

## E-PROPS : the world's lightest propellers

For E-PROPS, it is essential to design and realize the aeronautical equipments as light as possible, not for communication and regulation reasons, but only to respect the laws of physics.



*3-blade DURANDAL-3 diameter 170 cm, Titanium leading edge protection,  
with all screws = **2,1 kg***

### 1- Advantages of a light propeller

1.1 - First of all, in aviation, any weight savings are important.

1.2 - Then, the light propellers allow a better functioning of the engine :

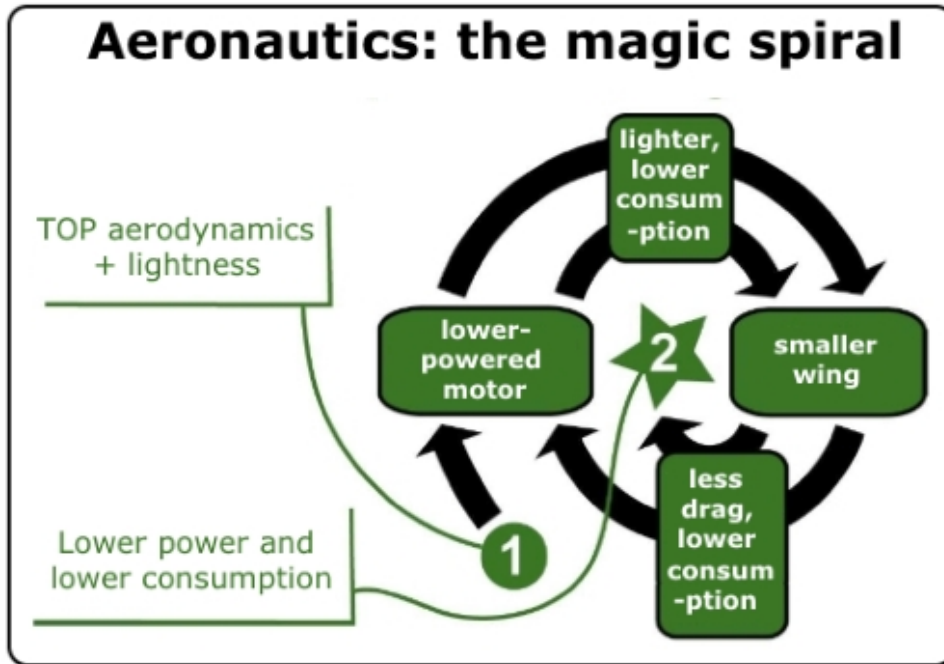
- better performances of the engine on the whole RPM range
- better linearity of the engine RPM
- smoother starting and shutdown
- much less constraints on the reducer [a]
- less vibrations due to the propeller

[a] A light propeller allows to respect the maximal value of the MOMENT of INERTIA of the engine.

Using of a propeller with a moment of inertia upper to the values indicated by the engines manufacturers is going to decrease of the longevity, even to break the reducer or the screws of the propeller.

1.3 - Then, a low moment of inertia also makes the propeller more reactive :  
 - this allows a direct and enjoyable piloting, without strength, without gap between pressing the accelerator and the increase of RPM.  
 - the propeller stops very fast : that is fewer risks of break in case of shock in the propeller. Less stored kinetic energy = fewer damages in case of impact.

1.4 - Last but not least, a lightest propeller increases fuel range and safety significantly. For example, a weight gain of 4 kg (common with E-Props !) = 5,6 liters of fuel, which allows to fly 50 km more with an aircraft with a Rotax 912 (consumption of 16 l/h). A real gain.



## 2- Why the E-PROPS are the lightest propellers ?

### 2.1 - Because of their design

The E-PROPS team is always working to propose very light products, because in aviation, mass is the bigger enemy.

From the beginning of the propeller design to the final finish, including all manufacturing process, every step has been thought to save weight as far as possible by the E-PROPS team.

Everything starts with Design. A well-kept and well-thought design of the parts makes possible to save mass significantly.

### 2.2 - Because of their materials

The E-PROPS are made in carbon braid, with continue fibers between upper and lower surfaces of the blade (very high resistance).

The carbon presents by far the best compromise rigidity / weight. E-PROPS parts have a very high carbon fibers ratio (63%).

The epoxy resin is the resin preferred in aeronautics.

The E-PROPS are made with only carbon braid and epoxy resin : no fiberglass, no mixture of materials.

The leading edge is made in Titanium, which is twice as light as Steel or Inconel.

*Simplicity is the ultimate sophistication !*

### **2.3 - Because of their manufacturing process**

The E-PROPS parts are injected with the RTM process (Resin Transfer Molding), which allows to save epoxy resin, while staying very strong.

This process is used by some major companies as AIRBUS or BOEING, in order to reduce the weight of airliners structural parts, while keeping a high strength.

RTM requires large investments, then it is very efficient to produce ultra-light parts, and allows to have a big production capacity.

