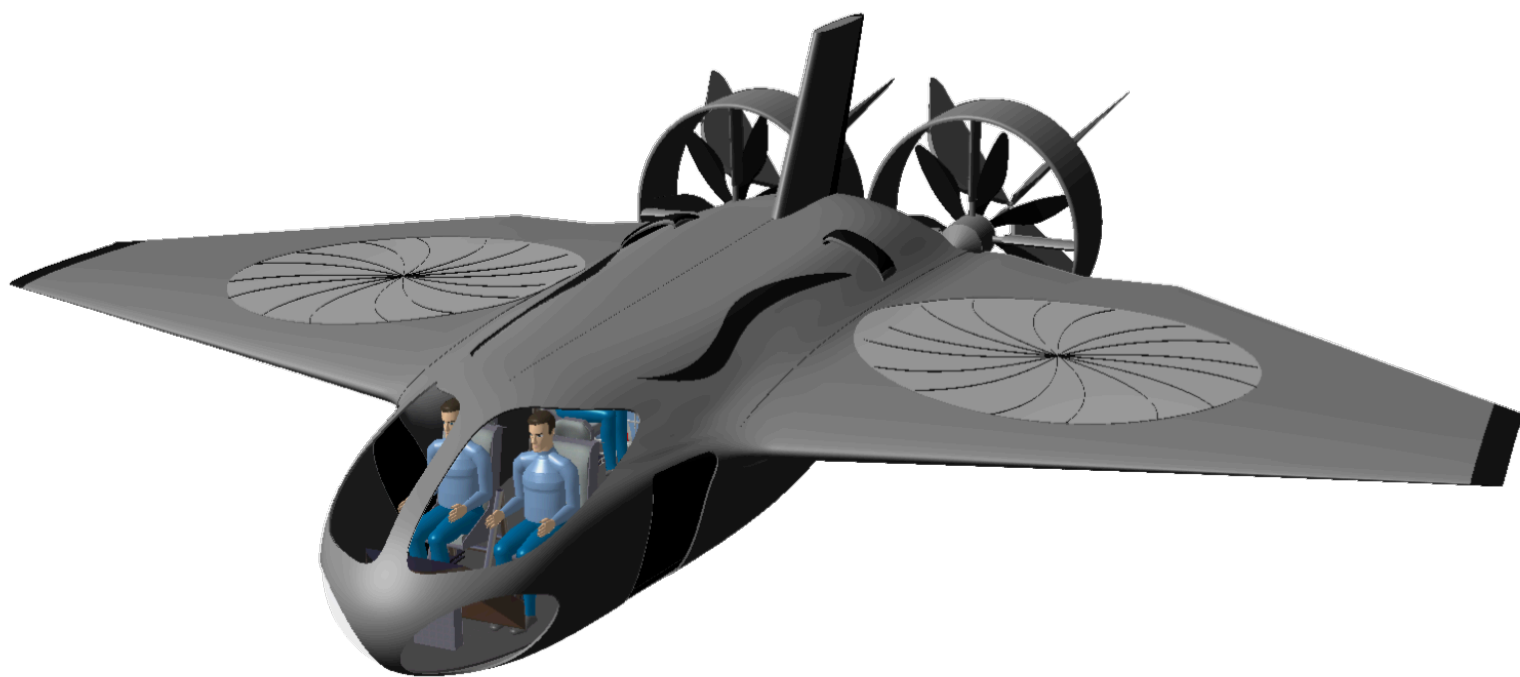


Executive Summary



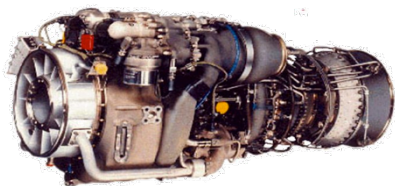
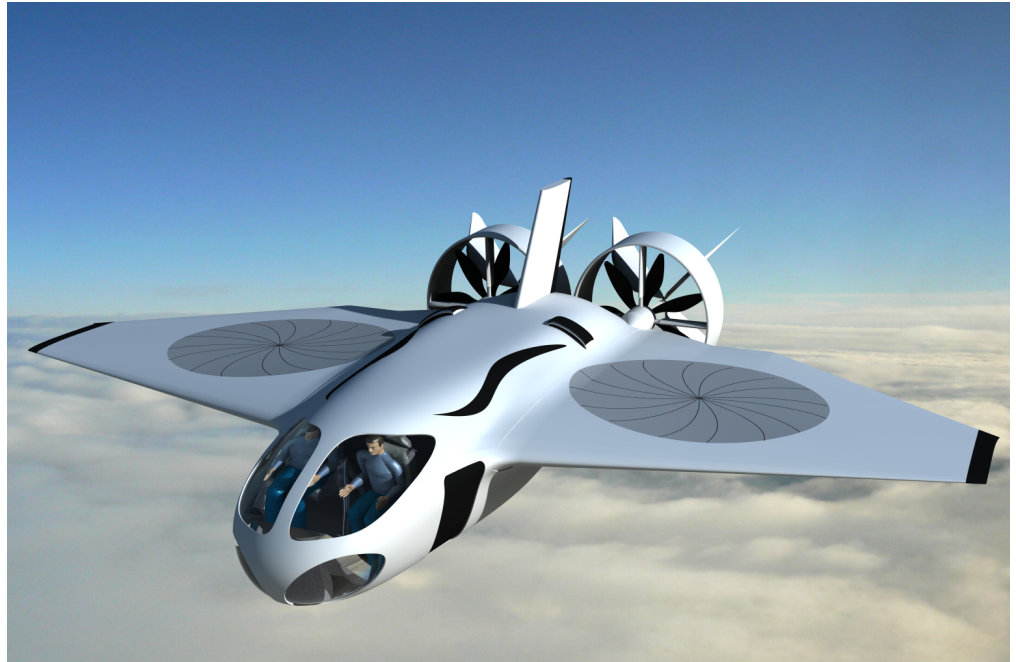
31st Annual
American Helicopter Society International
Student Design Competition

Georgia Tech



ENABLING TECHNOLOGIES

- Carefree Maneuvering ensuring maximum flight envelope
- Lightweight Composite drive systems
- Advanced blade design for maximum hover efficiency
- State-of-the-art Electrical Actuation Control Systems for increased reliability
- Integrated Health and Usage Monitoring (HUMS) and Condition Based Maintenance (CBM) for reduced dynamic design margins and increased reliability



Existing High-Performance Modular Powerplant



Fly-By-Wire Full Authority Control System



Game-Changing Performance with Superior Efficiency

TECHNICAL SPECIFICATIONS

Performance (at Design GWT)

