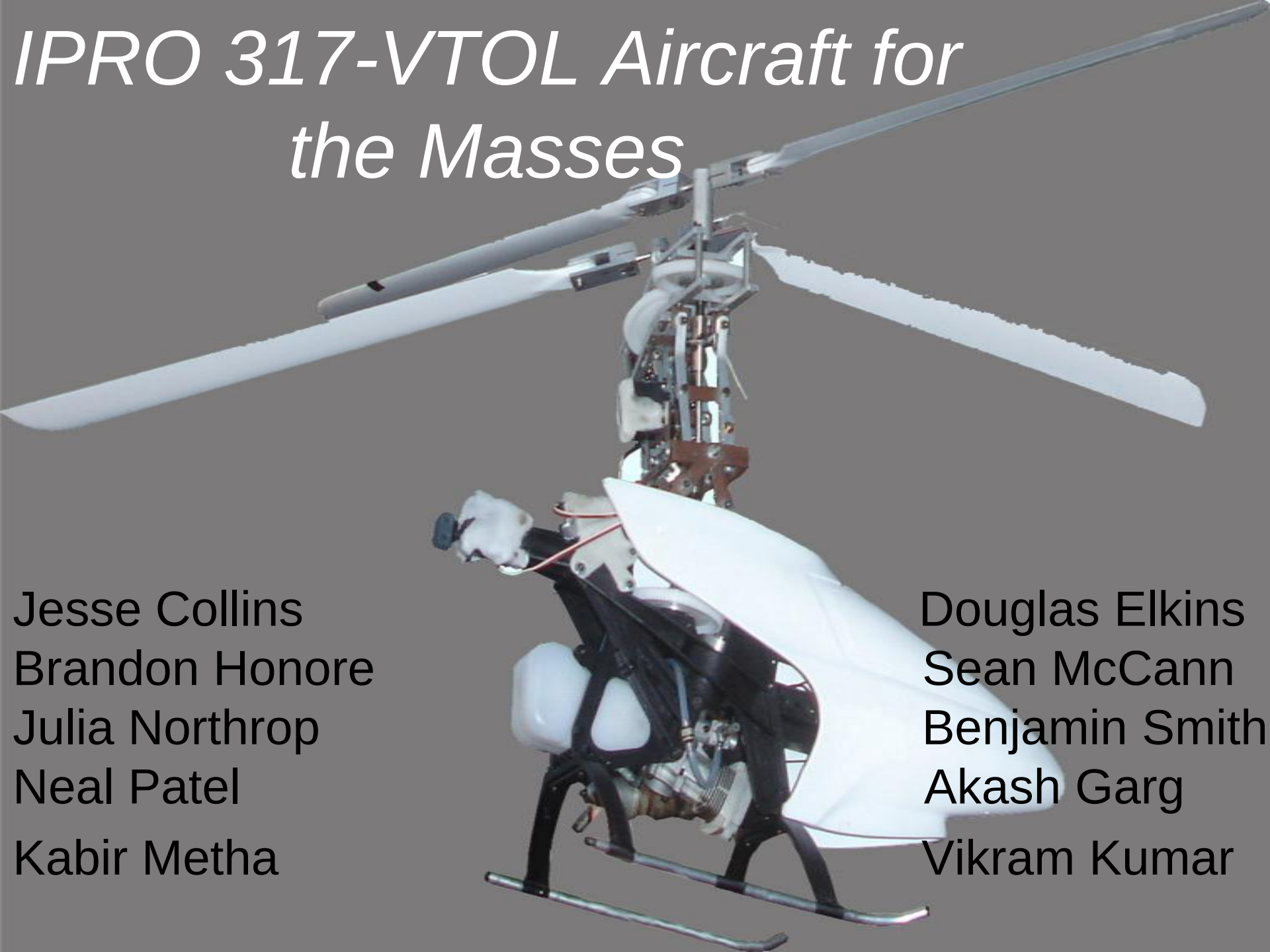
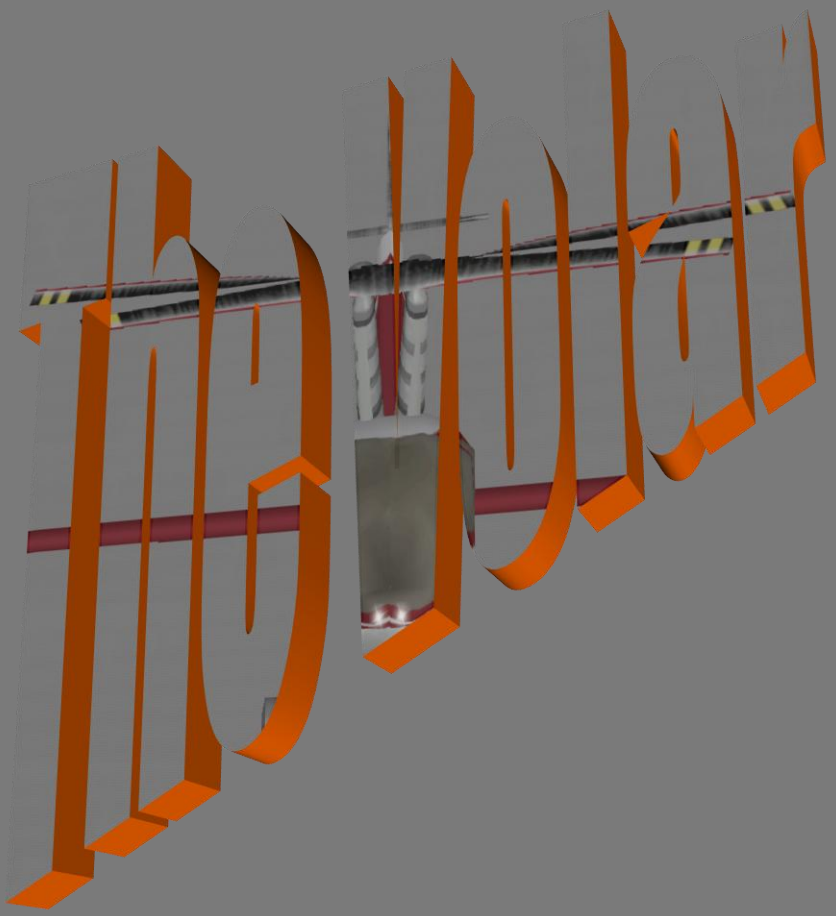
IPRO 317-VTOL Aircraft for the Masses

