Aerial Sonic Anemometry for wind resource assessment Preliminary results of ASA project

Ribeiro[1], L. M. F. & Marques, F.

[1]frolen@ipb.pt

University of Porto & Polytechnic Institute of Bragança (Portugal)

Project Outlook

This project intends to recurr to sonic anemometers in a airborne platforms to get wind information over the flying area between met masts or waypoints. Multiple platforms measuring simultaneously to complement ground based measurements.

The concept is being tested and preliminary results show that key issues are related to the positioning system – differential GPS and autopilot.

Development

Airframe

Objectives:

Construction, adaptation and use of sonic anemometer installed in aerial platform

Sonic anemometer in the plane

Location concerns:

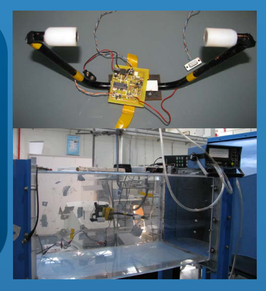
- Flow distortion from fuselage can influence sonic anemometer measurement of wind fields. CFD models and wind tunnel will be required.
-The massive structure of a sonic array causes distortion in the flow over the plane.
-The plane aero dynamical behaviour must be regular.

Instruments and logging devices

Ultrasonic Anemometer/Thermometer

Commercial models

In house development for specific purposes

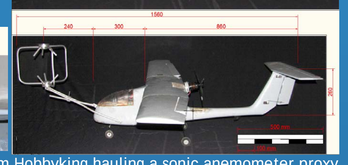


Logging devices

In house development for specific purposes

Propulsion Location

front
wings ?
middle
aft



Plane specifications:
Wing Span: 1660 mm
Fuselage: 1190 mm
Motor Mount Diameter: 58 mm
Dry weight: 1300 g
Wing Area: 3210 cm²

Model plane FPV-168 from Hobbyking hauling a sonic anemometer proxy

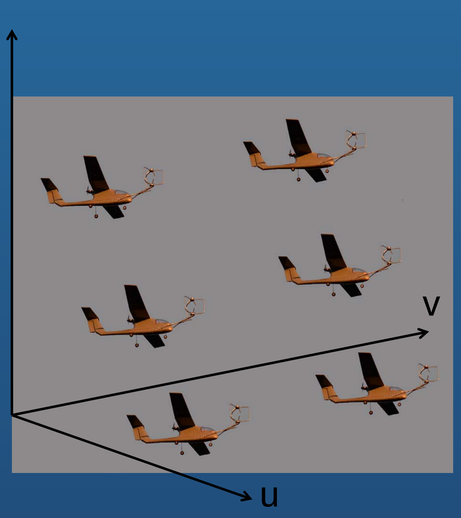
Aircraft control tests

To get the maximum control of the plane 8 flying tests were done in order to determine the most suitable centre of gravity point. This is an important issue that lead to an easier flight control and will be even more important for automatic flight control systems.

Perfectly controlable in dificult situations:
- Landing;
-Take off.

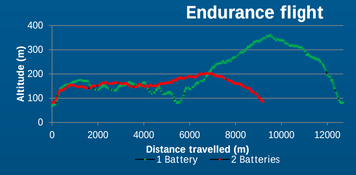
Autopilot

Under selection of different solutions – commercial or research equipment. Open to suggestions...

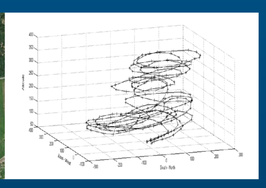


Flight results

Endurance flight tests with 1 and 2 batteries were done with success using an etrex Garmin GPS for track logging. With 2 batteries the payload limit was reached.



	Maximum Velocity (m/s)	Mean Velocity (m/s)	Mean Sample Rate (Hz)	Flight Time (min:s)	Distance (m)
1 Battery Flight	27,18	17,66	0,41	11:48	12663
2 Batteries Flight	23,56	15,80	0,39	9:38	9209



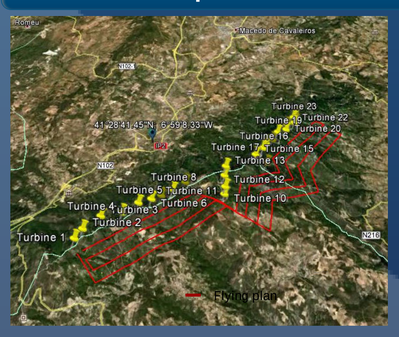
Finality

Scale-up

More than 1 sonic measuring simultaneously

Measurements

Complex flows over complex terrain



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