

# Laboratory of measure on drones Builders of drones testing tools

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## Introduction

This research about drones performance and safety started three years ago at High School IPSIA "Pacinotti" in Foggia, Italy, with my students. Our results are now under the eyes of the world: with a simple test, we are able to diagnose drones faults and quantify the risk of their flight through a single, novel, validated efficiency benchmark.

We are now working as a laboratory to measure, certify and share all the hidden parameters of the drones, from 250 g to 15 kg payload.

Big support and cooperation exist in Italy from IPSIA "Pacinotti" of Foggia, University UniSannio of Benevento, Politecnico of Bari.

## DronesBench Objectives

1. Help the regulators assess drones and increase flight safety;
2. Help the general public evaluate and compare the technical quality of drones in the consumer segment of the market;
3. Help the manufacturers study criteria to improve the technical quality of their drones and certify their efficiency as a whole.

## Methods



The DronesBench is able to measure contemporarily and without disassembling the drone: (i) the thrust provided by the drone, (ii) the instantaneous power consumption of the drone, and (iii) the pitch, yaw, and roll instantaneous angles during the test.

The force measurements can be used to detect failures referred to ESC-motor-propeller subsystem. The force and power consumption values can be used together to quantify the power efficiency. The pitch, yaw, and roll instantaneous measurements are useful for analyzing the system stability.



The dissemination of a prospective, novel benchmark for the power efficiency of the drone as a whole, the DronesBench Index (DBI), is being pursued with EASA and IEEE regulators. Significant decreases of the DBI reveal hidden defects. The DBI may appear on the drone's plate as measured at the manufacturer factory and then assessed periodically by independent verification and certification organizations.

	Builder: <b>Flytop, Roma</b>	Model: <b>Flysmart 2.0</b>
Date check: <b>26 giu 2016</b>	Weight: <b>2400 g</b>	Battery: <b>Lipo 4s 6c 10 Ah</b>
DBI (DronesBench Index): <b>75,41 mN/W</b>	Minimum DBI at take-off: <b>60,31 mN/W</b>	Max power: <b>722 W</b>

