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Aerodynamic performance of distributed electric propulsion with wing interaction

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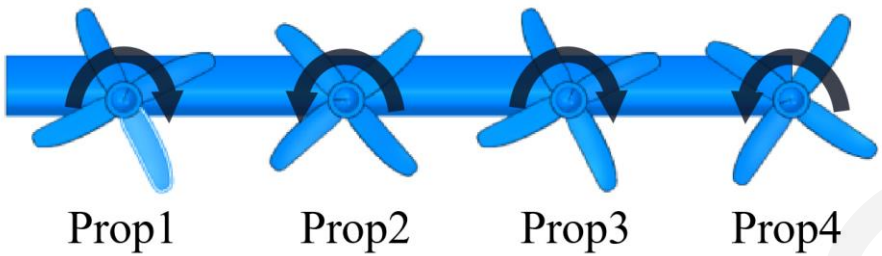
Distributed Electric Propulsion (DEP)



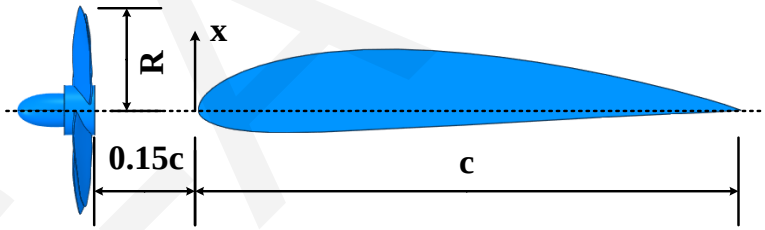


Fig. 1 DEP configuration

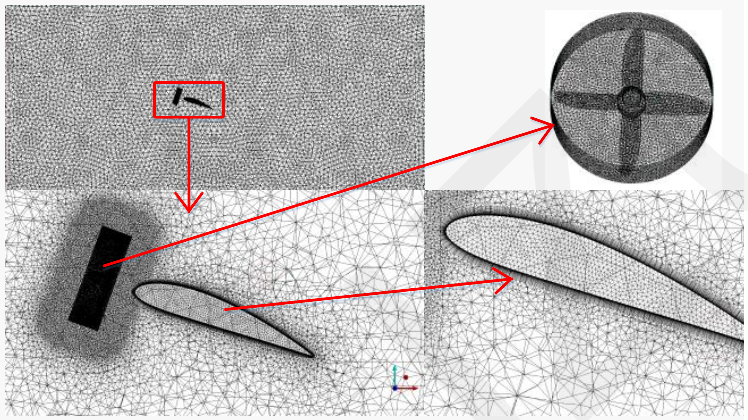


Fig.2 Mesh distribution

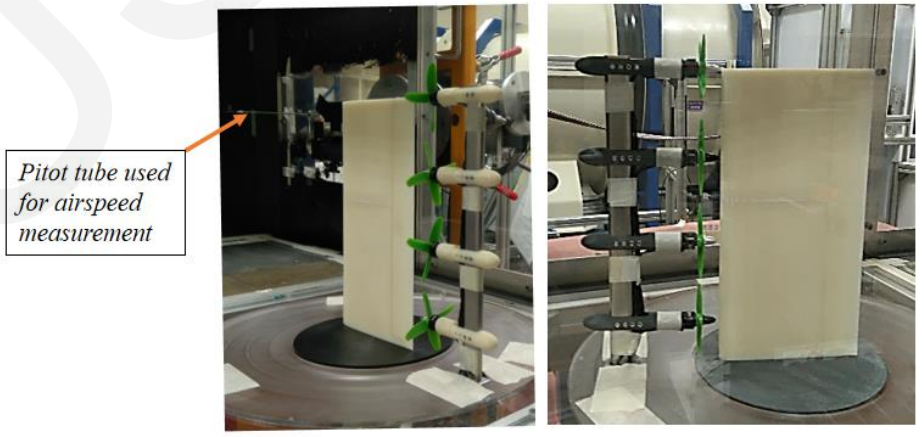
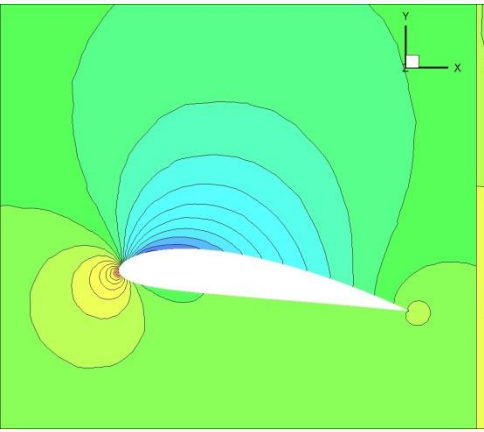
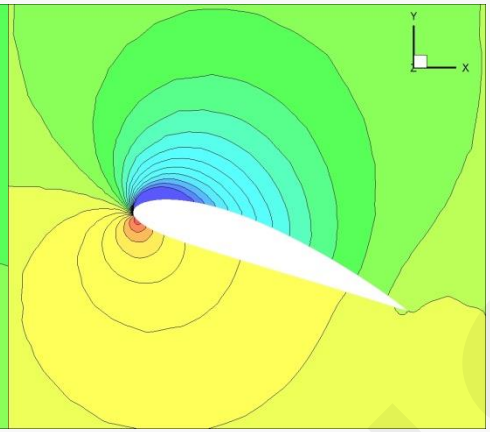


