

MANTA

From conceptual design to flight test

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Linköping University

Education structure

3rd year

Aircraft and
Vehicle Design

Aerodynamics

4th year

Flight Mechanics

Structure and
Systems

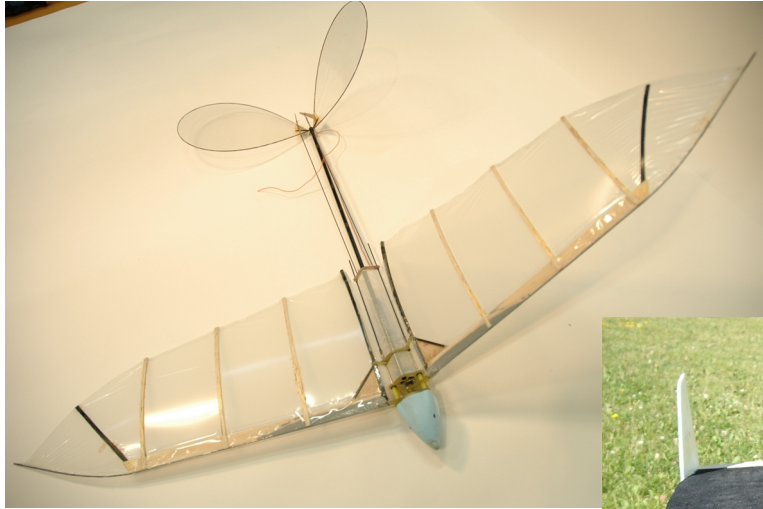
Aircraft
Conceptual
Design

Aircraft Project
Course

Aircraft Project

2004-2005

Student projects



THE TEAM 2005



Project
supervisors



Course Goal

- Cover several aspect of Aircraft design
 - Conceptual design
 - Preliminary design
 - Detail design
 - Manufacturing
 - Flight Simulation
 - Flight test
- Project related to related to current research at the university
- Team work and project management

Project Specification

- The mother ship shall have the following basic characteristics:
- Radio controlled
- Propulsion based on Wemotec HW750 fan and Plattenberg HP 370/30/A2S engine
- Designed to minimum weight
- To be housed within a maximum transport volume of: 1*1.7*0.8 m
- Endurance: 15min at 50% throttle
- Minimum rate of climb 3m/s
- Payload
 - Two small MAV:s of max 200g/each to be carry internally/partly submerged in the fuselage/wing
 - 400g extra payload in excess of the above
- Each MAV shall have the following basic characteristics:
 - Radio controlled
 - Payload of 11g (a camera)

Student's Goals

- Design 3 a/c
- Build them
- Successfully test fly
- (verify calculated performance and properties)
- Write a report

Timeline

19/01/2005 Start of the project

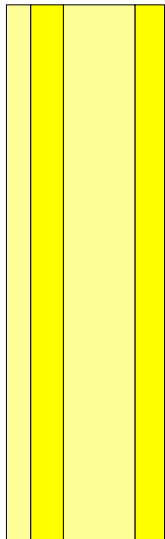
11/02/2005 Conceptual design presentation

11/03/2005 Complete drawing set for mold manufacturing

Building period

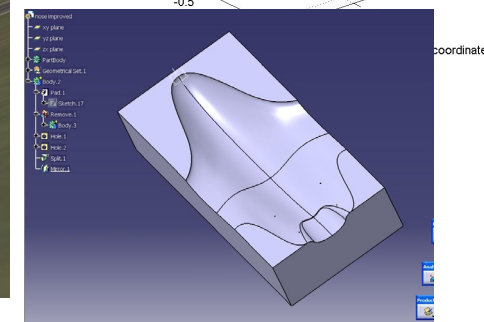
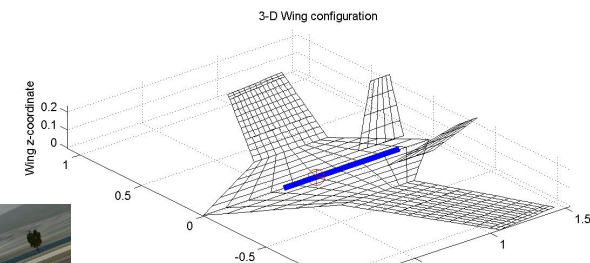
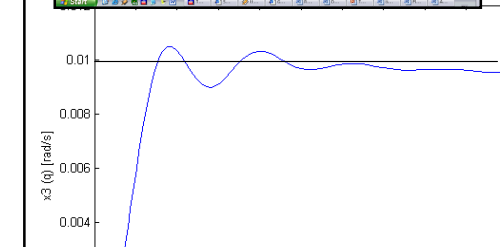
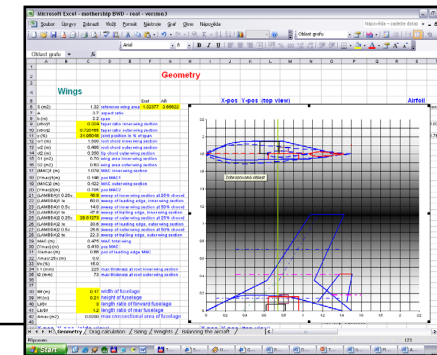
13/05/2005 First flight

