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(Asuncion, Paraguay, 4 – 6 December 2017)

Agenda Item 4: Follow up to the implementation of safety and air navigation regional priorities

XMAN: A CONCEPT TAKING ADVANTAGE OF ATFCM CROSS-BORDER EXCHANGES

(Presented by France)

SUMMARY

This paper presents the concept of Cross-Border extended arrival management (XMAN) and the contribution of DSNA (French Air Navigation Service Provider) in its implementation. This concept takes advantage of ATFCM cross-border exchanges to reduce arrival delays at busy airports and the environmental impact of the flights.

DSNA has been involved at an early stage in the development of the XMAN concept in partnership with European ANSPs and is today both a provider and a beneficiary of XMAN as a service with dedicated in-house tools in order to contribute to optimize cross-border operations within the European Core Area, one of the densest in the world.

This paper presents practices, tools and experience which could be valuable in the frame of the CANSO's CADENA initiative.

ICAO Strategic Objectives:	*A - Safety* *B - Air Navigation Capacity and Efficiency*

1. Introduction

1.1 In 2016 DSNA, the French Air Navigation Service Provider, broke two European records: for the first time in Europe an ANSP controlled over 3 million flights a year — an increase of more than 4% compared to 2015 — and controlled 10 820 flights in one single day. The 1.000.000 km2 of the French airspace is situated in the European core area (see Figure 1), one of the densest and most complex airspace in the world which includes numerous military areas and world class airports like Paris-CDG, London Heathrow and Gatwick, Amsterdam and Frankfurt.

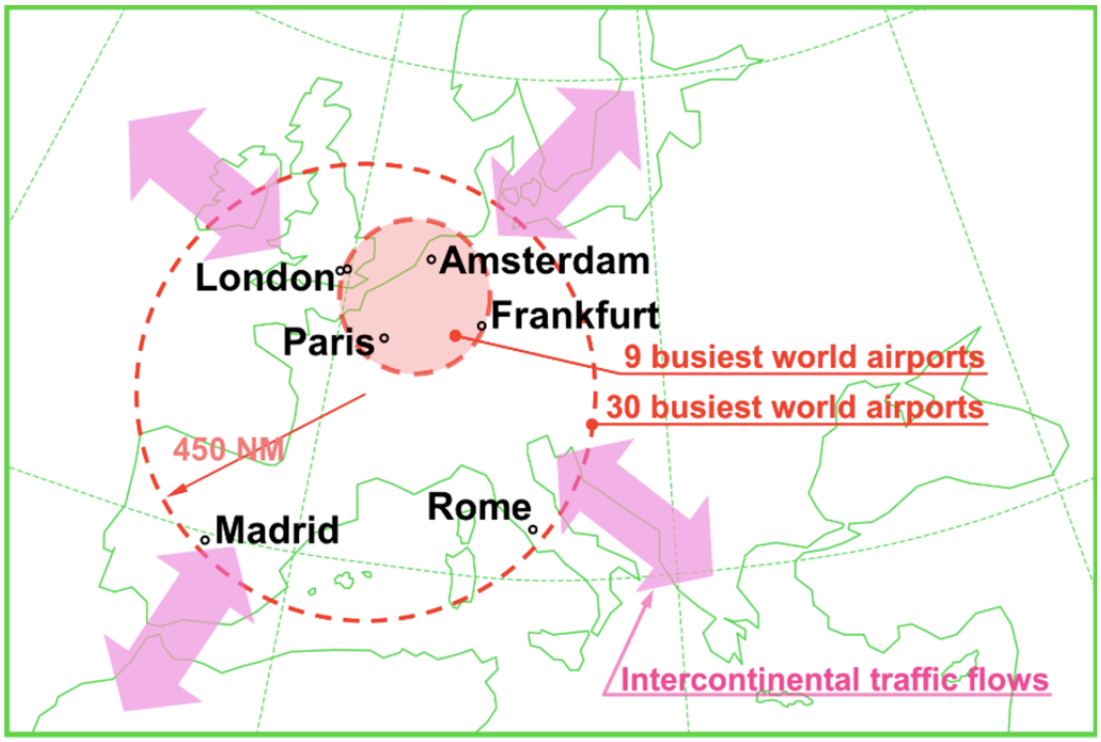


Figure 1: European core area (extract from EUROCONTROL report)

1.2 In order to maintain an excellent level of safety and punctuality within this high-density area, Air Traffic Flow Management is essential to mitigate the negative consequences of constraints like weather issues or operations disruptions at airports. In 1995 EUROCONTROL established a Central Flow Management Unit (CFMU) to bring a response to the increasing delays affecting European airports while optimizing flight efficiency, lowering fuel burn, cutting airline costs and reducing the environmental impact of Air traffic.

