International Civil Aviation Organization
South American Regional Office
Ninth Workshop/Meeting of the SAM Implementation Group
(SAM/IG/9) - Regional Project RLA/06/901
Lima, Peru, 14 to 18 May 2012

Agenda Item 9: Aviation System Block Upgrade

TECHNOLOGIES ASSOCIATED TO BLOCKS 0 AND 1 OF THE AVIATION SAFETY BLOCK UPGRADE (ASBU)

(Presented by Thales Air Systems)

SUMMARY

This Information Paper aims to present the characteristics of the Blocks 0 and 1 of the Global Aviation System Block Upgrade and related available technologies.

1. Background

1.1. Despite 2010 was the safest year on record: the accident rate is flat but without intervention according to given growth, the accidents will begin to increase exponentially in all parts of the world. New technologies can serve to decrease number of accidents if introduced in a globally harmonized and consistent manner and over US$ 12 billion is expected to be spent on new technology/systems over the next ten years worldwide.

1.2. The need for the aviation system to evolve is a given. The harmonization of the aviation system worldwide is necessary but this is not easy and the path is not clear. Technical and operational challenges are relatively easy to tackle.

1.3. Taking all of this into consideration, ICAO brought together senior aviation decision makers to develop some consensus and advocacy to move the aviation system of today into the future in a global framework to ensure safety, harmonization in ATM improvements, efficiency and environmental gains.

1.4. In 2008, ICAO hosted a Future Systems Symposium, and it was very clear that the U.S., Europe, and Japan had relatively mature plans, and were beginning to invest significantly in the development of these plans but standards are needed in order to produce new systems.

1.5. For that reason, ICAO convened a Standards Organization Roundtable so that ICAO could begin to coordinate with other standards bodies such as EUROCAE, RTCA, SAE, ARINC and others. This allowed ICAO to formalize relationships with other standards-making bodies and to have data sharing agreements and to coordinate timelines in order to establish an effective and integrated planning.

1.6. The second step was to begin to plan the future in ***blocks***, instead of ***pieces***. Airplanes and ATM systems are high value assets, and require years of planning for upgrades, in order to minimize their downtime. So ICAO began to look at the most effective and efficient way to plan for the future, for interoperability purposes, and for ease of understanding.

1.7. Foundation of blocks originates from existing, near term implementation plans and access to benefits that already exist and based on operational concepts extracted from NextGen, SESAR and

CARATS. All of them are aligned with ICAO ATM Operational Concept and the intention is to apply key capabilities and performance improvements across other regional and local environments with the same level of performance and associated benefits worldwide.

1.8. Block upgrades will provide a structured approach to meet needs of individual aviation communities worldwide while considering associated business cases.

2. Analysis

Block 0: Deployment Experience

Making the most of what we have today

2.1. Block 0 will ensure ANSPs across the globe have access to key safety and efficiency capabilities. By maximizing the use of what we have today, combined with appropriate best-practices, Block 0 will fix key safety and efficiency issues and improve environmental outcomes.

2.2. Airports can be made greener and more efficient with improved traffic flow through runway metering. AMAN and DMAN are already operational in different operating environments, namely Charles de Gaulle, Sydney, Johannesburg, Copenhagen, and in US TMAs, bringing significant improvements to capacity and efficiency as well as a positive impact on the environment. Improved runway safety will increase capacity at airports and enhance safety in all weather conditions. The deployment of A-SMGCS has provided improved situational awareness and runway incursion alerts at main airports in every region.

2.3. The global interoperability of systems and data will be ensured by increased performance through ground-ground integration. The implementation of AIDC and OLDI in ground systems is enabling automatic and seamless coordination between Flight Information Regions. The service improvement through Digital Aeronautical Information Management will implement the global standard AIXM for cost effectiveness and enhanced safety. A number of countries have already migrated to AIM (e.g. France, Taiwan ...).

