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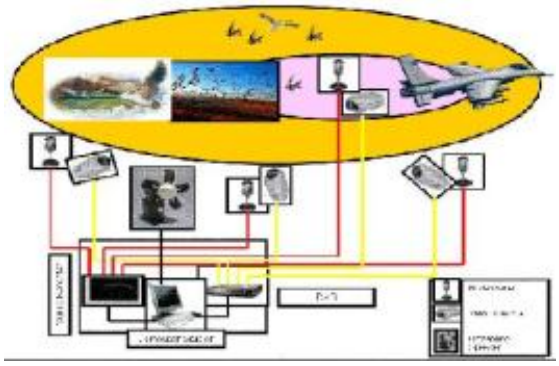
Title

Non-Lethal Avian Active Denial System Using Directed Energy



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Active Infrasound Non-lethal Denial Demonstration

SBIR Topic Number

AF093-224

Summary Report Type

Phase I Final

Summation

Considering the development of an active non-lethal avian denial system using directed energy, the feasibility of using infrasound to repel birds in critical areas around aircraft and other high value systems was examined. A rotary woofer was used as an infrasound generator in several indoor and outdoor tests to examine the impact on birds of signals that mimic natural atmospheric infrasounds. Another test was also performed using industrial blowers in a limited natural bird habitat. Promising results were obtained from the preliminary tests of the reaction of birds to particular infrasonic signals. The results demonstrated the feasibility of deterring birds by producing infrasonic signals that would jam the birds' acoustic navigational system and intermittent infrasonic signals that mimic the atmospheric disruptive features of unstable weather conditions that birds instinctively avoid, due to the workings of their innate navigational system.

Using techniques to frighten and scare birds can cause erratic behavior and chaotic conditions that may lead to aircraft damage and fatal injuries to birds. Accordingly, repelling birds in critical areas is safely achieved by broadcasting avian denial infrasonic signals, in addition to creating active bird-free zones by using interference constructive infrasound patterns around critical areas in the airfields together with low frequency noise cancellation at the perimeters of the active zones. In addition, interference destructive infrasound patterns can be used to create dead zones away from critical areas to attract birds away from airfields. Wild life sanctuaries may be established in the dead zones to navigate birds away from critical assets or divert the navigation path of the leader of a flock of migrating birds and court them away from critical areas around aircraft and other high value systems and lead them to the sanctuary; a strategy that is much safer to the assets, facilities and the birds.

Continuous and intermittent infrasound denial systems can be used alone or in conjunction with other deterrent techniques and can work in consort with a Doppler radar that detects birds' presence within the vicinity of airstrips and runways.

Anticipated Benefits

The main function of the active infrasound non-lethal denial system is to deny birds access to critical areas around aircraft and other high value systems and attract birds to a sanctuary far away from critical areas. The main uses are collision avoidance between aircraft and birds during daily flight operations without impacting mission requirements and prevention of any forms of damage caused by birds nesting and perching in unwanted areas. Accordingly the system will be of direct benefit to The Air Force Flight Test Center, Air Bases, Aircraft carriers and military facilities with high concentrations of birds in areas that pose a threat to aircraft from bird-strikes and/or aircraft/facility damage.

The secondary tier of Government agencies to benefit from the outcome of this project are: USAF in general as well as other DoD components, NASA, US Department of Homeland Security (US Coast Guard), FAA, US Department of Agriculture, Department of the Interior (US Fish & Wildlife Services).

Commercial entities that will directly benefit from this technology include: commercial aviation facilities, energy generating windmills, communication towers, harbors and shipyards and buildings and metropolitan areas. With slight modifications to the system, great benefits can be gained from other commercial applications such as: agriculture: protection of farms and crops, especially cereals and fruit trees; from various types of birds; reduction of feral pigeon population in public squares (some cities are keen to repel birds away since they tend to congregate in the central part of the cities); deterrence of feral pigeons from nesting on ledges of historic buildings (a challenging problem in many older cities); selective repulsion of vultures to protect domesticated birds; reduction of population of seagulls and other waterfowls on and near beaches and seashore resort areas; repulsion of waterfowl away from fishing and leisure boats; protection of open swimming pools and recreational areas, including man-made ponds and training race pigeons.

Additional beneficial spinoffs include: non-lethal weapons, crowd control tools, avian management tools, invisible fence to keep out birds/animals, music tools for the Deaf and hard of hearing; meditation music, sound effects, pollution forensics, human/animal presence in closed spaces (detection), detection of low-flying objects (helicopters, e.g.).

The following list delineates some of the prospective markets which have a substantial size and which can be easily penetrated:
Aviation: commercial airports/facilities - small airports (non military).
Marine: Aircraft carriers - Leisure and fishing Boats & ships - Harbors and docks - Beaches & piers - Shipyards
Land transportation: Vehicles in rural areas and wilderness
Energy/Power: Windmills - Overhead power transmission - Power transformers
Manmade structures: Ledges - City centers, public squares – Parks - High rise buildings
Property: Swimming pools and man-made ponds
Agriculture: Crops in the field
Communication: Towers - Overhead lines
Animals: Pest control – Pets - Wild animals flushing - Vultures
Human: Crowd control – Flushing - Pirate ships.