

AIR FORCE PROBLEMS WITH BIRDS IN HANGARS

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INTRODUCTION

The Air Force's Bird-Aircraft Strike Hazard (BASH) Team has been dealing with bird hazards to aircraft for over ten years, primarily through awareness programs, direct assistance to military bases, and through R&D aimed at world-wide BASH reduction. As with any problem where a biological system (in this case, birds) is involved, diversification is important in developing solutions. The BASH Team has recommended a variety of methods for working with hazards from birds. One area of particular concern is the nuisance of pest birds in hangars. These structures are extremely alluring to birds, which seek the roof-supporting I-beams and bars for nesting sites and shelter. In addition to the nest materials and feathers which fall onto aircraft and equipment, bird droppings can easily create a messy maintenance nightmare for those who clean the hangar floors and aircraft.

For the most part, Air Force hangar bird problems have centered on the three pest bird species: Rock Doves (domestic pigeon), (Columba livia), European Starlings (Sturnus vulgaris), and House Sparrows (Passer domesticus). Experience has shown that observation of the types and numbers of birds present, as well as their habits, is a crucial first step to dealing with the situation. Additionally, documentation of cleanup costs, damaged parts, morale problems, etc., can be helpful in gaining support from commanders for programs to remove birds.

The purpose of this paper is to provide a better knowledge of structural bird problems and a survey

of methods which have offered varied success on Air Force installations. One of these methods has proved to be very effective for worst-case aircraft hangar problems and will be discussed in detail.

THE PROBLEM

Hangars are built with the intent of creating a sheltered environment in which to perform maintenance, conduct inspections, and otherwise operate on aircraft. Although some hangars have been converted to storage facilities, training centers, and even office space, all hangars were originally constructed to accommodate one or more aircraft with their high tails and wide wingspans. To avoid using support columns for the roofs of hangars, which would limit space and access, a system of metal trusses, reinforced by bricks, concrete and iron rods, serves to hold the roof in place. High bay doors, which roll on railroad tracks, provide the space necessary to bring aircraft into and out of the hangar.

The high, protected areas created by hangars provide excellent roosting habitat for pigeons, starlings, and sparrows. Even when doors are closed, birds are able to find access through broken windows, small holes, and ventilation ducts. Once inside, birds usually search for suitable nesting/-roosting sites in the overhead structure. From this vantage point, they are able to avoid most dangers, and also produce the most damage.

Equipment Damage

It is very difficult to quantify, in dollars and man hours, the amount of damage done by birds, since this information is rarely recorded. Birds do the greatest damage when their droppings land on aircraft and equipment parts, which then require extensive cleaning and repairs. This

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takes valuable time away from actual aircraft maintenance; and where droppings are numerous, components may have to be replaced, costing thousands of dollars in new parts and manhours. Birds can also make their nests in wheel wells, panel openings, engine nacelles, and inside open cockpits, interfering with moving parts and causing fire hazards.

Another expensive maintenance item is the replacement of aircraft paint, which is designed to withstand the wide ranges of heat and cold to maintain a smooth aircraft surface for flight. Bird droppings speed up corrosion and chipping/peeling of the paint, often requiring the whole aircraft to be repainted, which can be very costly. For instance, to repaint a single F-15 fighter, over \$1000 dollars in paint and supplies, and almost 800 manhours are necessary before it can be flown again. Larger aircraft are much more costly. It has not been estimated the amount of time spent cleaning and repairing other equipment stored in hangars, such as aircraft power units and support vehicles, spare tires, panels, components, etc., to name a few. At one base, the cost of cleaning just two of the many hangars (floors and equipment) with pigeon droppings left daily by about 80 birds per hangar was 12 manhours per day.

Personnel Safety

No serious injury or disease has been documented as a result of birds in Air Force hangars. The likelihood does exist, however, of personnel becoming injured as a result of slipping on a floor slick with droppings. Also, because many serious diseases are vectored through birds, sickness and death become possibilities. For most bases, the perceived threat of disease manifests itself in an unusually large number of people reporting for sick call or for checkups at the dispensary. It is difficult in these instances to link

the health problem with the bird problem. In any case, workers in a bird-infested hangar will feel unsafe, even if no real threat exists, leading to poor work habits and low morale.