Fig. 3 Experimental setup

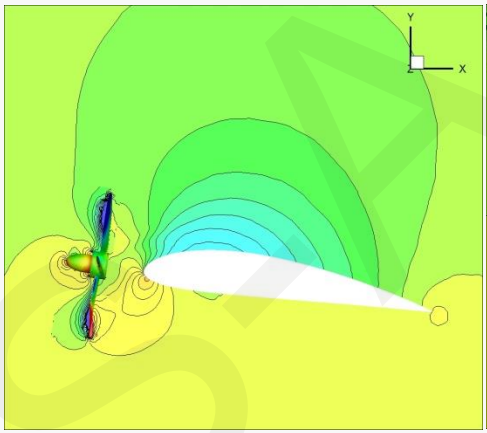
Simulation Results



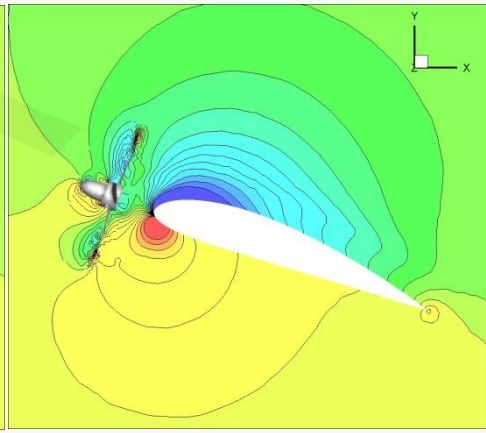
(a) Isolated wing at 8° aoa



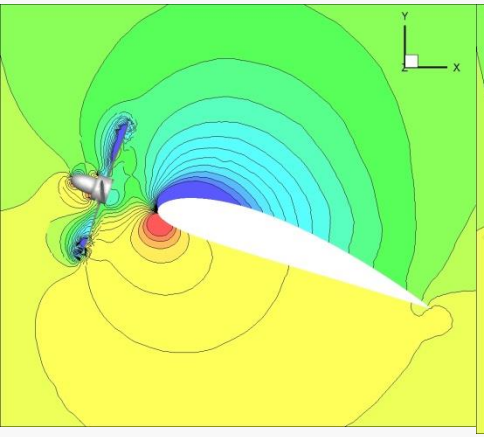
(b) Isolated wing at 20° aoa



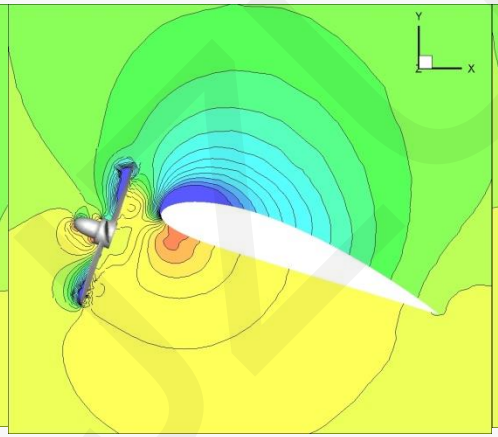
(c) xr0-0.15c at 8° aoa



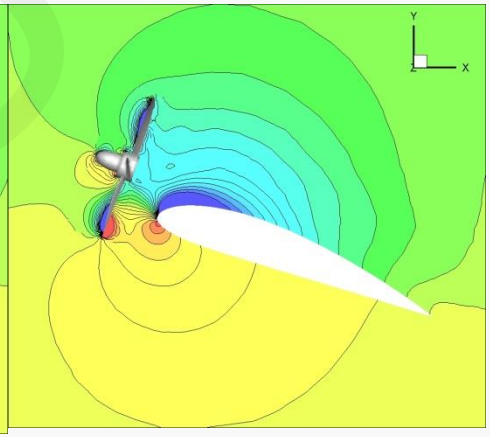
(d) xr0-0.15c at 20° aoa



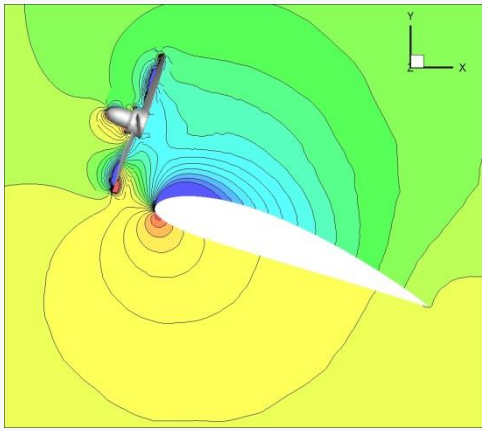
(e) xr0-0.2c at 20° aoa



