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THE USE OF AIRCRAFT IN PREDATOR CONTROL

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ABSTRACT: Private aerial hunting of predators for protection of livestock began before 1925 in the western United States. Apparently, it was first used in professional control programs in 1942. Inclement weather, dense vegetation and rough terrain are limiting factors and helicopters are more versatile than fixed-wing aircraft. When it can be employed, aerial hunting is unsurpassed as an immediate control method where livestock losses are severe and the need for control is urgent.



Figure 1. Aerial coyote hunting in North Dakota, 1929. Aircraft: Waco 90. Pilot: Fred Roberts, Bismarck, North Dakota. (Photo: Courtesy of William K. Pfeifer, State Supervisor, Animal Damage Control, U.S. Fish and Wildlife Service, Bismarck, North Dakota.)

Aircraft have been used to census and survey wild animals and in hunting predators for several decades. In Canada and Alaska this has included hunting of wolves (*Canis lupus*). In some states red foxes (*Vulpes fulva*) cause substantial losses to poultry and sheep operations and are occasionally hunted from aircraft. However, the majority of aerial predator hunting in the United States has been for protection of livestock on pasture and open range from depredation by coyotes (*Canis latrans*). Since aerial hunting statutes and regulations vary from state to state and are subject to change, this discussion will deal only with the method and not with its legal regulation.

Aerial hunting is carried out primarily where livestock losses are high and other control methods require excessive time and costs for loss reduction. The rapid transit time and utility provided by aircraft suitable for hunting are primary reasons for their use. Extensive distances and difficult travel conditions caused by snow and mud are added factors that severely restrict ground operations and encourage the use of aircraft for removal of problem predators. However, good visibility is necessary for effective and safe operations; therefore, relatively clear and stable weather conditions are essential.

The use of aircraft and a shotgun for hunting predators appears to have begun in the plains states of the western United States. A cursory records search does not clearly indicate the area where it first occurred; however, at least as early as 1923 there were efforts made by private pilots in North and South Dakota to evaluate and apply this control method. Its use gradually increased until World War II when pilots, aircraft and ammunition were difficult to find in the private sector.

Following World War II, aerial hunting became a relatively common practice by some private pilots as a method of taking red foxes and coyotes. In some areas, this was largely for protection of livestock, but fur values, and bounty payments in some states, were added incentives.

In 1942, aerial hunting was apparently first adopted officially by the U.S. Fish and Wildlife Service (USFWS) as an operational coyote control method in North Dakota. In 1949 it was approved for use in South Dakota by the USFWS. Its use in professional damage control programs gradually spread but took nearly two decades to reach some of the western states.

As a professional control tool it was used in the past primarily to supplement other methods. However, the President's Executive Order No. 11643 and the Environmental Protection Agency Order PR 72-2 issued in 1972 effectively prohibited the use of toxic chemicals for predator damage control. Since 1972, these restrictions have increased the importance and use of aircraft as a professional control method. Where statutes and regulations permit, aerial hunting has also been more extensively used for livestock protection by producers who fly, or who contract private aircraft and pilots.

An "accelerated program" of predator damage control was initiated in 1972 in the western states by the USFWS to attempt to compensate for the loss of chemicals. However, only limited funding and few skilled aircrews were available. In addition, aerial hunting is less effective in the dense cover and rugged terrain of many timbered mountain areas. In some instances, therefore, the aircraft were used primarily to transport experienced control agents into problem areas to apply other control methods. Thus, the "accelerated effort" was severely hampered by these factors which provide practical limits to aerial operations in many areas of the western states.

Aerial hunting is restricted primarily to relatively open areas due to the visibility required for successful operations. Prairie grasslands provide the greatest opportunity for success, but aircraft are also useful where brush and timbered areas are interspersed with large open meadows. Where conditions are suitable, it can be a highly effective and selective method to remove problem animals. This normally involves intercepting and shooting adult animals from the aircraft but may also include searching for their dens of young during spring and summer months. Searching for dens is more commonly done in areas of intensive livestock production and where one or both of the adults are extremely wary or difficult to locate.

