UNIVERSIDADE BEIRA INTERIOR

DEPARTAMENTO DE CIÊNCIAS AEROESPACIAIS

AFCEA PORTUGAL

II Encontro dos Clubes de Estudantes da AFCEA Portugal

AFCEA Covilhã Student Club

Lisbon | June 9th, 2017

AFCEA Covilha Student Club

- History
  - Founded in **2013**;
  - TechNet Internacional 2013;
  - **"Excellent Poster Award"** for *"A New Software for Propeller Design and Analysis"* article by MSc João Morgado in *6th AFCEA Student Conference*.

- Officers
  - **President:** Luís G. M. M. Trindade;
  - **1st Vice President:** Tiago M. R. Rosa;
  - **2nd Vice President:** Tiago N. Sanches;
  - **Secretary:** Laura S. N. Martins;
  - **Faculty Advisor:** Jorge M. R. Silva.

Laboratories

- Aerodynamics and Propulsion











Laboratories

- Anemometry





- Avionics and Control





Laboratories

- Computational Fluids Dynamics



- Structures and Vibrations

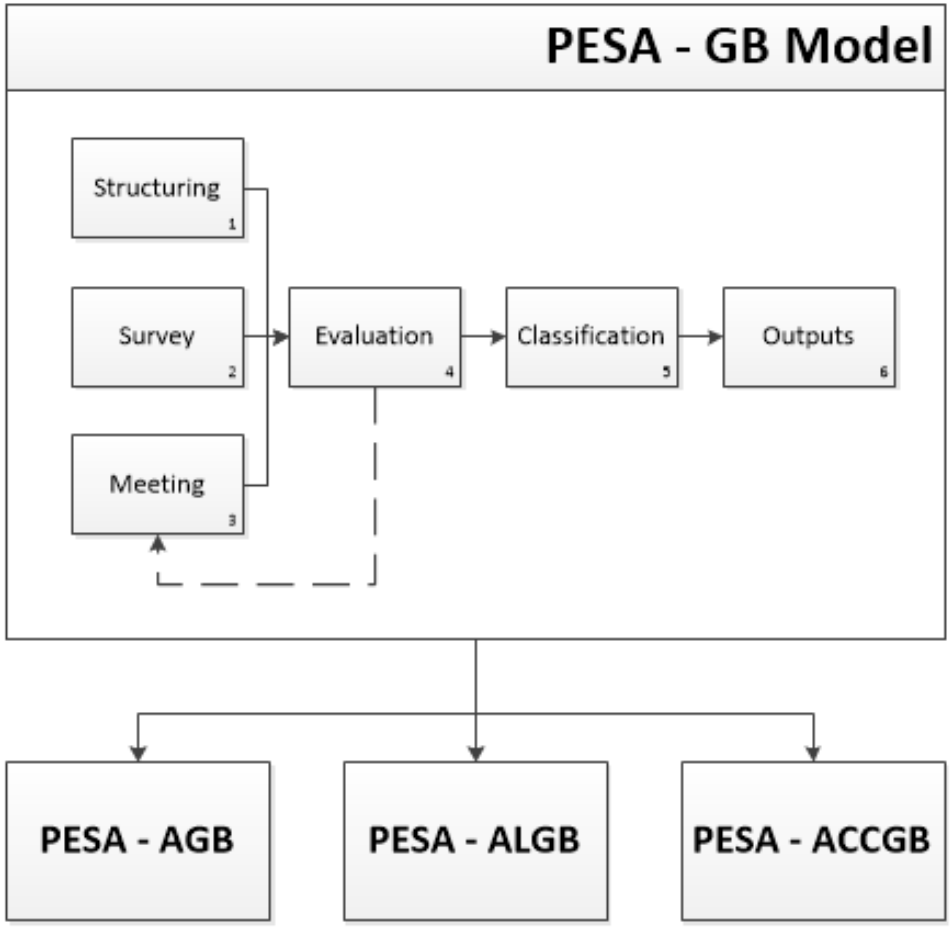


- Transportation Research



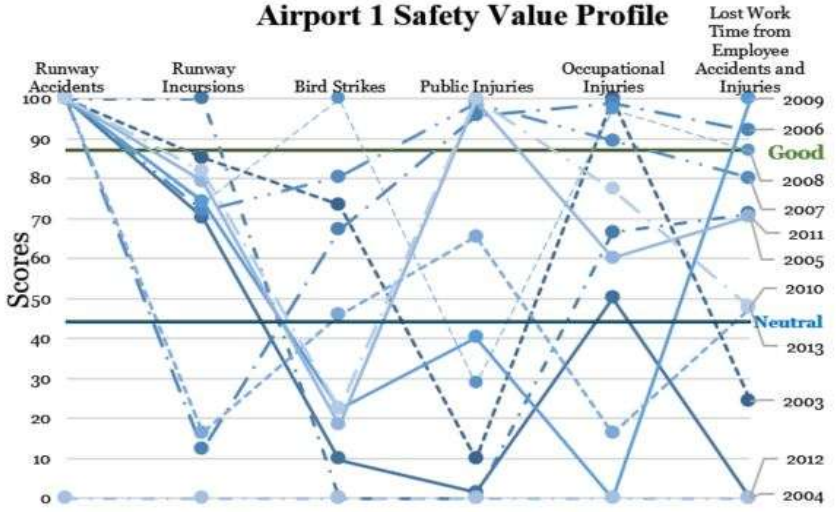


Performance and Efficiency Support Analysis for Global Benchmarking



- Benchmarking of complex systems and infrastructures;
- Help the decision makers to analyze a multiple criteria problem;
- Use experts' experience and judgement to evaluate key performance areas and indicators.

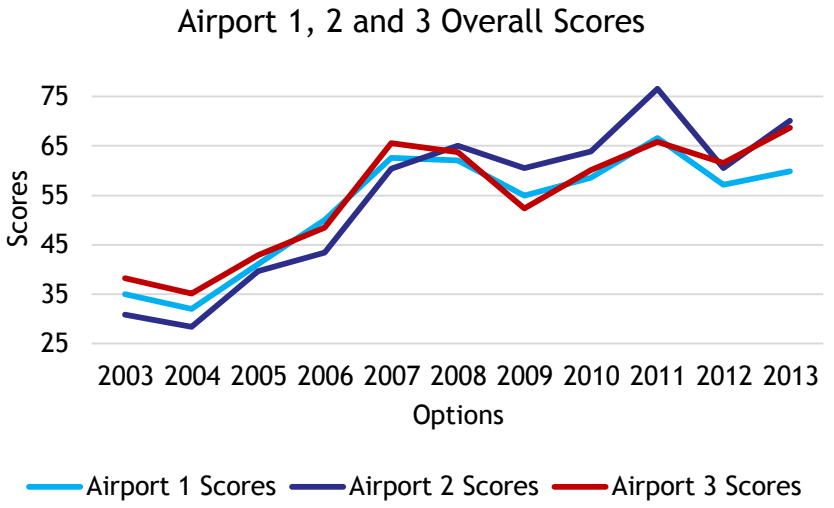
Performance and Efficiency Support Analysis for Global Benchmarking



Key Performance Indicators

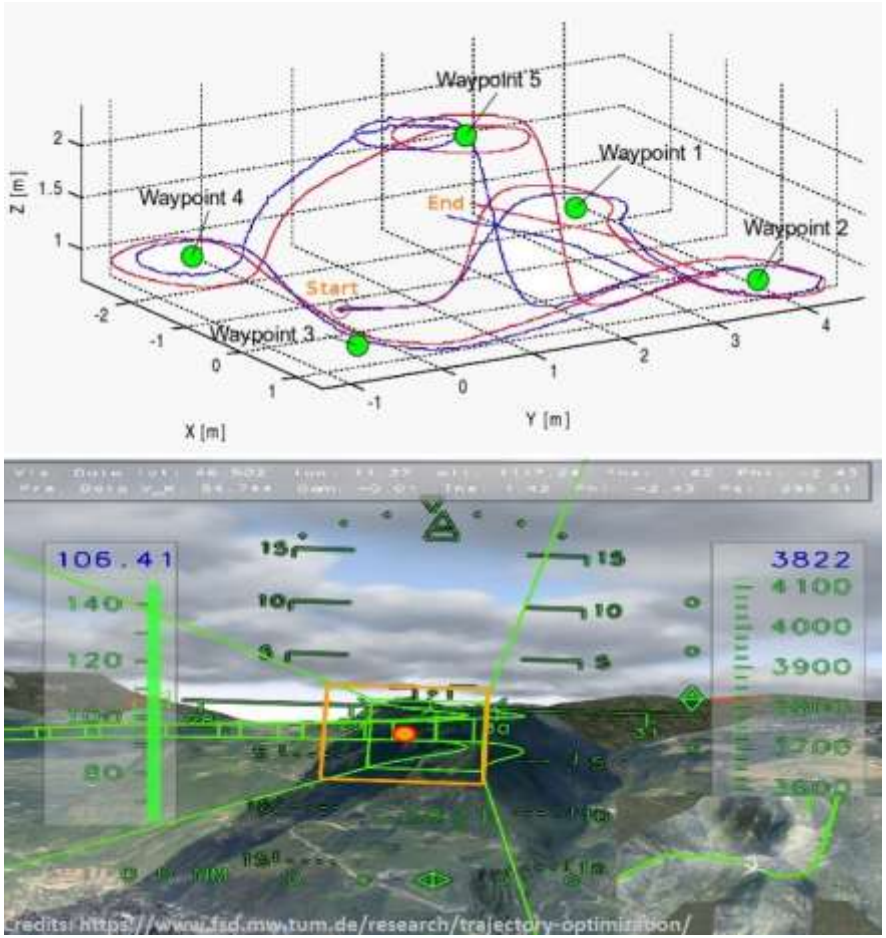
Levels	Scores	Category Thresholds
L0	0	Catastrophic
]L0, L1[		Alert - Catastrophic
L1	20	Alert
]L1, L2[		Alert - Poor
L2	40	Poor
]L2, L3[		Poor - Satisfatory
L3	60	Satisfatory
]L3, L4[		Satisfatory - Good
L4	80	Good
]L4, L5[		Good - Excellent
L5	100	Excellent