10/06/2005 Final report

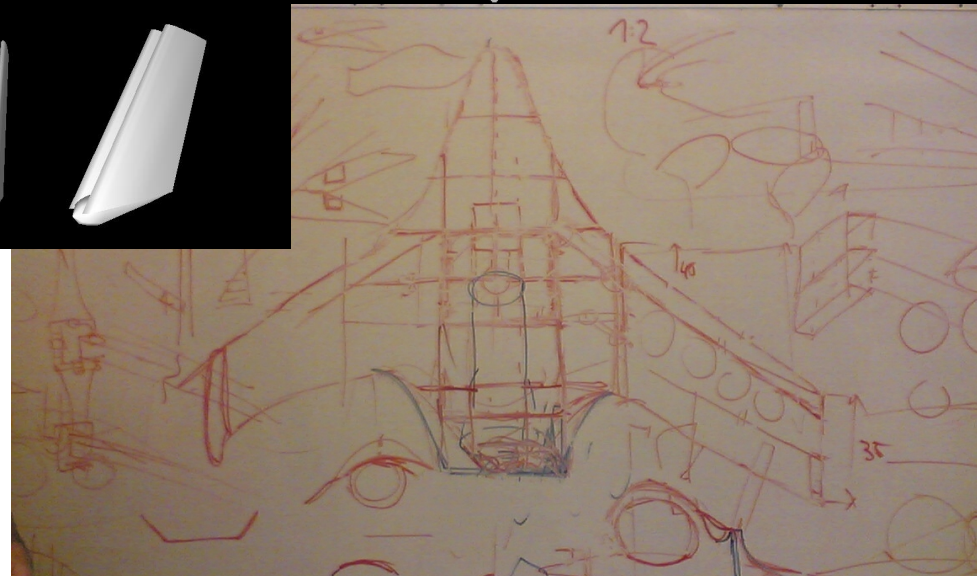
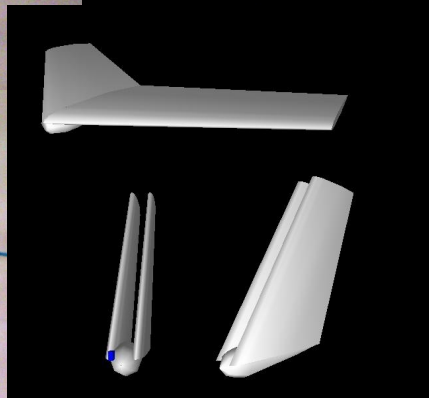
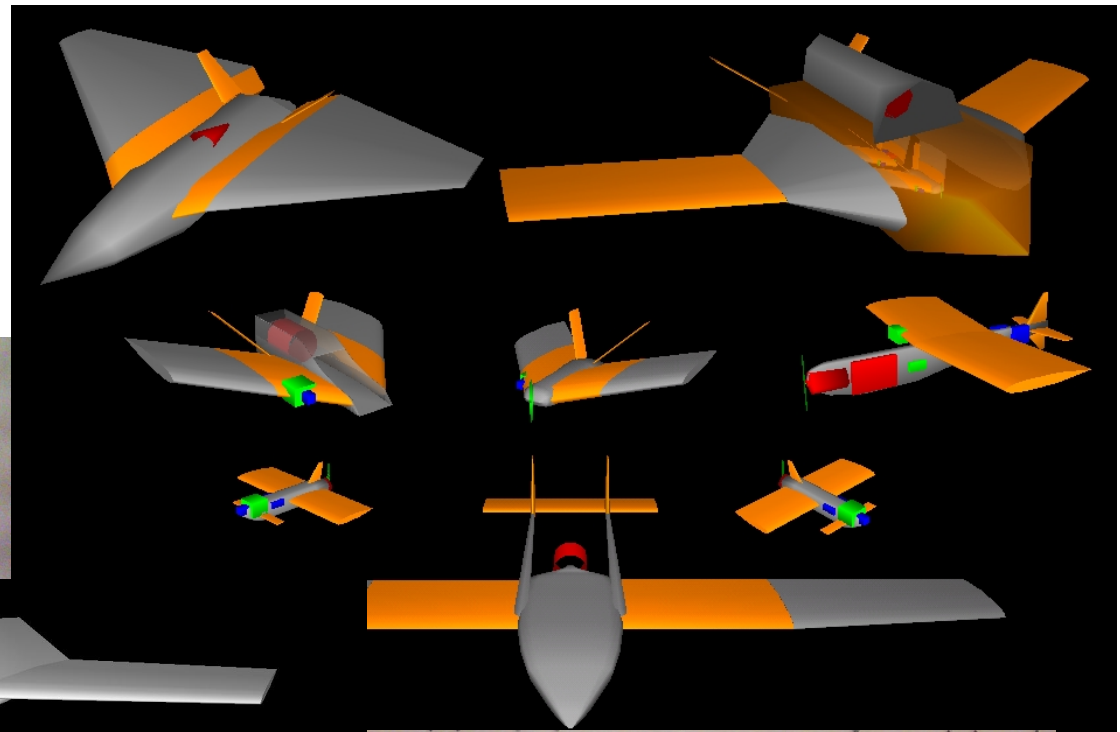
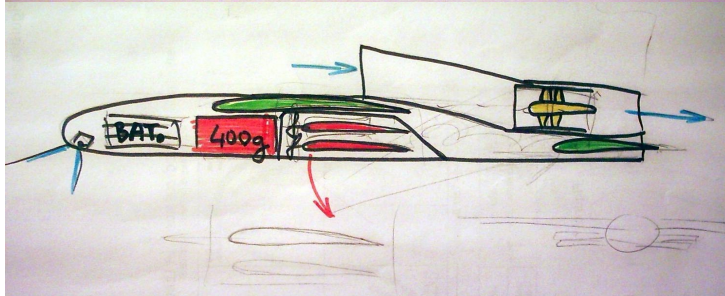
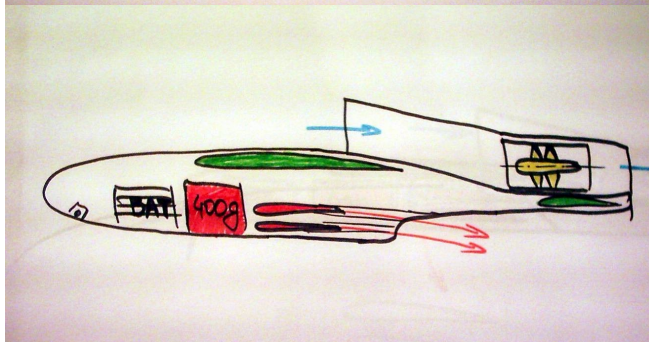
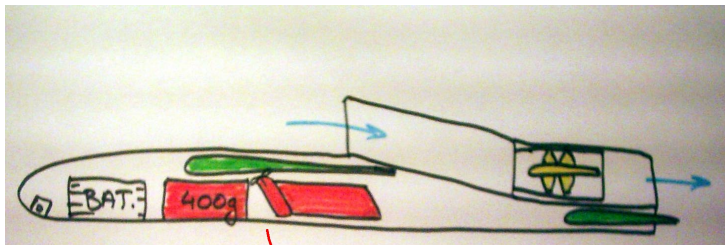
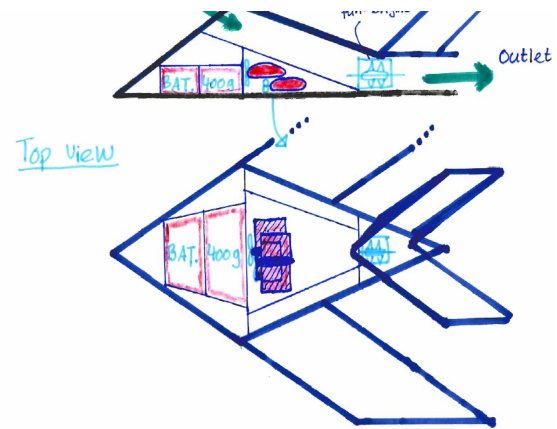


