THE HELIPLANE
Right technology, right time
Heliplane Overview

- Vertical Takeoff and Landing (VTOL) and hover capability of a helicopter combined with high speed cruise capability of a fixed-wing airplane
- Efficient high speed cruise at speeds 2-3x of today’s helicopters
- Reduced complexity and cost
# Heliplane

SET TO DISRUPT THE VTOL MARKETPLACE

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>400 MPH</td>
</tr>
<tr>
<td>Payload</td>
<td>1,000 LBS</td>
</tr>
<tr>
<td>Range</td>
<td>1,000 MI</td>
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</tbody>
</table>
Key Elements

- High Lift/Drag Ratio ~10 (efficient cruise)
- Reaction Drive (no antitorque or cross-shafting required)
- Rotor Essential for Hover, VTOL and Low Speed Flight
- Twin Turbofans for Forward Propulsion
- Wing Carries Majority of Lift during Cruise Flight
- Mechanically Simple and Robust
**Heliplane**

**KEY ELEMENTS**

- Williams International FJ44 Turbofan Engines
- Low Cost Rapid Development
- Reaction Drive - tip jets (no transmission or anti-torque required)
- Rotor: essential for hover, low speed flight, and low speed maneuverability.
- As airspeed increases, lift is steadily transferred from the rotor to the fixed wing.
- Highly Efficient Fixed Wing: most effective lifting surface at 400 mph - majority of lift
- Turbofan Propulsion: much more efficient than main rotor thrust for high speed cruise

**CABABILITIES**

- **Unmatched VTOL flight regime**
  - 400 mph cruise
  - 35k ft service ceiling
  - 4,000 fpm rate of climb
  - Hover off-of-ground effect at high altitude at max gross weight.
- **Mechanically simple/robust**
  - Unlike all tilt-rotor aircraft, no conversion mechanism or interconnecting shafting
  - No transmission
  - No tail rotor and associated shafting and gear boxes
Heliplane Leveraged 50 Years of Technology

LIGHTWEIGHT STRUCTURES

COMPUTATIONAL ANALYSIS

DIGITAL FLIGHT CONTROL

ROTOR SYSTEM

NOISE SUPPRESSION

ENGINES
**Heliplane Demonstrator Aircraft Vee Systems Engineering Diagram**

**Phase 1-2 Preliminary Design Activities**
- HDA Concept Selection
- Trade Studies Completed
- HDA System Requirements Defined
- HDA Design & Analysis
  - Sizing & Performance
  - Trim and Flight Dynamics
  - Rotor, Propulsion & Airframe Analysis

**End of DARPA Heliplane program after successful completion of Phase 1**

**Phases 3-4 Detail Design & Verification and Validation**
- Transition to Phase 2
- Fabrication – Phase 3
- Flight Test – Phase 4
- Final Review

**HDA Design & Analysis**
- Preliminary Design Substantiation
- Rotor PDR
- HDA PDR
- Whirl Stand Test, Flt Sim & SIL
- HDA Full-Scale WTT
- WTT & Analysis
- Flight Safety Analysis
- HDA CDR

- Final Review

**Transition to Phase 2**
- Concept Development
- Preliminary Design – Phase 1
- Detail Design – Phase 2
The DARPA Heliplane was designed to combine the key attributes of a helicopter and a fixed wing aircraft: VTOL and hover capability of a helicopter combined with high speed and efficient cruise capability of a fixed wing airplane.

“...with the potential for the lack of complexity to result in the much lower lifecycle cost that has been demonstrated by gyroplanes”

Heliplane successfully completed the extensive DARPA Preliminary Design Review (PDR), meeting all technical and programmatic requirements.

The underlying gyrodyne technologies are applicable to a range of platform configurations - from ISR UAVs to armed recon/escort, and transport manned or unmanned systems.
Paradigm Shift
Significantly Increased Performance and Greatly Reduced Complexity
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