Morale Problems

When working conditions become unfavorable as a result of pest birds, the mental attitude of employees severely declines. Not only do the droppings cause concern for hygiene, but there is also a great deal of apprehension when birds are heard overhead and droppings begin to fall around workers. And it is difficult to get someone to use a piece of equipment which is covered with bird droppings.

Another distressing by-product of pest birds in a hangar is the possible accumulation of mites, which fall on personnel from bird nests, insulation, or from the birds themselves. One base in Oklahoma, which utilizes numerous hangars, complained that thousands of workers were affected by bird mites which fell from insulation in the ceilings. At another base, union workers threatened several times to cease work unless something was done about the mites, which were found on the arms and necks of individuals. Only when the hangars were sprayed for mites was the union satisfied; but the birds remained.

When the hangar work force perceives that nothing is being done to effectively remove the pest bird problem, they often resort to unconventional methods of their own. Usually the first step is to throw small objects, such as bolts, screws, nails, rocks, wood, etc., at the birds. Some work crews at a Texas base have retaliated by devising homemade "darts" which are fired at the birds with the air compressors used to service aircraft. If people or aircraft are inside the hangar, injury or damage can result.

At this point, the base entomologist has usually been consulted, and must

begin to evaluate the situation in order to correctly deal with it. Misunderstanding workers often demand an instant solution to the problem, and the entomologist may resort to cheap, ineffective techniques to satisfy them. If he has an improper knowledge of how to deal with hangar pest birds, the entomologist may waste much time and money without seeing any results.

METHODS

As pest birds in structures became a notable problem to Air Force entomologists, the obvious approach was to use the same methods as those taken by farmers to remove pest birds from crops. These techniques offered a limited degree of success for indoor use; therefore new methods were devised which were aimed less at dealing with a food source and more at making the shelter undesirable. The role of the BASH Team has been to monitor these efforts, to provide limited funding for R&D in new approaches, and to evaluate and recommend the most promising procedures. The following techniques summarize Air Force attempts in past years to rid birds from structures.

Stuffed owls/Rubber snakes

Sometimes known as "scarecrows for buildings", these items have had very little or no effect on birds. The reason they are even included in this list is because so many pest managers and building supervisors have purchased them based only on the merchant's recommendation. They are placed on overhead beams and ledges only to have the birds stand on them or peck at them a few days after installation.

Rotating beacons/Shiny objects

Lights, reflectors, etc., can affect birds by initially distracting them and frightening them into hiding. Building managers have attested, however, to the brevity of their

usefulness, as the birds quickly become familiar with the steady sweep of the light or movement of the reflector. Even strobes have shown no lasting results, since the birds sense no real threat. One base recently calculated the dollar savings for removing its rotating beacons (which were left on continually) at over \$9600 per year in electricity and maintenance.

Ultrasonic Devices

In spite of an Air Force policy letter banning the use of ultrasonics, many bases purchase them for use in hangars. Since no conclusive tests have proved their effectiveness, the Air Force position is to avoid them. No high-frequency, sound-generating equipment has shown success in removing birds from Air Force structures.

Loud music/Other noises

Some hangar managers have reported success with playing loud music or variable noise generators through the speakers used for making announcements. The typical response is for birds to move as far as possible from the sound source, perhaps to the next bay area, but not out of the hangar. Problems result when workers become irritated by the noise, and when the birds realize there is no threat. Birds invariably return at night when the music is turned off.

Chemical Irritants

These usually come in the form of a gel or liquid, and create a chemical "hotfoot", or a tacky surface, making it uncomfortable to stand wherever the chemical is applied. Tanglefoot, Roost-no-More, and 4-the-Birds are products which have been used in Air Force hangars with limited success. The drawback to chemical irritants is that they collect dust and other debris and become ineffective. In hot conditions, some brands will melt and

run down walls or drip to the floor. Although companies claim that their products last for over a year, this has not been the case for the Air Force. Hangar personnel report that reapplication of chemicals was frequent because of dust and dirt problems. Also, hangars were never really free of birds because there were too many surfaces where the chemical could not be applied, and where birds could still roost. The number of beams and ledges in an aircraft hangar makes this method very difficult.

Sharp Projections

As with chemical irritants the chief problem with wire projections for bird control is the number of roosting sites which must be covered inside the hangar. Since the cost of such a plan is so prohibitive, the Air Force has never tried to bird-proof a hangar in this way. There are, however, many smaller areas where projections could be useful, such as perches outside hangar entry points, or along ledges on the outside of the hangar.