Tools

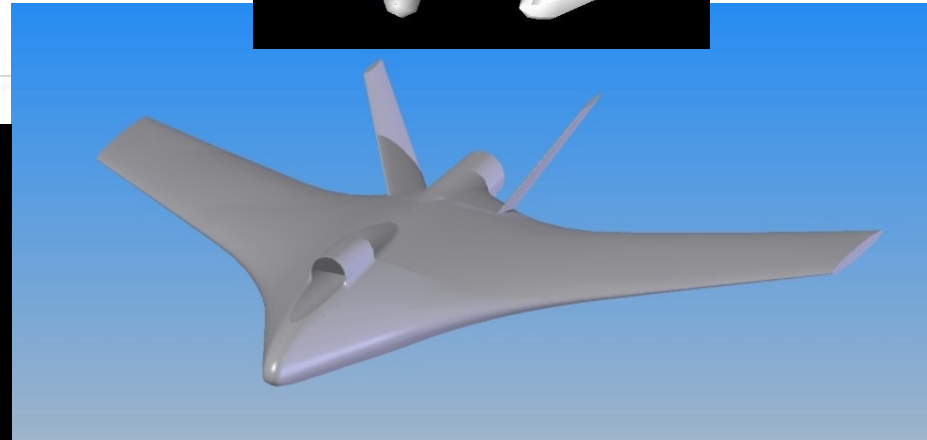
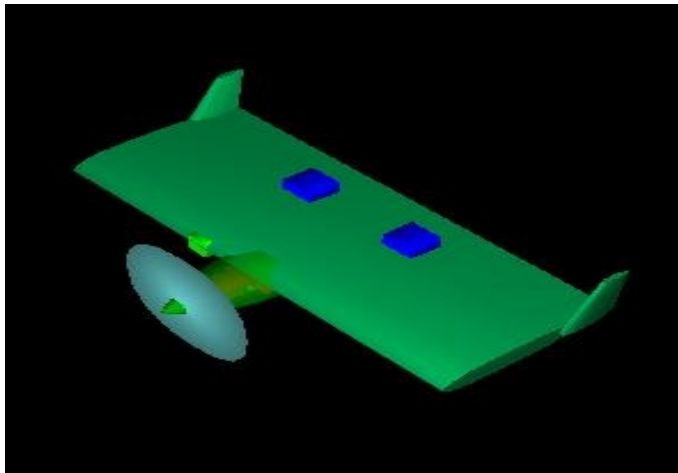
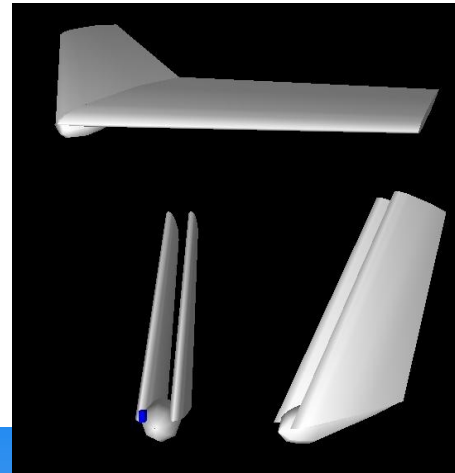
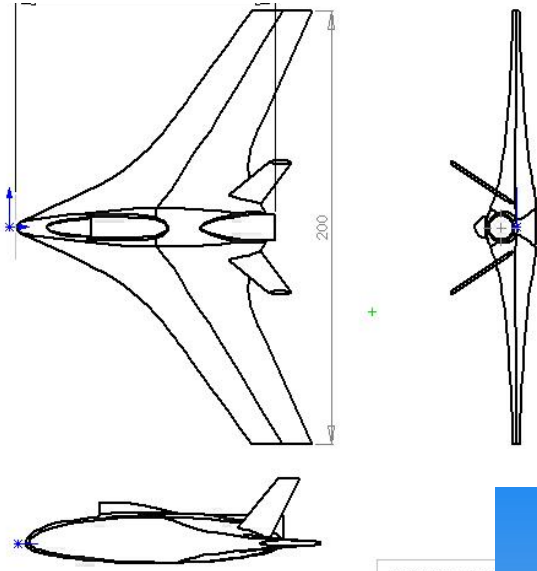
- Sizing Program in excel
- Matlab
 - Aerodynamics (Tornado from KTH)
 - Flight Mechanics
- Catia V5
- Flight Gear



