

Sustainable collaboration: Using the AWI's polar aircraft in the Harz

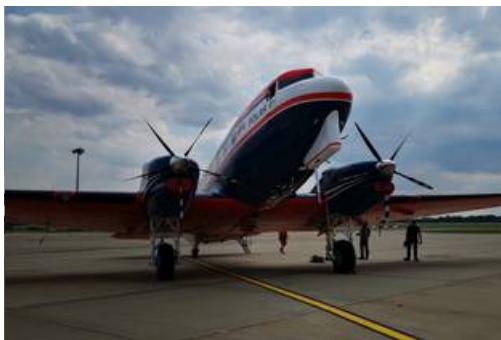
Researchers use test flights for upcoming Arctic campaign to quantify damage to forests

[15. July 2022] In Germany, the Harz is a region particularly hard hit by climate change: storms, arid conditions and subsequent bark beetle infestations are causing unprecedented damage to the forest. Sea-ice experts from the Alfred Wegener Institute are now helping to quantify the damage and contributing to the success of reforestation efforts - from the air. To carry out essential equipment tests for an upcoming Arctic campaign, they are engaging in survey flights over the Harz, during which they're putting their new, high-resolution camera systems through their paces.



In the spring and late summer of every year, the research aircraft [Polar 5](#) and [Polar 6](#) assess the status of the thinning pack ice in the regions to the north of Greenland and Canada, and in the Central Arctic, as part of the [IceBird campaigns](#). In this regard, the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) and its partner institutions rely on measuring equipment based on cutting-edge technologies. Before each new campaign, the Basler BT-67 aircraft, specially equipped for the extreme environmental conditions found in the polar regions, must be fitted with the requisite sensor systems. The setup work is done at Bremen Airport, where the AWI maintains its own hangar.

“Once a new system has been installed, there are test flights over the North Sea to ensure that everything works smoothly, since technical problems are often extremely difficult to solve in the remote reaches of the Arctic and can jeopardise the success of an entire campaign,” explains Dr Thomas Krumpfen, a sea-ice researcher at the AWI and coordinator of the aerial campaigns. “In addition to the tests, those using the new equipment need to be trained. Using the constantly changing sensors installed in the aircraft can be a complex task, and in the Arctic there’s no room for mistakes. We run separate training flights to familiarize the operators.”



Polar 6 in Bremen (Photo: Matthias Gessner, DLR)



View into the spruces' crowns (Photo: Niedersächsische Landesforsten)

Now Krumpfen has used one of these training flights for a somewhat unusual purpose from a polar research standpoint: in close collaboration with Lower Saxony State Forest (NLF), the Institute of

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Optical Sensor Systems at the German Aerospace Center (DLR) in Berlin and the Northwest German Forest Research Institute (NW-FVA, Göttingen), in the course of these training flights, forest areas in the Harz especially impacted by climate change were flown over and surveyed in high resolution. Two people came up with the idea of using training and test flights to support regional research projects: forester Gunnar Kanzenbach, who works at the Forestry Office *Revierförsterei Hallah* in the vicinity of Bremen, and Thomas Krumpen, who is himself a forester by training. Kanzenbach is who first put Krumpen in touch with his colleagues at the NLF's Lower Saxony Forestry Planning Office.

In Germany, the Harz is a region particularly hard hit by climate change: storms, arid conditions and subsequent bark beetle infestations are causing unprecedented damage to the forest. Although the harm done by major bark beetle infestations and resulting loss of



Forest severely damaged (Photo: Matthias Gessner, DLR)

spruce trees can be quantified with the aid of automated satellite imagery analyses, the accuracy of this method can only be verified using a combination of high-resolution flyovers and measurements taken on the ground. The equipment used on 13 July, the day of the six-hour aerial survey, included the MACS, a specially designed camera from the DLR that offers high-resolution optical images of the forest's status. In addition, the AWI's laser-based systems on board the polar aircraft made it possible to survey the forest three-dimensionally. The data gleaned can be used for forestry inventories, as well as estimates of the biomass and carbon budget. The information gathered during the flight will also serve as the basis for new advances in forestry inventories and tree species identification. According to Wolf Kleinschmit, Head of the Lower Saxony Forestry Planning Office: "The data collected will allow us to identify the tree species and their level of damage, and to verify how reliable the automated analysis of satellite imagery actually is. Together with insights into local soil conditions, the data will show us how successful recent reforestation measures have been, which will help us to establish climate-stable, resilient mixed forests."



Damage in Harz Mountains (Photo: Niedersächsische Landesforsten)

Over the next few weeks, the forestry experts will assess the imagery. Both sides intend to maintain their collaboration and use future training flights to gather essential data on the Harz. After successfully completing the test flight, Thomas Krumpen and his sea-ice team now

have a green light to begin their five-week summer IceBird campaign, which they will depart for on 20 July.

Institute

The Alfred Wegener Institute pursues research in the polar regions and the oceans of mid and high latitudes. As one of the 19 centres of the Helmholtz Association it coordinates polar research in Germany and provides ships like the research icebreaker *Polarstern* and stations for the international scientific community.

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