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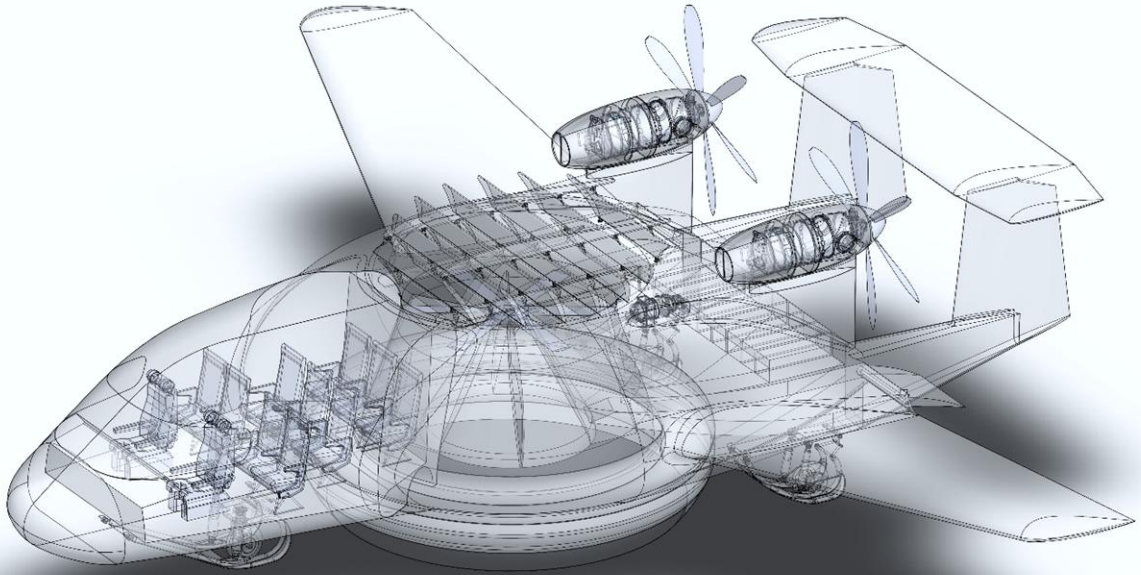


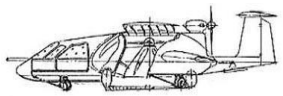
Analysis of engineering aspects of hybrid aerial vehicle - ESTOLAS

