Aircraft project 2007
Linköpings University

RAVEN

BizJet Medivac

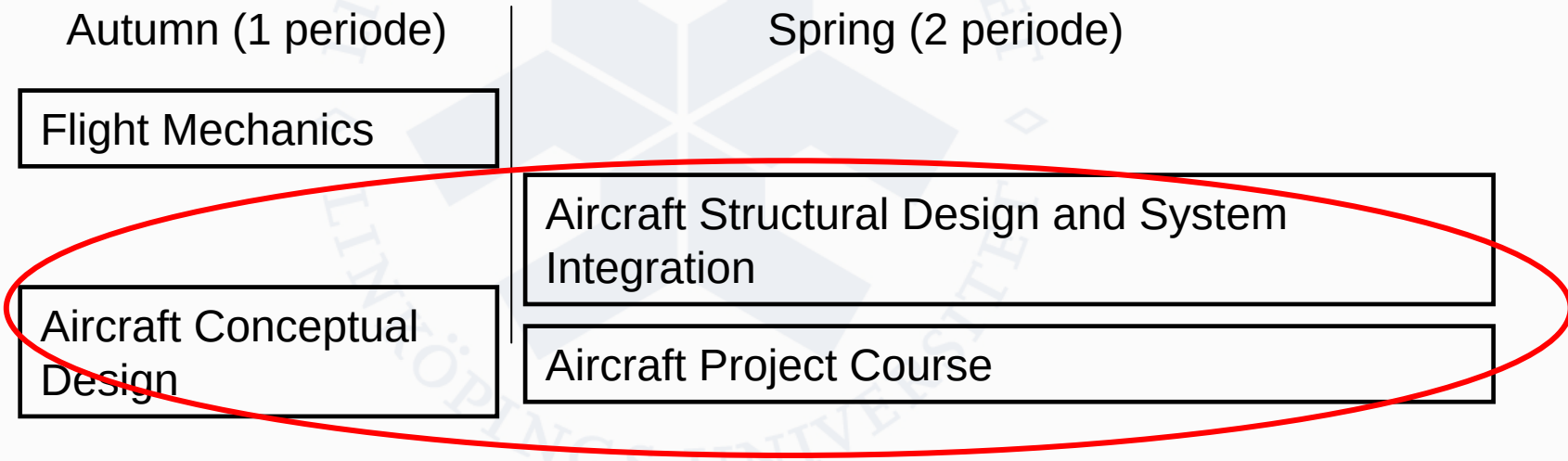
Agenda

- Introduction
- Goals
- Requirements
- Results
  - Full scale
  - Demonstrator

Introduction

- Course given in fourth year
- 13 students and 4 different nationalities
- Two different courses collaborates together
  - Aircraft Design
  - Ergonomy Design
- Sponsorized By Linklab and NFFP
- Budget of 20000€

Introduction



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Goals

- Design a BizJet/Medivac aircraft in full scale
- Design Manufacture Flight a “Dynamically scaled” aircraft based on the full scale study
- Design the interior solution for BizJet and Medivac application

- Why?
  - Simulate the “real” aircraft behavior with reduced risk
  - Extend the flight envelope
  - Understand difficulties with dynamic scalling

Requirements Full Scale

- Two roles: bizjet or medivac
- Quick change (30 min max.)
- Two pilots
- In medivac role:
  - 575 kg payload (max 700kg)
  - Range 1300 nm
  - Two Patients, one doctor and one nurse
  - Enable one stretcher to remain inside while the other is removed
- BizJet Role
  - 4 to 6 passenger
  - Offer space and high class interior
- Able to use runways 800m long (ISA+20)
- Sized around two Williams FJ33 engines

Requirements for Demonstrator

- Dynamic scaling
- Full instrumentation for flight testing
- Endurance minimum 20min
- Full Instrumentation
  - Alpha Beta vanes
  - Pitot Tube
  - IMU
  - Data logger based on FPGA with Linux
  - Potentiometers for all control surfaces
  - Engine monitoring
  - Telemetry with stall speed warning

Work Load

- 400 h/person
- 16 Weeks
- 25 h/week

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Dead lines

- 16 February Presentation of Redesign
- 23 March Outer geometry locked
- 18 May Flight test

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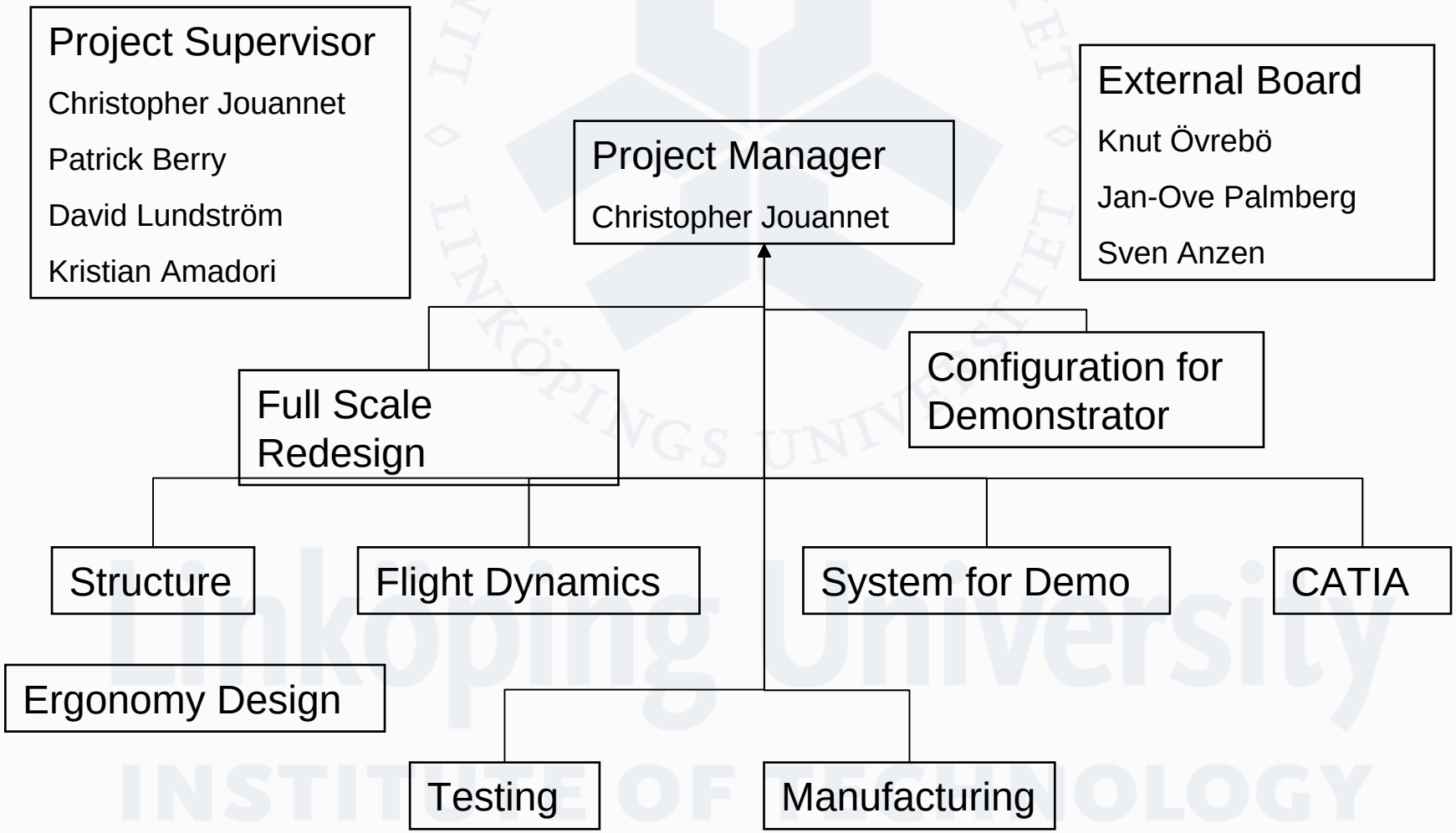
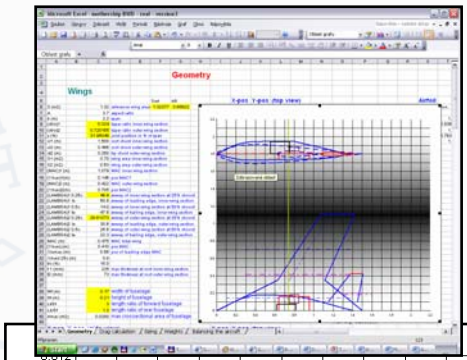
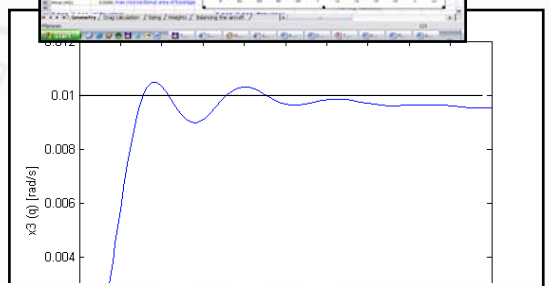
Project management

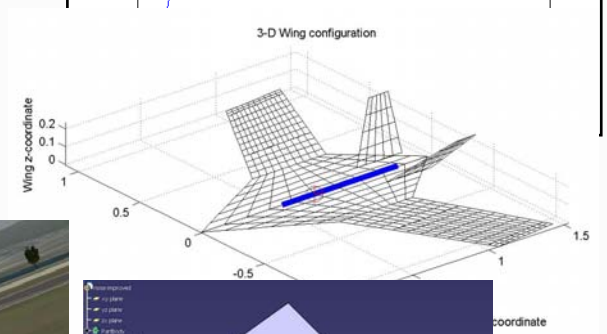


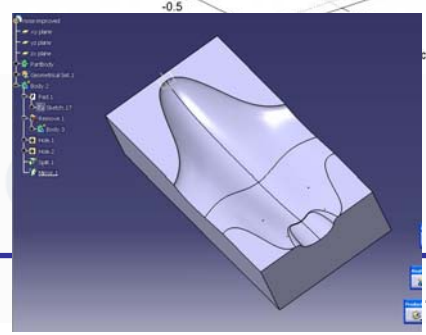
Tools

- Sizing Program in excel
- DATCOM
- Matlab
  - Aerodynamics (Tornado from KTH)
  - Flight Mechanics
- Catia V5
- Flight Gear
- OVL (aerodynamic)
- Xfoil (aero)

