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Radio-Controlled Models for Bird Dispersal*

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Abstract: Border Collie Rescue (BCR), in cooperation with the Dover Air Force Base (AFB), conducted a series of field trials to test the efficacy of utilizing radio-controlled models (RCs) (aircraft and boats) in dispersing several species of birds from troublesome locations around the Dover AFB environment. Results of these trials suggest that RCs can be used to effectively harass gulls, black vultures, ducks, and geese from difficult areas, though there are a number of limitations and contraindications that must be taken into account when determining the value of instituting a harassment program utilizing RCs. Though use of border collies in its wildlife management program had eliminated the majority of bird hazards at Dover AFB, a few troublesome areas and species remained, particularly those birds that were located in areas inaccessible to the dog (e.g. large quarries with heavy machinery, soaring vultures).

Radio-controlled aircraft were highly effective in dispersing large flocks of loafing gulls, black vultures soaring in thermals and passing through the airfield environment, as well as flocks of ducks and teal feeding and resting on open bodies of water. They were also partially effective at discouraging transitioning gulls and geese from utilizing the airspace over the base, as well as dispersing gulls feeding on earthworms on runways and taxiways, though several environmental and operational variables determined success. Radio-controlled aircraft were entirely ineffective in dispersing Canada geese from open water. Coordinated effort with a radio-controlled boat, however, solved this limitation and proved to be an effective means of eliminating the Canada goose presence from large bodies of water.

Key Words: border collies, radio-controlled aircraft, radio-controlled boats, harassment, wildlife control, bird control, gulls, *Larus* spp., black vultures, *Cathartes aura*, Canada geese, *Branta canadensis*, snow geese, *Chen caerulescens*, ducks, waterfowl, Dover Air Force Base

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INTRODUCTION

On February 1, 2000, Border Collie Rescue began a wildlife control contract with the Dover Air Force Base (AFB). The Dover AFB contract called for a complete wildlife control program package, focused around the use of border collies in wildlife harassment. Results from BCR's program at Dover AFB were overwhelmingly positive, as the majority of large birds were excluded from the airbase and the surrounding farmlands (Carter 2000a,b; Carter 2001a), an overall area encompassing roughly 46 km². However, a few remaining troublesome areas continued to pose a substantial threat to aircraft operating out of the airbase, and remote-control aircraft and boats were used to clear the remaining birds. Though the use of remote-controlled models was limited in the overall program, they effectively reduced the risk of very particular problems that could not be solved through other means. BCR conducted a series of field trials to determine the effectiveness of using remote-control models and their overall limitations in dispersing birds.

Dover Air Force Base is situated between three large wildlife refuges and along the eastern U.S. migratory flyway. The base is surrounded by farmland and is less than two miles from the Atlantic Ocean, providing the perfect habitat for large migratory birds. A squadron of C-5 Galaxy cargo planes operates out of Dover AFB, and even though the planes are larger and slower than most

military aircraft, bird strikes have posed a significant problem for the base. In the last two years (1998-1999), collisions between birds and aircraft have caused more than \$1.2 million in damage to Dover's C-5 fleet. The primary threats are large flocks of Canada geese (*Branta canadensis*), snow geese (*Chen caerulescens*), as well as smaller aggregates of ducks, teal, and gulls (*Larus* spp.). Prior to the contract with BCR, all attempts to eliminate birds from the surrounding environment were unfruitful. Pyrotechnic usage was unproductive, and an organized hunt of Canada geese resulted in a public relations nightmare for the airbase (as well as resulting in no overall change in bird presence). Geese are the most critical concern for aircraft operations at Dover AFB, and large flocks of the birds (100 - 20,000 individuals) congregate just outside of the base perimeter fence in the cultivated fields of neighboring farms. Through the employment of a border collie, these numbers were reduced dramatically and roughly 99% of the population of geese and ducks were removed by the dog (Table 1; Carter 2000a). However, small pockets of geese remained on a nearby quarry, and due to the large size of the ponds at the quarry (roughly 20 hectares each), the border collie was unable to be utilized in their dispersal.

