Low Reynolds Number Around a Flying Saucer Micro Air Vehicle

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Today UAVs are a reality. The tendency of these devices is to decrease their size. The purpose of this work was to analyze the behavior during flight of a small scale UAV. This device has the shape of a flying saucer with dimensions: 4.2885 mm high and 10 mm wide. In order to achieve our goal, we performed two simpler analyses which consisted on the simulation of a flow around a cylinder in 2D and around a sphere in 3D for different Reynolds number.
Hypothesis.

- Our device flies in very large spaces, therefore, for the simulation we considered a large domain.
- The speed developed by the vehicle is very low.
Flow around a cylinder

\[ 1 < \text{Re}_D < 20 \]

\[ 20 < \text{Re}_D < 100 \]

\[ \text{Re}_D < 100 \]
Comparison of the drag coefficient obtained by COMSOL and the ones obtained from the literature.
Comparison of the drag coefficient obtained by COMSOL and the ones obtained from the literature.
Flow around a flying saucer
Results

Time=10, Superficie: Magnitud de velocidad (m/s)

Excerpt from the Proceedings of the 2013 COMSOL Conference in Boston
Conclusions

- The results obtained for the analyses of the flow around a cylinder and a sphere are within the range of those found in the literature, this is because the percentage error obtained for the drag coefficient is less than 8%.

- Because the geometry of NAV is not a simple one, there are no references of the drag and lift coefficients; therefore, the results obtained for the simulation of the NAV with COMSOL can be considered adequate.
Thanks you for your attention!