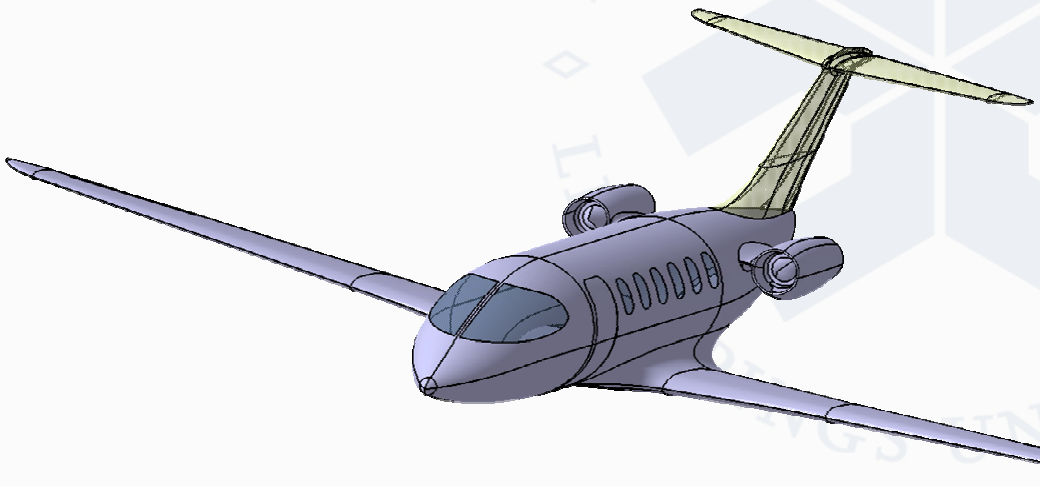


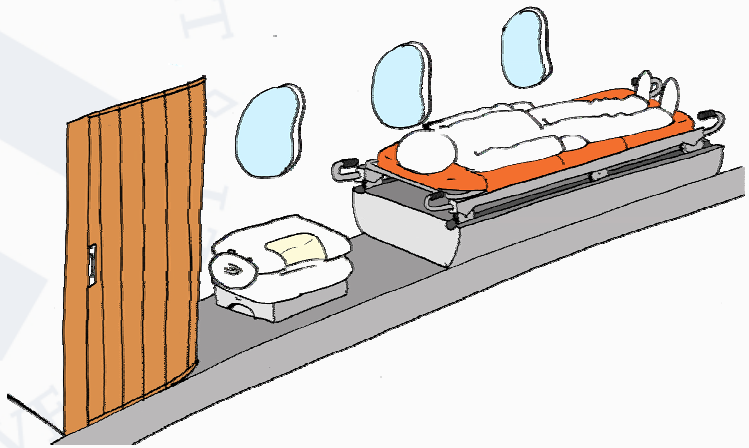


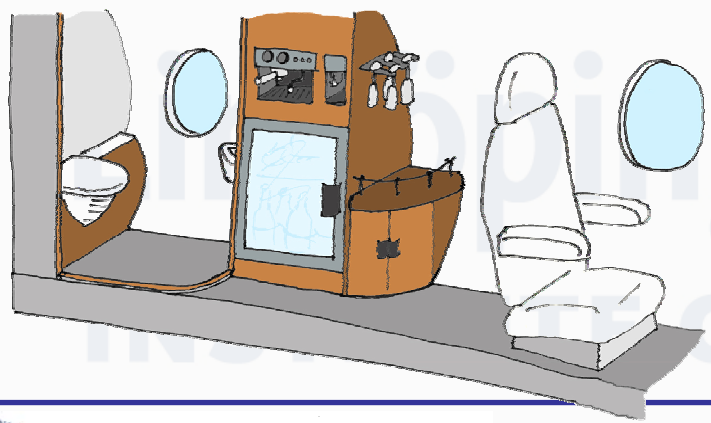


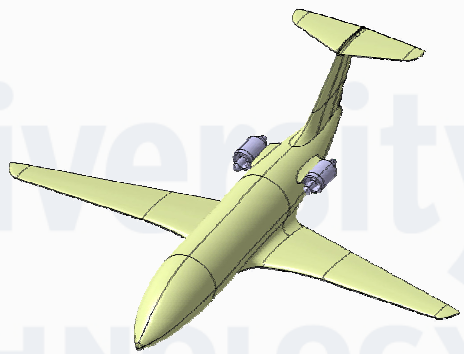


Project: Raven









General structure

Specifications

Length = 12 m

Diameter = 1,7 m

Sref 21,8m2

Mcruise 0,55 (40 000ft)