Additionally, there were a limited number of further situations where the border collie could not be employed to dispersed birds. Though they were not of primary

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Table 1. Weekly bird counts for Dover AFB within 4 km of the base perimeter fence after the initiation on Feb. 1, 2000 of a wildlife control program utilizing harassment by a border collie (Carter 2000a).

	Feb 1-7	Feb 8-15	Feb 16-23	Feb 24-29	Mar 1-7
Snow geese	90,000	40,000	4,000	16	0
Canada geese	60,000	40,000	10,000	1,000	20
Ducks / Teal	550	485	412	423	231

Table 2. Total weekly count of gulls at rock quarry adjacent to Dover Air Force Base, following initiation of use of radio-controlled aircraft (Carter 2001).

	Apr 17-21	Apr 24-28	May 1-5	May 8-12
Gulls	2,260	875	457	29

concern in the overall program, with the large numbers of migratory waterfowl removed from the area surrounding the airbase, they became the focal point of remaining bird control efforts. Soaring black vultures (*Cathartes aura*) and gulls loafing in and around the quarry machinery were one of the few remaining situations that needed to be addressed, and use of remote-control aircraft became the only viable solution to their presence.

PROGRAM RESULTS

Since the early stages of the wildlife program at Dover AFB, BCR has used remote-control models to disperse birds in several prescribed situations and has, through a series of field trials, determined their effectiveness in harassing a variety of bird species under various environmental protocols. Though the models do have their limits, they can be highly effective at harassing birds in specific circumstances and overall are a productive tool in wildlife control. The results of the field trials can be separated into three distinct classifications of the efficaciousness harassment attempts: highly effective, moderately effective, and ineffective.

Highly Effective Scenarios

The radio-controlled aircraft were highly effective in dispersing gulls that came to loaf and feed on open beach areas of a rock quarry adjacent to the airfield. The quarry, due to the presence of large sandy areas produced by the outfall of particulate matter runoff from the filtration process, attracts a large number and variety of gulls. During spring days, the number of gulls can reach into the thousands on an area roughly 20 hectares in size. The gulls accumulate on the beaches and rock piles of the quarry in the early morning, arriving individually or in small groups. By the late morning, hundreds of gulls can be seen loafing and foraging on the beaches and rafting in moderate numbers on the quarry pond.

Prior attempts to harass the gulls with pyrotechnics and other acoustical devices have been unproductive, and use of the border collie to harass the birds is precluded due to the large area of water and the presence of

operating quarry machinery in other areas where the birds are loafing. At most, when pyrotechnics are utilized, the gulls will rise up off the water, circle overhead for several minutes and then return to their foraging and resting areas. A small percentage of the birds will vacate the area but not enough to make pyrotechnic usage an effective harassment tool. The circling birds also present a flight hazard when they are in the air, and it can take more than 10 minutes for the birds to alight once again. As the quarry is directly at the end of a major runway at the airbase, this makes pyrotechnic usage an unacceptable method during flight operation hours.

The radio-controlled aircraft, on the other hand, were able to effectively remove all birds from the area in a time frame of 1 to 5 minutes. Not only were all individual birds harassed from the area, but also the short time period required for their removal did not affect overall flight operations. The RCs were able to effectively remove gulls from the surface of the water as well as all individuals loafing on the beaches, rock piles, and on quarry machinery. After an initial harassment phase of 2 to 3 days, the gulls would vacate the area as soon as the RC engine was started in the vicinity, responding only to the high-pitched whine of the engine. As the usage of the RCs increased, the returning population of gulls to the quarries decreased significantly. Within a month (from late April to early May 2000) the population of gulls loafing in and around the quarries went from approximately 400-500 individuals to 4 to 5 individuals total. Each week the population dropped by roughly 50%, until very few individual gulls could be found (Table 2).