Limiting building access

As simple as this sounds, many entomologists and hangar managers fail to make an effort to close off bird entry points where possible. This may mean putting wire screen over holes, replacing broken windows, or closing hangar doors if temperatures allow, in order to discourage birds from entering. Limited access is not the same as prohibited access, however, and most birds are persistent enough to find even the smallest hole or crack. Pigeons will even fly repeatedly into windows breaking the glass to fly inside.

Netting

Since the major attraction of hangars is a safe protected roosting area, one method of excluding birds is to deny access to the hangar superstructure by using plastic

netting. A good netting for this purpose must be lightweight, durable, and fire resistant. Although the netting itself is inexpensive, installation costs can be high, even in small buildings. The difficulty lies in reaching beams with high-lift equipment to fasten the sheets of netting while avoiding hangar lighting, overhead cranes, and important access areas. If any spaces are left, birds will quickly find them and gain entrance to roosting areas. If unable to get out, they will die in the netting, and must be removed using a high-lift, by cutting the net, removing the carcass, and repairing the hole. The BASH Team studied two hangars employing the netting method, and found it very successful with some minor drawbacks. Indeed the netting excluded birds from the superstructure, but because of the design features of both hangars, birds had access to other inside areas such as above hangar doors, on wall and window ledges, and through vents in the roof. Although birds were fewer, the hangars were not bird-free; and while no birds were intentionally killed, many were caught inside the netting.

Plastic Strips/Netting over hangar doors

Temperatures reach 90°F or more, requiring that hangar doors remain open to provide ventilation at many installations. Even if all other openings are sealed off, preventing bird access, the birds can still fly through the hangar doors. To remedy this situation, the BASH Team suggested that vertical plastic strips, similar to those used to keep bugs and birds out of grocery warehouses, be used to seal off the doors, allowing air to circulate, and vehicles and planes to enter/exit. Later on, netting was suggested as an alternative: Using a metal pipe as a spool, netting is raised and lowered by ropes similar to a stage curtain,

to allow aircraft to pass through the doors. Both these methods prevent some of the birds from entering, but do nothing about birds already in the hangar. Additionally, both the strips and the netting can tear or break over time, requiring much maintenance. For instance, one base described its frustration with the netting technique. Not only did ropes and pulleys get fouled frequently, but tears in the netting created easy entrance points for birds. The last straw was on a rainy day when a jet aircraft pilot drove his plane through the almost invisible netting, destroying the whole system.

Structural Design

Rarely are birds considered when designing any aircraft facility, but there are several alterations which could decrease problems from pest birds. For instance, one new concept in hangar design suggests moving the support beams to the outside of the structure. This makes roosting less attractive, and keeps any droppings away from people and planes. Some Air Force hangars have been fitted with a "false ceiling" just below the level of the superstructure. Although birds can still roost in the support beams, droppings and feathers fall onto the false ceiling and don't reach the floor. With some thought from planners, a variety of other design features could easily incorporate methods to reduce pest bird problems in hangars.

Night harassment

If birds can be repeatedly disturbed at night, they will search for other areas to roost. Methods used to annoy birds have included high-pressure water to knock them off perches, and falcons which attack individual birds, scaring off the others. Night harassment is very labor-intensive, and often aircraft and equipment must be removed from the hangar before any action is taken. Very little is known

on how long it takes to dislodge birds from a hangar roost, or how long they will stay away once removed. There is a great probability, however, that they will simply move from one hangar to another if harassment is the only approach taken.

Hawks/Falcons

These hunting birds can be very effective and warrant special note. As mentioned above, they are sometimes used in night harassment, which takes on the following scenario: After dark, the doors to the hangar are closed and all inside lights are turned on. The hawk/falcon is then presented to the birds. If no birds fly initially, tennis balls (to prevent damage to aircraft/equipment) are thrown at them to cause movement so the hawk/falcon can see and attack. Once the predator has its victim, the other birds seem to get the hint, and fly for the nearest exit. If not, more birds may have to be killed until the hangar is cleared. The base currently using this technique reported that hangars were bird-free for two to three months before the hawk was brought back to clear pigeons. Additionally, they had contracted with a local falconry club to do the work, which provided pigeons for the club and clean hangars for the base. As mentioned, however, this procedure is labor-intensive, and requires specialized training and coordination to be effective.