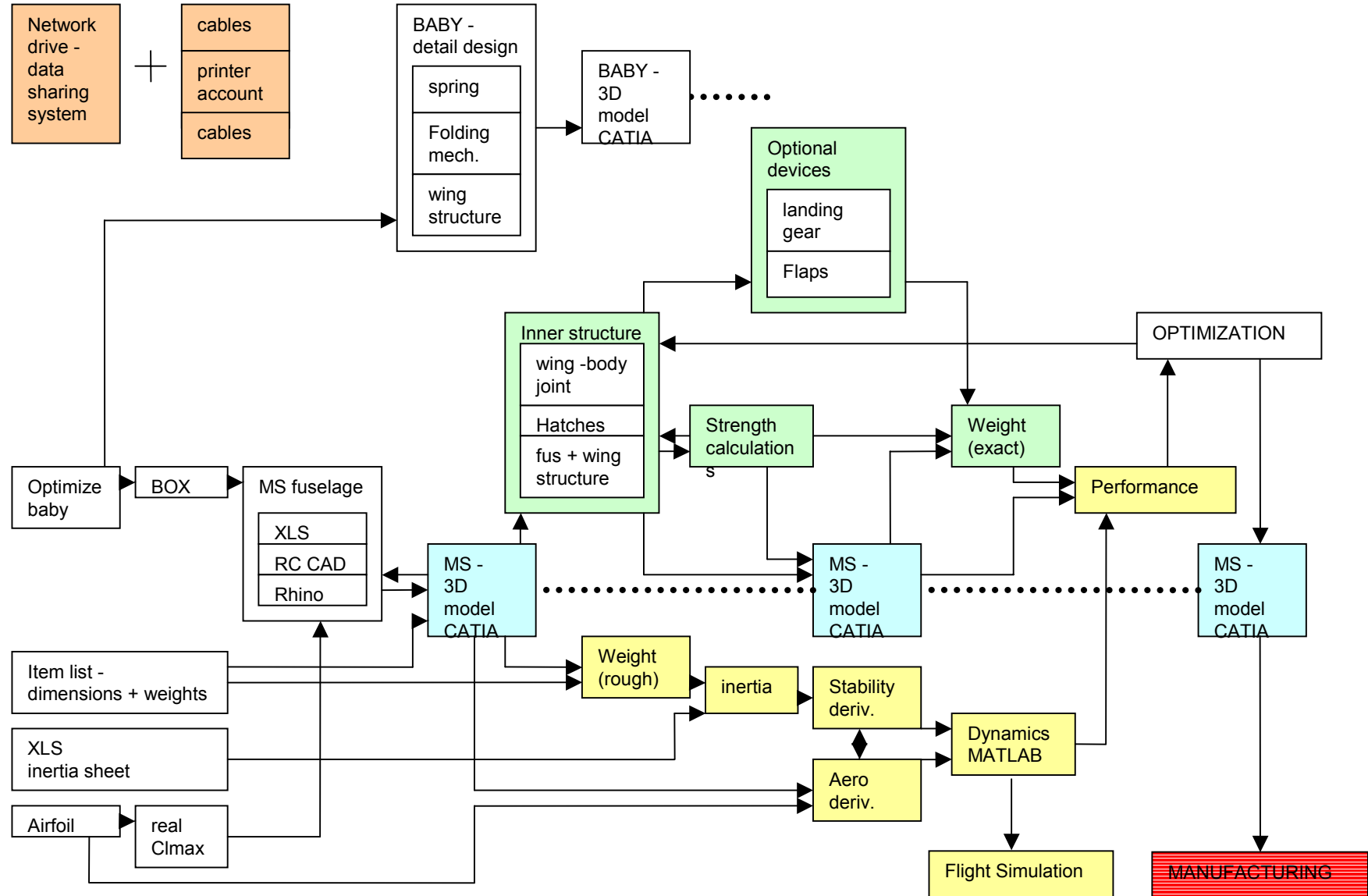
Conceptual Design



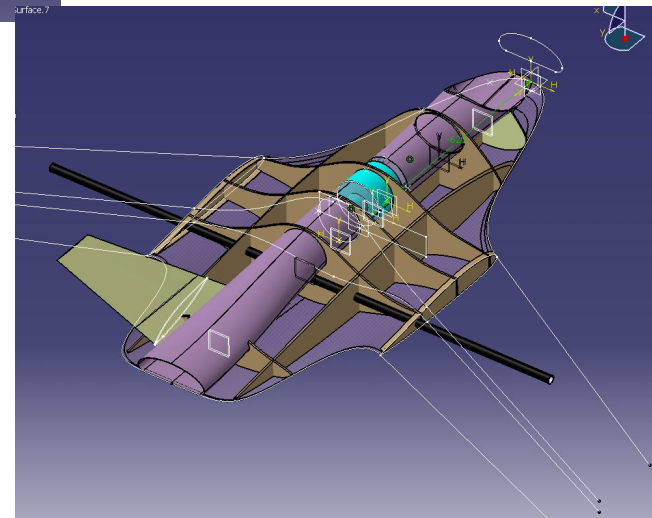
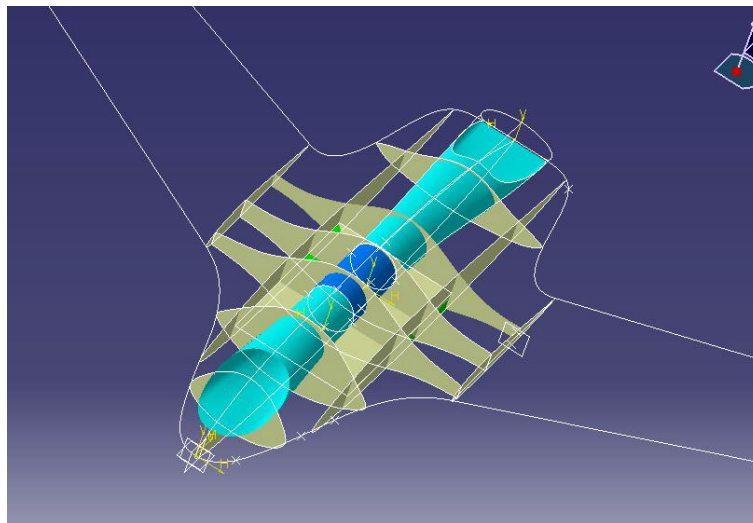
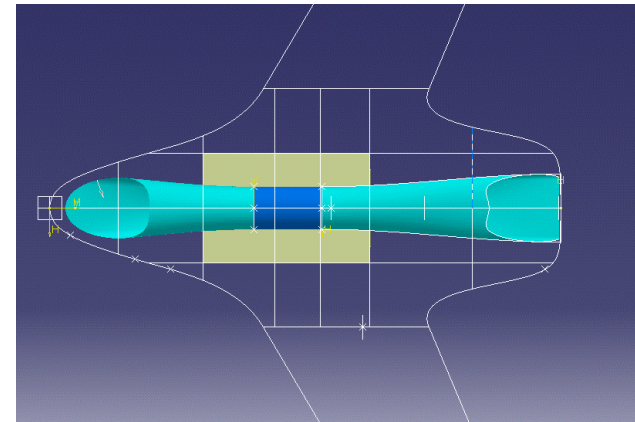
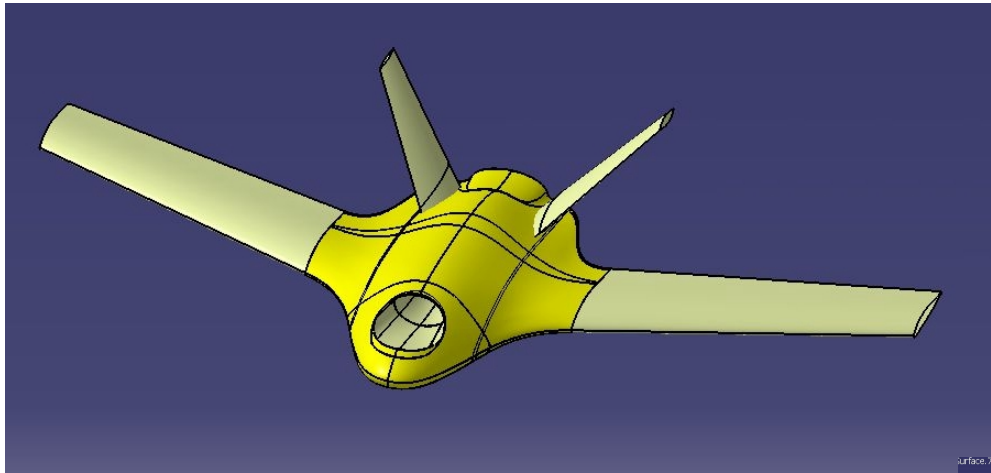
Chosen concepts



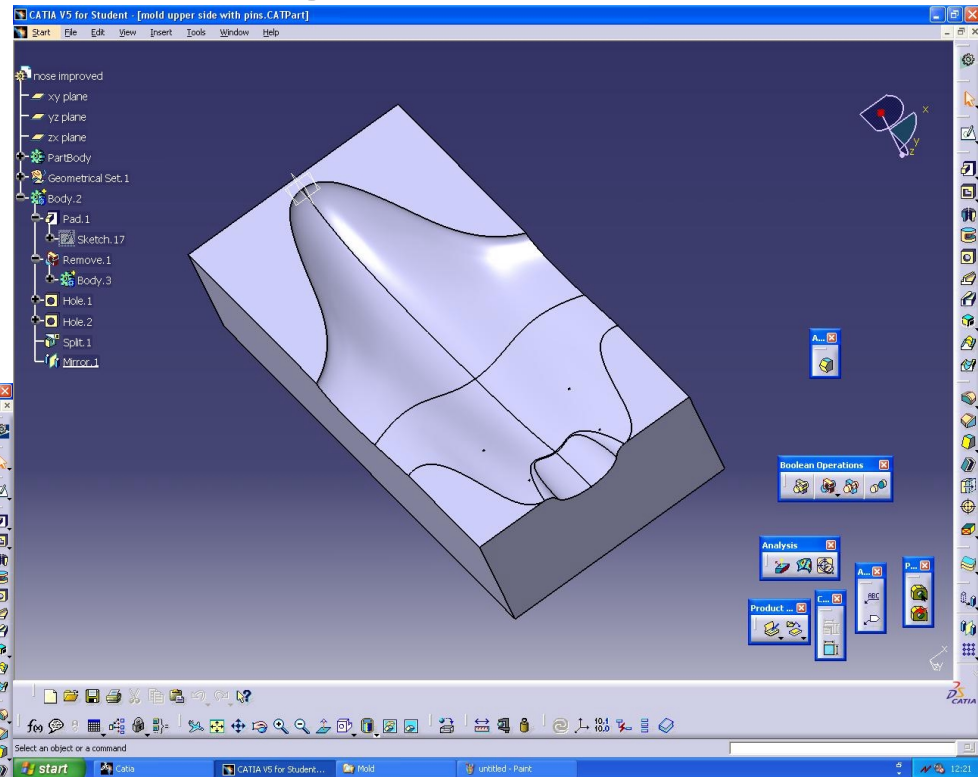
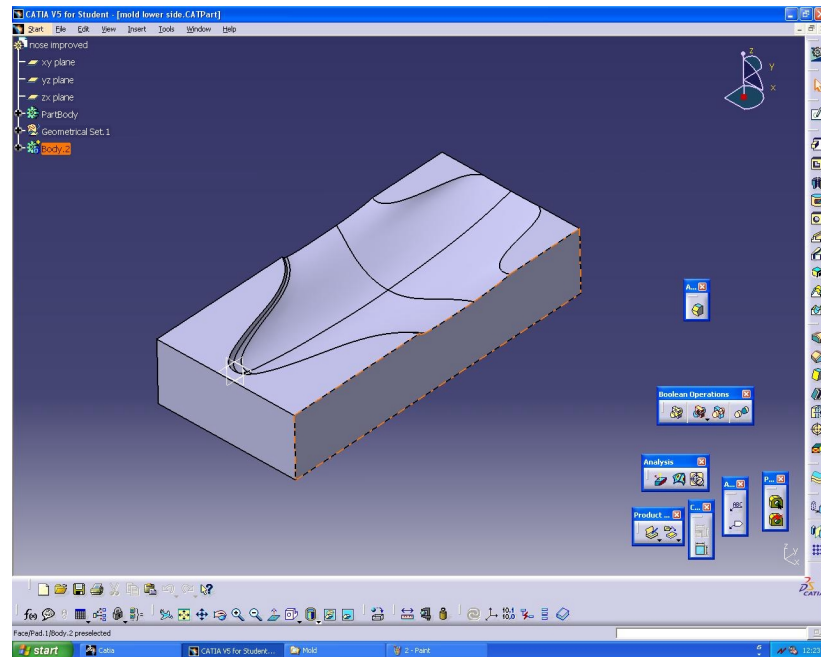
Detail design



