Logistics

'Polar 5' can cover distances of up to 2,900 kilometres and take off at heights of over 3,800 metres on the Antarctic plateau. This is important for bringing supplies to the Kohnen Antarctic summer station. It is situated at a height of nearly 3,000 metres on the inland ice. The polar aircraft also supplies the German Antarctic station Neumayer III, which is manned all year round.
For a long time now AWI has also been deploying aircraft for international logistics missions, e. g. DROMLAN (Dronning Maud Land Aircraft Network). DROMLAN is an association of eleven national Antartic programmes in which, among others, British, Scandinavian, Russian and Japanese polar research institutes take part. They jointly organise their expeditions in the Antarctic and the transfer to the research stations. 'Polar 5' is additionally available for assistance in emergencies, so-called search and rescue missions (SAR), in the Antarctic at any time.

▲ *Refuelling 'Polar 5' from a sledge-mounted drums at the Novolazarevskaya airfield*
(photo: A. Jenkins)

Technical equipment

'Polar 5' is specially equipped for operation in polar regions. It has a wheel and ski undercarriage with which it can take off and land on concrete, dirt and snow runways. It possesses modern navigation systems (GPS), is equipped for flying on instruments and can also land under difficult weather conditions (white-out). Special equipment enables operation at temperatures down to -54 degrees Celsius. 'Polar 5' is looked after by the Canadian company Kenn Borek Air Ltd in Calgary.

06/10

Technical data for 'Polar 5' - Basler BT-67

Overall length	20.66 m
Overall height	5.20 m
Span	29.00 m
Length of cabin	12.85 m
Width of cabin	2.34 m
Height of cabin	2.00 m
Empty weight	8,387 kg
Maximum takeoff weight	13,068 kg
Engines	Pratt & Whitney PT6A-67R
Engine power (per engine)	1,281 PS
Fuel consumption	570 l/h
Absolute ceiling	7,600 m
Maximum payload (for 3 flight hours)	2,500 kg
Range without payload	2,900 km
Maximum cruising speed	380 km/h
Number of passengers	18
Maximum takeoff height (with ski undercarriage)	3,800 m
28 V DC power supply	550 A

Cover photo: 'Polar 5' during a measurement flight over the ice ▶
(photo: J. Jenssen)

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English

AWI

Polar Aircraft

Alfred Wegener Institute
for Polar and Marine Research
in the Helmholz Association

HELMHOLTZ
ASSOCIATION

Aircraft for polar research

Aircraft are an indispensable tool for research in the inaccessible, ice-covered regions of the Arctic and Antarctic. They are essential for logistics between the research stations in Antarctica.

The Alfred Wegener Institute for Polar and Marine Research in the Helmholtz Association (AWI) has been operating aircraft equipped with skis for the German scientific community since 1983. Current 'Polar 5', a Basler BT-67, is in operation. On average AWI coordinates four to six long-term scientific aircraft expeditions in the Arctic and Antarctic every year. An Advisory Board decides on the projects to be implemented, which involve universities and research institutes in Germany and abroad. The aircraft is located at the Luneort regional airport in Bremerhaven.

'Polar 5' at Kohnen Station – first tracks at the start of an expedition in the Antarctic
(photo: S. Müller-Marks)

Research from the air

Geophysicists study the ice cover of the Earth (cryosphere) from the aircraft by means of radar equipment. In Greenland and the Antarctic they measure the thickness and structure of the ice. Even the topography of the bedrock concealed beneath it becomes visible with the help of radar. The measurements allow the scientists to calculate how much ice there is in certain areas. Regular repetitions of the measurements show whether the ice is increasing or decreasing. This provides indications on how climate changes impact polar regions and the sea level.

'Polar 5' with geophysical booms and antennae in front of hangar 5 at the Bremerhaven regional airport
(photo: G. Schläger)

The sea ice in the polar oceans is also measured in terms of its thickness and the topography of its surface from the aircraft with a high spatial resolution. These measurements as well as further ground-supported observations facilitate the interpretation of satellite data that are available only with a relatively rough resolution. Wind, air temperature and moisture can be measured at a high frequency. Among other things, this makes it possible to determine energy flows in the atmosphere and thus the energy exchange between ocean, sea ice and atmosphere. These measurements primarily serve the purpose of developing models with which researchers can calculate physical processes in the polar atmosphere realistically. The aircraft-based measurement of solar radiation and its attenuation as it penetrates clouds as well as its reflection from sea ice additionally contributes to a better understanding of the processes relevant for the polar climate and the development of sea ice.
Different particles suspended in the air, so-called aerosols, absorb or reflect solar radiation and thus influence the climate. Furthermore, as crystallisation nuclei they trigger the creation of clouds. The chemical, microphysical and optical characteristics of aerosols can be measured directly from the aircraft. The data are supplemented by measured values obtained at the German-French AWIPEV research base in the Arctic (Svalbard) and Neumayer Station III (Antarctic) as well as from satellite measurements.

Scientific equipment

The aircraft's scientific equipment can be flexibly designed for the various campaigns. Many devices on board have been developed at AWI or on behalf of AWI.
Remote sensing systems, such as magnetometers and gravimeters for measuring the magnetic and gravitational field of the Earth, are available. A laser altimeter records the surface structures of the ice.The structure of the ice layers can be examined by means of electromagnetic reflection measurements on the wings. A digital line scan camera records the distribution of the sea ice.
A device holder for atmospheric turbulence measurements is integrated into the front outrigger.
In addition, a mobile light radar (LIDAR) unit is installed that measures the vertical distribution of the aerosols. 'Polar 5' can hold further equipment and any voltage desired is available at several places on board via distributor panels – interesting aspects also for international external scientists.