Le Commandant Charcot, which features a Polar Class 2 icebreaking hull and hybrid-electric power plant powered by liquefied natural gas (LNG), will go to the Arctic region during the northern hemisphere summer, and to Antarctica for its summer months.

Le Commandant Charcot in ice

A team of Aker Arctic experts travelled onboard *Le Commandant Charcot*, the world's first icebreaking hybrid-electric expedition cruise ship, for full-scale ice tests in June 2021.

Le Commandant Charcot, which features a Polar Class 2 icebreaking hull and hybrid-electric power plant powered by liquefied natural gas (LNG), will go to the Arctic region during the northern hemisphere summer, and to Antarctica for its summer months. Aker Arctic developed the vessel concept together with Stirling Design International and the luxury expedition cruise company Ponant.

Representatives from Ponant, Vard, the flag administration, and the Aker Arctic team responsible for the ice trials boarded the vessel at the Norwegian shipyard Vard Langsten after it had been outfitted at Vard Søviknes. *Le Commandant Charcot* headed first north to Svalbard, and then west towards Belgica Bank off the east coast of Greenland. Propulsion adjustments were made before the ice trials started. The voyage continued along international waters to areas northwest of Greenland in search of suitable ice fields.

The aim with ice trials is to test various ice capabilities to verify that the vessel fulfils specifications and is safe to use in the intended operational areas.

Test results

Le Commandant Charcot is designed according to the Double Acting Ship (DAS™) principle which allows the vessel to operate both in ahead direction as well as stern-first, depending on the prevailing ice conditions.

Tests in ahead direction were conducted in two level ice thicknesses: 2.0 metres and 2.7 metres. *Le Commandant Charcot* was found to be able to maintain continuous motion even in the thicker ice. Stern-first tests were done in up to 1.7-metre-thick level ice. In addition, the

trials

The aim with ice trials is to test various ice capabilities to verify that the vessel fulfils specifications and is safe to use in the intended operational areas. The Aker Arctic Team responsible for the ice-trials (from left): Teemu Heinonen, Alexey Dudal, Jukka-Pekka Sallinen, Veikko Immonen and Maximilian Vocke.

vessel could penetrate a heavy ice ridge without any problems.

Safety tested

The International Code for Ships Operating in Polar Waters (Polar Code), regulating ships operating in the Arctic and around Antarctica, has many requirements concerning passenger and environmental safety, by, for instance, regulating the equipment for evacuation of the vessel, such as tents, warm clothes and food. One rule requirement specific for passenger ships is that a vessel must be able to return safely to port on its own, even when damaged.

"The Safe-Return-to-Port (SRtP) mode was tested by simulating that one switchboard room was damaged," says project manager Maximilian Vocke from Aker Arctic. "The vessel still achieved a speed of more than 2 knots in 1.6-metre-thick ice."

The results from the full-scale ice tests showed that the vessel fulfils all specifications and that they correspond with the ice model tests which were performed at Aker Arctic's ice laboratory prior to construction. Open water trials were completed earlier in spring 2021 showing that everything functions as it should, also on open sea. ■

First impressions of Le Commandant Charcot

The planning of *Le Commandant Charcot* began six years ago and now she is ready for her first cruise. Ponant representatives share their excitement after the ice trials.

"We began this project in 2015, and now six years later we boarded *Le Commandant Charcot* to experience how she performs in ice," says Mathieu Petiteau from Ponant, who has supervised the vessel's construction. "It was an exciting moment for all of us, feeling for the first time the ship's power. We were immensely impressed with its capability in ice and the sensations onboard in ice operations."

Disembarking on the ice for the first time was a spectacular moment. From left: Captain Marchesseau, Captain Garcia, Jukka-Pekka Sallinen, Alexey Dudal, Sophie Wahl and Teemu Heinonen.

The Ponant team was excited to experience the vessel's power in ice for the first time.

Passenger comfort

One of the important design aspects has been to ensure passenger comfort when operating in ice. Petiteau was positively impressed by the low level of noise and vibration.

"We pushed the vessel to the limits and did exactly the opposite of what we will do in real operations, where we will try to avoid ice and find the channels among ice floes, both to save energy and to prioritize passenger well-being. However, even in the extreme condition of the trials, passenger comfort was at its best."

Captain Marchesseau and Captain Garcia from Ponant will be the main captains in charge of the vessel in future. Marchesseau adds that he feels confident about the vessel after the trials. "The performance was above expectations. The vessel is powerful and strong, and despite all the manoeuvres we tried, we did not get stuck in ice, thus providing the level of safety and security we are aiming at."

Spaceship adventure

Petiteau says the trials felt like being on a space adventure. "Disembarking from the vessel on ice gave the impression of discovering a new world, almost like the first step on the moon."
The ridge penetration was an exciting moment after a full day of preparation, with Aker Arctic ice expert Teemu Heinonen guiding the captain in charge on how to control the ship and which way to turn the thrusters.