Authors:
I.Ozols, A.Urbahs, V.Bulanovs

Speaker:
Ilmars Ozols

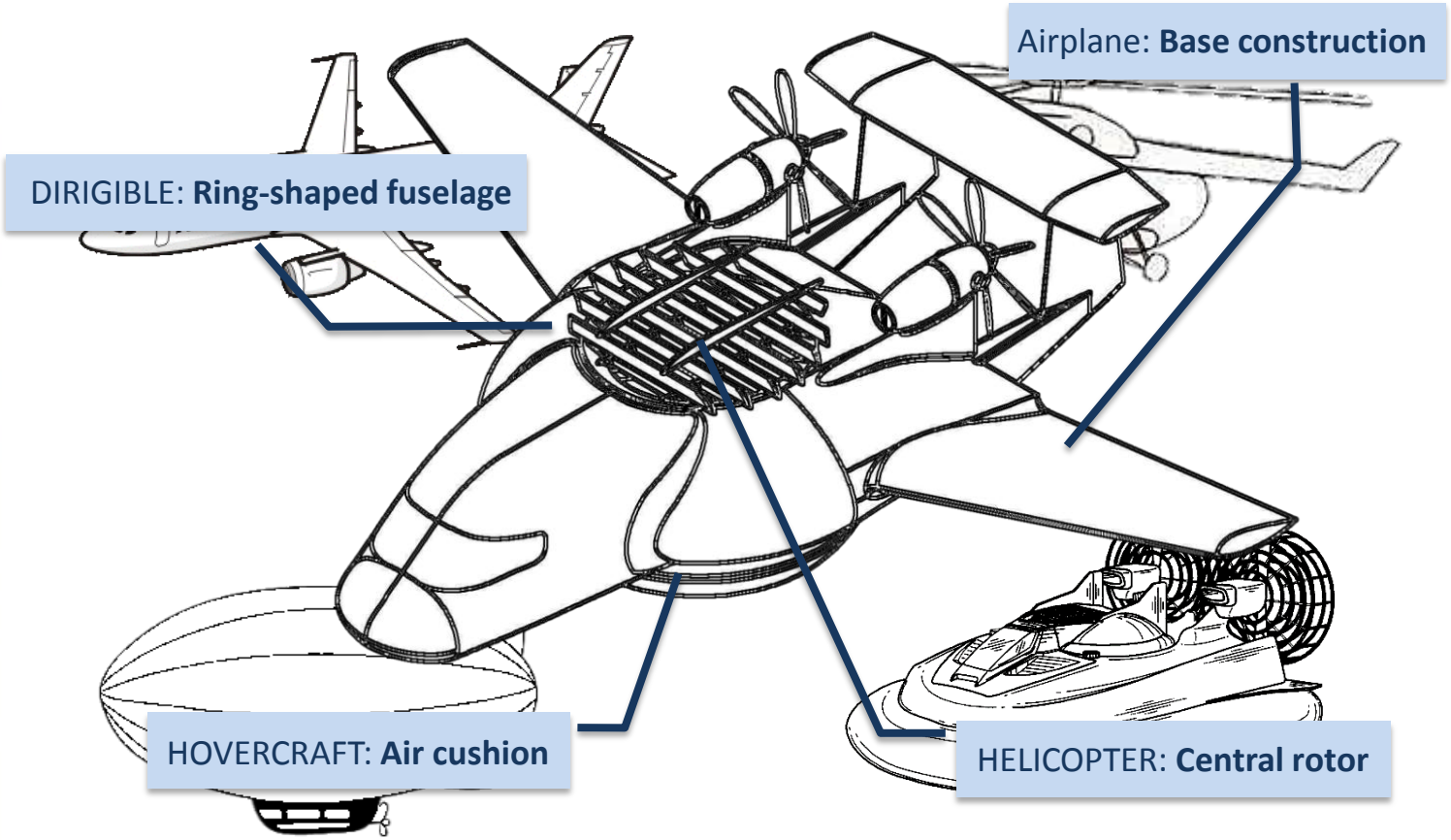
Riga 2014, April 10 - 11

Concept of ESTOLAS

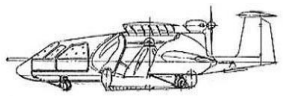


HYBRID AIRCRAFT

Combination of airplane, helicopter, dirigible and hovercraft



List of Structural Features



1. AIRPLANE:

High-lifting airfoil
2 side beams for tale
Jet flaps
Ski landing gear

2. HELICOPTER:

Central section for VTOL
Inlet mechanism

What exactly makes ESTOLAS a hybrid aircraft?

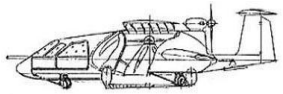
3. DIRIGIBLE:

Ring-shaped fuselage for helium

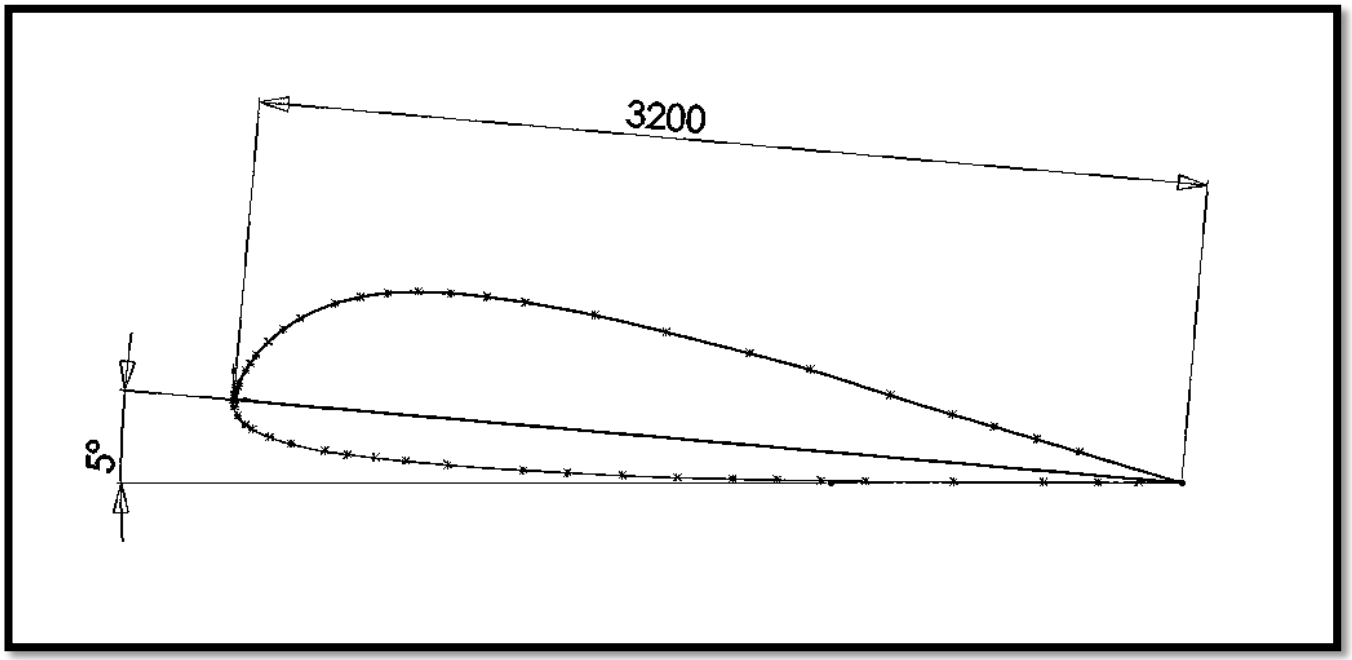
4. HOVERCRAFT:

Air cushion

Structural features



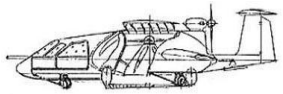
HIGH-LIFTING AIRFOIL



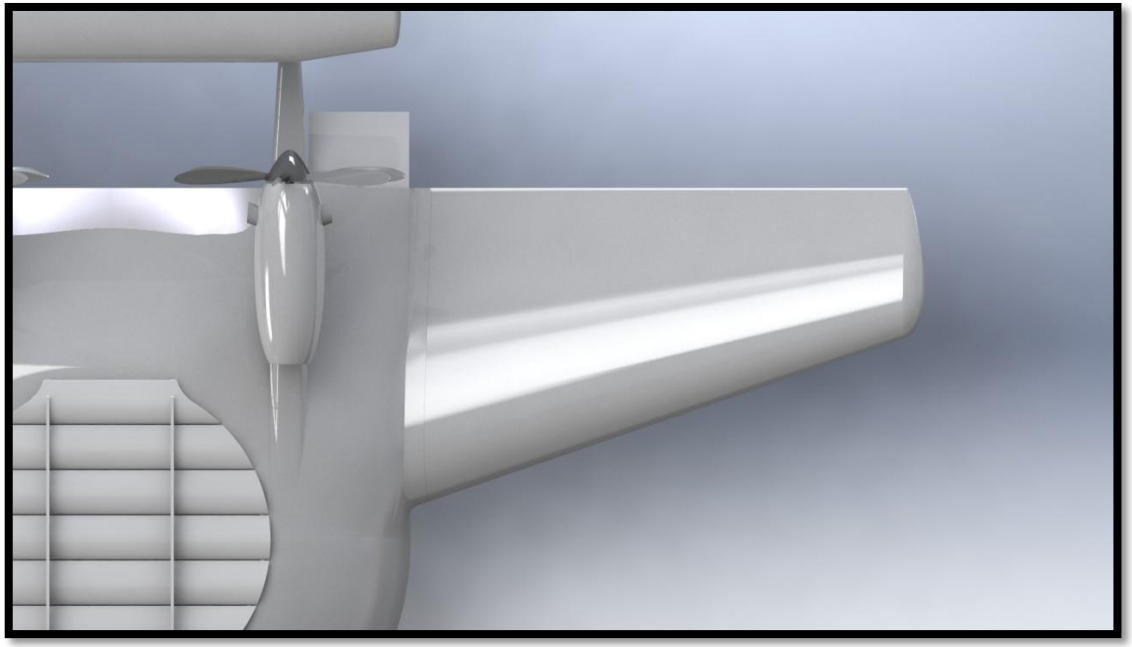
Wing profile TSAGI-R-III-18% (ЦАГИ-Р-III-18%)

- Higher lift
- Higher drag

Structural features



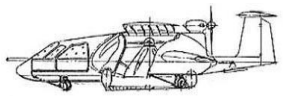
HIGH-LIFTING AIRFOIL



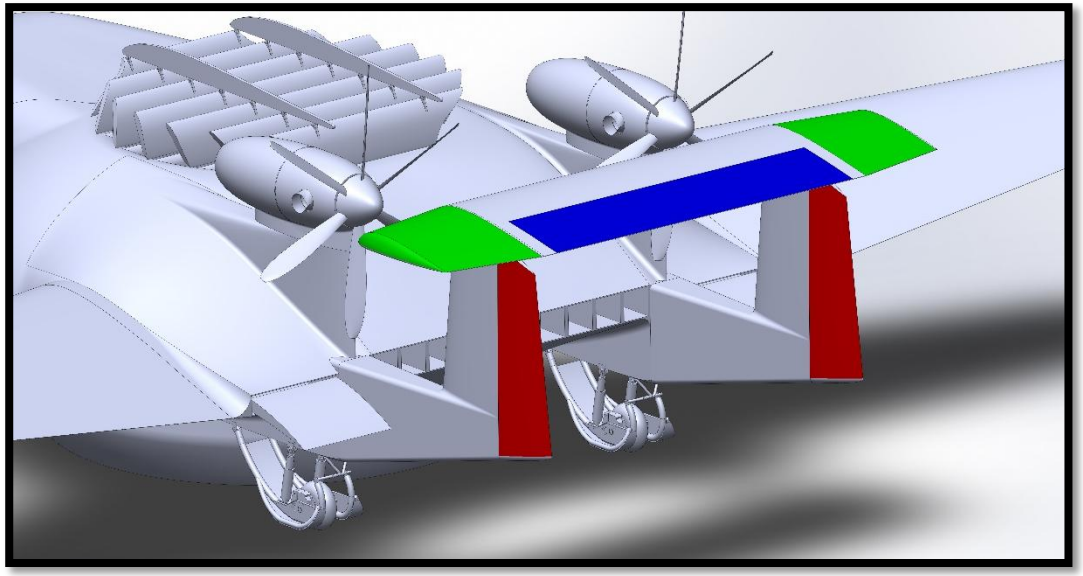
Aircraft wing (top view)