Options	Scores	Category Thresholds
2003	6,2	Alert - Catastrophic
2007	50,6	Poor - Satisfatory
2013	84,6	Good - Excellent



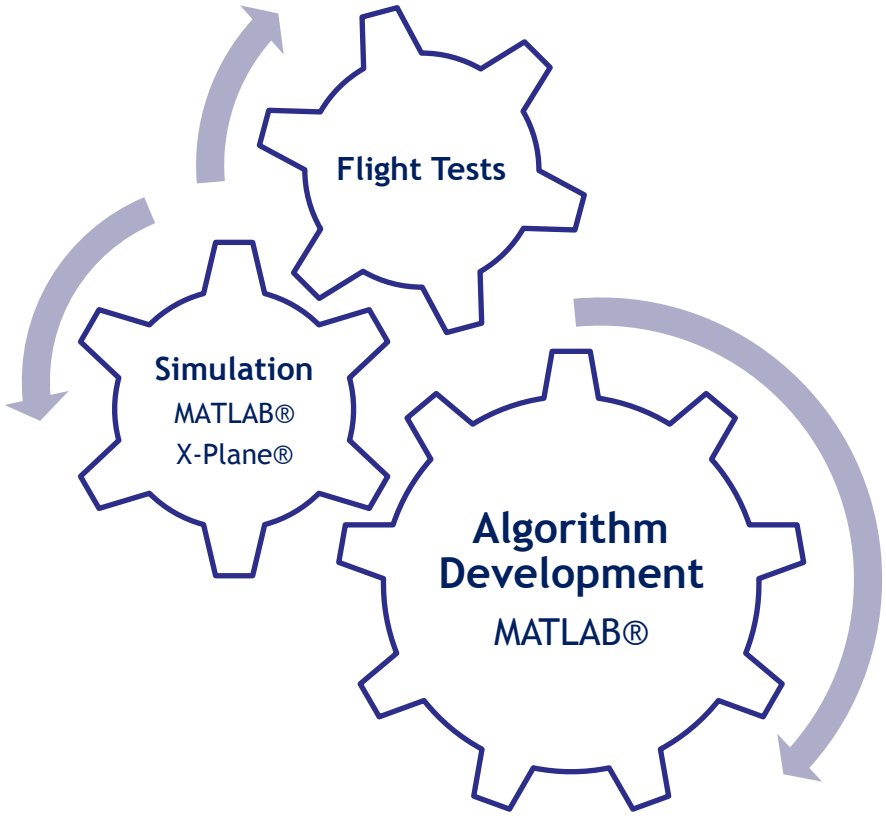
	Pearson Correlation Coefficient					
	Airport 1		Airport 2		Airport 3	
	LCCs' Passengers	LCCs' Movements	LCCs' Passengers	LCCs' Movements	LCCs' Passengers	LCCs' Movements
Safety and Security	0,39	0,43	0,37	0,40	0,37	0,41
Core	0,93	0,90	0,97	0,98	0,91	0,86
Productivity / Cost Effectiveness	0,64	0,71	0,79	0,82	0,65	0,65
Service Quality	0,89	0,85	0,67	0,68	0,78	0,74
Financial / Commercial	-0,67	-0,64	-0,39	-0,41	0,02	-0,02
Environmental	0,87	0,82	0,97	0,96	0,78	0,70
Airport Score	0,934	0,943	0,90	0,92	0,92	0,89

