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National Research & Development Agency
Japan Aerospace Exploration Agency (JAXA)
Yamato Holdings Co., Ltd.

Collaboration between JAXA and Yamato on aerodynamics of cargo pod for eVTOL aerial system

Japan Aerospace Exploratory Agency (JAXA), and Yamato Holdings Co., Ltd. (TYO: 9064) announced their collaboration on cargo pod for electric vertical take-off and landing (eVTOL) aerial system. The two organizations have worked together in designing and evaluating the aerodynamic shape of the **PUPA®8801** heavy-size eVTOL cargo pod concept.

PUPA8801 is a 400kg- (880lbs-) payload-class variant of the PUPA (Pod Unit for Parcel Air-transportation) series which Yamato has been developing, and is transportable by either loaded onto existing ground transports together with conventional load units, or externally attached onto future eVTOL aircrafts. During the event of ground transportation, the pod needs to follow existing cargo unit size standard and be as rectangular as possible in order to maximize its containing capability. On the other hand, the pod is required to obtain high aerodynamic performance as it is intended to be attached to the aircraft externally to enable rapid loading and unloading (see Figure 1). Regarding these constraints, PUPA8801 had to be designed in an innovative approach that differs either from traditional aerospace or logistics equipment design methods.



Figure 1. Concept art of the PUPA®8801 in use (© YHD/Future iNCITE!)

To cope with this issue, Yamato has conceptualized the pod based on its know-how on ground logistics that originates on its century-old business, and from studies on cargo eVTOL system the company has held so far. For this initial concept, JAXA provided [expertise in aeronautics](#) and performed a series of computational fluid dynamics (CFD) based analyses for improving aerodynamic efficiency, using its overwhelmingly high speed fluid analysis tool FaSTAR. The organizations held an open discussion to turn the hypotheses construction and evaluation loop rapidly and verified its aeromechanical feasibility within a period of about 4 months (see Figure 2).

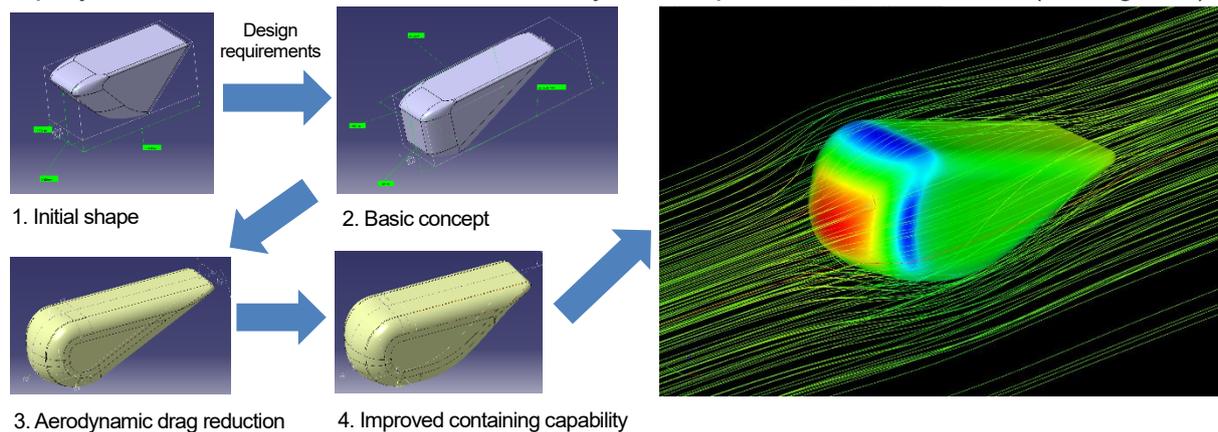


Figure 2. Evolution of the aerodynamic shape (© YHD/JAXA)

Based on the results, Yamato will further develop necessary components for the new-age eVTOL logistics service the company is intending to be introduced by early 2020s.

JAXA will continue facilitating the use of numerical simulation tools and other aerospace technologies for broad industries, including non-traditionally-aerospace, to meet the evolving needs of air mobility.

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