UN P’TIT CANARD

-Look there, a canard!

-Yeah, but where is the fin?

-Look sir, it's the propeller that serves as the fin...

-Ah well, could explain?

In the Zaic Yearbook 1957-58, Clarence Mather reveals the secrets of his canards. In passing he writes: '"All my canards needed a vertical fin area of 15% of that of the wing". On a three-view of a model, we see the single prop blade neatly folded towards the rear. What if it could act as a fin?
But folded back like that, it shouldn't be very effective. And first of all, how big are the propeller blades? Well, with a two-blade 40% of the wingspan, we are looking at 12% and, since it it all the way at the rear, it should be enough
But the blades should be feathered. That however does not sound so easy to implement !

Wait, what if we folded the blade on the relative wind rather than in the axis of the model? Well that's for sure, and the axis of articulation can even be in the plane of the blade! Well then, we'll have to try it.

-Okay, it will be enough fin action in the glide, but when climbing?

-Listen, it works too, one must believe that there is enough left!

- Ah well, explain all that to me...

<u>The propeller</u> is a variant of the classic folding propeller, the 90° folding is done in the plane of rotation of the propeller and in the direction of rotation. By judiciously placing the axis of articulation, in this way one passes from the nominal pitch to an infinite pitch (feathering)

We first decide which part of the blade should be exactly flat on the relative wind (choose & 60 or 70% of the radius). Seen from the tip of the blade, the folding axis will be parallel to the bisector of the angle formed by the blade at the chosen radius with the axis of the propeller. Seen in profile, the axis will make the same angle as
above with the axis of the propeller, forwards. (See example of calculation below)

To have the folding axis in the plane of the blade, it must be placed where the blade makes the angle found above with the axis of the propeller. (See below)

It remains to provide the normal and feathered position stops, and a spring or rubber band so ensure a reliable folding action and consquently a well determined gliding turn trim. When released, it unfolds automatically by inertia. By providing that the elastic exceeds the folding axis, the propeller holds open on its own and facilitates launching. The shock of the stopper ensures instant feathering at the end of the motor run.

The model is a 1/2 scale model of a Coupe d'Hiver and an A8 to come.

It has the wing loading (8.5g/dm?) and the motor/total weight ratio (1/8).
Apart from the propeller, it is rather classic for a canard, except perhaps the front plan without dihedral; but numerous tests having shown that things are going very well like that, why add dihedral?

The central part of the wing has about 2° more incidence than the tips, to account for the downward deflection of the front plane. The balance and the dimensions are such that the wing and the front plane fly at close to the same Cz.
The prototype has a construction defect in the form of negative twist of approximately 3° on the left wing tip. With this twist, the flight is a right climb followed by the glide is wide left turns. You can vary the gliding turn by acting on the folding stop of the upper blade: more folded = left turn; less folded = right turn. You can also try to lean the front plane to the side of the desired turn, but it's more tricky.

The glide is adjusted by the incidence of the front plane and the climb by twisting the "nose" bearing (opposite direction of a classic).

The flights regularly revolve around 55 seconds with winding only 500 turns only (K=5). The best so far, with the help of a small thermal, is 3'40. The question of dethermalization is therefore posed, but not yet addressed.

This model is intended as a starting point for experimentation. I would be very happy to have comments (constructive or destructive!) from model makers interested or passionate about this kind of models. J.M.PIEDNOIR (4A)

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(Calculations)
Example: Propeller of P/D=1.5; Blade flat at 0.7R.

Blade angle at 0.7R = Artg(1.5/(0,7xPI))= 34°
Angle relative to axis: 90-34 = 56°
Angle of the folding axis on the helix axis:56/2=28°

Distance from the folding axis to the propeller axis (Helix of constant pitch):
28° with respect to the axis of the propeller = 90-28 = 62° for the blade angle
This angle is that of the blade at the radius: 1.5/(PIxtan62°) = 1.5/(PIx1.881) = 0.254xR
By providing for the folding axis at 0.254xR, it will be in the plane of the blade.
No more drilling problems!

Table of values for 0.7R:

P/D	0.8	1.0	1.2	14	1.6	1.8
(a):Angle	35°	33°	31°	29°	27°	25°
(r):Radius	0.178	0.205	0.226	0.244	0.259	0.271

Table of values for 0.6R:

P/D	0.8	1.0	1.2	1.4	1.6	1.8
(a):Angle	33.5°	31°	29°	27°	25°	25°
(r)Radius	0.168	0.191	0.210	0.224	0.236	0.245

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