02 - LastHope: Drone to Call For Help

In recent years, the number of visitors to national parks in Europe has steadily increased, even more so as people cannot travel abroad due to the pandemic. As a result, the number of incidents where people have become lost or injured has increased in these parks, which are often remote areas without cell coverage. Even so, most people still choose to rely on cell phones and do not invest in more reliable emergency communication methods, such as satellite phones or locator beacons. Even though these options rely on satellite networks, most of which have near-global coverage, they are not always reliable depending on the situation. Steep terrain or weather can interfere with the required line-of-sight of the satellite and require the user to move elsewhere, which can be dangerous in an emergency situation.

Mission Objective

To tackle this challenge, a drone shall be created that utilises autonomous decision making to secure a connection in remote areas and transmit a message to emergency services. This drone shall have the same capabilities as other emergency equipment while being able to manoeuvre itself to an area with line-of-sight, all independent of the user. An altitude of 2 kilometres must be reached to escape any line-of-sight obstacles in Europe and a loiter time of a maximum of 20 minutes is necessary to establish a connection and send a message. The drone shall feature one two-way communication system and a redundant one-way communication system to establish connection with emergency services. Additional driving aspects of the mission require the drone to remain below 500 grams, charge itself in the field for up to a month, and be able to fit in a 200x100x100mm space when stored.

System Design

During travel, the drone is stored in a compact case along with its spare parts and charging module to keep its battery topped off in the field. The majority of the case is constructed from bio-based, recyclable material and has a user interface created for effortless deployment. The arms and propellers of the drone fold such that it can fit within a 100x100x195mm space. After deployment, the quadcopter is capable of reaching its 2 kilometre loiter altitude within 100 seconds. It features an optimised motor-propeller drivetrain for the longer-duration, loiter phase of the mission. It searches constantly for connection during its ascent and loiter using a two-way satellite communication system, relying on the existing Iridium network, and has a redundant 2G cellular module. If the drone cannot immediately climb, a sensor package and obstacle avoidance algorithm help it identify a clear path. The location data of the user is stored in a black box on board in case the drone is located after an unsuccessful rescue attempt. In the final weeks of the project, further work will be completed on the autonomous path-finding algorithm and additional iterations will be completed to decrease the total mass and cost of the drone where possible. A more in-depth analysis will be performed on its potential for success in the market.