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Drag Prediction of Two Production Rotor Hub Geometries

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This material was first presented at the America Helicopter Society.

The hub drag of traditional helicopters is nominally 15-25% of the total vehicle drag and fairings to reduce the drag on production hubs have generally not been used because they inhibit inspection and maintenance procedures. As an alternative to using fairings, it may be possible to minimize the hub drag by designing hub sub-components that result in a reduced drag when installed in the complete hub. This demands the accurate prediction of drag in a timely manner so that estimates of vehicle performance can be made with confidence as the hub design evolves.

This presentation describes the process and results of applying STAR-CCM+ to predict the drag of 1/2 scale models of the S-92A and UH-60A hubs spun in a wind tunnel. The predictions were compared to wind tunnel data and showed an absolute error of less than 7%. Results from this work indicate that it is now possible to generate grids in a timely manner for complex hub geometries and that the prediction of the drag of the spinning configurations is of sufficient accuracy to support design studies to minimize the impact of the hub sub-components on the total vehicle drag.

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