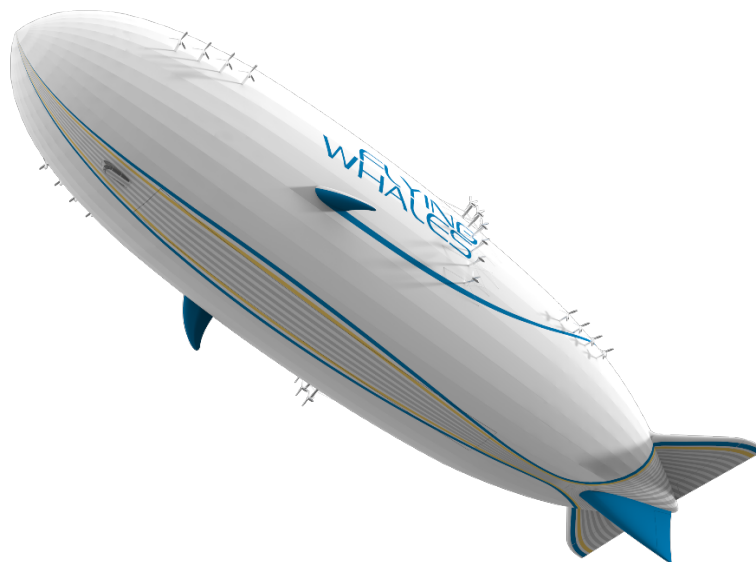


FLYING WHALES

Press release
December 11, 2020

The French company FLYING WHALES, which designs, manufactures and operates the LCA60T, the largest cargo transport aircraft in the world, reveals the design of this extraordinary airship for the first time.



The industrial phase of the LCA60T (60-ton Large Capacity Airship) program will begin in the year 2021 when the first assembly plant is constructed in Laruscade, Nouvelle-Aquitaine. It took years of development to complete the design of this distinctively modern airship, a symbol of French industrial know-how and the innovative capacity of the French ecosystem. Today, FLYING WHALES is proud to present the final version of the LCA60T, the result of over three years of hard work by its teams and industrial consortium.

A complex design meets the functional needs of the LCA60T

The shape of the LCA60T is the result of many complex compromises. First and foremost, it was necessary to ensure high aerodynamic performance to combine a high cruising speed of around 100 km/hr with easy in-flight handling. Particular attention was paid to the exterior to minimize drag, to the structure of the propulsion system and to the flight controls of this large-volume airship (~250,000 m³).

Additionally, it was necessary to provide a robust technical solution to the number one advantage of the LCA60T: its ability to load and unload during stationary flight, which grants it a unique operational (operating in any location, up to 60 tons) and major environmental (no ground footprint when operating) edge. The architecture of the propulsion system, which uses little energy but is extremely powerful (1.5 MW for continuous operations and up to 4 MW during peak performance), was designed to distribute this power to 32 electric motors at 7 propulsion points. The LCA60T can thus stabilize itself with great precision above the operations area while disregarding any disturbances caused by external conditions. Available on-board power is generated by turbo generators, which had to be isolated from the rest of the systems to limit the risk associated with using these technologies. In the absence of wings, power-generating turbines are placed inside the lateral winglets, which are reminiscent of whales' pectoral fins. This is a particularly useful position for turbine cooling that also provides for easy maintenance access.

The large cargo capacity of the LCA60T of up to 60 tons is made possible by a large bay of unprecedented size (96 m long) and by the airship's large and unique volume (3,600 m³). These three characteristics contributed their share of constraints into the airship's structural design. The aircraft is comprised of over 7 km of triangulated composite beams, which are both light and sturdy. The beams form the backbone of the LCA60T and anchor the propulsion points. They will be covered with technical textile panels to protect the airship from the outside environment.

The thousands of elements making up the structure grant the LCA60T an advantage when it comes to manufacturability and maintainability. Although the beams contain 53 km of tubes, the airship's structure contains fewer than 50 references. The assembly constraints of the structure were also considered while optimizing its external shape.

As for piloting, the cockpit will be inserted into the front section of the airship and will include a man-machine interface dedicated to steering the LCA60T and loading/unloading operations. The pilot and the load master can control its movements while on board, turning the LCA60T into one of the most innovative cargo aircrafts, combining the flexibility of a helicopter with the payload capacity of traditional cargo solutions. It operates independently of transport infrastructure, which means it has a limited environmental impact.

Digital simulation tools heretofore unseen in French aeronautics

To achieve these results, FLYING WHALES has been steadfast in orienting its development activities towards highly integrated simulation methods made possible by digital continuity.

