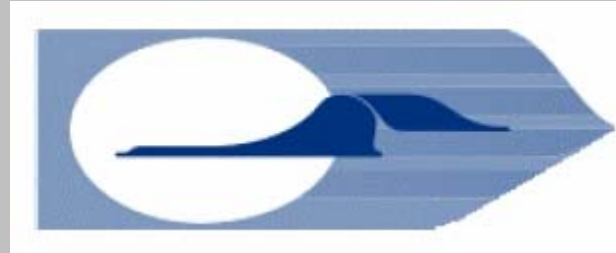




**8th European Workshop
on Aircraft Design
Education (EWADE 2007)**



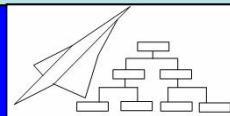
**SAMARA STATE
AEROSPACE UNIVERSITY
30.05. - 02.06.2007**



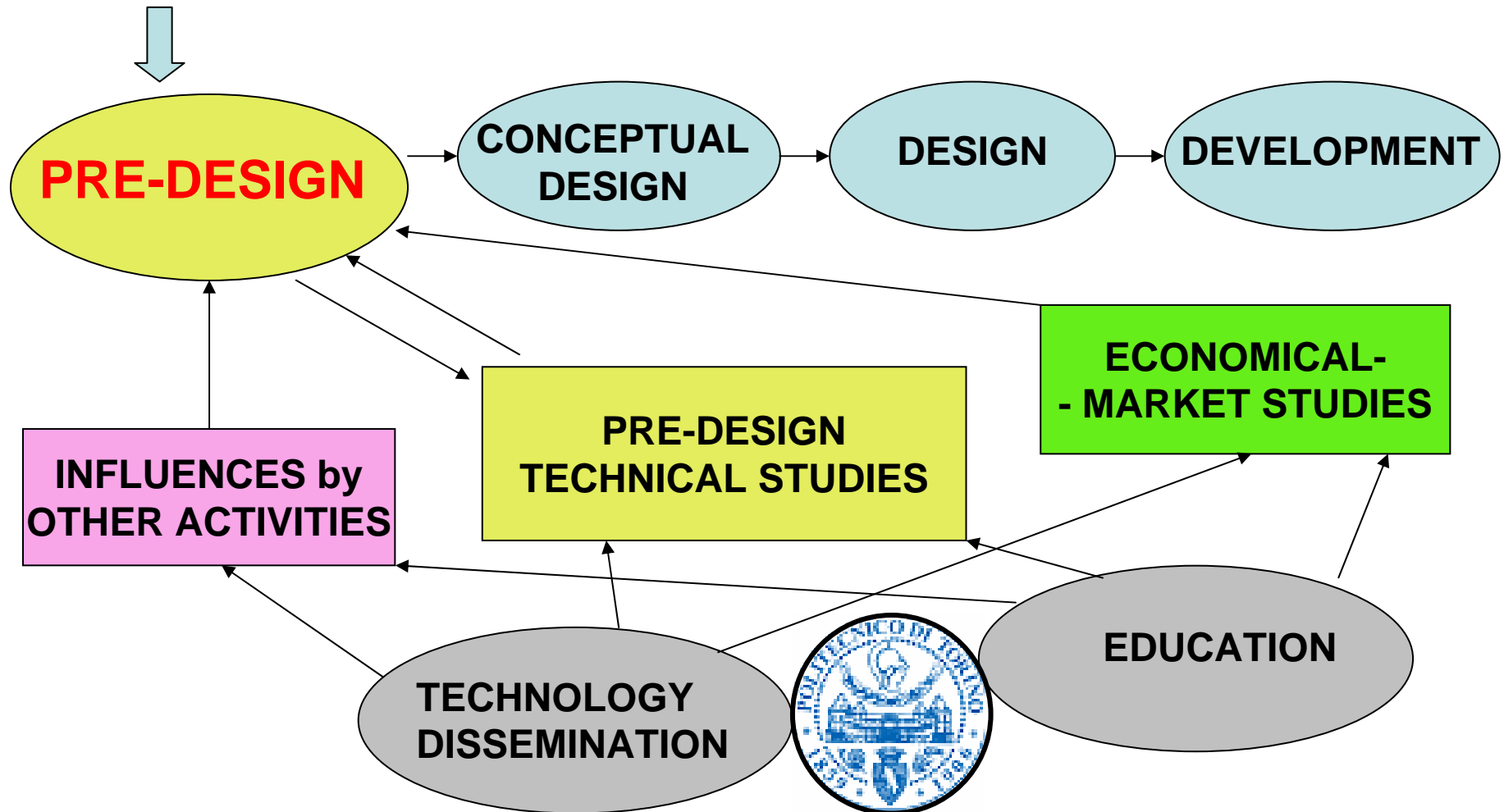
Advanced Ultra-light and U.A.V. Synergic Family Studied at Politecnico di Torino

- **Sergio CHIESA** – Full Professor, A.S.S.E.T.
- **Sabrina CORPINO** – Assistant Professor, A.S.S.E.T.
- **Nicole VIOLA** – Researcher, A.S.S.E.T.
- **Marco FIORITI** – Ph.D. Student, A.S.S.E.T.

