

# A New Exciting Homebuilt Aircraft

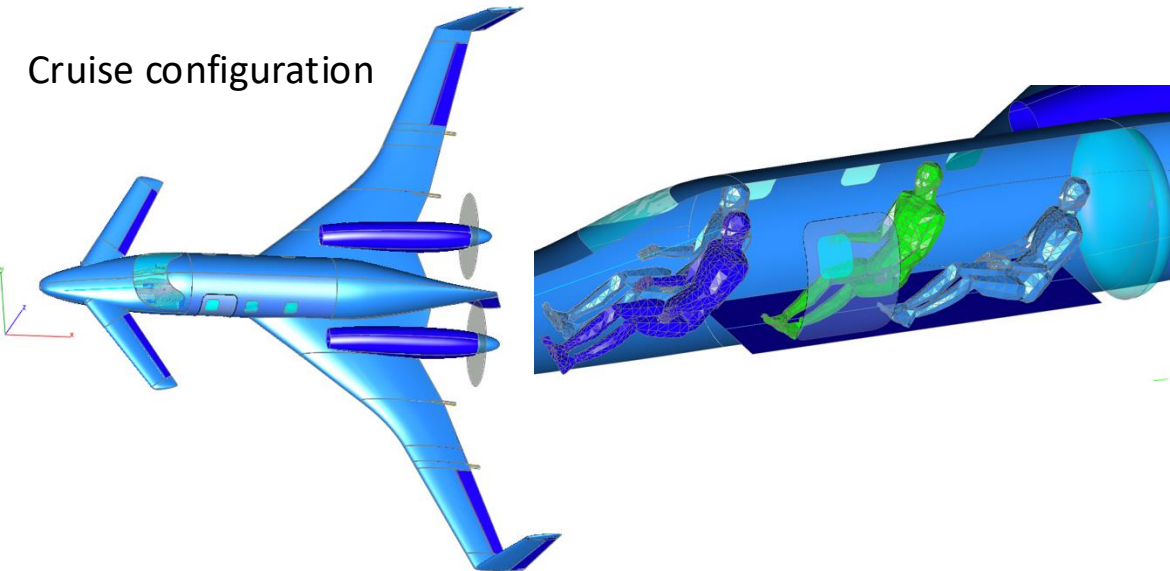
To “Bring Back” the beautiful, near-extinct Beech Starship –  
How about a small, experimental homebuilt?

This presentation shows a design for a twin engine, 4-place  
aircraft that can be powered by four types of engines: Recip,  
Turbocharged Recip, Turboprop or Turbofan.

Its size is 68% of the full-scale Starship.

A builder would buy a kit of materials plus several complex  
parts that are not appropriate for homebuilding (example - the  
shells of the pressurized fuselage and the canard elevators).

Cruise configuration



Takeoff & landing  
configuration



# What is Special about the Starship Configuration?

The experimental, amateur-built category has few options for the homebuilder for an airplane with propulsion redundancy (twin engine).

In addition, the Starship configuration offers other important safety features not available to the homebuilder:

- 1- Freedom from 'loss-of-control' departures - stall and spin resistant (like LongEZ and Boomerang).
- 2- No 'min control speed' – no yaw or roll-off when at full-aft-stick single-engine.
- 3- Controllable and safe climb even with wing flap failure (one flap down and the other flap up).

The full story about the 1980s Full-Scale Certified Starship program will be told in Burt Rutan's autobiography, chapter 34 (burtrutan.com BRAB). A shortened version of that story was presented on July 26<sup>th</sup>, 2024, at the AirVenture event in Oshkosh Wisconsin. That presentation's slides are available at BRAB.

Scaled even tested stalls with one flap down and the other flap retracted. Unlike the King Air, the asymmetry was easily controlled at all speeds..



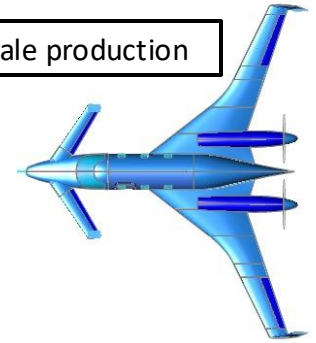
# How big is the Full-Scale and the Homebuilt?

The full-scale Beech Starship has a large cabin for 8 people. Its cabin size is like a medium business Jet.

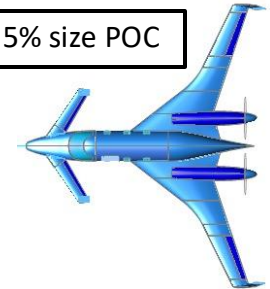
Its wingspan is 54.5 feet, and its fuselage diameter is 70 inches. Most of the fuselage is generally a cylinder to allow pressurizing to a comfortable level at its certified operation of 42,000 ft altitude.