The airship's aerodynamic performance was assessed using CFD methods on a server with a scalability hardly ever been achieved in the past, which we have also shared with Teratec (The European Pole of Competence in High Performance Simulation). The techniques implemented thanks to the interconnection of the clusters make it possible to reach up to 400 computing cores and divide the computing time nearly by a factor of ten.

The structure was optimized using a methodology based on parametric modeling, making it possible to optimize the number of component references while accounting for constraints such as standardization, aerodynamic shape and center of gravity. The flight controls were sized using an innovative simulation approach, which makes it possible to assess the iterative

design and identify the structure that would be the ideal compromise between performance and integration constraints on the structure. Finally, digital continuity helped create a model of the airship's integration process in order to maximize its manufacturability. These four interconnected important digital tools generated a convergence of the various iterations, notwithstanding the above constraints.

In the end, the extraordinary prowess presented today is backed up by a team of 120 collaborators who work hard every day, as well as an industrial consortium made up of about thirty companies, all of whom are at the forefront of this flying revolution. The airship is also the product of close design collaborations with some of FLYING WHALES' main partners, first and foremost ONERA for aerodynamic techniques and maneuverability, REEL and TECALEMIT for load exchange, as well as EPSILON COMPOSITE for structure and ADF LATESYS Group for ground handling of the machine.

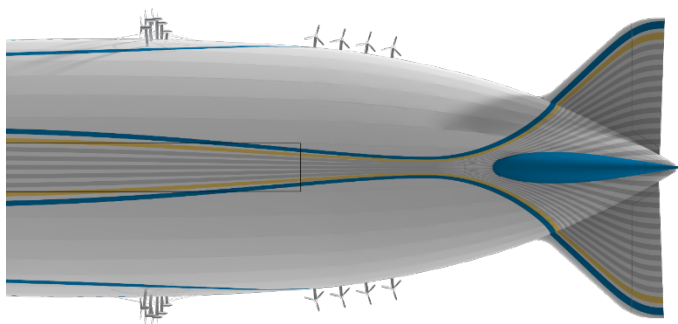
At the same time, the marketing, sales, and operations teams also made a lasting mark on the airship's development by serving as a conduit for the needs of FLYING WHALES clients. Their work was part of their partnership with FLYING WHALES and was instrumental in fleshing out usage scenarios and operating concepts. The LCA60T, ready to stand by for future missions, is truly a nexus of innovation.

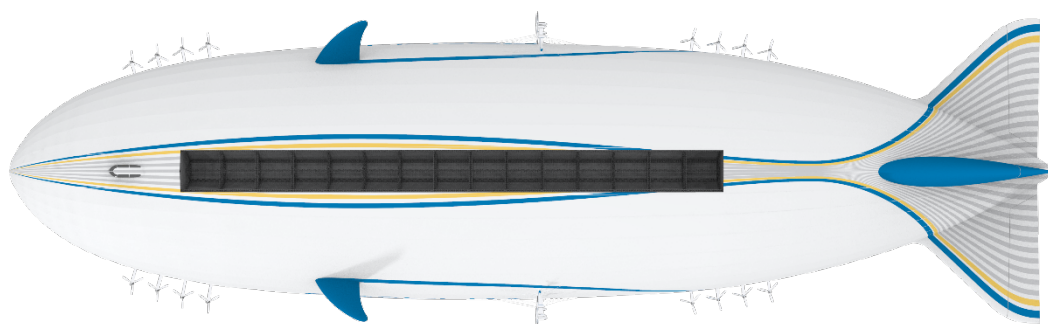
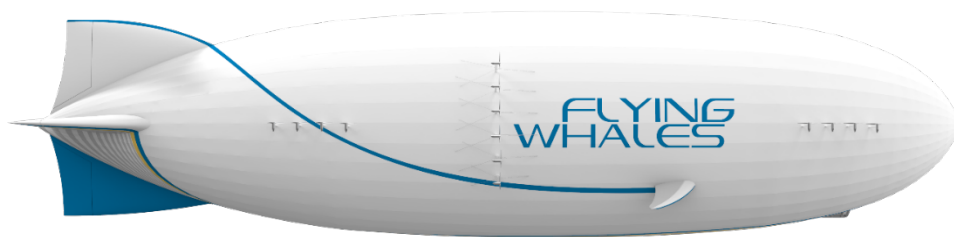
Quote by Vincent Guibout, Managing Director in charge of the LCA60T program and of the technical direction of FLYING WHALES