Complicating this data, however, was the fact that a great number of gulls (perhaps $\frac{3}{4}$ of the population) left the area to feed on horseshoe crab eggs along the coast during the yearly spawning of the crustaceans. It was difficult to tell whether the birds were leaving the area to forage on the horseshoe crab eggs or whether they were vacating due to the harassment of the RCs. Either way, they remained away from the quarries, even after the spawn was over, returning only to the riparian refuge area

just south of the quarries. The numbers in the refuge appeared to be equivalent to the pre-spawn numbers, indicating that the harassment minimally kept them from returning to the area, even if the causal relationship between the harassment campaign and their evacuation was uncertain. What can be said, however, is that most birds, if harassed in the morning, remained out of the area for the rest of the day with only the occasional individual returning (or arriving for the first time that day).

An additional benefit of the usage of the RCs proved to be the maneuverability of the harassment itself, as RCs were capable of “herding” the birds while in the air, away from the area of the runway, and dispersing them in the opposite direction. This effect ensured that the dispersal was directional in nature and avoided sending birds in undesirable directions. With high numbers of gulls, the dispersal could only be avoided in a single direction (e.g., having the birds not head in an easterly direction) but with smaller numbers of gulls, the directional dispersal could be far more precise.

Another scenario in which the RCs proved invaluable with the dispersal of gulls was during long rainy days, where water accumulated and worms were driven from the ground and littered the tarmac at the airfield. During these periods, pyrotechnics were utterly futile, and though the border collie could be effectively used to disperse the gulls from the runways, the birds would simply move to another area of the airfield more than ½ km away (because of the overwhelming incentive of an abundant food source), requiring further harassment. In coordination with the RCs, the border collie would drive the birds into the air and the model airplanes could then be used to “herd” the birds off the airfield, avoiding their relocation to another part of the tarmac. This combination proved extremely successful in removing feeding gulls from the runway area on rainy days (gulls were only present on the airfield during inclement weather).

A serious limitation to the use of RCs for this scenario was the actual precursor to gulls presence in the first place— inclement weather. Rain can affect the radio operation of the RCs, and though a little to moderate rain will not ground remote-controlled aircraft, extended use in the rain or heavy downpours would render the aircraft inoperable. Moreover, strong winds that normally accompany such rainy weather also make flying the RCs increasingly difficult. The RCs can be used in winds up to 20 knots, but they required powerful engines to overcome upwind airspeeds and skilled handling by the operator in order to avoid crashes. Though rainy and windy days may not be ideal circumstances for the hobbyist, the RCs used for bird harassment (with the overall safety of the actual large-scale aircraft at stake) could be utilized in reasonably “less than ideal” circumstances.

The RCs were also highly successful at removing flocks of ducks and teal (mostly mixed flocks, comprised of 20+ species) from large bodies of water in open areas.

“Buzzing” ducks a few meters above their heads resulted in immediate dispersal of all flocks and the birds vacated the area in a span of 1 to 5 minutes. Flying well over the ducks did not produce the dispersal response, as often the birds paid them no attention. When the aircraft came within several meters of their position, the ducks would rise off the water and fly off, apparently more as a response to the presence of the aircraft rather than actual fear of it as a predatory threat. Directional dispersal was generally not possible with the ducks, as their speed and maneuverability often far outmatched the ability of the RCs.

The final scenario in which the RCs were highly effective in harassing birds was in their utilization in dispersing soaring black vultures. Very little seems to dissuade soaring vultures, including pyrotechnics, live rounds, and long-range pyrotechnics, as they appear to learn the effective range of the ammunition and soar just out of the limits of the shot. When confronted by an attacking remote-control aircraft, the vultures radically alter their behavior and vacate the area in great haste. Normally, vultures soar for extensive periods around the airfield, rarely flapping their large wings and only in those circumstances to gain a small amount altitude for limited periods. Harassment with the RCs however, resulted in the rapid beating of their wings to alter their course and to gain speed, in order to escape from the buzzing aircraft. Utilization of the RCs caused them to attempt extreme maneuvers (e.g., barrel-rolls, steep dives, etc.) to evade the aircraft and to immediately seek better soaring locales away from the airbase.

