BY ORDER OF THE
SECRETARY OF THE AIR FORCE

AIR FORCE INSTRUCTION 13-101

25 NOVEMBER 2020

SPACE, MISSILE, COMMAND AND CONTROL

EVALUATION OF GROUND BASED RADAR SYSTEMS AND SENSORS SUPPORTING COMMAND AND CONTROL (C2) ENTERPRISE

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

ACCESSIBILITY: Publications and forms are available for downloading or ordering on the e-Publishing website at **www.e-Publishing.af.mil**.

RELEASABILITY: There are no releasability restrictions on this publication.

OPR: ACC/A3C

Certified by: AF/A3T
(Maj Gen James A. Jacobson)

Supersedes: AFI 13-101, 29 October 2004

Pages: 14

This instruction implements Air Force Policy Directive (AFPD) 13-1, *Command and Control Enterprise (C2 Enterprise).* This instruction provides guidance and procedures for the Air Force program for evaluating ground-based surveillance radar systems and sensors (fixed, tethered and mobile). This publication applies to all civilian employees and uniformed members of the Regular Air Force and the Air National Guard. It does not apply to the United States Space Force or Air Force Reserve units and members. This instruction requires the collection or maintenance of information protected by the Privacy Act (PA) of 1974. This Instruction requires the collection and or maintenance of information protected by the Privacy Act of 1974 authorized by Department of Defense Directive (DoDD) 5400.11, *DoD Privacy Program*. The applicable System of Records Notices F011 AF XO A, *Aviation Resource Management System* (ARMS) is available at: **https://dpcld.defense.gov/Privacy/SORNs/**. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Instruction 33-322, *Records Management and Information Governance Program*, and disposed of in accordance with Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS). Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Forms 847 from the field through the appropriate functional chain of command, to Air Combat Command (ACC)/Command and Control, Intelligence, Surveillance, Reconnaissance (C2ISR) Division (ACC/A3C), 205 Dodd Blvd, Suite 121, Joint Base Langley-Eustis VA 23665-2789. Major Commands (MAJCOMs)

are to forward proposed MAJCOM-level supplements to this volume to Headquarters United States Air Force/Information Operations Division (AF/A3TY), through ACC/Combat Integration Branch (A3CI), for review and coordination prior to approval. The authorities to waive wing and unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See DAFI 33-360, *Publications and Forms Management*, for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, as identified in **paragraph 1.4**, or alternately, to the Publication OPR for non-tiered compliance items.

SUMMARY OF CHANGES

This document has been substantially revised and needs to be completely reviewed. Major changes include; Supersedes AFI 13-101, 29 October 2004 and incorporates ACC Supplement into the AFI, updates the title of the AFI, completely updates all office symbols, updates OPRs and Office of Collateral Responsibility (OCRs), updates all sensors and radars that support the C2 Enterprise, adds mission support responsibilities to North American Aerospace Defense Command (NORAD), adds coordination between headquarters office of primary responsibility (OPR) and Headquarters Office of Collateral Responsibility (OCR) for any request, defines support to Department of Homeland Security (Customs Border Protection) and Federal Aviation Administration (FAA) Technical Operations (AJW), adds Obstruction Evaluation and Airport Airspace Analysis, establishes mission responsibilities of Operating Locations (OL)s at every Battle Control Center (BCC) and updates formal request procedures for 84 Radar Evaluation Squadron (84 RADES) support.

Chapter 1

GUIDANCE AND CONCEPTS

1.1. Overview. Radars and sensors systems play a vital role in air defense and air traffic control. Many special types of radars are installed in numerous operational environments. The capability of each radar, sensor and system must be measured and adjusted so they can be configured to provide optimum performance and effectively meet their operational and technical mission requirements. Affected systems include Joint Surveillance System, North Warning System, Tethered Aerostat Radar System, Wide Area Surveillance sensors, Atmospheric Early Warning System, National Capital Region-Integrated Air Defense System, Battle Control Centers (BCC) and the Control and Reporting Center (CRC).