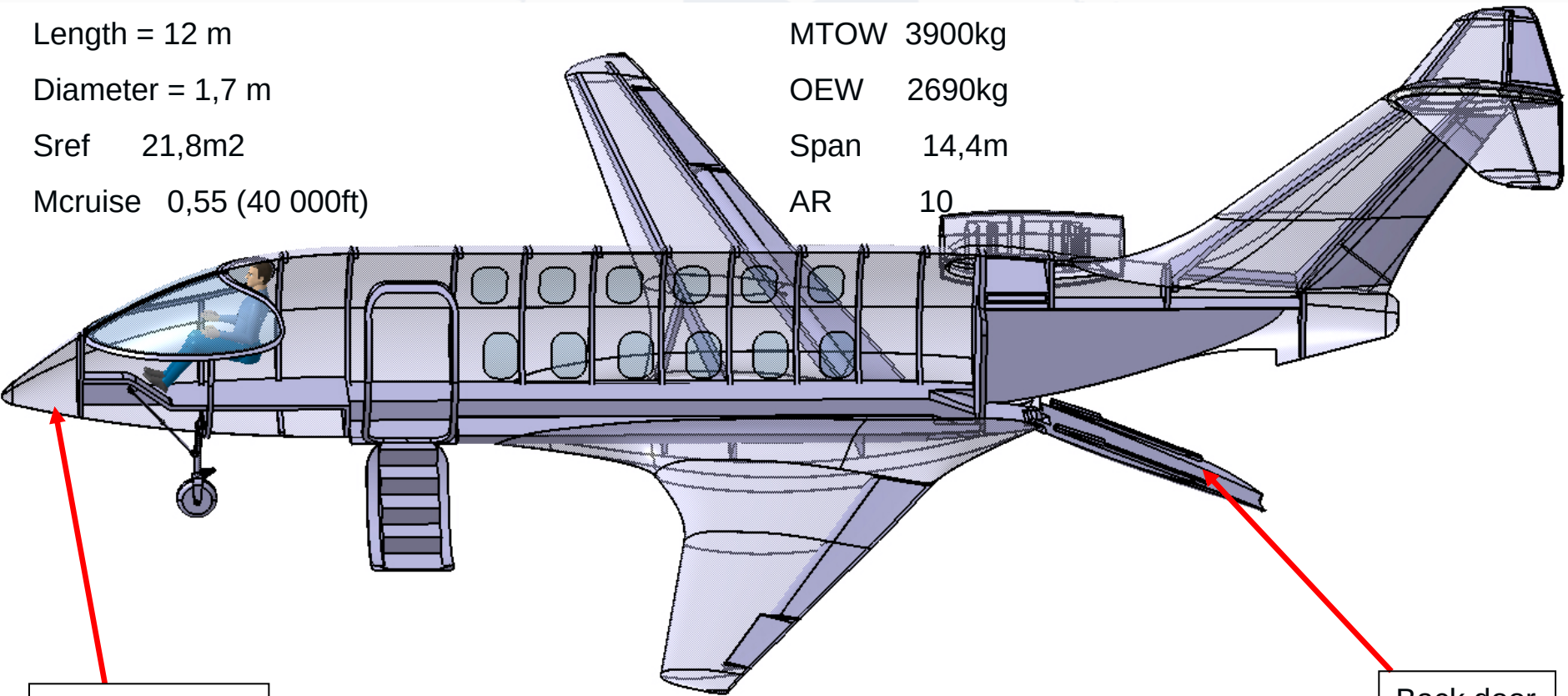
Specifications

MTOW 3900kg

OEW 2690kg

Span 14,4m

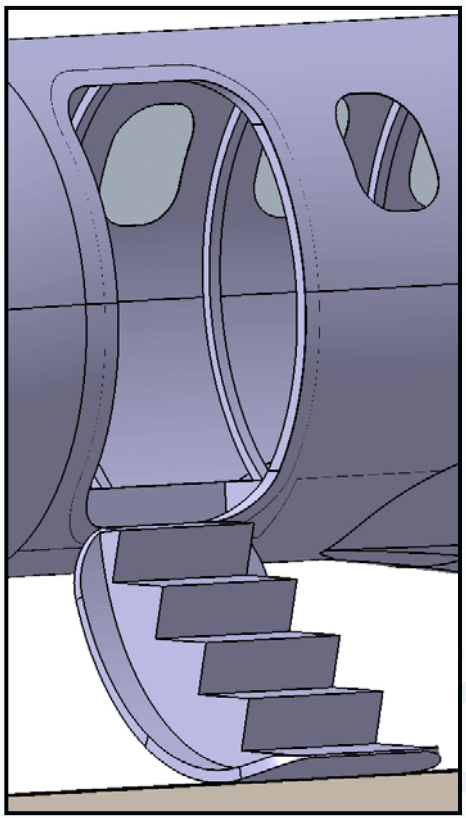
AR 10

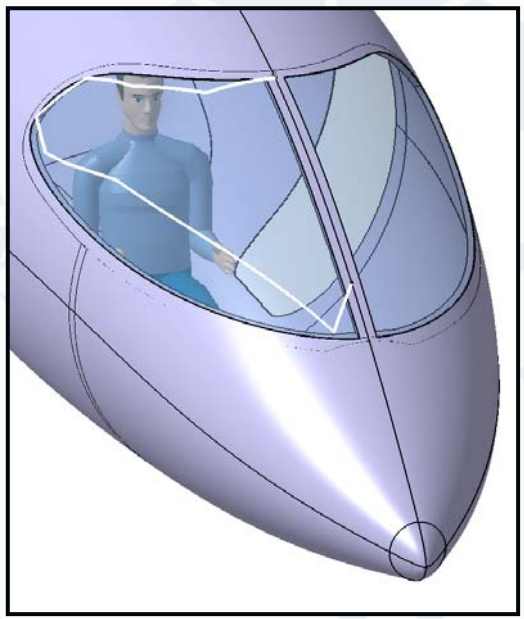


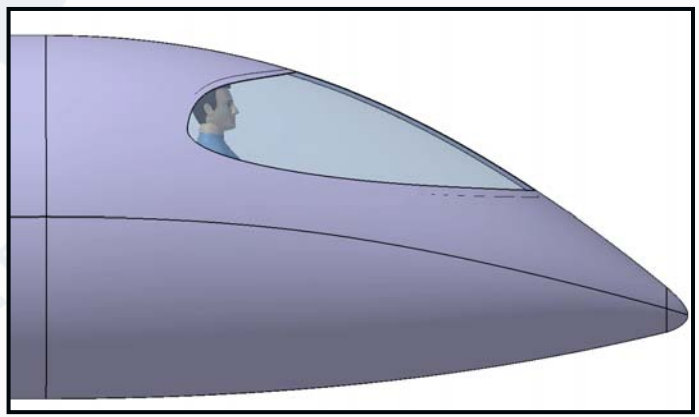
Weather radar location

Back door solution

Main door and canopy



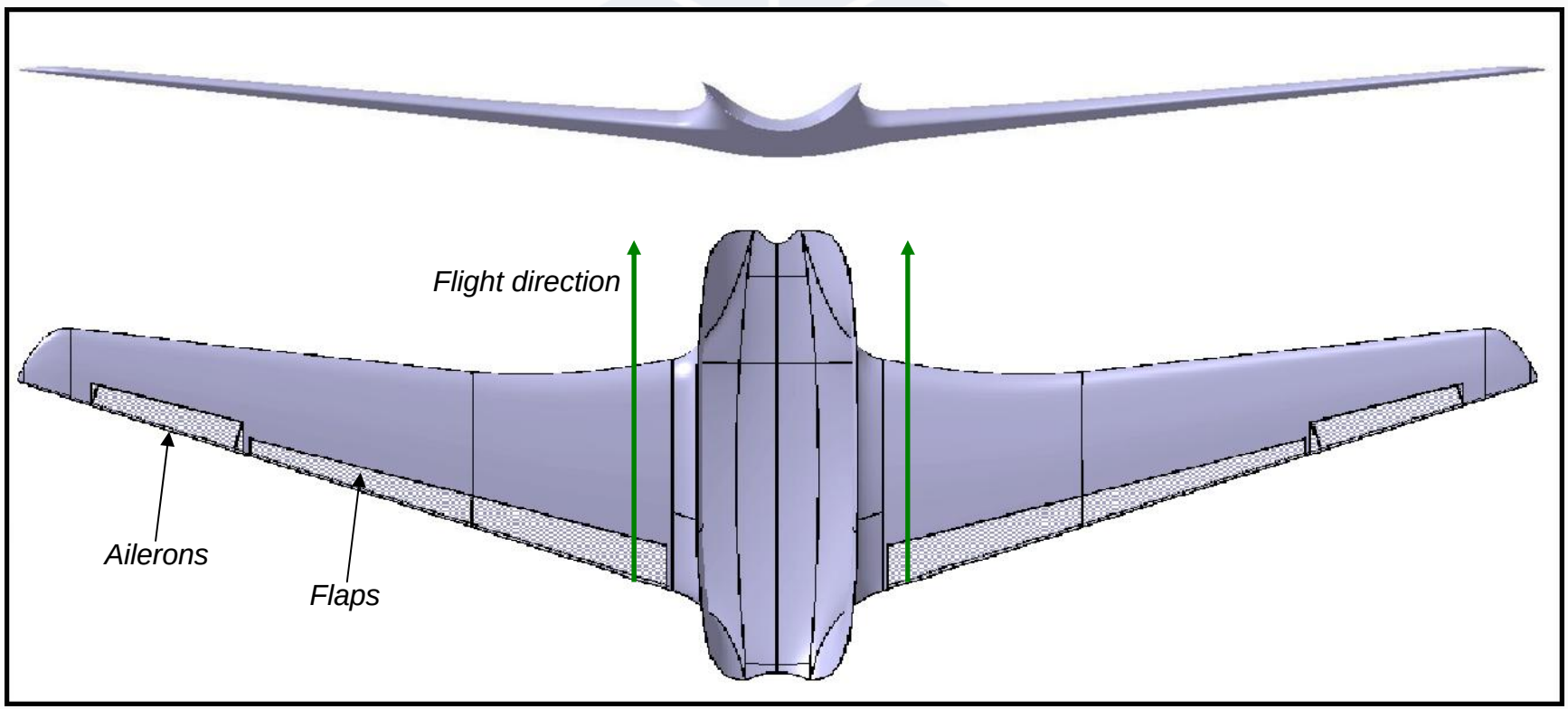




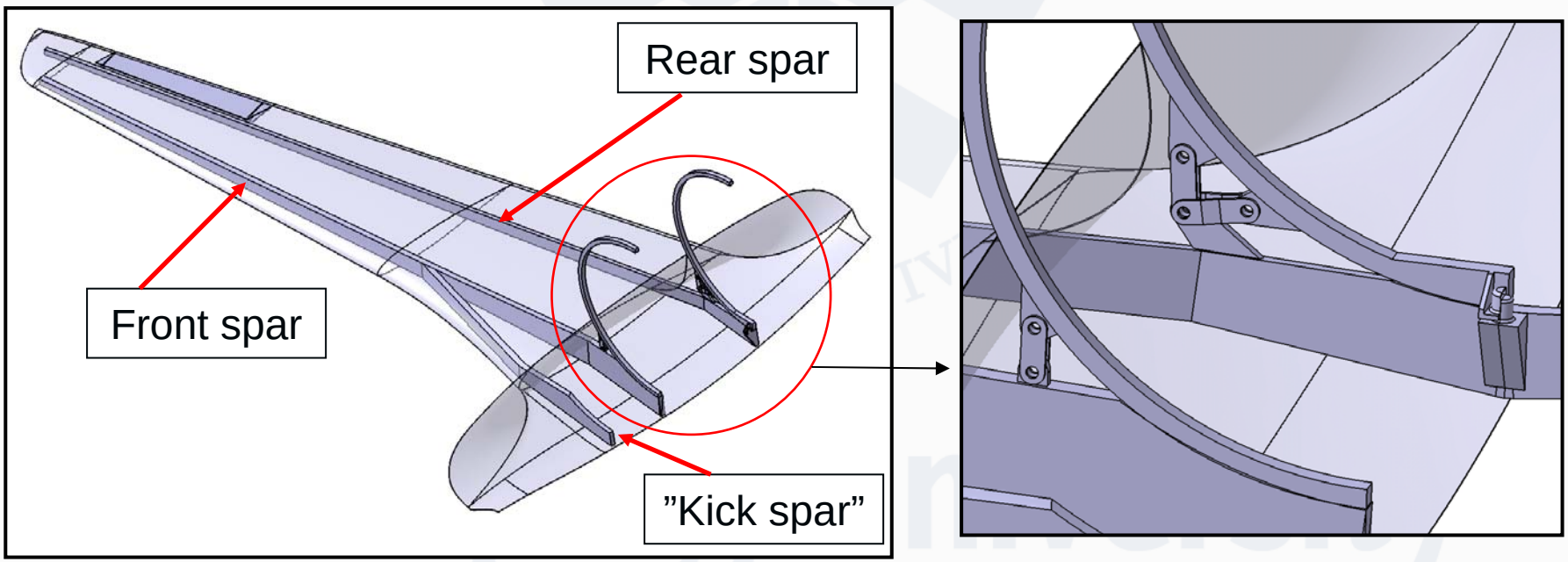
Canopy design:

- Follows the minimum visibility pattern

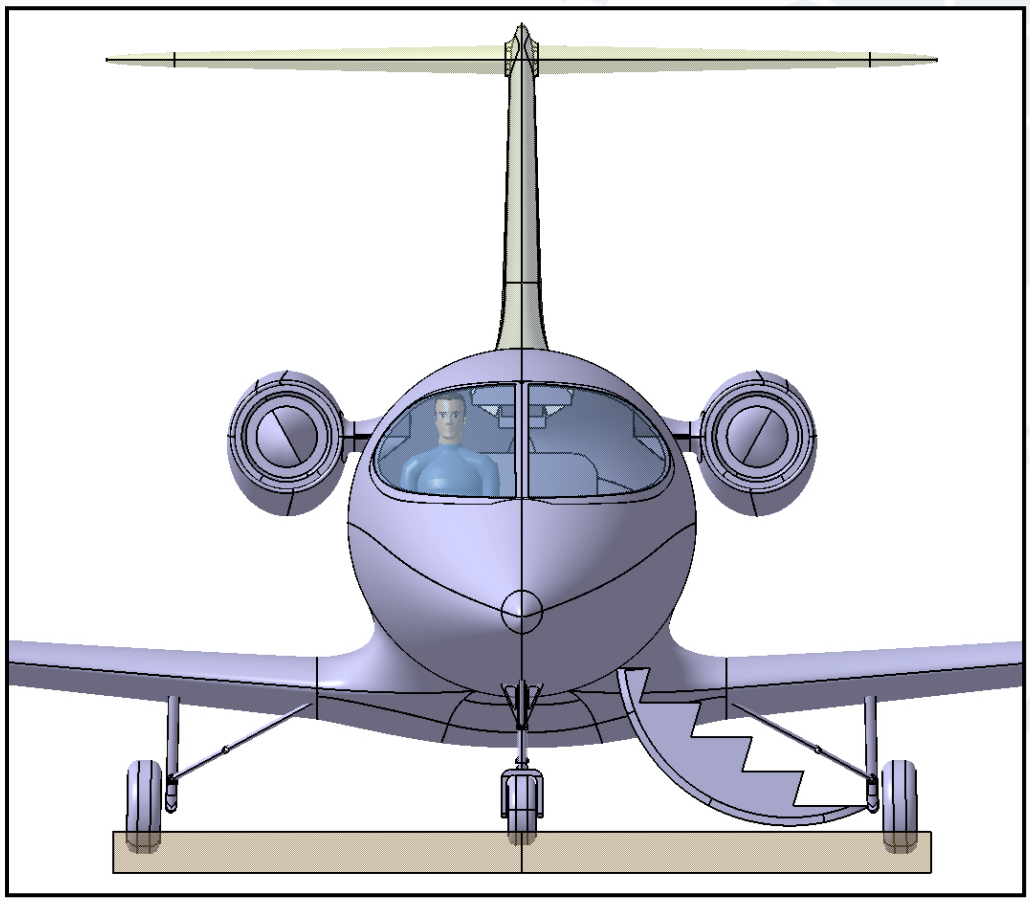
Wing: Main specifications

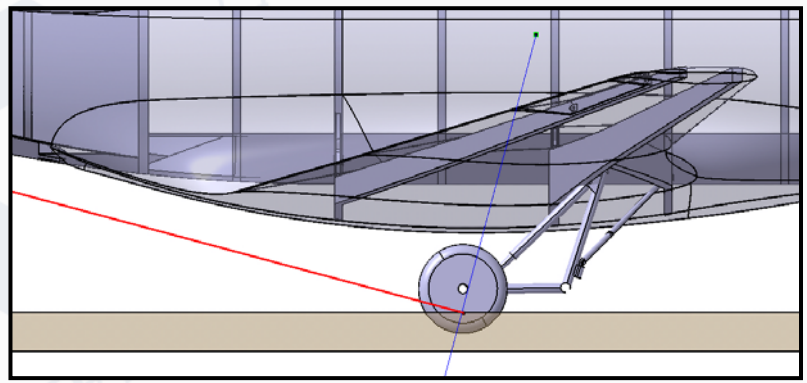


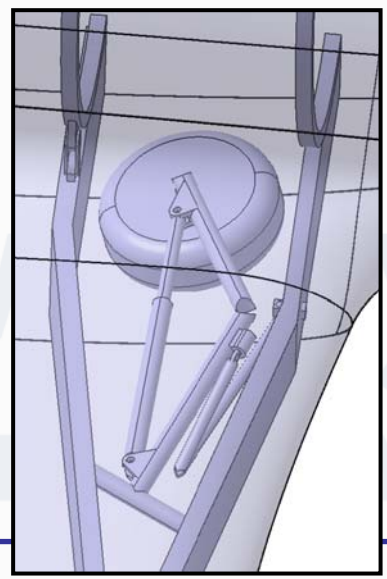
Spars and wing attachment



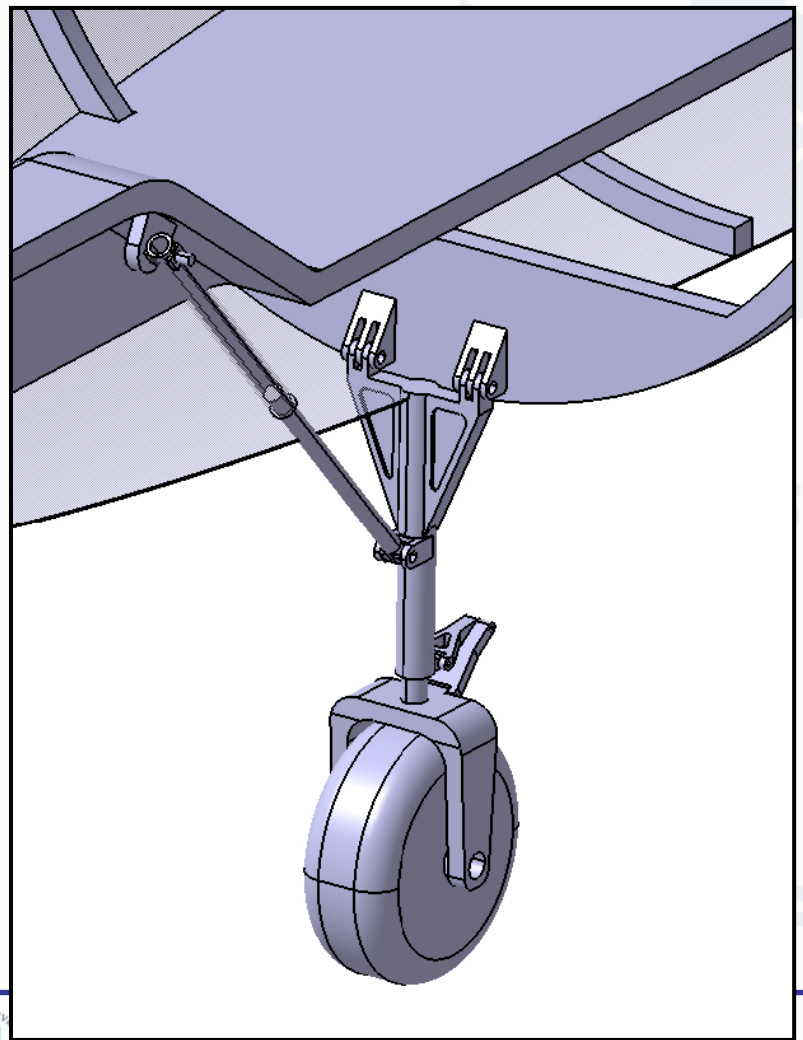
Main landing gear

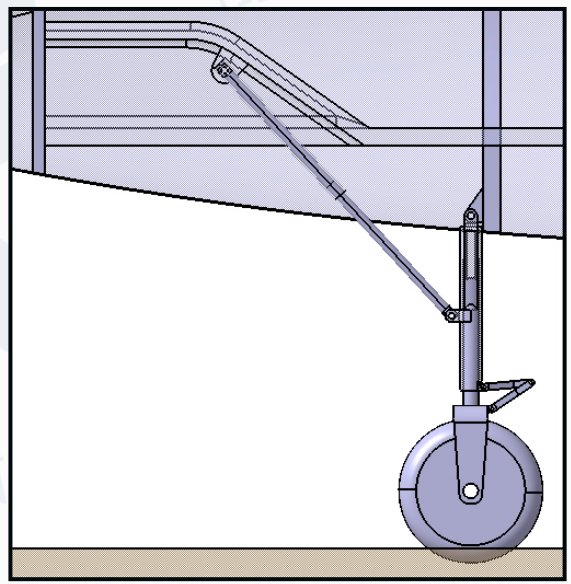


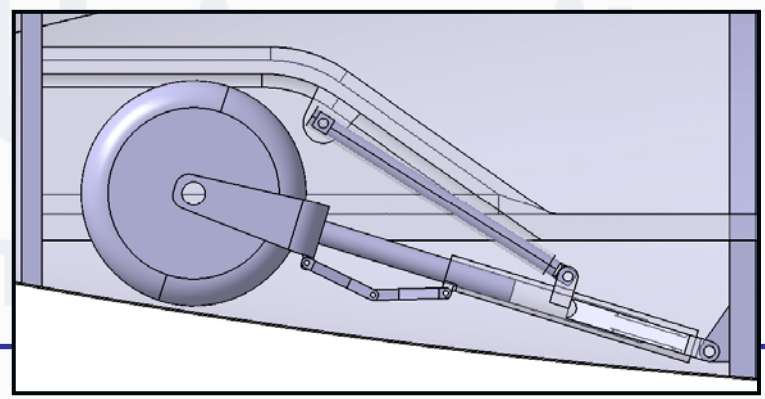




Nose landing gear

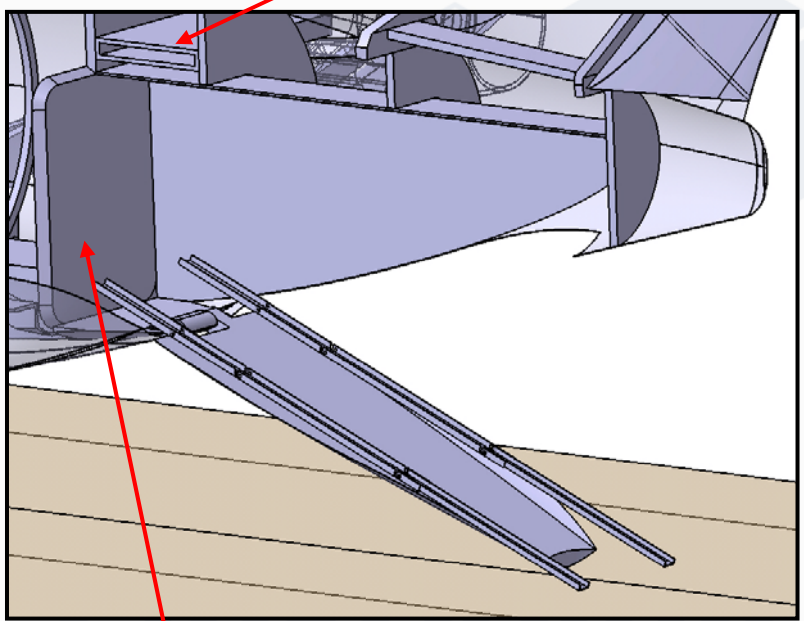






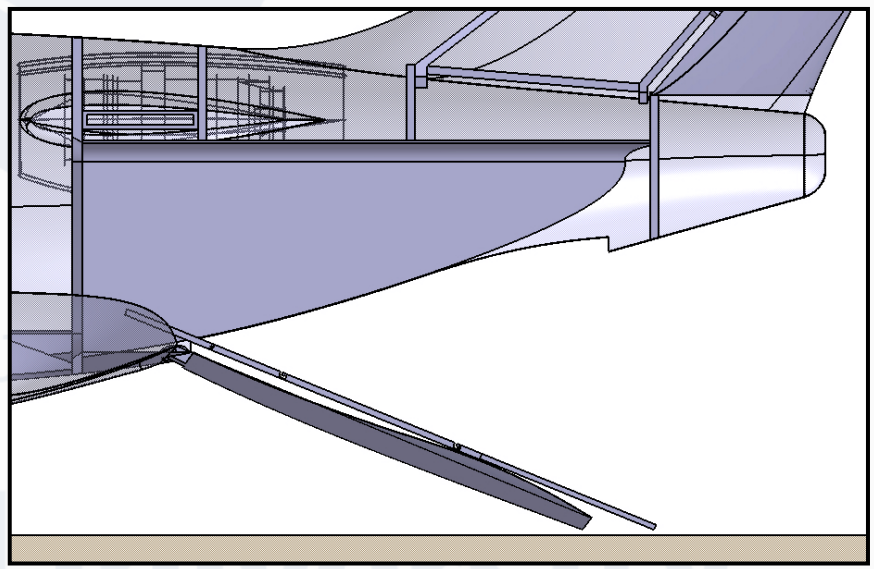
Back door solution