- Smaller dimensions
- Higher wing load
- Higher speed for take-off and landing

Structural features



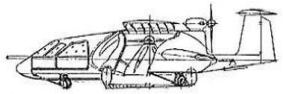
2 SIDE BEAMS FOR TALE



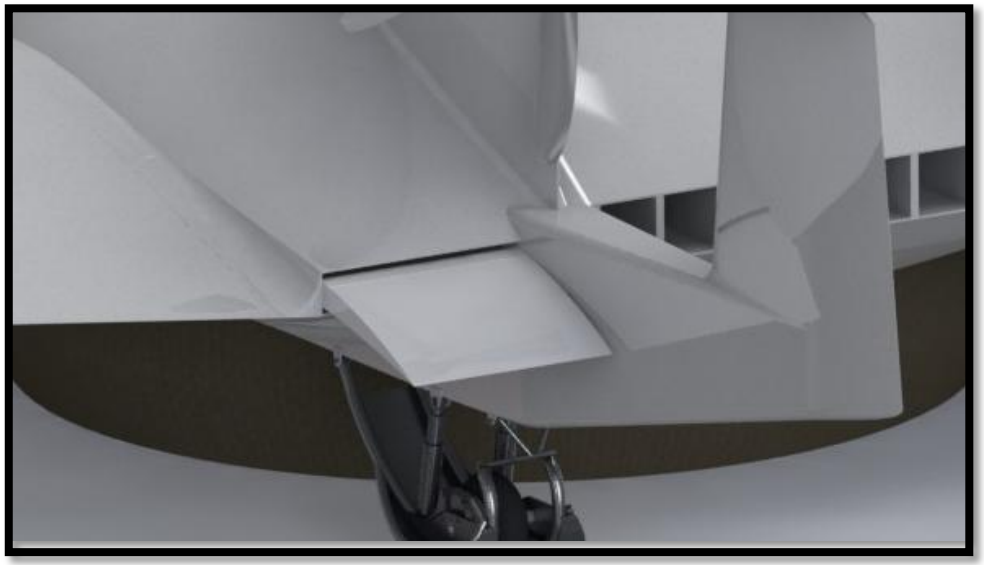
Tail section

- 2 vertical stabilizers + 2 rudders
- Bigger horizontal stabilizer and elevator
- Contra rotating control surface
- More stabilization and control over the aircraft
- Heavy and complicated construction