Optimal Robust Trajectory Control of Atmospheric Flights



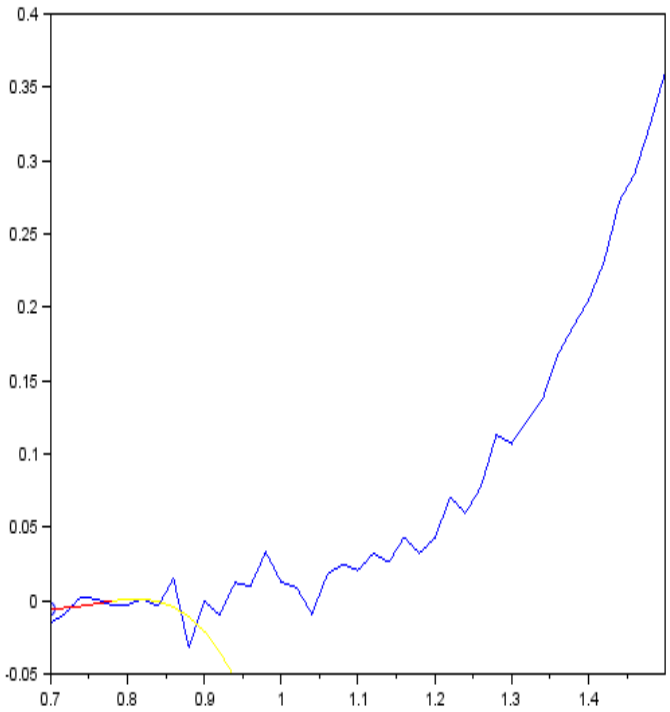
- Existing autonomous navigation procedures are mostly done in 3D;
- Whilst actual flight plan fulfillment requires 4D navigation (Scheduled Times of Arrival);
- Trajectory optimization and optimal control of UAVs along sequences of 4D waypoints.

Optimal Robust Trajectory Control of Atmospheric Flights



- Improve planning and operational efficiency of Flight (fuel efficiency & On-Time Arrivals);
- Improve the stand-alone capabilities of UAVs on out of reach signal range;
- Improve predictability for ATC services providers, thus increasing general aviation safety.

Air Vehicle Trajectory Estimation



Goals

- Identify the navigation trajectory with accuracy;
- Predict the position of the air vehicle;
- Reduce the measurement errors using satellites/radars.

Air Vehicle Trajectory Estimation

Applications

- Air traffic control improvements;
- Reduction of collision risk;
- In an emergency situation, stipulation of best itinerary;
- Interception of intruder vehicles;
- Defense and Security sector.



Robust Pursuit of Intruder Air Vehicles



Goals

- Guarantee and maintain national peace;
- Ensure efficient pursuit;
- Improve mathematical models and methods used so far in air defense;
- Reduce processing time;
- Validate systems.

Robust Pursuit of Intruder Air Vehicles

Applications

- Air surveillance sector;
- Technology and innovation sector.