(f) xr-0.5-0.15c at 20° aoa



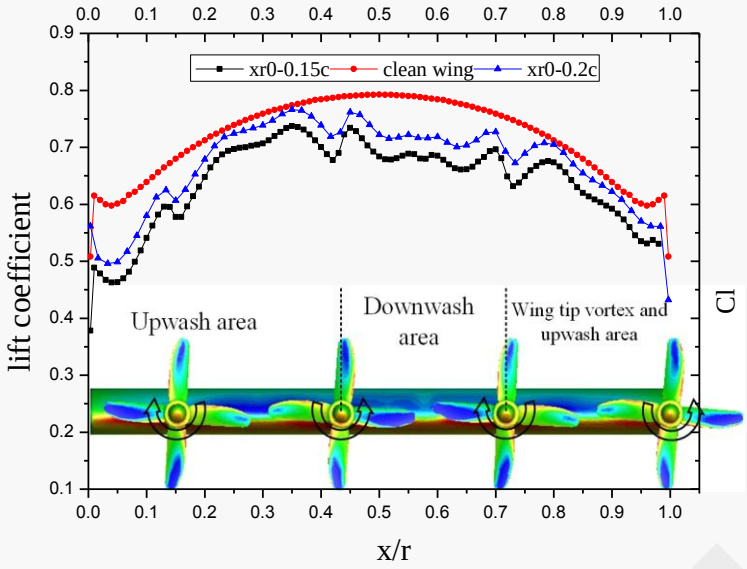
(g) xr0.5-0.15c at 20° aoa

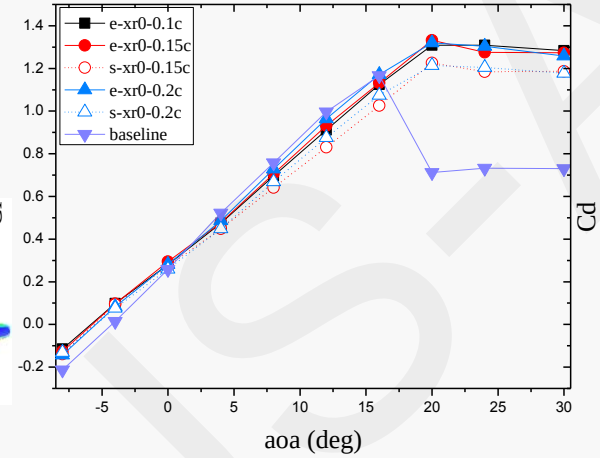


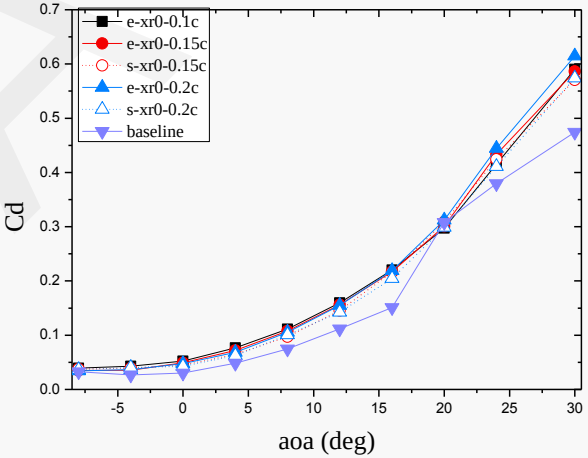
(h) xr1-0.15c at 20° aoa

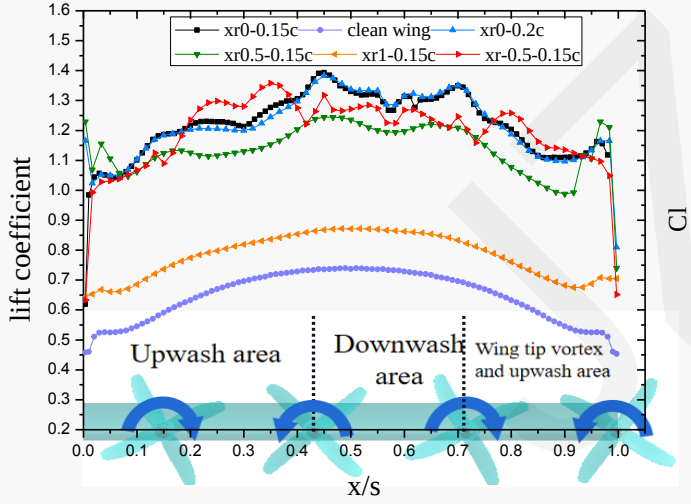
Fig. 4 Pressure distribution

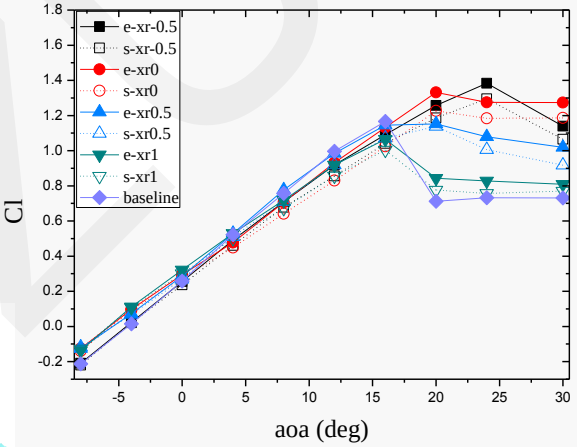
Experimental Results











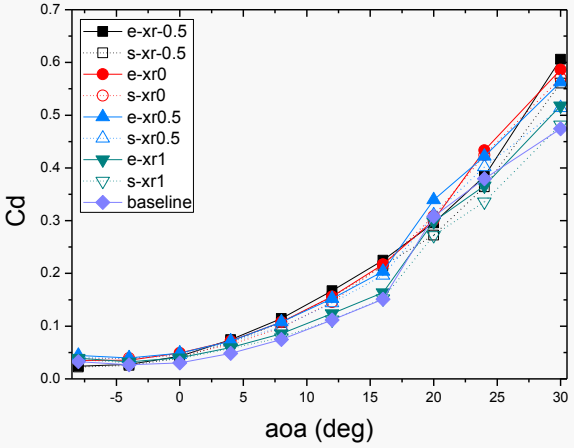


Fig. 5 Cl and Cd distribution

Conclusions

- Cl is not sensitive to the aoa when aoa ttack is less than 16. Cl increased 73%-87% with propeller when the aoa is greater than 16°.

- The upwash and downwash induced by the slipstream may improved the aerodynamic force of the wing to exhibit an increase in lift and drag, especially for aoa is less than 16.

- The tractor configuration presents higher lift and L/D which means the distance of climb and descending will decrease and require less energy.