

## **E-PROPS : LEADING EDGE PROTECTION**

The leading edge of the propellers blades needs a reinforced protection, against stones impact or other projectiles, and sometimes against erosion possibly generated by rain and sand.

E-PROPS proposes two solutions to reinforce its carbon blades : a Titanium leading edge protection and a leading edge protection in Nanostrength shock additive.

### **1- TITANIUM LEADING EDGE PROTECTION**

Since October, 2019, the E-Props propellers V20 range include a Titanium protection on the blade leading edge, 5/10e thick and 40 cm long (on propellers with diameters > 170 cm).

E-Props uses a superplastic forming process of the Titanium, like for the leading edges of the Rafale aircraft.

TITANIUM is the ideal material for blade leading edge protection thanks to its mechanical characteristics :

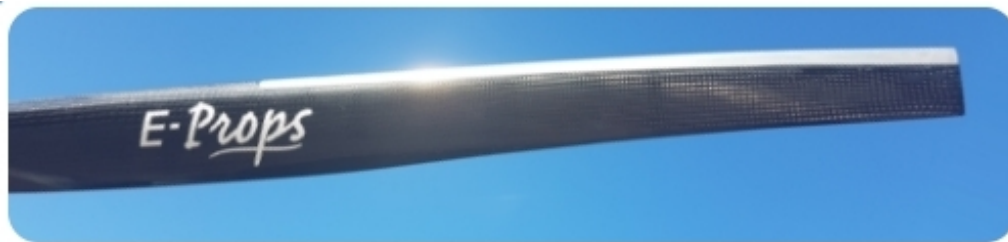
- specific resistance outpacing Aluminium and Steel
- expansion and elasticity close to carbon – epoxy
- exceptional corrosion resistance (in particular in marine climate)
- Titanium is twice as light as Steel or Inconel



Note:

- if the Titanium leading edge protection is damaged, E-Props can change it, without having to change the whole blade.
- the blades with a Titanium leading edge (V20 range) are specifically manufactured: the mould integrates a place (respecting the blade profiles) where E-Props comes to glue the Titanium leading edge protection. The blades of the V12 range do not have this place and therefore cannot receive Titanium leading edge protection.

The 3-blade Durandal model, full Carbon with Titanium leading edge protection, diameter 175 cm, weights 2 kg only (hub + blades + screws).



## 2 - LEADING EDGE PROTECTION : NANOSTRENGTH® SHOCK ADDITIVE

Each E-Props carbon propeller which has no Titanium leading edge protection has a protection with Nanostrength® additive shock in the epoxy resin.

Made by ARKEMA, Nanostrength® are new innovative additive to reinforce epoxy resin, with high energy absorbing capability.

The resin with Nanostrength® is injected in the leading edge during the manufacturing of blade in RTM (Resin Transfer Molding). It is completely integrated in the blade, without unsticking risks or materials incompatibility, and with a perfect respect for profiles.

This additive has been selected because the leading edge protection of the E-Props propellers range is more resistant as Steel or Inconel 5/10e (see COMPARATIVE TESTS below), and far more easier to repair in case of shocks.

It has been developed for the UAV with Rotax 914 that E-PROPS equips since 2008, and for ultralights and aircraft which are flying in Africa, on non-prepared airfields in laterite.

E-PROPS customers prefer this type of leading edge reinforcement to Steel or Inconel one (we are not talking here about Titanium), because :

- integrated in the blade : no risk of detachment
- no part in Steel or Inconel = no risk of galvanic corrosion
- reinforcement all along the leading edge
- no extra weight on the tips : smaller Moment of Inertia
- possibility to easily repair the leading edge protection, even on a big impact (when a metallic leading edge must be changed - or the whole blade) : every pilot can make this repair himself, with the E-PROPS repair kit

### 3- EXTRA PROTECTION : POLYURETHANE TAPE

In some specific cases, for example :

- seaplanes
- very long flights under very heavy rains (like monsoon) at high engine RPM
- paramotors : barefoot flights (just above the water surface or the beach) (please note that E-PROPS does not recommend those types of extreme flights) it could be interesting to put an extra protection on the blades leading edge, when they have no Titanium leading edge protection.



For those types of flights, E-PROPS recommends to add a polyurethane protection tape. This polyurethane protection tape is made from very high performance elastomer, resistant to erosion, abrasion, punctures, minor impact damage and tears. Its formula is also resistant to ultraviolet light. Its thickness is 0,36 mm.

This specific polyurethane protection tape is used on certified helicopter rotor blades. This protection tape does not impact the aerodynamic performances of the blades. The E-PROPS team has made many tests which all show that the performance gap between a blade with a polyurethane protection tape and a blade without this tape is not measurable.

This tape is clear and adhesive on one side. It can be painted or applied on painted surfaces.

The relative rigidity of this material makes it very easy to install and change.

