



## TESTS of E-PROPS PROPELLERS

Like most propellers, E-PROPS propellers are tested to meet the requirements of aviation standards and to ensure that the products supplied are as reliable as possible. But E-PROPS wanted to go far beyond the usual requirements, and propose propellers in constant improvement and always safer.

To achieve this, the company's Research Department has developed test facilities that are rarely found in light aviation propeller manufacturers : Data Acquisition System to record in-flight performance (MERLIN), means of measuring the stresses undergone by the propeller during flight (ELIAS), many instrumented ground test benches.

The company's aircraft allow flight test campaigns of all propeller models and prototypes, from the airfield of Sisteron-Vaumeilh (LFNS).

In 2020, E-PROPS hired a test pilot, Samy Dupland, to conduct all flight and ground tests.

### 1 – Tests on ground

All E-PROPS models are tested in order to be sure of their performances, of their mechanical strength, and if they match with the engines.  
Indeed, for each new model, it is necessary to compare calculations and physical reality.

Some tests have also been made in wind tunnel, during special developments for UAV.  
These tests are confidential and cannot be communicated.  
Many hypotheses have been tested, then enriched the

Many videos on tests are available on the E-Props Youtube Channel :  
<https://www.youtube.com/c/eprops>

### 2 – Tests in flight

The E-PROPS team conducts flight tests on its own aircraft and microlights, as well as tests with partners and customers.  
These tests are carried out to verify propeller parameters and performance, and to validate certification requirements (ASTM, EASA, FAA).

Links to numerous test reports can be found in the propeller comments section of the E-Props catalog.

### 3 - Means for tests on ground

- Test bench with instruments and traction measurement system.
- Fatigue tests bench, to stress the blade with alternating bending, to reproduce the engine's torque, and to establish the real MTBO of the propellers.
- Traction tests bench. 40 tonnes hydraulic cylinder.



*banc d'essais en rotation / banc de fatigue / banc de traction*

### 4 - Means for tests in flight (Aircraft, MERLIN, ELIAS)

In 2015, the E-PROPS team has acquired a SKYRANGER ultralight with a 100 hp Rotax 912S.

The SKYRANGER is a good aircraft to test over a speed range from 30 to 190 km/h.



It is the "prototype" of E-PROPS, which we equip with many recording systems.

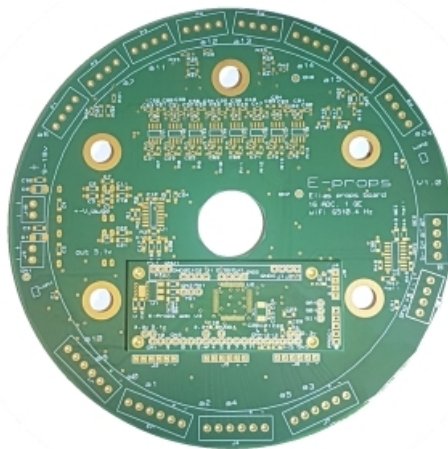
This aircraft has a very simple "tubes and fabric" structure, which facilitates the mounting of various equipment, such as a boom under a wing for speed and incidence measurements, a cockpit equipped with many instruments and cameras, etc...

A very important part of the development of the propellers is carried out with this SKYRANGER 100 hp, piloted by the E-PROPS test pilot. Once validated on this first speed range, our propellers are tested on faster airplanes, from 200 to 350 km/h.

This DAU (Data Acquisition System), called MERLIN, designed and manufactured by the E-PROPS design department, allows to obtain the following parameters at each moment of the flight:

- propeller thrust
- propeller torque
- $T^{\circ}$
- static et dynamic pressures
- engine RPM
- engine  $T^{\circ}$  and manifold pressure
- angle of attack and angle of sideslip

A complex system of different types of sensors, electronic card and strain gauges is integrated in the propeller's hub, on the feet of the blades, and on other key places of the airplane. During the flight, thousands of measurements are sent in real time via Wifi to a computer located in the aircraft, as well as to a display that allows the pilot to refine his flight according to the requested parameters.



*ELIAS : DAU electronic card*

The obtained results are far more precise and realistic than tests in wind tunnel, and they are obtained in a very short time (during the flight). To obtain the same number of data, this would be needed years of tests campaigns in wind tunnel. Besides, nothing replaces the real conditions of flight.

Then data are integrated in the LUKY software.

This set of tests resources and analysis (airplane + DAU + software) provides valuable assistance to the E-PROPS design department.