Building bridges in the sky

Seamless transition between neighbouring ANSPs is possible if all partners pursue solutions based on global best practice.

To foster a continuous and seamless transition across flight information region (FIR) boundaries it is necessary that similar procedures, services and separation standards are used by adjacent FIRs.

This can best be achieved by ensuring surveillance hand-offs when flights cross FIR boundaries. This enables flights to ‘fly smarter’, optimising their speed, course and altitude. Moreover, the safety levels in a continuous surveillance environment are higher than those in a procedural environment.

This rarely happens, however. Surveillance services are often terminated prior to the boundary and a procedural hand-off is used to transfer the aircraft to the neighbouring ANSP.

Kapri Kupper, Operations Programme Manager, CANSO, says there are two major reasons why this is the case. “First, the receiving ANSP might not have surveillance capability due to a lack of appropriate equipment or due to such geographical limitations as oceanic or remote airspace,” she notes. “And second, if surveillance services are provided on both sides of the FIR boundary, incompatible systems may make procedural hand-offs necessary.

The CANSO Best Practice Guide to Flight Information Region Boundary Crossings (FIRBX Guide) provides global, best practice solutions to overcome these challenges.

Best practice

Building surveillance capability is the obvious starting point. Kupper points out the key in this regard is ensuring neighbouring ANSPs collaborate to identify and minimise gaps in surveillance coverage and to ensure compatible technology and procedures are in place.

ICAO has identified automatic dependent surveillance – broadcast (ADS-B) and multilateration surveillance (MLAT) as appropriate systems for the application of surveillance-based separation between aircraft. A major benefit of these systems over traditional primary and secondary radar installations is that they are generally less expensive to install and maintain while providing similar levels of surveillance coverage.

Some ANSPs have used ADS-B and MLAT to increase surveillance coverage in areas that have traditionally been non-surveillance areas. For example, ICAO reports that ADS-B trials run as part of the Gulf of Mexico (GOMEX) Route Redesign project, demonstrated an increase in efficiency and cost savings to the user, and indicated that further benefits would accrue once ADS-B was fully implemented in GOMEX airspace.

Kupper notes one clear advantage of providing surveillance data to controllers in remote airspace is the ability to reduce separation between aircraft to as little as five nautical miles.

Other benefits include less air to ground communications, improved operational flexibility and ‘safety net’ alerting tools, such as short-term conflict alert.

Improvements in the areas of cross-boundary co-ordination, harmonisation, collaboration, communications, and integrated systems will drive benefits for the aviation industry as a whole.
Shared surveillance data can also provide additional situational awareness. ADS-B data from the Timor Sea is currently shared between Airservices Australia and AirNav Indonesia to improve controller situational awareness.

Although a surveillance separation service is not provided in this case, controllers use the surveillance data to apply non-surveillance separation, which provides such benefits as the ability to cross-check information against observed surveillance data. This can reduce the likelihood of incorrect co-ordination and ensure that flight plan data is consistent between FIRs.

Seamless transfer

If technology upgrades are not possible and neighbouring ANSPs do not both enjoy surveillance capability, then ANSPs must tackle the challenge of flights moving across an FIR boundary from a surveillance to a non-surveillance environment.

In essence, the problem is the disparity in systems covering such areas as airspace structure and communication. This necessarily involves an increase in minimum separation standards – in some cases going from five nautical miles to as much as 120 nautical miles or 15 minutes.

The problem is further compounded if flight plans have not been received or are incomplete. Take three flights that are cruising at optimal altitude and a longitudinal separation of 32 nautical miles and that cross to a non-surveillance flight information region. If the receiving ANSP did not receive flight plans for all three flights and requires at least 50 nautical miles separation then the middle flight would need to change altitude to a non-optimal level.

“The recommended practices in the FIRBX Guide mitigate such an occurrence and would make it possible for all three flights to transition from a surveillance-capable FIR to a non-surveillance FIR without a flight level change,” says Kupper.

The Arabian Sea Indian Ocean ATS Coordination Group (ASIOACG) provides an example of one of these recommended practices. Co-operation between individual ANSPs and across ICAO regions has achieved a standard for procedural separation. ASIOACG partners have agreed the implementation of standard and uniform procedural separation as below:

<table>
<thead>
<tr>
<th>Year</th>
<th>RNP Status of ASIOACG airspace</th>
<th>Horizontal separation lateral/longitudinal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>RNP 10</td>
<td>50/50 Nm</td>
</tr>
<tr>
<td>2016</td>
<td>RNP 4</td>
<td>30/30 Nm</td>
</tr>
<tr>
<td>2020</td>
<td>RNP 2</td>
<td>20/20 Nm</td>
</tr>
</tbody>
</table>

The FIRBX Guide encourages ANSPs to introduce RNP-4 airspace to cater to high traffic volumes as this allows the 30/30 nautical mile separation standard to be implemented in non-surveillance, oceanic and remote airspace. It also suggests ANSPs include contiguous airspace design as an agenda item during bilateral negotiations.

The North American (NAM) Common Coordination Interface Control Document (ICD) – which facilitates the transfer of current flight plan (CPL) data via automation – is another example of a valuable tool that ensures accurate and consistent CPL data across boundaries.

The FAA uses this to interface with such ANSPs as NAV CANADA, Instituto de Aeronáutica Civil de Cuba (IACC), and Mexican Airspace Navigation Services (SENEMIT).

“Implementing automation interfaces with adjacent FIRs to supplement or replace manual voice co-ordination is a positive move,” says Kupper.

Safety first

Where surveillance capabilities already exist on both sides of the FIR boundary, compatibility is paramount. Migrating from region-specific standards, such as Australian Area Navigation Operations to internationally recognised PBN standards, will help align separation standards with adjoining FIRs.

“When applying separation standards for crossing FIR boundaries, the aim should be to provide maximum benefit to the operators,” believes Kupper. “But we must always think safety first.”

So though reducing separation standards to ensure an optimal flow of traffic through the airspace minimises fuel burn and CO2 emissions, ANSPs must also consider the impact on safety management systems as well as airborne and ground-based capabilities.

The final word

The FIRBX Guide states that “improvements in the areas of cross-boundary co-ordination, harmonisation, collaboration, communications, and integrated systems will drive benefits for the aviation industry as a whole”.

These benefits may include reducing the number of air traffic incidents, improving the flow and accuracy of information, and improvements in flight optimisation by reducing overall flight times, fuel-burn, CO2 emissions, and the associated workload of operators and airspace users.

“Well small changes can have a big impact on improving efficiency and safety when a plane crosses a FIR boundary, such as the alignment of procedures, separation standards, and airspace classifications on either side of the boundary,” concludes Kupper. “The fewer the changes required by flight crews when crossing a FIR boundary, the greater the contribution to the safety and efficiency of the flight.”

In turn, that will allow the ATM system to meet elevated traffic volumes and facilitate aviation’s contribution to the global economic and cultural environment.

To download the CANSO Best Practice Guide to Flight Information Region Boundary Crossings, go to www.canso.org/publications