



AISat – over 52,000 ship signals received from around the world

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The first things the AISat satellite caught sight of were the Russian Kamchatka Peninsula and the Bering Sea – but at that time only one non-directional rod antenna was in use on board the satellite. Within eight minutes, the receiver picked up Automatic Identification System (AIS) signals from 45 ships. The four-metre helical antenna deployed and was brought into operation on 8 August 2014. Since then, orbiting at an altitude of 660 kilometres, the helical and non-directional rod antennas have captured over 52,000 datasets. This was a first, because an axial helical antenna had never before been used to detect ships. The researchers from the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) are satisfied – even although the satellite pointing is not yet completely correct. Some parameters for the attitude control system still need to be optimised before the satellite's orientation can be stabilised. "At the moment, we are collecting a lot of data. Now we need to evaluate its quality," says DLR project leader Jörg Behrens. The researchers are hopeful that the helical antenna will allow greater accuracy in the reception of ship signals, which provide information on position, vessel size and cargo from areas with heavy maritime traffic.

Listening to each individual ship signal

Non-directional rod antennas used until now have tended to become overwhelmed by large numbers of signals, especially in regions with heavy shipping traffic – they observe areas with a diameter of about 5000 kilometres and receive too many simultaneous messages to be able to assign the signals to individual vessels. "Our helical antenna targets a region just 750 kilometres in diameter," explains Behrens. "We believe that the system will enable us to detect individual ship signals with greater precision." This will help improve safety in areas such as the Mediterranean, the North Atlantic coast of America and major ports such as those of Beijing, Tokyo and Singapore.

The DLR satellite was carried into orbit on board an Indian launch vehicle on 30 June 2014. Since then, the project team has operated and controlled AISat from its base at the DLR site in Bremen. On the first day, AISat transmitted its initial Morse code signals containing information about the satellite's condition, and the messages were received in Bremen. "During the first few weeks following the launch, we were particularly concerned with increasing the communication time with the satellite, so we made use of the ground station at the Technische Universität Berlin, and colleagues working there gave us a lot of help," explains Behrens. "With AISat, it is pretty much new territory – the engineering as well as the commanding from DLR Bremen. At the moment, we are on a fairly steep learning curve." At present, there are multiple overflights every day, during which the scientists receive datasets containing recorded ship signals and transmit commands to their satellite.

Receiving global signals

So far, the extended helical antenna has detected ships travelling across all of the seven seas: "There are a large number of fishing boats on the move around Spitsbergen, while in Siberia we tend to see vessels heading along rivers; many of the other datasets come from ships passing through the Suez Canal or crossing the Mediterranean," says Behrens. So far, they are lacking data from the German Bight. The scientists intend to use this popular shipping area as a benchmark for the data they receive. Comparing data from this region with that received by ground stations will enable the researchers to audit the quality of satellite reception and to demonstrate that the helical antenna has the capacity to accurately receive ship signals – with a

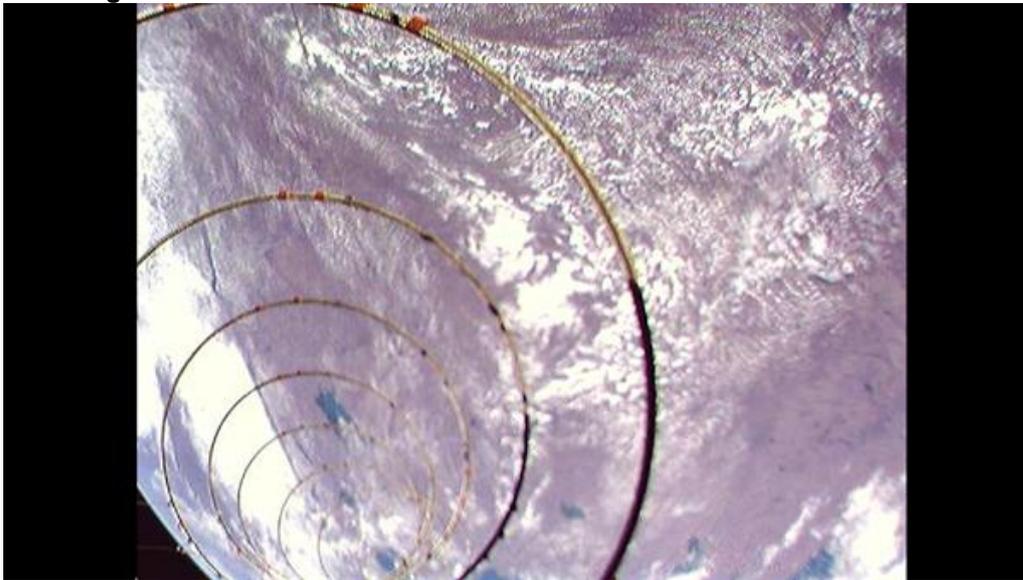
greater range than ground-based receiver systems. "The helical antenna can only be counted a success if it is better than non-directional rod antennas in space," emphasises Behrens.