Structural features



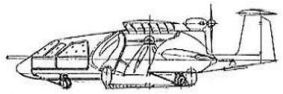
JET FLAPS



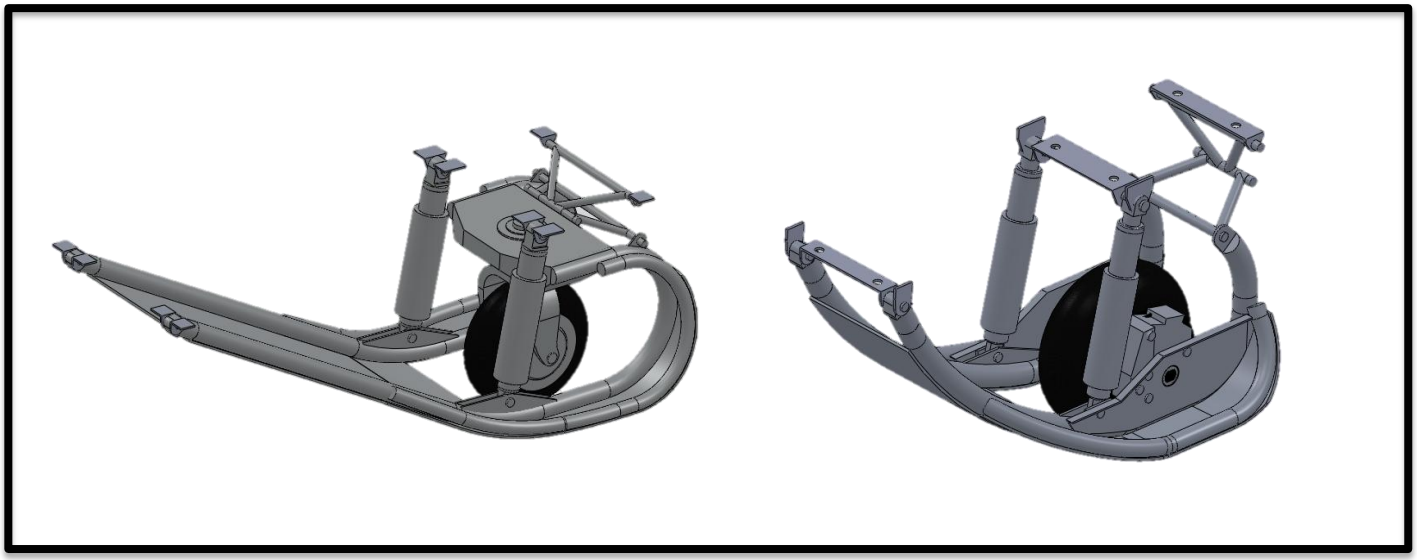
Jet flaps

- Increased lift at low speed performance
- Complicated construction

Structural features



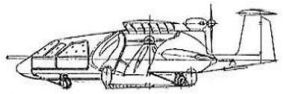
SKI LANDING GEAR



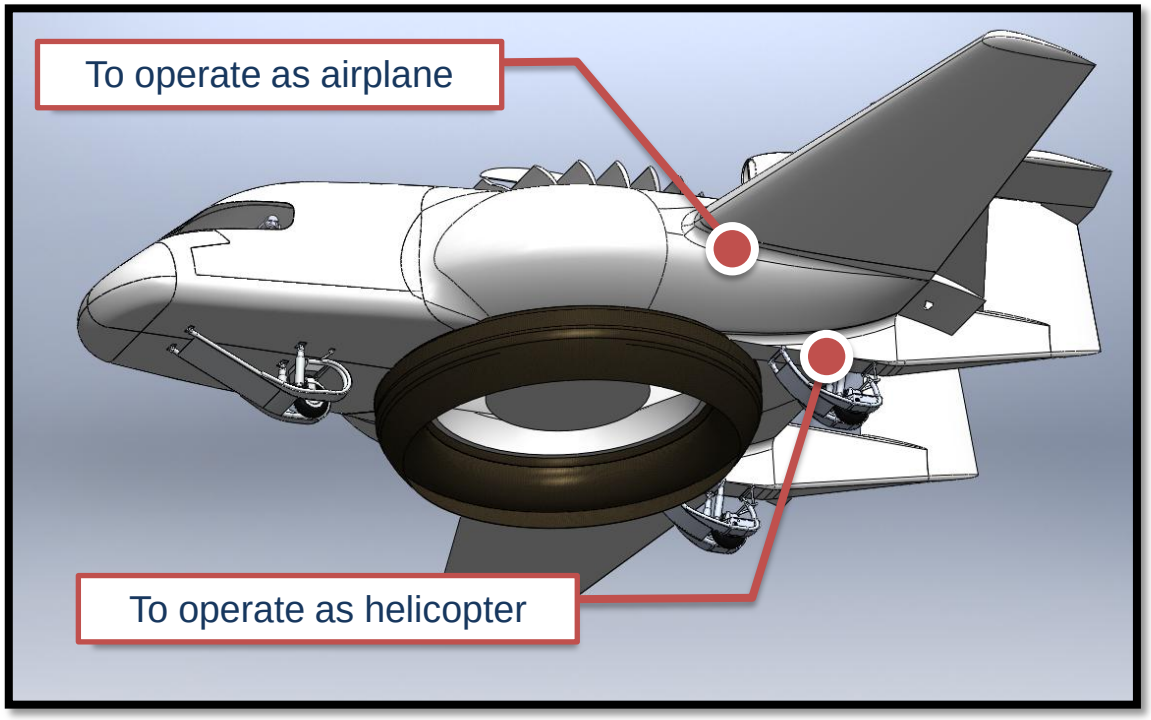
Front and rear landing gears

- Increased performance at take-off and landing on a wide range of surfaces
- Non-retractable landing gear increases drag

