

PLUG'n'FLY PROPELLER : CENTRIFUGAL LOAD TESTS

Centrifugal load tests are very important test in order to define the mechanical resistance of the propellers. In certified aviation (in Europe), they are defined by EASA Certification Specifications for Propellers (CS-P). The aircraft propeller must be tested for a period of one hour to a load equivalent to twice the maximum calculated centrifugal load. The propeller must show no failure or permanent deformation.

1. CALCULATION OF THE CENTRIFUGAL LOAD

$$\|\vec{F}\| = m\|\vec{a}\| = m \cdot \omega^2 \cdot R$$

The maximum centrifugal load on a PLUG'n'FLY propeller at 3.000 tr/min has been calculated by the software LmPTR© : 7.000 N (714 kg).

In this case, the CS-P for certified propellers says that the propeller must be tested for a period of one hour to a load of 14.000 N (1,4 tonnes).

2. TEST OF CENTRIFUGAL LOAD

Hélices E-Props has developed an hydraulic load test bench.

High : 3,5 m, weight : 300 kg, and maximum load 40 tonnes.



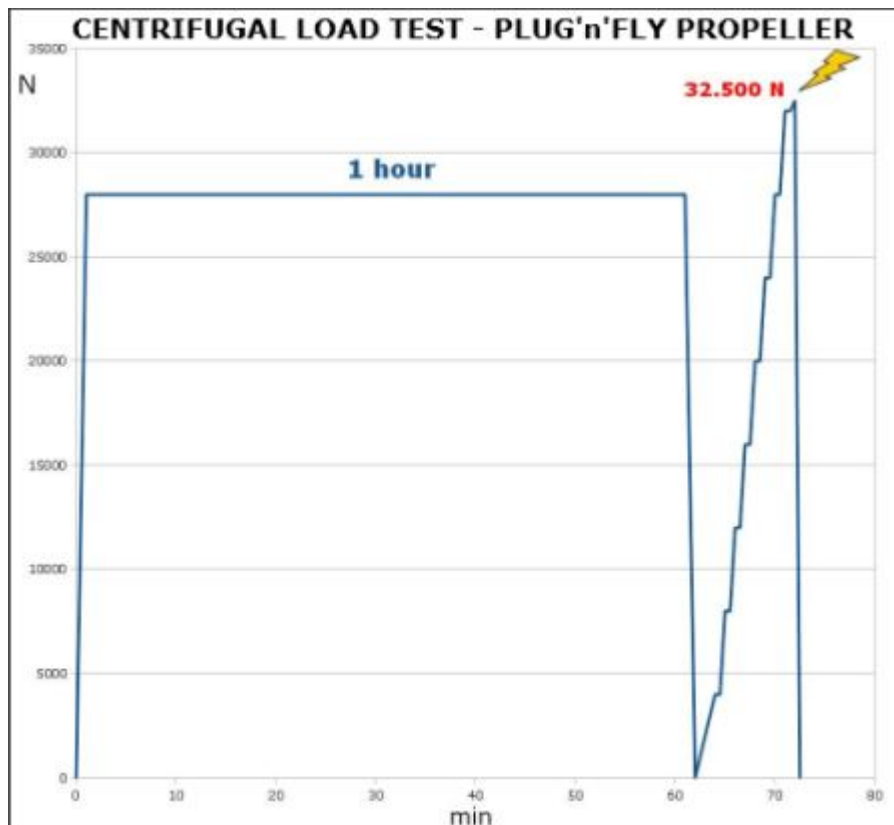
load hydraulic test bench and Plug'n'Fly propeller on the test bench

Date of the tests : 6 November 2013

Carbon Plug'n'Fly propeller

1/ Application of a load of 28.000 N (2,9 tonnes) during 1 hour. Then control : nothing to report.

2/ The load increases at 4.000 N per minute => break of one blade at load 32.500 N (3,3 tonnes).



3. RESULTS OF THE TESTS

The maximum centrifugal load at 3.000 RPM is 7.000 N, so the safety coefficient of centrifugal load is 4,6.

The propeller can hold 4 times the maximal load during 1 hour without any damages.

The EASA CS-P for certified aircraft propellers says that the propeller must be tested for a period of one hour to a load of 14.000 N. The propeller has holded a load of 28.000 N during 1 hour, it means twice what is asked by EASA CS-P.

Conclusion :

The propellers made by Hélices E-Props are not only the lightest and the most efficient, but also the strongest of the market.

E-Props manufacturing process allows to use the exceptional characteristics of the carbon, in order to obtain propellers 3 times lighter than the other propellers on the market, and 2 times stronger as asked by the EASA certifications specifications CS-P for certified aircraft propellers.