In some areas of intensive livestock production with a history of depredation, aerial hunting has been effective in preventing damage by reducing local populations. As a rule this would be done where livestock are held on pasture during months when the young are born. Sheep, goat and cattle ranges are the major areas for this type of reductional control.

Both fixed-wing and rotary-wing aircraft (helicopters) are used for aerial hunting. The fixed-wing craft should be a light, high-powered, two-place plane with tandem seating (one seat behind the other). It should have sufficient power for optimum performance and be equipped with a propeller designed for maximum takeoff and climbing capability for the engine used.

Early aircraft were severely handicapped for such operations by limited engine power and other factors. Some engines provided as little as 40 horsepower and were not capable of high altitude operation with a pilot and gunner. They were more severely limited by high temperatures and wind than modern aircraft. Improvements in engines and airframe design led to the more efficient aircraft now used.

The Piper PA-18 Super Cub seems to be by far the most common choice by pilots and agencies for aerial hunting with fixed-wing aircraft. The current model has a 150 horsepower engine, although earlier versions with less power were also quite effective.

Desirable features of the PA-18 include good visibility, including an overhead window (skylight), for both pilot and gunner and high capability for slow, low-level flight. It is a durable aircraft with rugged landing gear capable of withstanding the abuse of repeated landings in rough terrain. It is also very responsive to the controls.

With the engines now available, the PA-18 can operate at elevations above 10,000 feet. Special propellers increase its capability. However, oversize tires are necessary to provide adequate ground clearance for some of these special propellers. Larger tires at lower pressures have additional advantages. They reduce shock to the aircraft on rough surfaces and carry its weight more readily over muddy areas often encountered in field operations.

Other fixed-wing aircraft are also used to some extent, but a high wing, tandem seating and a skylight are essential for the most effective operational use. These features provide the optimum configuration for required visibility and efficient shooting from fixed-wing aircraft. Ski is standard equipment in place of wheels where snow is common during winter months. They are used primarily in northern states where landings in the field are necessary.

Helicopters are typically more costly to purchase and operate than fixed-wing aircraft but are much superior for observation and as shooting platforms. Their versatility in flight permits intensive searches that cannot be made by conventional aircraft. In addition, helicopters can operate in many areas of brush, scattered timber and rugged terrain where other aircraft cannot. Thus, they are often the most efficient and least costly aircraft for removal of problem animals in such areas. However, they, too, are limited by dense vegetation and terrain and are often less economical than fixed-wing aircraft for hunting open grassland areas. Helicopters which have been used effectively in aerial hunting include, among others, several models manufactured by Bell, Hiller and Hughes aircraft corporations.

The rest of this discussion will focus primarily on hunting by fixed-wing aircraft since they are used more extensively than helicopters in the western United States and are more limited in flight capability.

There are some pilots in private aerial operations who do their own gunning. However, this is not considered a safe procedure in professional control programs. USFWS regulations require both a competent pilot and gunner who have received adequate training and experience in low-level aerial operations. This is also true of other professional programs.

The pilot and gunner must function as a team with full confidence in the ability and judgment of the other. There are no substitutes for the personal qualities of experience, maturity, careful judgment and knowledge of personal and aircraft limitations. Low-level operations under any conditions leave little room for error and a mistake by either pilot or gunner can result in a serious or fatal accident.

Many people are not physically or temperamentally suited for this type of activity. Both pilot and gunner are subject to fatigue from hot weather, rough air and extended hunting periods. Human reactions are slowed under these conditions and occasional landings to stretch and relax are well worthwhile. Only an experienced pilot, preferably with additional experience as a gunner, should undertake this type of flying. No pilot or gunner should be required to fly with an individual whose qualifications or temperament he questions.

Competent aerial hunting requires extensive knowledge gained only through experience and not all pilots are good hunters. In addition, consistent expert shooting from aircraft requires more than ordinary ability. It is a distinct advantage for both pilot and gunner to be versed in other control methods and in coyote behavior. This permits more competent judgment of suitable control methods and a greater ability to handle problem animals from the air.