1.2. Guidance. Air Force policy is to ensure tactical and strategic air defense ground-based radars, sensors, C2 systems, and electronic resources are installed, maintained, and operated in a high state of readiness to provide the ability to rapidly detect threats. Ground-based radar systems evaluation provides management with a tool for determining the capability of each radar system to detect, identify, track and control aircraft; determine aircraft height and maximize operational readiness and flight safety. In addition, ground-based radar systems evaluations determine the configuration for optimal performance in a dynamic weather and radar environment. Lastly, the proper integration of radar systems into the C2 system ensures the C2 system properly processes, tracks, and displays the radar data.

1.3. Roles and Responsibilities.

1.3.1. ACC/C2ISR Division (A3C). ACC/A3C is the executive agency for the USAF Radar Evaluation Program.

1.3.2. ACC/A3C will:

1.3.2.1. Maintain the Department of Defense (DoD) and Air Force's radar systems evaluation capability. **(T-2).**

1.3.2.2. Support other Service, DoD agency, government, or non-government organization requests on a case-by-case basis. Approval authority is ACC/A3CI. ACC/A3CI will coordinate all requests with ACC Long Range Radar Joint Program Office (ACC/A3AJ) and ACC C2 Mission Systems Branch (ACC/A6OC) **(T-2).**

1.3.2.3. ACC will establish a periodic evaluation program for mobile ground-based radar systems (e.g., Command Reporting Center). This program will be tailored to mission requirements, detected losses in system performance, and/or time since the last evaluation. **(T-2).**

1.3.3. ACC/Combat Integration (A3CI). ACC/A3C delegates ACC/A3CI authority for subject matter experts in the management for this instruction and:

1.3.3.1. Will coordinate any changes to this publication with all OCRs listed below:

1.3.3.1.1. ACC/Long Range Radar Joint Program Office (A3AJ). **(T-2).**

1.3.3.1.2. ACC/C2 Mission System Branch (A6OC). **(T-2).**

1.3.3.1.3. Pacific Air Force (PACAF)/A3/6CX. **(T-2).**

1.3.3.1.4. Untied States Air Force, Europe/Africa (USAFE-AFAFRICA)/A3CO. **(T-2).**

1.3.3.1.5. Headquarters National Guard Bureau (NGB)/2/3/6/10Y. **(T-2).**

1.3.3.2. Will review all requirements for 84 Radar Evaluation Squadron (84 RADES) support with ACC/A3AJ and ACC/A6OC. **Note:** Radar systems that feed data into the NORAD Enterprise will receive top priority over all other requirements. **(T-2).**

1.3.3.3. ACC/A3CI is the tasking authority for 84 RADES evaluation activity and will coordinate the evaluation schedule with ACC/A3AJ and ACC/A6OC.

1.3.4. As the Combat Air Forces lead command, ACC is responsible for funding evaluations to support fleet-wide program acquisition and modernization efforts:

1.3.4.1. ACC/Resources and Budget will ensure platform modernization or new system acquisition programs include funding to support necessary evaluations.

1.3.4.2. Program element monitors for ground-based radar systems will ensure fleet-wide modification programs include funding to support necessary evaluations by the 84 RADES.

1.3.5. MAJCOMs that operate ground-based surveillance radars, sensors and C2 systems will:

1.3.5.1. Program funds for the 84 RADES evaluation of systems under the commander's operational control and related flight support.

1.3.5.2. Provide flight support for evaluating command fixed, tethered and mobile radars, sensors and C2 systems.

1.3.5.3. Request services for baseline, special, and system radar evaluations according to **Chapter 4.**

1.3.5.4. When a fixed radar system is not being evaluated using 84 RADES automated remote recording and monitoring equipment, the using command must maintain a periodic radar evaluation program. **(T-2).**

1.3.6. 84 Radar Evaluation Squadron (84 RADES). 84 RADES is ACC's subject matter expert for the planning, development, testing and implementation of ground-based radar, sensors, C2 systems and related matters. Adherence to AFI 91-401, *Directed Energy System Safety* and AFI 91-208, *Hazards of Electromagnetic Radiation to Ordinance (HERO) Certification and Management* is necessary.

