



# The car is about to take to the air!



**Developed by aeronautical engineer Jean-Michel Schulz, supported by a Franco-Swiss team, the concept vehicle FlightCab could be used like flying taxi, in a Paris increasingly crowded by traffic.**

From left to right: Romain Schulz, Pierre Lemeunier, Lucas Lodi, Sydney Bussard, Dimitri Glanzmann, Jean-Michel Schulz and Leopold Comby (absent in the photo: Fatine Essafi and Anthony Gaspoz).

The saturation of airport and terrestrial transport infrastructure, the difficulties in creating new ones and their increase in costs, enforce the idea to orient automotive research towards a "flying car". This being at the same time when part of the aeronautical industry focuses on "Vertical Take-Off and Landing" (VTOL) or on short runways "Short Take-Off and Landing" (STOL). Certainly, the helicopter already meets these requirements, but at the cost of complexity, environmental impact, reliability and ultimately excessive costs for its popularisation for general every day and even personalised use. Since the 1950's, a vast number of flying car prototypes or convertible planes have appeared, without commercialisation for the most part, except for a few military operations often unconvincing. But the apparition of composite materials, new aluminium alloys, multivariable flight controls, the reduction in weight-to-power ratio of the engines, the maturation of the principle of unstable aircraft, the reliability of systems and components, the precision and response time of sensors and actuators along with the power of onboard computers, artificial intelligence and many other innovations, give credibility to more and more projects. Numerous articles have previously been published on models more or less successful such as the Vahana from Airbus, l'Ehang 184,

the TF-X from Terrafugia, l'AeroMobil or even the very futuristic Xplorair.

Engineer, professor and researcher in aeronautical technologies, Jean-Michel SCHULZ, is working with a small team on a new original concept of a flying car, the FlightCab. Destined firstly for professional use in the form of "aerial taxis", these flying cars could quickly become widespread and become the principle mode for individual transport. A utopia you say? « It often appears that yesterday's dream is today's hope and the reality of tomorrow » Robert Goddard.

## A model for large agglomerations

The differentiation of the FlightCab and its main innovation revolves around the propeller shroud flaps, asymmetrical variable geometry and steerable, enabling to create and direct lift in order to remove the entire or part of the airfoil and/or guiding. We find to a certain extent the invention of W. CUSTER's "Wing Channel", doubled by a cap downstream to the propeller, aerodynamically optimised, associated with modern technologies of convertibles. This is complemented by aerodynamic shutters for lift and hatches of discharges, aggregated with different mechanisms of orientation of the fairing.

The aerodynamic concept is simple. It consists in using the depression located upstream to the propeller and the aeronautical pressure present downstream to generate a force normal to the main flow of propulsion. In addition to the aerodynamic phenomenon on the shroud, the jet is also slightly deviated downwards.



Le concept de voiture volante FlightCab propulsé par trois moteurs Wankel de 190 HP chacun, à 6000 tr/mn.

Initial tests reveal encouraging results with values of more the 30 N of lift per kW of propulsion.

A zero incidence to the propulsion unit allows for a flight cruise almost identical to that of the airplane. An incidence of around 23° allows it to take-off purely vertically like a helicopter, whereas greater incidence will enable, in the final approach phase, enough lift when combined with the braking of the aircraft. As to its negative incidence, it will largely increase the longitudinal acceleration in STOL mode and as such, further decrease take-off distance. Thus, depending on its load level, the same aircraft could be VTOL with an average load at take-off and STOL for a load far more important.

The first application of this patent, is the study of a rapid taxi. The FlightCab is rather intended for big cities, for example as a shuttle between airports and city centres. The aircraft, with its vertical take-off and landing system, has the following specifications : a maximum gross mass of 1000 kg, powered by 3 Wankel engines each with 190 HP for 6000 rpm is equipped with high speed propellers with 6 blades of 950 mm diameter and will carry in addition to the pilot 1 to 2 passengers. An astute system enables to turn the rear passenger seat from a large one-seater, to a 2-seater economic seat in a matter of seconds.

### Tubular frame

The aerodynamic equation of the FlightCab is unstable, with a total wing area of 5.6m<sup>2</sup>, distributed between a wing with an inverted arrow located at the front of the centre of gravity of the apparatus and a surface of depth bearing at the rear.

