. Verify it is visible without having to disassemble or remove any parts, covers, etc.

5. Record the results on the FGAR-1 form.

b. PCNP-2, Physical Characteristics - Subassembly, Components, Etc., Labeling Test.

1. Inspect all cables, cable connectors, CBs, wires, terminal boards (TB), etc.

2. Verify they are permanently and legibly labeled with their appropriate designation, value, and/or other descriptive information, e.g., ON/OFF for switch positions, etc., as appropriate.

3. Record the results on the FGAR-1 form.

10. TEST TITLE.

HECT-1/2/3 Human Engineering - Clothing Constraints Tests

10.1 TEST OBJECTIVE.

The objective is to verify the design of the radome access hatches does not present a constraint to personnel in heavy winter clothing, when passing through the hatches.

10.2 MOE.

The hatches do not constrain the movement of personnel through the hatches.

10.3 MOP.

Personnel can open, close, and pass through the hatches easily.

10.4 EVALUATION CRITERIA.

a. Individuals have sufficient room to pass through the zenith service hatch in either direction, while wearing heavy winter clothing, e.g., parka, insulated suit, heavy winter gloves, etc.

b. Zenith hatch assembly mounted equipment can be serviced, repaired, removed, and/or replaced by an individual wearing heavy winter clothing, e.g., parka, insulated suit, heavy winter gloves, etc.

c. Individuals have sufficient room to pass through the catwalk access hatch in either direction, while wearing heavy winter clothing, e.g., parka, insulated suit, heavy winter gloves, etc.

d. Latch handles or other devices used to open/close the zenith service and catwalk access hatches can be opened/closed, from either side, by individuals wearing heavy winter gloves.

10.5 PROCEDURES.

a. HECT-1, Human Engineering - Zenith Hatch Assembly Test.

1. Have an AFS radar or environmental technician, wearing heavy winter clothing, e.g., parka, insulated suite, etc., pass through the zenith service hatch in both directions.

2. Inspect the zenith service hatch to verify there is sufficient clearance for an individual to service, repair, and/or remove zenith hatch assembly mounted equipment.

3. Have the AFS technician simulate changing an aircraft obstruction light lamp while wearing heavy winter clothing, e.g., parka, insulated suit, etc.

4. Record the results on the FGAR-3 form.

b. HECT-2, Human Engineering - Catwalk Access Hatch Test.

1. Inspect the catwalk access hatch to verify there is sufficient clearance for an individual wearing heavy winter clothing, e.g., parka, insulated suit, etc., to pass through.

2. Have an AFS radar or environmental technician, wearing heavy winter clothing, e.g., parka, insulated suite, etc., pass through the catwalk access hatch in both directions.

3. Record the results on the FGAR-3 form.

c. HECT-3, Human Engineering - Zenith Service and Catwalk Access Hatches Latch Handle Test.

1. Inspect the zenith service hatch latch handle to verify there is sufficient room for and individual wearing heavy winter gloves to operate the latch handle from inside or outside the radome.

2. Have an AFS radar or environmental technician, wearing heavy winter gloves operate the zenith service hatch latch handle from both sides of the hatch. (NOTE: In the interest of safety, this step may be accomplished with the technician standing on the ladder and the zenith service hatch standing in the open position.)

3. Inspect the catwalk access hatch latch handle to verify there is sufficient room for and individual wearing heavy winter gloves to latch/unlatch the hatch from inside or outside the radome.

4. Have an AFS radar or environmental technician, wearing heavy winter gloves latch and unlatch the catwalk access hatch from inside and outside the radome.

5. Record the results on the FGAR-3 form.

11. TEST TITLE.

HEET-1/2/3 Human Engineering - Electrical Tests

11.1 TEST OBJECTIVE.

The objective is to verify electrical equipment is designed and provided with safety features to prevent personnel from injury.

11.2 MOE.

Personnel are protected against accidental electrical shock.

11.3 MOP.

Personnel are protected against accidentally contacting exposed electrical terminals.

11.4 EVALUATION CRITERIA.

a. All switches, CBs, TBs, etc., with 30 volts (V) alternating current (AC) RMS or direct current (DC) or greater, present during normal operation have covers, shrink tubing, etc., to protect personnel from accidentally contacting current carrying parts, e.g., terminals, etc.

b. Caution labels are affixed to doors, or other means of access to equipment with 30V AC RMS or DC or greater, present during normal operation.

c. CB(s) are provided with a means of locking them in the open (de-energized) position.

11.5 PROCEDURES.

a. HEET-1, Human Engineering - Protection From Electrical Shock Test.

1. Inspect all switches, CB(s), TB(s), etc., with 30V AC RMS or DC present during normal operation, to verify they have covers, shrink tubing, etc., to protect individuals from accidently contacting current carrying parts.

2. Record the results on the FGAR-4 form.

b. HEET-2, Human Engineering - Electrical Caution Label Test.

1. Inspect all electrical cabinets, boxes, etc., with 30V AC RMS or DC or greater, present during normal operation to verify CAUTION labels are affixed to doors or other means of access.

2. Record the results on the FGAR-4 form.

c. HEET-3, Human Engineering - CB Lock Out Test.