A: Aero
S: Space
S: System
E: Engineering
T: Team



The context of this presentation is the very first phase of an aircraft development program: specifications are not well defined yet , marketing considerations are relevant, but technical activities are already of great interest:



POLITECNICO di TORINO

MISSION:



Advanced Ultra-light and U.A.V. Synergic Family Studied at Politecnico di Torino:

**INFLUENCES by
OTHER ACTIVITIES**

Seventh International Seminar
on

**RECENT RESEARCH AND DESIGN PROGRESS IN AERONAUTICAL ENGINEERING AND ITS
INFLUENCE ON EDUCATION**

Tallinn, Estonia, 11-12 October 2006

**ULTRA LIGHT AIRCRAFT:
NEW CONCEPTS UNDER STUDY AT
POLITECNICO DI TORINO**

S. Chiesa, S. Corpino, M. Fioriti, N. Viola

Department of Aeronautics and Space Engineering

(DIASp)

Politecnico di Torino



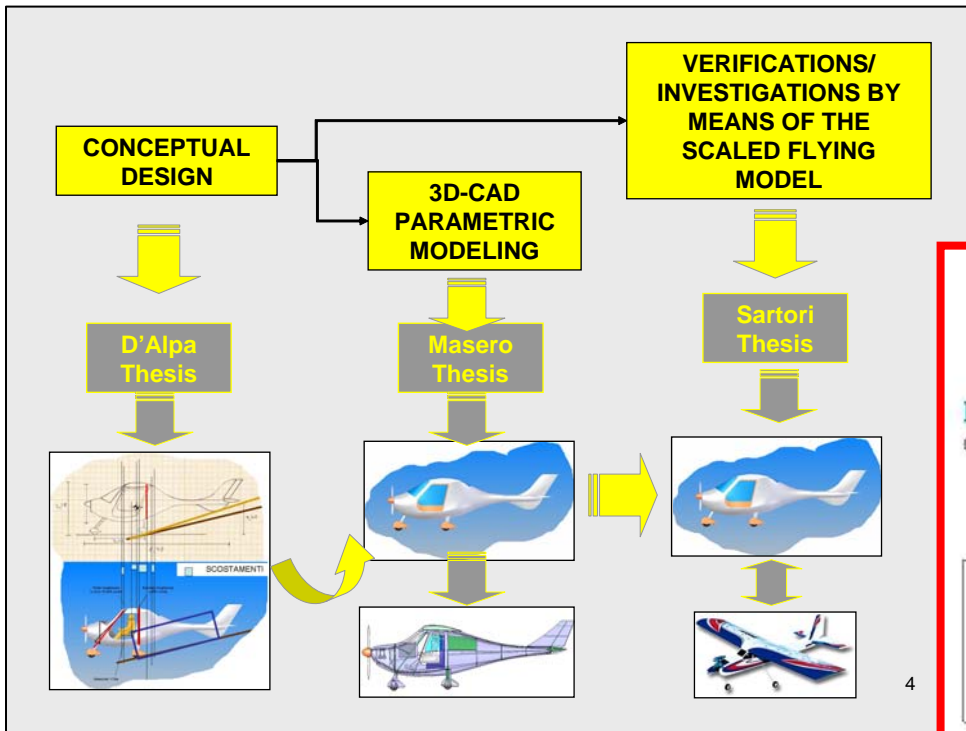
**INVOLVMENT OF
Prof. S. CHIESA AS TECHNICAL
CONSULTANT IN A LEGAL QUESTION
BETWEEN TWO U.L.M. MANUFACTURERS**



- **RESEARCH ACTIVITY ABOUT NEW U.L.M.**
(Founded by Piemonte Regional Government)
- **INTEGRATED** with a previous educational initiative based on 3-years Degree Thesis
- **PRESENTED** by the Authors at RRDPAEE-2006

Sergio CHIESA

RESEARCH ABOUT NEW U.L.M.



4

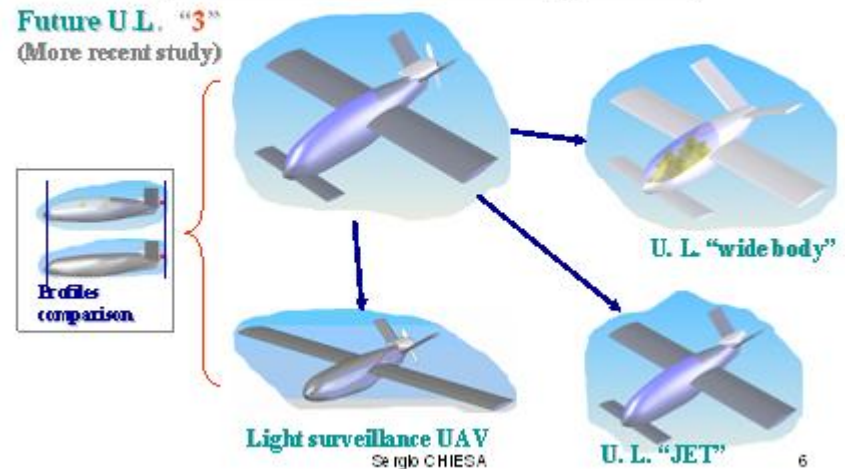
Seventh International Seminar
on
RECENT RESEARCH AND DESIGN PROGRESS IN AERONAUTICAL ENGINEERING AND ITS
INFLUENCE ON EDUCATION
Tallinn, Estonia, 11-12 October 2006

**ULTRA LIGHT AIRCRAFT:
NEW CONCEPTS UNDER STUDY AT
POLITECNICO DI TORINO**

S. Chiesa, S. Corpino, M. Fioriti, N. Viola
Department of Aeronautics and Space Engineering
(DIASp)
Politecnico di Torino