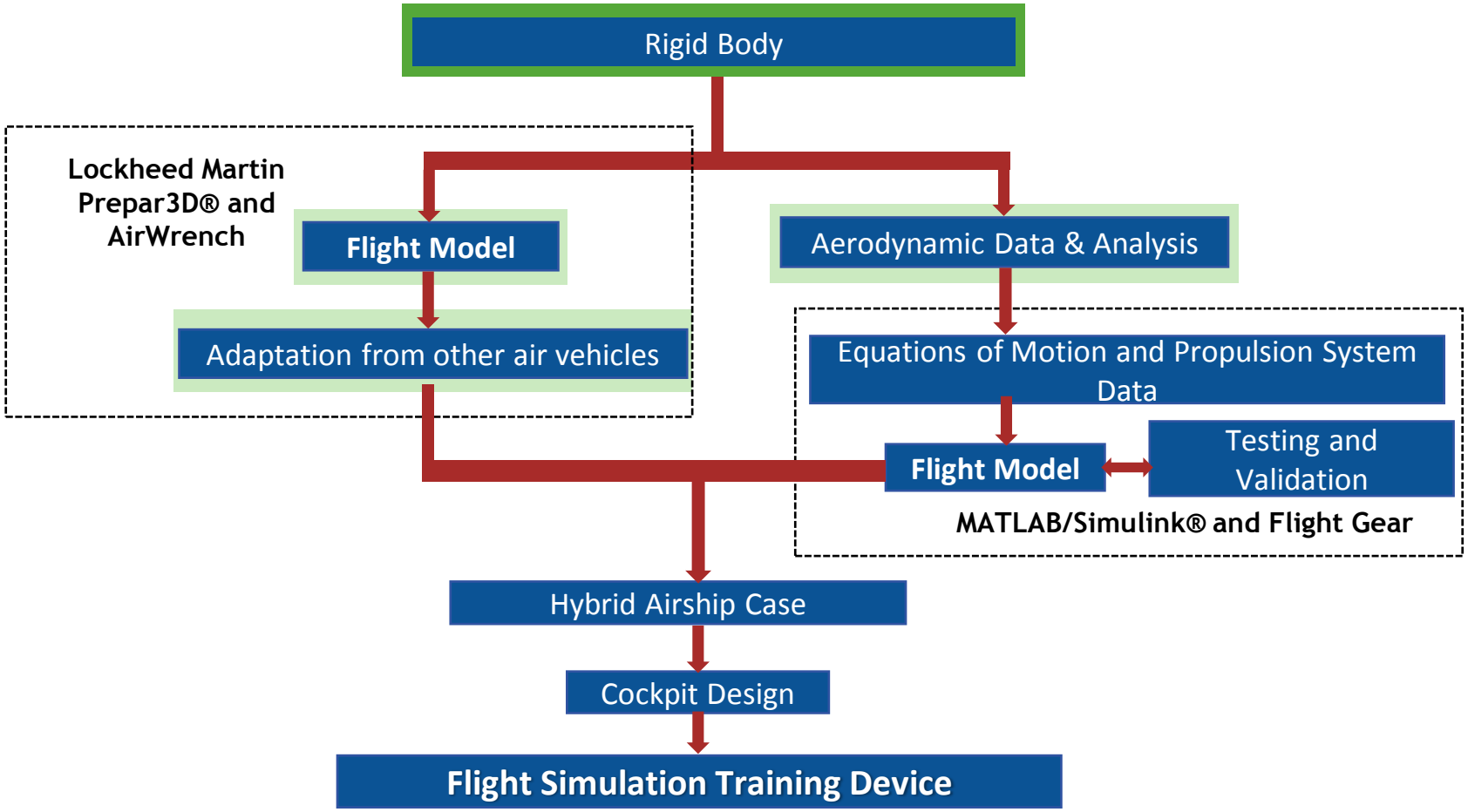
Hybrid Airships: Multifunctional Air Transport System

- Air surveillance and scanning for military and civil purposes:
  - Critical infrastructures;
  - Transport networks;
  - Territory;
  - Coastal;
  - Borders;
  - Search and rescue;
  - Support to communications;
  - Meteorology and weather related analysis.





