

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
Launch Vehicles in Service or in Development (1)

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EVOLUTION AND DEVELOPMENT OF THE VEGA LAUNCHER FAMILY AND LESSONS  
LEARNED

**Abstract**

In conjunction with the 10th anniversary of the first VEGA flight, AVIO team is now working on the maiden flight of the new and more powerful rocket VEGA-C. VEGA-C aims to consolidate the experience inherited by VEGA flights and offer a more competitive launch service on the market, along with increased payload capability. Despite the similarity with VEGA, several challenges, sometimes unexpected, were encountered during its development. This paper will focus on the lessons learned during the development cycle of the VEGA-C launch vehicle, especially in terms of how safety constraints can impact the development process and the mission design approach. Particular attention will be given to those criticalities that emerged specifically on VEGA-C and were absent with VEGA, despite the clear similarities between the two launch vehicles. In particular, issues related to visibility from telemetry stations forced the investigation of alternative mission profiles, leading to a redesign of the orbital module strategy from two-boosts Hohmann-like profiles to three-boosts profiles making use of a parking orbit. Safety issues related to the close proximity of the launch base also emerged due to the evolution of the first stage to a more powerful configuration. The rationale of the VEGA-C design and evolution, along with the criticalities that emerged during the development cycle, will be discussed in the paper. A further look into the future of VEGA will be given as the new three stages VEGA-E rocket is under development. The new launcher will be part of the “evolution” of the VEGA rocket family and it will allow to significantly simplify the flight operations. This is mainly due to the smaller number of stages and to a completely new cryogenic upper stage which makes use of an innovative LOX-Methane engine. This paper will give an overview of the differences in the mission design process and challenges between the VEGA-E launch vehicle and its predecessors of the VEGA family.