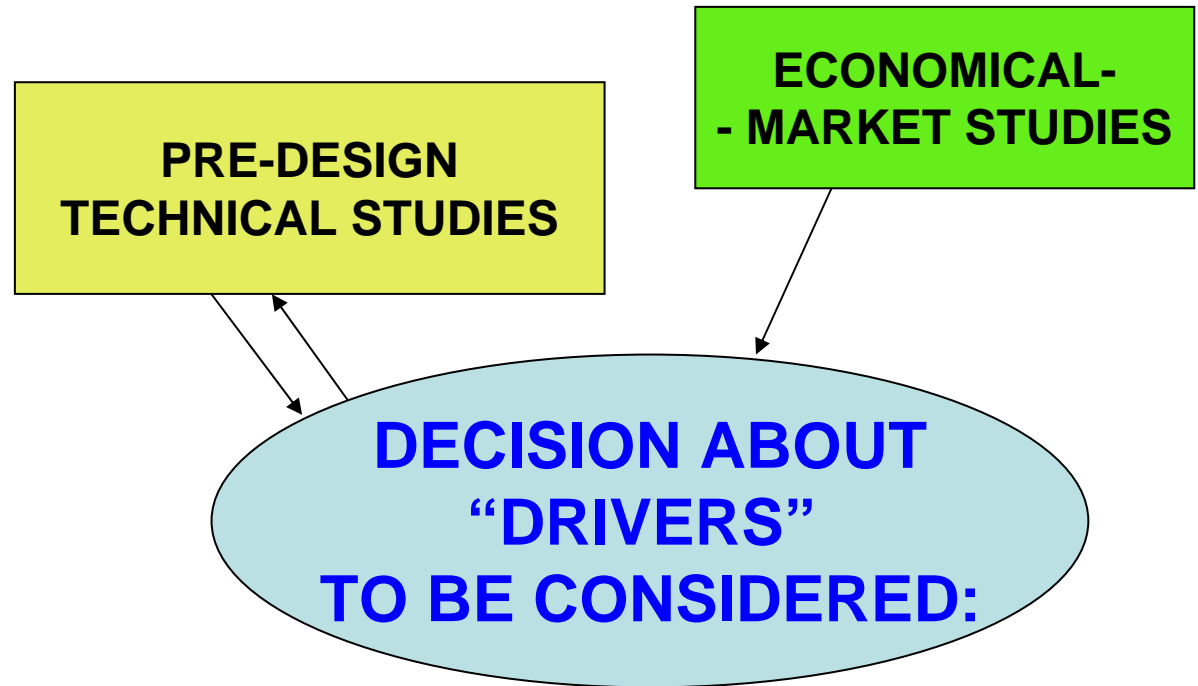


Possible future developments of research on ultra light ac:



6

HOW THE IDEA HAS BEEN CONCEIVED?



