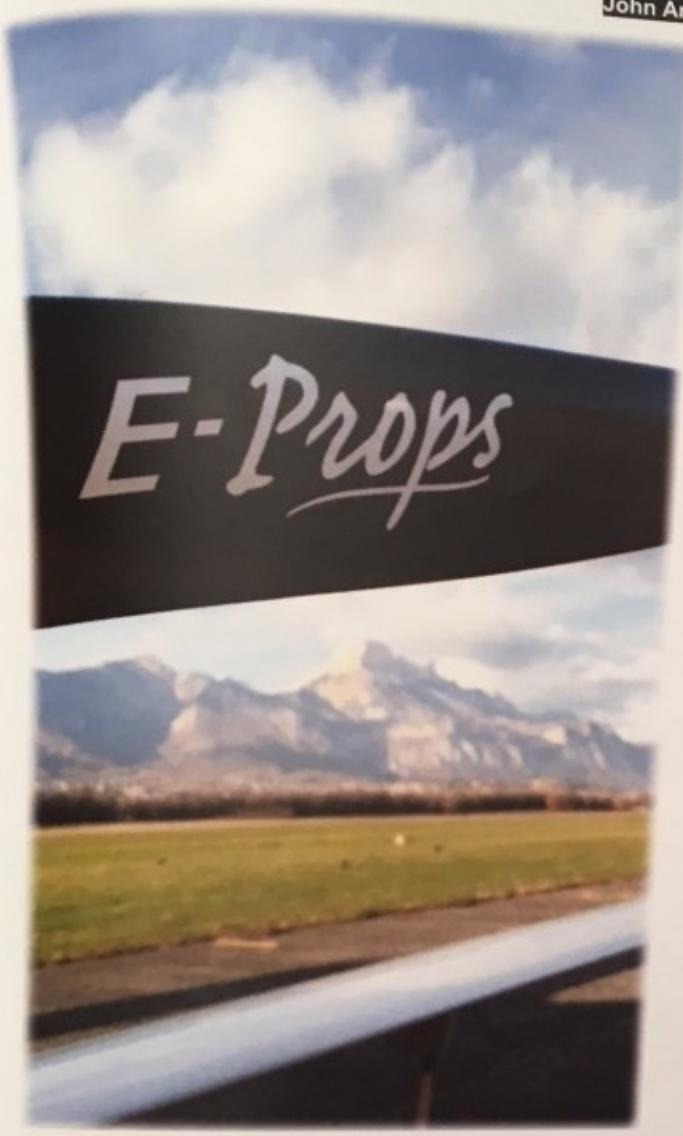
COMPARATIVE between a WARP DRIVE and a E-PROPS

A new prop in the LSA market!

John Archer



My Europa, kit number 192, like many other early models is fitted with a Rotax 912 UL engine and a Warp Drive propeller.

She spent her early years in the flat lands around Brittany, la Baule to be precise but when I acquired her the modus operandi changed as I live in Grenoble nestled in French Alps.

Being a keen mountain pilot it was clear that although I like the speed, comfort and economy that the 80 hp engine provides (in a Europa) for touring I wanted to optimise take-off performance.

I started by looking at the propellers on the market and of course everyone, especially Europaphiles recommended fitting a constant speed prop which I agree does provides the best overall performance in all modes of flight.

However, there was a relatively new company just down the road based on the Sisteron airport. They are making state of the art lightweight carbon composite propellers with what they call ESR (Extended Speed Range) effect.

The simplicity, lightness and cost of a ground adjustable propeller was appealing as was the feedback of their clients. I decided it was worth a try especially as they offer a six months return guarantee if you're not satisfied!

There was one snag however, nobody had previously fitted an E-Prop to a Europa in France so it was the occasion for me to learn the procedure for making modifications to a permit aircraft in France!

There was quite a bit of paperwork to go through and it seemed a bit daunting initially but in fact they are standard procedures and I was fortunate enough to get a template from someone who had fitted any E-Prop on another type of aircraft which helped enormously.

