Aurora eVTOL and Hybrid-Electric Experience

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Contents

• GoldenEye 80 – Low-noise ducted fan
• Excalibur – Hybrid-electric VTOL
• DARPA VTOL X-Plane (VXP) and
• Subscale Vehicle Demonstrator (SVD)
• Aurora eVTOL
DARPA Organic Air Vehicle II – GoldenEye 80

- signature dominated by
  - Exhaust-radiated engine tones
  - Rotor discrete rotational tones
  - Rotor broadband noise.
- inaudible at 500 feet

**Engine muffler**
- dual expansion chamber design
- -10 dB rel. to stock muffler
- -20 dB rel. to unmuffled engine

**Impeller and liner**
- 11-blade composite unit
- -15 dB compared with the GE100 4-blade rotor
- Early Risk reduction testing using an open-air fan driven by an electric motor
- lightweight absorptive acoustic liner material was incorporated with the duct inner wall

**Liner**
- lightweight absorptive acoustic liner material was incorporated with the duct inner wall

Custom tuned muffler
Low-noise 11-blade, ducted fan
Absorptive duct liner
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Excalibur Turbine-Electric Hybrid VTOL

- **Target Mission:**
  - Provide highly survivable, rapid-response strike asset to front-line troops
  - ISR, Battle Damage Assessment (BDA)

- **Design Features**
  - Vertical Takeoff and Landing
  - Three electric fans provide supplemental thrust and control during VTOL
  - Morphing Configuration
  - Fully autonomous

<table>
<thead>
<tr>
<th>Proof of principle</th>
<th>Objective Air Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty Weight</td>
<td>620 lbs</td>
</tr>
<tr>
<td>Wing Span</td>
<td>10 ft</td>
</tr>
<tr>
<td>Length</td>
<td>13 ft</td>
</tr>
<tr>
<td>Height</td>
<td>5 ft</td>
</tr>
<tr>
<td>GTOW</td>
<td>720 lbs VTOL</td>
</tr>
<tr>
<td>Payload</td>
<td>-</td>
</tr>
<tr>
<td>Useful Payload</td>
<td>100 lbs</td>
</tr>
<tr>
<td>Ceiling</td>
<td>20,000 ft VTOL</td>
</tr>
<tr>
<td>Maximum Speed</td>
<td>280 Knots at Sea Level</td>
</tr>
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*Aurora Flight Sciences*
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XV-24A Power Generation System (PGS)
Aurora’s XV-24A LightningStrike
High-speed VTOL aircraft

- Highly over-actuated
  - 24 blade pitch mechanisms
  - 48 actuated nozzle flaps
  - tilting wing and canard
- Complex coupled aerodynamics, structure, and propulsion systems
Subscale Vehicle Demonstrator (SVD)

Webster Outlying Field, NAWC-AD
Photo credit: Dr. Ashish Bagai, DARPA TTO

Gross Takeoff Weight: 325 lbs
Max Speed: 100 knots
Endurance: 5 - 8 minutes
Max Altitude: 500 ft AGL
Wing Span: 10.7 ft
Fuselage Length: 7.8 ft
Power: Lithium batteries
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Aurora eVTOL

- 2 passengers + luggage (225 kg)
- 1-Ton class TOGW

- Designed for robust transition

- 8 x lift rotors stopped in cruise, 1 x cruise motor
- $V_{\text{best\_range}} \sim 180 \text{ km/h}$

Nominal mission 50 km

- Inbound Transition
- Transition
- Vertical takeoff
- Warmup, Taxi

Reserve mission

- Inbound Loiter (5 min)
- Transition
- Land, taxi

Climb

- ~450m
- ~50m

1,000 m MSL