

# AEROSPACE ENGINEERING

## Centrifugal E-Pumps for Aerospace Applications

<b>Funded By</b>	Vanzetti Engineering S.P.A. [P.iva/CF:02104460049]
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<b>Contact</b>	
<b>Context of the research activity</b>	<p>The aim of this study is to complete the primary and secondary fluid dynamic design, development and testing of a submerged centrifugal pump moved by an electrical motor for aerospace applications. A detailed through flow analysis and CFD characterisation will be performed on both primary and secondary systems.</p>
	<p>The proposed numerical &amp; experimental research program will be carried out in Vanzetti Engineering. Specific focus will be aerospace applications of centrifugal turbopumps driven by submerged electrical motors for cryogenic propellants. Also storable propellants applications will be possibly investigated.</p> <p>Centrifugal flow path (Primary Systems) will be designed, characterised and tested for different cryogenic applications with enhanced blades study of inducer, impeller and volute in order to optimise suction (NPSH) and operating envelope pump performance at high rotational speed (over 15.000 rpm). Cavitation analysis and radial loads evaluation as boundary conditions for deeper rotodynamic analysis will be included</p> <p>Secondary Systems will be designed, characterised and tested for different cryogenic applications in order to minimise axial loads and manage electrical engine boil-off by studying two phase flow modelling on the critical motor air</p>

**Objectives**

gaps. Dynamic Seal Package fluid dynamic characterisation will be included

Main tasks include:

- To enhance CFD analysis for both rotor blade and secondary systems characterisation
- To model two-phase flow in complex electrical engine rotor / stator air gaps at high rotational speed in order to manage the boil off
- To study DSP (Dynamic Seal Package) fluid dynamic behaviour in this complex environment
- To confirm and tune mathematical modelling with experimental results

**Skills and competencies for the development of the activity**

Aerospace Propulsion - Rocket propulsion - CFD and experimental testing experience - Programming skills - Cryogenic/two phase flow background - Electrical motors background