The overall width of the device is less than 3 metres. Its structure is composed of an aluminium 6082 tubular chassis, welded around hydroformed square tube frame, which assures longitudinal and torsion rigidity of the aircraft. The same tube in which passes the electrical cabling and on which is fixed an aluminium flooring. The shell and the airfoil of the aircraft are made of composite materials, mainly by vacuum-infused process.



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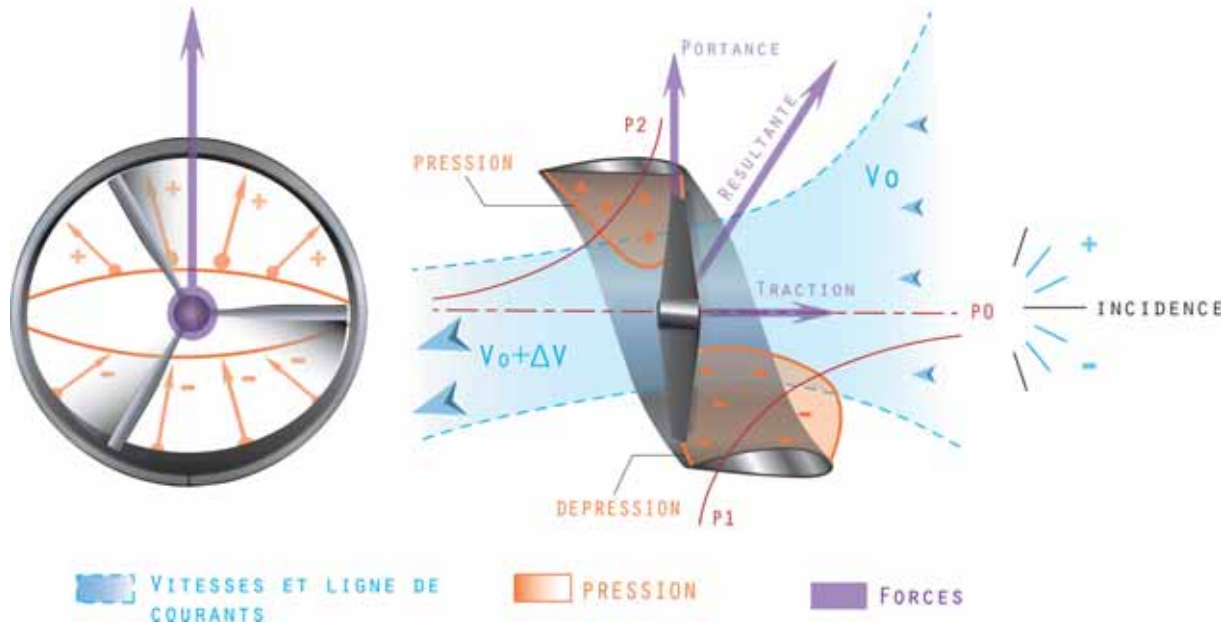
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### Principe de fonctionnement :

## Le Propulseur hypersustentateur



After take-off and a short transitional phase which uses power close to maximum power, the cruising speed will stabilise at 315 km/h, at an altitude between 1000 and 3000 metres, thus not requiring cabin pressurisation. Power consumption will therefore be around 135 kW at 4100 rpm and fuel consumption of the type aviation AVGAS 100LL will be in the order of 30 kg/h. This over exertion of the engines, imposed by the vertical take-off and landing for the duration of a few minutes per flight, will draw less from the engines when in cruising mode, thus increasing the time between maintenance services to about 2000 hours of flying and extensively decrease the costs of maintenance of this relatively simple, yet robust aircraft. In time, the selling price of the FlightCab should not be greater than 350,000 €, for an extensive life use of more than 10 years. Initially, the market can be estimated at around 1000 vehicles/year, then could rapidly rise. As seen in the comparison table, based on official publications, the DOC (Direct Operating Costs) forecasts, place this versatile concept in good stead in light of the current technological competition.