1. Inspect all CBs to verify they are provided with a means of locking them in the open (de-energized) position.

2. Record the results on the FGAR-4 form.

12. TEST TITLE.

PPTP-1/2/3/4 Physical Performance - Transient Protection

12.1 TEST OBJECTIVES.

The objectives are to verify:

a. The RMMS zenith and catwalk access hatch cable is protected against induced electrical transients entering the RMMS/ERMS.

b. The AOL power cable is protected against induced electrical transients entering the facility electrical systems.

c. The output of the AOL Adjustable Linear Current Sensor is protected against induced electrical transients entering the facility electrical systems.

d. The AOL Adjustable Linear Current Sensor is not falsely triggered by induced electrical transients.

12.2 MOE.

a. The facility electrical, RMMS, and ERMS systems are protected against induced electrical transients entering on the radome cables.

b. The AOL Adjustable Linear Current Sensor is not triggered by induced electrical transients.

12.3 MOP.

a. There are no induced electrical transients induced into the facility electrical, RMMS, or ERMS systems.

b. Induced electrical transients do not trigger the RMMS Control Panel.

12.4 EVALUATION CRITERIA.

a. There are no induced electrical transients present on the zenith and catwalk access hatch cable when measured at TB4, RMMS Control Panel.

b. There are no induced electrical transients present on the AOL power cable when measured at TB1, RMMS Control Panel.

c. There are no induced electrical transients present in the output of the AOL Adjustable Linear Current Sensor when measured at TB4, RMMS Control Panel.

d. The AOL Adjustable Linear Current Sensor is not triggered by induced electrical transients.

12.5 PROCEDURES.

a. PPTP-1, Physical Performance - Zenith and Catwalk Access Hatch Cable Induced Electrical Transient Test.

1. The ARSR and ATCRBS/Mode S must be operating normally, with the antennas rotating.

2. Connect an oscilloscope or spectrum analyzer, using a X10 capacitive probe, to terminal 1, TB5, RMMS Control Panel (see figure A12.5-1).

3. Utilize various oscilloscope/spectrum analyzer control setting and monitor the oscilloscope/spectrum analyzer display for induced electrical transients. Record the results on the FGAR-5 form(s).

4. Connect the oscilloscope or spectrum analyzer, using a X10 capacitive probe, to terminal 2, TB5, RMMS Control Panel (see figure A12.5-1).

5. Utilize various oscilloscope/spectrum analyzer control setting and monitor the oscilloscope/spectrum analyzer display for induced electrical transients. Record the results on the FGAR-5 form(s).

6. Connect an oscilloscope or spectrum analyzer, using a X10 capacitive probe, to terminal 5, TB4, RMMS Control Panel (see figure A12.5-1).

7. Utilize various oscilloscope/spectrum analyzer control setting and monitor the oscilloscope/spectrum analyzer display for induced electrical transients. Record the results on the FGAR-5 form(s).

8. Connect the oscilloscope or spectrum analyzer, using a X10 capacitive probe, to terminal 6, TB4, RMMS Control Panel (see figure A12.5-1).

9. Utilize various oscilloscope/spectrum analyzer control setting and monitor the oscilloscope/spectrum analyzer display for induced electrical transients. Record the results on the FGAR-5 form(s).

b. PPTP-2, Physical Performance - AOL Power Cable Induced Electrical Transient Test.

1. The ARSR and ATCRBS/Mode S must be operating normally, with the antennas rotating.

2. Connect an oscilloscope or spectrum analyzer, using a X10 capacitive probe, to terminal 1, TB2, RMMS Control Panel (see figure A12.5-1).

3. Utilize various oscilloscope/spectrum analyzer control setting and monitor the oscilloscope/spectrum analyzer display for induced electrical transients. Record the results on the FGAR-5 form(s).

4. Connect the oscilloscope or spectrum analyzer, using a X10 capacitive probe, to terminal 3, TB2, RMMS Control Panel (see figure A12.5-1).

5. Utilize various oscilloscope/spectrum analyzer control setting and monitor the oscilloscope/spectrum analyzer display for induced electrical transients. Record the results on the FGAR-5 form(s).

6. Connect an oscilloscope or spectrum analyzer, using a X10 capacitive probe, to terminal 2, TB1, RMMS Control Panel (see figure A12.5-1).

7. Utilize various oscilloscope/spectrum analyzer control setting and monitor the oscilloscope/spectrum analyzer display for induced electrical transients. Record the results on the FGAR-5 form(s).

8. Connect the oscilloscope or spectrum analyzer, using a X10 capacitive probe, to terminal 4, TB1, RMMS Control Panel (see figure A12.5-1).

9. Utilize various oscilloscope/spectrum analyzer control setting and monitor the oscilloscope/spectrum analyzer display for induced electrical transients. Record the results on the FGAR-5 form(s).

c. PPTP-3, Physical Performance - AOL Adjustable Linear Current Sensor Induced Electrical Transient Test.

1. The ARSR and ATCRBS/Mode S must be operating normally, with the antennas rotating.

2. Connect the positive terminal of a 12V DC power supply or 12 volt battery to terminal 5, TB4, and the negative terminal to terminal 3, TB4, RMMS Control Panel (see figure A12.5-1).