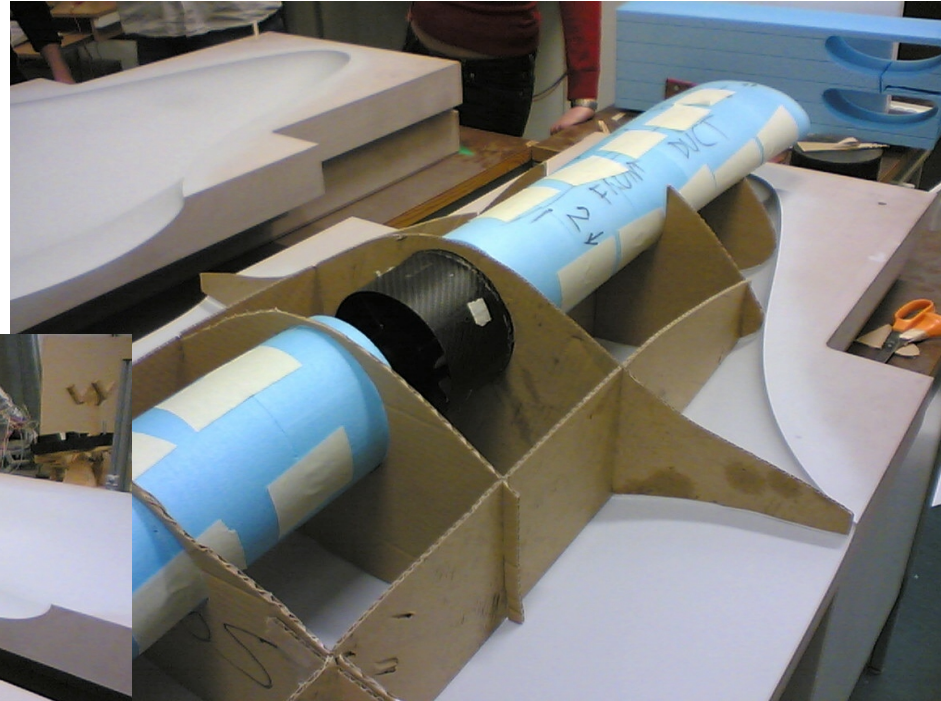
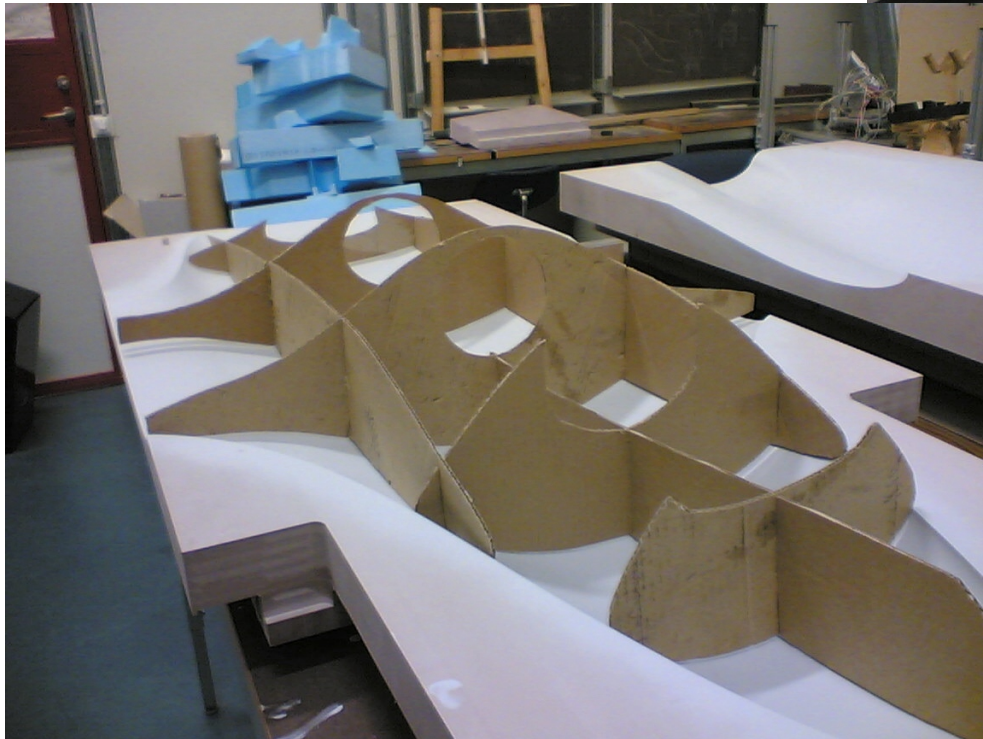
Detail design