Engine attachment



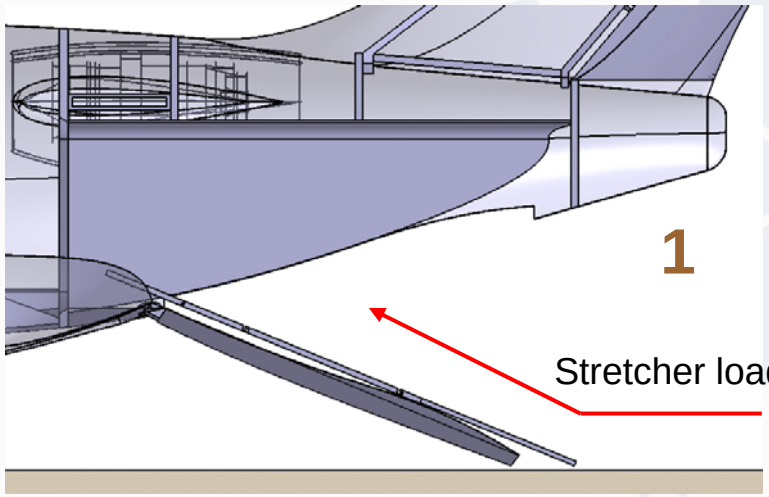
Bulkhead door

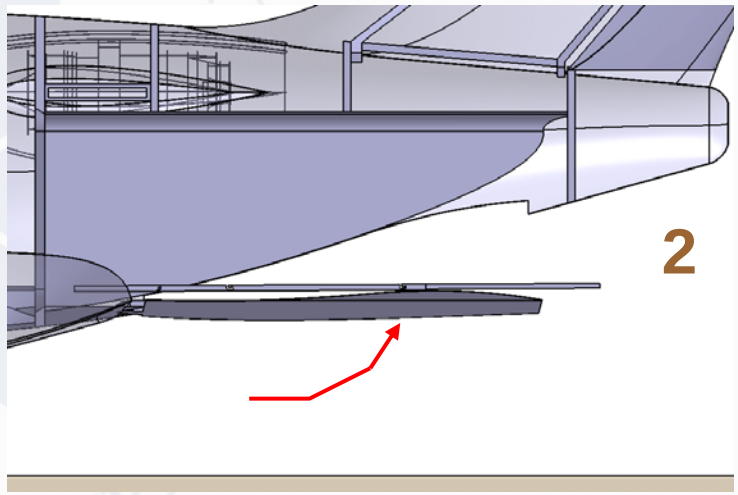
Back door

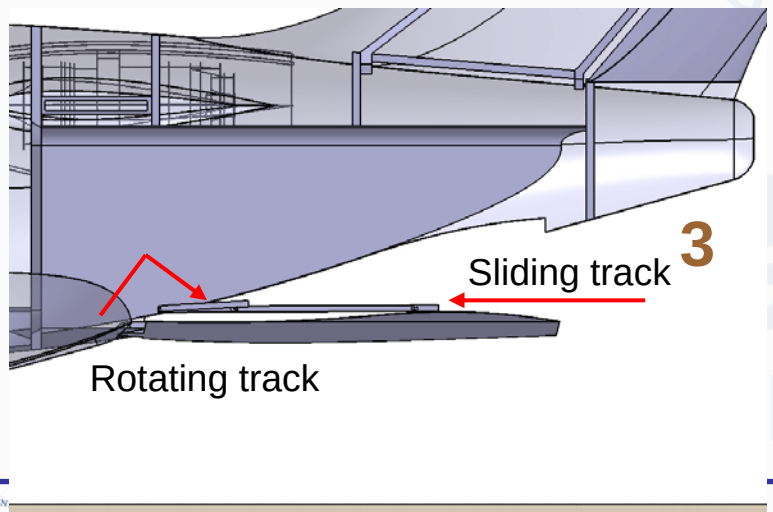


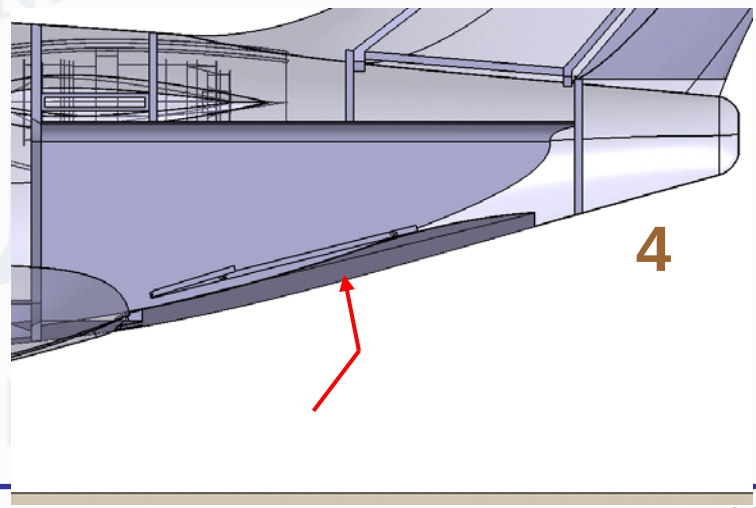
- Width= 0,68 m
- Height= 1 m

Back door opening



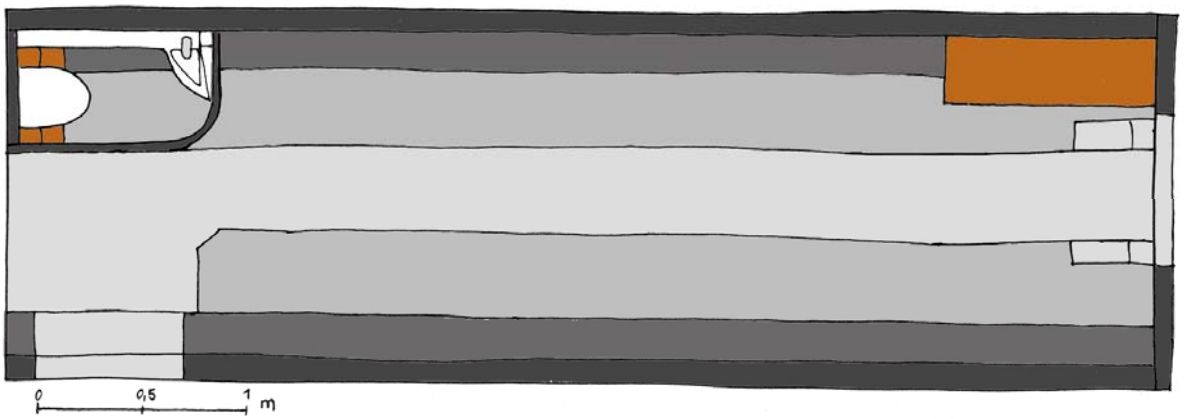


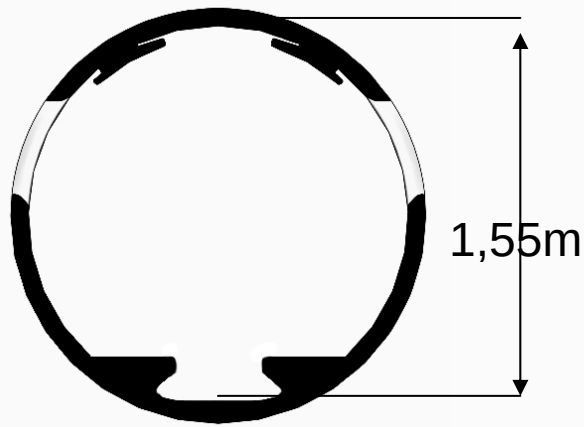




Result – Fixed interior

- Empty plane



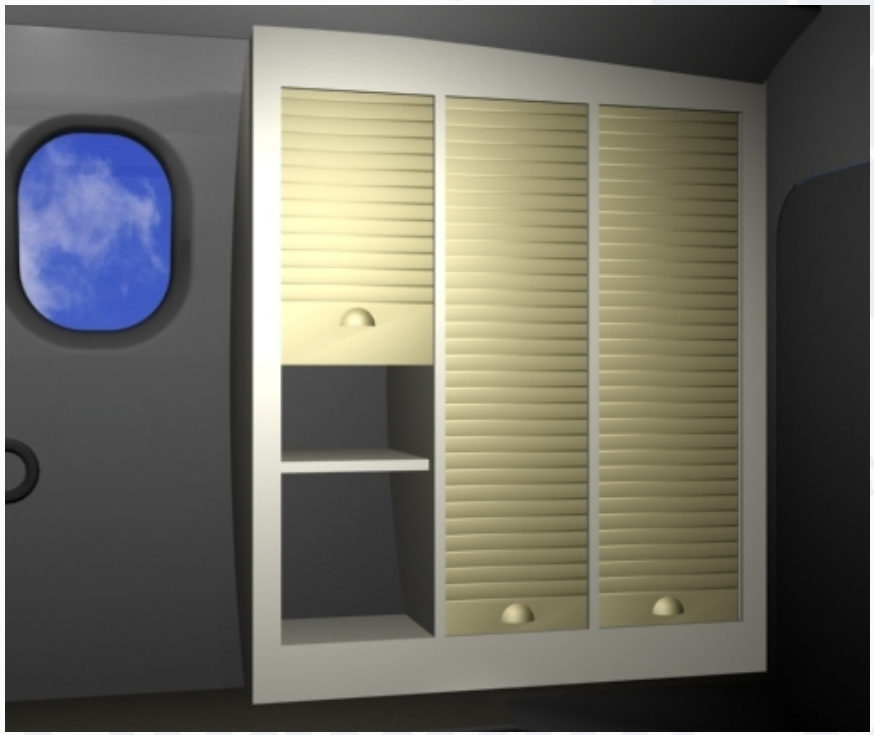


5,5m

Result – Fixed interior

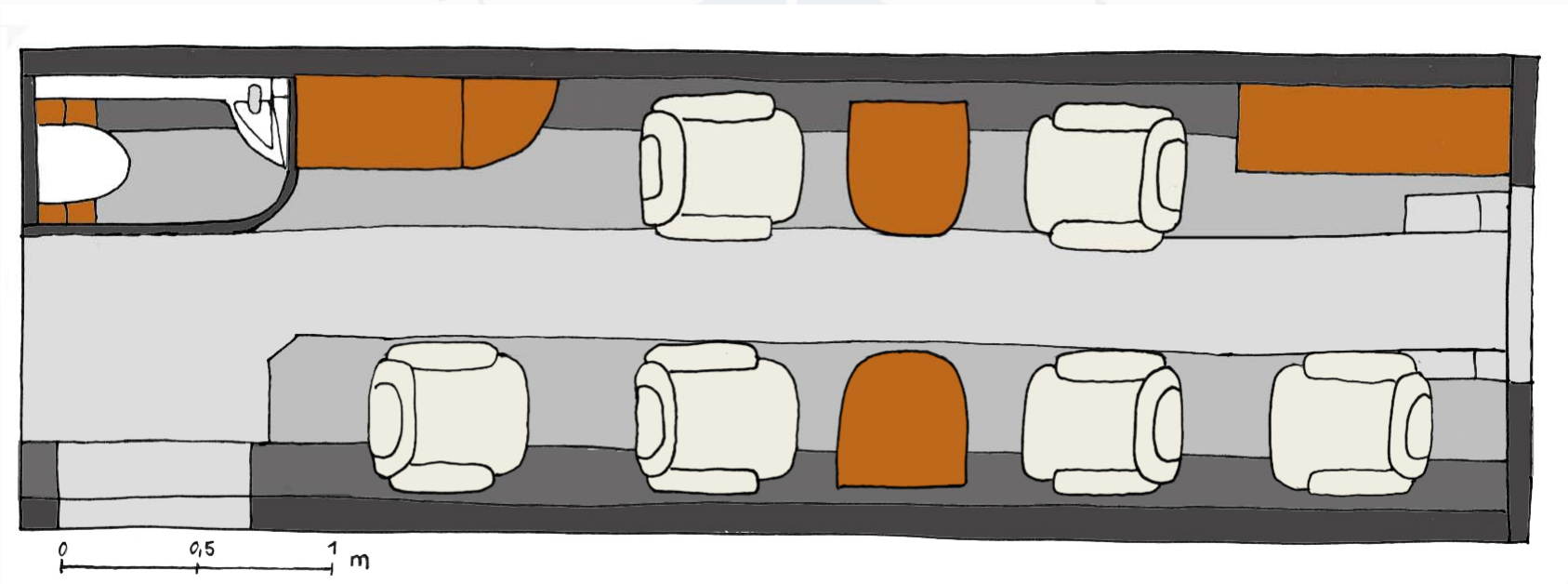