Max Speed (95% MRP)	368 KTAS	682 km/h
Cruise Speed	264 KTAS	489 km/h
Range (Maximum) ++	915 nm	1,695 km
Hover Ceiling+	11,350 ft	3460 m
Service Ceiling+	34,250 ft	10,440 m

Powerplant

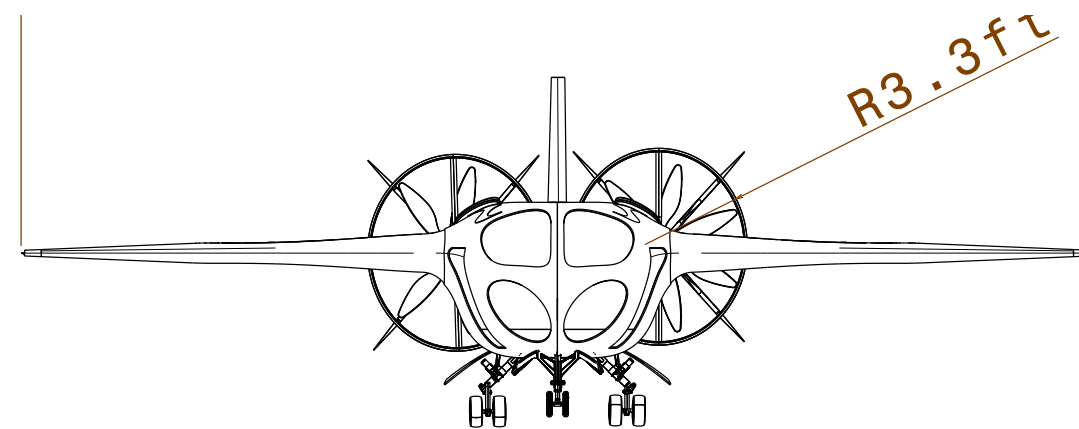
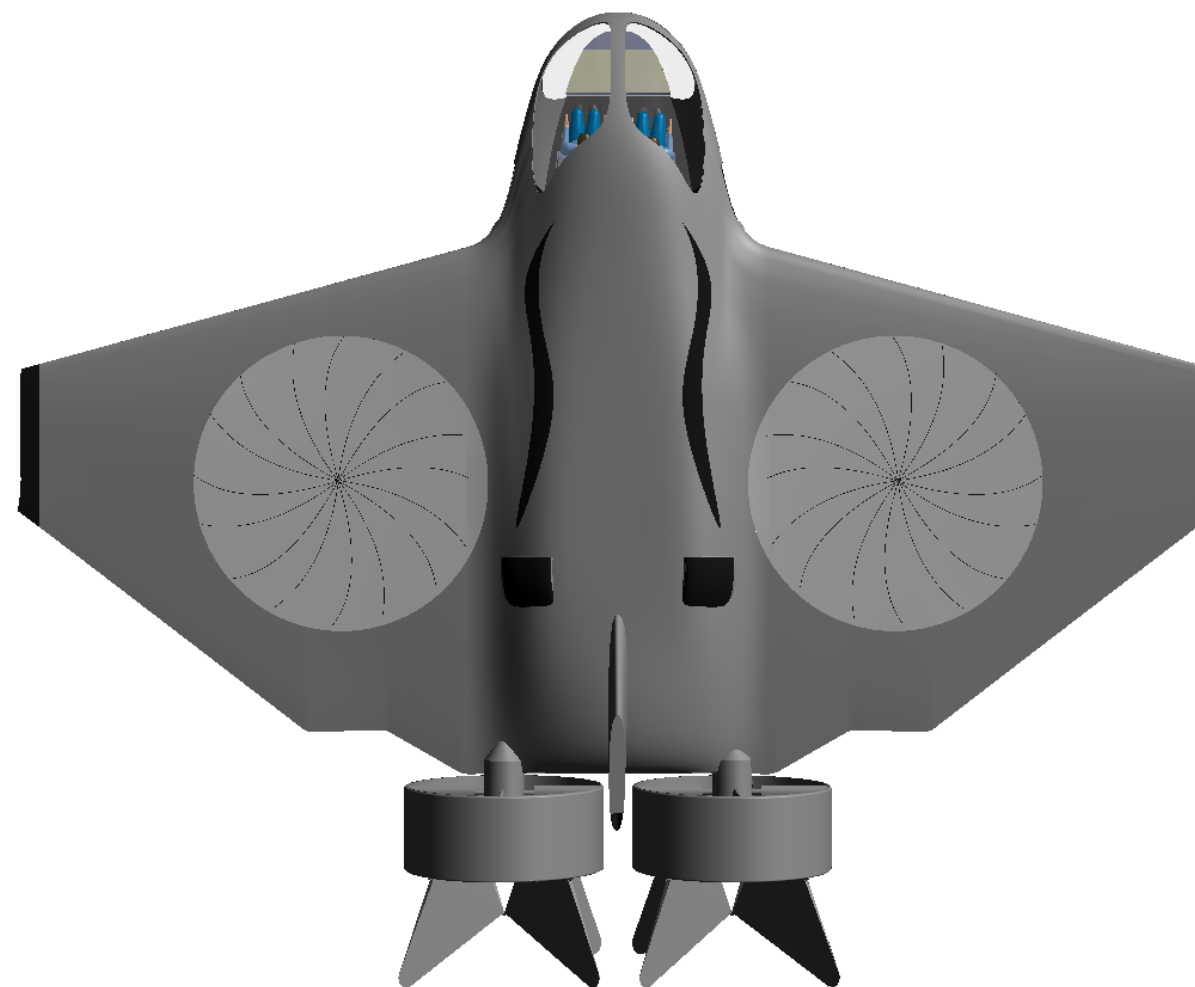
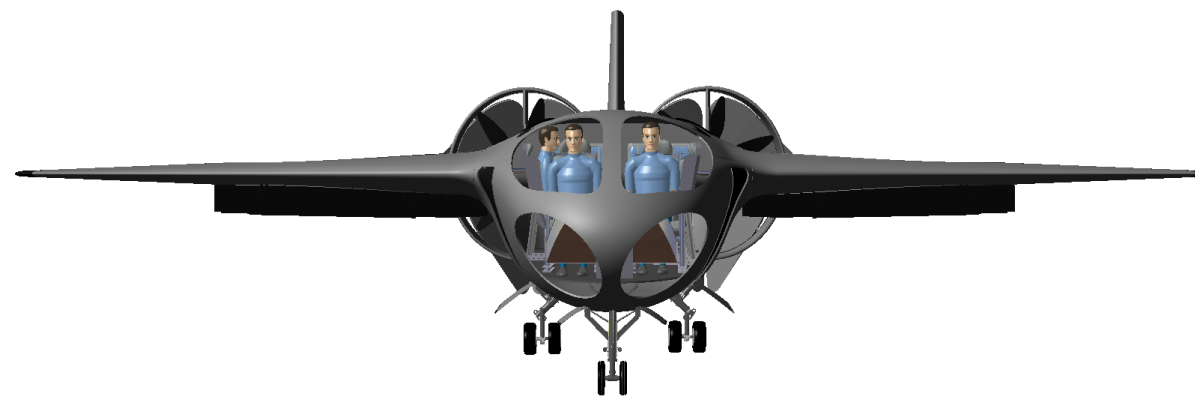
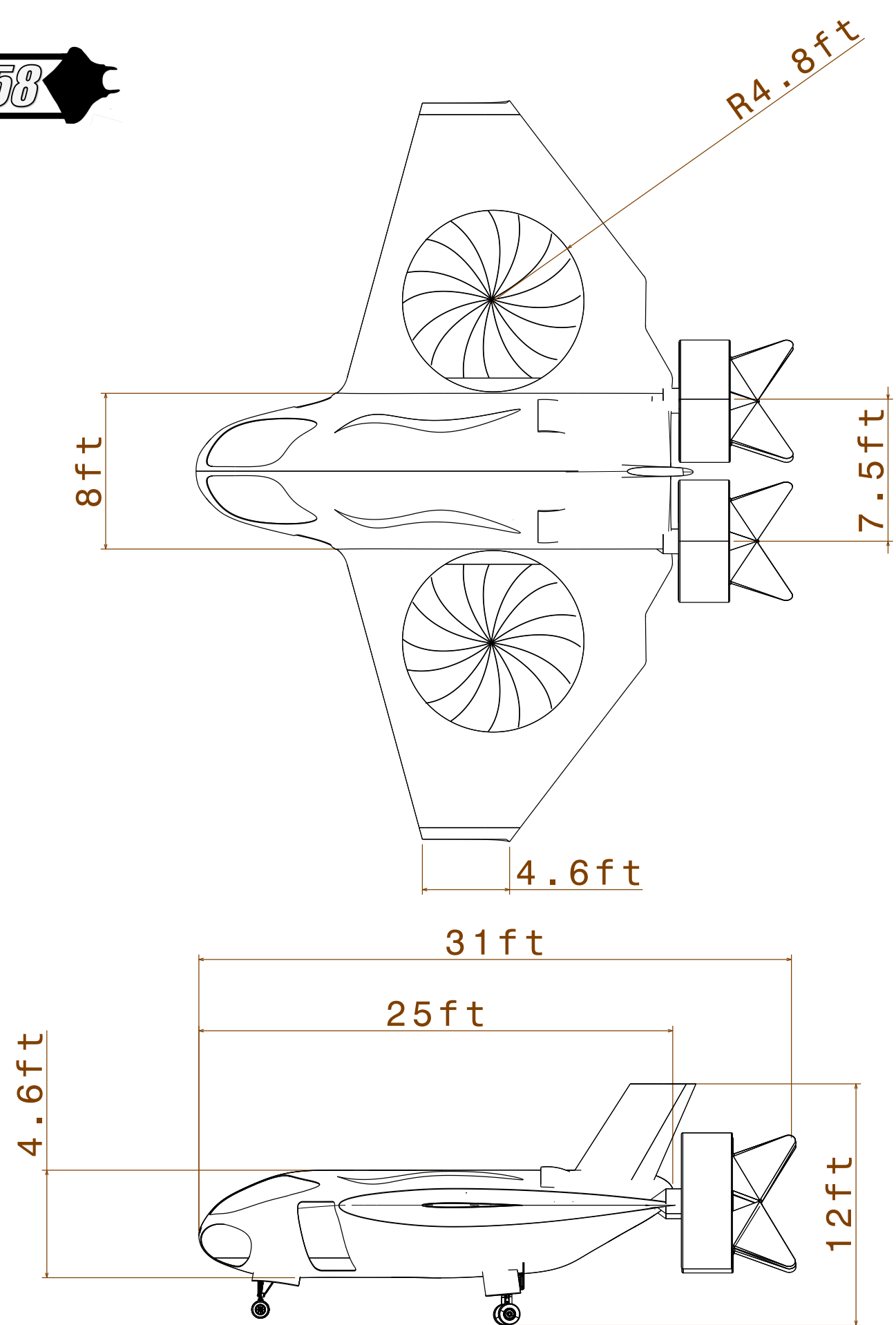
2 x GE CT7-8 (2500 SHP)