1.3 Since the mid 90s, DSNA has been contributing actively to the development and implementation of innovative and efficient ATFM concepts like FUA (Flexible Use of Airspace), AMAN (Arrival MANager), DMAN (Departure MANager) and the related tools supporting the concepts.

1.4 As anticipation remains a challenging key axis to improve arrival flow management, DSNA regards the Extended AMAN (E-AMAN) concept and its cross-border operational implementation (XMAN) as valuable ATFM innovations to bring further benefits to its own operations as well as to its neighbouring countries' airports. DSNA therefore is deeply involved in the implementation of these concepts in partnership with European ANSPs.

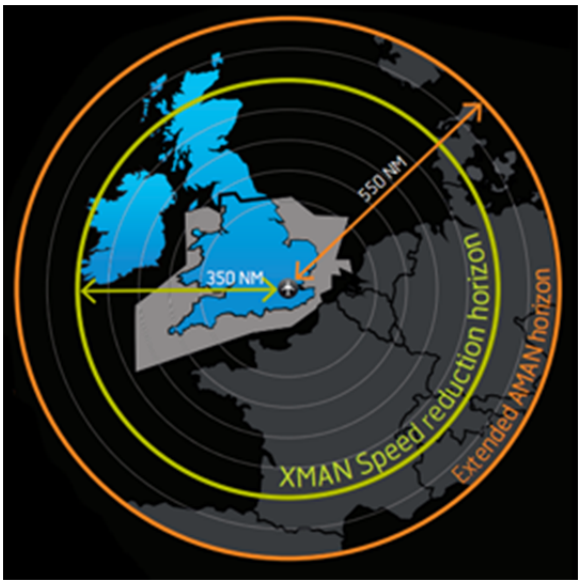


Figure 2: Active zone of XMAN and E-AMAN

2. From extended AMAN (E-AMAN) to cross-border E-AMAN (XMAN)

2.1 **E-AMAN** is a concept developed in the frame of the SESAR Programme (Single European Sky ATM Research1) to extend the conventional AMAN **horizon up to 550 NM** (Figure 2) and provide an enhanced and more consistent arrival sequence. E-AMAN refers to preparing further in advance the sequencing of air traffic destined for a given airport. The solution extends the arrival management coordination beyond the airport TMA to neighbouring en-route airspace. This allows controllers upstream to give early instructions to pilots to adjust their speed and trajectory before initiating descent towards the destination airport, reducing the need for stacking and holding over the destination airport.

2.2 E-AMAN offers a smart solution to alleviating congestion compared to the conventional AMAN horizon and is ready for implementation. The tangible benefits of E-AMAN based on live trials are a better predictability, noise and fuel reduction, better sequence planning and better adherence to the planned sequence.

2.3 In regions like Europe where aircraft fly across several national airspaces during the flight, **cross-border traffic management** is a necessity to take full benefits from Queue Management concepts. Cross-border Extended AMAN (XMAN) is the first operational cross-border implementation of the Extended-AMAN concept. DSNA is highly involved in this concept implementation to operate effective cross-border traffic management with its neighbouring ANSPs.

3. XMAN solution: effective cross-border ATFM

3.1 What is XMAN?

3.1.1 Derived from the Extended-AMAN concept, XMAN aims to develop arrival management processes and capabilities in the specific cross-border context to absorb delay earlier in the flight and at a higher altitude.

3.1.2 Cross-border arrival management as envisioned has a long-range component with a planning horizon of up to 550 NM. This component contains both ATFCM and ATC type elements (speed reduction, time at a point, miles in trail…) and will be largely time based. This will enable delay sharing techniques to be applied between TMA, extended TMA and en-route sectors. XMAN provides to Air Traffic Controllers operational constraints adapted to ATC sectors capacities.