Structural features



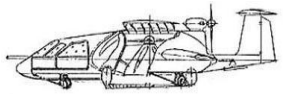
SKI LANDING GEAR



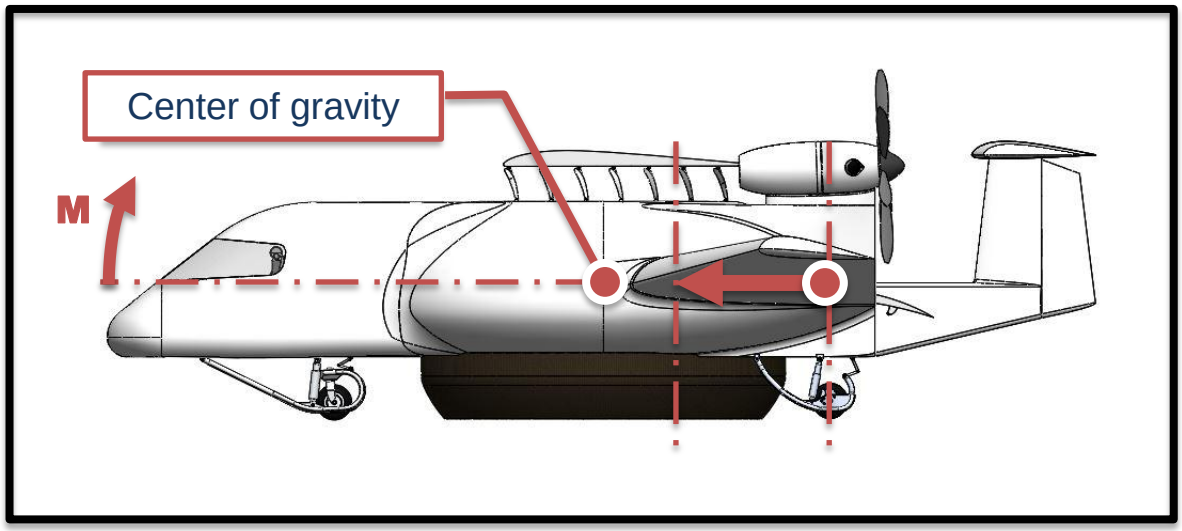
Placement of landing gears

- Good placement if the aircraft is performing more like helicopter during take-off and landing
- Not effective for airplane performance