1.3.6.1. Conducts baseline, special, system evaluations and continuous performance monitoring and evaluation for ground-based surveillance radars, sensors and C2 systems.

1.3.6.2. Conducts radar site surveys, radar site analysis, and produce radar coverage products.

1.3.6.3. Conducts Interference and Obstruction Analysis (i.e., man-made structures within system's line of sight) for ground-based radars and sensors for NORAD or as tasked by ACC/A3CI.

1.3.6.4. 84 RADES will extract relevant obstruction projects from the FAA Obstruction Evaluation and Airport Airspace Analysis system and conduct a technical analysis of the impact of obstructions within radar line of sight on the performance of long range and short range radars/sensors used for NORAD missions. **(T-2)**.

1.3.6.4.1. The analysis evaluation will include an assessment of the proposed and existing obstruction (such as a building or wind turbine farm) on the performance of the radar as well as a determination of the cumulative impact of existing interference. **(T-2)**.

1.3.6.4.2. The initial technical analysis reports will be forwarded to NORAD and ACC/A3AJ for further action if the obstruction impacts the radar's performance. **(T-2)**.

1.3.6.5. When tasked by ACC/A3CI, provides recorded data and associated analysis product requests to DoD or other government agencies supporting track-of-interest, event analysis, aircraft accident investigations, search and rescue missions, and test and evaluation of ground-based radars and C2 sensors.

1.3.6.6. When tasked by ACC/A3CI, supports live radar and sensor data requests for situational awareness or test and evaluation support.

1.3.6.7. Establishes and maintains OLs at the BCC. OLs will confirm data integrity of radar and C2 sensors feeding the BCC or prior to introduction to NORAD Enterprise; collects and analyzes radar and sensor performance data, as well as provides radar forensics in support of BCC missions. **(T-2).**

1.3.6.8. Maintains the capability to deploy survey and evaluation teams worldwide in support of contingency operations.

1.3.6.9. Develops and acquires software and hardware tools necessary to complete radar and sensor evaluation mission.

1.4. Waivers.

1.4.1. ACC Director of Operations (ACC/A3), PACAF/A3/A6, USAFE-AFAFRICA/A3 will serve as the respective MAJCOM OPR with waiver approval authority for all requests for waivers from tiered compliance statements in this instruction. File a copy of approved written waivers with this volume in accordance with DAFI 33-360. **(T-2).**

1.4.2. All waiver requests will be submitted in writing through channels to the appropriate MAJCOM OPR. **(T-2).**

Chapter 2

RADAR EVALUATION REQUIREMENTS

2.1. Baseline and Re-baseline . An initial baseline evaluation is required as soon as possible after a unit or agency completes installation acceptance testing and resolves major exceptions. The radar should be operationally stable and properly connected to the C2 Enterprise. A baseline evaluation and integration to the C2 Enterprise is required before the radar is fully mission capable. Mobile radar systems may require a baseline evaluation if their deployed location becomes fixed.

2.1.1. Re-baseline and integration into the C2 system is necessary following major repairs, major modifications, or permanent radar relocation or as specified in Air Force Manual (AFMAN) 11-225 IP, *United States Standard Flight Inspection Manual.*

2.1.2. A baseline evaluation, conducted in conjunction with the FAA is required before the commission of radars in the Joint Surveillance System and/or the integration of air defense ground-based radars into the National Airspace System.

2.1.3. The 84 RADES will monitor performance of previously baselined fixed radars on a continuous basis and they will perform a special evaluation when degradation is indicated. **(T-2)**.

2.1.4. Each established (in-place) radar or sensor system should receive an evaluation within 8 years, if possible, to assure sustained and optimal performance, as well as to validate the site's environmental impacts on the system.