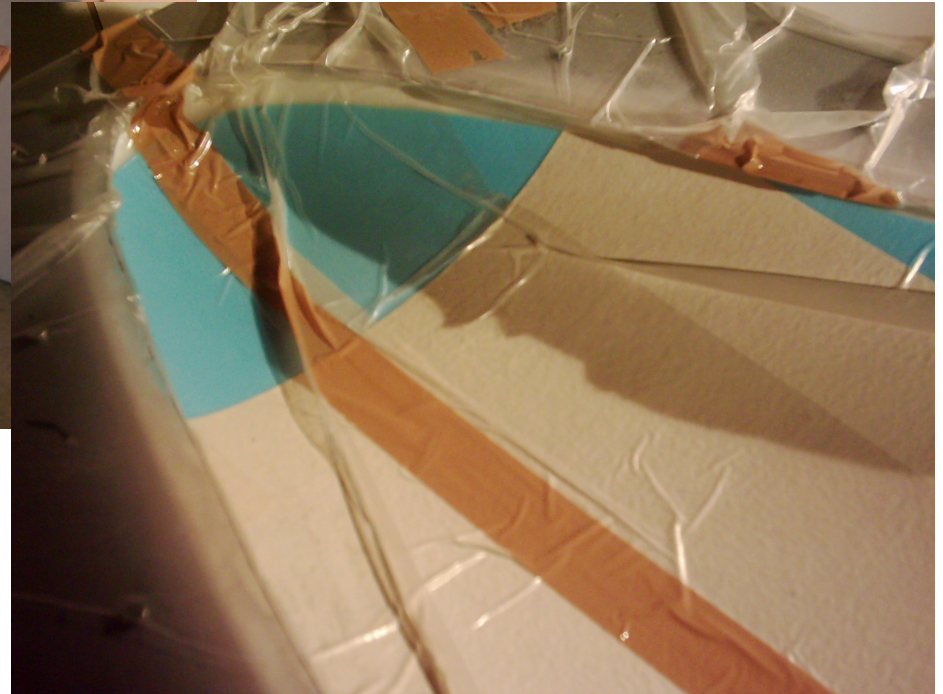
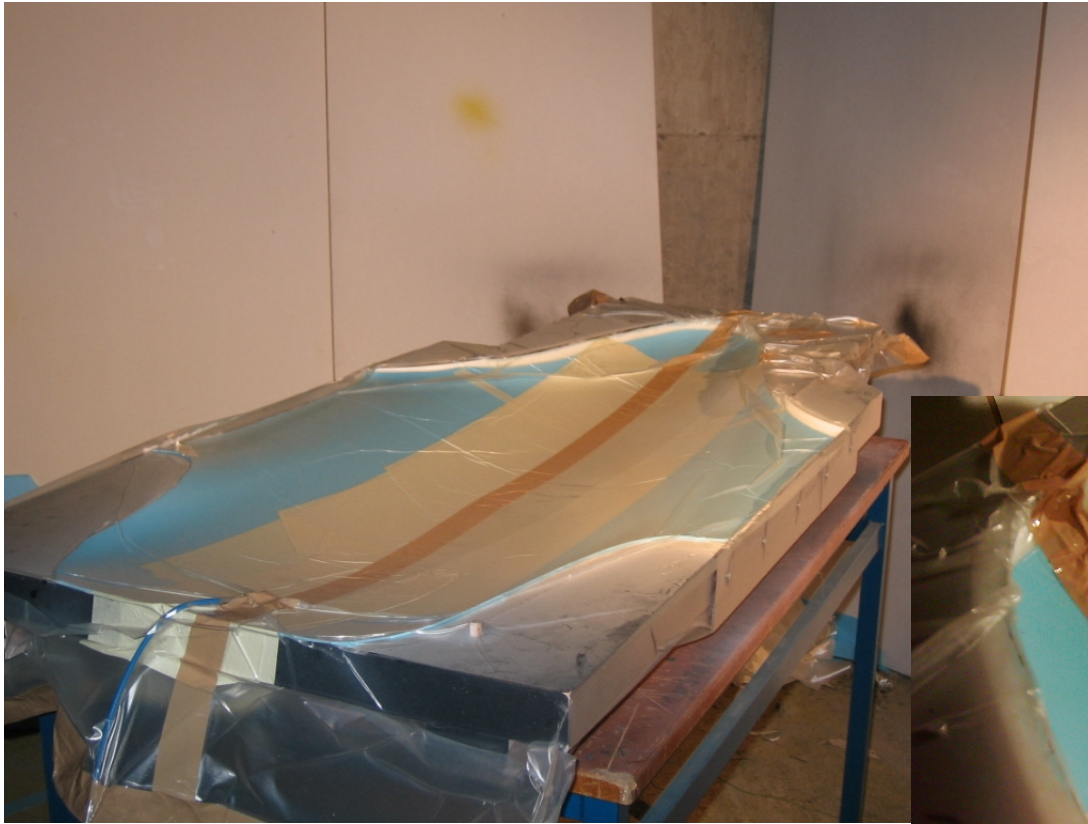
Detail design



