



New communication channels in the air

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DLR's ATRA research aircraft tests an integrated communications system

Internet on the airplane – digital systems are an everyday routine for more and more passengers, but pilots are largely cut off from this development. This is because, up until now, they have had to communicate using a completely separate system that is primarily analogue. Under the leadership of the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR), a new system that will lead pilots into the digital world of the 21st century has been tested in flight trials. A single device transmits communications with the ground and via satellite, digitally at high speed. Detailed information, such as the weather or the traffic situation can therefore be exchanged between the tower and the aircraft quickly and reliably, which increases air traffic safety. Thirty partners are involved in the development of the new system.

Tested for the first time in flight

"Until now, there have been separate communication boxes in commercial aircraft through which pilots communicate with the ground using VHF and HF radio or via satellite. The technology for this is sometimes several decades old," comments Simon Plass from the DLR Institute of Communications and Navigation in Oberpfaffenhofen. He is in charge of the test flights for the SANDRA (Seamless Aeronautical Networking through integration of Data links, Radios and Antennas) project. "We have developed a system that combines all communication channels in one device and adds a reliable automatic data transfer system to the ground and via satellite. Communication in the cabin and the cockpit is focused outwards." The new system has now been tested for the first time under real flight conditions using DLR's ATRA (Advanced Technology Research Aircraft) test aircraft, which is a modified Airbus 320. "ATRA is a fully-equipped airliner, which makes it an ideal platform for testing new communication systems for tomorrow's air traffic," said Oliver Brieger, Head of Flight Operations in the DLR Flight Experiments facility that is responsible for the operation of the A320 ATRA.

Connection switched as with a smart phone

ATRA took off from the special airport at Oberpfaffenhofen on four days in total in June 2013 and showed how flexible and reliable the exchange of information between ground staff and pilots could be in the future. "With smart phones, we have gotten used to surfing the Internet when we are travelling, using the cheapest possible connection available, be it WLAN, the mobile network or via Bluetooth. It is precisely this flexibility that is also required in the new approach to aircraft communication," explained Plass. "Pilots no longer have to speak to the tower using VHF radio. They can switch to a digital Voice Over IP connection and, at the same time, receive and send data via the best available channel." In addition, automatic data exchange is possible between all parties who are moving in the air or who manage them on the ground.

Air traffic controller and pilot looking at the same thing

For landing at airports, the SANDRA system has a quick data link that works via WiMax, and thus indirectly via the local WLAN. Plass stressed that, with all innovations, compatibility with the previous technologies has been borne in mind: "It can also be used to land at any airport in the world because, in the SANDRA project, we have combined the existing aviation communication standards in one unit and added new, faster technologies." Depending on availability, the SANDRA system automatically connects pilots to fast broadband connections, or the pilot can connect using an analogue system. Plass has a clear vision for future air traffic:

"One day, the pilot in the cockpit will be able to see all the information on weather, air traffic and current decisions at the same time as his colleagues in the tower. Automatic flight corrections to avoid critical situations and misunderstandings will be much easier."

No loss from ground station to ground station

The SANDRA system includes not only the newly-developed device on board the ATRA but also corresponding communication technology on the ground, which researchers have installed at the DLR site in Oberpfaffenhofen and at Toulouse-Blagnac Airport. During a flight from Oberpfaffenhofen to Toulouse, the ATRA tested the smooth exchange of data during a transition from one ground station to the other. "Up until now, for example, transatlantic aircraft could only connect with the ground occasionally via specific gateways, but the very reduced data transfer was often cut off and had to be started over again. We want to close this gap with our system," said Plass. "Until now, these digital exchanges have been restricted to a short text message service similar to SMS on mobile phones."

The partners

The SANDRA project is supported by 30 international development partners. DLR is responsible for the development of the network technology and carrying out flight tests on the new system with the ATRA aircraft. The Italian company, SELEX ES Spa, is, overall, responsible for the project.

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DLR ATRA research aircraft



The Airbus A320-232 D-ATRA, DLR's largest fleet member, has been in operation since the end of 2008.

Credit: DLR (CC-BY 3.0).

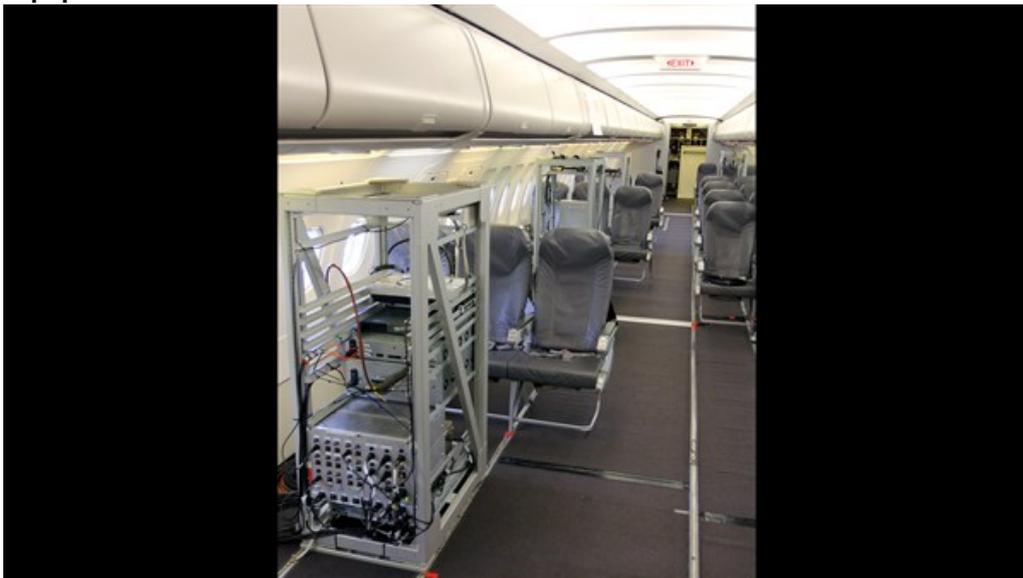
Installation of the measuring instruments



One of the frameworks with scientific measurement Instruments: The 'rack' for the testing of the SANDRA system partially weigh more than 100 kilogrammes.

Credit: DLR (CC-BY 3.0).

Equipment units on board



For the SANDRA project (Seamless Aeronautical Networking through integration of Data links, Radios and Antennas) DLR scientists have developed a system that brings together all communication channels of cockpit and cabin in one device to provide a reliable automatic data transmission to the ground and expanded via satellite. With the DLR test aircraft, ATRA, a modified Airbus A320, the new system could be tested for the first time under real flight conditions.

Credit: DLR (CC-BY 3.0).

On the outside: antennas and sensors



Detail of the newly installed AeroMACS C-band antenna.

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