### Future of transportation

The rates for this type of transport allow for a comfortable margin for the operator of the FlightCab and should be between 6 and 10 € per minute of flight time depending on its configuration (ie a trip Roissy-Paris city centre around 100 € for a 10-minute flight anytime during the day). The fuel capacity of more than 90 litres enables the possibility of intercity transport for distances of up to 600 km. For example, a personalised door-to-door trip from Paris to London, in less than 1h15 for around 500 €. The maximum speed at an altitude of 3000 m can reach 500 km/h. The security measures in case of serious aircraft failure is ensured by a parachute within the cabin of the aircraft and it also possesses the buoyancy required to float on any body of water. In urban areas, roof-tops will serve as privileged points for landing and will minimise the impact of ground noise. Some individuals will undoubtedly offer themselves the acquisition of this personal luxury. Popularisation, mass production, futuristic vehicles being more sober and ecological such as electrical or hybrid, maybe GPL or even liquid hydrogen, as well as the increase in battery or fuel cells, will allow for a mode of individual or family transport by 2050 for all to see.





## DOSSIER

Naturally, the increase in this type of motorisation within a reduced airspace during night time or during poor visibility, will increase the risk of collisions. The solution will certainly arise from the progress in artificial intelligence. The recent tests done by the US Air Force on multiple drones suggest that this is the path to be followed. The pilot only needs to set his arrival point. The intelligence is distributed over the totality of the devices in flight, the machines manage the positions and distances with the other aircrafts in proximity and automatically adapt their flight pattern accordingly. Likewise, this system communicates directly with tower control, reducing the need of ground personnel. As such, to pilot these aircrafts, a new concept with intuitive flight controls, self-regulated and many enslavements and assistances, allows for fast, secure and simple learning for the piloting of this type of aircraft with the generalisation to a majority of the population.

### Future of transportation

Other variations of this patent are also being studied. For example, a medical-intervention aircraft, swift and low-cost: the FlightHero. This would take almost all the benefits of the helicopter, for an exploitation cost closer to that of an ambulance and also capable of taking on board plenty of material and personnel in case of a catastrophe with STOL. Regional inter-city aircrafts, the FlightCoach, sort of futuristic bus, which would be able to land and take-off from the equivalent distance of a football field or supermarket parking in the city centre.

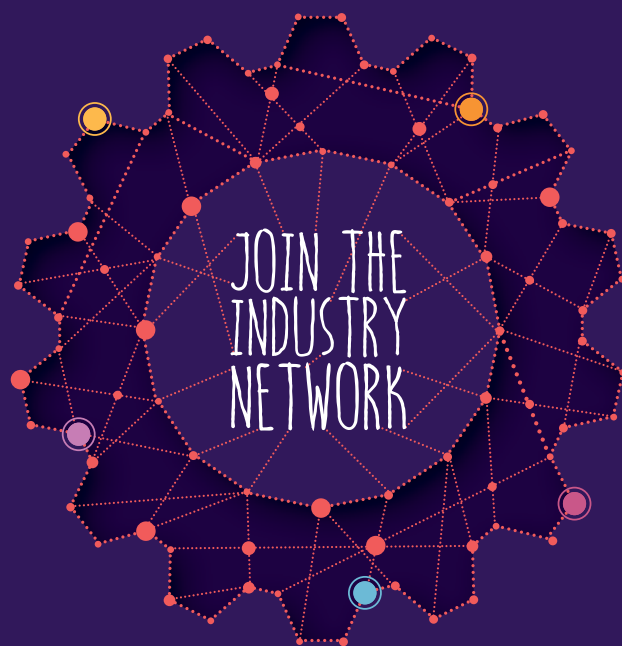
Or even the use and adaptation of this fairing to the reactors of medium and long-flight airplanes for a decrease in lift area and/or the suppression of all or part of the steering modules. Other projection relates to drones or military applications.

Of course, there still remains a lot of work, studies, testing and regulatory work before seeing this type of engine certified, evolve, and within our skies and in particular above our cities.

"To invent a plane is nothing, to build it is the beginning, to fly it is everything" Otto Lilienthal  
But the creators, Jean-Michel and Romain SCHULZ, are resolute and continue with a young and motivated team to refine and specify all the concepts, in the hope of gathering interest from technical and financial partners. For this purpose, they will be present at Ebace in Geneva and the Bourget Expo.

Jean-Michel Schulz

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