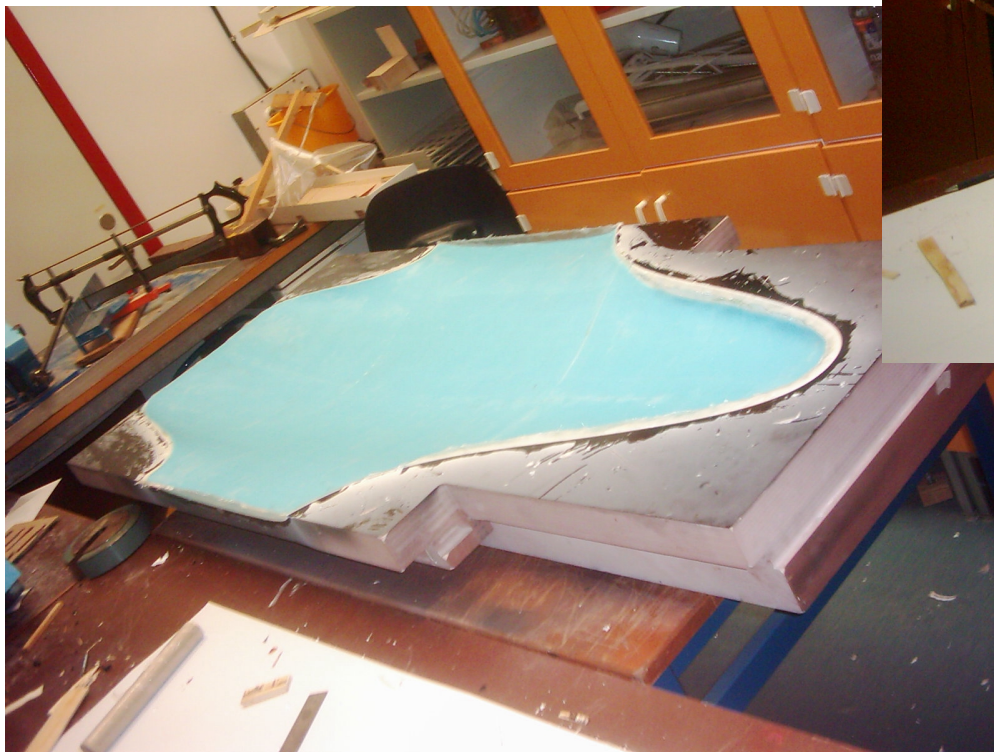
Manufacturing



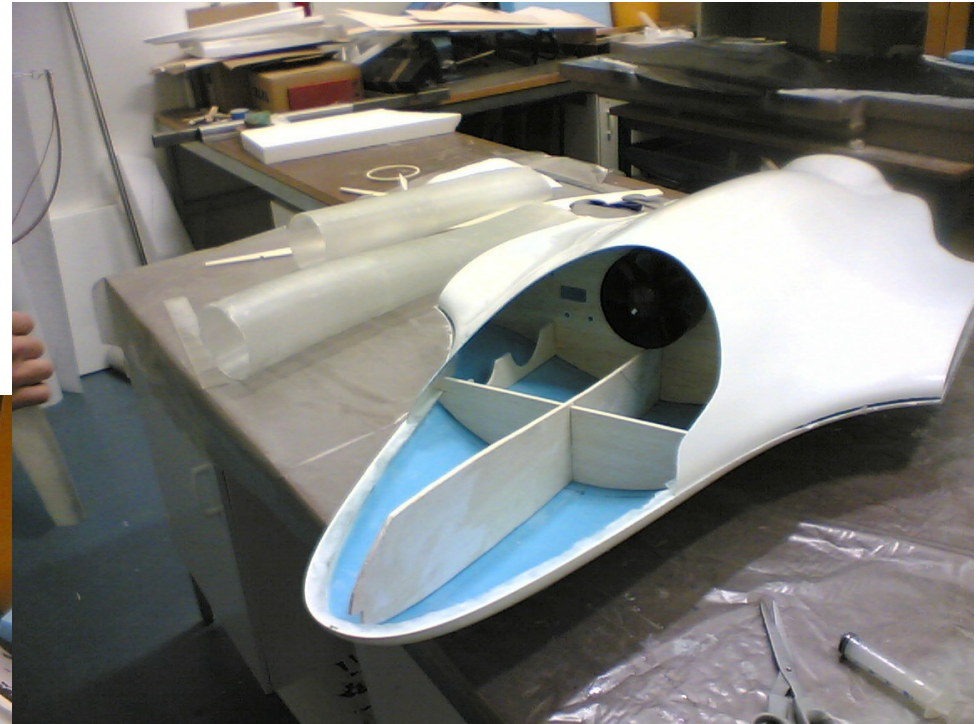
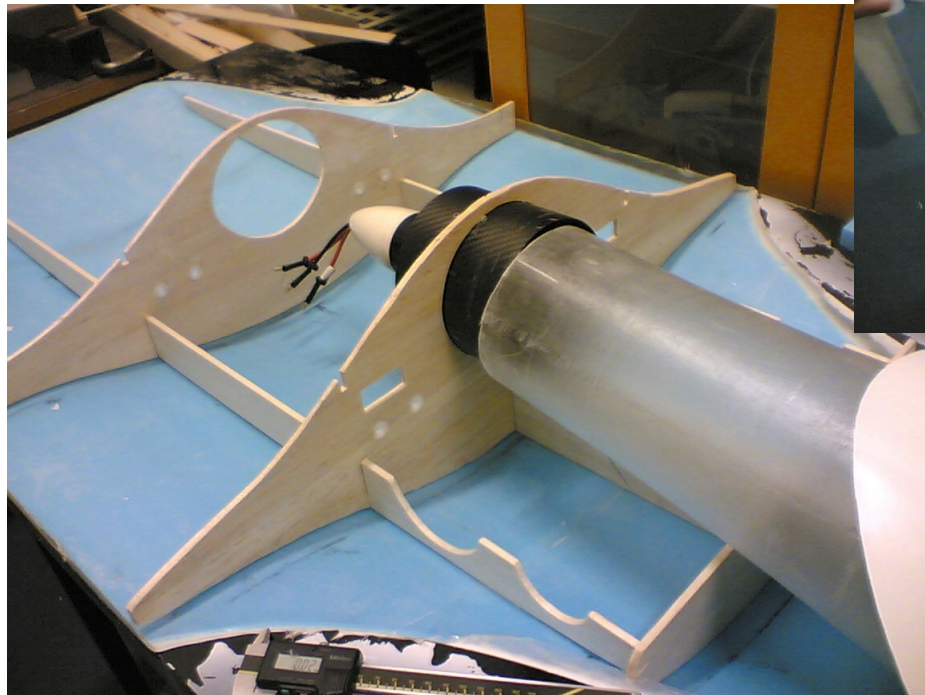
Manufacturing