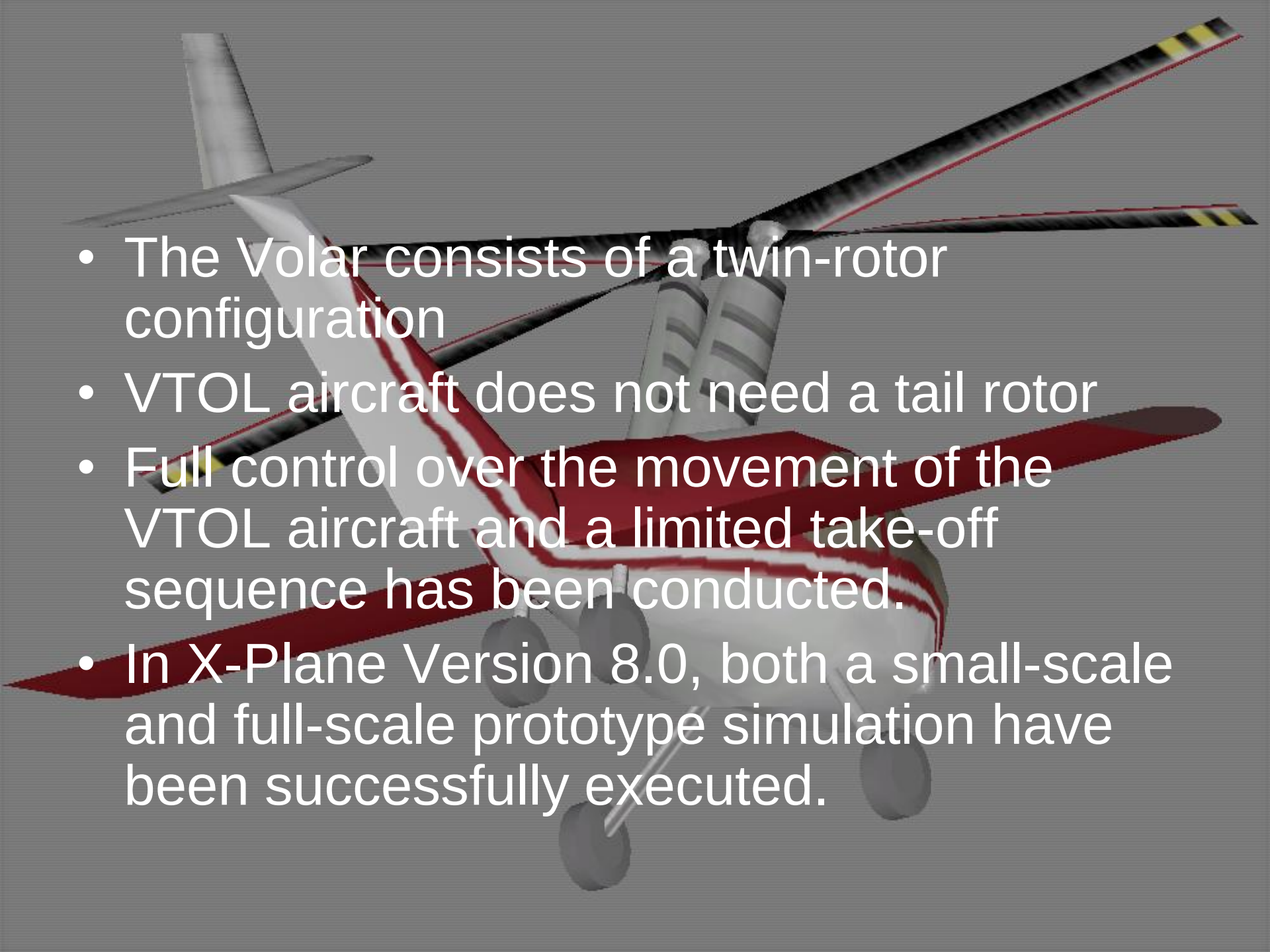


Jesse Collins
Brandon Honore
Julia Northrop
Neal Patel
Kabir Metha
Douglas Elkins
Sean McCann
Benjamin Smith
Akash Garg
Vikram Kumar

Allow Us To Introduce…



- **VTOL – Vertical Take off and Landing**



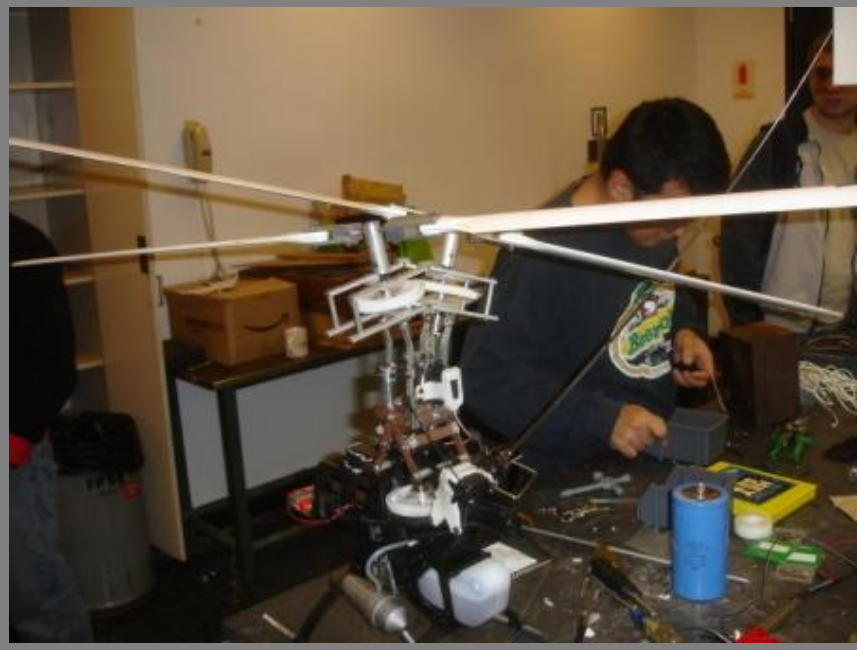
- The Volar consists of a twin-rotor configuration
- VTOL aircraft does not need a tail rotor
- Full control over the movement of the VTOL aircraft and a limited take-off sequence has been conducted.
- In X-Plane Version 8.0, both a small-scale and full-scale prototype simulation have been successfully executed.

