

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 ground adjustable model 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.

How Aircraft Weight Affects Performance ?

The weight and balance of an aircraft are crucial to its performance. If an airplane is overloaded or improperly balanced, its ability to fly safely and efficiently is compromised. Weight directly impacts several aspects of an aircraft's operation :

✦ Reduced Climb Performance

A heavier aircraft requires more lift, which increases drag and reduces climb rate. To climb at a steeper angle, excess thrust or power is needed, but weight increases drag, limiting this ability.

✦ Increased Fuel Consumption

With more weight, the aircraft needs a higher angle of attack (AOA) to generate lift, which increases drag. To counteract this, the engine must work harder, burning more fuel.

✦ Lower Cruise Speed

An overloaded aircraft will fly slower at the same power setting, reducing its efficiency and range.

✦ Higher Stall Speed

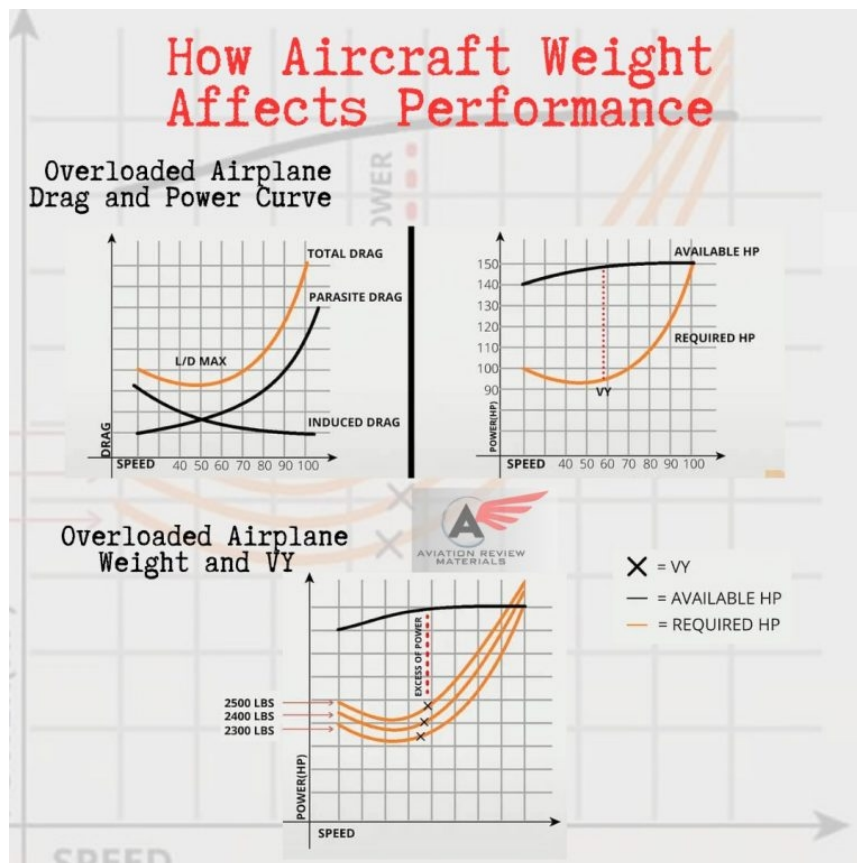
As weight increases, the required airspeed for maintaining lift also increases. This means that the aircraft will reach its critical angle of attack (stalling point) at a higher speed, which can be dangerous.

✦ Longer Landing Roll

Overloading requires the aircraft to travel a greater distance on the runway to achieve enough speed for lift-off, and similarly, a longer distance is needed to stop during landing.

✦ Risk

Overloading can cause structural damage, particularly during maneuvers or landings. Aircraft are designed to withstand specific load factors (G-forces), and exceeding weight limits can lead to structural fatigue or failure.



In conclusion, aircraft weight directly influences performance in several critical areas, including climb rate, fuel efficiency, speed, stall speed, and structural integrity. It is essential for pilots to operate within weight and balance limits to ensure safe flight.

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

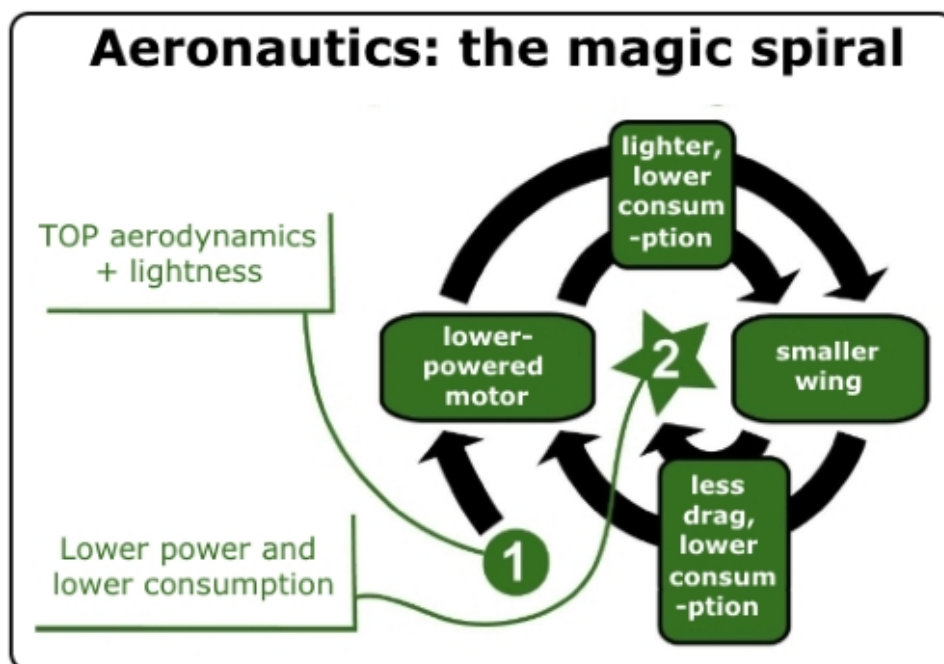
[a] A light propeller allows to respect the maximal value of the **MOMENT of INERTIA** of the engine.

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.