Result – Fixed interior

Result – Fixed interior

- 


Result – Business Jet

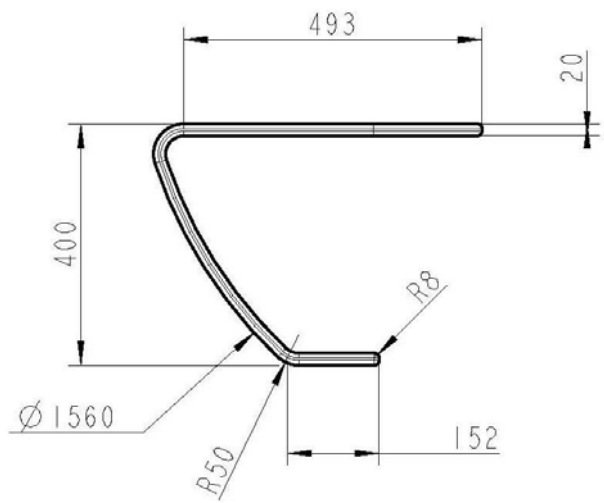
- Business Jet



Result – Business Jet

Result – Business Jet

Result – Business Jet



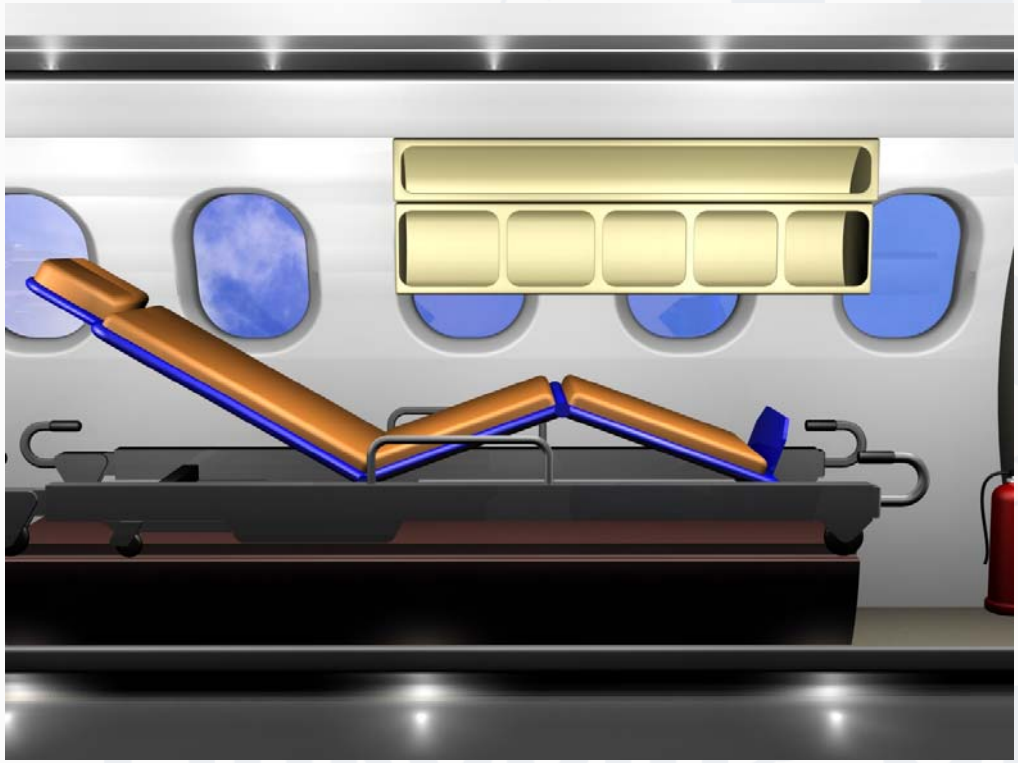
Result - Medevac

- Stretchers

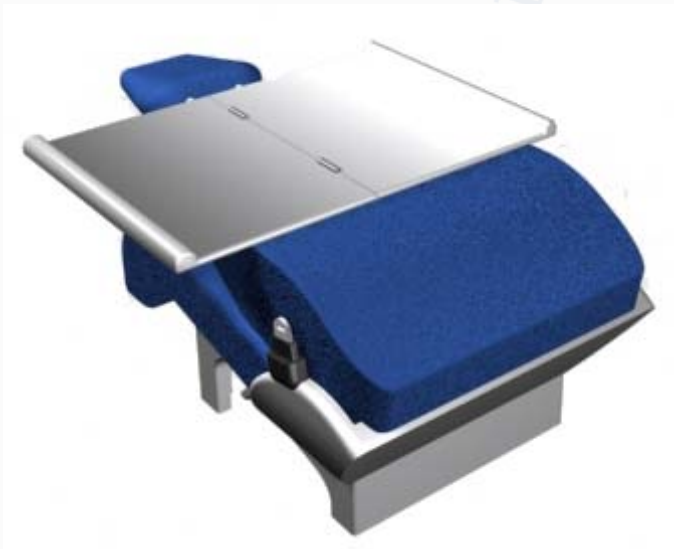
Allfa Europe

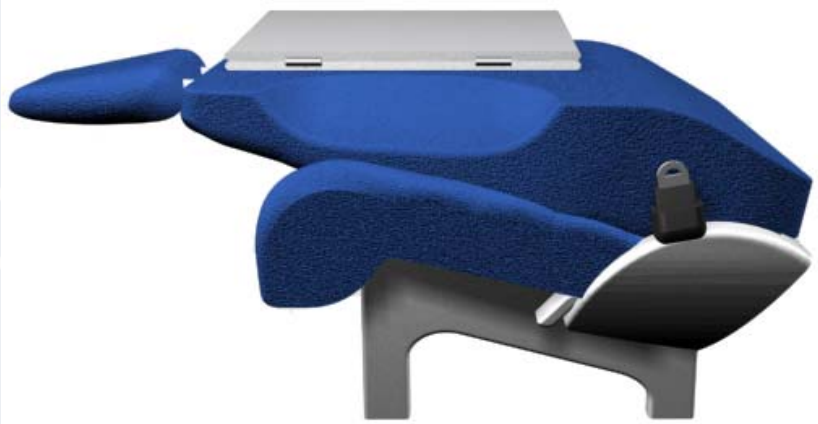
Mobile Intensive Care Unit

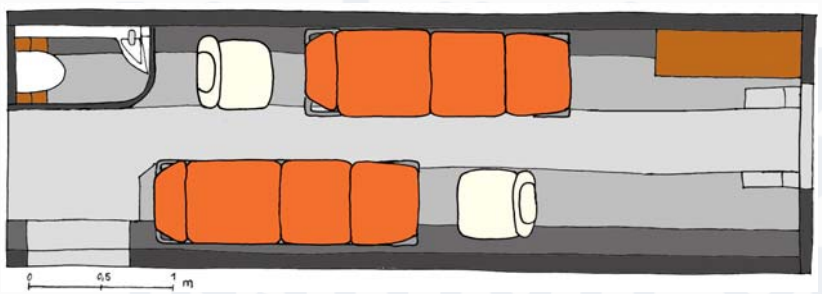
Result - Medevac