Before the Beech full-scale prototype flew in late 1986, Scaled Composites Mojave built, and flight tested an 85% size Proof-Of-Concept prototype which first flew in 1983

Beech full scale production



Scaled 85% size POC

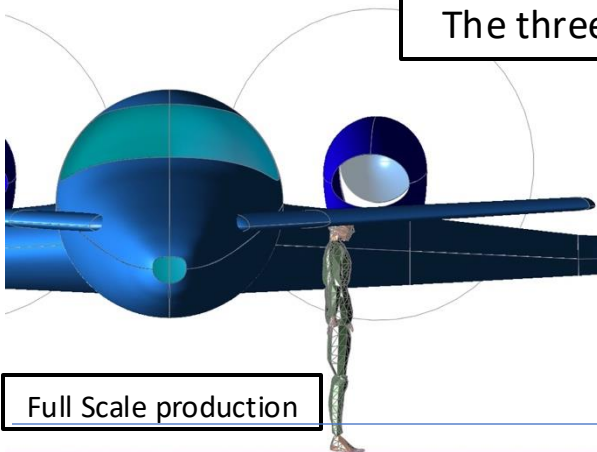


68% size Homebuilt

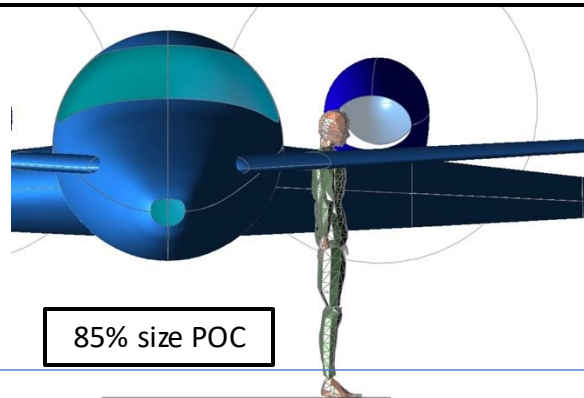


The three humans shown below are 75 inches tall.

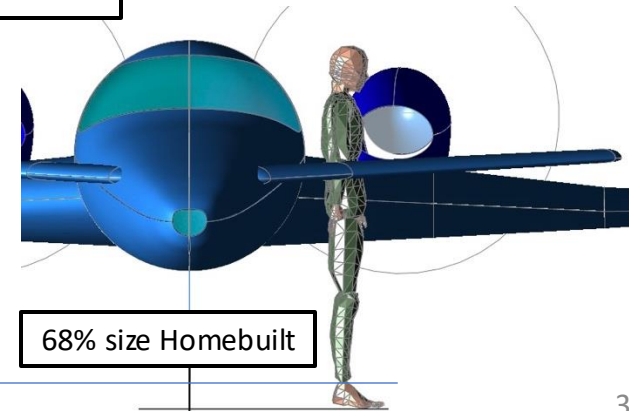
Full Scale production



85% size POC



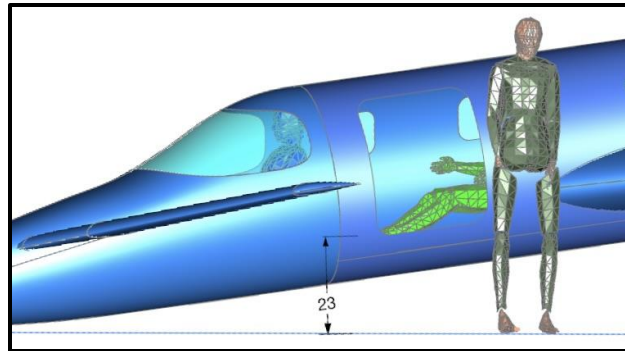
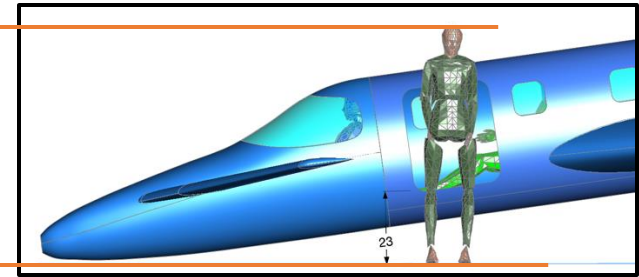
68% size Homebuilt



## Size Comparison and Nose-Down Parking

Like the LongEZ - with crew not on-board the parked 68%-scale Starship might tip backward in light winds. Thus, it will be parked nose-down, resting on its rubber bumper. Thus, it parks safe, even in high winds without tiedown ropes or wheel chocks. Typically, a LongEZ flyer leaves for lunch without the bother of chocks or ropes.

