D8 Series: Experimental Assessment of Boundary Layer Ingestion Benefit


**Backgrounds**
- D8 series aircraft configuration offers potentially large efficiency benefit
- Experimental assessment needed to address issues with configuration
  - Unconventional design traits: “double-bubble” fuselage, boundary layer ingestion
  - Potential challenges: engine response to distortion, tail configuration aerodynamics

**Goals**
- Experimentally assess D8 series configuration performance
- Compare D8 series performance to baseline (737-800) in a traceable manner
  - Benefits of boundary layer ingestion (BLI)
  - Effect of inlet distortion on fan performance
  - Presence of unanticipated losses due to propulsion system-airframe integration

1:11 Powered Airframe Experiments
- Purpose: back-to-back comparison of podded propulsor (non-BLI) and integrated (BLI) configurations to assess BLI benefit
- Experimental setup: propulsor power sweeps, flow field surveys
- Experiments were carried out using a commercial off the shelf fans
- Measurements: forces and moments, propulsor mechanical energy flow rates

**Experimental Total Pressure Surveys (Right Propulsor)**

Aerodynamic curves for the D8-series aircraft

Potted (non-BLI) configuration

Integrated (BLI) configuration

Boundary Layer Ingestion Benefit

6% BLI benefit at simulated cruise