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NTN-SNR TAKES PART IN THE EU'S CLEAN SKY 2 PROGRAMME: *We can be a "HEROe"...*

Powered by a global budget of €4 billion funded jointly by the EU and major European organisations, Clean Sky 2 is Europe's largest aeronautics research programme involving both industry and the public sector. NTN-SNR has been partnering leading aeronautics companies for more than 50 years and once again is drawing strength from its expertise to drive progress. The aim is to increase the sector's competitive edge, support innovation and reduce the environmental impact. The code name is HEROe.

High Efficiency ROller Bearing is the second European aeronautics project for which NTN-SNR has applied and been selected. This innovation is being developed for Italian aviation company GE Avio, and NTN-SNR faces the challenge of defining and designing the best hybrid roller for Airbus' Racer high-speed demonstrator, which is intended for the emergency services, hospitals, coastguards, oil platforms, intercity transport, and so on. The objective is to raise the bar on the demonstrator's performance while reducing its impact on the environment.

- **A patented innovation**

"The hybrid bearing that NTN-SNR is developing features tapered rollers, where the main component (metal) has been replaced with ceramic, which explains why we're calling it a hybrid," advises Guillaume Lefort, Innovation Project Leader at NTN-SNR. In the race to save weight, there is nothing trivial about the decision to change the material, since it has the potential to "save around 15% off the bearing's total weight, thereby lowering centrifugal forces and improving reliability." At the same time, this technology guarantees superior resistance to damage (minimising maintenance), less power loss and greater behaviour when operating without lubrication. If a failure hits the lubrication system, helicopters need to be able to continue flying in order to land safely. To address this need, endurance testing without lubrication is currently being performed for one hour to ensure that the bearings are performing correctly. In case of new projects, including the Racer, testing time is increased to four hours. This is one of the requirements for the HEROe project...



- **Harnessing technology to protect the environment**

The Racer will not simply be a showcase of Europe's aeronautical prowess, but a fast and reliable helicopter. It will build on the environmental goals laid down by ACARE (Advisory Council for Aeronautics Research in Europe) in terms of reducing the environmental impact of air transport.

Therefore, this helicopter should:

- Be capable of vertical takeoff and landing in order to be as close as possible to where it is required
- Double the distance travelled in one hour (400 km instead of the current average of 250 km), which in turn lowers the number of aircraft / hubs and their impact on the environment
- Reduce their gas emissions, sound pollution and fuel use

- **An all-French NTN-SNR team**

To meet these objectives, approximately 20 NTN-SNR operators, engineers, technicians and doctors working at the Annecy and Argonay sites in France's Haute-Savoie region have been involved in the Clean Sky 2 programme since March 2018.

The hybrid tapered roller bearing that they are designing will be mounted in the lateral gearboxes behind the propellers. For instance, this bearing "will not only help improve the aircraft's performance and reliability, but also reduce its weight and fuel consumption," explains Guillaume Lefort.

A total budget of €4 billion has been earmarked for the European Clean Sky 2 programme, and nearly €855,000 of which has been allocated to the HEROe project: 70% of this amount is subsidised by the European Union, while the remaining 30% is being bankrolled by NTN-SNR.

KEY FIGURE

20,000. That is the number of hours of tests that are being planned for the NTN-SNR test benches as part of the HEROe Bearing project.

DID YOU KNOW?

In 2016, of the 500 European projects participating in Clean Sky 1, NTN-SNR's propeller blade bearings for open rotor aircraft engines was ranked in the final TOP 10!



FIVE QUESTIONS FOR... GUILLAUME LEFORT, INNOVATION PROJECT LEADER AT NTN-SNR

What is the objective behind the Clean Sky 2 programme?

The Clean Sky 2 programme is pursuing the research efforts required to reduce the impact on the environment. It is aligned with the goals laid down by ACARE (Advisory Council for Aeronautics Research in Europe) for 2050. For example, the aim by 2035 is to reduce CO2 emissions and fuel by 20% and 30%, NOX emissions by 20% to 40% and noise exposure by as much as 75% (compared to existing technologies in 2014).

What goals has ACARE laid down for 2050?

ACARE wants to see the aviation industry in 2050 producing considerably less pollution than in 2005. Over the next 30 years, this represents a 75% reduction in the CO2 emissions per passenger kilometre generated by air transport. This is a large-scale challenge, especially when bearing in mind how air transport is growing exponentially, i.e. + 5% every year!

Specifically, whereabouts are you at the moment with the HEROe project?

We are halfway through the project. We started on 1 March 2018, and the end date is scheduled in 2021. To date, we have completed the entire bearing design process and we have finalised creating the prototype. Now the time has come for the test campaign, modelling and model/test correlation.

Where is testing being carried out and under what conditions?

Tests are being performed at our test centres in Annecy in France's Haute-Savoie region. There are different types of tests on specific machines, including endurance testing on sound and indented bearings until they start spalling, the spread of spalling, endurance of rolling elements with defects, and testing after lubrication has been stopped. Test benches have been modernised accordingly and thermocouples have been added to the rotating parts to ensure measurements with greater reliability and precision. The project will require 20,000 hours of testing.

After testing, will NTN-SNR be responsible for developing the bearing?

Our role in the Clean Sky 2 project is to research, design and validate the prototypes for our patented hybrid tapered roller bearing. Once the project is completed, NTN-SNR will provide GE Avio (Italy) with prototypes that are similar to the HEROe prototypes, but which have been engineered to suit the specific gearbox interfaces used by GE Avio, our industry partner in this project. GE Avio mounts our prototypes in its subassemblies and supplies them to Airbus Helicopters.



HEROe: an EU-subsidised project

FACT SHEET

Name: HEROe - High Efficiency ROller Bearing
Budget: €854,193.75
End customer: Airbus Helicopters
Model concerned: Racer
Industry partner: GE Avio
Project duration: 36 months
Project start: 1 March 2018
Project end: 28 February 2021
NTN-SNR sites: Argonay and Annecy (Haute-Savoie, France)!



NTN-SNR ROULEMENTS is an NTN Corporation entity. Generating revenue in excess of €5.7 billion, NTN Corporation is a world-leading designer, developer and manufacturer of bearings (world no. 3) and transmission seals (world no. 2). NTN Corporation is present in all major industrial markets, from the automotive sector to aeronautics. The takeover of SNR ROULEMENTS in 2007 by the NTN Corporation group enabled the latter to consolidate its presence in Europe and its position as world leader. NTN employs nearly 7,000 people in Europe and has 15 production sites, 7 of which in France.

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