2.2. Developmental Testing (DT)/ Operational Testing (OT) Taskings . Development Testing is the Government's method to verify and demonstrate how well the weapon system meets its technical requirements from the contractor. Operational Testing is field test, under realistic combat conditions, of any item of (or key component of) weapons, equipment, or munitions for the purposes of determining the effectiveness and suitability of the weapons, equipment, or munitions for use in combat by typical military users; and the evaluation of the results of such test. Tasks are supported by the following units:

2.2.1. 46th Test Squadron for DT.

2.2.2. 605th Test Evaluation Squadron for OT.

2.2.3. Air Force Operational Test & Evaluation Center (AFOTEC) for OT.

2.2.4. 133rd Test Squadron for DT and OT.

2.2.5. FAA AJW DT and OT events for new radars.

2.3. Additional Test and Evaluation Support. 84 RADES will provide additional test and evaluation support of C2 systems and sensors as required and tasked by ACC/A3CI. **(T-2)**.

2.4. Live/Recorded Data Requests . 84 RADES will support live/recorded data requests for test and evaluation, safety investigations or overall situation awareness to DoD or other government agencies as required. **(T-2)**.

2.4.1. 84 RADES will maintain a historical archive of recorded sensors. **(T-2)**.

2.4.2. Analysis products shall include track-of-interest, event analysis, aircraft accident investigations, search and rescue missions for operating locations, safety centers and other government agencies. **(T-2)**.

2.5. 84 RADES will develop and acquire software and hardware tools necessary to complete C2 system, radar and sensor evaluation missions. (T-2).

2.6. New Radar Systems. The 84 RADES shall evaluate new radar systems prior to integration into the C2 Enterprise when verification services are requested by NORAD and approved by ACC/A3CI. **(T-2)**.

2.7. Manpower. Because of the unique mission and specialized equipment of the 84 RADES, Air Force Personal Center will normally limit 84 RADES enlisted assignments to personnel who hold 7-level skill qualifications. The 84 RADES commander will ensure an assignment availability code is annotated in accordance with the ACC stabilized tour guides. **(T-2).**

Chapter 3

TYPES OF EVALUATIONS

3.1. Baseline Evaluation. This evaluation is performed to:

3.1.1. Determine optimum configuration of adjustable and selectable features (software and hardware), capabilities and limitations, and airspace coverage. It is tailored to individual radar sites and missions and includes effects of weather and terrain on detection and tracking performance. Dedicated flights may be required to make this assessment.

3.1.2. Provide a performance database and determine operational parameters and airspace coverage for inclusion in the 84 RADES electronic monitoring evaluation system.

3.2. Special Evaluation . This evaluation is performed to:

3.2.1. Assist an operating organization in isolating the causes of substandard performance.

3.2.2. Determine the effects of proposed and existing modifications on the operational capability and recommended configuration.

3.2.3. Determine the best site location or positioning of a radar and the optimum setting of adjustable features for use under varying conditions.

3.2.4. Determine the effects of proposed and existing structures within the radar line-of-sight on the operational capability and recommended configuration.

3.2.5. Support radar acquisitions, developmental and operational test and evaluation programs, and system integration.

3.3. System Evaluation. This evaluation determines how well multiple sensors integrate into a central facility or system to include assessment of the radar inputs processing portion of the central system, such as radar message handling, tracker and display functionality.

3.4. Continuous Performance Monitoring and Evaluation. This type of evaluation is a continuous and near real-time evaluation process performed on previously baselined radars. The data collected during the baseline evaluation is used for initial pass/fail criteria and establishes a baseline for performance for each individual radar system. This evaluation is performed to:

3.4.1. Continuously monitor/assess radar performance based on short-term and long-term trends.

3.4.2. Continuously monitor radar data quality.

3.4.3. Detect radar performance deviations from established standards.

3.4.4. Alert users of system effectiveness and deterioration in detection capability.

3.4.5. Allow for corrective action to be effected before complete system failure.

3.5. Remote Evaluations. This type of evaluation uses recorded or live data feeds to perform a radar or C2 sensor system evaluation. It supplements the on-site evaluation through the use of available radar data feeds and specialized software to provide an in-depth look at a particular system's performance. This type of evaluation may fulfill the requirements of a re-baseline, special or system evaluation when conditions and/or equipment cannot support an on-site evaluation.