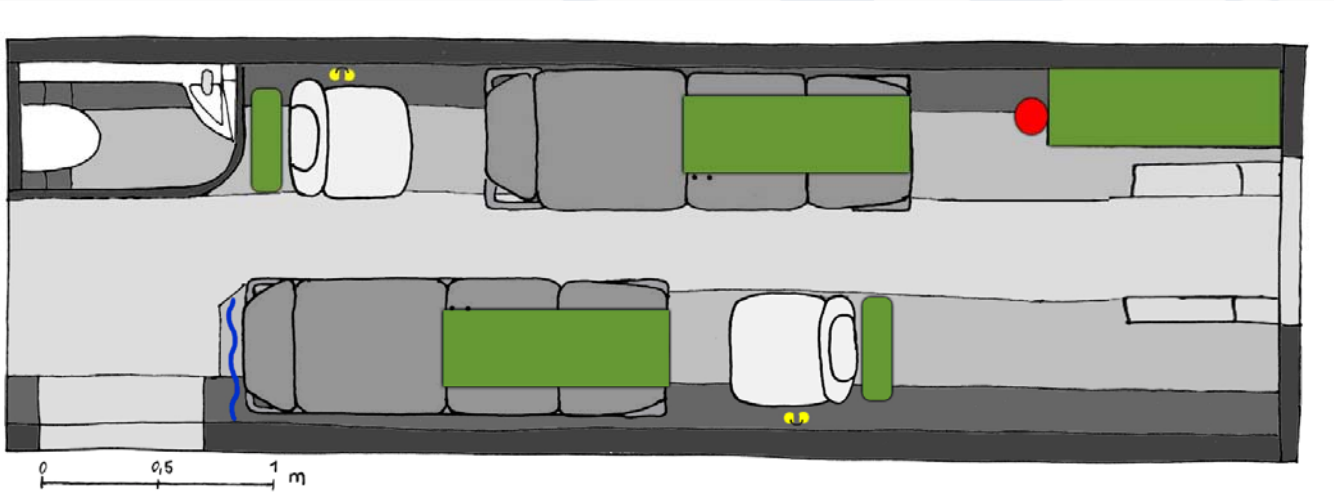
Result - Medevac

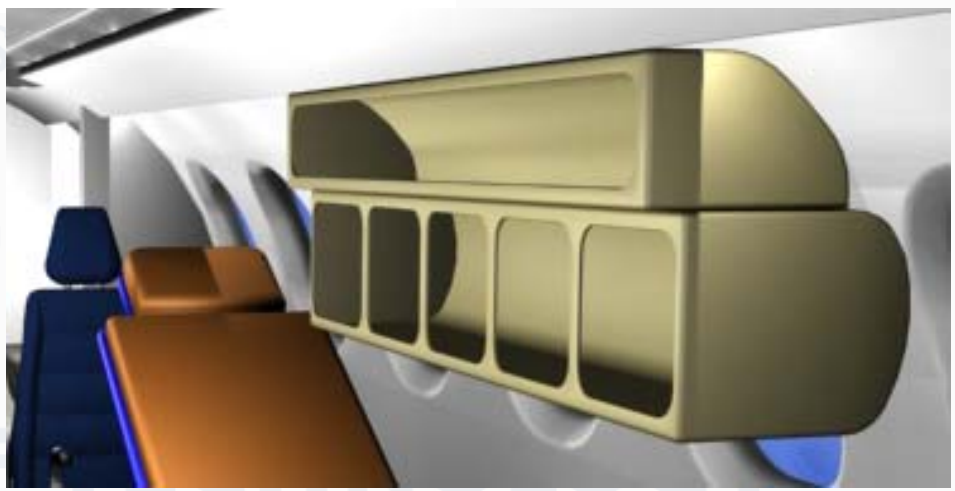






Result - Medevac





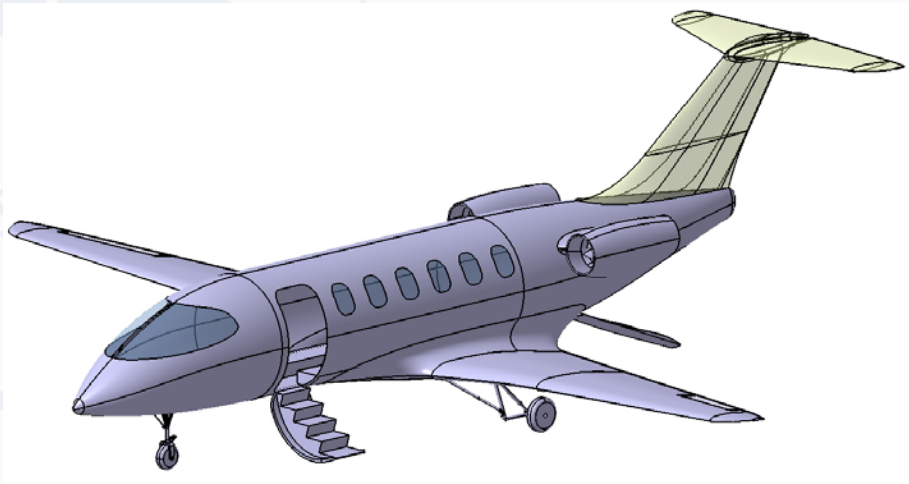
Dynamic Scaling

National Aeronautics and Space Administration

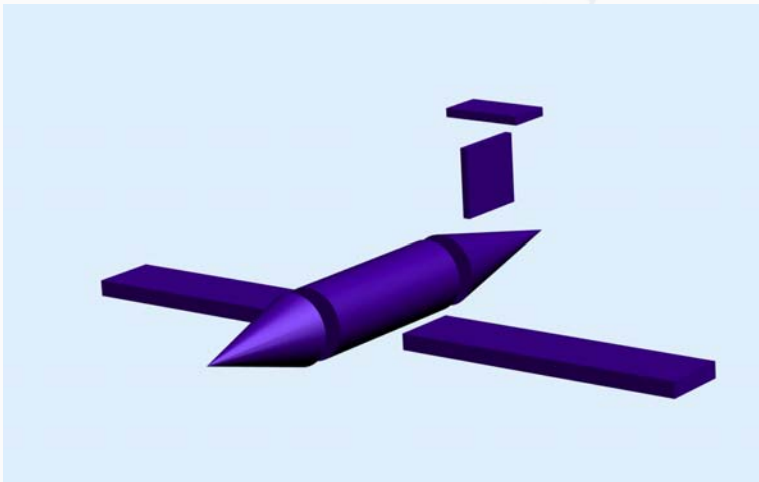
Froude-scaling acounts for gravitational-, and inertial effects:

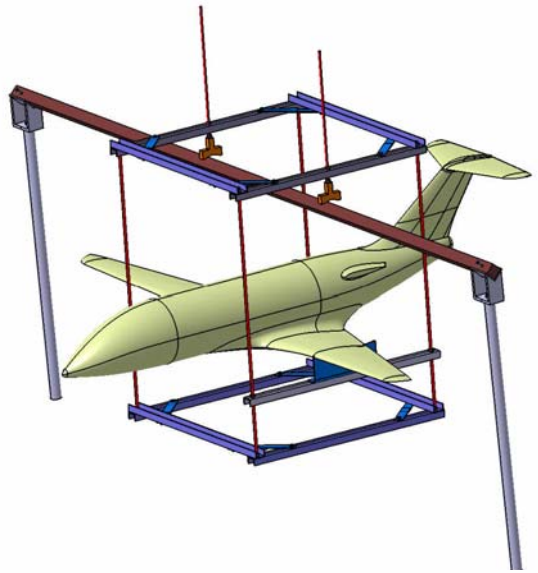
Response according to scale

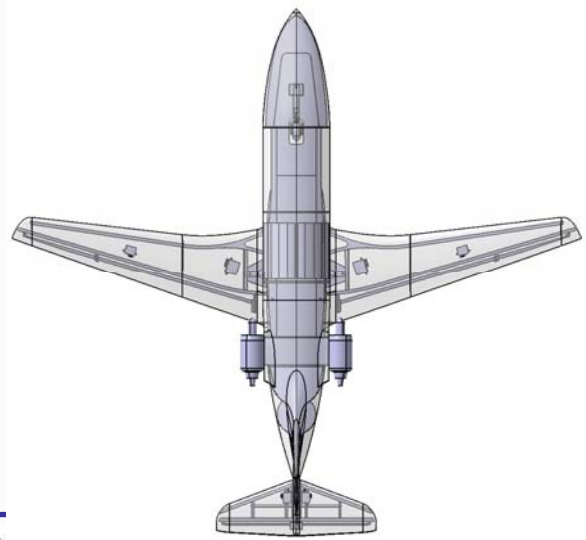
- *Velocities*
- *Forces*
- *Angular rates, etc…*

