

Jet-Stream Airsail: Study of the Shape and the Behavior of the Connecting Cable

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Abstract : A jet-stream airsail concept takes advantage of aerology in order to fly without propulsion. Weather phenomena, especially jet streams, are relatively permanent high winds blowing from west to east, located at average altitudes and latitudes in both hemispheres. To continuously extract energy from the jet-stream, the system is composed of a propelled plane and a wind turbine interconnected by a cable. This work presents the aerodynamic characteristics and the behavior of the cable that links the two subsystems and transmits energy from the turbine to the aircraft. Two ways of solving this problem are explored: numerically and analytically. After obtaining the optimal shape of the cross-section of the cable, its behavior is analyzed as a 2D problem solved numerically and analytically. Finally, a 3D extension could be considered by adding lateral forces. The results of this work can be further used in the design process of the overall system: aircraft-turbine.

Keywords : jet-stream, cable, tether, aerodynamics, aircraft, airsail, wind

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