The 68% Starship is much larger than a Long-EZ. These two graphics are the same scale (75-inch man).



The door is a simple, light plug-type like the side door on SpaceShipOne.

There is no need for a complex, heavy air-stair door. For crew egress, ingress or parking, the nose gear is extended or retracted with an electric screwjack. Crew can easily step in without a ladder (23" above ground).



The VariViggen cannot be parked nose-down because the nose is a light removable aerodynamic fairing, not a strong structure. I parked mine tail-down on its small wheels in the back. If its windy it is usually secured by tying the airport's tail rope to the nose gear attachment structure.

A secret (to Beechcraft) photo !! → Scaled's 85%-scale 'Proof-of-Concept' PT-6 turboprop prototype, "Grazing" nose down with a VariEze and a Long-EZ.





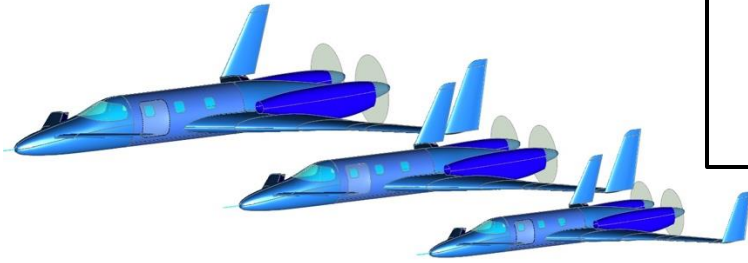
# Why is the homebuilt Starship 68% of full-scale size?

The wingspan of 37 feet is long for a personal homebuilt which are typically built in a residential garage.

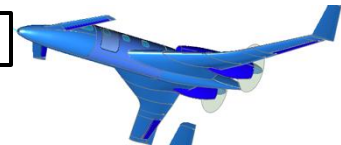
At 68% size the fuselage diameter is 47.6 inches. If is smaller, the cockpit and cabin would be too small for large human pilot/copilot with dual controls. Also, ingress/egress for the passengers would be difficult.

A goal for the homebuilt is to have the ground observer think the homebuilt is a full-size starship when seen flying overhead.

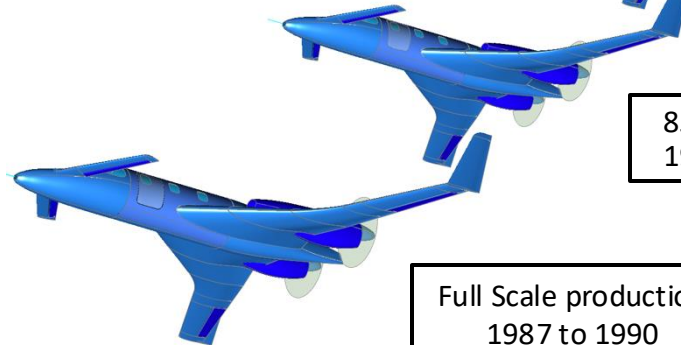
Interesting to see the three sizes in formation. An unlikely formation because Beech destroyed the unique 85% POC.



Proposed 68% size Homebuilt



85% size POC  
1983 to 1987



Full Scale production  
1987 to 1990

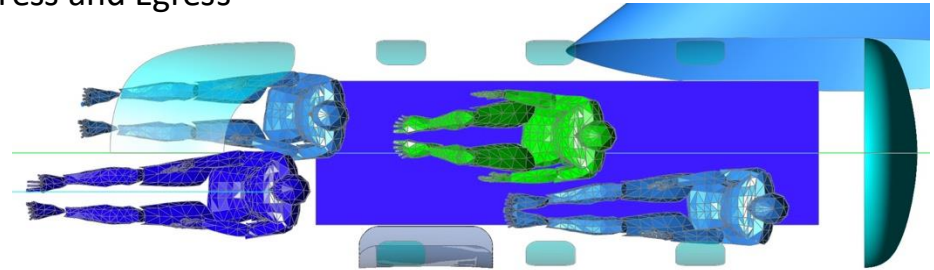
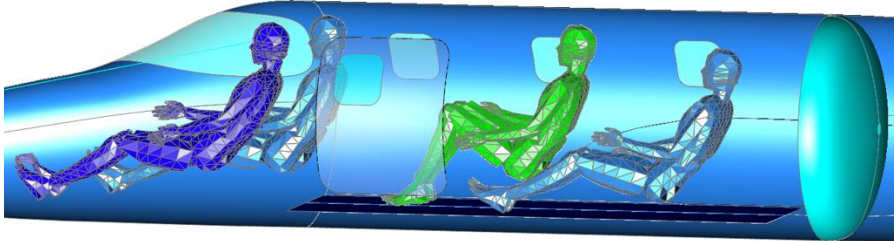
The Wichita Beech team with the first 3 full-scale Starships in 1986