3. Place CB1, RMMS Control Panel in the ON position and verify both AOL lamps are lighted.

4. Connect an oscilloscope or spectrum analyzer, using a X10 capacitive probe, to the terminal with the RED wire, LINE side, SUP2, RMMS Control Panel (see figure A12.5-1).

5. Utilize various oscilloscope/spectrum analyzer control setting and monitor the oscilloscope/spectrum analyzer display for induced electrical transients. Record the results on the FGAR-5 form(s).

6. Connect the oscilloscope or spectrum analyzer, using a X10 capacitive probe, to the terminal with the WHITE wire, LINE side, SUP2, RMMS Control Panel (see figure A12.5-1).

7. Utilize various oscilloscope/spectrum analyzer control setting and monitor the oscilloscope/spectrum analyzer display for induced electrical transients. Record the results on the FGAR-5 form(s).

8. Connect the oscilloscope or spectrum analyzer, using a X10 capacitive probe, to the terminal with the BLACK wire, LINE side, SUP2, RMMS Control Panel (see figure A12.5-1).

9. Utilize various oscilloscope/spectrum analyzer control setting and monitor the oscilloscope/spectrum analyzer display for induced electrical transients. Record the results on the FGAR-5 form(s).

10. Connect an oscilloscope or spectrum analyzer, using a X10 capacitive probe, to terminal 1, TB4, RMMS Control Panel (see figure A12.5-1).

11. Utilize various oscilloscope/spectrum analyzer control setting and monitor the oscilloscope/spectrum analyzer display for induced electrical transients. Record the results on the FGAR-5 form(s).

12. Connect the oscilloscope or spectrum analyzer, using a X10 capacitive probe, to terminal 2, TB4, RMMS Control Panel (see figure A12.5-1).

13. Utilize various oscilloscope/spectrum analyzer control setting and monitor the oscilloscope/spectrum analyzer display for induced electrical transients. Record the results on the FGAR-5 form(s).

14. Connect the oscilloscope or spectrum analyzer, using a X10 capacitive probe, to terminal 3, TB4, RMMS Control Panel (see figure A12.5-1).

15. Utilize various oscilloscope/spectrum analyzer control setting and monitor the oscilloscope/spectrum analyzer display for induced electrical transients. Record the results on the FGAR-5 form.

d. PPTP-4, Physical Performance - AOL Adjustable Linear Current Sensor False Triggering Test.

1. The ARSR and ATCRBS/Mode S must be operating normally, with the antennas rotating.

2. Connect the positive lead of a 12V DC power supply or 12 volt battery to terminal 5, TB4, and the negative terminal to terminal 3, TB4, RMMS Control Panel (see figure A12.5-1).

