ONE STRIKE AND YOU'RE OUT

As recent events have shown, bird strikes remain a distinct threat to aviation but a solution is available in the form of bird radar

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The January 2009 bird-related crash of US Airways flight 1549 at New York's LaGuardia airport brought worldwide attention to the birdstrike issue, with much discussion on use of new technologies to reduce the risk. Bird radars have been successfully used operationally to provide real-time, tactical bird-aircraft strike avoidance since 2003 by the US Air Force (USAF) and the Royal Air Force (RAF) at military airfields and training ranges, with documented records of their success in preventing and reducing birdstrikes while increasing airspace use[1].

NASA has also successfully used bird radars since 2006 for birdstrike avoidance during launches of the space shuttle. This was in response to a shuttle striking a vulture during launch in the summer of 2005, which was subsequently determined to have caused the potential for catastrophic damage[2]. Both NASA and the military have conducted extensive validation testing to certify the accuracy and reliability of the systems and NASA will not launch the US$2 billion space shuttle without its bird radars being operational.

Commercial airports – particularly those outside the USA – are now moving forward more aggressively in deploying these proven military technologies operationally for civil aviation to provide more concise, timely and reliable information on hazardous bird activity on and around the airport to bird control units, air traffic controllers and pilots. Additionally, with the current economic conditions in the air transport industry, airlines are increasing pressure on airports to reduce aircraft-bird strikes in order to minimise damage and delay costs, in some cases going as far as filing legal claims against airport operators to recover costs[3].

Development and application of radar technology for aircraft-bird strike risk avoidance has required a unique combination of expertise in radar engineering, radar ornithology (the use of radar to study birds), aviation flight safety, airport operations and airfield bird control. Use of bird radars at military training airfields is somewhat less complex than at commercial airports as the aircraft traffic volume is generally much lower, and should severe birdstrike risk conditions exist, the military in most cases can ground aircraft until risk conditions pass. To apply the technology in commercial aviation, a common sense, realistic approach in developing procedures for operational use is needed to improve flight safety while maintaining system throughput.

There are those who say that much more research is needed into bird radars before we can deploy them at commercial airports, citing concerns that we do not know if the current bird radar technology can detect all birds, among other issues. They are missing a key point. Just as we do not have to see every rain drop to know it is raining, a bird radar does not have to see every bird for us to use the information operationally and in a meaningful manner.

First of all, various studies have already determined that bird radars can see 50 or more times as many birds in the environment than human observers, providing vastly improved situational awareness about bird activity on and around the airport. We also do not necessarily need to see every bird, only the larger ones and flocks that pose the greatest strike damage risk to aircraft. The currently generation of production bird radars can already provide airport bird control staff and managers with real-time and highly reliable information on the current level and location of hazardous bird activity on and around an airport, essentially functioning as a pair of electronic binoculars that can look for birds much farther in all directions, continuously and more reliably.

Most commercial airline pilots would say that the birdstrike risk advisories currently provided at airports are virtually worthless – and are therefore generally ignored – as they typically provide only generic, never changing information such as 'elevated bird activity around the airport'. The 'Hero of the Hudson' Captain Sullenberger stated as much at the recent US NTSB hearing on the US Airways flight 1549 crash.

Pilots will tell you they need timely information and specificity: current level of the risk; distance from the airport;

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Aircraft birdstrike avoidance radar operating at Boston Logan International Airport

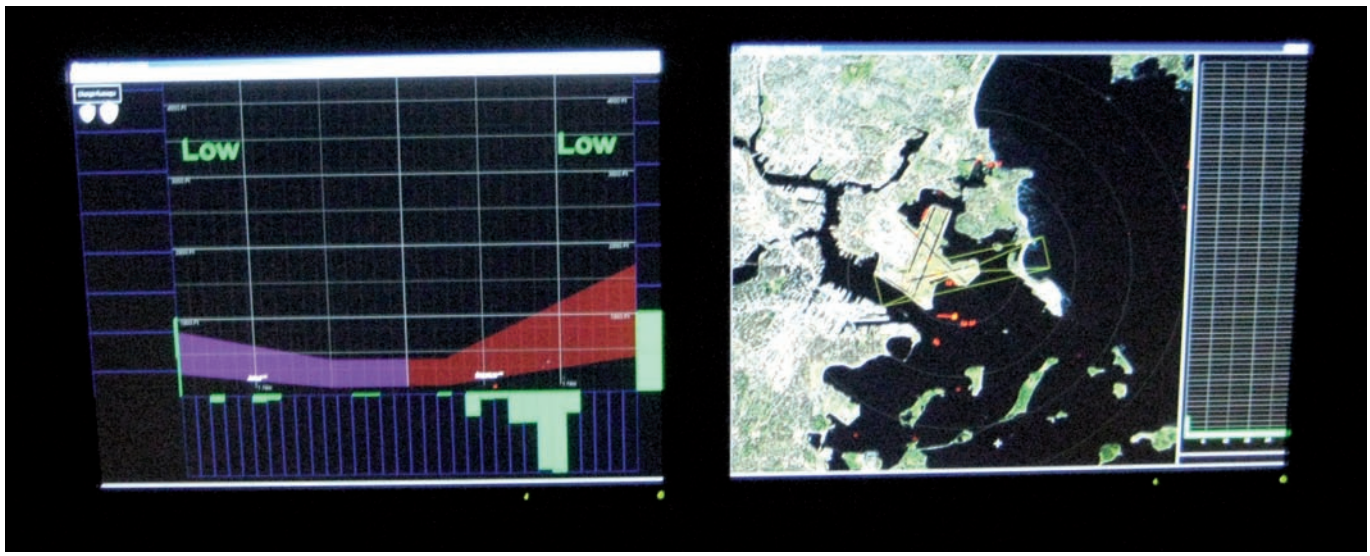
approximate altitude. Similarly controllers will say that they need a usable, intuitive system that is highly automated and in real-time as they do not have the staff to continuously monitor another system in the tower nor the skill sets to decide how many or what kind of birds represent what level risk. Additionally, as most airport wildlife control programs are understaffed, or in some cases non-existent, bird-control staff will say that they need real-time information to help them be where the birds are for improved efficiency, and to alert them when and where activity is increasing. They also need a system that will allow them to determine more accurately the current risk level for advisories and help them know when it needs to be raised or lowered.