Example of drone's plate

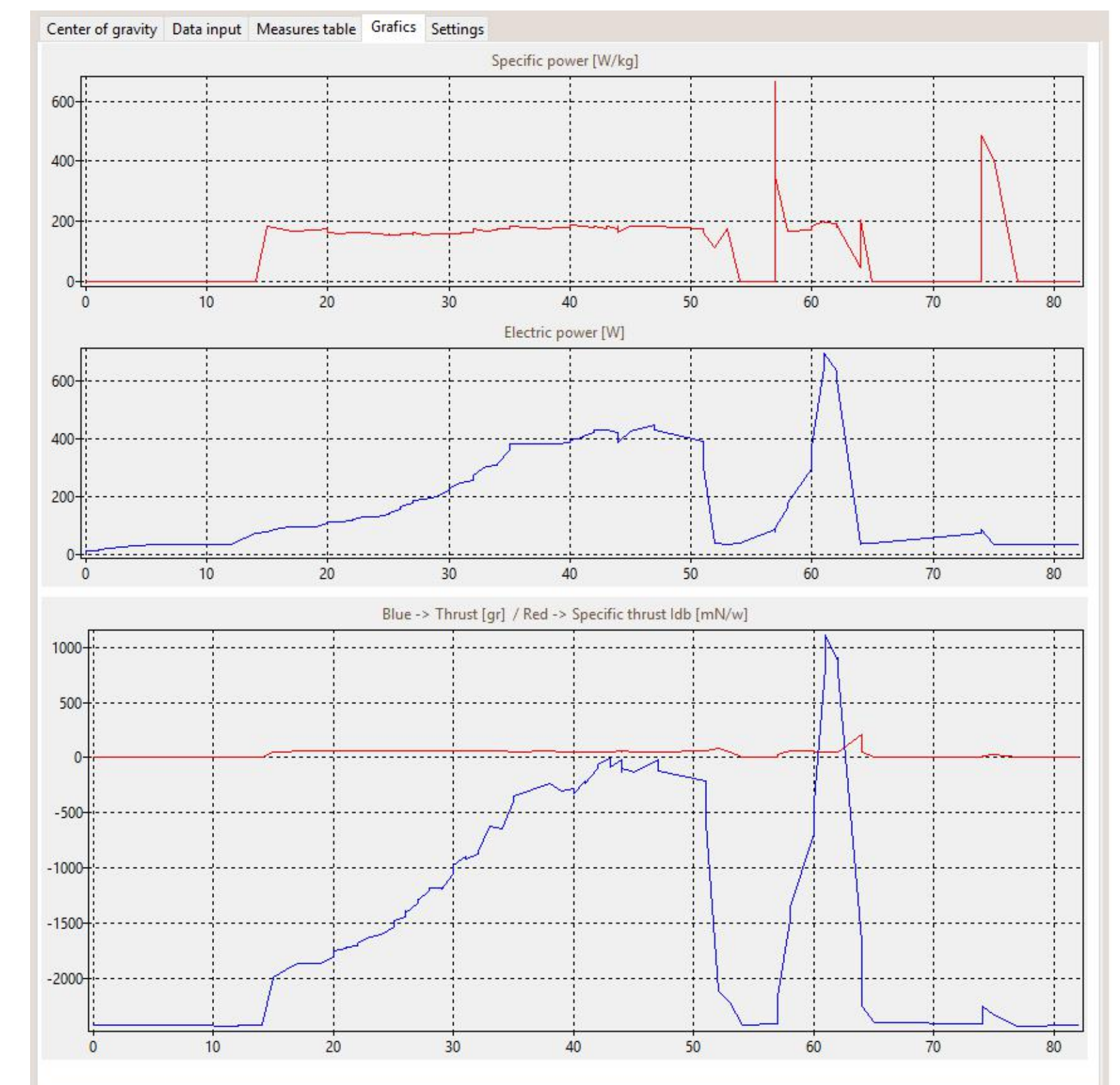
## Results

DronesBench has been used to assess a commercial quadrotor drone Tali H500 having the diagonal wheelbase length and weight equal to 490 mm and 2.42 kg, respectively. The test was executed in 77 seconds, with the pilot performing two throttle variations from the minimum to the maximum values allowed by the drone.

The DBI value was 53 mN/W at take off and 50 mN/W at maximum power, which is low in this market segment. It shows that there are margins to improve the efficiency of this drone.

Post test, we suggest to use a battery with bigger C (>6) and propellers with bigger pitch and diameter.

With the DBI from the factory reported on the plate, our tests might compare and evaluate if something changes.



Parameter	Motors stopped	Take off	Max power
Voltage [volt]	23.9	23.2	22.8
Current [ampere]	1.1.5	19.2	30.4
Power [watt]	28 medium	445	694
Thrust [grams]	0	2420	3530
DBI (FoM) [milli newton/watt]		53	50
Specific power [watt / kgf]		185	196

Drone measurements performed by external power supply

## Business Opportunities

- Laboratories for the measurement and certification of drones: we are looking for companies or institutions in the EU and the US as potential partners or franchisee at national level.
- Educational sector: we are looking in the EU and the US for national distributors of the DronesBench technology for technical high schools and universities.
- Testing tools and custom r&d activities: we are open to requests. We are collecting data from every drone tested with our benches.

## References

- [1] P.Daponte, F.Lamonaca, F.Picariello, M.Riccio, L.Pompetti, M.Pompetti, "A measurement system for testing light remotely piloted aircraft", Proc. of IEEE International Workshop on Metrology for AeroSpace (MetroAeroSpace), Padua, Italy, 21- 23 May 2017, pp. 397-402.
- [2] P.Daponte, L.De Vito, F.Lamonaca, F.Picariello, S.Rapuano, M.Riccio, L.Pompetti, M.Pompetti, "DronesBench: a tool for the diagnosis of drones" Proc. of IEEE International Conference on Instrumentation and Measurement (I2MTC), Turin, Italy 22-25 June 2017, pp.1-6
- [3] P.Daponte, L.De Vito, F.Lamonaca, F.Picariello, M.Riccio, S.Rapuano, L.Pompetti, M.Pompetti, "DronesBench an innovative bench to test Drones", Instrumentation and Measurement Magazine.

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