3. Place CB1, RMMS Control Panel in the ON position and verify both AOL lamps are lighted.

4. Set the controls of a DMM to measure 5V DC.

5. Connect the leads of the DMM to terminals 2 and 3, TB4, RMMS Control Panel (see figure A12.5-1).

6. Verify the DMM reads a constant 5V DC and does not jump to 1V DC (both lamps out) or 3V DC (one lamp out).

7. Record the results on the FGAR-5 form(s).

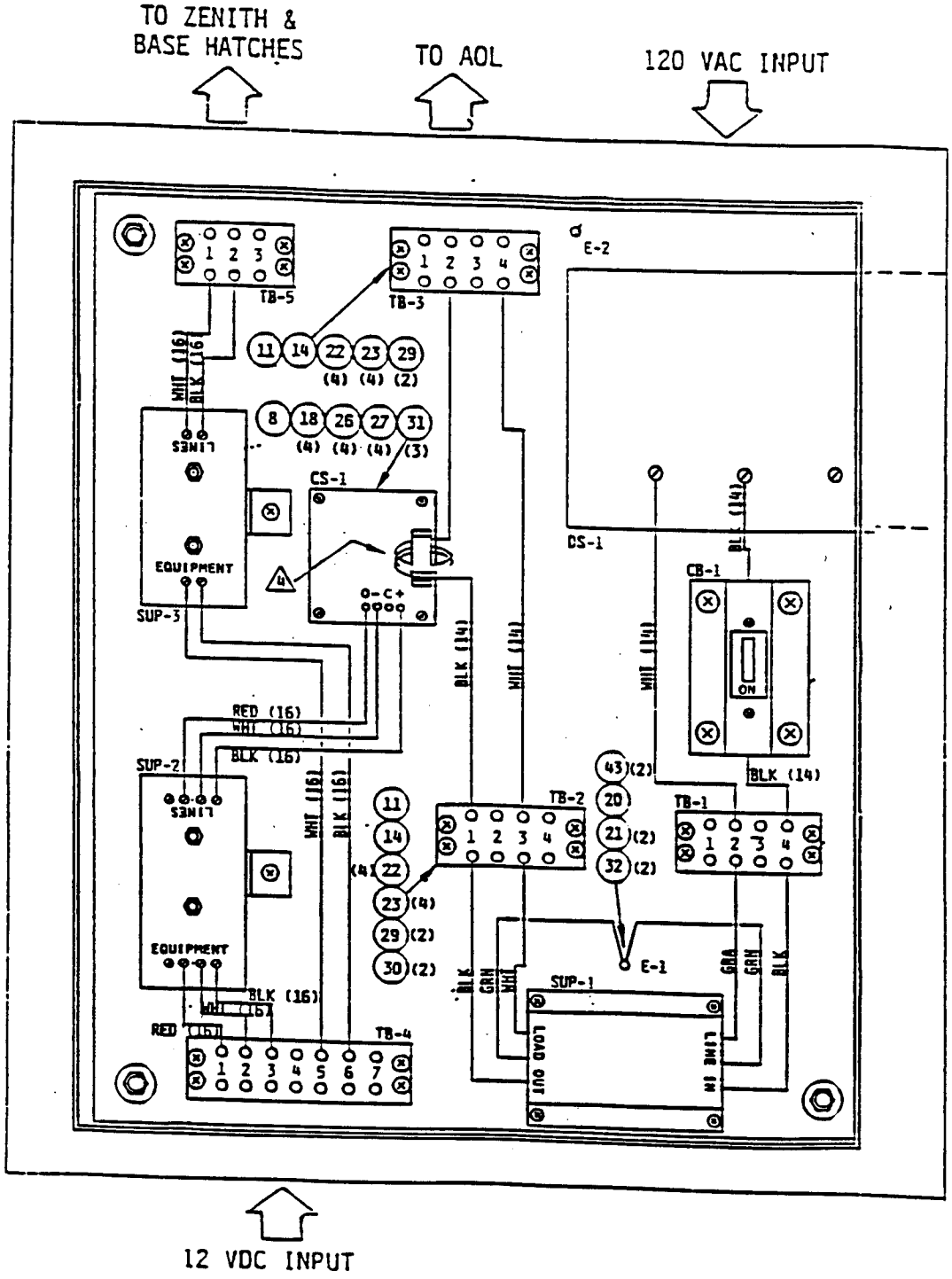


FIGURE A12.5-1 RMMS CONTROL PANEL

13. LIST OF TEST TITLES.

| | |
|---|---|
| ATAB-1 | Albuquerque ARTCC (ZAB) Air Traffic Control Specialist (ATCS) Evaluation Test |
| ATDV-1 | Denver ARTCC (ZDV) Air Traffic Control Specialist (ATCS) Evaluation Test |
| EPAB-1 | Existing Radome - Albuquerque ARTCC (ZAB) QARS Program Test |
| EPAB-2 | No Radome Installed - Albuquerque ARTCC (ZAB) QARS Program Test |
| EPAB-3 | FGAR Installed - Albuquerque ARTCC (ZAB) QARS Program Test |
| EPDV-1 | Existing Radome - Denver ARTCC (ZDV) QARS Program Test |
| EPDV-2 | No Radome Installed - Denver ARTCC (ZDV) QARS Program Test |
| EPDV-3 | FGAR Installed - Denver ARTCC (ZDV) QARS Program Test |
| EPEL-1A | Inflatable Radome - Elwood Primary (ARSR) Radar Electromagnetic Performance Test |
| EPEL-1B | No Radome Installed - Elwood Primary (ARSR) Radar Electromagnetic Performance Test |
| EPEL-1C | FGAR Installed - Elwood Primary (ARSR) Radar Electromagnetic Performance Test |
| EPEL-2A | Inflatable Radome - Elwood Mode S Electromagnetic Performance Test |
| EPEL-2B | No Radome Installed - Elwood Mode S Electromagnetic Performance Test |
| EPEL-2C | FGAR Installed - Elwood Mode S Electromagnetic Performance Test |
| EPTD-1A | Existing Radome - Trinidad (TAD) Primary (ARSR) Radar Electromagnetic Performance Test |
| EPTD-1B | No Radome Installed - Trinidad (TAD) Primary (ARSR) Radar Electromagnetic Performance Test |
| EPTD-1C | FGAR Installed - Trinidad (TAD) Primary (ARSR) Radar Electromagnetic Performance Test |
| EPTD-1D | No Radome Installed - Trinidad (TAD) Primary (ARSR) Radar Solar-Based Antenna Pattern Measurement Test |
| EPTD-1E | FGAR Installed - Trinidad (TAD) Primary (ARSR) Radar Solar-Based Antenna Measurement Test |
| EPTD-2A | Existing Radome - Trinidad (TAD) ATCRBS/Mode S Electromagnetic Performance Test |
| EPTD-2B | No Radome Installed - Trinidad (TAD) ATCRBS/Mode S Electromagnetic Performance Test |

