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Computational Fluid Dynamics Analysis and Optimization of the Coanda Unmanned Aerial Vehicle Platform

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Abstract : It is known that using Coanda aerosurfaces can drastically augment the lift forces when applied to an Unmanned Aerial Vehicle (UAV) platform. However, Coanda saucer UAVs, which commonly use a dish-like, radially-extending structure, have shown no significant increases in thrust/lift force and therefore have never been commercially successful: the additional thrust/lift generated by the Coanda surface diminishes since the airstreams emerging from the rotor compartment expand radially causing serious loss of momentums and therefore a net loss of total thrust/lift. To overcome this technical weakness, we propose to examine a Coanda surface of straight, cylindrical design and optimize its geometry for highest thrust/lift utilizing computational fluid dynamics software ANSYS Fluent®. The results of this study reveal that a Coanda UAV configured with 4 sides of straight, cylindrical Coanda surface achieve an overall 45% increase in lift compared to conventional Coanda Saucer UAV configurations. This venture integrates with an ongoing research project where a Coanda prototype is being assembled. Additionally, a custom thrust-stand has been constructed for thrust/lift measurement.

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