Construction and Testing Objectives

- Complete airframe, gimbal control, engine test of aircraft, and test with rotors attached
- Design, determine placement, and install wing and tail structures.
- Achieve operational flight status; begin tests outdoors
- Improve design of components throughout the testing process.

Progress

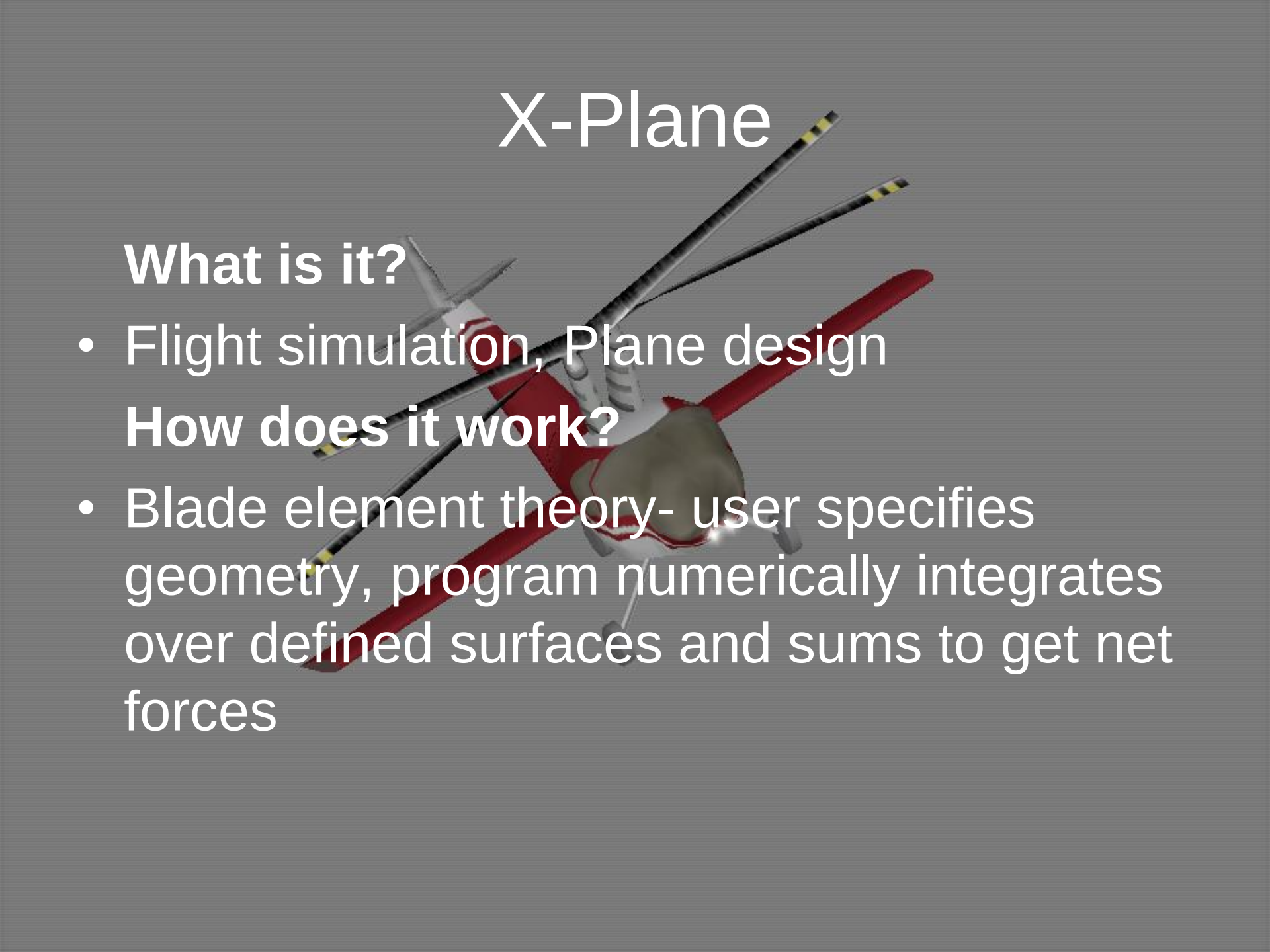
- Completed construction of all servo motors and control arms for the gimbal mechanism
- Balanced and attached rotors and achieved engine startup
- Reinforced gimbal structure
- Diagnosed problems
- Limiting blocks for gimbal motion
- Constructed tail control surface and servo and cleaned up wiring and controls
- Achieved lift and directional thrust during tests with rotors



Obstacles and Setbacks

- Loss of engine control during tests
- Replacement of main gear
- Difficulty of obtaining parts