[1] https://www.sesarju.eu

3.2 A web-based architecture to tackle interoperability issues and offer XMAN services

3.2.1 In a cross-border context, Extended-AMAN may imply some interoperability issues:

- AMAN system interoperability: airports operate a wide variety of AMAN systems with varying capability and accuracy;
- Cross-border coordination: ground-ground data exchange between ATC units may rely on point-to-point data link facilities which are difficult to expand for cross-border coordination and often dependent from the ANSP's Flight Data Processing System.

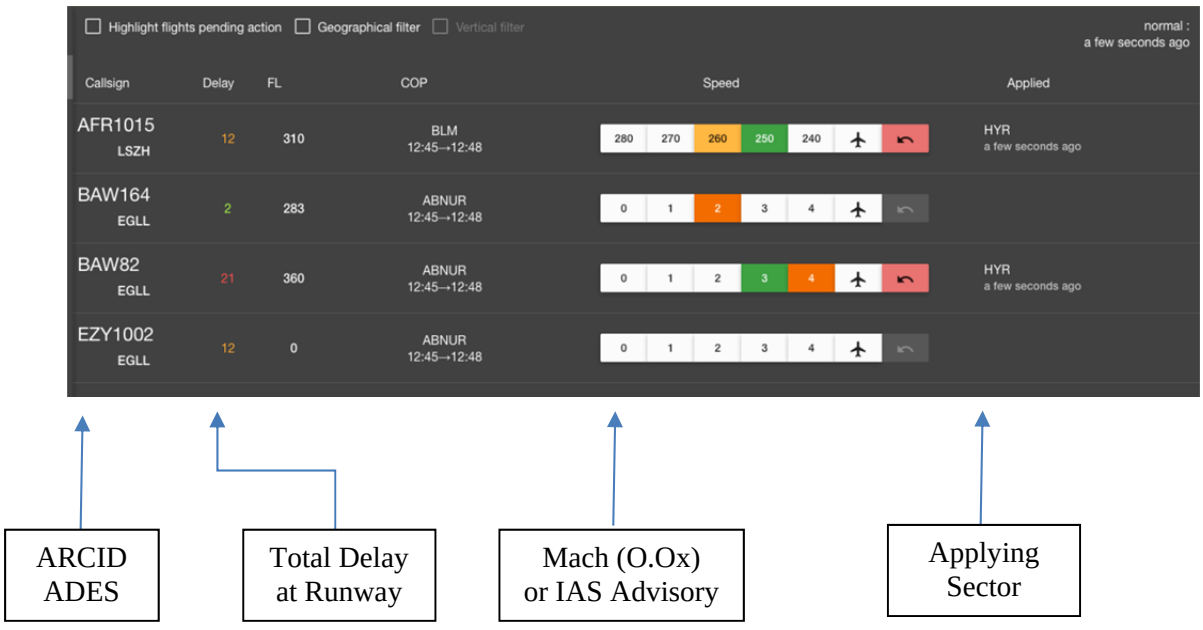
3.2.2 XMAN tackles these interoperability issues by promoting a web-based solution for exchanging arrival planning information. The today's capabilities of web-based services allow to offer efficient and cost-effective alternate system architectures as well as the opportunity for airports to be users of XMAN services provided by ATC en-route sectors to further optimize their arrival flow management. Nonetheless XMAN concept is also compatible with physical data link infrastructure.

3.3 4ME: the DSNA tool to Display XMAN Information

3.3.1 **4Me is a dedicated HMI** deployed by DSNA on its ACC's Control Working Positions (CWP) to support System Wide Information Management (SWIM) web-services such as:

- XMAN procedures (plug & play integration of new airports such as Zurich);
- Extended ATC Planning procedures, including dissemination of Short Term ATFCM Measures onto the CWP;
- Interactive weather information;
- Network Manager flight 4D-profile access from the CWPs.

3.4 4ME is fully approved by the French National Supervisory Authority and was granted with a full operational status on 8th December 2016.



4. DSNA as an XMAN service provider for airports

4.1 DSNA is currently providing the XMAN service from Reims Upper Area Center (UAC) to the benefits of London-Heathrow and Zurich arrivals.

