



Ready for Landing!

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Travel in the infinite expanses of space – a dream of mankind!

With the development of the manufacturing processes and the production of four complete landing legs for the T1H launch vehicle, Connova Group is significantly contributing to enabling the reusability of launch vehicles.

The client for this fascinating project is the Swiss company Almatech, which offers engineering services for the space industry, among other industries. Almatech, in turn, supplies ArianeGroup – a joint venture between the European aerospace company Airbus and the French Safran Group making the joint venture to Europe's leading space transportation company. ArianeGroup – the company behind Europe's current Ariane6 launcher – is already ensuring Europe's strategic independence in space after 2030 by developing a successor project. The development and manufacture of the landing legs is integrated as a sub-project into the overall Themis project at ESA level.

Themis: How this project came about

Until now, all launchers, such as Saturn, Ariane, Soyuz and Vega, were so-called Expandable Launchers, meaning they were and are used one-time only. However, from the point of view of European space travel, SpaceX has shown that it is possible to reuse launchers. To do this, they must

land safely on Earth after their journey through space. Following the example of SpaceX, this can be solved by, among other things, a fold-out landing leg system. The weight plays a decisive role here. The landing gear system must be as light as possible and at the same time withstand enormous loads.

Through the European Space Agency (ESA), the Themis project aims to make the reusability of launchers possible. Developments and demonstrations are underway for this purpose. The test program is planned for several years. Almatech has been selected by the ArianeGroup to develop and manufacture a landing gear system for a reusable launcher in the frame of ESA's Future Launcher

Almatech and Connova Group: A Perfect Fit!

Almatech and Connova Group have a long-standing and well-established collaboration. The Swiss presence, a strong convergence of values such as reliability, flexibility and efficiency on the one hand, and the perfect complement of capabilities – Almatech in engineering and Connova Group in manufacturing – justify the perfect fit of the two companies. The quick and uncomplicated agreement between the two partners – commercially as well as technically – finally led to the launch of the project.

Client Feedback

Travel in the infinite expanse of space!

«We appreciate Connova Group as a reliable production partner for many years. The Connova Group team has once again demonstrated its high level of development competence and agility in the production of the large CFRP components for the Themis landing gear system. Despite difficult requirements, the task was solved in an exemplary manner in every respect.»

Fabrice Rottmeier, Almatech

ALMATECH

Ready for Take off!

Phase 0

First talks between Almatech and Connova Group at the end of 2020. Proposals and negotiations. Explanation of technical descriptions and all details in the context of intensive technical presentations.

Phase 1

Start of development of production processes and start of material procurement in the 4th quarter of 2021. Production of the first complete landing leg in the first half of 2022, including all necessary tools, molds, and fixtures. Integration of the first landing leg system in September 2022.

Phase 2

Material procurement and production of three additional complete landing legs immediately after completion of the first landing leg. Deliveries to Almatech between January and May 2023.

Contract Partners

The Swiss company Almatech located in Lausanne offers, among others, **end-to-end engineering solutions in the fields of mechatronics & lightweight structures** for the space industry. In this context, Almatech has been selected by ArianeGroup - a joint venture between the European aerospace company Airbus and the French group Safran, making the joint venture to Europe's leading space transportation company.

Sector

Space, Engineering

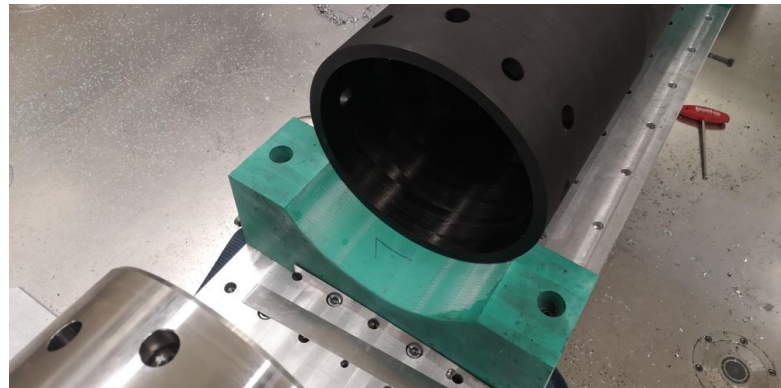
Objective of the overall project «Themis» at ESA level:

The objective of the Themis project is to provide technologies for new re-usable launcher concepts that shall be more cost-effective than current expandable launcher systems: Themis shall become a potential successor to Ariane 6 after 2030. To enable reusability, among other features, a deployable landing gear system is necessary.

Task of Connova Group as sub-contractor to Almatech

The production of lightweight CFRP components for the deployable landing gear system for the demonstrator of the Themis launch vehicle. This includes:

- Development of the manufacturing processes for components of this size
- Manufacture of mechanical components (e.g., struts) from CFRP and aluminum.



The order to Connova Group

The design of the landing legs includes a system of different struts (rods) which are rotatable at their ends so that the entire system can be folded in and out by means of hydraulic cylinders. Connova Group focused on the manufacture of the mechanical components, i.e. the large CFRP struts made of carbon fiber reinforced plastic (CFRP) and aluminum or steel fittings at the ends. The total order in two production batches included the manufacture and delivery of four complete sets of CFRP struts to Almatech. These components will be used during the first tests of the demonstrator at the Kiruna Space Station in Sweden.

Countdown's on!

The overall concept for the production as well as all necessary molds, jigs, and other tools were developed by Connova Group's engineering team, which has many years of experience and specialized know-how in this segment. In order to start manufacturing of the landing legs, the item-specific molds – so-called winding mandrels – had to be designed and procured for the carbon-fibre winding process.

The large CFRP tubes were manufactured by Connova Group at Germany location using special CFRP winding machinery and delivered to Switzerland location. In Villmergen the partially very large aluminium parts were milled and machined together with the CFRP tubes by means of the so-called match drilling process (aluminum and CFRP is machined at the same time). All parts were precisely matched to each other, carefully measured and finally examined for the smallest defects, including an ultrasonic test.



The first leg goes on the journey

In the 3rd quarter of 2022, the first complete set of 5 large and 4 small CFRP struts for a landing leg of the Themis T1H launcher was handed over to Almatech on time. In September 2022, the first landing leg was successfully integrated by Almatech at Payerne Airport within a rented large aircraft hangar. Immediately after the completion of the first landing leg, further raw materials were procured and three more complete landing legs were manufactured, which were delivered to Almatech by mid-2023.

Specific challenges

Already the first talks between Almatech and Connova Group fell during the time of the global pandemic. The massive restrictions in business required new solutions for a constructive and efficient collaboration with all parties involved. Added to this were the global shortage of raw materials and problems in supply chains. It was particularly difficult to procure carbon fibres in sufficient quantity, quality and strength class. These challenges were solved by creative solution thinking and flexible acting.



Results and outlook

Due to the use of CFRP tubes in the design of landing gear systems for launchers, the solution offers a significant weight advantage of approx. 25 to 30% over a purely metallic solution. The concept developed by Almatech combines reusability with low maintenance and thus significantly improved cost efficiency. In the future, of course, it will be a matter of making production even more cost-effective and easier. But not only in terms of costs, but also in terms of sustainability, the reusability of launchers will represent a quantum leap.

Serial production of the components for the landing gear system is not expected to start before 2027/28. But the groundwork for massive cost reductions in European space has been laid. With this development, which could eventually make reusable launchers the natural vehicle for space travel, we are one step closer to the goal of cost-effective access to space.



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