This type of flight involves maximum low-level maneuvering to bring the aircraft within effective shotgun range of the animal and relatively slow airspeeds to permit accurate shooting. This creates problems not encountered in normal flight and every possible safety precaution should be taken. Hunting should be done only when air conditions and weather are favorable. Equipment should be kept in the best of condition and in cold weather the aircraft should be winterized.

Both pilot and gunner should develop consistent habitual safety practices. The pilot should be aware at all times of his own limitations and those of the aircraft and operate safely within these limits. He should plan his approach to animals with every possible precaution. Wind velocity and direction and the effects of terrain on air currents should always be kept in mind. Passes at animals should not be made uphill or with hills ahead where the aircraft might be unable to climb out. Man-made obstacles such as telephone and power lines present hazards that are easily overlooked. There should always be an open route ahead in which to regain airspeed and altitude. These factors are often much more critical for fixed-wing aircraft than for helicopters.

The gunner should be fully versed in handling and shooting the shotgun he will use. It should never be pointed at the pilot or himself and extreme care should be taken to prevent shot from hitting any part of the aircraft. The gun safety should be left in the "safe" position until the barrel is outside the aircraft window and the animal is in range. It should be reset to the "safe" position before returning the gun into the ship. The barrel chamber should not be loaded until the shotgun is in shooting position and it should be unloaded before returning the shotgun into the aircraft.

Before a new gunner makes his first flight, he should make several "practice runs" with an unloaded gun under a competent instructor. Every movement of the gun from the transport to shooting position and return to transport position, including proper use of the gun safety and reloading, should be practiced until it is routine. An untrained or easily-excited person should not act as a gunner.

It is possible to shoot from either side of the Piper PA-18 aircraft. However, left-handed shooters often prefer to shoot from the right window and right-handed people from the left window due to the limited space in the aircraft. This procedure further restricts pointing the shotgun toward the propeller and may be desirable in some cases for safe operations.

Typically, a 12-gauge semi-automatic shotgun with a barrel no longer than 28 inches is used. Some aircrews prefer a barrel length of 20 to 24 inches for handling ease in the aircraft. The barrel choke (restriction at the muzzle) preferred varies, but modified to improved cylinder seem to be most commonly chosen. Since the choke is contained within the first three inches of the barrel, shortening more than this removes all constriction that holds the shot charge together. This allows the shot charge to spread more rapidly and gives a larger shot pattern. Where shooting ranges are short, this may be an advantage. However, at long range, the shot density in the pattern may be inadequate and some choke is desirable. If necessary, a competent gunsmith can swage the desired degree of choke on the end of the barrel. It is also possible to have an adjustable choke installed. However, shavings from shot cups and wads occasionally lodge in choke devices, particularly those with ventilated sleeves. This often results in shooting the choke off the end of the barrel and can be hazardous to the aircraft and crew.

Typically, large heavy lead shot is used in aerial hunting. Number 4 Buck or BB shot are most commonly chosen with No. 2 occasionally being used in summer months and for red foxes. The smaller sizes permit more shot in each shell and form denser patterns but do not always provide adequate penetration at long range. Extremely cold temperatures reduce chamber pressure and shot velocity and therefore affect shot penetration. In northern states at temperatures well below zero, some aircrews prefer copper-coated shot to offset this velocity loss and improve penetration through the dense heavy fur that animals have during late fall and winter. However, No. 4 Buck shot is not available with a copper coating.

Aerial hunting is done at varying distances from the ground, normally 500 feet (150 meters) or less. More often the search will be from approximately 300 feet (90 meters) depending on air and light conditions. Good visibility is essential and flight must be at suitable altitudes to readily observe animals. In some instances animals are found by tracking them in snow or by checking for tracks in the soft soil of creek bottoms, washes and crossings where they travel. This often requires lower flight levels than for direct observation of animals.

Aerial coyote hunting is most effective in deep snow. Coyotes are more easily observed from the air with this background and are handicapped in attempting to avoid the aircraft and reach cover. With snow cover, much of the hunting can be done by searching for coyote tracks. In fresh snow, coyote tracks can often be followed directly to the animal. Snow cover is not essential to effective hunting but is extremely helpful in removal of plane-wise animals.