**FLIGHT
PERFORMANCES**
(maxSpeed, Range)



**FIELD
PERFORMANCES**



SAFETY



APPEAL



LOW COST

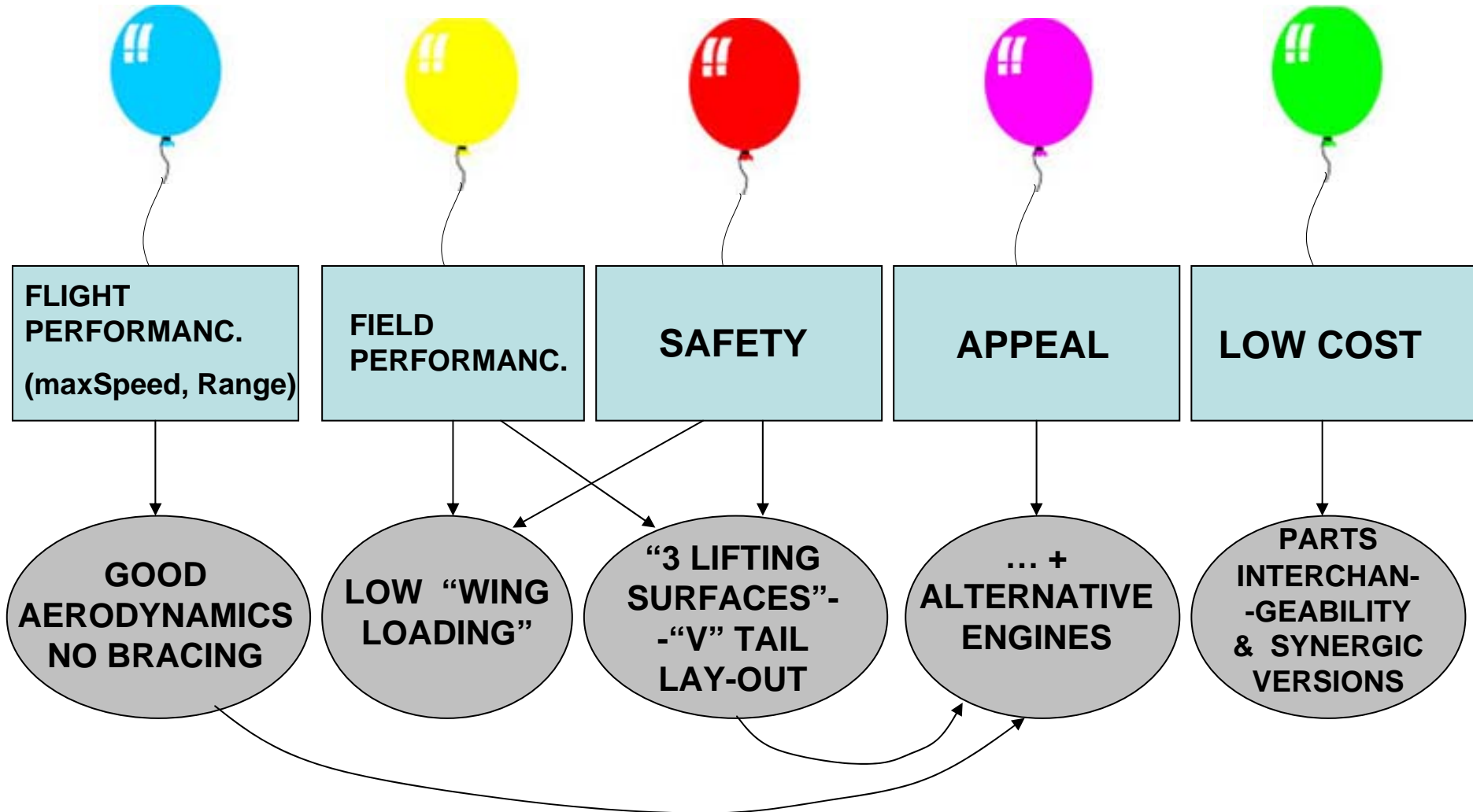
ECONOMICAL- - MARKET STUDIES



**SEARCH FOR A BETTER
“SYNTHESIS” !!!**

(*) Hypothesis of non professional Pilot !

SEARCH FOR A BETTER “SYNTHESIS” :



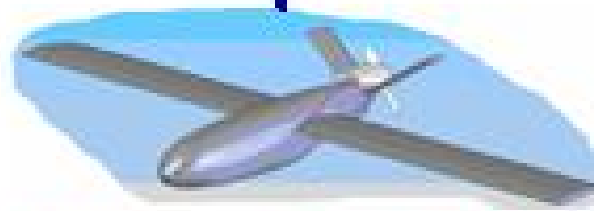
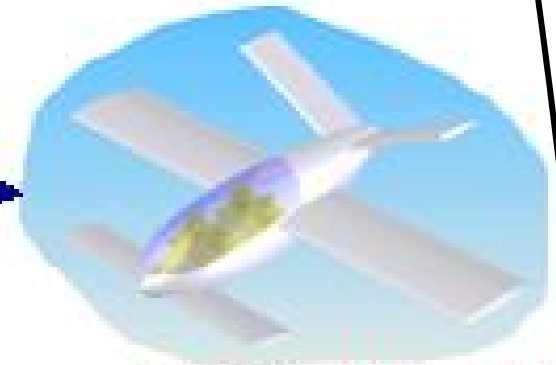
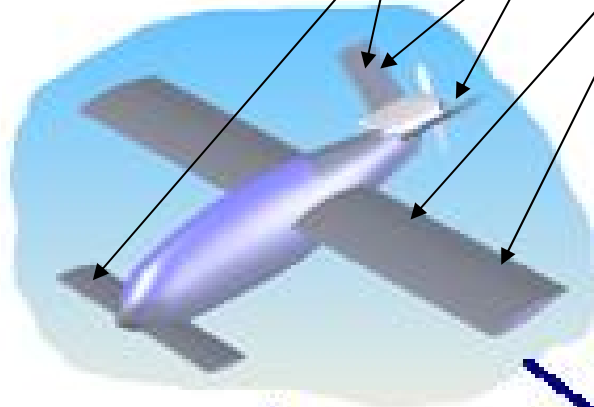
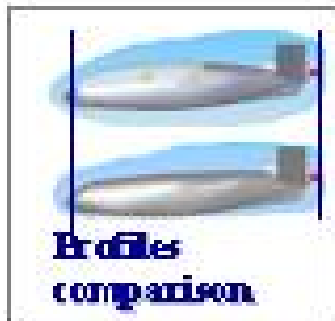
**AERODYNAMICS &
ARCHITECTURE**

**INTERCHANGEABILITY
OF PARTS**

**ALTERNATIVE
ENGINES**

SYNERGIC VERSIONS

Future U.L. "3"

