

APPLICATION OF INNOVATIVE TECHNOLOGIES IN THE DEVELOPMENT OF FREIGHT AIRCRAFT FLEET

According to Boeing World Air Cargo Forecast, international air freight will drive overall world air cargo growth through 2029, and world air cargo traffic will represent an average of 5.6 % for the following 20 years.

The percentage of annual growth of freight aircraft fleet will be 3.5% for the period from 2011 year till 2030 year, doubling approximately from 1.760 aircraft in 2010 to 3,500 in 2030. Wide body freighters will account for about 60 % of the airplanes in the freighter fleet.

Still this forecast model remains related to the current configuration of aircrafts, 90% of which derives from the conversion of passenger aircraft in order to reduce acquisition costs. A noticeable leap forward in air transportation may occur with the introduction of completely new aircraft of unconventional design.

The main requirements for the civil air transport of the future are: more available space and comfort, 10-12% time reduction for boarding and disembarkation of passengers and luggage, improvement of cargo capacity, possibility of operating from present runways and airports, 30% reduction of Direct Operative Costs, improvement of the operative life, reduction of initial investment and costs for maintenance, 0.85 Mach cruise speed, more cargo in addition to luggage, stricter noise and emission requirements.

All these requirements can be fully satisfied by the introduction of innovative PrandtlPlane freighter. The aircraft was called after German physicist Ludwig Prandtl, who demonstrated the existence of a Best Wing System (BWS) minimizing the induced drag. The BWS is a biplane where the wing tips are connected together by two bulkheads. The lift distribution over the two wings, under optimum conditions, is approximately elliptical plus a constant and it is equal over the two wings.

The application of Twin-Fin PrandtlPlane configuration as a freighter aircraft is straightforward, due to the fuselage shape. Cargo doors can be positioned on the front and back fuselage, and, hence, the loading and disembarkation of goods and luggage is simpler and faster. The front wing crosses the fuselage under the cargo floor thus allowing a cargo compartment wider than conventional aircraft. Configuration of PrandtlPlane is especially approaching for use of new kinds of fuel.

At the present time, Prandtl's idea is developed in Italy as a project of five Italian universities, titled "Development of an innovative configuration for transport aircraft".

Actual airplanes have reached their maximum development; they are approaching the so called "technological asymptote". We cannot comply with strict requirements of the 2029 year with the existing scheme. A jump to the next level is required. The development of unconventional configurations of cargo aircraft is one of the tasks of the future transport aviation.

Supervisor – T. Gabrielova, Ph D in Economics