

Design and fabrication of 3D wing test article

Objective

The objective of this assignment is to plan and fabricate a test article for use in wind-tunnel testing. The article consists of a three-dimensional wing that is similar to the wing of a Boeing 737. You will also need to finish the part so that it can be fastened to the force balance securely and its stiffness is increased.

Instructions

The test article is a three-dimensional wing with root chord of 5 inches and a wing span of 11 inches. The tip chord is 5 times smaller than the root chord at 1 inch. A three-dimensional rendering of the article is shown in Fig. 1.



Figure 1: Three-dimensional render of the 3D wing test article.

The bottom of the wing is outfitted with counterbore holes in order to enable the insertion of metal inserts, which facilitate the fastening of the article to the force balance stack

assembly. Further, two round rods ($3/32$ in and $1/8$ in in diameter) are inserted and glued to improve stiffness and resistance to layer separation.

Plan for 1 central $1/4$ " anchoring screw and 4 additional #6 anchoring screws.

Please refer to the class notes for details on the dimensions, design, screws and the placement of the required counterbores and their sizes.

You should turn in

Together with the fabricated test article, you should turn in the following files through the Canvas submission page

- CAD file of the wing in whichever format is compatible with the CAD software you used to design the item
- Comprehensive and exhaustive printouts of wing views from the CAD file with dimensions in inches (in PDF format), suitable for machining the part
- STL file of the wing for meshing (without counterbore and spar holes)
- Figures from ParaView detailing the STL file visualization (in PNG format).
- STL file of the wing for 3D printing (with counterbore and spar holes)
- gcode of the wing for 3D printing
- Various photographs of the 3D printed wing test article. Include detailed views of the counterbore holes for the metal inserts and the spar holes for the metal rods.