| | |
|---|---|
| EPTD-2C | FGAR Installed - Trinidad (TAD) ATCRBS/Mode S Electromagnetic Performance Test |
| EPTD-2D | No Radome Installed - Trinidad (TAD) ATCRBS/Mode S Solar-Based Antenna Pattern Measurement Test |
| EPTD-2E | FGAR Installed - Trinidad (TAD) ATCRBS/Mode S Solar-Based Antenna Pattern Measurement Test |
| HECT-1 | Human Engineering - Zenith Hatch Assembly Test |
| HECT-2 | Human Engineering - Catwalk Access Hatch Test |
| HECT-3 | Human Engineering - Zenith Service and Catwalk Access Hatches Latch Handle Test |
| HEET-1 | Human Engineering - Protection From Electrical Shock Test |
| HEET-2 | Human Engineering - Electrical Caution Label Test |
| HEET-3 | Human Engineering - CB Lock Out Test |
| PCNP-1 | Physical Characteristics - Assembly Nameplate/Labeling Test |
| PCNP-2 | Physical Characteristics - Subassemblies, Components, Etc., Labeling Test |
| PPTP-1 | Physical Performance - Zenith and Catwalk Access Hatch Cable Induced Electrical Transient Test |
| PPTP-2 | Physical Performance - AOL Power Cable Induced Electrical Transient Test |
| PPTP-3 | Physical Performance - AOL Adjustable Linear Current Sensor Induced Electrical Transient Test |
| PPTP-4 | Physical Performance - AOL Adjustable Linear Current Sensor False Triggering Test |

# APPENDIX B

# DATA ANALYSIS PROGRAMS

## DATA ANALYSIS PROGRAMS

The programs that will be used to analyze the electromagnetic performance of the primary and secondary radars are described below.

1. Beacon False Target Summary - Analyzes false beacon targets in azimuth, i.e., target splits, ring around, uplink reflections, and downlink reflections. The uplink reflections are used to calculate the location and orientation of the reflectors. Range verses azimuth, range verses altitude, and azimuth verses altitude plots are provided for the false targets. The program also provides a plot of the reflections.

2. Mode S List - Prints the replies, reports, surveillance files, and disseminated reports. All of the information is contained on one line.

3. Mode S Extraction Plot - Plots replies and reports from a Mode S extraction file.

4. Monopulse Analysis - Analyzes the distribution of monopulse values for a stationary target. Plots of monopulse verses antenna azimuth, azimuth error verses antenna azimuth, absolute value of azimuth error verses antenna azimuth, mean and standard deviation, the Mode S sensor monopulse table, and scatter plots of the raw data points are provided.

5. Nine Point - Analyzes the range and azimuth accuracy of the target reports for a given target. The reference range and azimuth positions are determined using a nine point curve fit centered on the target report of interest.

6. Radar Analysis - Analyzes search performance on all tracks. Statistics are provided individually for each track and combined for all the tracks. A range verses azimuth plot is provided that contains track initiations, coasts, and drops.

7. Surveillance Analysis - Analyzes beacon and search performance for all beacon tracks. Statistics are provided individually for each track and combined into ATCRBS, Mode S, and total categories. Range verse azimuth, range verses altitude, and azimuth verses altitude plots are provided which contain track initiations, coasts, and drops.

8. Surveillance File Analysis - Analyzes the surveillance file and hence the tracking function of the Mode S sensor. Statistics are provided individually for each track and combined into ATCRBS, Mode S, and total categories.

9. Surveillance Print - Prints the replies, reports, surveillance files, and disseminated reports, using several lines for each. This printout contains similar, but more detailed information than the Mode S List program.

10. Quick Analysis of Radar Sites (QARS) Program - The QARS programs is divided into two sections, (1) verification of the radar system interface, and (2) Radar Data Analysis Summary routine which analyzes the beacon tracks.

    a. Radar System Interface Verification.

       The following applicable parameters are supplied:

       1. Site identification.

2. Beacon percentages.

   (a) Radar reinforced percentage

   (b) Mode 3/A validation percentage

   (c) Mode C validation percentage

   (d) Mode 2 validation percentage

3. Status summary - provides the status of the primary and secondary radars, and the CD.

b. Radar Data Analysis Summary.

The following parameters are supplied:

1. Adapted radar site name.

2. Video - The receiver videos used for the CD input.

   (a) Beacon (BCN)

   (b) Moving Target Indicator (MTI)

   (c) Normal (NML)

   (d) Combined MTI and Normal video (SCH)

3. Scans -

   (a) Beacon - total number of antenna revolutions for the period of time the beacon return was tracked.

   (b) Surveillance - will vary according to a targets range and elevation.

4. Blip/Scan - The percentage ratio of the number of times a target was detected (BLIP) to the number of times a target could have been detected (SCAN).

5. Radar Reinforced (R/R) - Ratio of number of beacon messages with the reinforced bit set to the total number of beacon messages received.

6. Collimation (COLL) - The collimation percentage for NML and MTI video.

7. Beacon split -

   (a) Azimuth Split (ASPLT)

   (b) Range Split (RSPLT)

8. False Beacon (FALSE-BCN) -

   (a) Ring-a-round (RAR)

   (b) Reflections (REF)

   (c) Code zero percentage (ZER)

9. Code Reliability -

   (a) Mode 3/A reliability percentage (M3REL)

   (b) Mode 3/A validity (M3VAL)

   (c) Mode C reliability percentage (MCREL)

   (d) Mode C validity (MCVAL)

10. Range - Beacon track start and stop histories.

11. Azimuth (AZ) - Beacon track start and stop histories.

12. Altitude (ALT) - Beacon track start and stop histories.

13. Deviation (DEV) - Mean difference of the predicted versus the actual position of a track.

14. Collimation Distribution - Variations of the closest surveillance return relative to the beacon return that was being tracked.