### **2.4 - Because of their finish**

E-PROPS propellers are polished : it is the lightest solution and the blades stay shiny during their all life.

They do not have a heavy gel-coat layer or paint coat, as many competitors props, which could shines when they are new, but which ages very quickly.

A gel-coat layer can add more than 400 gr on a 3-blade 170 cm diameter propeller, et cannot be repaired once damaged.

## **3- Could a propeller be "too light" ?**

No.

It is sometimes said that a heavy propeller is required for the engine to "rotate" at ground idle, that is, have a more constant rotating speed.

But if the speed variations are smaller, the variations in the forces between the propeller and the pistons (on the whole mechanical chain, reducer or not) are more important. And speed variations don't cause damage, whereas forces variations, yes.

The major engines manufacturers give very low values of MOMENT of INERTIA.

This shows that there is no problem to put a very light propeller, with a very low Moment of Inertia, on aeronautical engines.

Even a very light propeller generates a sufficient flywheel. With an ultra-light propeller, the idle adjustment would be different, that's all.



#### 4- Propellers weights comparative

Here is a comparative of 3-blade composite propellers, tractor configuration, for Rotax 912S (100 hp) engines, ground adjustable pitch, diameters about 170 cm, screws included, without spacers.

<b>brand</b>	<b>model</b>	<b>materials</b>	<b>blades #</b>	<b>diameter in cm</b>	<b>weight in kg</b>	<b>gap in kg</b>
E-PROPS	DURANDAL-100 V20	carbon	3	170	<b>2,1</b>	<i>ref</i>
PESZKE	B-LINE	glass fibers	3	170	<b>3,5</b>	<b>+ 1,4</b>
DUC HELICES	SWIRL-1	glass fibers + carbon	3	170	<b>3,8</b>	<b>+ 1,7</b>
IVOPROP	ULTRALIGHT-QUICK	glass fibers + carbon	3	170	<b>3,9</b>	<b>+ 1,8</b>
KIEVPROP	MODEL 273	glass fibers	3	171	<b>4,1</b>	<b>+ 2,0</b>
WOODCOMP	KLASSIC	glass fibers	3	170	<b>4,3</b>	<b>+ 2,2</b>
SENSENICH	3BOR5R68C	glass fibers	3	172	<b>4,4</b>	<b>+ 2,3</b>
HELIX	H60F	glass fibers	3	170	<b>4,4</b>	<b>+ 2,3</b>
DUC HELICES	WINDSPOON	glass fibers + carbon	3	172	<b>4,5</b>	<b>+ 2,4</b>
DUC HELICES	SWIRL-3	glass fibers + carbon	3	170	<b>4,5</b>	<b>+ 2,4</b>
DUC HELICES	FLASH	glass fibers + carbon	3	170	<b>5,1</b>	<b>+ 3,0</b>
WARPDRIVE	HPL	carbon	3	172	<b>5,1</b>	<b>+ 3,0</b>
FITI DESIGN	ADJUSTABLE MODEL	glass fibers	3	168	<b>5,3</b>	<b>+ 3,2</b>
NEUFORM	CR3-65-(IP)-47-101,6	glass fibers	3	170	<b>5,4</b>	<b>+ 3,3</b>
ARPLAST	ECOPROP	glass fibers	3	168	<b>5,8</b>	<b>+ 3,7</b>



Here is a comparative of 3-blade composite propellers, tractor configuration, for Rotax engines, inflight variable pitch, spinners & screws included, without spacers.

### Constant Speed Propellers - Weight Comparison

Brand	Ref	Type	Rotax	Technology	TBO in hrs	Diameters in cm	Weight	
							in kg	in lb
E-Props	GLORIEUSE-3	electro-hydraulic	912S, 914, 915iS	Full Carbon	2000	155 to 190	<b>4,1</b>	9,0
Duc Hélices	SWIRLBLACK-3	hydraulic	912S, 914	Carbon + Alu	1500	162 to 190	<b>9,8</b>	21,6
Duc Hélices	FLASHBLACK-3	hydraulic	912S, 914	Carbon + Alu	1500	152 to 190	<b>9,9</b>	21,8
Woodcomp	SR3000/3N	electric	912S, 914	Wood + Alu	700	160 to 178	<b>13,8</b>	30,4
Woodcomp	KW-31	electric	912S, 914, 915iS	Wood + Alu	700	160 to 170	<b>13,8</b>	30,4
Woodcomp	KW-21	hydraulic	912S, 914	Wood + Alu	700	160 to 174	<b>14,8</b>	32,6
Woodcomp	KW-30	hydraulic	912S, 914, 915iS	Wood + Alu	700	160 to 170	<b>15,2</b>	33,5
MT Propeller	MTV-34-1	hydraulic	912S, 914, 915iS	Wood + Alu	1500	150 to 178	<b>15,2</b>	33,5
MT Propeller	MTV-7-A	electric	912S, 914, 915iS	Wood + Alu	2000	140 to 190	<b>16,5</b>	36,4