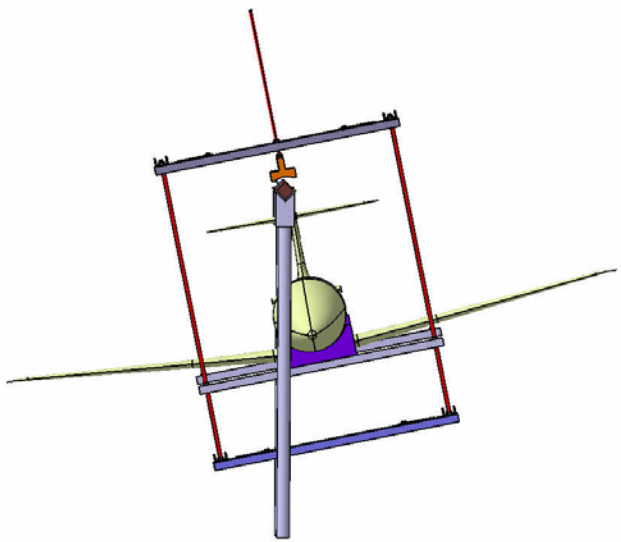


Inertia determination







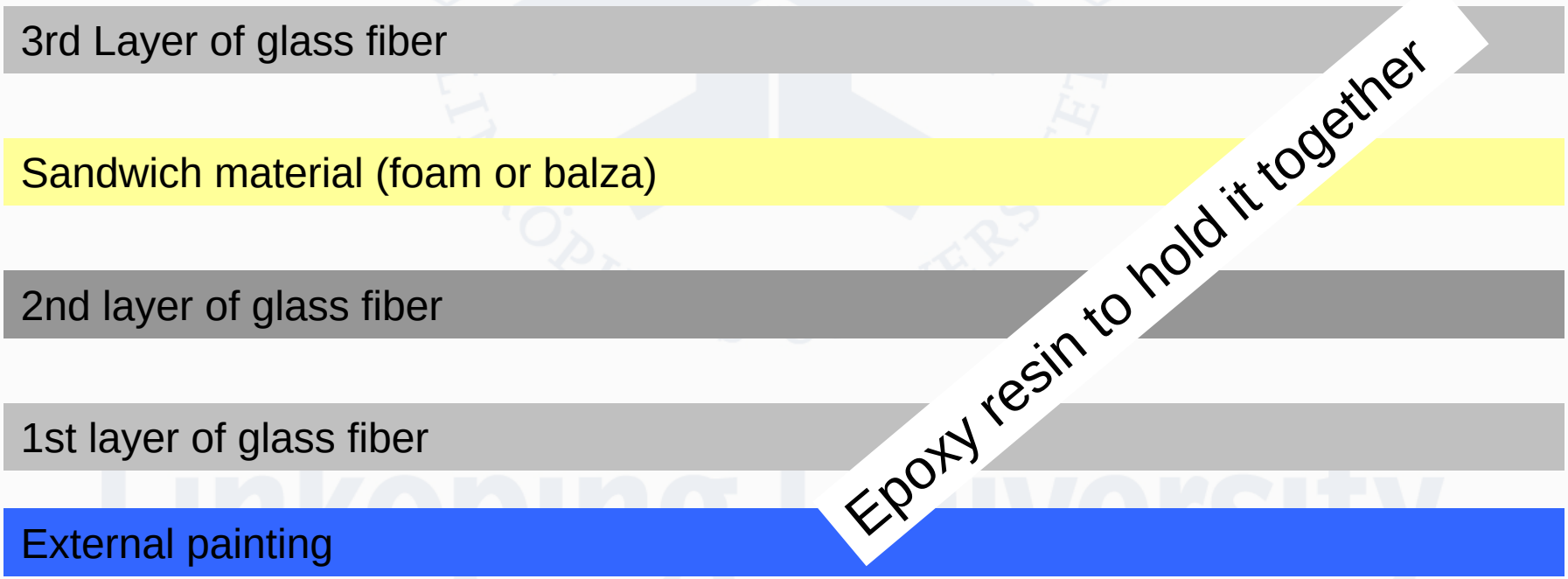


Car top testing

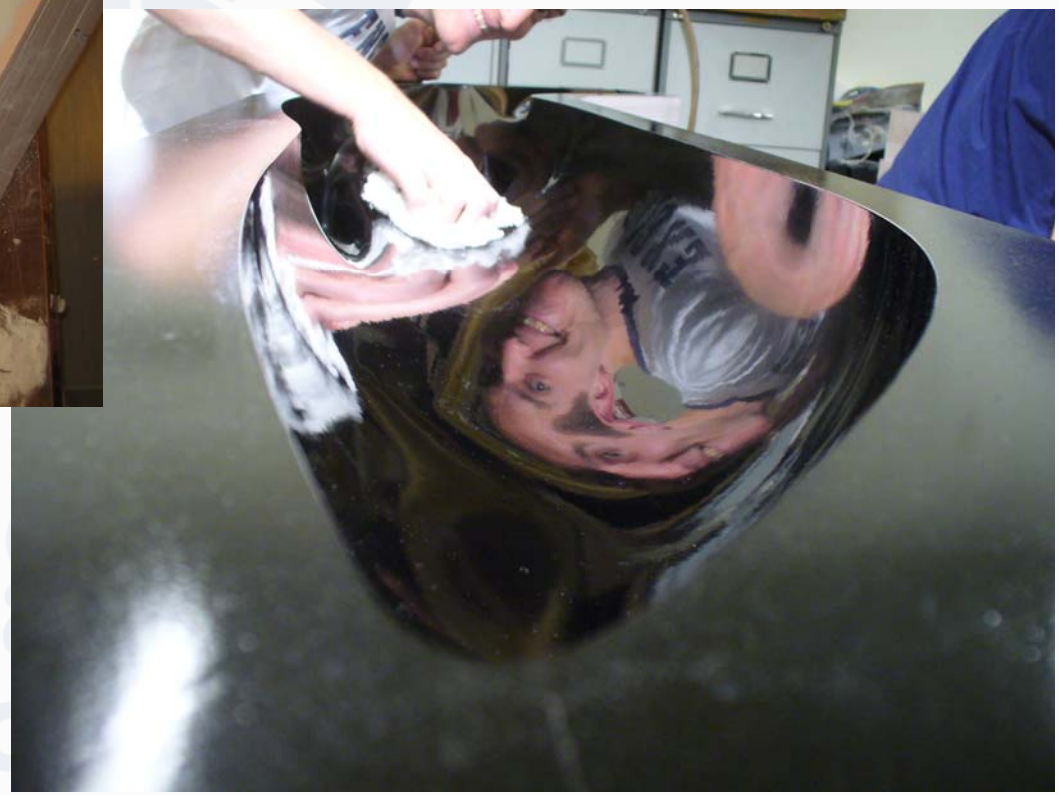
Propulsion

Engine testing

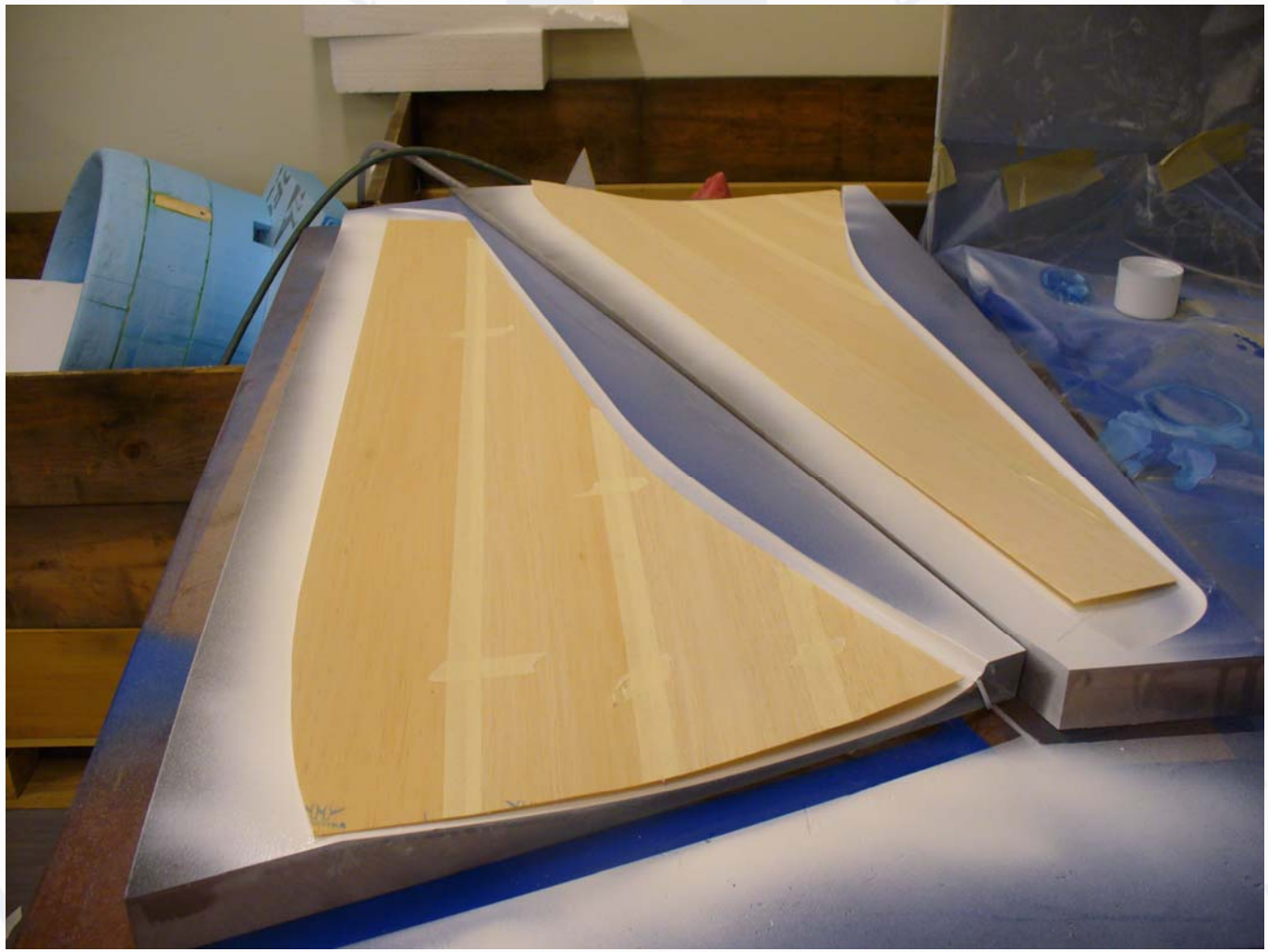
Sandwich technology :



Mold Preparation



Wing manufacturing

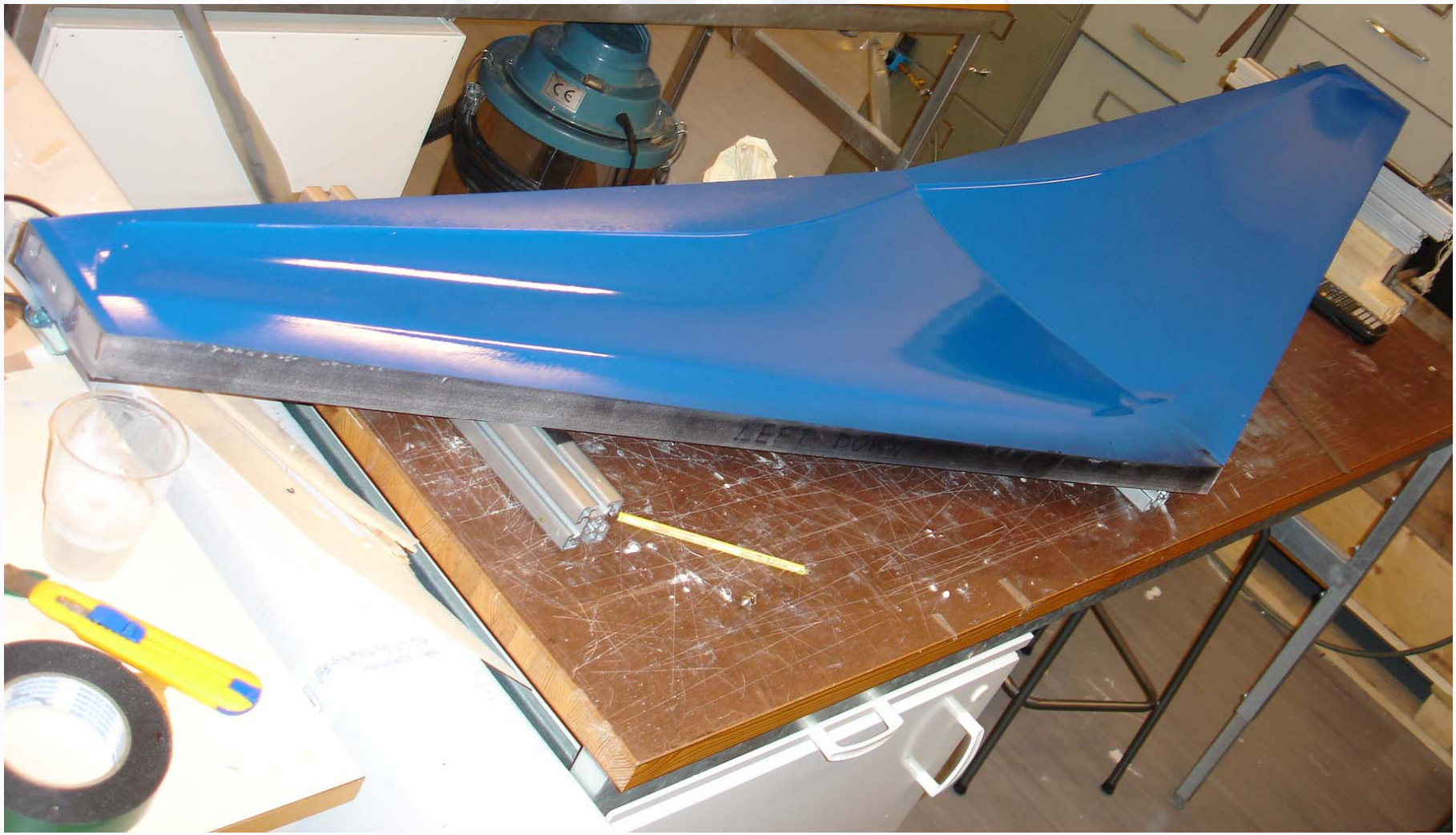


Manufacturing

Manufacturing

Manufacturing

Manufacturing



Curent Status

- Wing Finish Now...
- Systems instalation and testing need to be completed
- First flight end of June

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Conclusion