15. Permanent Echo (PE) Verification - Range of the adapted PE in whole and eighths of a mile, together with the mean error in whole and tenths of Azimuth Change Pulses (ACP).

16. The mean predicted versus actual position of all the tracks for the site.

# APPENDIX C

# TEST FORMS

PCNP-1/2 NAMEPLATE/LABELING TEST DATA SHEET
FGAR OT&E OPERATIONAL TEST

Test Site: _____

| Equipment Description | Expected Result | Result (Yes/No) |
|---|---|---|
| AOL Assembly | Labeled with equipment title. | |
| AOL Assembly | Labeling is permanent and weather resistant. | |
| | | |
| RMMS Control Panel | All components in the Control Panel are correctly labeled. | |
| RMMS Control Panel | Panel has permanent nameplate on the outer cover, with FA- type number and serial number permanently imprinted. | |
| RMMS Control Panel | Labeling is permanent and clearly legible. | |
| | | |
| Radome | Switches, etc., are permanently and legibly labeled. | |

COMMENTS: _____

TEST EQUIPMENT

| |
|---|
| No test equipment is required for this test. |

_____ _____
Operator (Name, Title, Organization) Date

FGAR-1

ATCS EVALUATION QUESTIONNAIRE
FGAR OT&E OPERATIONAL TEST

## BACKGROUND

The FAA is currently replacing the en route radar facility radomes. The first radome installed was at the FAA Technical Center's En Route Radar Beacon Test Facility. The second radome was installed at the Trinidad En Route Radar Facility, this installation began on October 17, 1994.

The radomes were developed and manufactured by the Electronic Space Systems Corporation (ESSCO) located in Concord, MA. Because the new radomes can affect the primary and secondary (beacon) radar electromagnetic antenna patterns, the FAA and ESSCO conducted an extensive Development Test and Evaluation (DT&E) program. There were no problems detected in the DT&E that would affect radar system performance. All Operational Test and Evaluation (OT&E) testing conducted to date indicate an improved system.

This questionnaire is looking for your evaluation of the displayed primary and secondary radar air traffic control data. We are looking for any changes that may have occurred between what you were use to seeing with the old radome and what you are see now.

The questionnaire is divided into three parts: Primary Radar Evaluation, Secondary (Beacon) Radar Evaluation, and Overall Evaluation. The questionnaire is very subjective - it's main purpose is to detect any changes that should be addressed prior to integrating the new radomes into the National Air Space (NAS) system.

ATCS EVALUATION QUESTIONNAIRE
FGAR OT&E OPERATIONAL TEST

Test Number: ATAB-1

Test Title: Albuquerque ARTCC (ZAB) ATCS Evaluation Tests

Test Site: Trinidad En Route Radar Facility (TAD)

Evaluator's Name: _____

## PART I - PRIMARY RADAR EVALUATION

1. Has the detection of primary targets changed, i.e., more or less: target drops, detection at various altitudes, less detection as target range increases?

   YES/NO (circle one)

   Comments: _____

   _____

2. Has the displayed primary track trajectories changed, i.e., track histories: are they following a straight or arched path smoothly, or do they appear to be shifting back and forth in azimuth from scan to scan?

   YES/NO (circle one)

   Comments: _____

   _____

3. Has the number of primary false targets changed, i.e., false targets appearing more frequently or at undesirable locations?

   YES/NO (circle one)

   Comments: _____

   _____

4. Are the primary Permanent Echo's (PE) where they were before?

   YES/NO (circle one)

   Comments: _____

   _____

## PART II - SECONDARY (BEACON) RADAR EVALUATION

1. Has the detection of beacon targets changed, i.e., more or less: target drops, detection at various altitudes, less detection as target range increases?

   YES/NO (circle one)

   Comments: _____

   _____

2. Has the displayed beacon track trajectories changed, i.e., track histories: are they following a straight or arched path smoothly, or do they appear to be shifting back and forth in azimuth from scan to scan?

   YES/NO (circle one)

   Comments: _____

   _____

3. Has the number of beacon false targets changed, i.e., target splits, code swaps, incorrect code changes, false targets appearing more frequently, or at undesirable locations?

   YES/NO (circle one)

   Comments: _____

   _____

4. Are you experiencing any beacon target ring-around <u>not</u> seen before?

   YES/NO (circle one)

   Comments: _____

   _____

5. Are the beacon Permanent Echo's (PE) they were before?

   YES/NO (circle one)

   Comments: _____

   _____

6. Does the radar to beacon reinforcement appear the same?

   YES/NO (circle one)

   Comments: _____

   _____

## PART III - OVERALL EVALUATION

1. Do you detect any degradation in the data displayed not experienced before?

   YES/NO (circle one)

   Comments: _____

   _____

2. Since the new radome has been installed, taking into account the limited time you have had in performing your air traffic control duties with the new radome, do you see or know of any reasons why the FAA should not continue the replacement of en route radomes?