Structural features



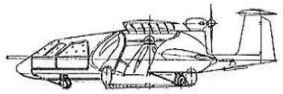
SKI LANDING GEAR



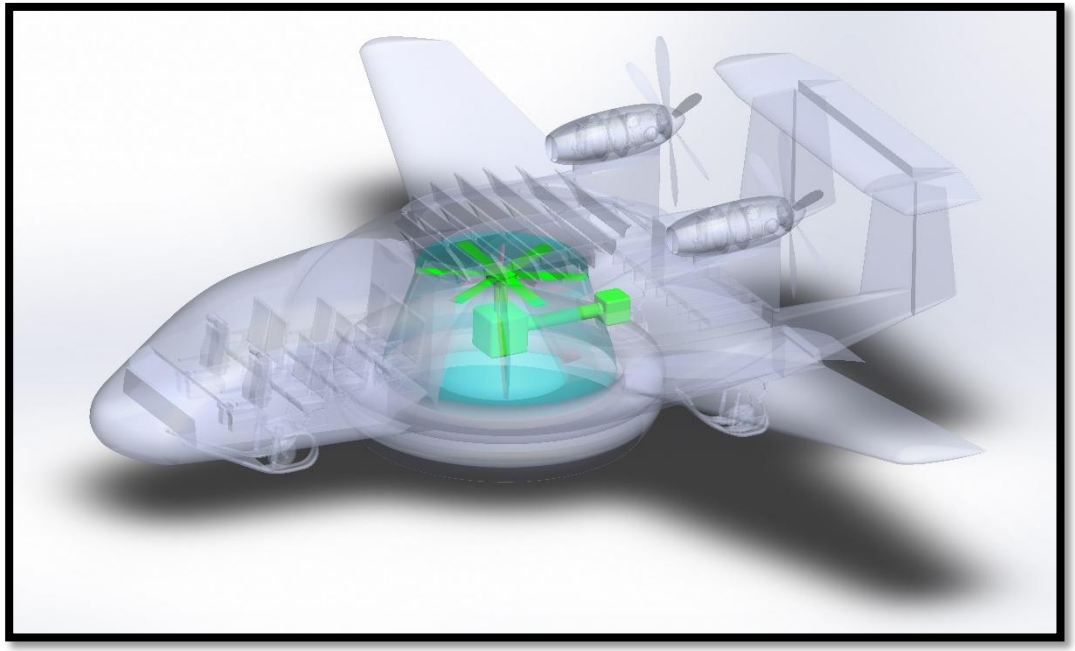
Placement of landing gears

Landing gear closer to CG = increased nose pitching up

Structural features



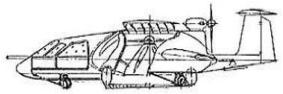
CENTRAL SECTION FOR VTOL



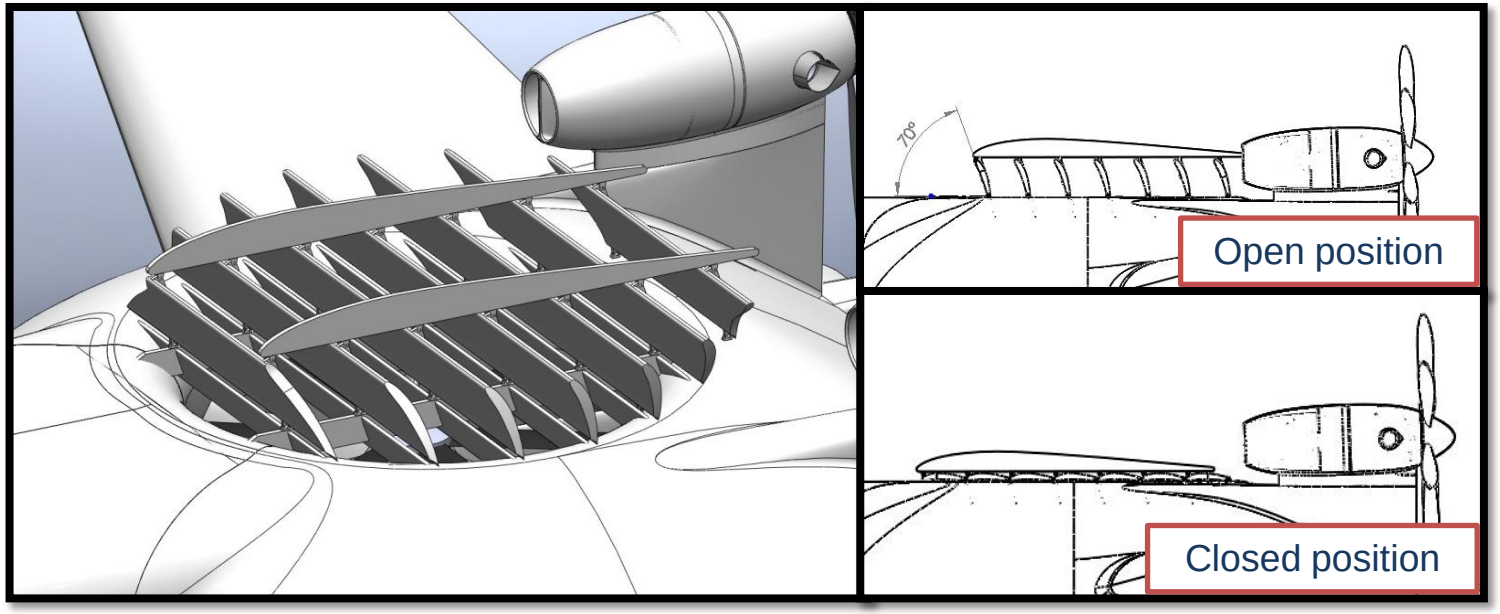
Central section

- Increased lift during take-off and landing configurations
- Air stream supply to the air cushion and jet flaps
- Low efficiency - provided lift = only 14% of overall mass
- Low safety factor for passangers

Structural features



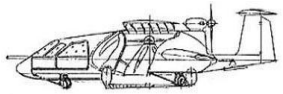
INLET MECHANISM



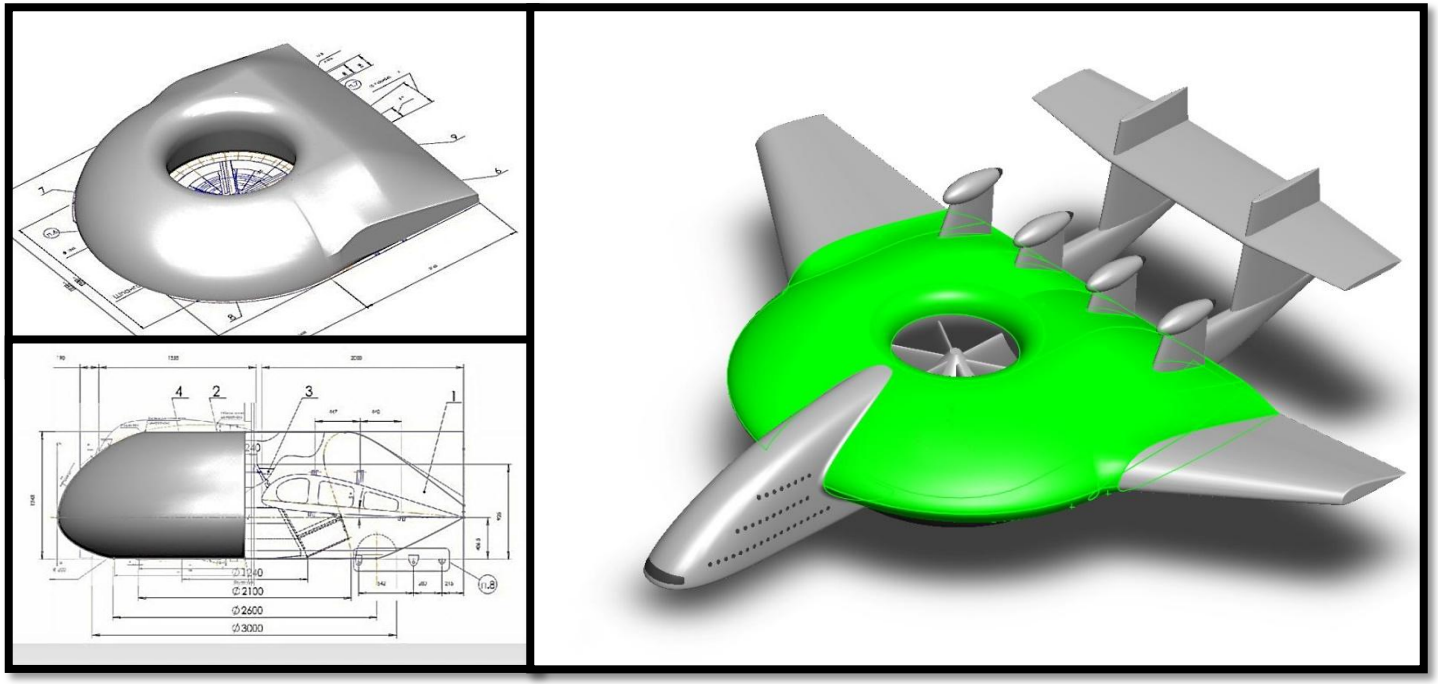
Inlet mechanism

- Inlet control
- Increased effectivenes of central rotor during take-off and landig
- Increased drag during take-off and landig