4.2 At Heathrow 65% of arrivals experience stack holding due to capacity constraints. The XMAN concept developed together by the FABEC and the UK-Ireland FAB introduces the ability for controllers to manager delays in the tactical phase of flight well before the top of descent.

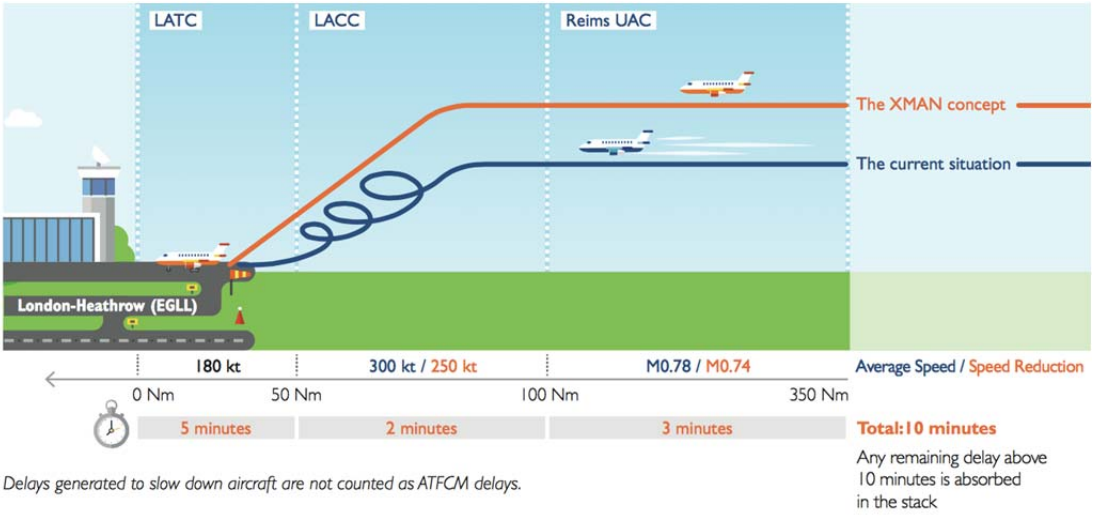


Figure 3: delay sharing between London Terminal, London ACC and Reims UAC

4.3 At Zurich airport arrival delays mainly occur at peak times. The traffic is transferred by Reims UAC to Zurich ACC in the descent phase at FL190 only 23NM from the Initial Approach Fix. The arrival management data have been completed with a speed advisory provided directly by the AMAN and relayed to the Reims UAC ATCOs via the XMAN web service.

4.4 These two operational implementations prove that the XMAN concept and its supporting technical architecture can cope with different environments and operational constraints.

5. DSNA as a user of XMAN services from partners En-route sectors

5.1 Nice airport, the 3rd largest in France, is mainly served by Marseilles ACC and Milano ACC. The airport being located very close to the French-Italian border, the current AMAN horizon is not symmetric: flights coming from the North-East (Milano sector) are under constraint and the Nice arrivals flows are not fully optimized. An in-house DSNA technical solution is now operational allowing an arrival management horizon of about 200NM.

5.2 The objective of the XMAN project at Nice is to extend the horizon over the Milano ACC airspace and to share sequence and speed advisory with ENAV, the Italian ANSP, by using modern service oriented technology to further optimize Nice arrivals.

