Data Exchange as the Next Cornerstone of Aviation Efficiency

As with all management clichés and buzz-words, there is seldom anything fundamentally new created. Today we talk of "collaboration", in the 90s it was "team-work", before that it was just "work". Indeed, to borrow a phrase, "there is nothing new under the sun", and this is no less true when it comes to data exchange in collaborative operations in air traffic management.

Sharing information has been inherent to aviation ever since there was more than one aircraft in the sky, and supranational bodies like ICAO, IATA and EUROCONTROL have been seeking increased standardisation since the Chicago Convention. Airspace users file flight plans and share them with Air Navigation Service Providers (ANSPs) and aerodromes. ANSPs share estimates on inbound aircraft via telephone or using standards like OLDI over TCP/IP. Meteorological information is shared by ATIS or over AFTN.

Underpinning all these are legacy systems, which have served the industry well, but in some cases are reaching their maturity, and are showing signs of strain to the point of breakage as global traffic increases, leading to a lack in resilience and hence delays rippling through the system

All the while, aircraft are becoming increasingly economical. Engines are becoming more fuel efficient, aerodynamics are improving in new generation airframes, and operators are working with Flight Management System manufacturers to optimise Cost Index calculations. Meanwhile, ANSPs are working day in and out to deliver operational efficiencies within the context of their own borders and aerodromes

- direct routings at high altitudes,
- continuous descent approaches,
- innovative approaches to traditional constraints such as Time Based Separation on final approach at Heathrow.

All these solutions are gaining fuel, CO2 and cost efficiencies for airspace users, however they are by-and-large constrained to an individual ANSPs sphere of influence. But with European air traffic movements predicted to increase by 19% by 2021[1] from a 2014 baseline, the question for the industry is where can more operational efficiency gains be found, and where can the operational cross-border and inter-organisational pinch points be resolved? How can ground industry reach an improved level of information and data exchange between a myriad of different systems from different providers?

The two largest holistic research programmes currently underway in the Air Traffic Management space are SESAR, in Europe, and NextGen, in the United States. Both of these programmes are looking closely at the implementation of SWIM – System Wide Information Management. The SWIM concept envisages a scenario where organisations in the entire ATM network, be they airlines, ATC, military, meteorological service providers, ground handling, airport operations and many more, are able to exchange information pertinent to efficient operations with each other in a standardised, coherent and consistent way. Central to the success of information

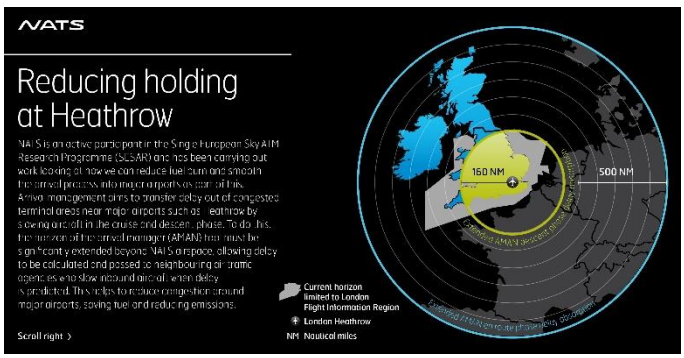
[1] EUROCONTROL STATFOR Seven Year Forecast September 2015
http://www.eurocontrol.int/sites/default/files/content/documents/official-documents/forecasts/seven-year-flights-service-units-forecast-2015-2021-Sep2015.pdf

exchange is the use of agreed standards. In recent years, both EUROCONTROL and the FAA have endorsed the use of common exchange models for this data.

Although to many, this may seem like an inconsequential technical decision, the fact that some areas of the industry are already embracing these standards and other exchange models, has resulted in some early wins for the SESAR programme delivering operational efficiency and capacity gains already. For instance, EUROCONTROL have established the Network Manager B2B web services, enabling organisations to access much operational data including air traffic regulations at aerodromes and in airspace and available conditional routes. My own organisation has been working closely with NATS, to develop XMAN. This is a cross border delay sharing system which enables air traffic controllers in countries adjacent to the UK to know the expected delay at Heathrow for a given aircraft, and slow it down earlier en route in order to reduce the inefficient and expensive low level holding around Heathrow. This one example of standards based information exchange has already been proven to have saved £1.65 million in direct airline costs and 8,000 of CO2 since going since April 2014[2].