Hybrid Airship: Flight Simulation Training Device Development



Laura S. N. Martins
Luís G. M. M. Trindade

Hybrid Airships: Multifunctional Air Transport System



Olharapo RPAS

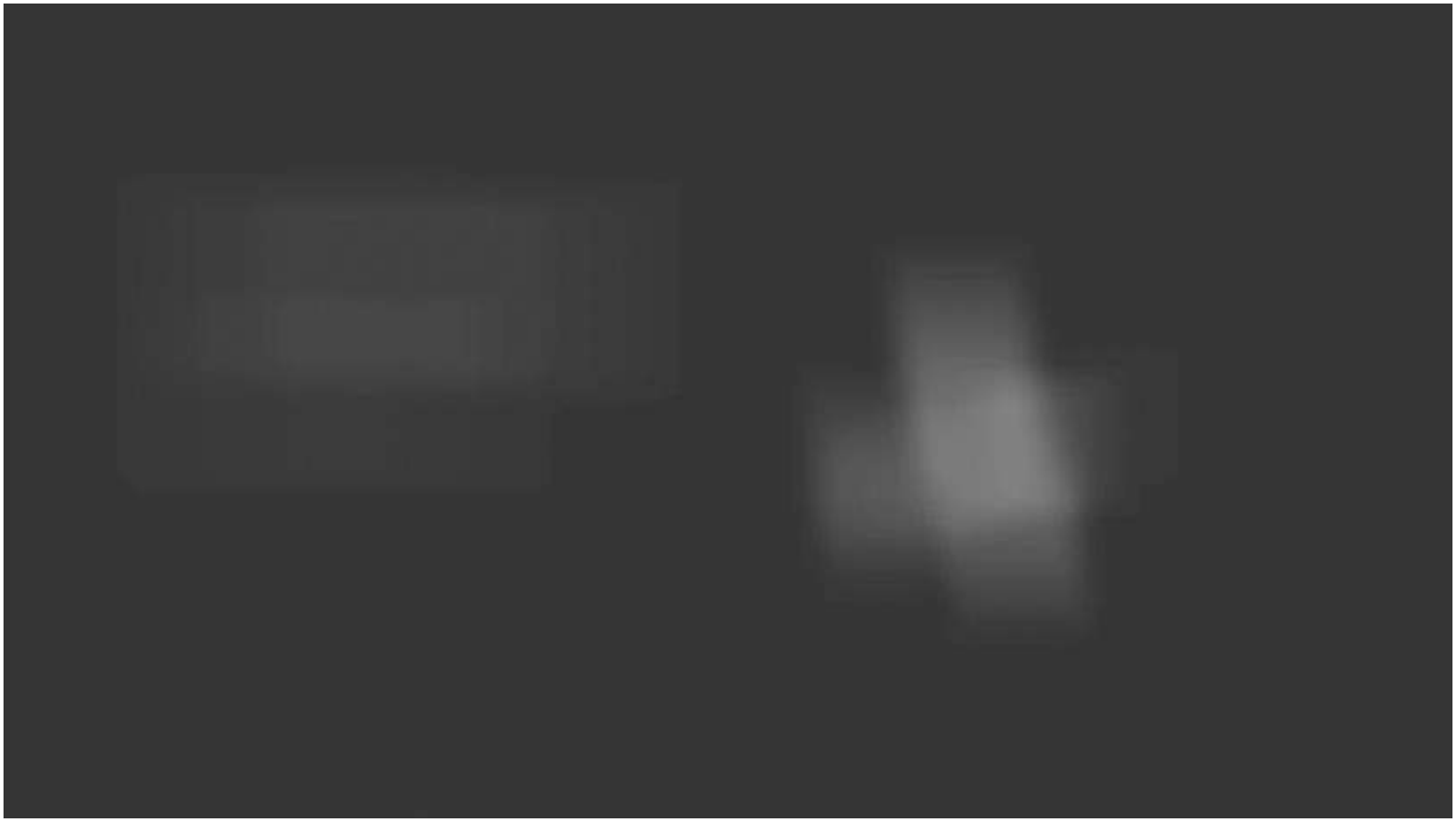
- Objective:
  - Instrumented airframe for telescopic wing performance evaluation;
  - Stable and easy to fly yet low cost;
- Airframe:
  - Span: 2.5m;
  - Takeoff mass: 6kg;
- Systems:
  - First Person View system;
  - Long range radio control system;
  - Autopilot system;
- Performance:
  - Cruise speed: 60km/h to 70km/h;
  - Stall speed: 45km/h;
  - Endurance: up to 60min;
  - Takeoff distance: 60m;







Olharapo RPAS



Solar UAV

- Objective:
  - Develop UAV capable of flight during 8 hours on the equinox;
  - 132W maximum installed solar power;
  - Consumption less than 60W.
- Results:
  - Endurance up to 5h30min in February;
  - Aerodynamic efficiency up to 18:1.





Solar UAV



Solar UAV



Air Cargo Challenge











- Design, build and fly R/C Airplane that lifts as much payload as possible and perform a task given design and operational requirements;
- Participation since 2003, UBI achieved three 1st places and one 3rd place;
- UBI has organized 2 events.

Shell Eco Marathon

- Battery Electric Vehicle Prototype;
- In house scratch built in-wheel coreless permanent magnet AC synchronous motor;
- In house motor controller.



2014



2015

19th place (among 33 scoring teams), with 331km/kWh.

Shell Eco Marathon



11th place (among 29 scoring teams, 37 total teams in battery electric prototype vehicles), with 372 km/kWh.

Flight Simulation Meetings









Airborne Projects

AIRBORNE PROJECTS

Main Office: Instituto Pedro Nunes Edf. C, Coimbra| Portugal
Email: info@airborneprojects.com

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