

Motivation

Need of better aerodynamic performance & maneuverability
Spanwise discontinuities => flap tip vortices => additional drag
Limited CFD based study of longitudinal trimmed flight
3D CFD simulation => computationally costly

Objective

A/D comparison among HF, SCMF, S-SCMF wings
A/D & Trim comparison b/w UAV with HF-E & SCMF-E
2D-to-3D model development for A/D characteristics prediction

Results

Figure 1: Drag by S-SCMF ↓ by 7% (@ SCMF) & ↓ 14% (@ HF) for $C_L = 1.2$
Figure 2: Drag by SCMS ↓ by 23% and δ_e ↓ by 90% (@ HS) for $C_{L(des)} = 1.21$
Figure 3: A/D values by model almost coincides with CFD (RMS error < 1%)

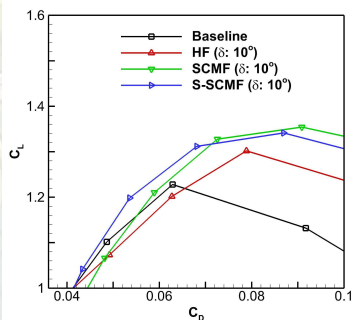


Figure 1

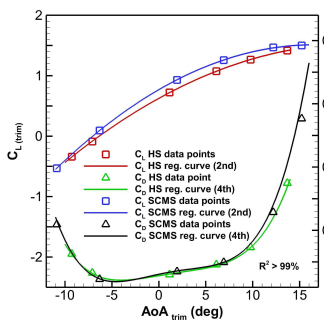


Figure 2

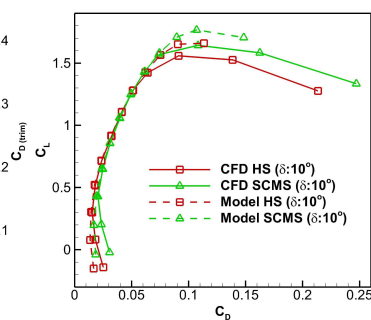
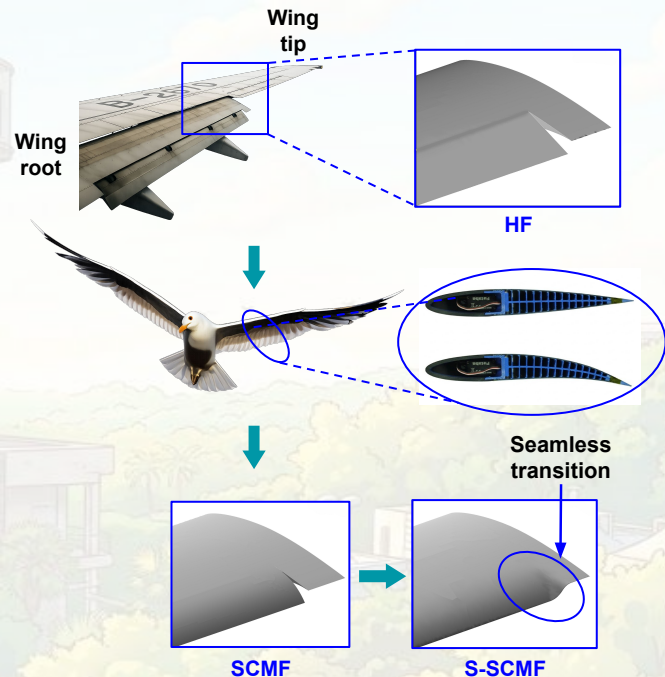


Figure 3



A/D: Aerodynamic

δ_e : Elevator deflection

HF: Hinged Flap; (-E): Elevator

SCMF: Smooth Camber-Morphed Flap

S-SCMF: Seamless Smooth Camber-Morphed Flap