

Introduction

Strong from the experience gained with the "Dieselis",
<http://membres.multimania.fr/dieselis/>

I was aiming at creating a new two seater aircraft, powered by a diesel engine, highly efficient, even more economical and relatively simple to build. It has to be compliant as either Experimental Aircraft or Ultra Light Aircraft with the JAA legislation (Joint Aviation Authorities - European aviation authorities), depending on the choice of wing plan. It also is possible to remove the wings in minutes and store the aircraft in a trailer.



The design was inspired by the best modern aircrafts currently on the market. Wooden aircrafts are usually easier to build to a great number of builder as the Gaz'aile 2 is available as plans exclusively.

The weight to power ratio for a diesel engine is about 2 kilograms per horse power. The design has proven a true airspeed of 110 knots for 6-7 liters per hours (1.9 U.S. gallons) of diesel or Jet A. However, the mass and balance requirements remain the same: the excess of weight of the engine (about 60 lbs) and the wooden structure, are compensated by the little quantity of fuel load. The Maximum Take-Off Weight (MTOW) is 450 kilograms (992 lbs) for empty weight of 260 kilograms (573 lbs). It allows 2 people to remain airborne for 4 hours.

The engine of choice is the one extracted from the French Citroën AX or the Peugeot 106 (it might be difficult to find them outside of Europe). This is the smaller diesel engine, 1.4 liter, available on the market with a classical pump,

made of aluminum. It deploys 53 hps at 5000 rpm for 80 kilograms (132 lbs). In Europe, this engine is widely available for 300 euros used, or 1300 euros new. As a comparison, the Rotax engine is about 15000 euros... There are no fundamental modification and every builders have mounted this engine surprisingly easily.



diesel 53 hp



petrol 80hp

The total cost of this aircraft with basic instruments is about 10 000 euros. Hundreds of thousands of engines have been produced since 1986 on various cars and hundreds of hours have been reliably experienced of this aircraft.

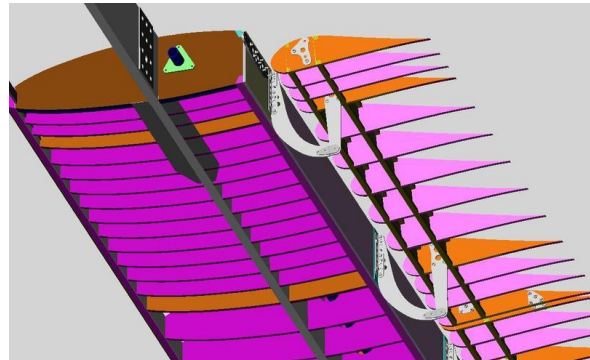
It is not more complicated than a Jodel. The fuselage is made of wooden frames assembled together on longitudinal wooden rails. It is covered with Okoume plywood and a thin layer of glass fiber and epoxy. The other shapes are made of regular laminated foam. The external aspect is similar to the most modern composite aircrafts. Once again, there is no need to be an expert in composite materials.



The elevator is a one piece surface with an auto-tab. It is made of a single wooden spar with ribs made of extruded polystyrene foam and covered a 1.2 millimeters plywood. It is a simple as remote controlled models.



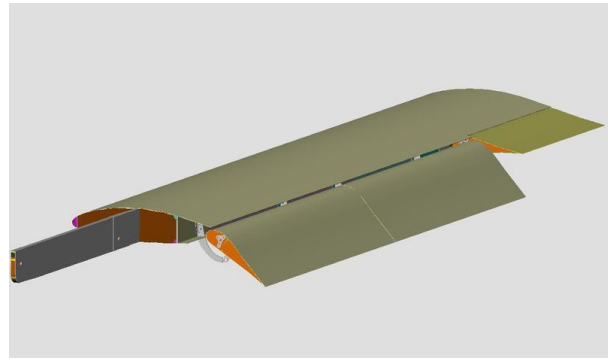
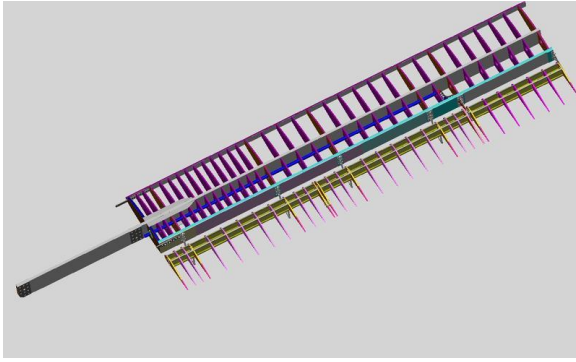
The building technics used for the experimental and the Ultra Light are the same. The spar is made of wood and carbon fiber; the ribs are made of extruded polystyrene foam and the wing is covered with plywood sheets and layered with glass fiber and epoxy.