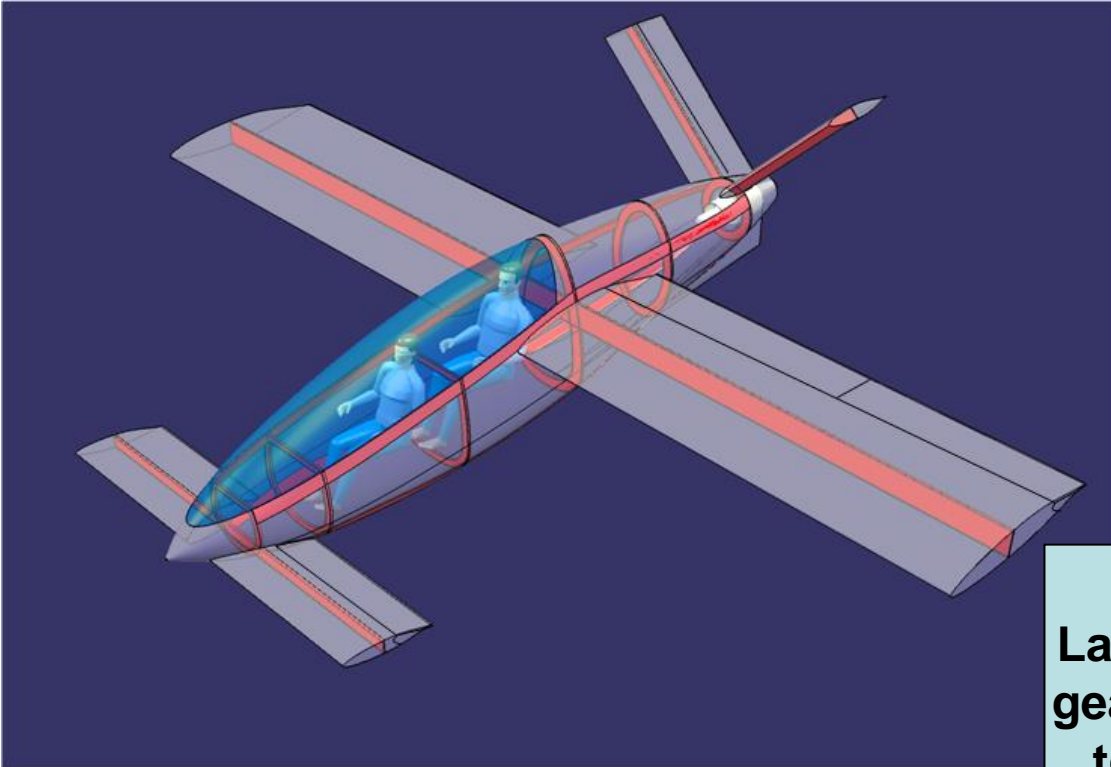


Light surveillance UAV

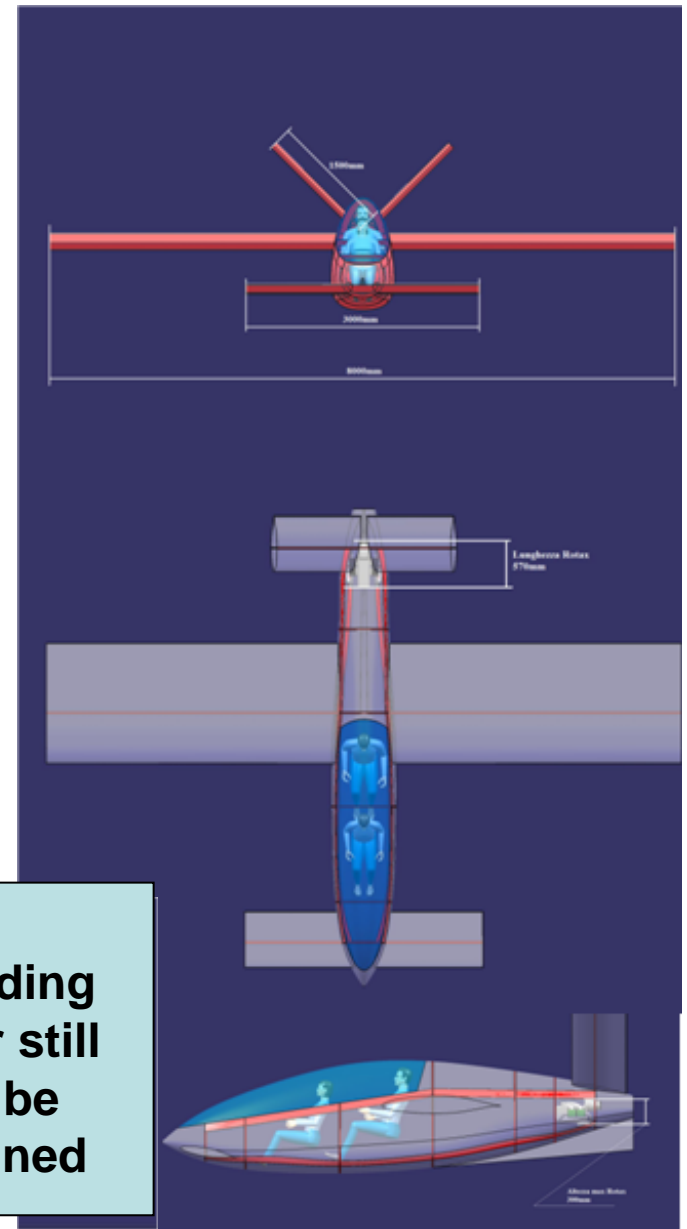
U.L. "wide body"

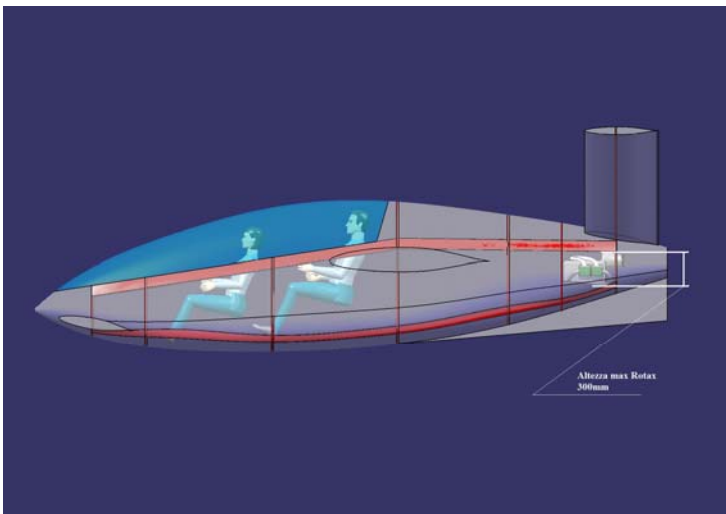
U.L. "JET"