There were six documents to be provided:

1. A document from Europa Aircraft stating they had no technical objections to the modification

2. A request for modification with the objectives sought.

3. Presentation of the material to be fitted

4. A declaration of conformity for the acceptance of a modification to a kit aircraft.

5. Propose a flight test program, this was actually based on Far 23 amendment 7

6. An official request for modification to the DGAC (Direction Générale de l'Aviation Civile) the French equivalent to the UK CAA

And finally a payment of €50 for administration charges which seemed quite reasonable.

I decided to fit a manifold pressure gauge prior to changing the propeller as this would be the only way to make any sort of comparison between them. This idea corresponded perfectly with the card compass in my aircraft failing which provided the perfectly placed hole for the MP gauge. Incidentally, I replaced the compass with a SIRS model and it is just incredible how well it keeps up with the aircraft in turns and it's stability in turbulence.

With the Temporary Permit to Fly from the DGAC in hand I decided to fly down to Sisteron (any excuse for a flight) to get the new propeller fitted at the E-Props factory, a service that they kindly offered gratuitously.

The most striking things about the E-Props are its high twist, the narrow chord and when you pick it up, the weight, only 2.9 kg with all the fasteners and the spinner! I saved nearly 3 kg compared to the Warp Drive

The Temporary permit imposed two hours of flight time prior to heading off cross country which was used constructively to find by experimentation the best angle of the blades, "bedding" them in and re-torqueing the hub.

The flight back to Grenoble le Versoud took us, my wingman and I, also in a Europa through the Alps via several passes and Alpe d'Huez

Once back I repeated the flight test that I had carried out with the Warp Drive in what were very similar meteorological conditions.

As can be seen from the results, take-off distance, initial climb and time to climb 1000' were appreciably improved for essentially the same cruise

The wheel/flaps down initial climb perhaps shows one of the very few weaknesses of the mono-wheel due to the extra drag created by having more flaps than required in that phase of flight.

Comparison between Warp Drive and E-Propellers on a Europa Mono-wheel with a Rotax 912 UL

Climb Speed IAS KTS	Time sec for 1000'	
	Warp Drive*	E-Props**
60	60	51
70	60	52
80	60	52
90	67	58
	Wheel Down 60 KTS	
	82	74
T/O run meters	175	165
Height Gain Feet After T/O ***	200	260
Cruise Test KTS #		
RPM/MP/KTS	4450/26.5/102	4800/26.5/108
RPM/MP/KTS	4800/27.2/112	5000/27.2/111
RPM/MP/KTS	5000/28/118	5200/28/121
5500 RPM	132	131

To summarise, I am happy with my choice of propeller, it has enhanced the performance of my aircraft directly and indirectly. The indirect gain was the change in the centre of gravity which allowed me to move the battery an Odyssey 545 from behind the baggage bay to the engine compartment. This shed another half kilo in weight by the removal of several metres of copper cable but above all helped facilitate starting especially during cold weather.

I recently heard that there are 2 more French registered Europas using E-Props so that brings the total to 3! One on each of the Rotax engines in fact, a 912 UL/ULS and a 914.

* Flight test using 62" Warp Drive propeller, 11 December 2015 09-30 UTC QNH 1034 temperature -1, headwind 2 KTS, 55 litres fuel and pilot.

** Flight test using E-Props Durandal 80S, blade set at 24.1 degrees at 75% cord, 27 January 2016 QNH 1030 temperature 4 degrees C, headwind 2 KTS, 45 litres fuel and pilot.

*** Accelerate to 60 KTS, height gain with wheel down at runway end (Runway length 900m)

All climb data taken in a stabilised climb passing through 1000 AMSL to 2000 AMSL

#Warp Drive cruise test 19 January 2016 14-30 UTC Speeds are wind compensated GPS ground speed. QNH 1015, 4 degrees C, cruise altitude 3000 feet, 30 litres fuel and pilot.

#E-Props cruise test 27 January 2016 Speeds are wind compensated GPS ground speed. QNH 1030, 4 degrees C, cruise altitude 3000 feet, 40 litres fuel and pilot.

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