

Bird Strike!

USING RADAR TO STUDY BIRD ECOLOGY



by Peter Coates, Michael Casazza, Joseph Fleskes, and James Laughlin

Imagine an eight-pound Canada goose taking down an airplane that weighs approximately 80 tons! Most of us recall the image of U.S. Airways Flight 1549 floating on the Hudson River while a few of the 155 passengers stood on the wings awaiting their rescue. In this case, the passengers were soaked and freezing but more importantly they all survived. Accidents from bird-aircraft collision (i.e. bird strike) do not always have such favorable outcomes. These collisions cost the aviation industry \$628 million a year and have resulted in numerous human fatalities. Canada geese are one of the most frequently encountered species. The Pacific Flyway migration corridor includes portions of the Central Valley of California, and civilian and military airports here are often in close vicinity of wetlands used by migrating geese. Bird strike is a big concern and is recently the focus of increasing attention by wildlife researchers. Radar is a useful tool to study bird flight patterns, because tracking can be done during both day and night. Weather radar has been shown to be a useful tool for monitoring avian migration patterns for nearly five decades. However, these systems do not have coverage in all areas and have relatively low resolution. Thus, while very useful for some purposes at regional scales, weather radar lacks local precision and is not always useful for managing local wildlife populations. Recently, portable radar systems that have smaller zones of coverage and provide much higher resolution signals than weather radar systems have become available for civilian applications.

At Beale Air Force Base (AFB), wildlife biologists with USGS-

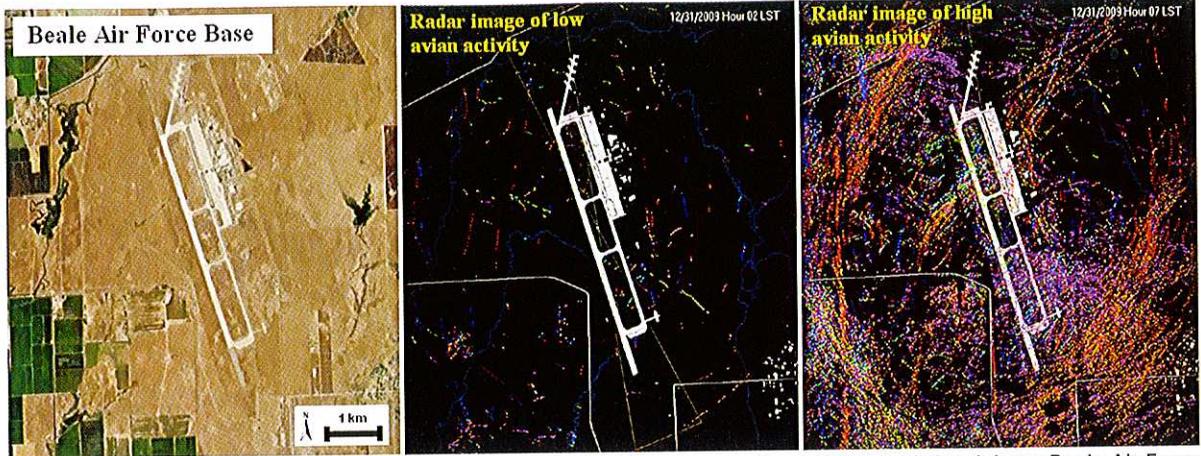
Western Ecological Research Center and USDA-Wildlife Services have teamed with DeTect Inc. to investigate the utility of one of these advanced high-resolution surveillance avian radar systems to aid management decisions for local bird populations, particularly those of waterfowl. This state-of-the-art system uses a real-time automated processor. The program software (Merlin™) is set to assign identification numbers to each bird that enters the

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radar beams, up to six miles from the system, and track each bird individually through time. Coordinates of each bird's location are updated every few seconds and stored into a database onsite. Birds can be discriminated somewhat based on size classifications. Using both vertical and horizontal radar beams, the system will determine the distance to the bird, the direction from the radar, as well as the bird's altitude. Thus, at any point in time, researchers can determine the number of birds flying and their direction of flight within the radar's field of vision.

Preliminary results from Beale AFB indicate that this technology may be very useful to examine bird populations and may help inform airport operators of bird activity patterns and other factors related to bird strike risk. Data clearly show a high degree of variability in the number of birds flying near the airfield, with bird

◀ Radar systems have the potential to increase flight safety as well as help biologists study waterfowl populations.
Photo Courtesy of USGS



An avian radar system allows wildlife biologists to study the high degree of variability in bird activity at Beale Air Force Base.
Photo Courtesy of USGS

activity related to a suite of factors including amount of daylight, season, and weather conditions. For example, during the spring migration most of the bird activity consists of flyovers that occur just before sunrise on days with low winds, no precipitation, and clear skies. However, during fall migration, most activity occurs after sunrise, and birds are more active at lower temperatures. Using these and other relationships, bird activity models predict when the risk of bird strike is greatest and help inform airport operators. The USGS-USDA research team is cooperating with the Bird/Wildlife Aircraft Strike Hazard team, which manages the largest bird strike database in the U.S., to investigate factors that influence bird strike at different airfields within each major migration flyway. Using these data, our goal is to develop more comprehensive statistical models of the odds of bird strike based on bird activity (obtained from radar), flight altitudes, air traffic, and other hypothesized factors.

Data derived from these radar systems will not only help prevent bird strike but appear to be promising for answering some long-standing questions about bird migration. Thus, not only do these data help flight safety but also waterfowl population conservation. It has been an ongoing challenge to link meteorological factors to bird migration, especially at local levels. With this dramatic improvement in the technology of avian radar, scale of measurement is much more localized, allowing investigation of clear relationships with local weather patterns. In addition, the relatively small scale allows for investigation of habitats across the landscape selected by birds, particularly waterfowl. Data will be used to identify daily movement patterns through time and relate these to key habitat features using detailed imagery of the landscape. For example, we can develop a better understanding of how waterfowl use different types of land cover (i.e. wetlands or rice fields) based on irrigation regimens, time of day, and season.

With exciting results already, our goal is to use radar technology to provide critical ecological information that will improve the way we manage our waterfowl populations in the Central Valley of California. Additionally, let us not forget how important these data will be to our safety while traveling by air. Research

that continues using radar to identify factors that influence bird activity in relation to our airports should help reduce the chance that a pilot will again have to utter the words "You guys got to brace for a hard impact," as Pilot 'Sully' warned his passengers just before he heroically landed U. S. Flight 1549 on to the Hudson River. 🦅

Dr. Peter Coates, Michael Casazza, and Dr. Joseph Fleskes conduct avian research for the USGS-Western Ecological Research Center. James Laughlin is an avian biologist with USDA-Wildlife Services.



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