Capacity

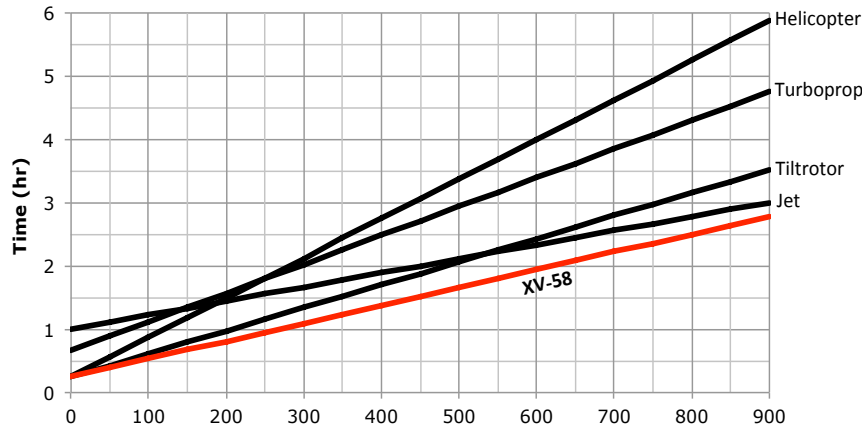
Crew	2 pilots, 1 flight engineer	
Payload (maximum)	1741 lbs	790 kg
Fuel (maximum)	3980 lbs	1805 kg
Cargo/Passenger Volume	183.5 ft ²	17.0 m ²
Max Takeoff Weight	12207 lbs	5537 kg