   YES/NO (circle one)

   Comments: _____

   _____

3. Do you have additional questions you believe should be added to this questionnaire?

   YES/NO (circle one)

   Comments: _____

   _____

   _____

If you have any questions concerning this questionnaire or the En Route Radome Replacement program, contact Len Baker (609-485-5353) at the FAA Technical Center's, Secondary Surveillance Systems Division, ACW-100, Atlantic City International Airport, New Jersey 08405.

**Thank you for taking your time to provide us with this valuable information.**

ATCS EVALUATION QUESTIONNAIRE
FGAR OT&E OPERATIONAL TEST

## BACKGROUND

The FAA is currently replacing the en route radar facility radomes. The first radome installed was at the FAA Technical Center's En Route Radar Beacon Test Facility. The second radome was installed at the Trinidad En Route Radar Facility, this installation began on October 17, 1994.

The radomes were developed and manufactured by the Electronic Space Systems Corporation (ESSCO) located in Concord, MA. Because the new radomes can affect the primary and secondary (beacon) radar electromagnetic antenna patterns, the FAA and ESSCO conducted an extensive Development Test and Evaluation (DT&E) program. There were no problems detected in the DT&E that would affect radar system performance. All Operational Test and Evaluation (OT&E) testing conducted to date indicate an improved system.

This questionnaire is looking for your evaluation of the displayed primary and secondary radar air traffic control data. We are looking for any changes that may have occurred between what you were use to seeing with the old radome and what you are see now.

The questionnaire is divided into three parts: Primary Radar Evaluation, Secondary (Beacon) Radar Evaluation, and Overall Evaluation. The questionnaire is very subjective - it's main purpose is to detect any changes that should be addressed prior to integrating the new radomes into the National Air Space (NAS) system.

ATCS EVALUATION QUESTIONNAIRE
FGAR OT&E OPERATIONAL TEST

Test Number: ATDV-1

Test Title: Denver ARTCC (ZDV) ATCS Evaluation Tests

Test Site: Trinidad En Route Radar Facility (TAD)

Evaluator's Name: _____

## PART I - PRIMARY RADAR EVALUATION

1. Has the detection of primary targets changed, i.e., more or less: target drops, detection at various altitudes, less detection as target range increases?

   YES/NO (circle one)

   Comments: _____

   _____

2. Has the displayed primary track trajectories changed, i.e., track histories: are they following a straight or arched path smoothly, or do they appear to be shifting back and forth in azimuth from scan to scan?

   YES/NO (circle one)

   Comments: _____

   _____

3. Has the number of primary false targets changed, i.e., false targets appearing more frequently or at undesirable locations?

   YES/NO (circle one)

   Comments: _____

   _____

4. Are the primary Permanent Echo's (PE) where they were before?

   YES/NO (circle one)

   Comments: _____

   _____

## PART II - SECONDARY (BEACON) RADAR EVALUATION

1. Has the detection of beacon targets changed, i.e., more or less: target drops, detection at various altitudes, less detection as target range increases?

   YES/NO (circle one)

   Comments: _____

   _____

2. Has the displayed beacon track trajectories changed, i.e., track histories: are they following a straight or arched path smoothly, or do they appear to be shifting back and forth in azimuth from scan to scan?

   YES/NO (circle one)

   Comments: _____

   _____

3. Has the number of beacon false targets changed, i.e., target splits, code swaps, incorrect code changes, false targets appearing more frequently, or at undesirable locations?

   YES/NO (circle one)

   Comments: _____

   _____

4. Are you experiencing any beacon target ring-around <u>not</u> seen before?

   YES/NO (circle one)

   Comments: _____

   _____

5. Are the beacon Permanent Echo's (PE) they were before?

   YES/NO (circle one)

   Comments: _____

   _____

6. Does the radar to beacon reinforcement appear the same?

   YES/NO (circle one)

   Comments: _____

   _____

PART III - OVERALL EVALUATION

1. Do you detect any degradation in the data displayed not experienced before?

   YES/NO (circle one)

   Comments: _____

   _____

2. Since the new radome has been installed, taking into account the limited time you have had in performing your air traffic control duties with the new radome, do you see or know of any reasons why the FAA should not continue the replacement of en route radomes?

   YES/NO (circle one)

   Comments: _____

   _____

3. Do you have additional questions you believe should be added to this questionnaire?

   YES/NO (circle one)

   Comments: _____

   _____

   _____

If you have any questions concerning this questionnaire or the En Route Radome Replacement program, contact Len Baker (609-485-5353) at the FAA Technical Center's, Secondary Surveillance Systems Division, ACW-100, Atlantic City International Airport, New Jersey 08405.