The challenge is how to take these successful examples of data sharing forward. There are many areas of day-to-day operations where organisations hold pieces of information internally, which can be of immense value to other operational players, and consequently to the entire networked operation. The example I regularly use is the take-off weight of an aircraft. For a given aircraft type on a given route, this value is highly sensitive between competing airlines as it can indicate a lot of operational and business information about an airline, for example load details, efficiency indices and more. However, this value can be used by air traffic control systems to enhance the trajectory prediction models being used to assist controllers. Prediction models are forced to make many assumptions about a given airframe; knowing only the aircraft type and route for certain leave many variables open to a wide range of uncertainty.

Industry needs to work with operational stakeholders to create an environment where information can be shared between duly qualified organisations. Although highly sensitive, this data holds the potential to be of significant benefit to the overall ATM operation. Once the information is being more readily shared, operational efficiencies will follow.



There are many legitimate barriers which hinder this increased information flow today. Security of sensitive information is a key one. As I've already mentioned, much of the information which could deliver operational efficiencies is commercially sensitive to airline, ANSP and aerodrome businesses. Organisations may have legitimate security concerns both from a corporate espionage as well as from

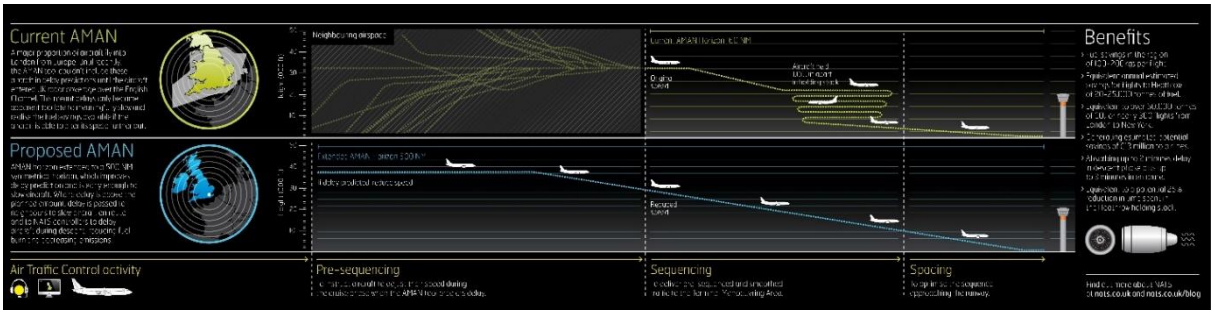
[2] http://www.snowflakesoftware.com/2015/12/xman-london-heathrow-cross-border-arrivals-management-system-goes-live/

malicious attack perspectives. The SESAR programme and the FAA are already going to great lengths to address this concern as they develop and implement SWIM systems into research and development phases as well as live operations. An indeed, institutions are working together to address the security issues collaboratively through bodies such as the NATO/EUROCONTROL Air Traffic Management Security Coordination Group (NEASCOG).

Modern information security best practice including encryption and user profiling technologies can be readily deployed in the aviation world. These techniques are proving to be robust, secure and safe enough for the international banking sector, as well as in complex collaborative military arrangements such as NATO. It's time for the aviation community to take on the learning from these sectors, adapt for our specific needs and move into the next phase of deploying modern, standards-based information sharing technologies.

It's not true to say that the air traffic management system is broken today. However, given forecasts from EUROCONTROL and elsewhere, it is clear that our systems and skies will soon be reaching their capacity. Governments will continue to put pressure on ANSPs and airline operators to find more and more efficiencies, and in the next 10-15 years, those efficiencies will increasingly have to involve cross-organisational collaboration and information sharing at the lowest working levels. Our research programmes can develop complex and elaborate technical solutions, but the research tail cannot be allowed to wag the operational dog. Research must lead to deployment, so priority must be given to research solutions which are deployable. This has started to happen through systems such as Heathrow XMAN, the Network Manager web services and the FAA's Collaborative Trajectory Options Programme.

Through an ongoing commitment to collaborative development of data exchange technologies, and principles to determine how and when such data can be accessed and used, I am certainly in no doubt that information exchange through SWIM, using standards, will be the vehicle through which the next generation of ATM will realise its most significant operational efficiency benefits.



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