+Design GWT, ISA, MRP Limit ++100lb Payload

XV-58



SUPERIOR PERFORMANCE FOR ALL MISSIONS



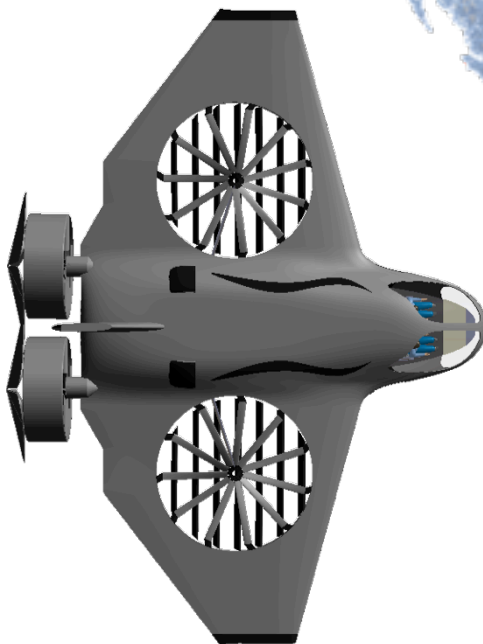
+Assumed Access Time: Distance (nm)

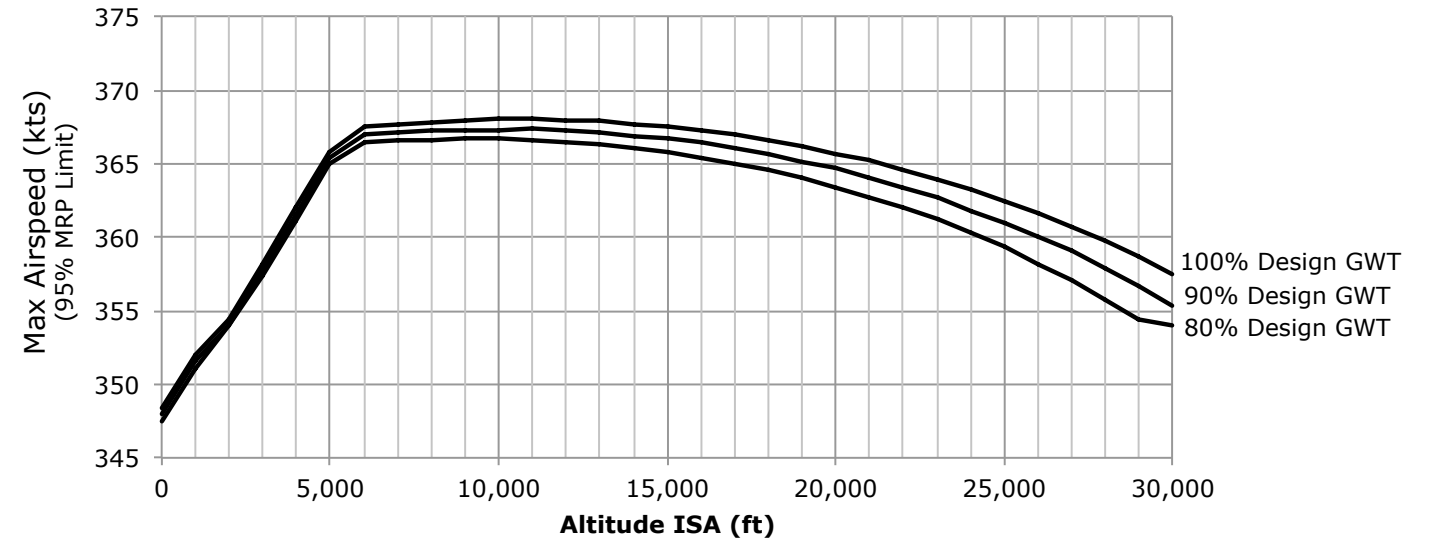
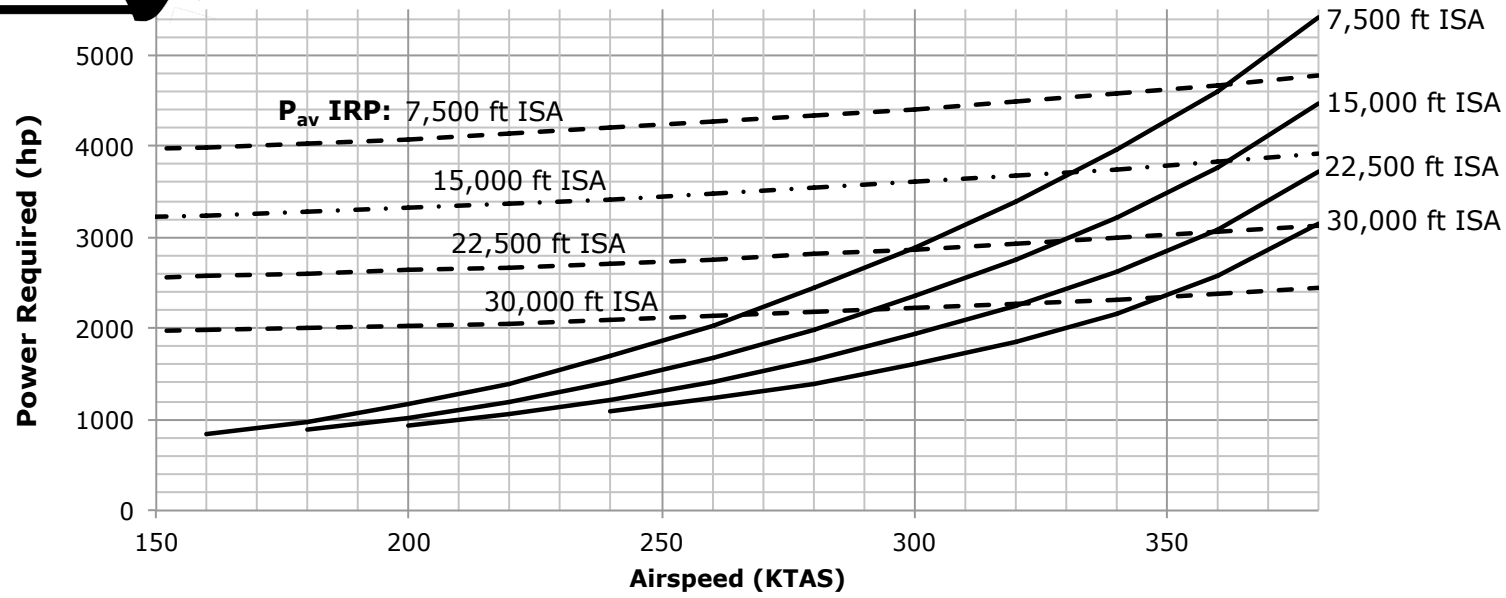
VTOL Aircraft	15 min
Turboprop	40 min
Jet	60 min

- Large, flexible useful load capability (4700 lbs)
- Large available cabin/cargo space and fuel volume provide mission versatility
- VTOL ability, combined with high speed performance provide unmatched performance for any mission
- Hover OGE at 11,500 ft (ISA, max gross weight).
- Cruise above the clouds at 30,000+ ft.