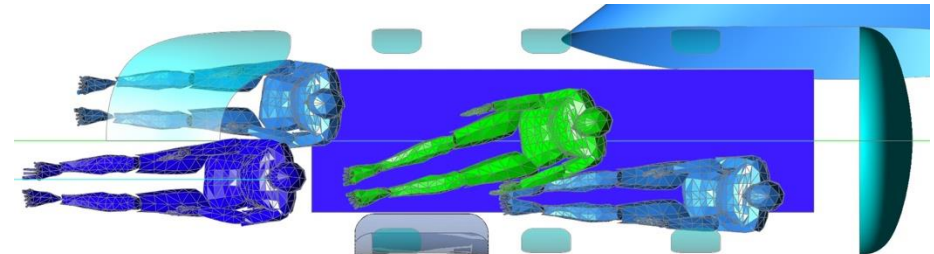
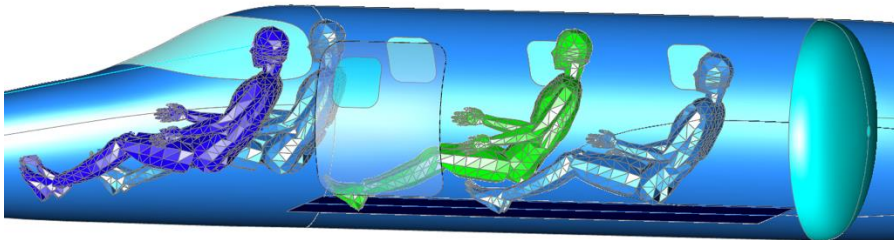
# Seating for the four large humans. 68% size Homebuilt Starship.

Four place, plus lots of pressurized baggage:  
Pilot/CoPilot – Staggered Side-by-Side Seating.  
Two passengers – Staggered Tandem seating.  
Baggage – Netted to the right of aft passenger.

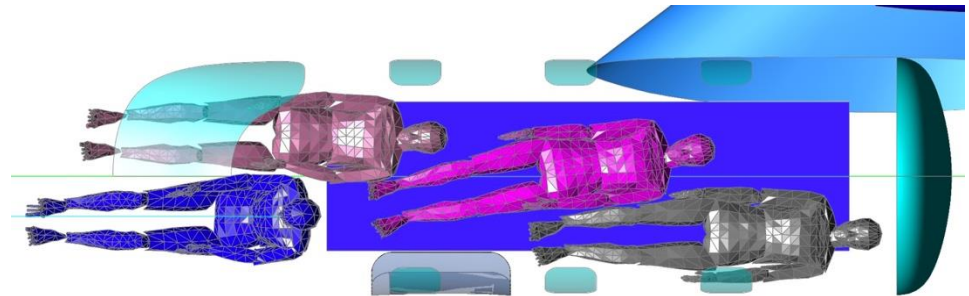
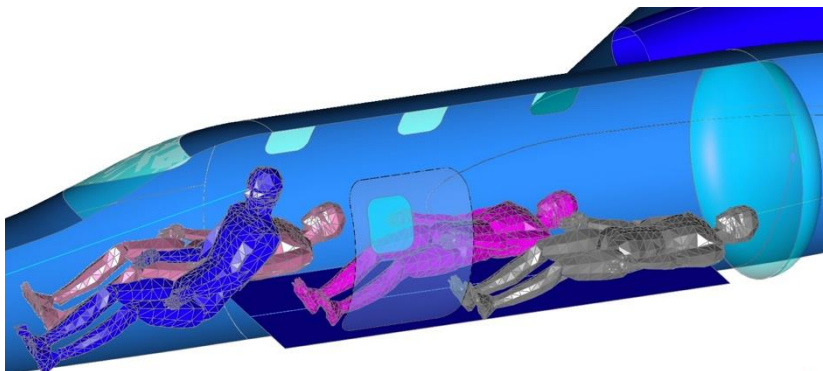
Takeoff, Landing, Ingress and Egress



Climb, Cruise and Descend



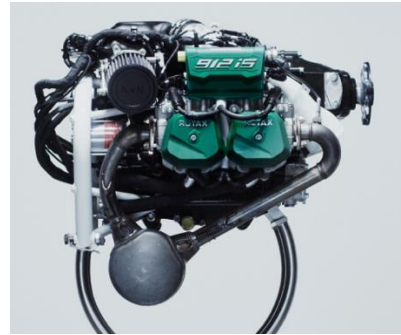
Reclined to Sleep (Long Range Cruise of Model 405 is more than 11 Hours)



# Performance for the four Models.

## 68% size Homebuilt Starship.

**Model 405** Max Cruise = 155 KTAS at 10,000 ft.  
Two fuel injected, 100 BHP, Rotax 912-iS Recips.  
Simple, non pressurized. Best for long range.  
Range at max cruise speed = 1023 nm, 6.6 hours.  
Range at 110 KTAS = 1250 nm, 11.4 hours.