X-Plane



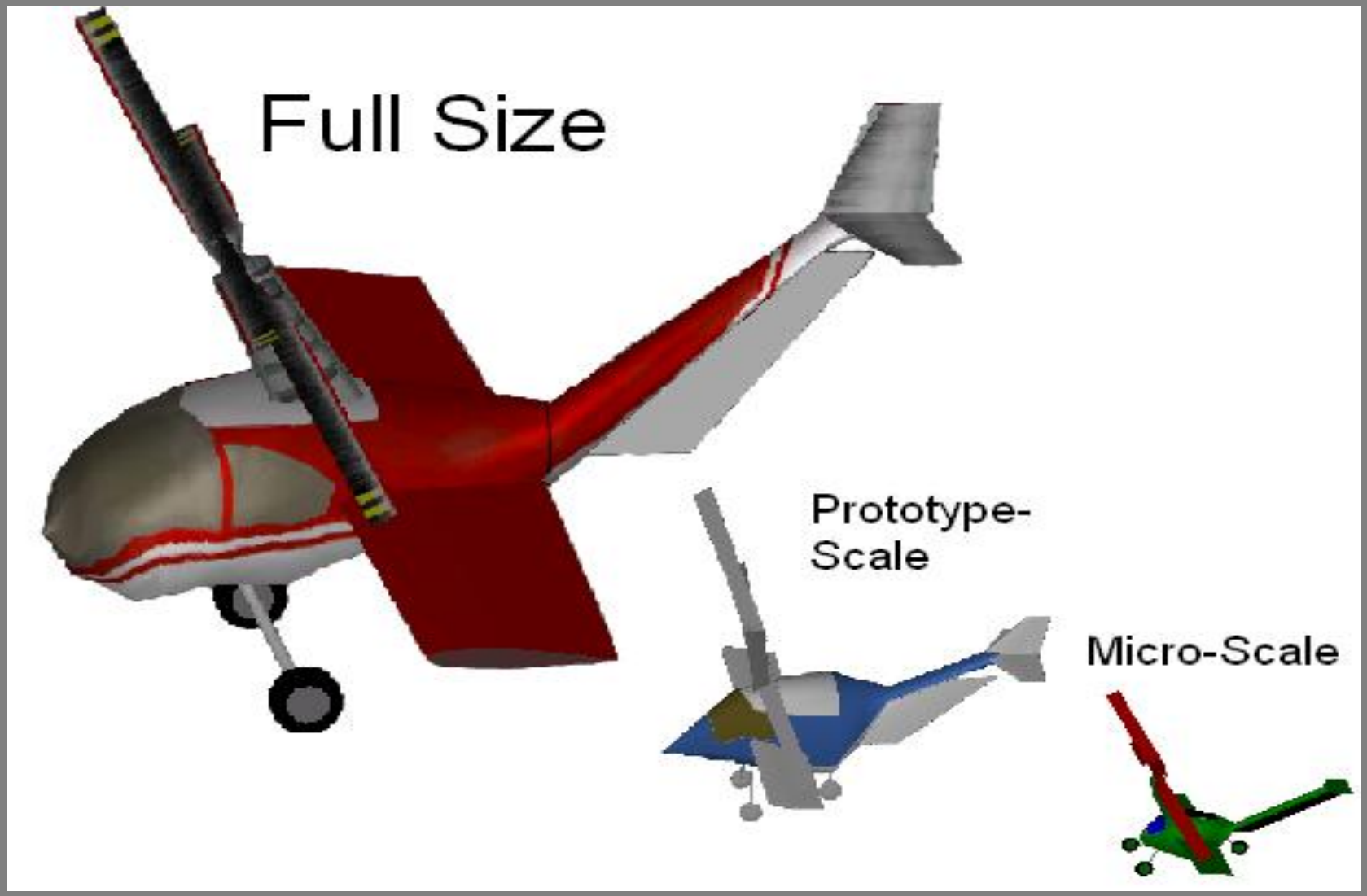
What is it?

- Flight simulation, Plane design

How does it work?

- Blade element theory- user specifies geometry, program numerically integrates over defined surfaces and sums to get net forces

Objectives



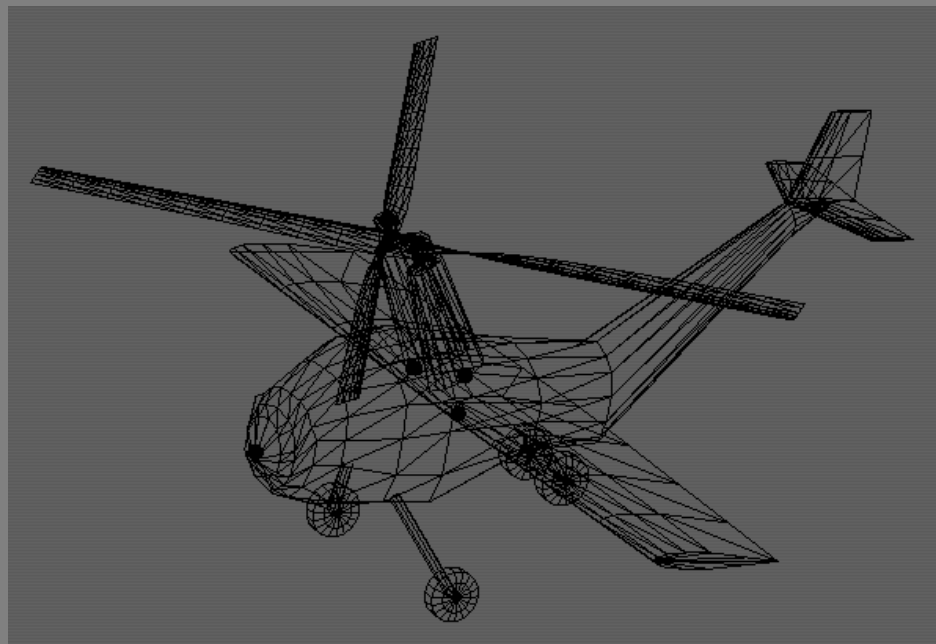
Full Scale model

- Wingspan: 22ft
- Fuselage length:15ft
- 140hp reciprocating engine
- Propeller radius: 10.6ft
- Empty weight: 8,500lb

