DLR examines the benefits of 'sectorless' airspace

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Air traffic will continue to grow in the foreseeable future, increasing the workload of air traffic controllers. Researchers at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) have been examining what would happen if air traffic controllers started to view German airspace as a whole, rather than continuing the current practice of viewing it as small areas known as 'sectors'. This approach would reduce air traffic controllers' to reduce their workload while contending with higher volumes of air traffic; also, pilots would only have one air traffic controller as their point of contact.

Currently, the airspace managed by air traffic controllers is divided into sectors defined by fixed boundaries. These sectors vary in size, depending on the density of air traffic. Whenever an aircraft flies into a sector, the air traffic controller responsible for the previous sector through which the aircraft flew hands over that flight to the relevant colleague responsible for guiding that aircraft through 'its' airspace before passing it on to the controller responsible for the next sector. In the face of rising volumes of air traffic, this system has several long-term disadvantages: "the higher and more complex the air traffic volume is within a given area, the smaller the sectors need to be," explains Bernd Korn, head of the Pilot Assistance Department at DLR's Braunschweig-based Institute of Flight Guidance. "But it is already becoming apparent that the reduction of sector sizes cannot go on indefinitely, because at some point the supply of radio frequencies required for each sector runs out, as do the options for directing air traffic within that sector," continues Korn. There is a further disadvantage to reducing the size of the sectors and thereby increasing their total number. A higher number of sectors would mean that air traffic controllers must conduct more handovers, increasing their workload.

Increasing capacity

The concept examined by DLR, in collaboration with Deutsche Flugsicherung GmbH (DFS), the company responsible for air traffic control in Germany, is very promising. For example, if an air traffic controller guides an aircraft from its point of entry into German airspace through to the point at which it enters another country's airspace, initial studies show that the same number of air traffic controllers can handle substantially higher volumes of traffic. This also dispenses with all the additional workload associated with frequent handovers. Moreover, the concept also offers an excellent framework for routing flights more directly, thereby reducing flight times. Pilots would also have an advantage, a single point of contact for their entire flight across German airspace.

In 2009, DLR researchers conducted a joint study with air traffic controllers from DFS under the title 'Airspace Management 2020', to establish just how feasible a concept of this kind might be in airspace at higher altitudes. The results of this study were very encouraging, so the concept is now being examined in greater depth. At the end of 2010, eight active air traffic controllers from DFS took part in a simulation to test the control of 'upper', or high-altitude, German airspace as a single sector. By the end of this simulation, using small display screens – a separate one for each aircraft – the air traffic controllers were able to manage up to six aircraft each. "We tested several variants," explains Korn. "It emerged from this that the air traffic controllers were able to work effectively in this simulation environment with up to six aircraft. Analyses have shown that, with this ratio of 1:6, it would be possible to double air traffic volume."

Of course, this new concept has disadvantages; it will be necessary to establish precisely what happens when two aircraft need to make collision avoidance manoeuvres while each is in the

hands of a separate air traffic controller. "For cases such as this, we have drawn up a set of rules that clarify exactly who must give way to whom," states Korn.

It is possible

The air traffic controllers adapted to these new working practices after just a short adjustment phase and demonstrated great interest in the possibilities of this new concept. During the tests, they provided the scientists with direct feedback and a record was kept of their proposed improvements. Following this success, the DLR Institute of Flight Guidance is continuing to pursue the idea. The researchers are considering how best to continue to improve the processes and are working on concepts that, in the longer term, will make it possible to implement the results of their work. However, there are still technical and operational matters to resolve.

Contacts

Jasmin Begli
German Aerospace Center (DLR)
Corporate Communications, Braunschweig
Tel.: +49 531 295-2108
Fax: +49 531 295-12100
Jasmin.Begli@dlr.de

Dr Bernd Korn
Deutsches Zentrum für Luft- und Raumfahrt (DLR) - German Aerospace Center
Institute of Flight Guidance, Pilot Assistance
Tel.: +49 531 295-2540
Fax: +49 531 295-2550
Bernd.Korn@dlr.de

How an air traffic controller could work in 'sectorless' airspace

A DLR staff member demonstrates how an air traffic controller can work with the display.

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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.

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