The experimental aeroplane features flaperons (a mix of flap and aileron) across the span of the wing

The ultra-light features separate flaps and ailerons

The spar of the flaperons, ailerons and flaps are made of: a wooden spar, extruded polystyrene foam ribs, covered with plywood and fiberglass/epoxy



Rigide aileron controls with tubes and gear.

Rigide flap controls, manual operation.

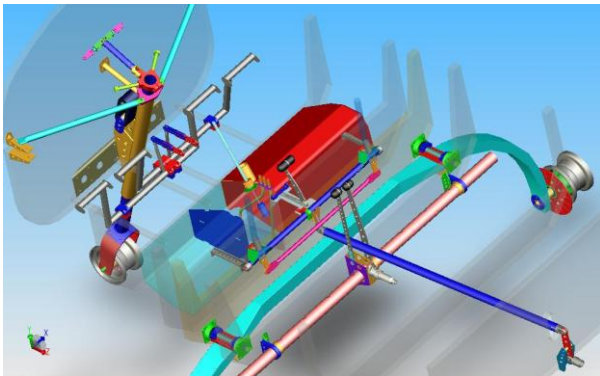
Rigide elevator controls.

Rudder controls by cable

Landing gear

The main landing gear is made of fiberglass and epoxy. It is fixed to the airframe, letting the wing spar free from landing chocks.

The wheels are 400/4 and are mounted with hydraulic brakes. The front directional gear is made of a 25cd4s telescopic tube. The suspension consists of rubber rings. The direction from the rudder pedals are driven with cables and are coupled with the rudder aileron. The front wheel is 350/4 for the experimental aeroplane or 400/4 for the ultra-light.



The engine

Why the Citroen AX and Peugeot 106?

Moteur 1.4 diesel PSA"

There are many options available on the market. Other engines are interesting, but most of them are either injected or turbocharged, full of electronics; thus, very challenging and much more expensive to home builders. The weight is also a concern: we must pay attention to mass and balance and secure a fair weight margin for the ultra-lights. When building a Gaz'aile 2, we must keep in mind that the aircraft must be simple and very economical.

Off-course, we can improve the concept and it is work in progress!!!

Here is a French article on Diesel engines for light aircrafts:

Auther motors possibility + + + +



toyota yago 75/80 hp Jabiru 80 hp ROTAX 80 ou 100 hp ULPOWER 100 hp

Performances (diesel 53 hp)

So far, here is what we have measured.

- Cruising speed: 108 kias @ 65% and 119 kias @ 75%,
- Maximum cruising speed: 135 kias/h,
- Fuel consumption is about 1.48 US Gallons @ 97 to 108 kias,
- Max climb rate is about 750 ft/min @ MTOM (Maximum Take-off Mass),
- Take-off distance is about 1150 ft @ MTOM,
- Landing distance is about 655 ft @ MLM (Maximum Landing Mass = MTOM for the Gaz'Aile 2).

For more details, or for 80hp please see the "[caracteristiques.php](#)" specifications

Building requirements

Thanks to its small size, it is possible to build this aircraft in a garage: the fuselage is 4.25m long (14ft). Each wing's spar is only 3.6m (12ft) for the experimental aeroplane and 4m (13.1ft) for the ultra-light. Some builders have hanged the fuselage to the ceiling upside down when building the wings.

Isolation: the temperature should not be a issue. It is possible to build a heat tent with vinyl sheets and a blowing heater to cure the epoxy on the composite elements.



There is no need for large wooden equipment. A regular bandsaw and the help of another person should be enough cut a red cedar beam into the smaller bits and parts. Other classical power tools are sufficient for the rest of the construction: a circular saw, a jigsaw, a belt sander, etc...



For metal work, there are two options:

You can build all parts if you own a milling machine and some welding equipment/skills.

The plans are detailed enough to sub-contract the parts. French builders have an association that build the parts at the best rate.



How much time is it going to take?

Plan your project with 3000 hours in mind, but it really depends on the time you decide to put daily. Count on 3 years at least.

Liens :

- [Jean-Jacques Ballot](#)
- <http://aviongazaile44.wifeo.com/index.php> bruno Ferry
- <http://www.passionavion.com/gazaile.html> Monforte