Coyotes are more readily observed on clear bright days than under humid, cloudy or overcast conditions. This is much more noticeable in the absence of snow cover. Bright green grass is nearly as good as snow in providing a background contrast to coyotes. Perhaps the most difficult hunting conditions occur when snow is interspersed with bare ground and vegetation. The varied light reflections make coyotes extremely difficult to see and to keep in sight after they are found.

During cool weather, particularly in northern states and during winter months, coyotes may be active through most of the daylight hours. This is more common when food is scarce and they are not well-fed and is characteristic during their breeding season in midwinter. However, when they are well-fed and the days are warm, they tend to bed down in protected locations and move about very little from mid-morning to late afternoon.

Although coyotes can and do kill livestock at any hour of the day or night, normally they kill in late evening or early morning hours. When this occurs on a fairly regular basis, it is often possible to intercept them on their way in to kill, or before they leave. This is most commonly done during the first few hours after sunrise.

There are several reasons why early morning is normally best for aerial hunting. First, coyotes make more kills during this period than at any other time of the day. They are more active because of cooler temperatures and thus are more readily observed. Light conditions are best and coyotes show up much better during the first few hours of sunlight. Also, the aircrew is not working against time and loss of light in accomplishing control as they must during evening hours.

Coyotes are highly mobile and easily lost from sight under poor light conditions. This is a much greater problem with fixed-wing aircraft than with helicopters. When making turns to follow animals, the lower wing may totally block the animal and a large section of landscape from view of both pilot and gunner. Even under ideal light conditions, this is a disadvantage. Therefore, a skylight in the aircraft is essential to avoid losing the animal during turns.

The area to be hunted is systematically searched just as in hunting on the ground. Open grassed areas are covered but more attention is directed to rough hilly sections, watercourses and draws, brush patches and other locations where coyotes are most likely to be found. Typically the fixed-wing pilot gives most of his attention ahead and to the side where lighting is best. The gunner should watch alternately to the sides and rear for coyotes that get up or move as the plane passes over them. Helicopters have side-by-side seating and excellent visibility forward for both pilot and gunner so this procedure is not as important in them.

When a coyote is found, the pilot maneuvers the plane into position for an approach, or "pass" at the animal. The pass is made into the wind if possible and as slowly as is safe to overtake the coyote from the side or rear. As the plane passes within effective shotgun range, the gunner shoots from the open window on one side of the plane while the pilot applies power to regain airspeed and altitude. Shooting may be done from either side of the Piper PA-18 dependent on the pilots and gunners preference and whether the gunner is right- or left-handed. However, it is desirable to establish a standard approach from the side that is most advantageous to the gunner and use the same approach for all animals. As soon as airspeed and altitude are regained following each pass, the pilot normally should turn as short and fast as possible within safe limits to check the animal. Often another shooting pass may be necessary on the same animal or others with it. In making turns it is often best to make them in 90 degree segments to allow more frequent observations of the animal rather than by making full 180 degree turns.

Individual coyotes react differently to approaching aircraft. Usually, they begin moving but they may simply stand and watch. Occasionally, those found lying down will not even get up. After they have been chased or shot at they become plane-wise and will make every effort to escape into brush, timber, or other cover. Some will go to escape cover long before the aircraft begins an approach, often at distances of several miles. It is important, therefore, for the aircrew to study the terrain where coyotes are found and observe their behavior. Two or more are often found together and may begin to disperse as the aircraft approaches. A mistake in handling them can result in most or all of them escaping.

If possible, the approach should be made from the direction in which they would be most likely to escape. Normally, the nearest is shot first unless another shows evidence

of being plane-shy. Another exception is often made during spring and summer when an adult pair with young persist in killing livestock. Normally, the male does most of the killing. If the female does not show plane-wise behavior, or if neither does, and it appears likely that one of the pair may escape, the male should be shot first. In general, removal of the male is more likely to reduce livestock losses temporarily than is removal of the female if one of the pair does escape.

