SHARING EXPERIENCE AND LEARNING TO IMPROVE ENVIRONMENTAL ASSESSMENTS OF PROPOSED AIR TRAFFIC MANAGEMENT OPERATIONAL CHANGES

BY ROBIN DERANSY (EUROCONTROL)

Although aviation is only responsible for 2 to 3 percent of anthropogenic CO_2 emissions in the world, all facets of the industry are heavily engaged in managing and reducing its environmental impacts, including climate change, and impacts on local air quality and noise around airports. It is well known that most of the impact reductions are expected to come from more efficient airframe and aircraft engine technologies, as well as sustainable bio-fuels. Nevertheless, air traffic management (ATM) improvements can also make a significant contribution to the CO_2 emission reduction efforts.

One of the key benefits of introducing a change in the ATM system is that it can be applied to all aircraft in a specific airspace or region, in a relatively short timeframe. With ATM, a change can be applied literally overnight, and apply immediately to all aircraft. An excellent example of this was the introduction of Reduced Vertical Separation Minima (RVSM) in Europe on 24 January 2002. This introduced six (6) new flight levels, cutting fuel burn and greenhouse gas emissions by 5% above FL290, in a single stroke. Such a major project required years of preparation and assessment, but once it was implemented, it clearly demonstrated that ATM can deliver step-change improvements in efficiency and capacity enhancement across the fleet in a particular airspace.

Environmental Assessments

One of the critical activities for the successful development and deployment of an operational improvement is the performance of any required environmental assessments. Environmental assessments can help ensure that the benefits of an improvement are adequately captured, communicated, and potentially maximized. It can also support the overall acceptability of a change among aviation stakeholders, including potentially affected communities.

There is no one unique way of performing environmental impact assessments for ATM. In fact, many countries around the globe have already developed their own robust and detailed environmental assessment methodologies that must be followed before an air traffic management change can be implemented. However, some countries that either have no formal requirements, or do not have the capability to perform these assessments, might benefit from general guidance on how to perform environmental assessments. That is why CAEP has developed a guidance document in response to a growing need for ICAO Member States to measure the environmental impacts associated with operational ATM changes in a globally harmonized and compatible way.

This *Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes* was published in May 2014 as ICAO Doc 10031. It provides States, airport operators, air navigation service providers (ANSPs) and other stakeholders, with environmental assessment guidance to support sound and informed decision-making when analysing proposed ATM changes such as those related to operational procedures, airspace re-design, etc. This environmental assessment guidance was developed without specific geographic restrictions, in order to make it applicable worldwide.

In particular Doc 10031 provides a "multi-steps review" process, as shown in **Figure 1**. That approach will ensure that the following fundamental questions are addressed:

- When should a formal environmental assessment be carried out?
- What needs to be prepared before conducting an assessment?
- How should the proposed change, its purpose, and its alternatives, be described?
- How should the scope and extent of the assessment required be determined?
- What types of environmental impact should be taken into account, and when?
- How should the assessment be conducted?
- Which documents should be produced and communicated?

Through examples, Doc 10031 also provides insight into the interdependencies and trade-offs between environmental impacts (e.g. fuel, emissions and noise), and environmental impacts and non-environmental performance aspects (e.g. safety, capacity, flexibility).

Learning From Case Studies

In addition to Doc 10031 guidance, lessons can be learned from the actual case studies of existing environmental assessments and methodologies. Sharing experience and learning from each other will help improve and harmonize environmental assessments processes worldwide. While Doc 10031 already included an

