#20 - Remotely Piloted Atmospheric Science Unmanned Aircraft (RePLASMA)

The 21st century marks the advent of the digital age, where the availability of data procured through cutting edge technology fundamentally alters the way we approach problems. In no arena is this more prevalent than the fight against climate change. Often regarded as one of the most pressing problems of the modern age, the need to combat climate change has spurred innovation to new heights. A critical element in combating the impact of climate change is access to precise and accurate data on the presence of chemical species in the atmosphere. The collection of atmospheric samples and performance of in-situ experiments at high altitudes is a domain curtailed by technical challenges and previously, high costs. The time sensitive nature of the issues posed by climate change call for missions, such as RePLASMA, capable of providing the much needed data.

Mission Objective

In order to provide a platform capable of sufficient data collection, the RePLASMA is required to be capable of collecting samples and conducting experiments at altitudes in excess of 25 kilometres. Flying at such high altitudes poses technical challenges that have deterred previous missions or caused large delays in implementation timelines. Heeding this, the aim of RePLASMA is to provide a novel, remotely controlled aircraft for in-situ and remote sensing atmospheric measurements at high altitudes, to facilitate research into, and monitoring of climate change.

System Design

The RePLASMA is designed to house a variety of atmospheric science payloads, facilitating data sampling through high endurance at high altitudes. High aspect ratio wings combined with an aerodynamically optimised fuselage allow for reduced drag, improving performance in the harsh flight conditions. Furthermore, the 'V' shaped empennage facilitates controllability and stability for optimum performance within the mission profile. In the context of the mission goal, the aircraft is powered by two reciprocating engines, converted to run on bio-ethanol, reducing the carbon footprint significantly. This directly supports RePLASMA's sustainability strategy, that aims to offset the ecological costs of production and operation within 5 years. From a manufacturing perspective, the aircraft is designed to be recycled following a lifetime of operations. The large planform combined with the powerful propulsion system facilitate take-off from shorter runways, allowing the RePLASMA to operate from a host of airfields. Hence, the operation of the UAV can be facilitated from both tropical and mid-latitudes, serving scientific research effectively by providing data across a large number of regions. In summary, the RePLASMA is equipped to operate from a large variety of airfields, while remaining highly customizable to suit client needs. While providing this, the UAV minimizes its carbon and environmental footprint through various phases of life, allowing it to contribute towards solving a great challenge of the 21st century.