Every effort should be made to kill any animal on which action is begun. If the animal is left, it will often escape and be plane-shy, whereas others which have not been chased are far more likely to remain in or near the area where they were found. The gunner should shoot at least two shots or more on each pass even though the animal goes down on the first shot. A wounded animal is more likely to escape by hiding than one that is not wounded. As the aircraft pulls up from each pass, both pilot and gunner should try to locate the others and keep track of their travel direction.

Landings should be held to a minimum under these conditions except as needed to check specific animals and to allow necessary rest periods for the aircrew. Every unnecessary landing increases the hazards and adds to operational costs. The use of ground crews is an advantage when they are available to conduct necessary checks on animals and other evidence.

A great deal of assistance to aerial operations can be provided in many areas by a competent ground crew. However, shortwave radio transceivers in the aircraft and ground vehicles are essential for coordinated efforts. These should also include light portable units for use by ground crew members when away from their vehicle. The aircraft radio should have dual earphones and microphones to provide maximum use of the gunner as an observer and assistant to the pilot.

The ground crew can often save a great deal of time and allow more efficient use of the aircraft by checking coyote depredation sites and establishing the direction of coyote travel. Often it is possible to determine the approximate area in which the coyotes are living. This greatly reduces the flight time needed to remove depredating animals when the aircraft arrives. Even during unfavorable weather, there are often limited periods in which flying can be done where such ground work has been completed.

Under some conditions dogs trained in such work can be of immense help in removing problem animals. These can be released at fresh depredation sites and can often trail the predator by scent from the kill. The aircrew can then observe the direction taken by the dogs and watch the area ahead of them to aid in locating the predator. This is most effective in early morning hours before sunlight and air currents dissipate the predators scent. Trail hounds are normally the breeds most useful for this purpose. Dogs of this type are also extremely helpful in finding plane-shy coyotes that have escaped into holes or heavy cover. Some dogs can also be trained to search out and confirm occupied coyote dens and find individual animals underground.

Ground crews can often provide additional help in locating problem animals by the use of high-pitched sirens or by simulating coyote howls. Coyotes frequently can be induced to respond to these sounds by howling, thus revealing their location. Normally, the siren or the simulated howl is sounded for 5 to 15 seconds, followed by a listening period for the coyotes response. Knowledge of the direction and approximate distance of the coyotes from the siren permits the search to be concentrated in a relatively small area and increases the chance of success.

Aerial hunting provides a good method during denning season to remove problem coyotes that have not been susceptible to other methods. Support by a competent ground crew and trained dogs provides additional improvements to this method of reducing coyote depredation on livestock. Hunting dens is done in the same general way as hunting the animals by searching suitable denning areas for evidence of such activity. Den sign includes evidence of extensive coyote travel in limited areas, holes cleaned out by the coyotes, the den itself, in addition to adults or pups outside the den. If the adults are not seen at the time the den is found, return trips will usually result in finding them. An aircraft flying over the den will not normally disturb the adults enough to cause them to move their young.

Air and weather conditions often limit effective flying to early morning and evening hours. These are normally the best hours to hunt adult coyotes and pups that have

dispersed in late summer and fall. However, dens and den sign are more readily observed during the middle of the day when light comes more directly from above. Trails and resting sites, worn vegetation and other evidence are much easier to see with mid-day light. With this in mind, it is obvious that den hunting is more efficient after pups are old enough to play outside the den and develop sign that is visible from the air.

Aerial den hunting should be coordinated with efforts on the ground, with ground crews locating general areas of coyote activity to be searched systematically by the aircraft. However, removal of adult animals during the denning season and handling of dens is best accomplished during early morning hours. Often the adults can be followed as they return from a kill at this time. This is a distinct advantage should the den be hidden in brush, rocks, logs or other cover.

When it can be employed, aerial hunting of problem animals and dens is unsurpassed as an immediate control method where livestock losses are severe and the need for control is urgent. However, it is not effective in inclement weather, in dense vegetation and in extremely rough terrain; therefore, it must be considered as a supplement to other methods in control programs.

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