PRE-DESIGN TECHNICAL STUDIES



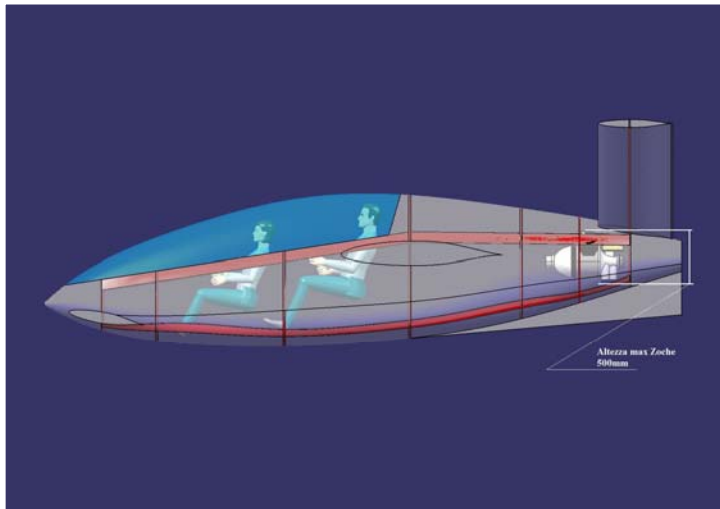
Landing
gear still
to be
defined





ROTAX
(basic version)

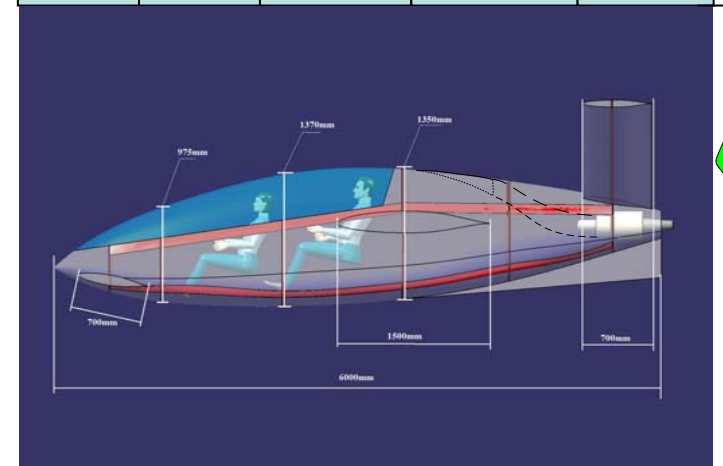
**ALTERNATIVE
ENGINES**



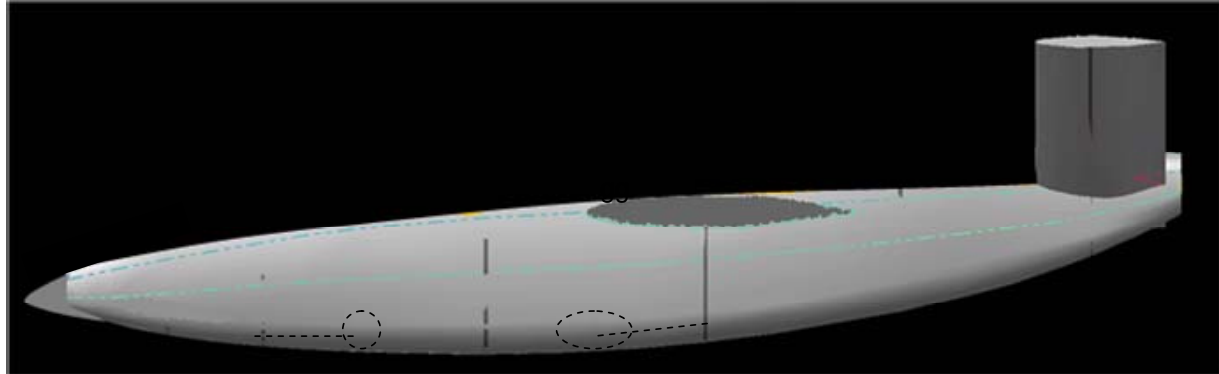
DIESEL "ZOCHE"



FLIGHT.	FIELD.	SAFETY	APPEAL	LOW COST
---------	--------	--------	--------	----------



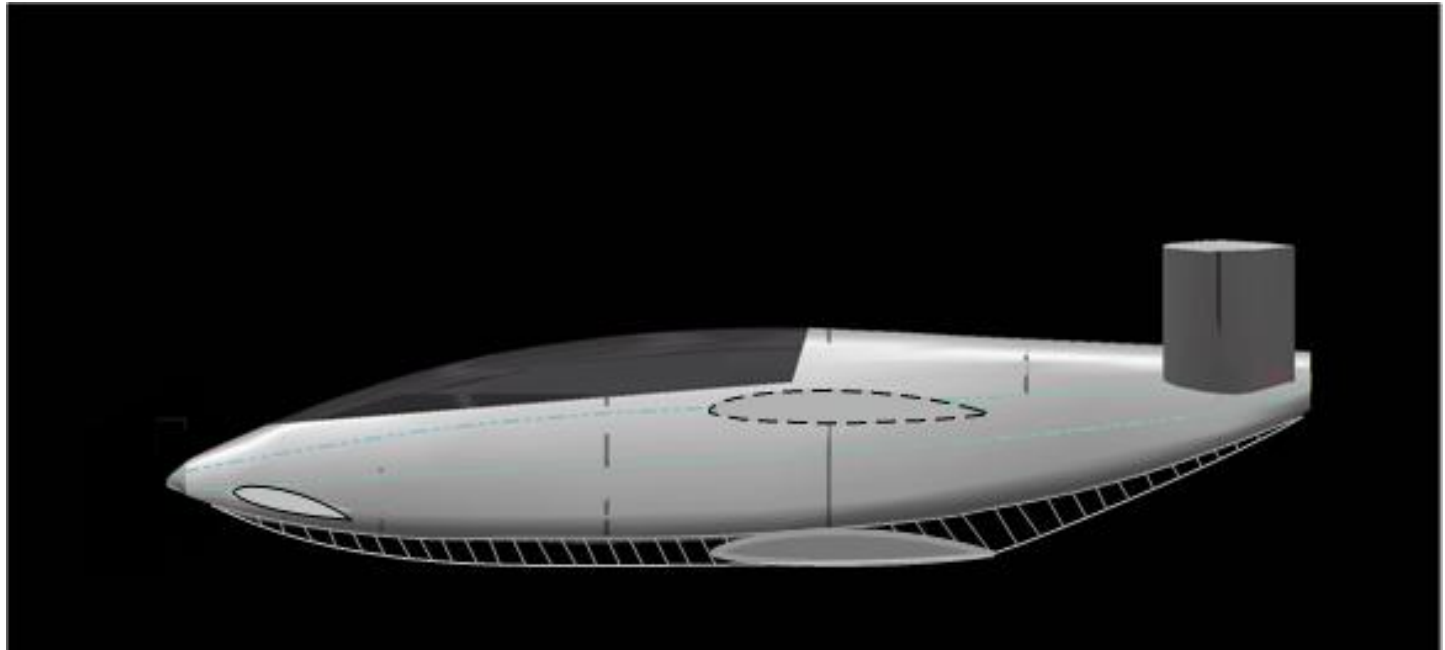
Microturbo TRS18 (Thrust =120kg)



