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The two-seat Alérion M1h is one of two hybrid eSTOL aircraft being developed by France's Avions Mauboussin. (Image: Avions Mauboussin)

## FRENCH GOVERNMENT BACKS ZÉPHYR HYDROGEN PROPULSION PROJECT WITH COVID GRANT

CHARLES ALCOCK / FEBRUARY 16, 2021

The French government has awarded an €800,000 (\$969,000) grant to eSTOL aircraft developer Avions Mauboussin under its *Plan de relance aéronautique* program to help the country's aerospace industry recover from the impact of the Covid-19 pandemic. The funding, announced on February 16 by the Ministry of the Economy, Finance and Recovery, provides support for the development of the Zéphyr hybrid hydrogen propulsion that will power its planned Alérion M1h and Alcyon M3c aircraft.

The Avions Mauboussin team is starting work this year on the Zéphyr technology at its base at Belfort in eastern France and expects the project to run through the end of 2024. The company now plans to get a jet-A-fueled hybrid version of the two-seat Alérion M1h model in service in 2025, followed by a hydrogen-powered model in 2027. Similarly, the respective timeline dates for the six-seat Alcyon M3c are now projected to be 2026 and 2028.

The start-up also intends to offer the Zéphyr propulsion system to other aircraft manufacturers, including those working on eVTOL designs and helicopters. The government funding will support the research and development phase of the program, including design of the powertrain, purchasing components, building a demonstrator, and ground testing.

The powerplant is based on a turbine engine because the company believes this is more compatible with the switch to hydrogen as a fuel source than a piston engine. The company intends for the aircraft to be operated in so-called "flex-fuel" mode so that users could refuel with either gasoline or hydrogen, depending on which is more readily available.

Meanwhile, Avions Mauboussin is already working on cockpit and fuselage mockups of the planned fixed-wing aircraft. The company hopes to be ready to begin flight testing the jet-A-fueled hybrid Alérion prototype before the end of 2022.

## WEB

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Avions Mauboussin is working on a new two-seat hybrid hydrogen powered aircraft called the Alerion.

## AVIONS MAUBOUSSIN HEADS BACK TO THE FUTURE WITH NEW HYBRID-HYDROGEN DUO

by Charles Alcock

France's Avions Mauboussin is taking a hybrid-to-hydrogen path with its duo of new fixed-wing, short takeoff and landing (STOL) aircraft. Last week, the company announced plans for the six-seater Alcyon M3c and the two-seater Alerion Mh, both of which it sees providing range to support intercity mobility while having the flexibility to be able to land in locations where only a short landing strip is available.

The private company's business plan calls for a first test flight with a hybrid Alerion prototype in 2022, followed by a hydrogen-powered version in 2024. It expects the initial aircraft to be ready to enter service around the end of that year, with the larger Alcyon model likely following about a year or two later.

Aeronautical engineer David Gallezot founded the current iteration of Avions Mauboussin in 2013 as an homage to the original enterprise, which was founded in 1928 by famous French aircraft maker Pierre Mauboussin, who later developed the Fouga Magister jet trainer. The new company's core activity has been providing consultancy services, and this has generated cash flow to cover work on the new aircraft that started in 2016. The company also has experience supporting owners of vintage aircraft.

Gallezot told **FutureFlight** that he opted to develop a fixed-wing hybrid aircraft because it will offer better performance than all-electric aircraft limited by current battery technology. His new designs are expected to provide a range of up to around 900 miles and speeds of around 155 mph.

A hybrid-propulsion system called Zephyr that the company has developed in-house will power both aircraft. It is named for an aircraft developed for the French military by the original Avions Mauboussin company in the 1930s.

The powerplant is based on a turbine engine because the company believes this is more compatible with the switch to hydrogen as a fuel source than a piston engine. The company intends for the aircraft to be operated in so-called "flex-fuel" mode so that users could refuel with either gasoline or hydrogen, depending on which is more readily available.

Avions Mauboussin opted to develop its own propulsion system after finding that manufacturers such as Rotax or Siemens could not offer suitable hybrid drives. Gallezot said that he remains open to cooperating on propulsion technology with eVTOL aircraft developers.

The plan is to maintain the serial hybrid propulsion option for early examples of the aircraft to support initial customers who may feel discouraged by difficulties in getting hydrogen fuel supplies. The propulsion system is dispersed, with the electric motor in the front, leaving space for hydrogen and/or fuel tanks in the wider center section of the fuselage, and the batteries in the wings. Multiple firewalls separate these elements to ensure safety. The motor drives a pair of coaxial propellers installed on the wingtips.

Gallezot is supported by four other shareholders, among them Patrick Goudou, the former executive director of the European Aviation Safety Agency. The company also employs four full-time engineers and is looking to expand the team.

In these early stages of the program, the design and development work is receiving significant support from the Université de Technologie Belfort-Montbéliard (UTBM). Under a series of commercial partnerships, Avions Mauboussin is also being supported by half a dozen other French aerospace and engineering schools, including ESTACA, ISAE Supaero, ENAC, ELISA

Aerospace, INSA Strasbourg, and IPSA.

The company has its own design office and rents space in UTBM's laboratories to use as a ground test bench. It is now exploring possible sites in the Bourgogne-Franche-Comté region of eastern France to use for flight testing and manufacturing. These include two local airfields near Belfort and a French air force base.

Apart from light aircraft maker Robin, the region does not now have much of an established aerospace industry. However, there is extensive local expertise in hydrogen propulsion applications for cars and trains.

Avions Mauboussin aims to build the Alerion technology demonstrator as well as a cockpit mockup between now and the middle of 2021. Gallezot said that his team will also produce a structural mockup to evaluate materials to be used in building the aircraft and construction principles. It is also in the process of selecting batteries that will store power from the turbogenerator.

Apart from the airframe and propulsion system, Avions Mauboussin is selecting commercially available off-the-shelf options for other aircraft systems. The avionics suite will be based on the AeroVue Touch primary flight display from Bendix King, which will also supply items such as radios and transformers. The cockpit will feature a head-up display from another U.S. supplier, Epic Optix.

The design work on the Alerion will lay much of the engineering groundwork for its larger Alcyon sibling. "This means that when we are ready with the Alerion, we will be able to design the six-seater aircraft with a more controlled [engineering] risk," explained Gallezot.

EASA will require extensive ground testing before it issues a permit for flight testing. This is mainly due to the novel configuration of the hybrid propulsion system. An early small-scale model is already being evaluated in a wind tunnel in Paris.

Avions Mauboussin estimates that it will need to raise just over \$7 million to start flight testing of the Alerion prototype. It will then assess further capital needs to get the aircraft into production. It is now seeking early-stage investors to add to funds already contributed by French economic development agencies, and it will also apply for support from the European Union's Horizon 2020 and Clean Sky programs.

Apart from personal transportation for owner-pilots, the start-up sees its aircraft being suitable for operations such as air taxi service and a variety of utility applications, such as medical support. "We are aiming to revive the Avions Mauboussin tradition of aircraft building from the 1930s with environmentally friendly aircraft for the 21st century," Gallezot told **FutureFlight**.



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