Large groups of the birds (15-25 individuals) were successfully cleared from the airspace around the base, even in extremely windy and inclement weather. The vultures did not habituate to the presence of the RCs and no change in their avoidance behavior was ever observed. The birds always vacated the area promptly. However, like some other bird species, they did not seem to respond in the long-term, as the numbers of vultures soaring in the area did not decrease over time. The RCs were able to drive them away from the airbase environment but they generally returned the next day (or at regular intervals) in equal numbers. It is unclear whether they were the same individuals, but they were often found frequenting the same locales as the previous populations.

Moderately Effective Scenarios

A serious concern for the airbase is the transitioning of birds over the airspace of the runways, as birds move from their nighttime roosts to daytime foraging areas and back again. Immense numbers of geese (100,000 to 300,000 daily, including Canada geese and snow geese) transition over the airfield, presenting a potentially disastrous hazard for aircraft operations. Additionally, gulls transitioning each afternoon at the approach end of the runway nearest to the rock quarry posed another serious threat, and attempts to affect their movements with the RCs met with moderate success.

Each day, between approximately 1630 and 1830 hrs EST, a large number of gulls (500 - 4,000 birds) transitioned from their diurnal loafing areas located directly south of quarry ponds (after the initial harassment success on the quarry itself) to their nocturnal foraging and resting sites located somewhere on the shore of the Delaware Bay, just east of the airfield. Though the RCs were successful at removing birds directly from the ponds themselves, a wildlife refuge is located several hundred meters behind the quarry and large numbers of gulls remain in this area each day.

The gulls rise from their loafing spots each day in large spiraling congregations (generally over an hour-long period) until they reach approximately 100 meters above ground level and then split off in a single-file fashion to transition to the northeast. This brings an almost continuous stream of gulls directly past the approach vectors of both main airbase runways, at approximately the same height as aircraft on their landing glide slope. Use of the radio-controlled aircraft during this period was partially successful at diverting some of the individuals from this flightline; but in general, these attempts were unfruitful, as the gulls simply diverted their paths to the east, still putting them within the approach vectors of aircraft (though it can keep them from approaching the runway areas). Additionally, the RC was unable to stay aloft for more than approximately 15 minutes due to limited fuel capacity, far shorter than the transition period of the gulls.

Attempts to divert the immense flocks of transitioning migratory geese have also met with mixed success. The RCs are able to divert transitioning geese from directly flying over the airfield itself, but only with groups numbering in the hundreds. Oftentimes, flocks of several thousand geese will travel over the airfield, and at these times the RCs are simply overwhelmed by the sheer size and area covered by the flock. The entire front of geese cannot be dealt with at the same time, and the birds that are harassed by the aircraft flow around the harassing planes and join the other continuing birds flying on either side. It becomes like a school of fish flowing past an oncoming shark, with individuals directly in the path of the threat diverting their swimming pattern to either side. The enormous numbers of geese are just too overwhelming for the RCs to handle at one time.

The same limitations of fuel capacity also affect harassment of geese during these transition periods (often several consecutive hours each morning and afternoon). It is easier for airfield operations to suspend flight operations during this time than to deal with the birds by these imperfect harassment techniques. If, however, the numbers of geese are reasonable, then the use of the RCs becomes a viable method of harassment.

Ineffective Scenarios

Several scenarios showed the limitations of RCs, and harassment of birds in these circumstances proved completely unproductive. Though the RCs served as very

effective means of harassment in specific instances, they were not the ultimate tool in removing all birds from the airfield and surrounding environment.