"We expected the ridge penetration to last much longer and were surprised at how easily we went through," Petiteau says. "The importance of an experienced captain became very clear. You can spend hours or 15 minutes, all depending on the skills of the captain. The azimuthing propulsion units are like multi-purpose tools and the captain needs to master the techniques, such as flushing the hull for lubrication and to reduce friction, how to spray the ridge with water, etc."

"Overall, we were impressed with the Aker Arctic team and their different skills complementing each other," Petiteau adds.

Dry-run in September

After the ship's delivery, Ponant is planning to organise what they call a dry-run, and travel to the North Pole. The intention is to train sailing in ice, practise all safety operations and test all safety equipment such as lifeboats and polar shelters.

"We have worked hard to develop the safety equipment and procedures and want to ensure that all runs smoothly without any gaps," says Captain Marchesseau. "Additionally, we are trying to organise a search and rescue exercise with all Arctic nations."

Scientific research emphasized

Ponant is strongly committed to preserving the polar areas and has decided to give scientists the opportunity to travel onboard the ship for research.

"We have dedicated space for multi-purpose research including both dry and wet laboratories. There is a tube crossing the hull where you can take samples from the sea, a multi-beam sonar current measurement system, a sea-ice measurement system recording the ice thickness along the vessel path, a weather station to collect information about air temperature and humidity, in addition to water temperature and salinity recording systems," Petiteau lists.

"There will additionally be a participating programme for passengers where they can collect samples, attend lectures and learn about protecting the environment."

Passenger reactions

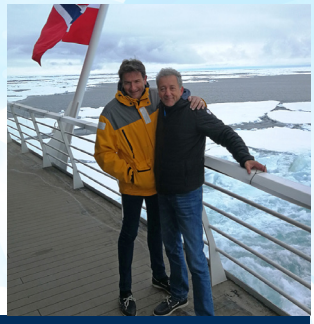
Passengers arriving at *Le Commandant Charcot* will first discover the external design of the ship, which is quite spectacular, looking strong and refined. "Entering inside they will discover a magnificent vessel, where we have put more effort in the architectural design than in any of our previous vessels. The standard in every de-

tail is high and they will feel the comfort at open sea," says Petiteau.

"Experiencing ice for the first time will be another spectacular moment. The sense of direction is lost when you are surrounded by ice as far as you can see. Also, the complete silence is striking."

Captain Marchesseau adds that there is a lot of volume and space on the ship, which will never feel crowded. "The splendid windows allow uninterrupted views to the far horizon."

Le Commandant Charcot will depart on her maiden cruise from Puerto Montt in Chile to open the Antarctic season in November 2021, promising an extra-ordinary experience for the passengers onboard this luxurious ship. ■



Mathieu Petiteau from Ponant has supervised the vessel's construction. One of the important design aspects has been to ensure passenger comfort.

Captain Marchesseau and Captain Garcia from Ponant will be the main captains in charge of the vessel in future.

Special features of Le Commandant Charcot

Le Commandant Charcot is designed according to the Double Acting Ship (DAS™) principle which allows the vessel to operate both in ahead direction as well as stern-first, depending on the prevailing ice conditions.

Le Commandant Charcot features a modern Polar Class 2 icebreaking hull, which combines smooth icebreaking ahead in up to 2.5-metre-thick multi-year ice, and astern in severe ice conditions such as heavy ice ridges using the Double Acting Ship (DAS™) principle. The vessel's performance is comparable to existing polar icebreakers, but with lower ice resistance ensuring better fuel economy.

First hybrid cruise ship

This is the first hybrid-electric cruise ship powered by liquefied natural gas (LNG) and electric batteries, reducing emissions and environmental impact. She also complies with IMO and ECA regulations and fulfils the "clean ship" requirement with advanced waste-water treatment, energy optimisation, a heat recovery system and zero emissions in electric hybrid mode.

New cruise experience

"*Le Commandant Charcot* is a new step for the cruise industry," says Maximilian Vocke. "Technically, the hull is optimised for both icebreaking and open water. All the machinery and equipment chosen is highly advanced with proper winterization, while all interior decorations are luxurious with the aim of creating a once-in-a-lifetime experience for passengers."
During the concept development, Aker Arctic was responsible for everything from the main deck downwards, as well as the machinery and design of the steel hull. Stirling Design International was responsible for the upper decks and interior design, while Ponant provided the guidelines for the development and ensured that everything met their requirements. Vard joined the design team during the contract negotiations.

Le Commandant Charcot was built by Vard with the steel hull constructed in Romania, while final outfitting and commissioning were done in Norway. The vessel was delivered in July 2021. ■