

Evaluation of the ChromaFlair® Crow Buster as a Starling Repellent at Nest Sites

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ABSTRACT: Aircraft collisions with wildlife pose a threat to human health and safety for both the civil aviation industry and the military. Worldwide, wildlife strikes have resulted in the deaths of more than 157 people and the destruction of at least 140 aircraft since 1990. From 1990-2003, European starlings caused about \$2.5 million in damage to civil aviation in the United States and are ranked among the top 21 most hazardous species to aviation. Lethal control to solve wildlife conflicts is often undesirable or impractical. Frightening techniques to keep birds away from airports are available, but may be untested, only temporarily effective, or cost-prohibitive. A new product, “Crow Buster”, was developed in Japan to repel crows from small agricultural plots. The product is based on ChromaFlair® pigments that allow the device to change color depending on the angle at which it is viewed and the angle of light on the product. The Crow Buster is made from lightweight plastic that forms a spiral when hung vertically from the top of the product. The objective of this study was to determine if the ChromaFlair®-based Crow Buster will deter European starlings from occupying starling nest boxes. There was no difference in the presence of nest material between treated and control nest boxes. In nests with eggs, clutch size was similar between treated (4.7 ± 0.2) and control (4.6 ± 0.1) boxes, but the mean initial date of egg laying was delayed 6 days in treated boxes. Because the device provided an initial level of repellency, it could be applied in and around starling nest sites as a deterrent until more permanent control efforts (e.g. modifying habitat) can be employed.

KEY WORDS: aviation, Crow Buster, European starling, nest box, *Sturnus vulgaris*, visual repellent

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INTRODUCTION

Aircraft collisions with wildlife pose a threat to human health and safety for both the civil aviation industry and the military. Worldwide, wildlife strikes have resulted in the deaths of more than 157 people and the destruction of at least 140 aircraft since 1990 (Richardson and West 2000, Thorpe 2003). In the United States, the estimated annual loss to civil aviation due to wildlife strikes is at least \$496 million annually (Cleary *et al.* 2005). Wildlife strikes have caused 163 human injuries and 9 fatalities in the United States since 1990 (Cleary *et al.* 2005). During this same time period, birds were involved in 97.5 % of all wildlife strikes reported to the Federal Aviation Administration (Cleary *et al.* 2005). Approximately 78% of all bird strikes occur below 244 m altitude (above ground level [AGL]) and 90% occurred below 610 m AGL (Cleary *et al.* 2005). Since most bird strikes occur either on or in the immediate airport environment, it is apparent that bird control on the airport is critical to safe airport operation.

From 1990-2003, European starlings (*Sturnus vulgaris*) caused about \$2.5 million in damage to civil aviation in the United States (Cleary *et al.* 2005) and are ranked among the top 21 most hazardous species to aviation (Dolbeer *et al.* 2000). The hazard presented by starlings is highlighted in 2 incidents: in 1960, a Lockheed Electra aircraft struck a flock of starlings on takeoff from Boston and crashed, killing 62 people (Thorpe 2003); in 1996, a flock of starlings caused a C-130 military aircraft to crash in Eindhoven, Holland, killing 34 people (Richardson and West 2000). In addition to the aviation hazard posed by starlings, they

also damage buildings, crops, and other property, and may transmit diseases (Weber 1979, Feare 1984, Johnson and Glahn 1994).

Lethal control to solve wildlife conflicts is often undesirable or impractical (Dolbeer 1986, Dolbeer *et al.* 1997, Dolbeer 1998). Frightening techniques to keep birds away from airports are available (Salmon and Marsh 1991, Cleary and Dolbeer 2005) but may be untested, only temporarily effective, or cost-prohibitive (Dolbeer *et al.* 1995). It has been especially difficult to deter starlings from nest sites (Dolbeer *et al.* 1988, Belant *et al.* 1997, Belant *et al.* 1998, Seamans *et al.* 2001, White and Blackwell 2003). A new product, “Crow Buster”, was developed in Japan to repel crows from small agricultural plots. The product is based on ChromaFlair® pigments that allow the device to change color depending on the angle at which it is viewed and the angle of light on the product. The Crow Buster is made from lightweight plastic that forms a spiral when hung vertically from the top of the product.

METHODS

We used 60 starling nest boxes (28 × 13 × 17 cm) with removable roofs (Dolbeer *et al.* 1988) attached to utility poles at the 2,200-ha National Aeronautic and Space Administration (NASA) Plum Brook Station, Erie County, Ohio. Nest boxes were ≥240 m apart and their entrances were covered until the day of treatment. On the day of treatment we used a random numbers table to assign boxes as either treated or control with the caveat that no more than 3 boxes in a row could be assigned to a treatment.

We placed a 40-cm metal rod made from #9 wire on each utility pole 32 cm above the door. The front of the rod, which ended in a loop, extended 15 cm beyond the plane of the front of the box. On treated boxes we attached a Crow Buster to the front of the rod with a swivel so that the center of the device was about 15 cm in front of the entrance to the nest box.