RCs were completely ineffective at removing geese from large bodies of water. If the birds were already swimming in the open areas, use of the RCs actually reinforced their desire to stay on the water. The natural defensive reaction of geese is to seek refuge on the water when under threat, and harassing them with RCs at these times proved to strengthen their desire to stay. Even "buzzing" the geese no more than a meter or two over their heads was effective in removing them. They simply "hunkered down" even further, or occasionally dove under water. More often than not, the geese paid no attention to the low-flying remote-control aircraft and simply went about their business.

However, remote-control boats (or even normal outboard motor boats) were effective in removing the geese from the large bodies of water. The border collies are able to remove all birds from bodies of water that are not large than approximately 5-10 hectares, but anything bigger and the birds were capable of outswimming the dogs. In these circumstances, remote-controlled boats proved to be the answer, as the boats can reach speeds up to 45 mph.

Again, there are limitations to this method. If the body of water is particularly rough, the boat becomes very difficult to maneuver, as the engine and rudder may be out of the water for a portion of the time, as the boat skips along the surface over the small waves. This makes straight-line forays possible, but maneuvering to chase very mobile and agile geese extremely difficult. Attempts to rectify this limitation through the use of remote-controlled "airboats" (where the craft is propelled by the use of a normal aircraft prop and engine, which stays out of the water and avoids the problems associated with in-water propulsion) have not yet been developed at the time of this writing.

Finally, there are far more scenarios in which the RCs are not efficacious than the specific circumstances in which they are highly effective. RCs are useless against flocks of smaller birds like starlings or blackbirds; the birds simply do not see them as a threat. Individual birds are also not worth the effort of setting up the aircraft, starting the engine, getting it airborne, and then chasing down the single bird. The inability to quickly deploy (3-4 minutes is a normal startup time) compared to the use of pyrotechnics or a border collie, make the RCs an inefficient method of routine bird control.

CONCLUSIONS

RCs can be a very effective tool in combating bird problems at airfields, but only in specific prescribed circumstances and under limited conditions. Results of the field trials with RCs suggest that they can be used to effectively harass gulls, vultures, ducks, and geese from difficult areas, though there are a number of limitations and contraindications that must be taken into account

when determining the value of instituting a RC harassment program.

Even with the situations in which the use of RCs is recommended, the method has other considerations that must be taken into account. The limitations of a program utilizing RCs are two-fold: 1) the method is extremely manpower-intensive, requiring continual patrols of the airfield and perpetual removal/flight/stowage/transport of the RC for each group of birds, and 2) inclement weather, with the associated high winds and heavy rains, are the most difficult (and sometimes impossible) times to fly the tiny and fragile aircraft.

Additionally, cooperation by control tower personnel is also a critical factor. Oftentimes, tower personnel are extremely wary of utilizing the RCs in an active airfield environment (hobbyists are actually prohibited from using them within 3 miles of an airfield without airfield permission) and without their cooperation and understanding, RC usage is of limited benefit. Radio interference is of particular concern, along with the actual collision potential of remote-controlled aircraft. These fears and concerns must be alleviated, and a strict protocol of notification, procedures, and limitations must be agreed upon before commencing such operations. At Dover AFB, not only have control tower personnel been immensely cooperative in coordinating flights of the RCs on the Aircraft Operating Area, they have opened the entire airfield for use of the planes, either for harassment of birds or training flights. All that is required is that personnel operating the RCs communicate their location to Air Traffic Control (ATC) and let them know that the

RCs will be in use, as well as when the flights are concluded. To date, there has not been a single problem with this program or its procedures. The cooperation of the ATC staff is crucial to any program utilizing RCs for wildlife harassment.

Overall, the use of RCs in Dover AFB's wildlife control program has been a success, and they have afforded harassment tools that fulfill a niche that is not currently provided for by other wildlife control means. Though their usage is limited and there are several contraindications against their employment, RCs can serve as an effective tool for bird control in prescribed circumstances.

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