

ANALYTICAL AND NUMERICAL APPROACHES FOR THE COMPUTATION OF AEROELASTIC SENSITIVITIES USING THE DIRECT AND ADJOINT METHODS

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OVERVIEW

Validating the fluid Jacobian via Finite Difference

$$\left. \frac{\partial \mathbf{R}}{\partial \mathbf{w}} \right|_{\mathbf{w}_0} \mathbf{u} = \frac{\mathbf{R}_i(\mathbf{w}_0 + \epsilon \mathbf{u}) - \mathbf{R}_i(\mathbf{w}_0 - \epsilon \mathbf{u})}{2\epsilon}$$

Validate the fluid solution via the finite difference of two steady state simulations

$$\left. \frac{d\mathbf{w}(s)}{ds} \right|_{\mathbf{w}_0} = \frac{\mathbf{w}(s + \epsilon) - \mathbf{w}(s - \epsilon)}{2\epsilon}$$

Simple NACA0012 profile

- $\alpha = 0.0^\circ, 3.0, 6.0, 9.0$
- $M = 0.1, 0.3, 0.7, 0.9$
- Stiffened Gas

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