

## DRONE DEVELOPMENT TO DETER BIRDS FROM ACTIVE AIRFORCE AIRSPACE

### About the Client

The client is one of the leading Indian Governmental organizations.



### The Requirement

DEP was given a set of requirements including that the drone should be able to deter in-flight birds away from manned aircraft. Main objective is to avoid collisions and mitigate the risk of damage to assets. Functionally, the drone should have an inflight time of up to 60 minutes, reach an altitude of 1 kilometer, and have a range of 10 kilometers.

The structure of the drone was required to be light-weight so that the intensity of a potential collision would be minimal.

### The Challenge

When dealing with million dollar assets that the air force does, the protection of these assets is of utmost importance. What the

air force was dealing with was not a foreign threat but a local natural one. Birds would fly into flight paths, putting both the bird and the plane at risk of harm. The Airforce requested DEP to design a drone that would act as a bird deterrent.

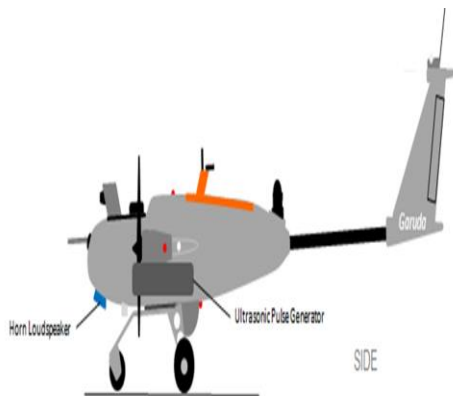
### The Solution

Based on the requirements brief, DEP's product engineering team set out to develop an application specific unmanned aerial system (UAS). DEP's approach consisted of designing the airframe, deterrence method, radio control & autopilot, camera, power, ground control, drive train, and pre-flight systems.

For the airframe, Garuda (named after a Hindu mythology character) incorporates the

conventional twin-propeller airplane layout rather than the flying wing type, which was initially proposed. This decision was made based on a more stable flying platform afforded by conventional aircraft layout as well as meeting weight and material requirements.

For bird deterrence, the first line of defense mounted on Garuda is the audible range sound generator, which consists of a 50 Watt RMS continuous amplifier. This comes with an SD card that plays sounds of predator birds and even gunfire. The speaker drivers are installed on Garuda facing downward to avoid efficiency loss with forward flight counter pressure on the speaker cone.



## The Result

DEP successfully met the requirements it was produced with and manufactured a final functioning prototype seen below. Updates are underway to even further improve the already impressive range and other flight capabilities.

Another deterrence feature was a visible paint scheme on the nose that depicts a predatory bird.

The Garuda autopilot system includes an accelerometer, inertial measurement unit (IMU) compass, global positioning system (GPS), airspeed sensor, temperature and barometer sensor as well as option for optical sensor. Autopilot can fly Garuda to waypoints, perform automatic take-off and landing, loiter and return to user. As for the cameras, two are mounted on Garuda for front and rear views.

A GPS module is mounted on top of Garuda with a clear view of the sky. The drive train system consists of the propulsion motor, the motor speed control, and the propellers. Drone take-off weight and endurance was used to determine the motor power

and propeller pitch. The propellers for Garuda is a three blade type, made of an extended polypropylene plastic strong enough to endure damage. DEP also provided a comprehensive list of Pre-flight system checks and failure management tips.



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