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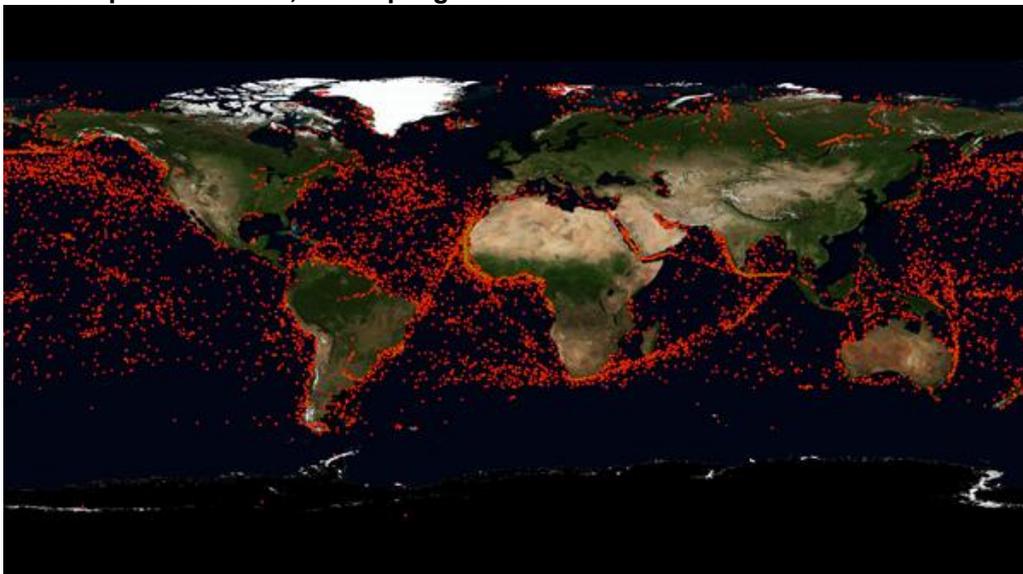
Listening with a helical antenna



The camera on board the German Aerospace Center (DLR) satellite AISat has acquired the first image of the deployed helical antenna. With the four-metre antenna, ship signals can be received with greater precision than when using non-directional rod antennas.

Credit: DLR (CC-BY 3.0).

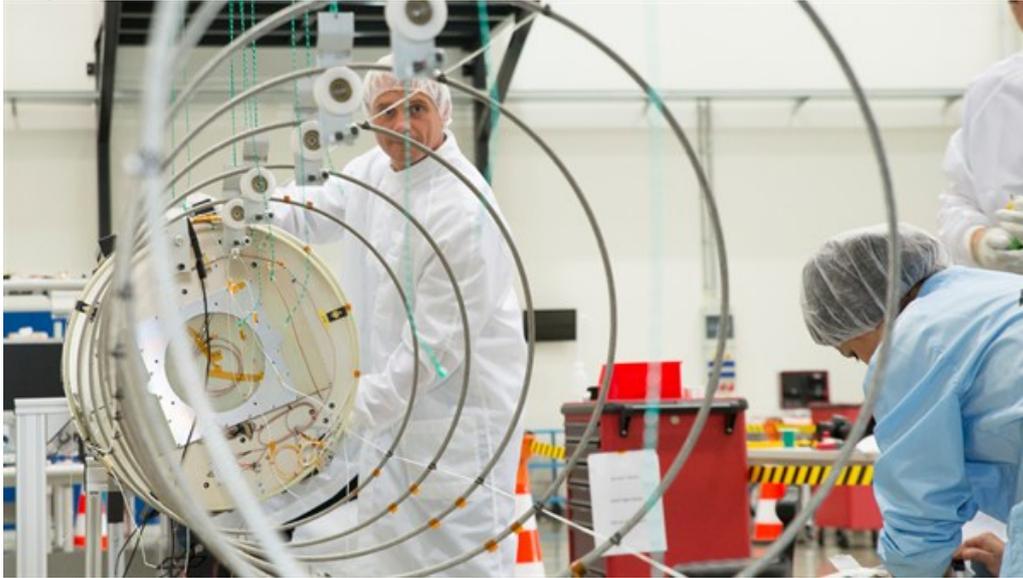
AISat captures over 52,000 ship signals



Since its launch on 30 June 2014, the German Aerospace Center (DLR) satellite AISat has received over 52,000 ship signals from around the world.

Credit: DLR.

Ship detection with the AISat satellite



The AISat satellite will receive Automatic Identification System (AIS) signals transmitted by ships while it orbits at an altitude of 660 kilometres. Its helical antenna will be pointed towards Earth and will locate ships, especially in high traffic areas like the German Bight.

Credit: DLR (CC-BY 3.0).

An antenna for ship detection



Until now, satellites equipped with non-directional antennas have monitored maritime traffic, and the individual signals cannot easily be distinguished in areas with large numbers of vessels. For the AISat satellite, the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) has developed a four-metre-long helical antenna and a satellite receiver. The spacecraft will be controlled and operated by the DLR Institute of Space Systems in Bremen.

Credit: DLR (CC-BY 3.0).

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