DESIGN AND FABRICATION OF COVERT UNDERWATER LAUNCH VEHICLE FOR UAV DURING SURVEILLANCE

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Abstract- One of the major application of UAV is surveillance due to their small size and aerial advantage. Everyday newer technologies are integrated into UAVs to improve their surveillance capability. At the same time anti-surveillance technologies are being developed to counter UAV surveillance. Environmental factors also play a role in increasing the difficulty of surveillance. One such difficult environment is when you have to approach the target from the ocean, the ocean is vast and does not provide any cover for the UAV such as trees, buildings etc. Another difficulty attributed to this environment is UAVs do not have long flight times and they could spot during their slow approach. To negate this disadvantage we are going to employ a torpedo like launch vehicle launched from a submarine. Torpedoes are covert missiles which have an explosive warhead and can travel underwater. We have created a torpedo shell in which we replaced the explosive warhead with a place to store the UAV which is to be ejected when the torpedo reaches the surface, while the torpedo shell acts as a distraction for the UAV so it finish the surveillance mission.

I. INTRODUCTION

A drone, in technological terms, is an unmanned aircraft. Drones are more formally known as unmanned aerial vehicles (UAVs) or unmanned aircraft systems. Essentially, a drone is a flying robot that can be remotely controlled or fly autonomously through software-controlled flight plans in their embedded systems, working in conjunction with onboard sensors and GPS. In the recent past, UAVs were most often associated with the military, where they were used initially for anti-aircraft target practice, intelligence gathering and then, more controversially, as weapons platforms. Drones are now also used in a wide range of civilian roles ranging from search and rescue, surveillance, traffic monitoring, weather monitoring and firefighting, to personal drones and business drone-based photography, as well as videography, agriculture and even delivery services. The concept of the project is to integrate the drones with the torpedoes shell, so that the shell can operate as a launch vehicle for the drone in covert operations.

II. FABRICATING THE DRONE

The basic first step of making a drone is to build the frame of the drone. For building a frame, we can use different materials such as metals, plastic or wood. The materials would be different based on the sturdiness of the drone. Metal is the sturdiest followed by plastic and then wood. For our drone, we have bought a readymade quadcopter frame available for purchase with other components. The material of the frame is plastic. The ESC, Motor and the propeller are among the most important elements of a functional drone. They must be in accordance with the size of the drone. The number of motors required for the quadcopter is four and the same number of ESC's and propellers. First we have to attach the motors to the frames using the screw holders and should double check whether screws are tight and the motors are correctly placed. If the motor is not fixed tightly, it may lead to hazardous accidents. Add the propellers to the motor heads. Next we have to mount the electronic speed controllers and connect them with the motors. The ESC's are the most important components which control the motors speed so if one of the ESC's is not connected properly, it could lead the quadcopter to not able to fly. Next we have to mount the flight controller which is the control element of the quadcopter. We have to attach the ESC and receiver to the flight controller terminal. Next we have to add the power source for the quadcopter which is a lithium polymer battery. The battery should also be connected to the flight controller. First check whether all the components are connected properly to the flight controller and then start calibrating the receiver with the transmitter remote. After calibration, check whether all the components of the drone are working properly. The next step is to take the quadcopter for the flight test. Take the quadcopter outside to an open field where the flight of quadcopter is allowed and check the performance of the quadcopter in the air.

III. DESIGNING THE OUTER SHELL

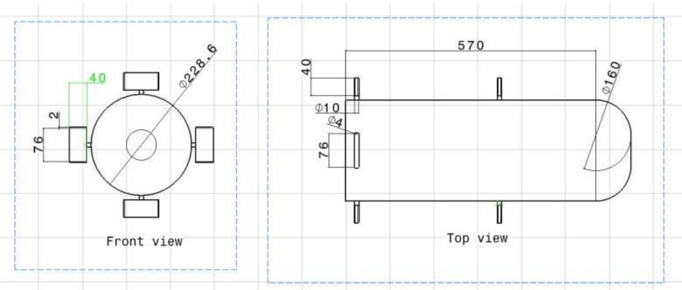

Fig 1: Dimensions of the outer shell

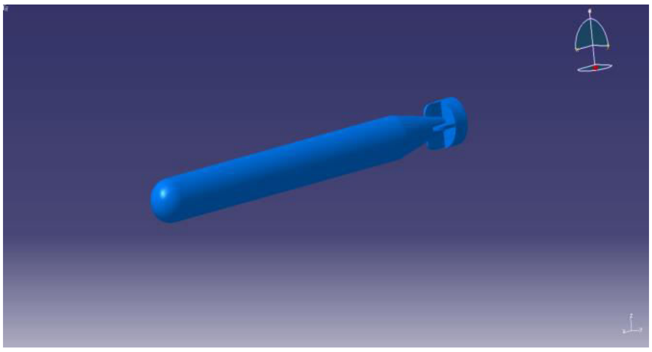

Fig 2: Outer shell design in CATIA V5

The outer shell is designed with hollow head to accommodate the drone that had already been fabricated. The model of the outer shell was created using CATIA V5. Based on this model, a prototype has been built.

IV. FABRICATING THE OUTER SHELL

Fig 3: Fabricated Outer Shell Prototype

The material used to fabricate the outer shell is PVC pipes, the front section is hollow leaving space to place the drone, and the back section consists of four fins for directionality. There is a brushless DC motor attached with five bladed propellers present in the rear end which gives the propulsion for the launch vehicle. The motor is attached with an electronic speed controller to control the speed of the launch vehicle. It is powered by a 2200 MAH lithium polymer battery and five servo motors are present to control the angular position and velocity of the torpedo.

V. RESULTS AND CONCLUSION

The fabricated prototype gives us an insight into how an torpedo shell like model can be used in covert surveillance operation as a launch vehicle for drones. The outer shell we have designed does not have the required propulsion systems which can be used in surveillance but with an better propulsion systems this model can be used in military surveillance of ocean and coastal areas.

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