U.A.V. PLATFORM → H.A.L.E. operations

- **Removed Canards Surfaces / Increased Wing Area & Aspect Ratio**
- **Retractable Landing Gear**
- **Diesel Engine**

SYNERGYC
VERSIONS



LOW WING VARIANT → CRASH SAFETY

- Retractable Landing Gear
- Lower body SHIELD (to be studied)



FLIGHT.	FIELD.	SAFETY	APPEAL	LOW COST
---------	--------	--------	--------	----------

A QUITE SIMILAR DESIGN (of some years ago):

The [Aceair](#) AERIKS 200 is a Swiss [sports plane](#) of highly unusual design. It is being marketed in [kitplane](#) form. The AERIKS 200 has a highly-streamlined, bullet-shaped fuselage, with a [T-tail](#) and large [ventral fin](#), [pusher propeller](#), and [canard](#). The pilot and passenger are seated in tandem. Development aircraft have fixed undercarriage.

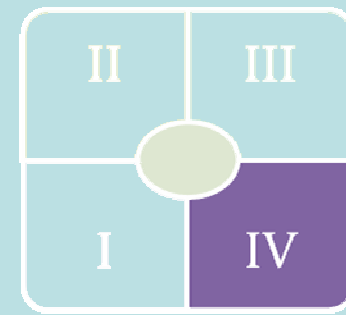


Status

Aceair ceased operation in 2004, and with it the Aeriks 200 project was cancelled. This was principally due to Diamond Engines cancelling the manufacture of **the rotary engine the 200 was based around.**

Our Study is independent by engine !

The following slides are taken from
final report of Students Work
in Economics and Business Course



Innovative ULM Modules

Business Assessment Report



Entrepreneur – **Professor Chiesa Sergio**

Realized By :

Assice Dorian
Fioriti Marco
Gawron Wioleta
Tronco Vicente

[France]
[Italy]
[Poland]
[Brazil]



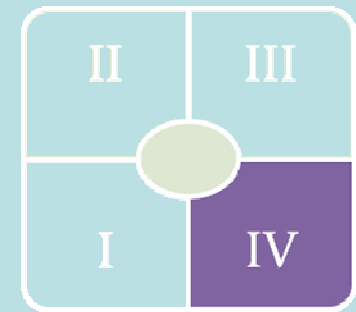
Under the Coordination of – **Gervasoni Luca**

Gruppo
11

Table of Contents



- **The Project, The Idea, The Challenge**
- **Value Proposition**
 - ✈ Market Needs & Product Features
 - ✈ Product Description
- **The Market Assessment**
 - ✈ A Luxury Market Niche
 - ✈ Starting off in Europe
- **The Industry Assessment**
 - ✈ Porter's 5 Force Analysis
 - ✈ A Sustainable Competitive Advantage
- **Sales Forecast**
 - ✈ Per Product
 - ✈ Per Market
- **Conclusion**



Market Needs & Product Features

The 4 S's

Stall free

Sporty

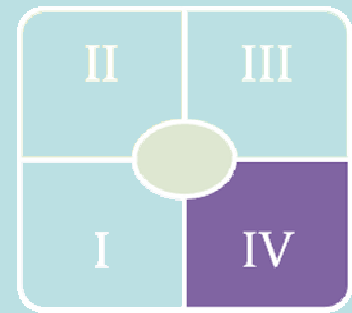
Safety & Comfort

Style & Appealing Aerodynamic Design



**Flying has never been Safer,
never been Easier !**

Porter 5 Force Analysis



✈️ Barriers to the entry

- ✈️ Investment costs very high
- ✈️ High technological Knowledge necessary

✈️ Suppliers

- ✈️ Highly dependent on suppliers
- ✈️ One supplier per Component

✈️ Substitute Products:

- ✈️ Paragliders, hang-gliders, multi-axis, gyroplanes, hot-air balloons
- ✈️ Price and performance extremely different

✈️ Competitors

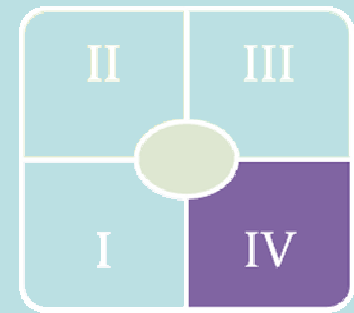
- ✈️ Highly nebulous industry , small competitors
- ✈️ Lack of innovation
- ✈️ No leader