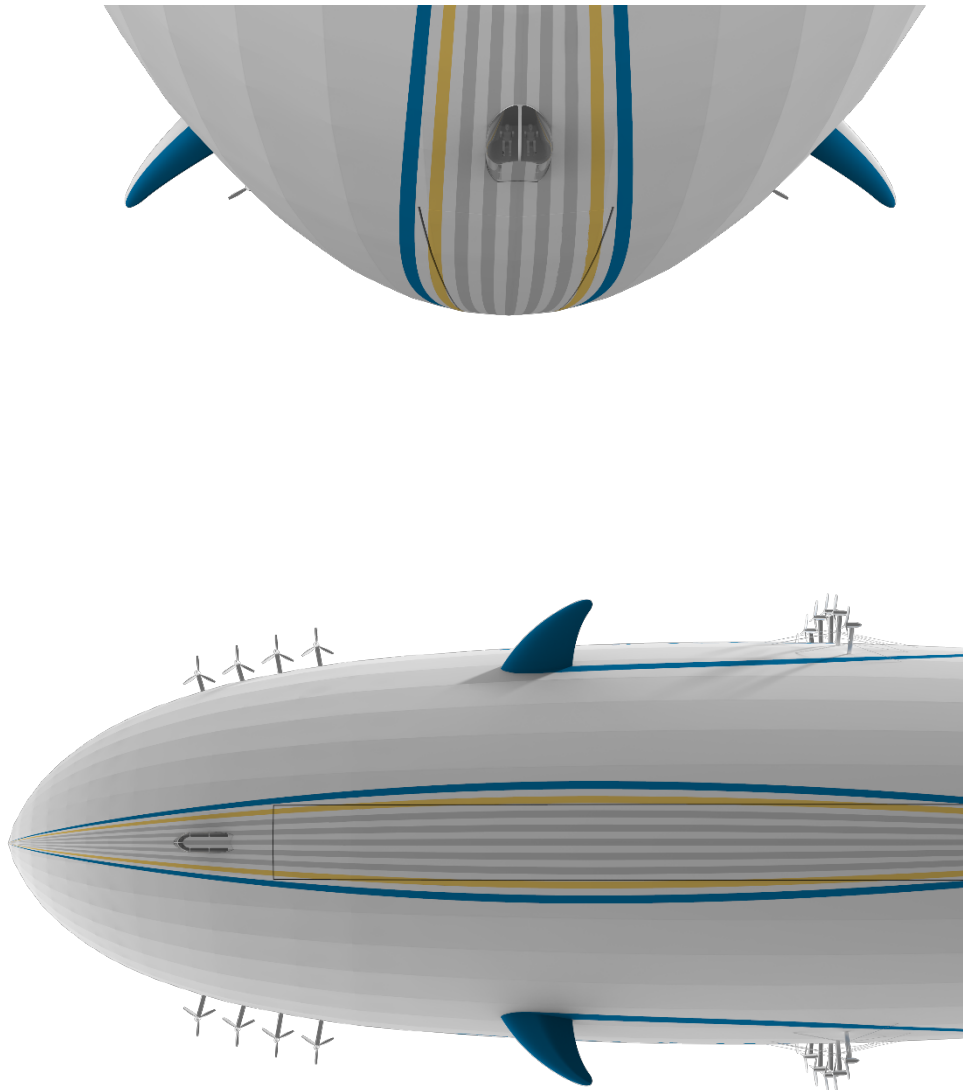
"Robust methods grounded in a solid culture of aeronautical developments, combined with a new approach firmly anchored in integrated digital design, made it possible to manage the high level of design complexity. Work on designing the airship demonstrates the extent to which the creativity and top-notch quality of French aeronautics engineering can be expressed today. FLYING WHALES is one of the spearheads of this excellence. Our teams are proud to unveil this aircraft. This is an important achievement, which brings us one step closer to the industrial phase of the LCA60T program."

Quote by Charlie Lavie, Industrial Designer at FLYING WHALES

"Whereas the uses for the LCA60T require strong functional qualities, the strategy of FLYING WHALES has always included an important pillar: the will to design an aesthetically powerful device. The airship which we are presenting today is an illustration of this, as its design was conceived to serve its future uses, while also drawing inspiration from the world of cetaceans, a signature characteristic of our company."







About FLYING WHALES:

FLYING WHALES is a French company, which, drawing on its innovation, high-quality teams, and industrial consortium, is working on an ambitious and unique program: the LCA60T. **The LCA60T is an airship with a payload capacity of 60 tons used to transport heavy loads.** Originally designed to meet the needs of the French National Forestry Office (ONF) – extracting wood from hard-to-access areas – the LCA60T, thanks to its **unique ability to load and unload during stationary flight**, is able to resolve numerous logistical and to reach isolated locations around the world while maintaining a small environmental footprint. This solution frees the LCA60T from any constraints on the ground during point-to-point transport of heavy or large loads. Finally, FLYING WHALES is also developing FLYING WHALES SERVICES, the operating company for the LCA60T.

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