Chapter 4

REQUESTING 84 RADES SUPPORT

4.1. Requests for 84 RADES Support. All requests for support will be submitted to ACC/A3CI. The email address is **ACCA3.A3CI.CombatIntegration@us.af.mil**. **(T-2)**.

4.2. Required Information. All radar evaluation/site survey requests will, as a minimum, contain the following information:

4.2.1. Purpose. Define problems and state the reason for the request. **(T-2)**.

4.2.2. Location. **(T-2)**.

4.2.3. Type of radar or C2 system and associated equipment to be evaluated. (**T-2)**.

4.2.4. Desired date for support. **(T-2)**.

4.2.5. Mission impact if the evaluation is not performed by the desired date. **(T-2)**.

4.2.6. Special items of concern and other pertinent information. **(T-2)**.

4.2.7. Points of contact. **(T-2)**.

4.2.8. Funding source to conduct requested support. After being tasked, 84 RADES contacts the requesting unit to provide a cost estimate and to secure a fund cite. If applicable, include funds for dedicated flights if requestor is not providing aircraft. **(T-2)**.

4.3. Engineering Support Requests. All engineering support requests, including C2 testing, recorded radar data, live data feeds, network connectivity issues, and software support must contain the following information.

4.3.1. Minimum requirements: **(T-2)**.

4.3.1.1. Purpose. Define problems and state the reason for the request. **(T-2)**.

4.3.1.2. Requesting agency and organization. **(T-2)**.

4.3.1.3. Desired date for support. **(T-2)**.

4.3.1.4. Mission impact if the evaluation is not performed by the desired date. **(T-2)**.

4.3.1.5. Special items of concern and other pertinent information. **(T-2)**.

4.3.1.6. Points of contact. **(T-2)**.

4.3.2. Additional requirements for specific requests are annotated below:

4.3.2.1. Testing requests (OT, DT, Research and Development, Analysis, etc.).

4.3.2.1.1. C2 system to be tested. **(T-2)**.

4.3.2.1.2. Dates and location of testing. **(T-2)**.

4.3.2.1.3. Listing of testing requirements. **(T-2)**.

4.3.2.2. Recorded data requests. (e.g., National Transportation Safety Board Investigations, Air Force Safety Center investigations, legal request, obstruction analysis)

4.3.2.2.1. Start and stop date/time of requested data.

4.3.2.2.2. Release authorization by data owner(s). If authorization has not be granted, coordinate with the 84 RADES to assist in identifying the proper release authority/data owner.

4.3.2.2.3. Area of interest (including top left and lower right coordinates, or center point and radius of the area of interest). Alternatively, the customer can provide a list of all radar sites to be included.

4.3.2.3. Live data feed requests:

4.3.2.3.1. Listing of radar sites required including filtering information if applicable. (If unknown, coordinate with 84 RADES)

4.3.2.3.2. Release authorization by data owner(s). If authorization has not be granted, coordinate with the 84 RADES to assist in identifying the proper release authority/data owner.

4.3.2.3.3. Transmission start date and duration of feed.

4.3.2.3.4. Description of the how the data will be used.

4.3.2.4. Software support requests:

4.3.2.4.1. Software title requested.

4.3.2.4.2. Description of support required.

4.3.2.4.3. Email address for software delivery.

4.3.2.5. For any other 84 RADES engineering support requests not listed, the customer will provide a description of the support, and an estimated duration of the required support. **(T-2)**.

4.4. Track of Interest, Event Analysis and Radar Data Reduction. All track of interest, event analysis and radar data reduction requests will contain the following information as known:

4.4.1. Description of the needed reduction including special items of concern and other pertinent information. **(T-2)**.