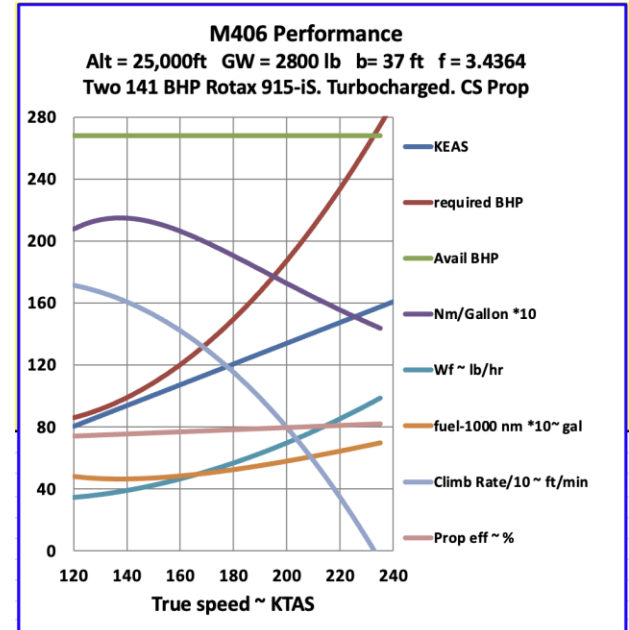
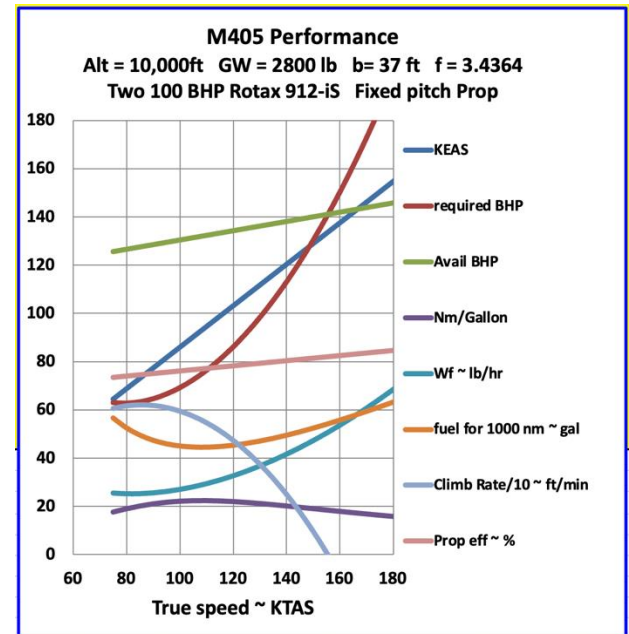


**Model 406** Max Cruise = 233 KTAS at 25,000 ft.  
Two fuel injected, turbocharged, 141 BHP Rotax 915-iS Recips. Pressurized cabin.  
Range at max cruise speed = 770 nm, 3.3 hours.  
Range at 130 KTAS = 1170 nm, 9 hours.



**Model 407** Max Cruise = ??  
Two, not yet available small Turboprop engines.  
High engine cost if fuel efficient. Pressurized cabin.

**Model 408** Max Cruise ~ .68 Mach at 35,000 ft.  
Two, Williams International FJ-33-5A Turbofan engines.  
Pressurized cabin. To get the range of Model 406, the fuel must be increased to ~ 88 gallons (increasing the GW and stall speed).  
About the same airplane cost as a used 1972 Cessna Citation-I, but only ~ 1/3 the fuel required for any given trip.