POTENTIAL FOR RADICAL NEW MISSIONS

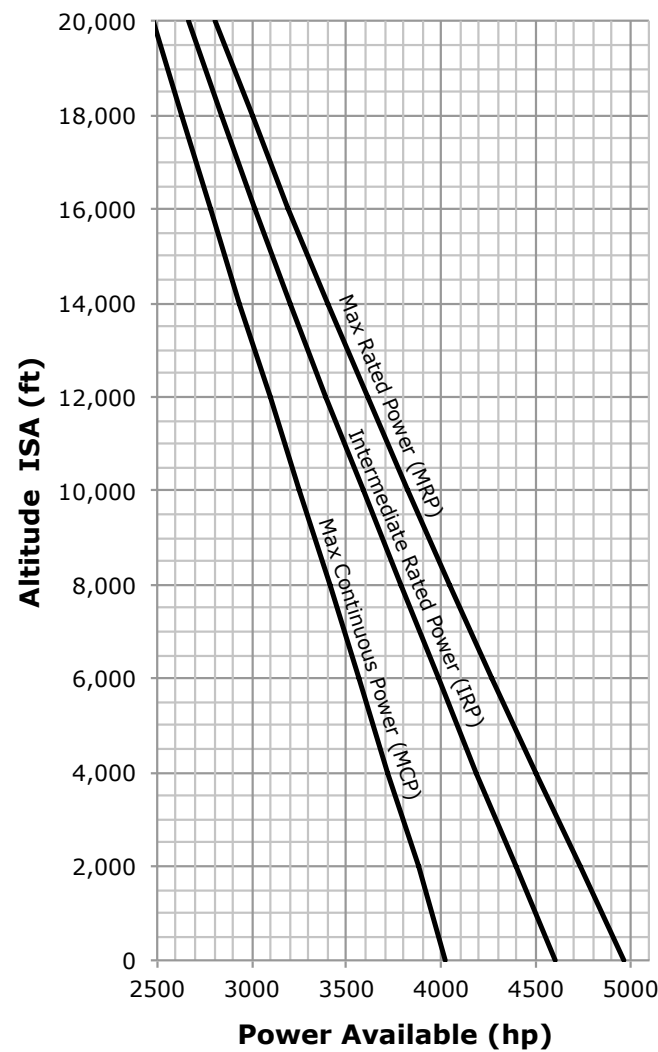
- **VIP/Corporate:** Combines the convenient VTOL capability of a helicopter with the ability to cruise past most turboprops, providing the ideal means to get the people you need, where you need them, fast.
- **Search and Rescue:** Get to those in need quickly, and hover high, hot, and heavy for difficult extractions. Respond the quickest when it means the most.
- **Military:** Whether it's moving personnel anywhere, quickly, surveilling the enemy from beyond their reach, or bring firepower where it's needed, the XV-58 has the potential to provide game-changing military capabilities.
- **Emergency Medical Service:** Move patients between hospitals and cities quicker than any existing helicopter, without sacrificing the space or cabin quality needed to care for them on-route.