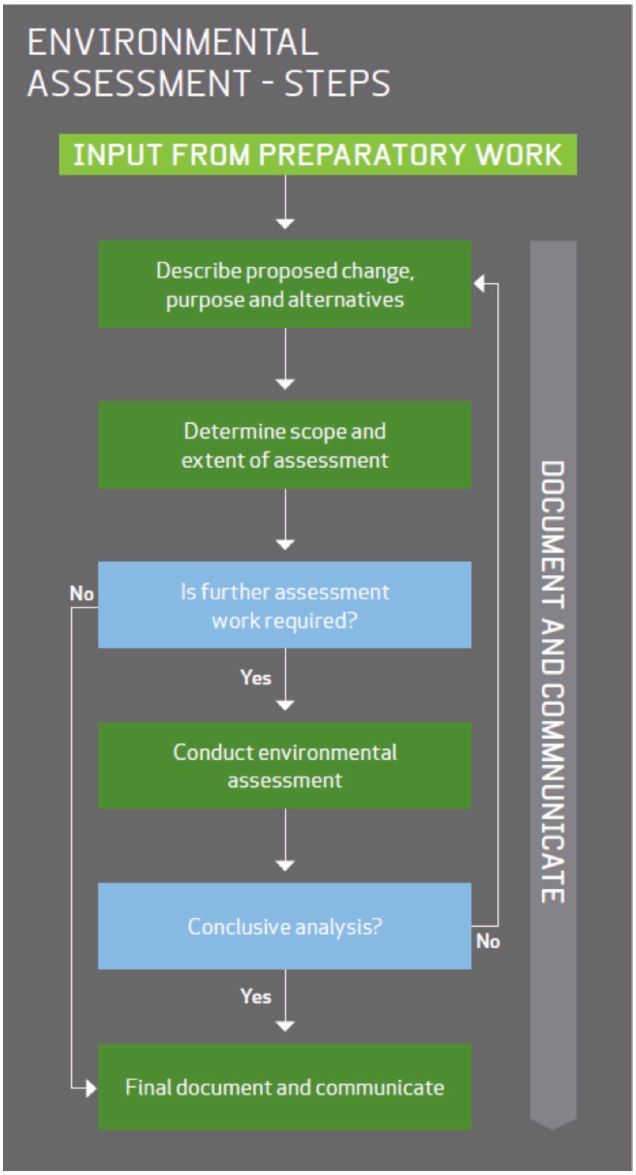

Figure 1. Environmental Assessment Steps.

appendix of assessment examples at local, non-local, and intercontinental levels, it was determined that a greater variety of examples from which everyone could learn would be beneficial. This is why ICAO/CAEP started to collect other examples of case studies, using the template that is provided in Appendix E of Doc 10031.

Ten case studies have been collected to-date. These have all been reviewed by CAEP and are now available on an ICAO web page specifically designed to inform readers about Doc 10031 and to provide examples of environmental impact assessments. (http://www.icao.int/environmental-protection/Pages/EnvironmentalAssessment.aspx)

These case studies are listed below, followed by their reference:

- CAEP Working Group 2, Aviation System Block Upgrade (ASBU) analysis, 2015 (WG2 – ASBU, ID: ASBU).
- Changes to the Required Navigation Performance (RNP) approach and departure procedures for Canberra Airport, 2013 (Australia – ID: AU).
- FRAMaK (Free Route Airspace Maastricht and Karlsruhe), a joint project of DFS Deutsche Flugsicherung GmbH, Deutsche Lufthansa AG and EUROCONTROL Maastricht UAC, funded by the SESAR Joint Undertaking, 2014 (ID: DE).
- ILS interception altitude increase in the Paris area, 2008-2011 (France – ID: FR1).
- New Global Navigation Satellite System (GNSS) procedure QFU 30 at Nevers airport, 2012 (France – ID: FR2).
- "Italian Airspace Reorganization", 2012-2014 (Italy – ID: IT).
- Validation and implementation of next generation airspace at Göteborg Landvetter Airport (VINGA), from the approach, landing, and surface phase until parking at the gate, 2011 (Sweden – ID: SE).
- Point Merge concept in the London Terminal Control Area (TMA), 2012 (United Kingdom – ID: UK1).
- LAMP Phase 1A is the first phase of the London Airspace Management Project which will implement Performance Based Navigation (PBN) and modernise the airspace structures supporting airports in South East England (ID: UK2).
- Greener Skies over Seattle: Proposed Arrival Procedures to Seattle-Tacoma International Airport submitted by US Federal Aviation Administration (FAA), 2012 (ID: US).

As can be seen in **Table 1**, the ten case studies collected so far illustrate different types of environmental assessment. They range from simple cases looking only at noise, or fuel burn and CO_2 emissions, to more complex examples that also had to consider interdependencies with other performance factors such as capacity, predictability, and air traffic controller workload. Different kinds of operational change such as: airport approach, local and regional airspace reorganization, and gate-to-gate improvement, were assessed. The process advocated by Doc 10031 has even been found to be applicable to analyses being undertaken within CAEP, such as the high-level analysis of the fuel saving benefits of ASBU[1] Block 0.

The ten environmental assessment case studies also highlight the importance of some of the guiding principles discussed within Doc 10031. Below are some examples of instances where a case study reinforces a key recommendation of Doc 10031:

- **Choosing appropriate indicator or metric to best communicate results of an environmental assessment (Doc. 10031, section 2.4):** The FR1 case study describes a "lesson learned" in this area. A metric initially used in the environmental assessment appeared not to be appropriate (i.e. was not easily understood by the public) when presenting results to the public. For this reason this metric was not included in further assessments and other metrics, more easily understood by the public (density and NA65dB/25 events), took its place.