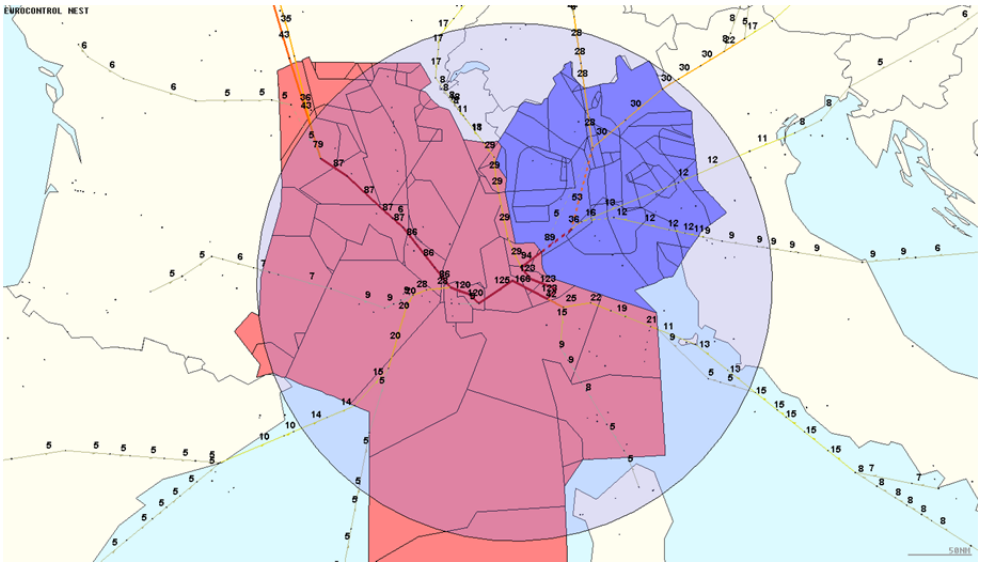


Figure 4: XMAN horizon optimizing arrivals at Nice Airport (France)

6. XMAN benefits and way forwards

6.1 Benefits

6.1.1 The average benefits at Heathrow airport since the trials began in April 2014 are the following:

- 40% of the total flow are candidates flight for the XMAN procedures;
- 75% of the candidates have been speed instructed by upstream centres;
- Reduction of up to 1 minute in holding;
- €4 million in fuel per annum for the customers;
- 15.000 tonnes of CO2 per annum;
- Reduced noise beneath the stacks;
- No additional equipment needed for aircraft;
- Acceptable workload increase for ATCOs and flight crews.

6.2 Extended AMAN Deployment Program

6.2.1 The European regulation has made the deployment of Extended AMAN mandatory at 25 targeted major airports by 2023, meaning that the En-Route centres of the Core Area will have to deal with 12 to 15 XMAN implementations. Issues related XMAN overlapping horizons will be assessed and addressed in the frame of the ATFCM process.

Figure 5: Airports covered by the Extended AMAN Program

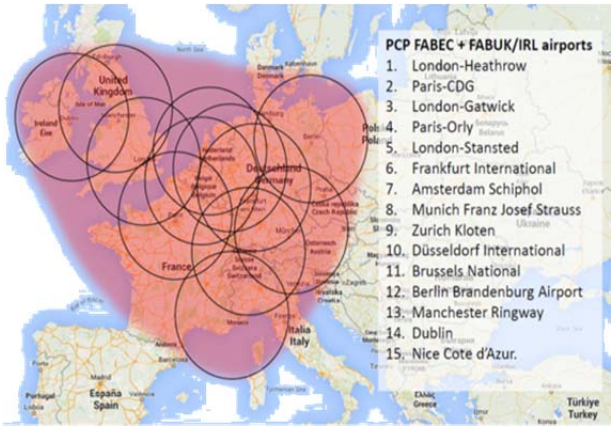


Figure 6: Overlapping horizons of Extended AMAN

7. Conclusion

7.1 The XMAN concept introduces the ability for controllers to manage delays in the tactical phase of flight well before the top of descent. When the destination airport is congested, air traffic controllers can ask for pilots to slow down in the more efficient en-route phase of flight in order to reduce fuel burn while minimizing delays upon arrival. This service is only possible thanks to the excellent cooperation between units and across operational borders. The procedures result in some added workload for controllers, but this is entirely manageable and does not impact on their performance or the service offered to other flights.

7.2 DSNA has been involved at an early stage in the development of the XMAN concept in partnership with the Ireland-UK FAB and is today both a provider and a beneficiary of XMAN as a service in order to contribute to optimize cross-border operations within the Core Area.

7.3 DSNA is ready to share implementation experience of the XMAN concept at Reims UAC and Nice airport with the CADENA Stakeholders and demonstrate its in-house XMAN tools.

8. Suggested Actions

8.1 The meeting is invited to:

a) Note the information contained in this paper

b) Discuss any relevant matters as appropriate, such as the opportunity of implementing such concepts in the NACC area

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