Experimental validation of aerodynamic computational results in the aft-deck of a simplified frigate shape (SFS2) MARINE 2019

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ABSTRACT

Military frigates develop an essential tactical element and have a great importance in all navies operations around the world. This is because they provide marine and submarine surveillance, as well as support for different emergencies, rescue, and humanitarian aid. These operations increase their range, even more, when the frigate allows for helicopter operations on its deck. Thus, troops can be transported between frigates and surveillance and rescue operations can be done faster.

However, the aerodynamic interference between frigate and helicopter results in a complex airflow which causes an increase in the pilot's workload during aircraft operations above the helideck. This complex airflow is due to the fact that the frigate has a non-aerodynamic design with sharp surfaces. They cause large areas of turbulent detached flow and low-velocity recirculation zones above the flight deck endangering helicopter take-off and landing maneuvers.

For this reason, a large number of tests must be carried out on all frigates which can host helicopters operations. Tests have traditionally been performed in wind tunnels. Advances in the computing power of computers and their costs reduction have allowed better computational fluid dynamics (CFD) analysis reducing the need for experimental testing. However, CFD still has certain problems in predicting some complex flows such as the perturbed flow over the flight deck of a frigate resulting in a necessity of validation by experimental data.

The aim of this paper is to conduct a comparative study between numerical and experimental results of the flow around a simplified frigate shape (SFS2). The numerical study has been performed using a commercial software (FLUENT). The experimental study has been carried out in *Instituto Nacional de Técnica Aeroespacial INTA (Spain)* by wind tunnel testing a sub-scaled SFS2 model by means of Particle Image Velocimetry (PIV). The comparative is made comparing point by point the velocity and turbulence values obtained from experimental maps with those obtained in the numerical study. The comparison focuses on the helicopter rotor plane during its approach to the frigate. All the results presented could be a step forward in solving computational problems and improve their results related to marine engineering. They also could provide an important basis as a validation method for future researches.

REFERENCES

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