Unmanned Cargo Aircraft with innovative propulsion system - comparative evaluation with traditional freight systems

Frame, structure and deliverables expected

Unmanned Aircraft will be the future of the cargo industry, according to several experts. Being an application already well established in the military segment and relying on a mature technology, these vehicles are only missing the implementation of a proper regulation by the authorities to make their breakthrough into the markets.

Within this frame, Avio Aero is interested in developing an assessment of the competitiveness of the new generation of Unmanned Cargo Aircraft (UCA) powered by innovative propulsion systems and in better understanding their positioning in the market. To do so, Avio Aero believes that a benchmark of the performances of the cargo vehicles used today in the logistic industry such as trucks, trains, ships and airplanes with UCA's performances would provide a valuable insight of their potential impact in the marketplace.

Avio Aero has preliminarily identified the following benefits for the UCA with new propulsion systems:

1. Reduced operating cost compared to traditional air cargo;
2. Higher speed than trucks, train, ships;
3. Reduced social impact;
4. Reduced CO2, NOx and Noise emissions;
5. Improved reliability and predictability of deliveries, together with high flexibility.

The aim of the study is to support these statements with evidence. For this purpose, Avio Aero suggests an approach based on a modular structure where each module gives as an output a certain set of indicators. The key indicators will be the operating costs per ton-km and the transit time for each type of transport system, specified for different market segments.

It should be noted that it is not clear what future UCA will look like. The aerodynamic shape, propulsion system and other features will determine the performance of these aircraft. These uncertainties can be dealt with in two ways. Either define one or more notional UCA and calculate their theoretical performance, or assess which performance UCA under particular circumstances should have so as to be able to compete with other transport modes. The definitive approach is to be chosen later.

Below, the structure that Avio Aero propose with the related deliverables expected:

- **Module, basic elements:**
    a. Cost per ton-km for airfreight, road, railroad, water, UCA (some assumptions to be taken) transport types, plus the factors that determine these costs
    b. Transit time for the same transport modes, plus the factors that determine transit time

- **Module 1, geographic segmentation** – segmentation of the cost per ton-km and the typical transit time for the mentioned transport modes by geographical areas:
    a. EU
    b. North America

c. Latin America
d. South America
e. Africa
f. Asia Pacific
g. Middle East
h. Locations with poor infrastructure susceptible to natural disasters

- **Module 2, type of goods segmentation** – segmentation of cost per ton-km and typical transit time for the relevant transport modes by type of goods transported. This can concern both single-mode transport (i.e. inter-hub UCA transport) or multimode transport ((UCA combined with, for example, last-mile delivery by truck).

- **Module 3, distances** – typical distances traveled by transport type and by area

- **Module 4, premium price** – market driver and percentage of goods by transport type and geographical area for which the logistic operators are willing to recognize a premium price

- **Module 5, social costs and benefits** – Social cost and benefits by area and transport type (cost to build new infrastructure or reduced need for ground infrastructure, environmental impact, (reduction of) traffic congestion and/or accidents, unlocking potential of isolated areas, efficient allocation of production and distribution sites, etc.).

Timing, duration and participation

The project has an expected duration of 6 months and should be concluded by the end of 2018, which translates into starting no later than the end of Q2 2018. The project doesn't have any limitation on the number of students that can participate.

Avio Aero and PUCA support

Avio Aero will provide the necessary support to the student(s) involved free of charge in the form of specifically dedicated "consulting"/Q&A sessions.

PUCA will take care of providing additional sources of valuable insights and key players to be involved in the study such as Logistic operators, Cargo Council and others.

INFORMATION about Avio Aero

Avio Aero is a GE Aviation business that designs, manufactures and maintains propulsion systems for civil and military aviation. It is the center of excellence for the entire General Electric group in the field of mechanical transmissions and low-pressure turbines. It employs more than 4,200 people at its headquarters at Rivalta di Torino, where its largest production plant is also located, and at its other major plants in Brindisi and Pomigliano d'Arco (Naples). Abroad, it has a plant and a test center in Poland. Founded in 1908, the company has overcome many technological challenges in over a century of history. Continuous investments in research and development and an established network of relationships with leading universities and international research centers have enabled Avio Aero to develop technological and manufacturing excellence recognized across the globe: an achievement borne out by a range of collaborative partnerships with key operators in the global aviation industry.

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