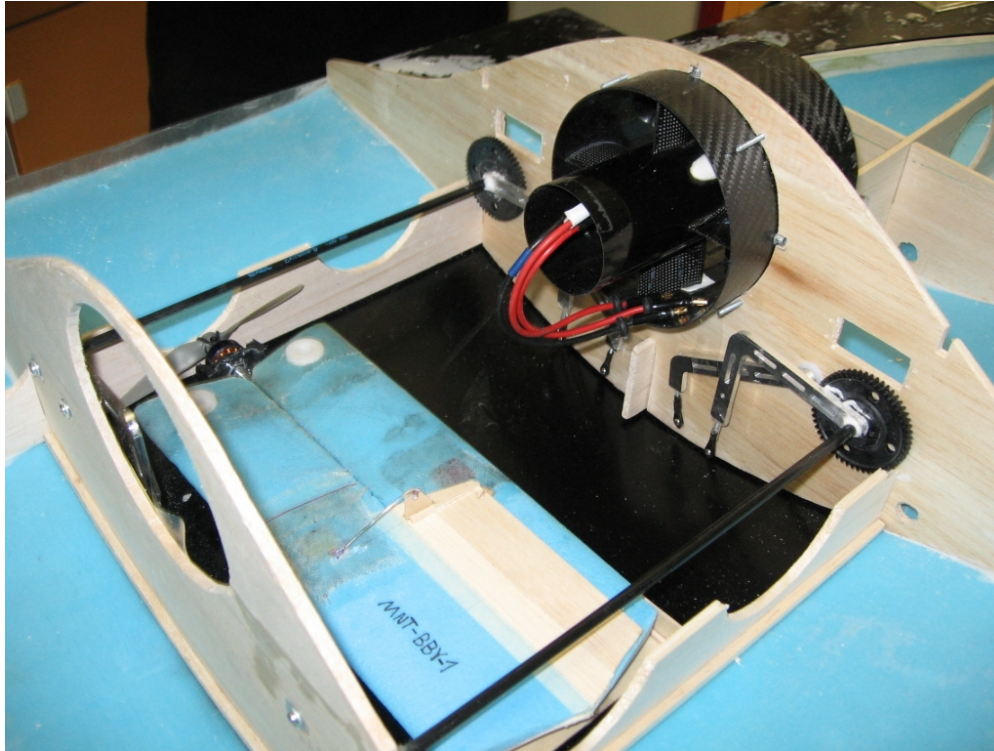
Manufacturing

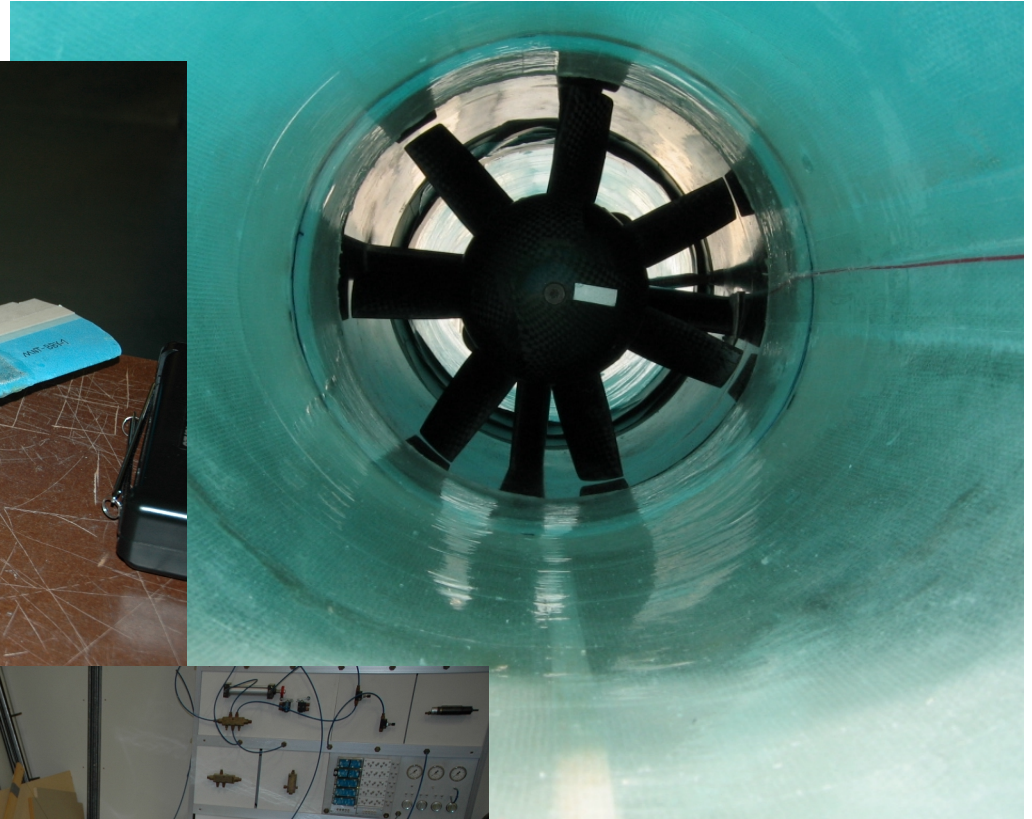
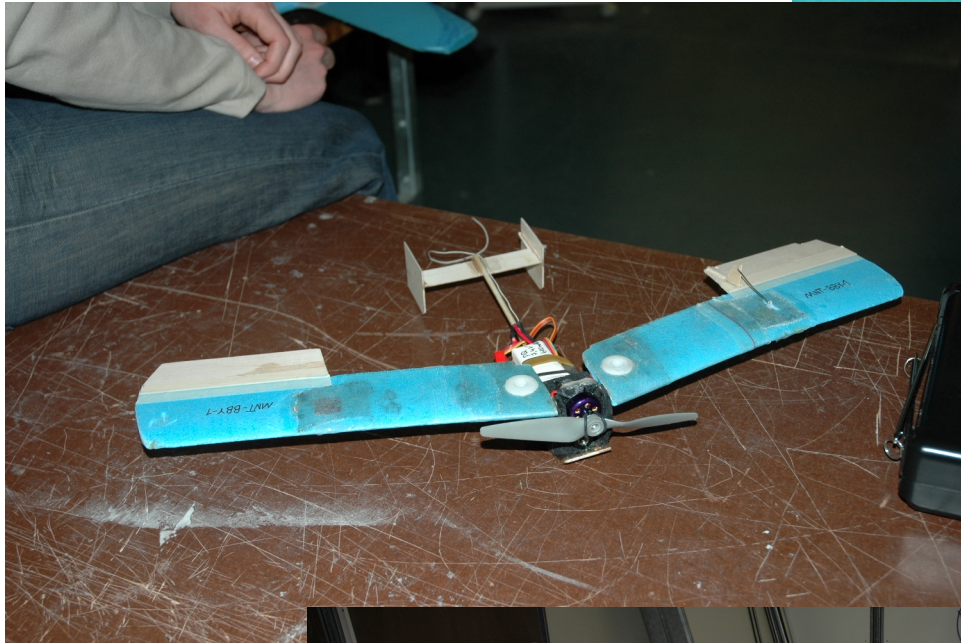


Manufacturing

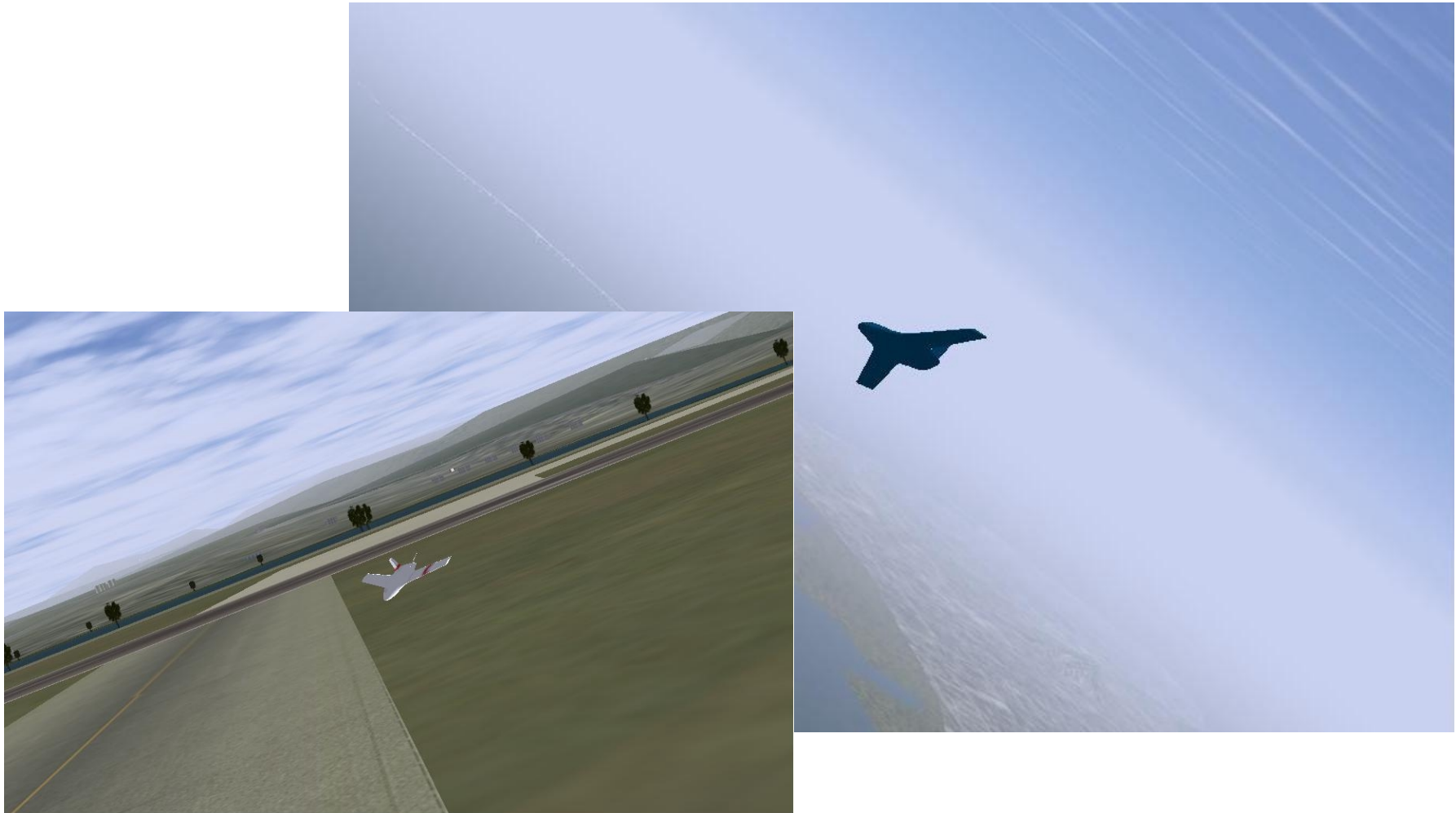


Manufacturing





Flight simulation



Flight test



Conclusion

- Full aircraft design from start to flight
- This course binds up the other courses and allows the students to apply their knowledge on a real project
- Introduce the student to international team work and project management

Conclusion from the students

- You apply your knowledge
 - You work in team
 - You have deadlines
 - You should achieve your goal
 - You learn from the others
 - You teach them
-
- You get support from your teachers

What's next?

- Include flight control system simulation
- Flight control implementation for flight simulation
- Instrumentation of future project to close the design loop
- International network, EUROMIND
- Collaboration with other institutes, cross-boarder project.

What's next?



Research areas

- The use of water tunnel models in conceptual design and high angle of attack
- Coupling between conceptual design program and CATIA (under development)
- Micro UAV development (with Witas)
- Ornithopter development
- Design and development of affordable demonstrators

Affordable demonstrators

- Half-scale flying model of future Saab demonstrator built by Linköping University