Trapping

Many bases have used trapping at one time, especially with pigeons, but most of them used too small of a cage design and therefore made it unattractive to the birds. The best programs employ very large traps which a man can stand in. These have one-way entrances for birds and provide perches and food/water for captives which serve as decoys. Traps are portable, so they can be moved to other locations or into storage. Once

birds are caught, they are humanely killed and disposed of. Attempts to release birds in new locations have resulted in the same birds returning to populate the hangars a few days later. A disadvantage to trapping is that frequent monitoring of the traps can require a great deal of time. During heavy periods, a full time employee may be needed to move traps, dispose of birds, and keep food and water filled.

Shooting

The BASH Team frequently recommends shooting hangar pest birds with pellet guns or light-load shotguns on a short-term basis. Many birds can be removed with this method but there are also associated problems. Stray or ricocheting rounds can break windows, damage equipment, and injure personnel (proper safety gear and procedures is absolutely necessary). It is also very difficult to shoot all the birds in a hangar since many only return at night, and others are very adept at hiding in support beams. Many commanders do not allow shooting in hangars because of the proximity to sensitive equipment and the increased likelihood of foreign object damage to engines from projectiles. As with other methods shooting is very labor-intensive.

Avitrol

A variety of poisons are available for pest birds, but until recently, Avitrol was the only one used in connection with Air Force hangar problems. It is very important to ensure prebaiting is done properly to allow the entire population adequate time to adjust to the food source. Sometimes more than one population may be involved, and multiple feeding stations may be required. When the treated bait is used, personnel should be on hand to observe the birds and dispose of carcasses. Avitrol causes birds to emit a distress call, which could arouse the interest of

bystanders, in which case public relations issues should be considered. Several bases currently put out bait boxes of Avitrol-treated corn for pigeon control. Boxes are placed on ledges inside the hangar and connected with a string so birds won't knock them off above someone. Any dead birds are picked up and disposed of. Only limited results have been obtained from the use of bait boxes.

Toxic Perches

For the past year, the BASH Team has been examining this technique of dealing with worst-case bird problems in hangars. While not new, the Rid-a-Bird product seems to offer a cost-efficient, low maintenance means of keeping structures bird-free. Essential to successful use of the product is a preliminary survey which provides the pest controller with a knowledge of what types of birds are present and what their habits are. Once this is known, perches can be installed in the necessary locations to eliminate them (Currently the Air Force position is to use fenthion as the active ingredient toxicant in perches, since tests are not completed to show the secondary poisoning effects of endrin. Both are EPA approved for use in Rid-a-Bird perches.) As with netting, high-lift equipment is required to position the perches; however, perches take less time to install, thereby decreasing the cost. Whereas netting projects are frequently priced at \$30,000 to \$50,000, the range in cost per Air Force hangar with toxic perches has been \$4,000 to \$14,000. The only maintenance needed is a semiannual refill and cleaning for each perch, which frees entomology and hangar personnel to deal with other concerns than birds. The only problem encountered with toxic perches has been inadequate bird surveys, resulting in too few perches installed, or perches positioned in the wrong areas. In each of these

cases, a few more perches were added, eliminating the remainder of the birds. Since the chemicals do not cause birds to emit distress calls, there have been no public relations problems, nor have any reports of secondary poisoning been recorded. The BASH Team feels that this technique has great potential for controlling pest birds in worst-case hangars. Several of the hangars have been monitored by the BASH Team and have shown positive results, as seen in the following case studies.

CASE STUDIES

The following observations are not conclusive, nor are they part of a scientific study of the Rid-a-Bird product. These examples serve to illustrate several positive experiences with Rid-a-Bird, and in no way does the Air Force endorse this method to the exclusion of any others. The BASH Team continues to maintain that the best approach to bird problems is one that is diversified, and no one product will meet the requirements of all Air Force hangars.

