INTERNATIONAL WORKSHOP ADITIVE MANUFACTURING

1ST INTERNATIONAL CONGRESS ON ADDITIVE MANUFACTURING

BOOK OF ABSTRACTS

IWAM 22

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BOOK OF ABSTRACTS

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WELCOME

Additive manufacturing technologies are playing a decisive role in the laboratory environment, making a significant difference in STEAM education. Students use additive manufacturing to create physical models, topographic maps, biology artifacts, artwork, all types of engineering prototypes and solving mathematics challenges. By bringing additive manufacturing capabilities to the classroom, educators can raise interest in STEAM, introduce new concepts and capabilities, and help set the future for more skilled STEAM professionals.

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Manufacture wing models to analyze air fluid flow in wind tunnel using a 3D printer

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ABSTRACT

Aerodynamics is a field that is very present in our daily lives, but we are unaware of it. One of the best examples of this is our car, which was not designed at random. This study of aerodynamics has been very important in recent years in several areas, namely motor racing and aeronautics, which is so useful for us when we want to travel.

This study consists of developing prototypes of aircraft wings for wind tunnel simulation and numerical simulations due to the high demand to be able to better develop cars, aircraft, and all means involving aerodynamics. The prototypes were created using the SolidWorks CAD software, and additive printing was done in a 3D printer using PLA filament.

INTRODUCTION

Aerodynamics is the study of forces acting on surfaces. Aerodynamic forces acting on any moving object in the air, water, or other fluids. Aerodynamic forces affect everything that moves in the air, including planes, boats, automobiles, and submarines [1], [2]. They also employ aerodynamic concepts to design and build bridges and buildings, taking into consideration the force of the air acting on them [3], [4].

SOLIDWORKS software was utilized for this project, which is a Computer-Aided Design (CAD) package with hundreds of capabilities, including the Flow Simulation area, which is where the computational portion of this project was built. Flow Simulation is a simple solution based on Computational Fluid Dynamics (CFD) and integrated into SolidWorks that enables the quick and easy calculation of liquid and gas flow.

The primary goal of this research is to model and fabricate three models, as well as to simulate aerodynamic forces using the SolidWorks software's Flow Simulation function.

RESULTS

The modeled wings are designed to be distinct from typical models; the goal of this study is to analyze flow interference for three identical models that differ in beginning diameter. The effort to print a 200 mm long model, as shown in Figure 1, was unsuccessful due to the long length as well as the geometry of the part, which did not have adequate contact with the 3D printer table. Previously 200 mm long variations became 120 mm long, with diameters of 2.5 mm, 3.0 mm, and 3.5 mm.
The wings were generated vertically due to inadequate contact with the printer's bed, as seen in Figure 2. Vertical printing would eliminate the requirement for supports, which would subsequently be shown in practical tests to be unsuccessful. The brackets were printed vertically to minimize the necessity for them, decreasing the component's material and texture.

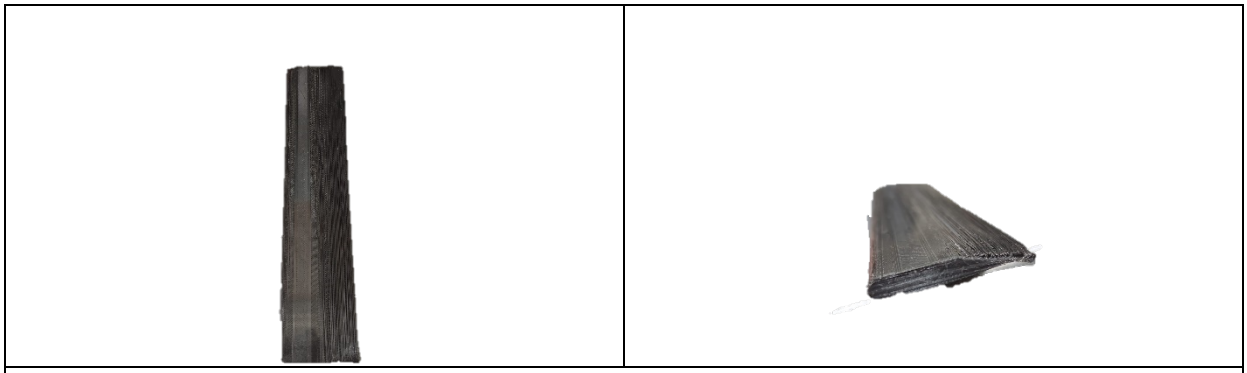

Figure 1 - Models with 3D printing defects.

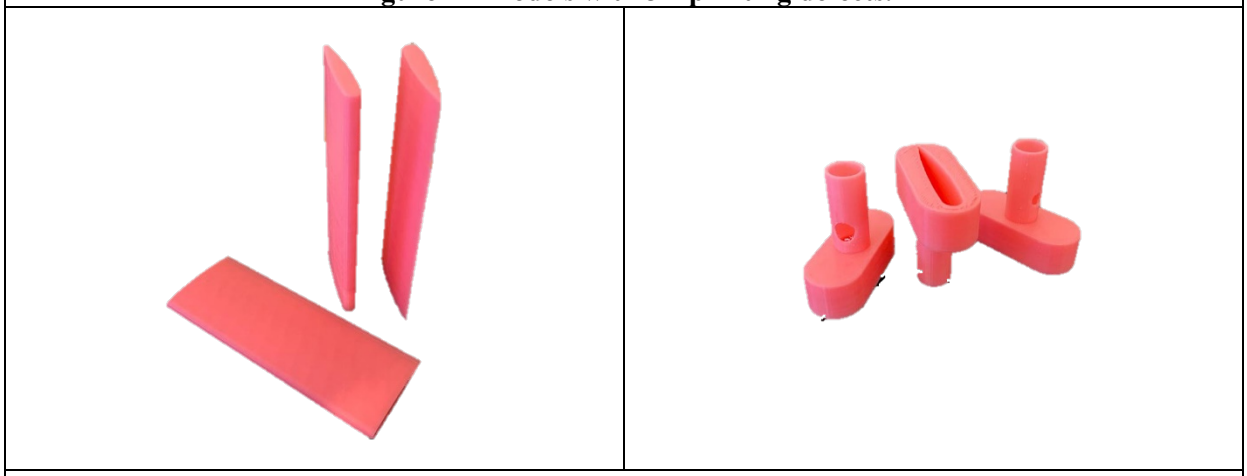

Figure 2 - Models made with 3D printer.

CONCLUSIONS

In this study, an airplane wing model that does not adhere to the previously utilized standard was created. Modeling and manufacturing were completed successfully, thanks to the adaption of printing in vertical form without the need for support.

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