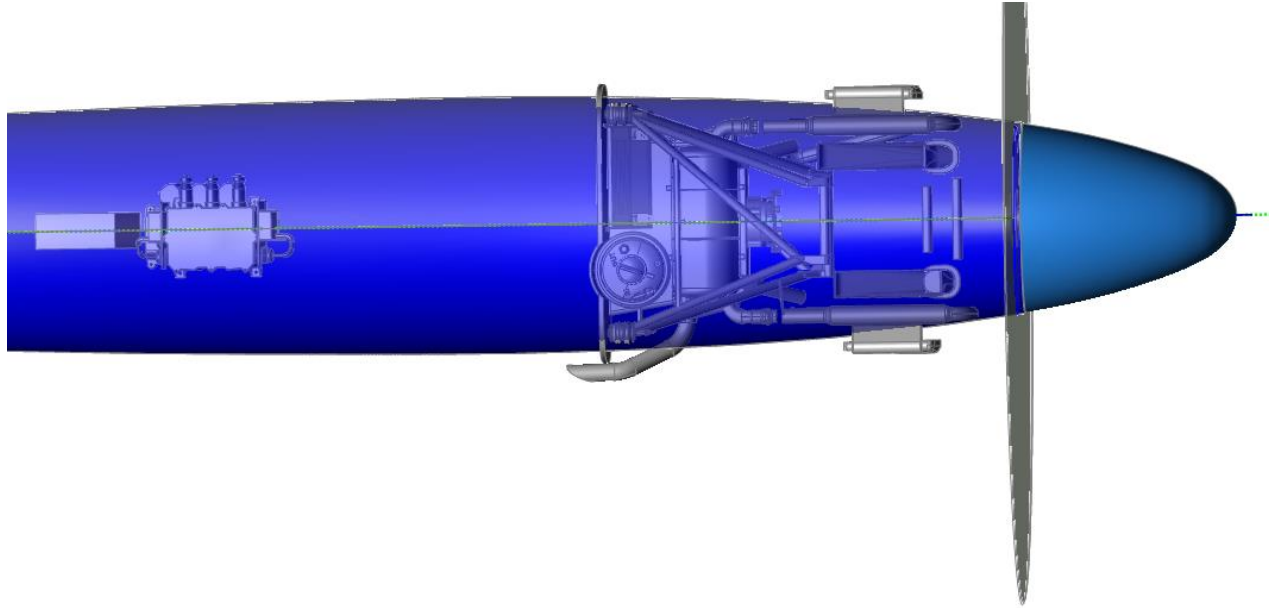


Flat plate drag area = 3.4364 sqft  
Max fuel = 360 pounds = 60 gallons

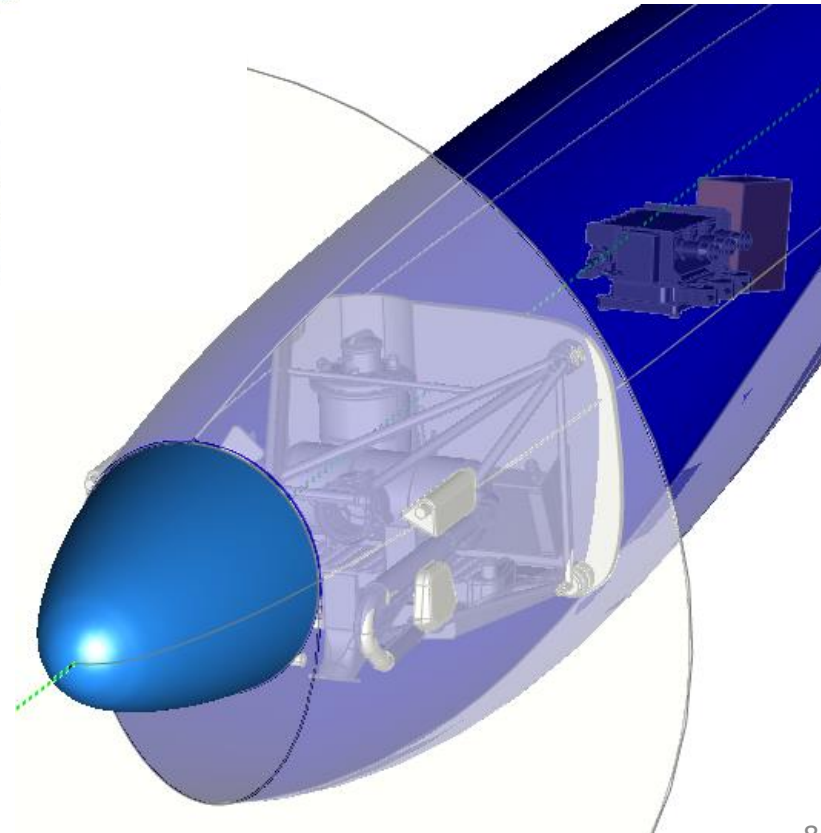
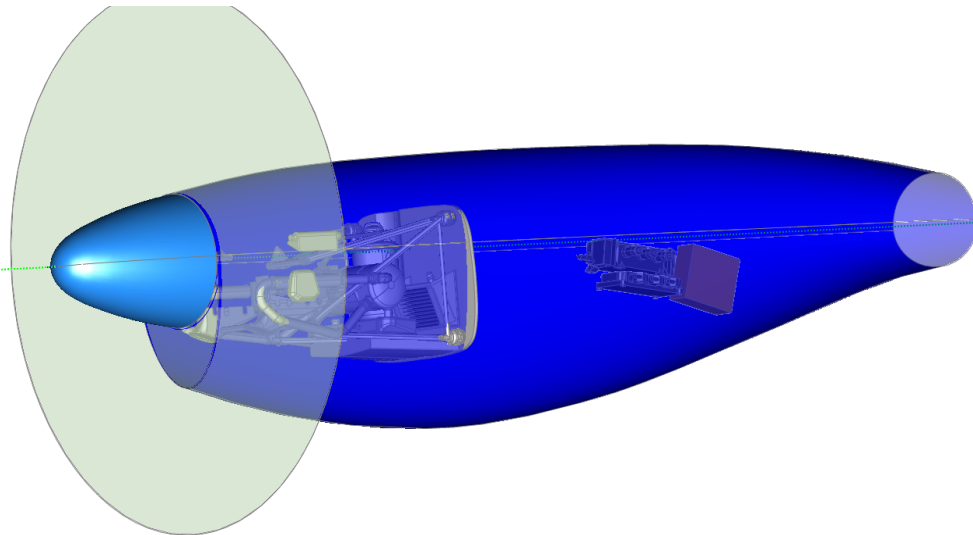