✈️ Buyers

- ✈️ Strong power
- ✈️ To be treated with particular attention

Constituted of a highly **nebulous industry** with many small competitors this industry **lacks innovation** and has above all **no leader** which is **an opportunity for the entrepreneur to acquire a strong position.**

A Sustainable Competitive Advantage



• The 3 Winged Technology

- ✈ Stall Free
- ✈ Unusual and Attractive esthetical aspect
- ✈ Strong element of differentiation
- ✈ Shortens Takeoff and Landing Distances

• Modularity

- ✈ Interchangeable Engine [Diesel , Fuel , Jet]
- ✈ One conception - 3 Products :
 - ✈ The 3 Winged ULM
 - ✈ The LOW WING (“Crash Safe”) ULM
 - ✈ UAV and Ultra Light Jet

• Materials

✈ Aluminum

- ✓ Great Know how, Widespread, Common
- ✗ Easy to copy, rough design

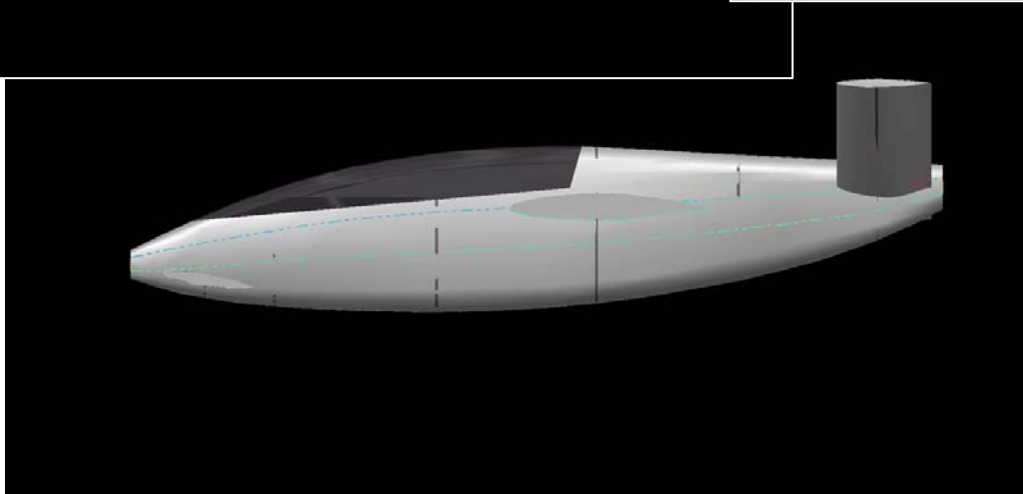
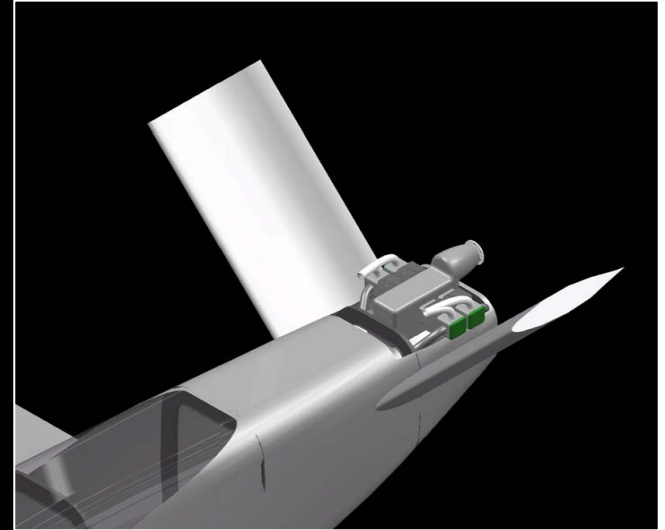
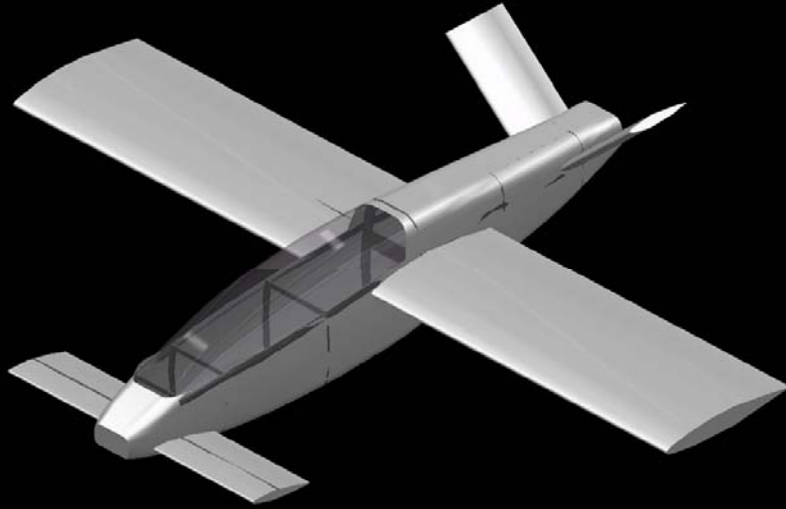
✈ Composite Materials

- ✓ Sophisticated Design, Light
- ✓ Good guarantee against copying
- ✗ Higher Investment,
- ✗ Higher Cost of the final product

Some technical activities are now starting in order to better focus “Business Opportunities”

TRADE – OFF ALUMINIUM ALLOY vs COMPOSITES

Alluminium Version Study



Sergio CHIESA

But a lot of work is
waiting for us !



**THANK YOU FOR
YOUR ATTENTION !**