4.4.2. Incident class (A-F or none). **(T-2)**. (If unknown, coordinate with 84 RADES)

4.4.3. Priority (High/Med/Low). **(T-2)**. (If unknown, coordinate with 84 RADES)

4.4.4. Requesting agency and organization. **(T-2)**.

4.4.5. Desired completion date. **(T-2)**.

4.4.6. Mission impact if the evaluation is not performed by the desired date. **(T-2)**.

4.4.7. Points of contact name, organization/office symbol, phone number, and email. **(T-2)**.

4.4.8. Product routing information to include name, organization/office symbol, phone number, and email. **(T-2)**.

4.4.9. Incident details for each aircraft shall include:

4.4.9.1. Aircraft type. **(T-2)**.

4.4.9.2. Incident date. **(T-2)**.

4.4.9.3. Start time (Z) and stop time (Z). **(T-2)**.

4.4.9.4. Modes and codes. **(T-2)**.

4.4.9.5. Latitude and longitude. **(T-2)**.

4.4.9.6. Heading. **(T-2)**.

4.4.9.7. Tail number. **(T-2)**.

4.4.9.8. Departure airport. **(T-2)**.

4.4.9.9. Arrival time. **(T-2)**.

4.5. Request for Support Approval and Priorities. ACC/A3CI must review and approve all requests for 84 RADES support received. ACC/A3CI will coordinate all requests with ACC/A3AJ and ACC/A6OC. All requests are to be considered on a case-by-case basis with priority given to support NORAD missions. Other priorities are to be Air Force, other service or DoD agency, other government agency, or non-government agency, in that order. Prioritizations for requests are:

4.5.1. Priority 1: Operational systems (inoperable).

4.5.2. Priority 2: Operational system (degraded).

4.5.3. Priority 3: New program.

4.5.4. Priority 4: Operational system.

4.5.5. Priority 5: All others.

4.6. In accordance with classification guidance, such as Sensor/Radar Program Security Classification Guides and Sensor/Radars Security Classification References, for release authority for 84 RADES coverage products, evaluation reports, data analysis studies and other 84 RADES generated artifacts will be the 84 RADES commander.

JOSEPH T. GUASTELLA JR., Lt Gen, USAF
Deputy Chief of Staff, Operations

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

DAFI 33-360, *Publications and Forms Management*, 1 December 2015

AFMAN 11-225_IP, *United States Standard Flight Inspection Manual,* 1April 2015

AFI 33-322, *Records Management and Information Governance Program*, 23 March 2020

AFI 91-208, *Hazards of Electromagnetic Radiation to Ordinance (HERO) Certification and Management,* 28 March 2018

AFI 91-401, *Directed Energy System Safety*, 28 Novemeber 2018

AFI 91-208, *Hazards of Electromagnetic Radiation to Ordinance (HERO) Certification and Management*, 24 October 2019

AFPD 13-1, *Command and Control Enterprise (C2 Enterprise),* 6 August 2012

Prescribed Forms

None

Adopted Forms

AF Form 847, *Recommendation for Change of Publication*

Abbreviations and Acronyms

84 RADES—84 Radar Evaluation Squadron

ACC—Air Combat Command

AFRIMS—Air Force Records Information Management System

AFOTEC—Air Force Operational Test & Evaluation Center

AJW—Technical Operations (Federal Aviation Administration Technical Operations)

ARMS—Aviation Resource Management System

BCC—Battle Control Center

C2—Command and Control

C2ISR—Command and Control, Intelligence, Surveillance, Reconnaissance

CRC—Control and Reporting Center

FAA—Federal Aviation Administration

DoD—Department of Defense

DT—Developmental Testing

MAJCOM—Major Command

NGB—National Guard Bureau

NORAD—North American Aerospace Defense Command

OCR—Office of Collateral Responsibility

OL—operating location

OPR—Office of Primary Responsibility

OT—Operational Testing

RDS—Records Disposition Schedule

PACAF—Pacific Air Force

USAFE-AFAFRICA—United States Air Force, Europe/Africa