Wind Tunnel Tests of the Counter-Rotating Propeller of Stratospheric Airship

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Abstract: *In* this paper, a design of counter-rotating propeller (CRP) for stratospheric airship in low Reynolds number is tested in experiment for the first time. In consideration of stratosphere environment, a two-bladed counter-rotating propeller is designed for stratospheric airship. With the similarity theory of Reynolds number and advanced ratio, the experiment is conducted in low Reynolds number wind tunnel at Beihang University. The results indicate that counter-rotating propeller were 4%-7% percent more efficient than single-rotating propeller (SRP). This shows that for the counter-rotating propeller: 1) with the same diameter and power, the thrust coefficient is higher; 2) with the same thrust coefficient and power coefficient, the diameter could be reduced; 3) with the same thrust coefficient and diameter, the power coefficient could be reduced.

Keywords: stratosphere air; counter rotating propeller; wind tunnel tests; advanced ratio