Hydrodynamic study of a bioinspired Underwater vehicle by CFD.

MARINE 2023

R. Bardera Mora*, A.A. Rodriguez-Sevillano†, E. Barroso Barderas* and J.C. Matias García*.

* Instituto Nacional de Técnica Aeroespacial (INTA)
Torrejon de Ardoz, Madrid, Spain, 28850.
e-mail: barrosobe@inta.es.

† Escuela Técnica Superior de Ingeniería Aeronáutica y del Espacio (ETSIAE-UPM)
Madrid, Spain, 28040.
e-mail: angel.rodriguez.sevillano@upm.es.

ABSTRACT

This paper provides a detailed CFD study of the hydrodynamic characteristics of a bioinspired underwater vehicle for ocean exploration and seafloor mapping. This vehicle is intended to simulate the underwater movement of a manta ray through its Zimmerman configuration. With 1 m of wingspan, this AUV (Autonomous Underwater Vehicle) can swim with a velocity of 0.5 m/s.

The design methodology used to develop this vehicle is based on the generation of a 3D CATIA model, which is divided into three main parts. The body is composed of Whitcomb II airfoils to accommodate all the electronic components, the pectoral fins are made of Eppler 61 airfoils to provide up/down or forward thrust, and the tail represented as the body elongation to increase the vehicle manoeuvrability. In Figure 1 there is the AUV model with the different parts and the velocity of water field by Ansys-Fluent.

The CFD study is completed with several iterations to come up with an efficient model. This numerical analysis gives a deeply understanding of hydrodynamic characteristics of this UAV vehicle that will lead to manufacture a real demonstrator in the future.

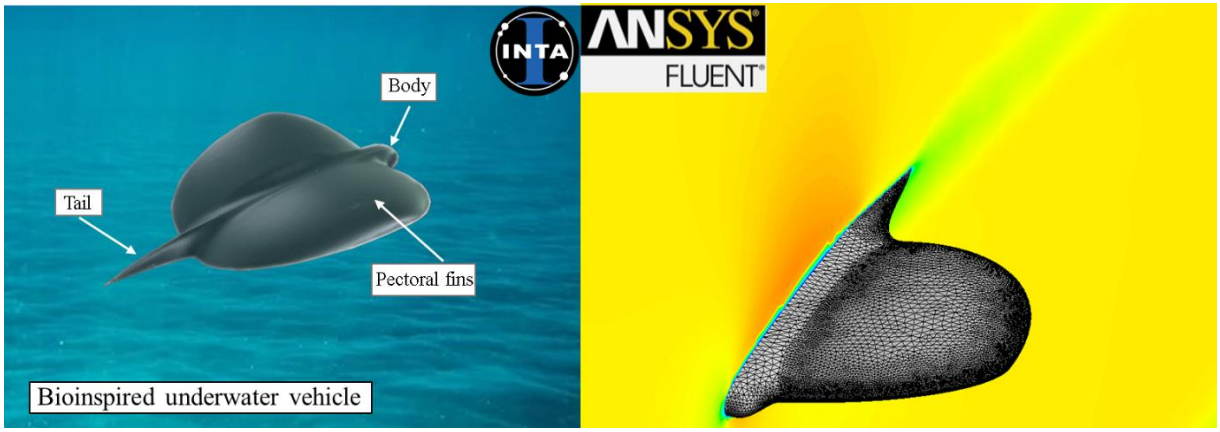

Figure 1. AUV model (left) and velocity water field by Ansys-Fluent (right).

REFERENCES

[1] J. Prakash Panda, A. Mitra, and H.V. Warrior, "A review on the hydrodynamic characteristics of autonomous underwater vehicles", *J Engineering for the Maritime Environment*, Vol. **235**, pp. 15–29, (2021).

[2] S. Mitra, V. Sehgal, S. Rathore, R. Puri, S. Chouhan and A. Sharma, "Design and Control Strategy of Bio-inspired Underwater Vehicle with Flexible Propulsor", *Journal of Modern Mechanical Engineering and Technology*, Vol. **8**, pp. 57-65, 2021.