Full Scale Model

Progression of Assignments

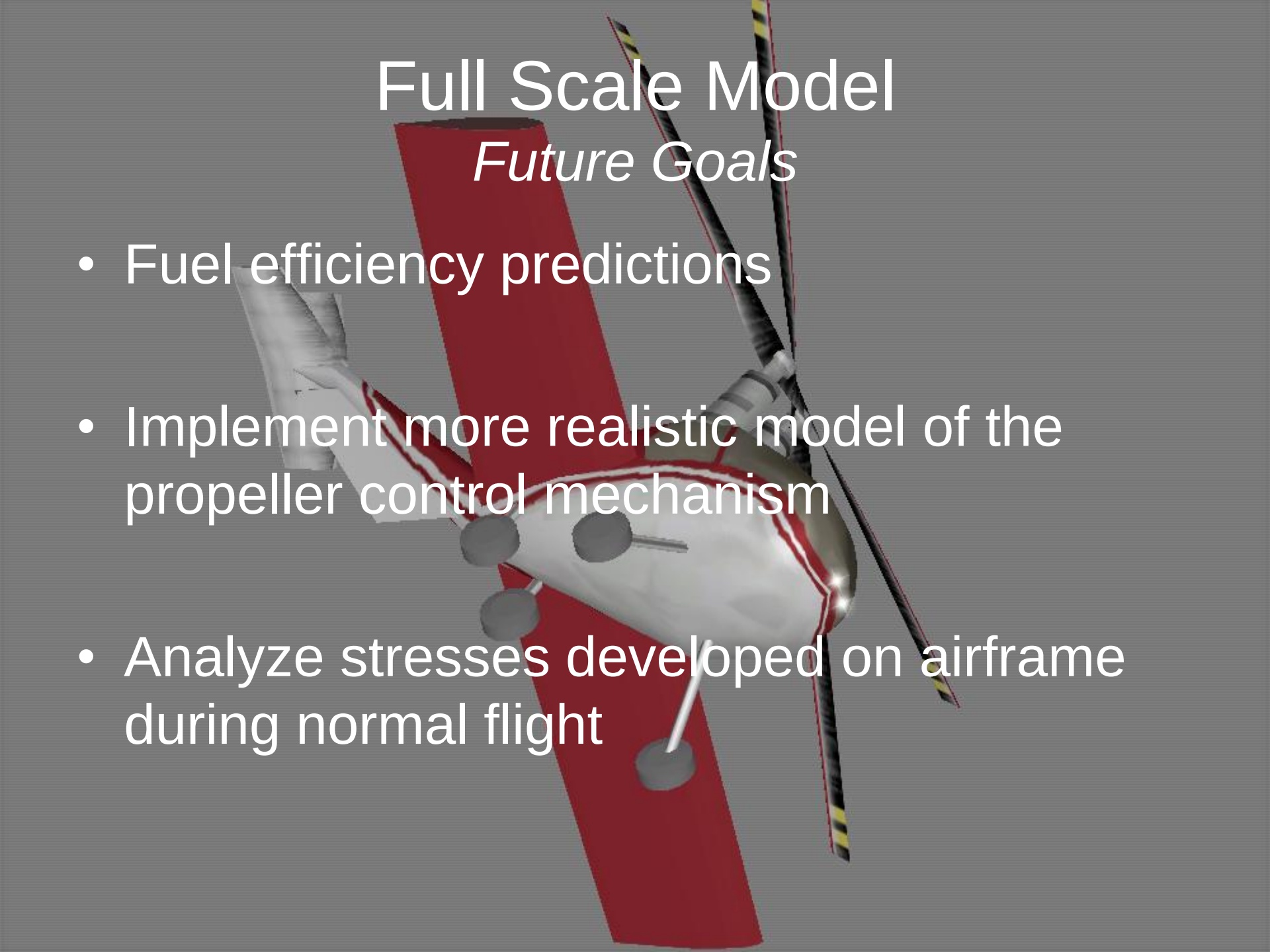
- Updated older volar file from an obsolete version of X-Plane
- Added rudder for increased stability and yaw control
- Optimization



Full Scale Model

Future Goals

- Fuel efficiency predictions
- Implement more realistic model of the propeller control mechanism
- Analyze stresses developed on airframe during normal flight



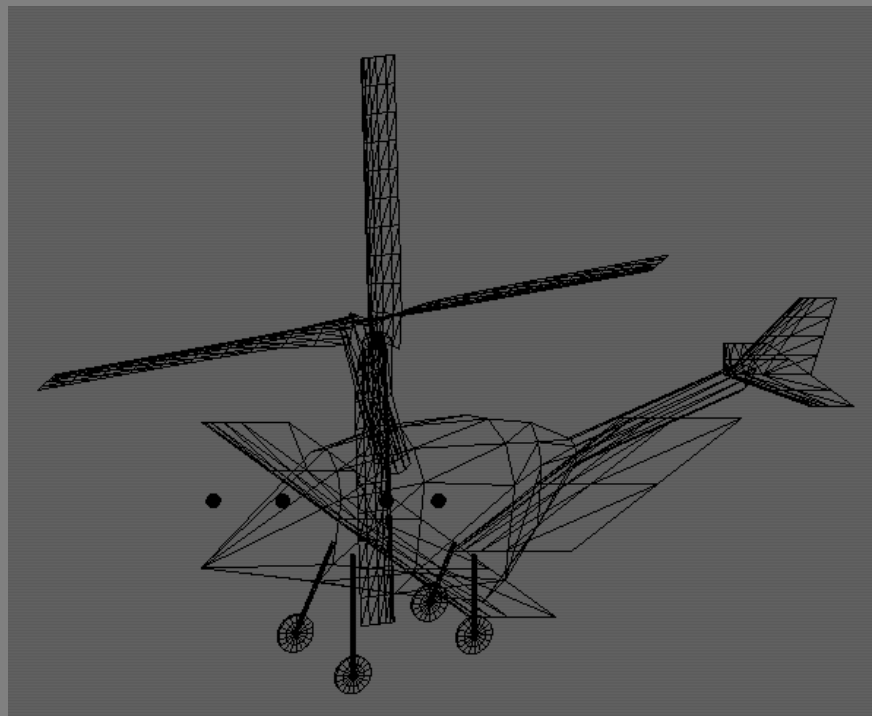
Prototype Scale Model

- Wingspan: 2.84ft
- Fuselage length: 3ft
- 1.8hp reciprocating engine
- Propeller radius: 2ft
- Empty weight: 9lb