## For Model 405 and Model 406

Rotax 912-iS does not fit in the 68% Starship nacelle.  
Will require fatter nacelle and a 20" diameter prop spinner.



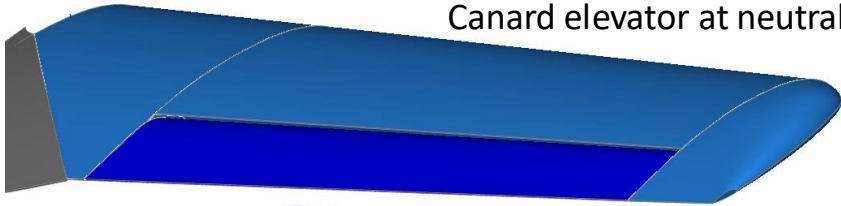
SkiGull firewall shown



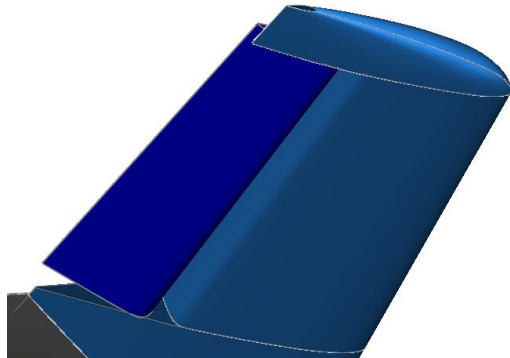


# Control Surface deflections

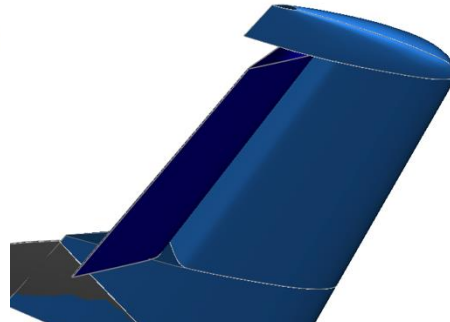
Canard elevator at neutral



Canard elevator cove



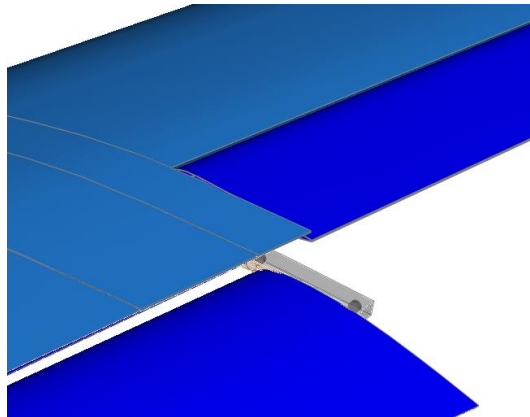
Canard elevator, 15 deg TEU



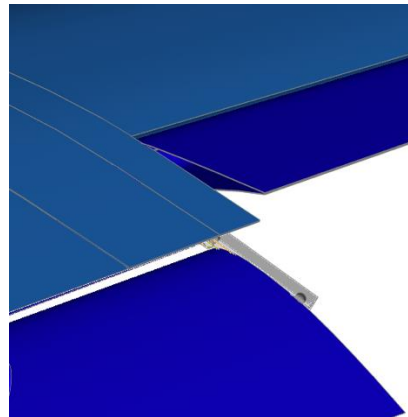
Canard elevator 30 deg TED

Canard elevator and Elevon at full pitch control  
Full forward stick      Full aft stick