- **Choosing appropriate environmental assessment methodology (Doc. 10031, section 3.3):** The UK1 case study notes

Study ID	Assessment aspects	Operational change	ASBU Blocks[2]	Operational Maturity	Base Methodology followed
ASBU	Fuel burn/CO_2	Gate-to-Gate	All	Deployment	Doc 10031
AU	Fuel burn/CO_2	Airport approach	CDO; APTA	Deployment	Air services Environment Management System (EMS)
DE	Fuel burn/CO_2	Regional En-route	FRTO	Demonstration	SESAR
FR1	Noise	Airport approach	APTA	Deployment	DSNA internal process
FR2	Noise	Airport approach	APTA	Deployment	DSNA internal process
IT	Fuel burn/CO_2	Regional airspace	Partially NOPS, FRTO	Deployment	ENAV S.p.A. internal process
SE	Fuel burn/CO_2 and Noise	Gate-to-Gate	APTA; CDO; CCO	Deployment	Own VINGA methodology
UK1	Noise, Fuel burn/CO_2, capacity, predictability & ATCO workload	Airport approach	RSEQ	Demonstration	SESAR methodology + UK CAP725
UK2	Fuel burn/CO2	Airport approach, enroute, SIDs, Holds / point merge	CDO, CCO improvement	Deployment	Process followed UK CAP724/725 and DfT Air Navigation Guidance
US	Noise, Fuel burn/CO_2 and emissions and other aspects	Airport approach	All	Deployment	FAA Order 1050.1E, FAA Order 7400.2K (Chapter 32); Council of Environmental Quality (CEQ's), Regulations for Implementing the National Environmental Policy Act (NEPA)

Table 1. Attributes of Case Studies Collected So Far.

that there may be a need to satisfy requirements at both the State level (i.e. the UK Civil Aviation Authority) and the regional level (i.e. the European Civil Aviation Conference) when carrying out environmental assessments of SESAR concepts.

- **Integrating environment into the decision-making process (Doc. 10031, section 1.3):** The AU case study highlights Airservices Australia's efforts to embed environment into the procedure-design process, thereby supporting Airservices' mission to provide safe and environmentally responsible air traffic services.

- **Communicating results of the environmental assessment (Doc. 10031, section 3.5):** The AU case study also describes various mechanisms used to communicate the results of the environmental assessment, including: a technical assessment document; an "assessment on a page" technical summary document to support advance preparation of communication strategies for internal stakeholders; a community consultation package, including text and a PowerPoint presentation – communicated through a Community Aviation Consultation Group (CACG) meeting; and a summary assessment document – produced for government and industry briefing and published on the Airservices Australia website.

- **Engaging with stakeholders (Doc. 10031, section 2.5):** The US case study describes the importance of early engagement with all stakeholders, including local communities, as the FAA continues to implement Performance Based Navigation. The project in the case study was deemed successful due to the collaborative approach taken and a commitment to effective communication and engagement.

The ten case study examples mentioned, illustrate how we can all learn from the experience of others when conducting environmental assessments. They could also provide potentially useful data points for quantifying the environmental benefits of certain operational changes. The Swedish VINGA case study, for example, showed that the implementation of RNP STARs and RNP AR approaches has a potential for saving around 22-90kg of fuel per flight, compared with the traditional P-RNAV STAR structure followed by an ILS approach. This type of data can be used as a high-level reference point in other environmental assessments of aviation system block upgrades.

Conclusion

CAEP will continue to solicit examples of environmental assessments of ATM operational changes and post them on the ICAO CAEP Environmental Assessment web page. Learning from stakeholder feedback on the application or applicability of the guidance provided in Doc 10031 will help CAEP refine Doc 10031 in the future and ensure that it still provides the most current thinking in an area that is critical to the sustainability and growth of aviation.

Case studies may be submitted via the dedicated "Environmental assessment" web page below (which also includes a link to download Doc 10031): http://www.icao.int/environmental-protection/Pages/EnvironmentalAssessment.aspx.

References

1. The Aviation System Block Upgrade (ASBU) initiative is a programmatic framework that develops a set of ATM solutions or upgrades, taking advantage of current equipage in order to enable global interoperability. It consists of a number of operational improvements or modules (e.g. CDO) defined by time periods or Blocks (e.g. Block 0: 2013 to 2018), which may be deployed in a coherent transition from basic to advanced capability as time progresses. Such modules are grouped together in Performance Improvement Areas (e.g. Greener airports) to provide operational and performance objectives.
2. see article " Environmental Benefits Assessment of Aviation System Block Upgrades"