Structural features



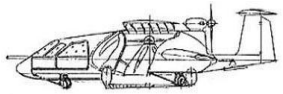
RING-SHAPED FUSELAGE FOR HELIUM



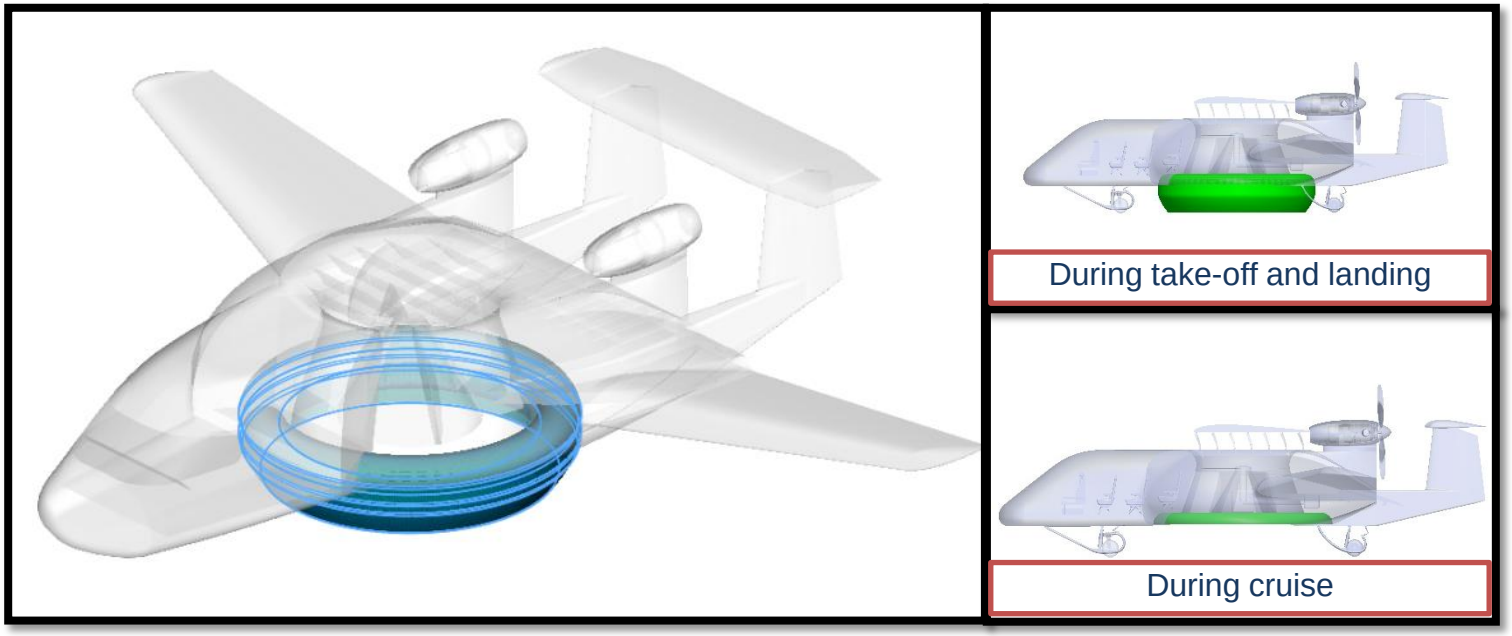
Fuselage for helium – volume: 6600 m3; lift: 6976 kg

- Increased lift by helium and airfoil
- Not effective - provided lift = only 5-7% of overall mass

Structural features



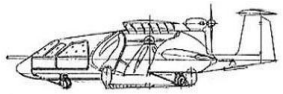
AIR CUSHION



Air cushion

- Landing on all surfaces
- Heavy construction
- High drag during take-off and landing

Conclusion

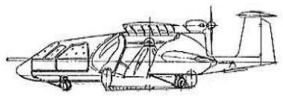


FULL MODEL

Performance during take-off and landing

Vehicle type	Provided lift
Airplane	~ 80 %
Heliciopter	~ 14 %
Dirigible	~ 6 %
Hovercraft	0 %

Aerodynamic data must be analysed deeper



RIGA TECHNICAL UNIVERSITY
THE INSTITUTE OF AERONAUTICS

Address:
Lomonosova 1A, k-1, Riga, Latvia

E-mail:
aerti@rtu.lv

Phone number:
(+371) 67089990