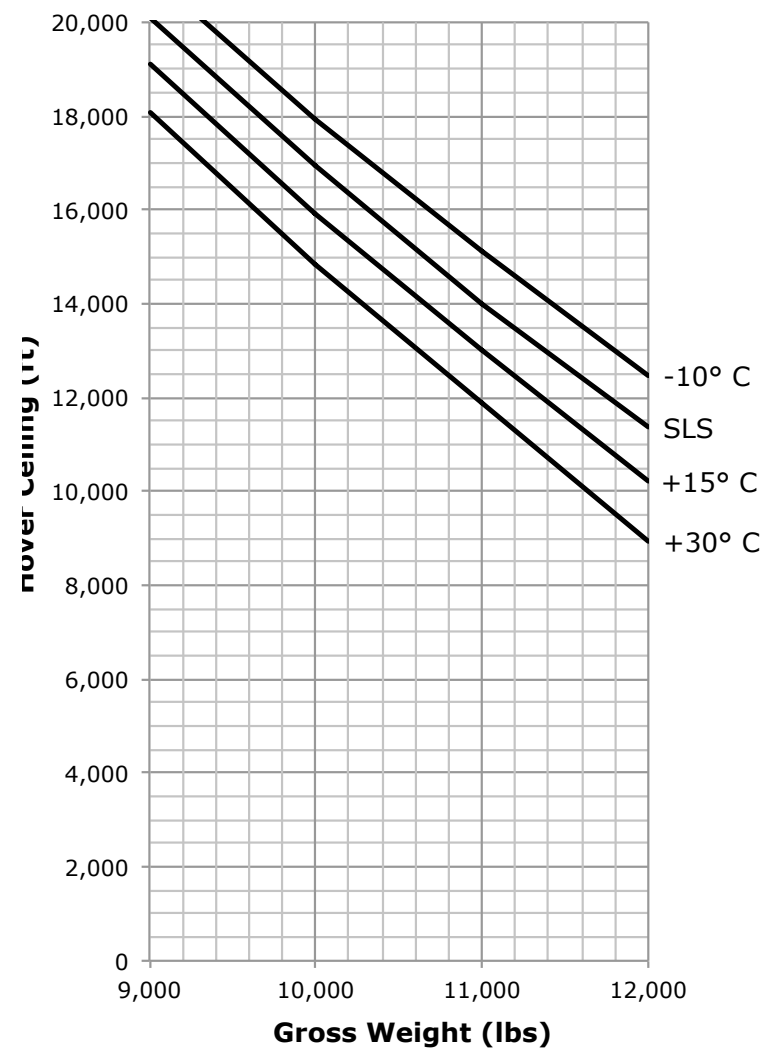


Maximum Cruise Speed at 95% Maximum Rated Power Available

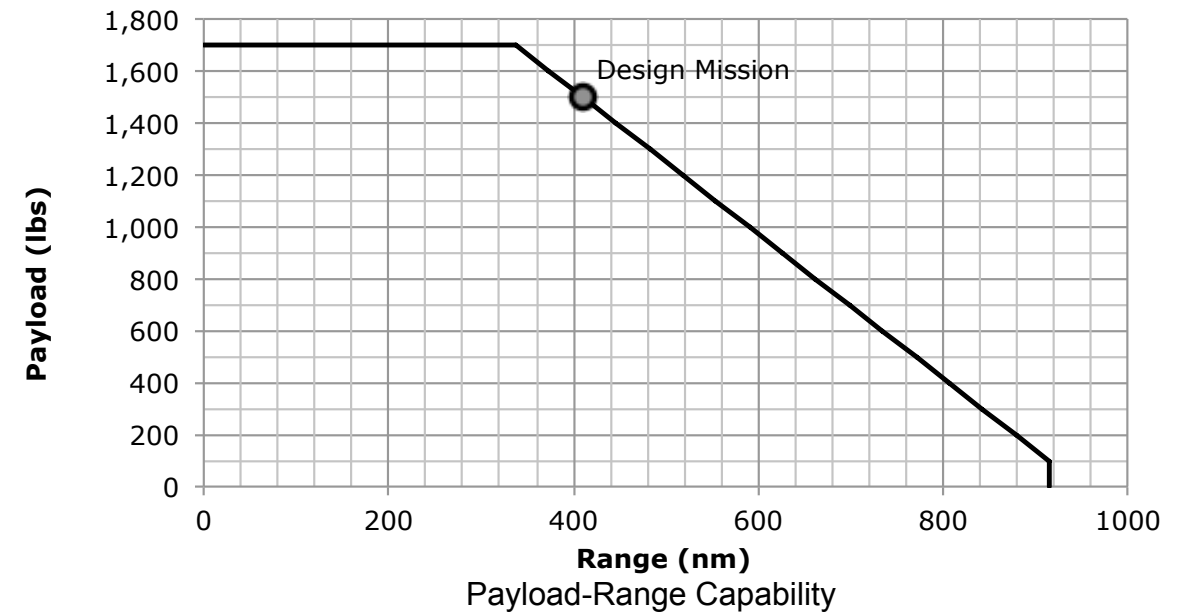
XV-58 Power Required and Available (IRP Limit) vs. Altitude (ISA) at Design Gross Weight



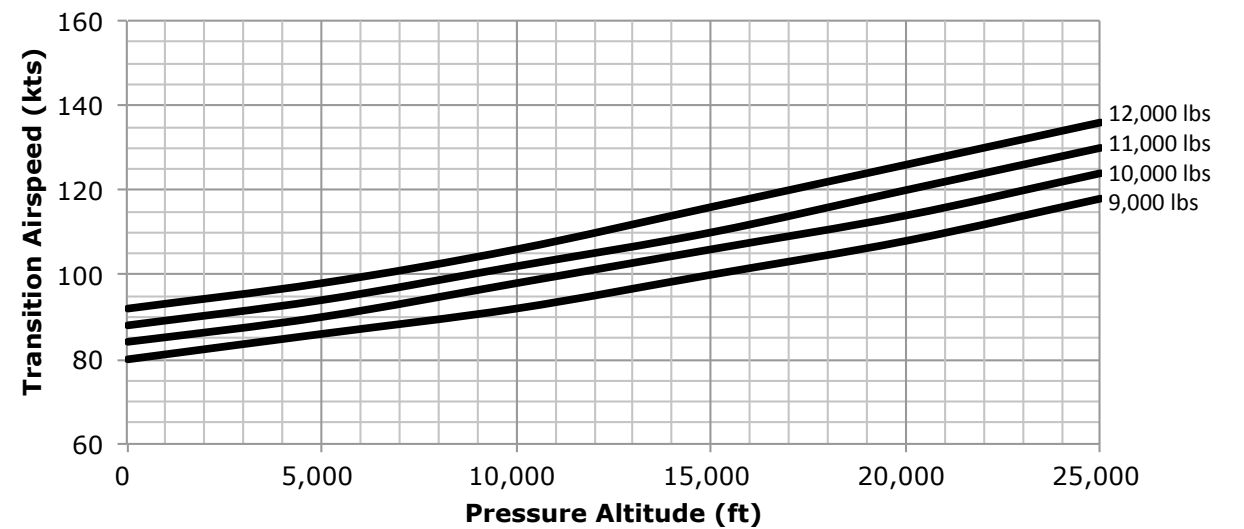
XV-58 Power Available



XV-58 Hover Ceiling (at Max Rated Power)



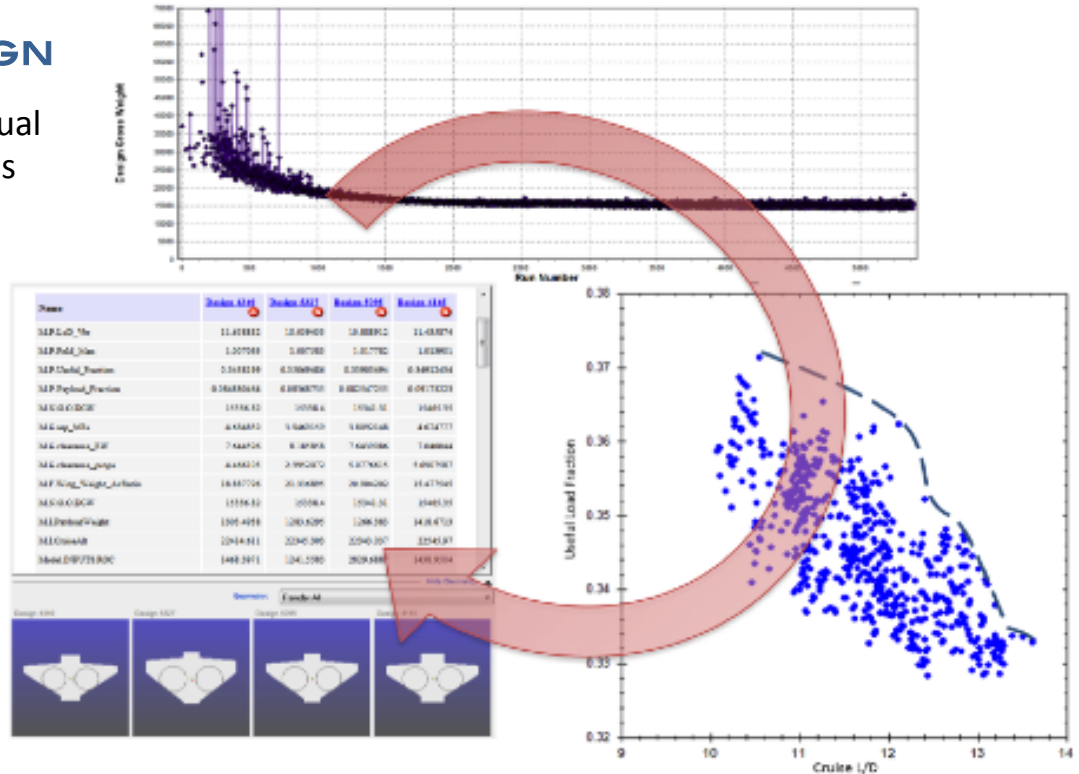
Payload-Range Capability



Airspeed for Full Transition to Forward Flight

OPTIMAL DESIGN

- Over 5000 individual conceptual designs explored.
- Multi-objective optimization of vehicle for ideal range of capabilities
- 10,471 feasible combinations of 20 different possible technologies explored for optimum combination for the concept.