Prototype Scale Model

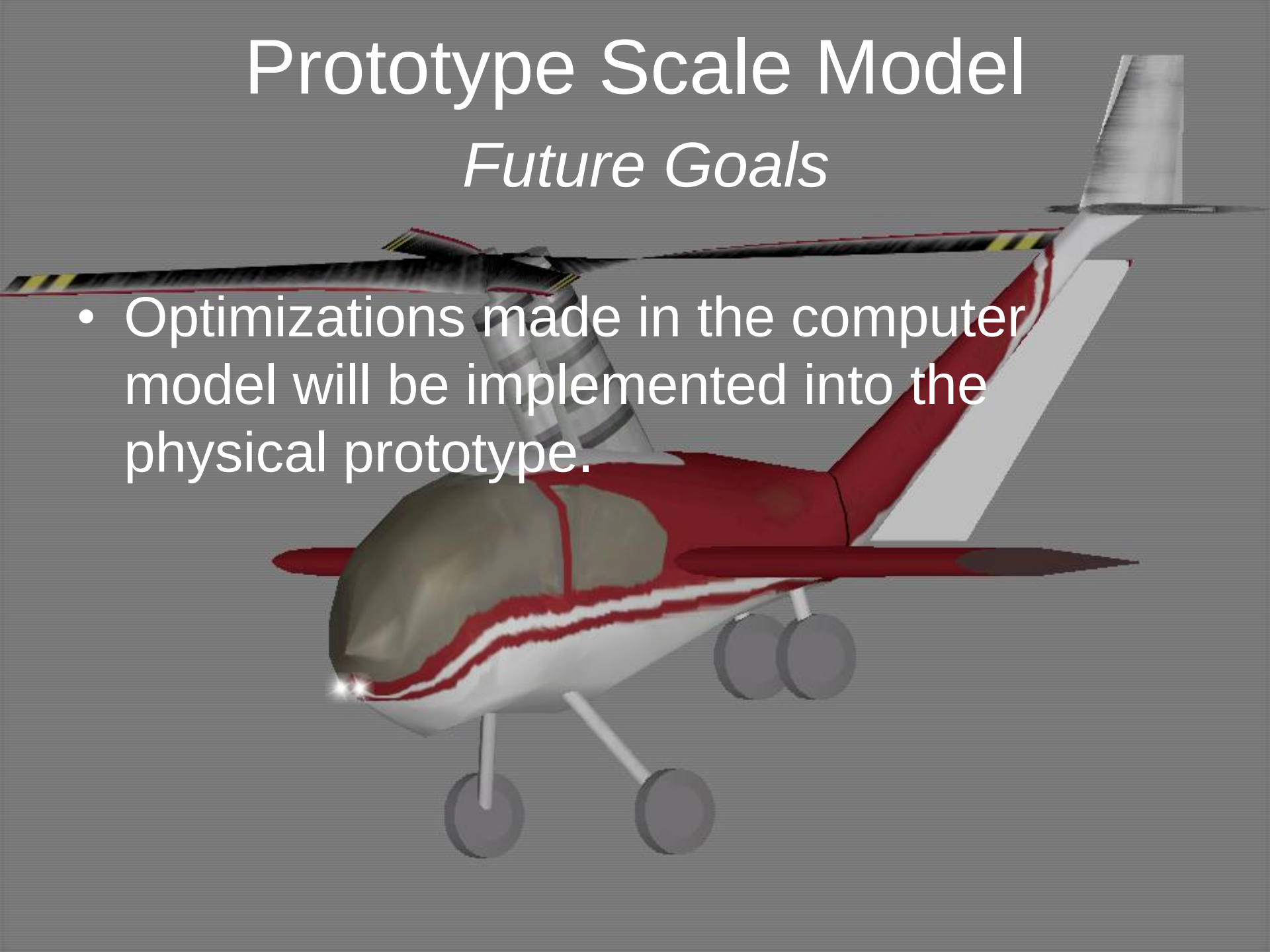
Progression of Assignments

- Model designed based on the previously built physical prototype
- Improving on the parameters of the physical prototype
- Implementation of the defining volar characteristics on a prototype scale



Prototype Scale Model

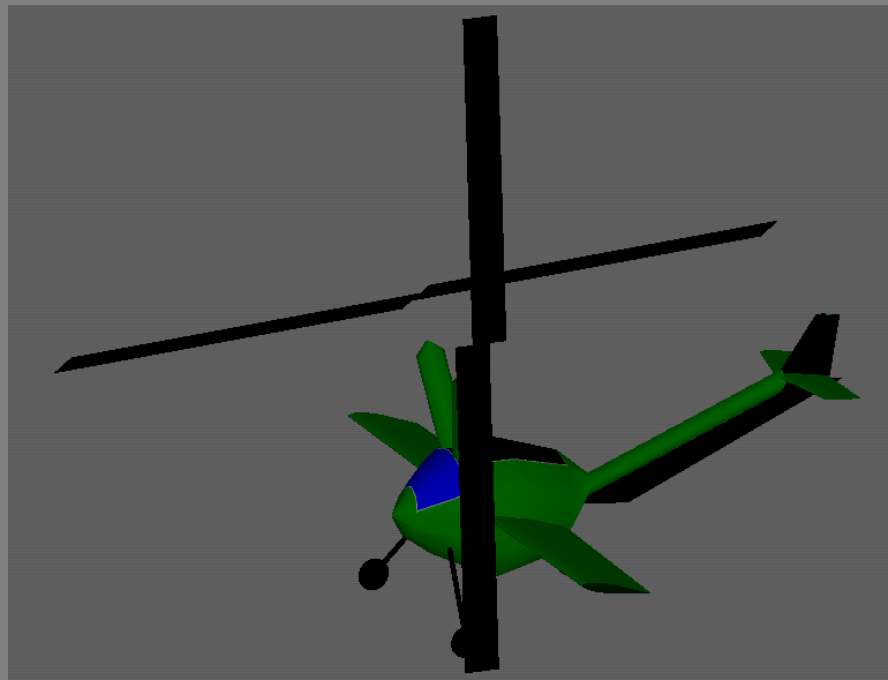
Future Goals



- Optimizations made in the computer model will be implemented into the physical prototype.

Micro Scale Model

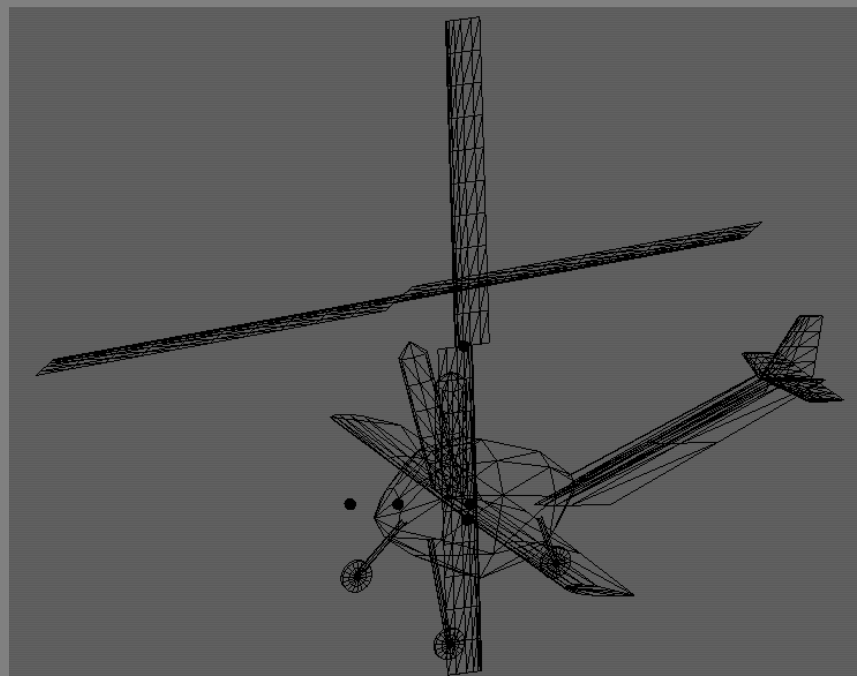
- Wingspan: 1.8ft
- Fuselage length:1.66ft
- 0.2hp reciprocating engine
- Propeller radius: 1.67ft
- Empty weight: 0.7lb



