

21 - Unmanned flying cargo delivery van for high value goods

During the CoViD-19 pandemic, it has become clear that the air transportation of cargo is largely dependent on passenger aircraft routes and schedules. Furthermore, the CoViD-19 crisis showed an increasing demand in the air transportation of time critical goods such as vaccines and other medical equipment. Before the start of the CoViD-19 pandemic, cargo was mostly transported using the belly of passenger aircraft. As the development of the CoViD-19 crisis is far from predictable, new modes of air cargo transportation are needed to decrease the dependency on passenger aircraft. Therefore, Ir. Paul Roling has come up with the idea of an unmanned aerial cargo van which can be used to transport high value goods with a low volume. In order to achieve this reduction of dependency on passenger aircraft and to minimize ground handling efforts, the aim is to design an accessible unmanned aircraft that can fly a medium range with a small payload and can access most airports.

Mission Objective

The objective of this project is to design an autonomous aircraft that transports a low quantity of high value and time-critical goods while being economical, sustainable and accessible to most airports. A team of ten well-motivated TU Delft aerospace students worked during an 11 week time span to finally present an aircraft design that fulfills this objective. An important aspect of the design objective is the performance on sustainability. The project team aims to limit the environmental impact, focusing on noise and CO_2 emissions.

System Design

AirGO Zero-15 is a medium-sized unmanned cargo aircraft that will be deployed to perform intercontinental transportation of high value goods. In order to achieve an affordable unit and maintenance cost the aircraft will be featured by a single-engine configuration, located on top of the aircraft. To avoid jet flow interference with the empennage a V-tail is selected. The engine will be altered such that it can run on synthetic kerosene, in order to reduce its CO_2 and noise emissions. Moreover, the aircraft will be unmanned such that no cabin crew is required.

The aircraft is designed to carry 2000 [kg] of cargo, which will be distributed over three air cargo pallets. In order to improve the ground handling efficiency, the cargo directly fits inside a typical-sized van such that loading times are minimised. In general, the aircraft is designed for the coverage of a range of 5556 [km] carrying the design payload, which would be capable of flying from Amsterdam to Dubai. However, due to slight modifications in the layout and fuel tank system, the aircraft is adaptable and can also either carry 25% more payload at a shorter range, or 25% more fuel to cover

a longer range while carrying less payload. To account for safety in case of an engine failure, a parachute system is included to reduce the impact on the ground.

The payload can be loaded into the aircraft by means of an opening nose mechanism. Once the nose has rotated upwards, the cargo pallets can be loaded into the fuselage in sequential order. This in combination with a low ground clearance and short runway requirement makes the aircraft accessible to most airports.

Conclusively, due to the economical, sustainable and accessible attractiveness of the aircraft, it can be deployed on a large variation of air transportation missions.