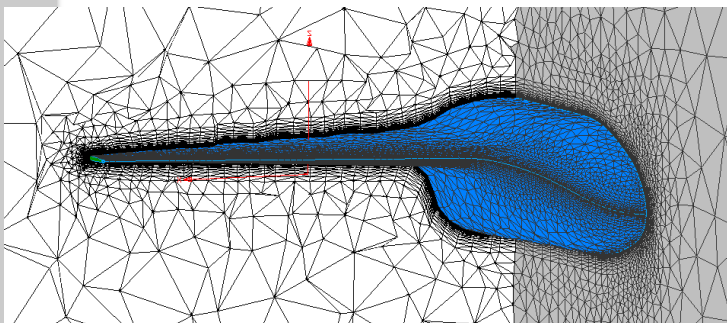
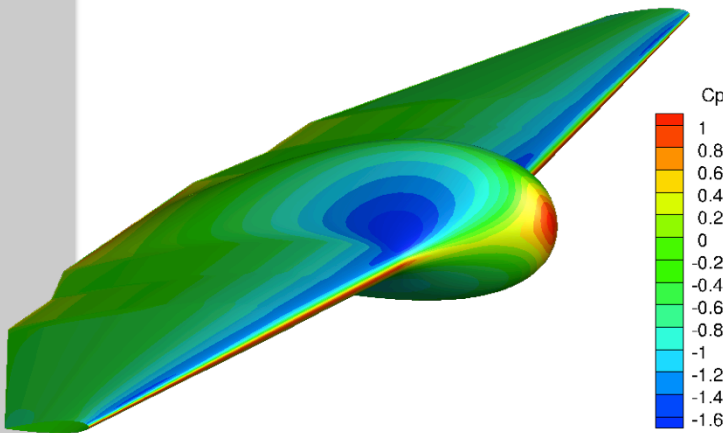


AERODYNAMIC OPTIMIZATION WITH 3D PANEL CODE

- Combined sources and doublets, using Dirichlet BC for improved efficiency with Prandtl-Glauert compressibility correction for high speed flows and LU-decomposition for fast matrix inversion.
- The 3D panel code specifically developed for the project was combined with a custom BWB shape-generator and optimized to maximize aerodynamic efficiency.

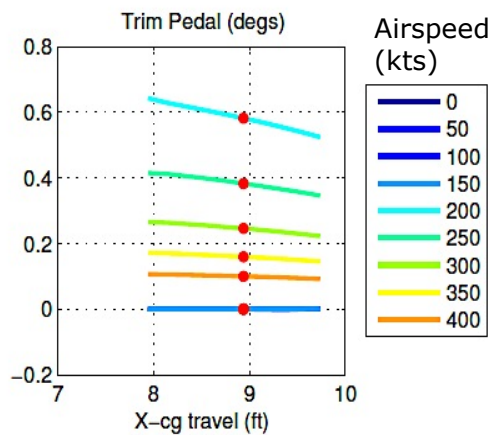
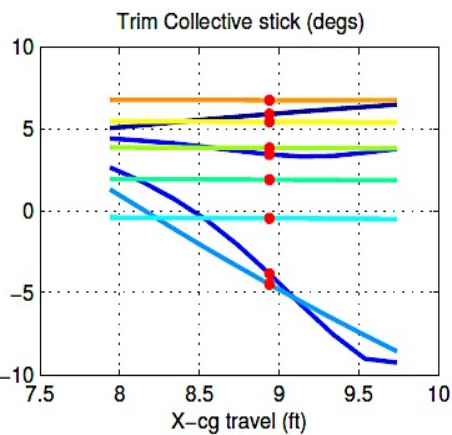
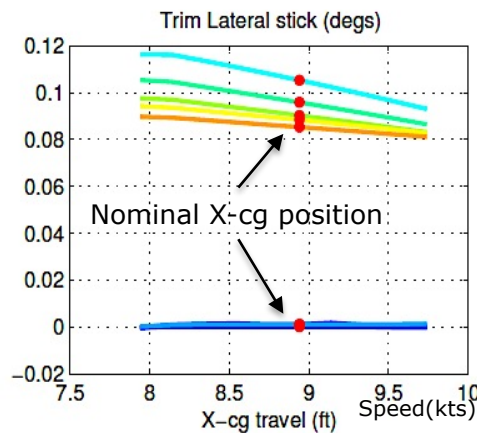
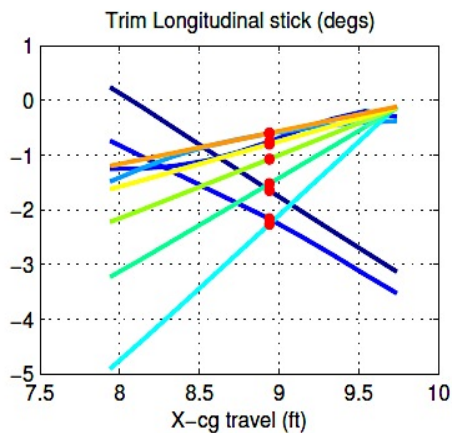
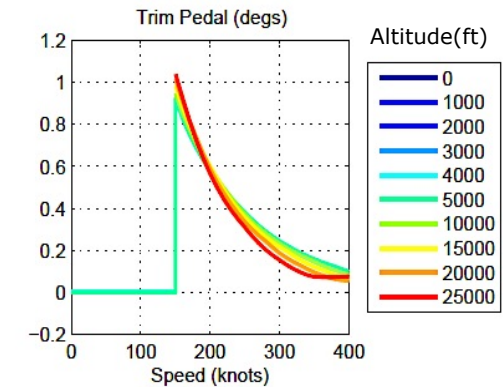
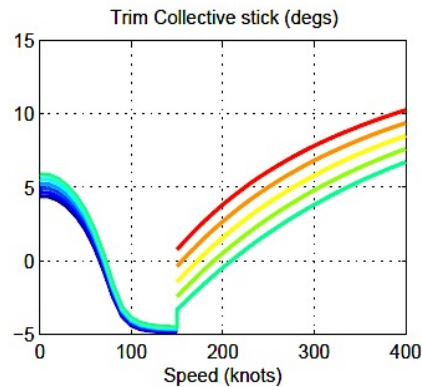
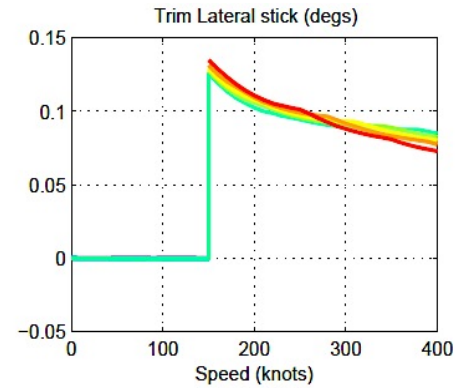
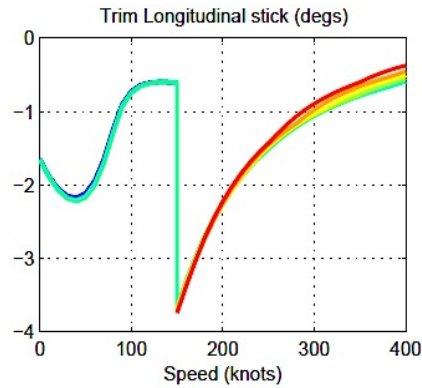
ADVANCED CFD ANALYSIS