Micro Scale Model

Progression of Assignments

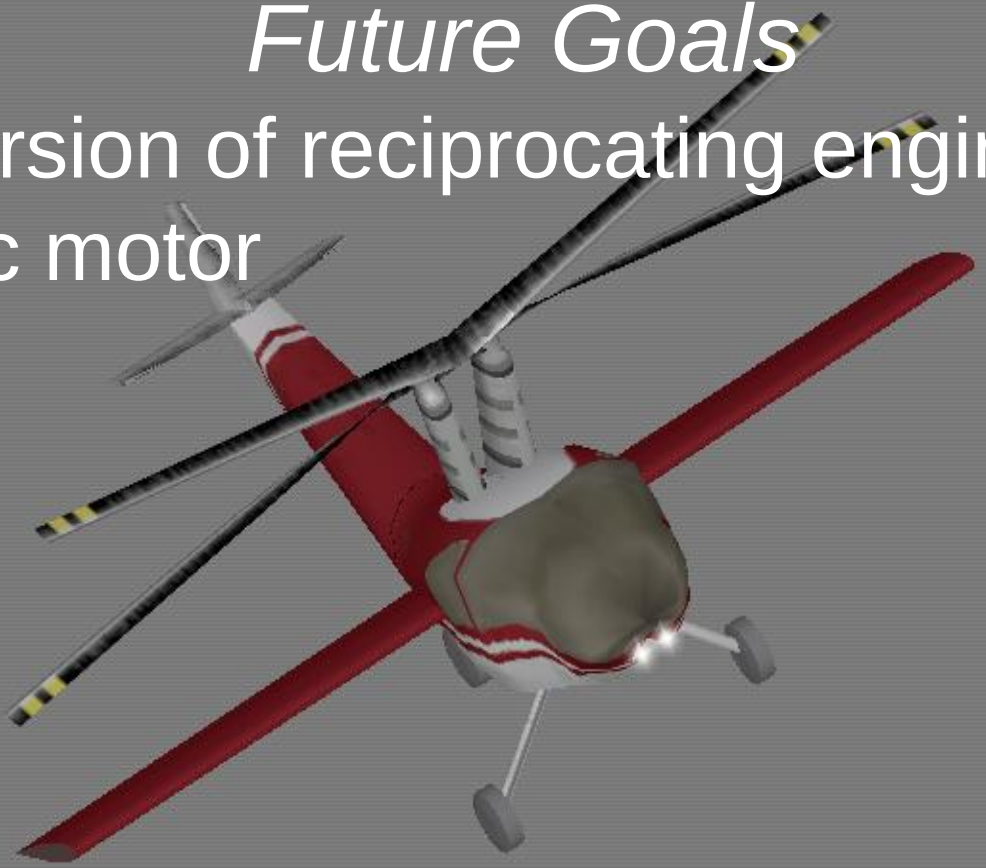
- Research on electric RC helicopter specifications
- Based on available parts, new model was designed from the ground up in X-Plane using the basic Volar geometric design