We opened nest boxes and placed Crow Busters on 4 May 2005. Nest boxes were inspected for nesting activity on the same day, 7 days apart, from the date of opening until the same number of starling eggs were present in a box for 2 consecutive weeks. When a clutch was considered complete, we no longer inspected the box. At each box check, we recorded the presence of nest material or nest cup, number of eggs, and species using the box. A nest check was completed in approximately 1 minute. Date that the first egg was laid was estimated by back-dating from the observed number of eggs at the time of inspection and assuming a laying interval of 1 egg/day (Feare 1984). Non-starling nests were not included in the data analysis. We drove by all boxes daily to check for damaged or missing Crow Busters. Damaged Crow Busters were repaired, but tangled Crow Busters were left until the weekly nest check, when they were returned to the initial set-up position. When all boxes containing active starling nests were complete, we ended the study.

We used chi-square statistics to test whether number of nest boxes with nest materials, nest cups, and with eggs was related to treatment. We did not make multiple comparisons of each nest phase due to the lack of independence of the data and the increasing chance of an experimentwise error rate (Milliken and Johnson 1992). We used one-way analysis of variance (ANOVA) to compare estimated mean date of first egg laying and clutch size of nests containing eggs.

Table 1. Nesting activity by European starlings in 60 nest boxes assigned to 1 of 2 treatments (control, treated with Crow Buster), Erie County, Ohio, May-June, 2005.

Nesting Parameter	Control	Treated
No. of boxes with:		
Nest material only ^a	5	7
Nest cup ^a	20	9
≥1 egg ^a	17	9
Mean (SE)		
Julian date of 1 st egg	137 (1.2)	143 (1.7)
Clutch size/nests with eggs	4.6 (0.1)	4.7 (0.2)

^a means do not differ among treatments ($\chi^2 = 2.84, P = 0.24$).

RESULTS

Birds used a total of 52 nest boxes (23 treated, 29 control). Starlings were active in 16 treated and 25 control boxes. There was no difference ($\chi^2 = 2.84, P = 0.24$) in the proportion of boxes with starling nest material, a completed nest cup, and a clutch (Table 1). In starling nests with eggs, clutch size was similar ($F_{1, 26} = 0.55, P = 0.46$) between treated (4.7 ± 0.2) and control (4.6 ± 0.1) boxes, but the mean initial date of egg laying was delayed ($F_{1, 26} = 10.5, P < 0.01$) 6 days in treated boxes (Table 1). Three other species nested in boxes during the study: house wrens (*Troglodytes aedon*) with 2

nests in control boxes; eastern bluebird (*Sialia sialis*) with 1 in control and 6 in treated boxes; and 1 tree swallow (*Tachycineta bicolor*) in a treated box.

On the daily drive-by checks, we found tangled Crow Busters on 35% of the checks. The device caught on the nest box, utility pole, or wire holder. Damage to the device, which was a broken swivel 96% of the time, was noted on 6.4% of the checks. The device was in working order on 51.6% of the checks.

DISCUSSION

Our primary goal was to determine if starlings could be kept out of a desired nesting location. Slightly over half of the treated boxes had some form of starling nesting activity in them and about 75% had some bird activity in them. Although this is numerically fewer than the control boxes (83% use by starlings; 97% overall use) it is still biologically noteworthy because starlings were using treated boxes. Whether starlings completed nesting was not as important as the fact that starlings were using the site in some form. The apparent increased use of treated nest boxes by birds other than starlings may be a function of location and not selective repellency. Based on previous studies with the same nest boxes, it is evident that there are boxes starlings do not use while bluebirds and house wrens readily use (Seamans *et al.* 2001, White and Blackwell 2003).

Despite locating the device at the entrance of the nest box, we only noted some level of repellency of starlings for approximately 1 week. The delay was measured by the date of first egg laying, but in many boxes nest material was present at least 1 week before an egg was laid. If it was critical to keep nesting material out of a specified area (e.g., small plane engines), then this device might provide an initial level of protection but would need to be supplemented with a more permanent solution within 3 days of initial deployment.

The nest box test regime used in this study is a severe test of a product. Nest boxes are used to simulate areas in buildings or equipment or other places where the presence of a nest may cause damage or potentially introduce disease (Weber 1979). The drive to nest is strong in starlings (Feare 1984), and these boxes have been in place for at least 8 years (Seamans *et al.* 2001). Therefore, starlings are used to the box locations, and in all previous years no products tested in conjunction with the nest boxes have successfully repelled starlings (Dolbeer *et al.* 1988, Belant *et al.* 1998, Seamans *et al.* 2001, White and Blackwell 2003). However, use of an integrated approach that involves multiple techniques and tools may reduce starling nesting activity.

The device was prone to tangling on the wire holding the device as well as on the boxes. This in part was due to some strong storms (winds in excess of 30 km per hour) that occurred several times during the test. We also had to replace all of the swivels that were supplied with the device. When the original swivels were replaced with ball bearing swivels, the breakage problem was solved. Two of the devices did rip near the point of swivel attachment and had to be replaced.

The Crow Buster was designed to repel crows, not starlings. Based on the results from this test, the device

does not repel starlings from a nesting situation. We did not test the device on any other species or in any other circumstance, therefore results of the test should not be extended beyond the scope of the test. However, we cannot recommend the use of this product to reduce starling nesting activity in and around buildings or structures.

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