- The aerodynamic performance of the concept was validated using advanced CFD techniques
- Grid generated using Pointwise
- Simulation run with FLUENT on Georgia Tech's supercomputer PACE (using 36 cores).



SMOOTH TRANSITIONS

- The XV-58 AFCS is designed to reduce changes to trimmed pilot inputs during transition between hover and cruise.
- Ability to provide full control authority to effectors throughout all flight regimes, while providing control mixing and inherent stability.
- Reduced chance of coupling and PIO
- Predicted ability to obtain Level 1 Handling Qualities in hover and forward flight.



ROBUST CONTROL SYSTEM

- The XV-58 is robust against movement of the longitudinal CG, providing in-flight payload flexibility.
- Tolerance of up to +/- 1 feet offset envelope in both low-speed and high-speed configurations.
- Allows for expansion of payload types and mission flexibility.



As a demonstrator aircraft, the XV-58 Manta is meant to illustrate the next-generation performance and operational efficiency available from this radical new concept. Scalability is a critical feature of the concept. Scaling down isn't easy, but at larger gross weights, the XV-58 provides superior performance.

SCALING DOWN

Performance (at 5000 lbs)

Max Speed (95% MRP)	304 KTAS
Cruise Speed	283 KTAS
Range (Maximum)**	512 nm

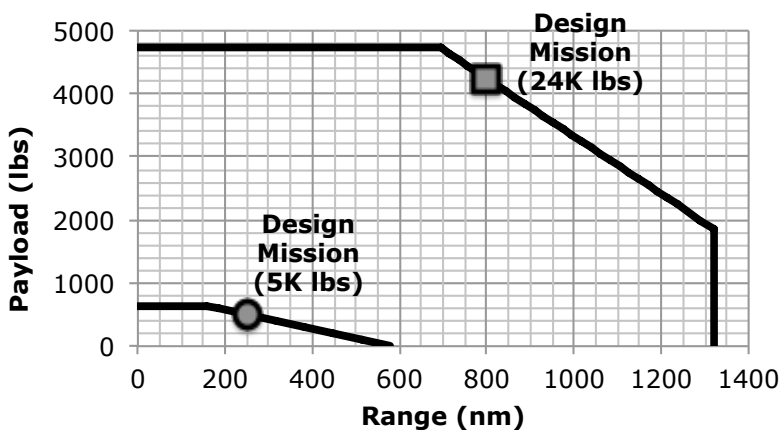
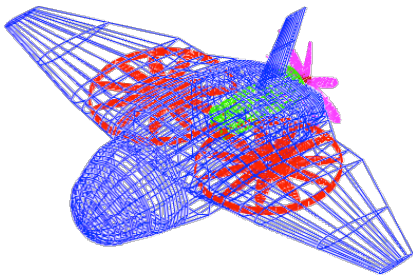
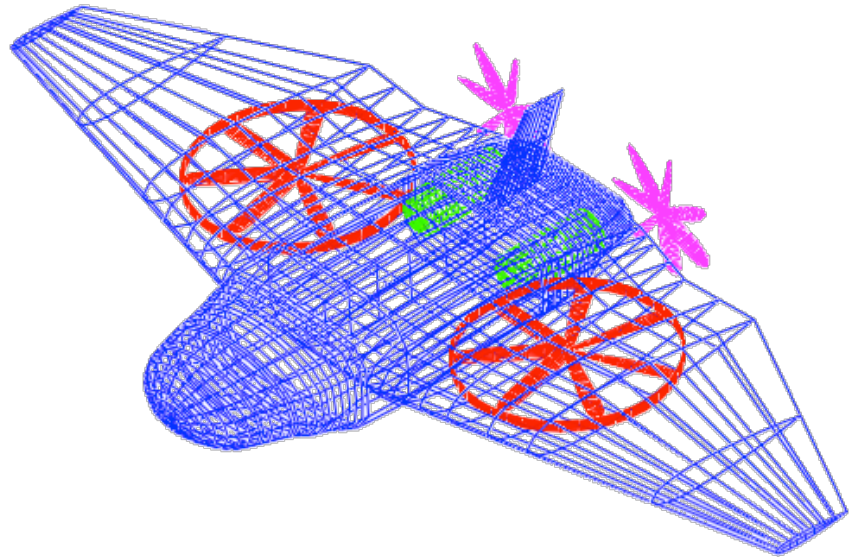
Powerplant

1 x GE CT7-8 (2500 SHP)

Capacity

Useful Load (maximum)	1378 lbs
Payload (maximum)	640 lbs
Crew/Passengers*	2/1
Max Takeoff Weight	5143 lbs

+Design GWT **100lb Additional Payload



SCALING UP

Performance (at 24,000 lbs)

Max Speed (95% MRP)	351 KTAS
Cruise Speed	245 KTAS
Range (Maximum)**	1322 nm

Powerplant

2 x Rolls Royce AE 2100 (4480 SHP)

Capacity

Useful Load (maximum)	4725 lbs
Fuel (maximum)	8000 lbs
Max Takeoff Weight	24430 lbs
Crew/Passengers*	3/19
Cargo/Passenger Volume	1521 ft

+Design GWT **1850lb Payload



- **NURTURING RADICAL IMPROVEMENTS IN VTOL FLIGHT**
- **RADICAL NEW CAPABILITIES THROUGH UNPRECEDENTED PERFORMANCE**

