T-Wing VTOL UAV: Technology Demonstrator

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Project Mission:
To research and develop the technologies required for a family of tail-sitter Unmanned Air Vehicles (UAVs)

VTOL OPERATIONAL ADVANTAGES - Sea

- Ship VTOL
- Supports helicopter operations
- Sonar buoy / SUS deployment
- Signal relay platform
- Over-the-horizon data gathering

VTOL OPERATIONAL ADVANTAGES - Land

- No runway required
- Wide area surveillance
- Can protect vital assets
- Hover and monitor target area
- Supports surveillance operations
- Sensor/Weapon payload
Research Program and Goals

Specific Research Goals:

- Demonstrate autonomous hover operation in windy conditions;
- Perform transition maneuvers between horizontal and vertical flight;
- Demonstrate full autonomous flight from take-off to landing;
- Confirm theoretical aerodynamic predictions for hover controllability;
- Develop high fidelity simulations of vehicle dynamics;
- Use high level rapid prototyping tools to design and implement controllers.

Accomplishments:

- Vehicle finished - Feb 2000;
- Second airframe finished and structurally tested - October 2000;
- First manual hover flight – December 2000;
- Real time flight simulation developed - Jan 2001 (and ongoing);
- Successful autonomous “flight” on test-stand using high level control design techniques - October 2001.
- First hover flight imminent, under automatic control, October 2001.
T-Wing: Typical Flight Profile

Vehicle orientation: Arrow head = front of vehicle

Mission Phase (Horizontal Flight)

Pull-up to Vertical (Nominal)

Stall - Tumble (Nominal)

Optimised Transition

Takeoff Vertically

Land Vertically

Key:

Flight Path

Optimised Transition
T-Wing: Aerodynamic Panel Method Model

(Wind is 10-15 knots from the right).

First Full Autonomous Hover Mode Flight: September 2002.
First Autonomous Vertical Flight: September 2002
T-Wing: Real-Time Flight Simulation

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![Diagram of T-Wing flight simulation](image)