Some have posited that it is necessary to detect and track birds around an airfield with TCAS-like precision and military-level targeting 3D radar accuracy before bird radars can be used operationally for commercial aviation, going so far as to suggest that currently available bird radar systems would have been unable to provide accurate avoidance guidance to flight 1549, "since at 2,800 feet and three miles from La Guardia the geese it struck were too far away"[4].

This simply is not factually correct as systems used by the military do this on a daily basis and large flocks of geese are regularly detected and tracked as far out a 10 miles from military airfields. If one of these systems had been in use at LaGuardia it very likely would have detected and alerted controllers about the geese that brought down flight 1549. Further, this attitude is fundamentally flawed and demonstrates a lack of understanding of airfield operations, bird control and aviation operational risk management. Even researchers that have been heading the FAA bird-radar program for the past nine years have commented that it will take years more development before these theoretical bird radars become available for operational use. Such positions appear to be motivated more by a desire to obtain government research funds to continue to pay for esoteric R&D programs for corporations and universities.

What is needed is a realistic, pragmatic, cost-effective solution to the birdstrike problem for commercial aviation – and it is needed today. According to the US Department of Agriculture Wildlife Services, 95 percent of commercial aircraft bird strikes occur in runway approach and departure corridors or during ground aircraft movement (85 percent occur below 250ft), so focus on this highest risk zone provides the best opportunity for increased aviation safety and near-term return on the investment in the technology. Commercially available, production-model bird radars currently on the market from several manufacturers can immediately meet this need without more government funded R&D. Use of these bird radars at commercial airports, however, will require a new Concept of Operations (CONOPS) from the ones currently used by the military and NASA, but this does not present an insurmountable obstacle, as some of the naysayers would lead us to believe.

The various users of bird-radar information at a commercial airport have different data needs and objectives from the system. Placing new systems in an ATC tower is a complex process, and while this should be the ultimate objective, bird-radar information does not have to go into the tower to provide immediate results in improved flight safety and payoff in



Bird-radar display showing the current runway birdstrike risk level for approach and departure corridors and activity on and around the airport

reduced aircraft damage costs. The most immediate beneficiary of bird-radar technology at commercial airports is the bird-control staff, who can have a real-time bird-radar display in the bird-control vehicle to provide a real-time view of where activity is highest or developing. Additionally, bird radars already in production are capable of automatically monitoring bird activity by user-defined zones, giving visual, audible and text message alerts when increased risk is detected, enabling bird-control staff to provide concise advisories and respond immediately to hazards before they become critical.

The most widely used bird radars today additionally include dedicated radars for each runway that scan the runway and flight corridors as far out as four miles, continually monitoring bird activity in the corridor and converting it to a risk level (low, moderate or severe) with specific detail as to where the activity is located. Before an aircraft takes off, the radar is checked to ensure that the corridor is clear of high-risk bird activity. The same process is applied to landings, when pilots can be advised if elevated activity is present in the flight corridor with precise locational information.

As with weather advisories, the pilot may decide to continue the takeoff or landing even if birds are present, but at the minimum the aircrew is better aware of the risk and more prepared for the eventuality of a birdstrike. This few extra seconds of preparedness can be the critical difference between a minor and major birdstrike incident. Bird radars also provide situation awareness at night when visual observation is not possible, and systems using new solid-state S-band radar sensors provide reliable data on bird activity in rain and heavy fog when X-band systems are effectively blind. The wide beam and supplemental radar sensors in the most widely used bird-radar designs also can support pending NextGen flight standards.

The new King Shaka Airport in Durban, South Africa, is the first commercial airport in the world to use a bird radar operationally. The airport is three kilometres from a European barn swallow roost of 3-5 million birds that winter there from October through April each year. During design, concerns were noted about the potential risk to aircraft from birdstrikes and potential mortality to the barn swallow population. In 2007 the airport conducted a market survey of available technologies and conducted an avian radar survey to collect data on bird movement patterns, altitudes and densities to enable it to develop a risk assessment of the problem. In 2008 the airport issued an open, competitive Request for Proposals for supply, installation, CONOPS development and support for a bird radar system that would provide real-time birdstrike risk advisories to air traffic control.

The contract was awarded to DeTect of Panama City, Florida, for a MERLIN Aircraft Birdstrike Avoidance Radar that was delivered in December 2008. The system provides controllers in the tower with a real-time display of bird activity, delivering automated birdstrike risk advisories that include a custom-developed swallow risk-prediction algorithm. This installation is the first use of real-time bird radar information at a commercial airport and demonstrates how the technology can be used today for improved risk management.

The bottom line is that implementing bird radars at commercial airports does not have to be overly complicated and common-sense practices and approaches to the problem can quickly yield a major reduction in birdstrike risk and payback in reduced aircraft damage costs. The systems and procedures already used by the military and NASA can be readily adapted to commercial aviation to immediately improve passenger and aircrew safety. ❖

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