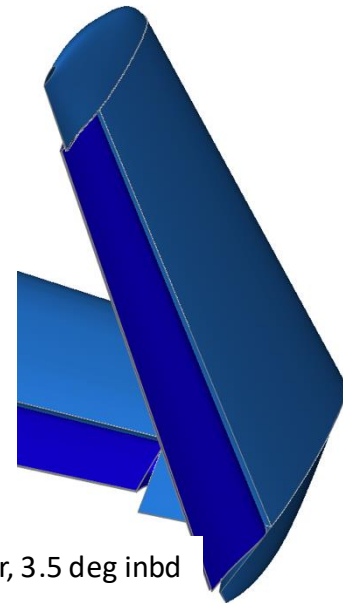
Elevon 4.5 deg TED when canard  
elevator is 15 deg TEU



Elevon 13.5 deg TEU, when canard  
elevator is 30 deg TED



Rudder, 27 deg outbd



Rudder, 3.5 deg inbd

Not shown:  
Electric-actuated trim tabs on  
elevons for pitch and roll trim

Note:  
The elevons also move  $\pm 20$  degrees  
When the pilot commands full roll

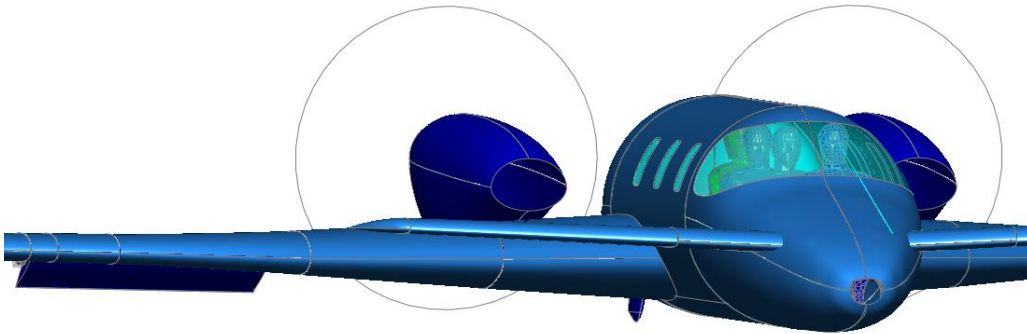
# What is next?

Find a sponsor to fund two phases:

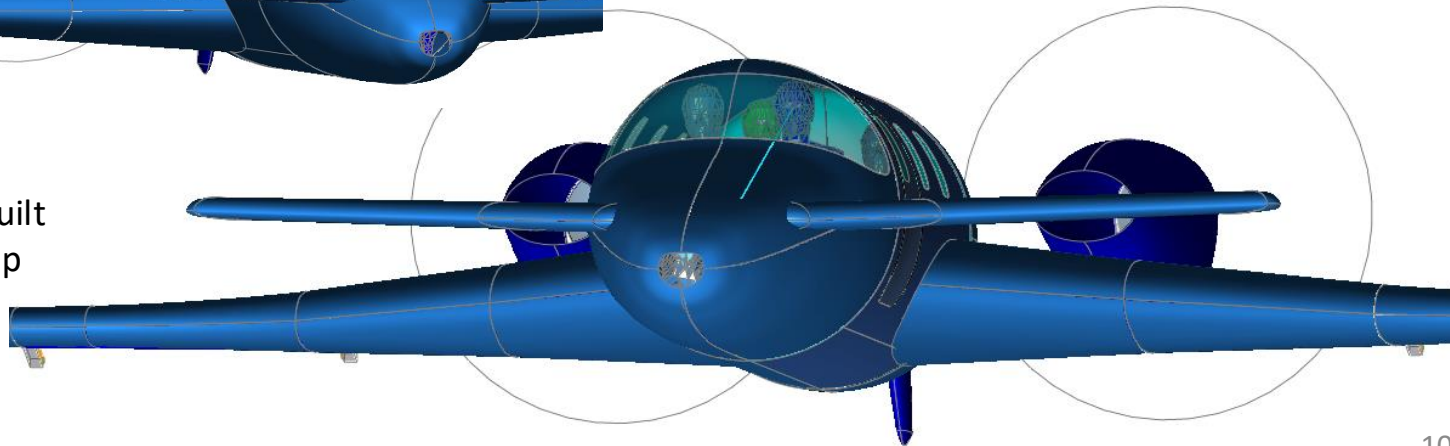
- 1- Build and flight test a proof-of-concept prototype built in soft tooling.
- 2- If phase 1 is successful, then initiate the homebuilt kit program.

**End**

68% four-place homebuilt  
Canard un-swept, flaps down



68% four-place homebuilt  
Canard swept, flaps up



Another secret photo:  
Starship 85% POC with three homebuilts.