**Thank you for taking your time to provide us with this valuable information.**

HECT-1/2/3 CLOTHING CONSTRAINTS TEST DATA SHEET
FGAR OT&E OPERATIONAL TEST

Test Site: _____

| Description | Expected Results | Results (Yes/No) |
|---|---|---|
| Zenith Service Hatch | Personnel in heavy winter clothing can pass through the hatch in both directions. | |
| Zenith Service Hatch | Personnel with heavy winter gloves can open the Zenith Hatch Latch from either side. | |
| | | |
| Catwalk Access Hatch | Personnel in heavy winter clothing can pass through the hatch in both directions. | |
| Catwalk Access Hatch | Personnel with heavy winter gloves can open the Catwalk Access Hatch from either side. | |

COMMENTS: _____

TEST EQUIPMENT

| |
|---|
| No test equipment is required of this test. |

_____ _____
Operator (Name, Title, Organization) Date

HEET-1/2/3 ELECTRICAL TEST DATA SHEET
FGAR OT&E OPERATIONAL TEST

Test Site: _____

| Equipment Description | Expected Results | Results (Yes/No) |
|---|---|---|
| Catwalk Access Hatch | Switch terminals are protected against accidental contact. | |
| Zenith Service Hatch | Switch terminals are protected against accidental contact. | |
| | | |
| RMMS Control Panel | TB's, CB, etc., are protected against accidental contact. | |
| RMMS Control Panel | Has 120V CAUTION label on outside of Panel door. | |
| RMMS Control Panel | Circuit breaker can be locked in OPEN position or Panel door locked closed. | |
| | | |
| | | |
| | | |

COMMENTS: _____

_____

_____

TEST EQUIPMENT

| |
|---|
| No test equipment is required for this test. |

_____ _____

Operator (Name, Title, Organization) Date

FGAR-4

PPTP-1/2/3/4 TRANSIENT PROTECTION TEST DATA SHEET
FGAR OT&E OPERATIONAL TEST

Test Site: _____

| Equipment Description | Expected Result | Result (Yes/No/Level) |
|---|---|---|
| Terminal 1, TB5 | RF transients and/or 60 Hz | |
| Terminal 2, TB5 | RF transients and/or 60 Hz | |
| Terminal 5, TB4 | No RF transients or 60 Hz | |
| Terminal 6, TB4 | No RF transients or 60 Hz | |
| | | |
| Terminal 1, TB2 | RF transients | |
| Terminal 3, TB2 | RF transients | |
| Terminal 2, TB1 | No transients of any type | |
| Terminal 4, TB1 | No transients of any type | |
| | | |
| RED wire, LINE side, SUP-2 | RF transients and/or 60 Hz | |
| WHITE wire, LINE side, SUP-2 | RF transients and/or 60 Hz | |
| BLACK wire, LINE side, SUP-2 | RF transients and/or 60 Hz | |
| Terminal 1, TB4 | No RF transients or 60 Hz | |
| Terminal 2, TB4 | No RF transients or 60 Hz | |
| Terminal 3, TB4 | No RF transients or 60 Hz | |
| | | |
| Terminals 2 & 3, TB4 | Voltage reads +5 VDC | _____ VDC |
| Terminals 2 & 3, TB4 | Voltage is steady and does not jump to +1 or +3 VDC | |

PPTP-1/2/3/4 TRANSIENT PROTECTION TEST DATA SHEET
FGAR OT&E OPERATIONAL TEST

COMMENTS: _____

_____

_____

_____

_____

_____

_____

_____

TEST EQUIPMENT

| Description of Equipment | Manufacturer | Model Number | Serial Number | Calibration Due Date |
|---|---|---|---|---|
| Oscilloscope/Spectrum Analyzer | | | | |
| Oscilloscope Probe, X10 | | | | |
| 12 VDC Power Supply | | | | |
| Digital Multimeter | | | | |
| | | | | |
| | | | | |

_____ _____

Operator (Name, Title, Organization) Date

FGAR-5/2 (Continued)

TEST MISSION LOG
FGAR OT&E OPERATIONAL TEST

Date:_____

Test Number: _____

Test Title: _____

Test Location: _____

Test Team Members/Participants: (Name/Organization/Phone Number)

_____

_____

_____

_____

_____

1. Are there any open items, e.g., deviations from the test procedures, required regression testing, etc.?

_____

_____

_____

_____

_____

_____

_____

_____

(Use additional sheets, if necessary)

2. The test objective(s) are listed in the appropriate paragraph of Appendix A, of this document.

3. The equipment configuration is described in the appropriate paragraph of Appendix A and Figure A1.5-1, of this document.

_____

Test Director (Name, Title, Organization)

TEST CONDUCT LOG
FGAR OT&E OPERATIONAL TEST

Date: _____

Test Number: _____

Test Title: _____

Test Location: _____

Record specific events, measurements, problems encountered, anomalies and/or deficiencies, etc. Include a description of the test performed and any problems.

_____

_____

_____

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Test Director (Name, Title, Organization)

FGAR-7

TEST SUMMARY LOG
FGAR OT&E OPERATIONAL TEST

Date:_____

Test Number: _____

Test Title: _____

Test Location: _____

Record an deviations from the test procedures noted in the Test Mission Log and/or the Test Conduct Log, a summary of the test conduct, a preliminary assessment of the test results, and any anomalies and/or deficiencies noted.

_____

_____

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_____

Test Director (Name, Title, Organization)

FGAR-8

TEST DISCREPANCY REPORT (TDR)
FGAR OT&E OPERATIONAL TEST

TDR No. _____

Test Number: _____

Test Title: _____

Test Location: _____

Describe, in detail, any problems, failures, etc., encountered during the test.

(Use additional sheets, if necessary)

_____ _____
Test Director (Name, Title, Organization) Date

FGAR-9