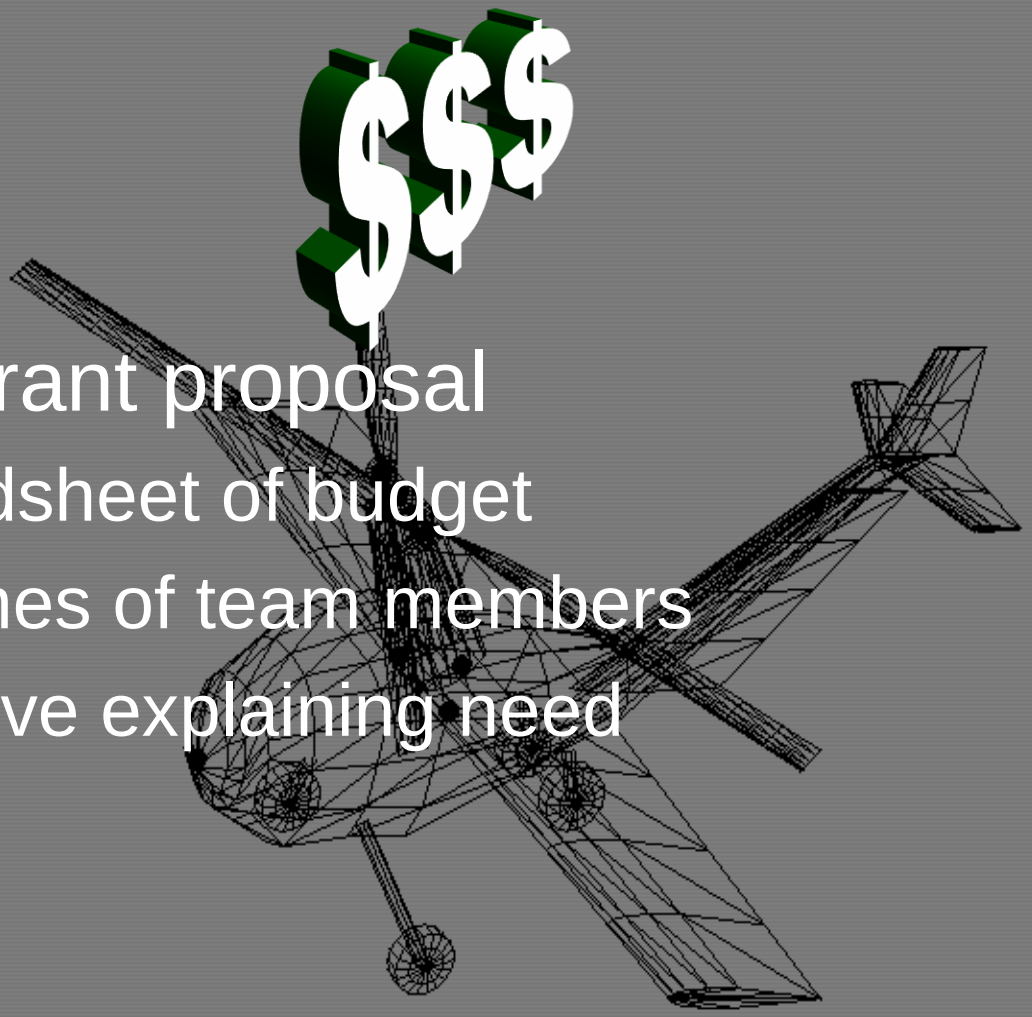
Micro Scale Model

Future Goals

- Conversion of reciprocating engine to electric motor



- Stability and overall flight control improvements



- NCIIA grant proposal
  - Spreadsheet of budget
  - Resumes of team members
  - Narrative explaining need

NCIIA

Operation VTOL

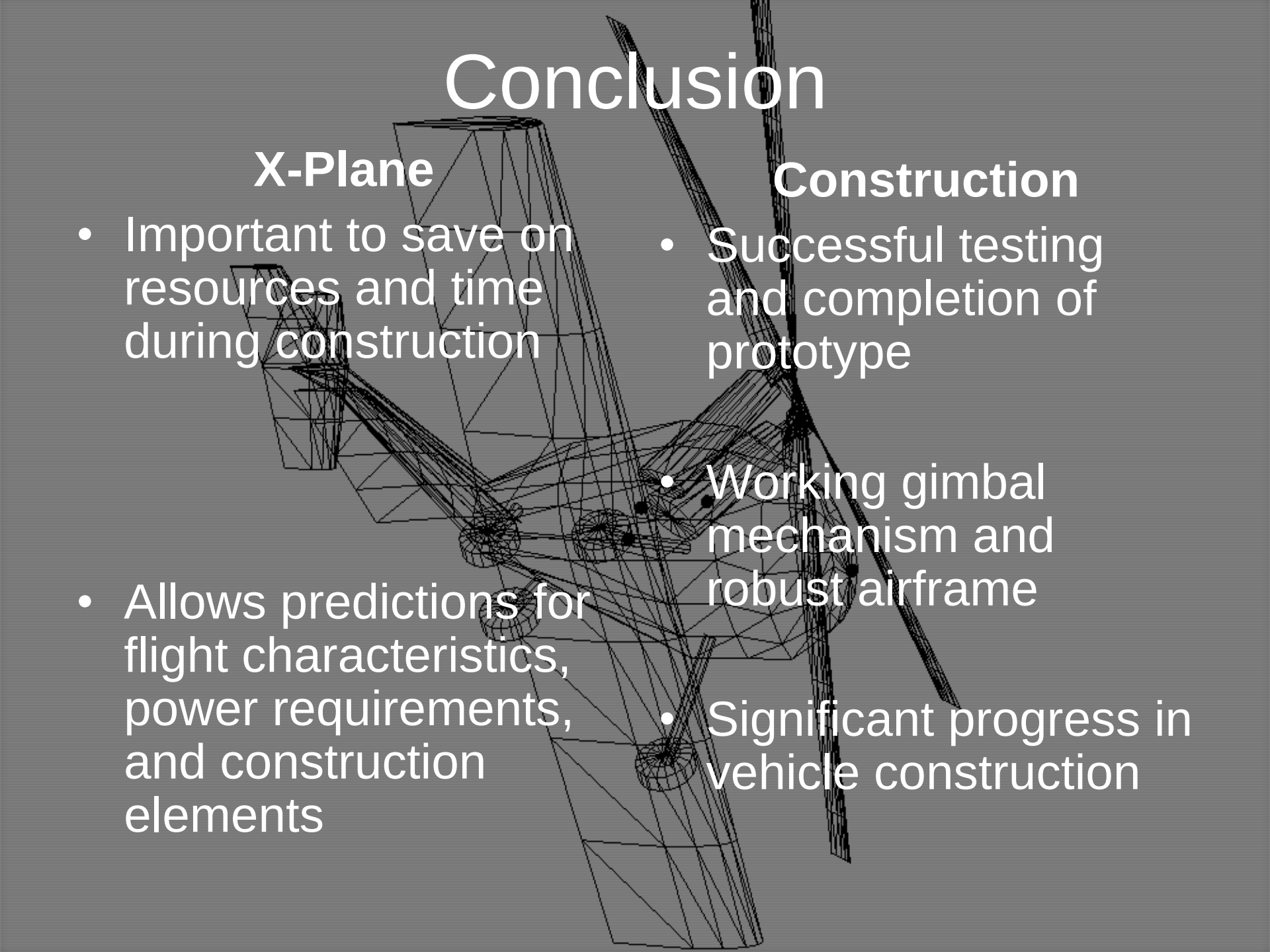
Volar...reach for the solar

Introducing The Volar. The number one, affordable VTOL aircraft.

SKIP INTRO ::

Part Needed	***Quantity***	***Price Per Unit***	***Total Price***
Mazda 2 Rotor Engine	1	2000	$2,000
Carbon Fiber Composite	100 lbs	$3.5 per lb	$350
Servo Motors	5	$120	$600
Machine Shop Labor	150 Hours	$60 Per Hour	$9,000
Nuts, Bolts and Accessories	1	$500	$500
Flight Avionics	1	$500	$500
Batteries	2	$215	$430
Plane Power Alternator	1	$500	$500
Aircraft Electrical System	1	$100	$100
Miscellaneous	1	$1,000	$1,000
1.5" Fiberglass Round Tube	10	$59	$590
2" Fiberglass Square Tube	10	$30	$300
Plexiglass (5' x 8')	1	$172	$172
Grand Total			**$16,042**

Conclusion



X-Plane

- Important to save on resources and time during construction
- Allows predictions for flight characteristics, power requirements, and construction elements

Construction

- Successful testing and completion of prototype
- Working gimbal mechanism and robust airframe
- Significant progress in vehicle construction

Thank You From IPRO 317