Dobbins AFB Georgia

In October 1984, the BASH Team met with Rid-a-Bird (RAB) to make recommendations for a starling/sparrow problem in the mobility hangar used to store airdrop equipment and to process personnel during training exercises. At that time RAB offered to put up perches to demonstrate its product, free of charge, as proof of efficacy. Since working in hangars was relatively new to the RAB people, several spots were missed, and birds remained until a second group of perches were added about three weeks after the first. Many lessons needed to be learned to accomplish the desired results. One perch was redesigned to prevent leakage, and the area over the hangar doors was discovered to be essential for placement of perches if all birds

were to be removed. Even with these changes, the hangar was bird-free within only two months of the initial survey. Although the results were not convincing enough to recommend RAB for all Air Force hangars, the theory seemed to offer hope if the "bugs" could be worked out. Meanwhile, the Dobbins test hangar continues to be free of birds to the present.

Beale AFB, California

Once proper installation criteria were established at Dobbins AFB, another hangar was sought for testing the RAB system. Beale AFB requested BASH Team assistance to deal with pigeon problems in hangars containing highly sensitive planes and equipment, and RAB was recommended. The base entomologist monitored the project, recording perches installed and approximating numbers of birds present. Seven hangars were surveyed and found to contain about 100 pigeons in each. Installation began 22 Apr 85, but was hindered somewhat by maintenance operations within the hangars. Perches could only be put into place once the aircraft underneath were moved. The following is a day to day account of perch placement:

22 Apr 85	Hangar #1	6 perches
23 Apr 85	Hangar #1	42 perches
		Total 48
	Hangar #2	23 perches
24 Apr 85	Hangar #2	15 perches
		Total 38
	Hangar #6	29 perches
	Hangar #7	15 perches
25 Apr 85	Hangar #7	46 perches
		Total 61
	Hangar #4	44 perches
	Hangar #3	8 perches
	Hangar #6	8 perches
		Total 37
26 Apr 85	Hangar #3	45 perches
		Total 53
	Hangar #5	37 perches
		Total 37

On Monday, 29 Apr 85, the following

observations were made:

Hangar #1 and #2 - no birds present
Hangar #3 - 8 birds were found dead outside the hangar, 12 seen alive in and around the building.

Hangar #4 - 1 bird was found dead inside the hangar and no birds were seen alive.

Hangar #5 - no birds present

Hangar #6 - 1 bird found dead outside hangar and none seen alive

Hangar #7 - 2 birds found dead inside and none seen alive.

Grounds personnel picked up numerous birds while cutting the long grass on the airfield, and several hundred dead pigeons were removed from a field where they had been feeding less than a quarter mile away. Fifty Barn Swallows (*Hirundo rustica*) nesting in one of the hangars were completely unaffected by the perches.

Bergstrom AFB, Texas

One hangar containing pigeons, starlings, and sparrows was dealt with at Bergstrom AFB. A month before RAB was used, a shotgun patrol using pellet guns and .410 shotguns killed enough birds to fill six garbage cans of birds and noticed no difference in the population of approximately 700-1000 birds. A survey was conducted with the conclusion that 100 perches would be needed to eliminate the problem, after the BASH Team's recommendation of RAB perches. On Saturday, 27 Apr 85, 40 perches were installed, and by Monday, only 12 birds (all species) were seen flying inside the 150'x150'x70' hangar.

The next day, only about 12 starlings remained. On 10 May 85, no more dead birds were found, but a few droppings were noticed and some starlings had returned. At that point it was determined that additional perches

were needed even though 90 percent of the birds were gone.

Vance AFB, Oklahoma

Several years of attempts to get rid of roosting pigeons and starlings, as well as a threat to stop work by union employees working in a hangar, prompted the base entomologist to try RAB. Unsuccessful methods included trapping, shooting, rotating lights, chemical irritants, and Avitrol. Also, netting had been installed in a small hangar with little effect. The base entomologist recently reported that within 24 hours of RAB perch installation, his worst hangar was bird-free.

Dyess AFB, Texas

This was one of the worst hangar bird problems in the Air Force. Since the new B-1 bomber was to be based at Dyess, hangars needed to be cleared of birds as soon as possible. Within a few days of RAB installation, several hundred birds were 100 percent removed.

CONCLUSION

The BASH Team will continue to evaluate methods of dealing with pest birds in hangars. At present, the RAB system seems to provide the best "quick fix" for our worst-case situations; however, several issues need to be resolved concerning secondary poisoning effects and equipment maintainability. Total reliance on one technique is still unpractical, and as a result, the BASH Team will be responsible for recommending a variety of methods for hangar bird control. Only by proper testing over many years can any conclusion be made for safe, efficient elimination of Air Force bird problems in hangars.