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DOD Integration and Validation of Avian Radars (IVAR)

Publications. IVAR: Functional Requirements and Performance Specifications
IVAR: Cost & Performance Report
IVAR: Final Report

[Link](#)

Scope: A three-year (2007-2010) science-based field validation of avian radar technology for Bird-Aircraft Strike Hazard (BASH) and natural resources management applications at military airfields.

Application: The Functional Specifications report extracts from the Final Report the functions a modern digital avian radar ought to be able to perform and the levels at which it ought to be able to perform those functions. The Cost & Performance Report is a ~60 page distillation of the results, conclusions, and applications detailed in the Final Report: it was written for safety personnel and wildlife managers who are interested in avian radar technology and want to know more about its capabilities, costs, installation and operation. The Final Report is an approximately 400-page compendium of the methods, results, and conclusions of the IVAR study.

Background: The IVAR project was funded by the US Department of Defense's Environmental Security Technology Certification Program ([ESTCP](#)) and staffed by a team of scientists and radar engineers from the US Navy, Marine Corps, Air Force, USDA Wildlife Services, FAA, industry, and academia. The Navy's SPAWAR Systems Center in San Diego, California was the lead agency. The studies were conducted between 2007-2010 using **Accipiter® Avian Radar systems** at NAS Patuxent River, MCAS Cherry Point, Elmendorf AFB, NAS Whidbey Island, and elsewhere. **The project staff established six performance objectives with 38 metrics and criteria to test digital avian radar systems: the Accipiter systems passed all 38 criteria.**

Key Points.

Modern digital avian radar systems:

- Extend the surveillance of bird activities on and off the airfield by automatically tracking the 3D position of thousands of individual birds of all sizes (depending on range) through 360° of coverage, in real time, day and night under most weather conditions.
- Display the real-time position of each tracked target while simultaneously recording the position, size, speed, heading, etc. of each target for subsequent playback and analysis.
- Send detection and track data across networks to present various customized displays to different types of users (e.g. wildlife biologist, control tower personnel, etc.)
- Generate and record alerts that can be sent to wildlife management, air operations, and air traffic control personnel to inform them of bird activity in user-defined zones that represent a risk to aircraft.
- The tested avian radars are ready to transition to military users on a wider scale.

Airfields need to:

- Understand that avian radar is a tool that can aid existing BASH and wildlife management protocols, and not a replacement for them.
- Assess their needs for avian radar technology and develop a detailed specification of the operational and performance capabilities of the system(s) they require.
- Be aware that selecting the site for the radar and commissioning the radar at that site are critical for optimal coverage and performance.
- Take into consideration that the quality and level of long-term operational support and service for avian radar systems are as important as the initial procurement of



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Key Features & Specifications. Avian radar vendors should be able to demonstrate their systems can:

- Provide third-party documentation that demonstrates their systems' ability to detect and track various species and sizes of birds, at different ranges, under different environmental conditions, as verified using independent methods.
- Operate unattended continuously (24/7/365) under typical airfield conditions and in almost all types of weather.
- Continuously detect and track the spatial trajectory (latitude, longitude, height) of at least 100 individual avian targets in three spatial dimensions through a 360° field-of-view.
- Record each tracked target's unique target ID, date, time, latitude, longitude, altitude, speed, heading, range, azimuth, size (RCS), track duration, and track quality (e.g., covariance) every 2.5 seconds (i.e., in "real time").
- Automatically and dynamically adapt to changing "clutter" conditions to maintain a constant false alarm rate (CFAR), while minimizing false negative and false positive target detections, including multipath and side lobe detections.
- Detect and track a medium-sized bird (1.1 kg/2.5 lbs.) such as a duck (RCS ~-16 dBm²) at a distance of at least 5.6 km (3 nautical miles), and large-size birds such as raptors (4.5 kg/10 lbs.) at a distance of 11 km (6 nautical miles), from near ground level to 1 km above ground level.
- Mask coverage areas to suppress extraneous information; filter tracks based on size, speed, etc.; and generate visual, auditory and text alerts to notify personnel that user-defined threat conditions have been met in an alert zone.
- Display avian targets as plotted bird detections or processor-identified bird tracks.
- Display tracks from multiple radar sensors in a single, integrated common operating picture (COP).
- Use standard network protocols to a) stream plots and tracks data securely and without errors for remote display and analysis, in real time, over local and wide area networks using wired and wireless connectivity; and b) remotely operate and control the radar.
- Simultaneously digitize the radar target signals and record the "raw" digital data without interfering with the detection or tracking processes, or with the recording of the detection and track data.
- Record at least one hour of raw digital data to support reprocessing with different track display criteria.
- Store plots and tracks data, plus metadata for all targets tracked by a single radar operated continuously for one year on a commercial off-the-shelf storage medium with a capacity of 1 TB or less.
- Store plots and tracks and associated metadata, alerts, etc. on a user-accessible "data server" that: a) has database management system software that meets industry standards and supports open-source access protocols and a human-readable data dictionary; and b) easily retrieves archived plot and track data based on a given date and time.
- Export plot and track data in a standard, non-proprietary format (e.g., Google Earth KML).
- Provide spatial and temporal alignment for the fusion of tracks from multiple sensors with overlapping coverage.

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Accipiter® Avian Radar systems are fully compliant with the functional and performance specifications derived from the IVAR studies. We have helped military airfields procure and deploy avian radar with great success. Avian radar marks significant progress towards increased aviation safety through bird-strike reduction. Contact us and get started on the path to improved management of bird-strike hazards today.

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