2.4. Improved operations through enhanced en-route trajectories and improved air traffic flow management will contribute to achieving optimum capacity and flexible flights in Block 0. Air traffic control has already been made more efficient thanks to ground systems operational with Flex Tracks and User Preferred Routing (e.g. Furthermore, Air Traffic Flow Management systems are already operational today in Europe, the USA and South Africa.

2.5. Aircrafts will fly efficient paths with an improved performance in descent and departure profiles, and through the application of data-link en-route. Ground systems today support procedures using RNP, RNAV, CDO and CCO, and advanced aircraft capabilities are available but currently underutilized. Datalink en-route is applied as ground systems support CPDLC and ADS-C for FANS-1/A+ and Link2000+.

2.6. The capabilities required for Block 0 are already available both on the ground and on aircraft. Nevertheless, some procedure and airspace design are still needed to facilitate some Block 0 implementations. Ultimately a commitment to the use of existing standards is needed as well as sharing the experience of early implementers; there is no technical excuse to do nothing.

Block 1: Planning and later blocks

Towards Block 1

2.7. Block 1 and later blocks will make advanced SESAR and NextGen capabilities available to the broader ANSP community.

2.8. Greener and more efficient airports will notably be made possible by an increased runway throughput through dynamic wake turbulence separation. The dynamic management of wake-vortex separation minima based on the real time identification of wake-vortex hazards is under development in SESAR.

2.9. The safety and efficiency of surface operations will be enhanced by introducing new routing monitoring functions to complement ground surveillance but also safety logic, cockpit moving maps and visual display systems for taxi operations. SESAR airport projects are developing advanced multi-sensor fusion for A-SMGCS, enhanced surface conflict prediction and detection SESAR projects are also developing enhanced routing and guidance functions both on ground and on board with project such SESAR D-TAXI live trials that will take place in 2012.

2.10. Departure, surface and arrival management will further improve airport operations, bringing robust runway management and increased airport performance and flight efficiency. Finally, Airport CDM will optimise airport operations, improving the way operational partners work together.

2.11. Increased interoperability, efficiency and capacity through FF-ICE/1 application before departure will entail the global interoperability of systems and data. SESAR is notably performing flight object validation exercises. Interoperability will be ultimately maximised through the implementation of SWIM and integration of all Digital ATM information. In the frame of SWIM developments in SESAR, a first prototype has been delivered to EUROCONTROL.

2.12. Optimum capacity and flexible flights will be achieved through free routing and better operational decisions through integrated weather information. Free routing over large continental and oceanic area is already supported and deployed by current systems. Weather information will support the automated decision process or aids involving weather information, weather translation, ATM impact conversion and ATM decision support.

2.13. Improved flexibility and efficiency in descent profiles, and improved traffic synchronisation and initial TBO will lead to efficient flight paths. By deploying performance-based aircraft and arrival procedures, aircraft will fly their Optimised Profile Descents (OPDs) taking into account airspace and traffic complexity. Current systems are ready for OPDs. Trajectory management is being developed in SESAR and NextGen to improve traffic flow synchronisation at en-route merging points and optimise the approach sequences.

2.14. Key dependencies on SESAR and NextGen could potentially influence final Block 1 implementation. Aircraft capabilities for Initial-4D will be progressively available from 2018 with ground capabilities available in a consistent timeframe. Improved weather modules are being developed, however advanced concepts, notably a common weather picture for the FMS, will not be available before 2025. With regards to SWIM, SESAR and NextGen have different drivers which will require other ANSPs and regions to consider the applicability of each model. Additional TBO capabilities will not be available in SESAR and NextGen within coherent timeframes, TBO capabilities being available in SESAR Step 2 but only in NextGen beyond 2025.

3. Conclusion

3.1. The capabilities for Block 0 are already available in both air and ground systems; Thales solutions fully enable today the implementation of Block 0 and the following list will give you examples of what has already been achieved :

- A-SMGCS deployed and in operation at Abu Dhabi, Bangkok, Incheon and Mexico City, improving the safety of airport surface operations.
- Automatic and seamless coordination between FIRs is operational with AIDC in Asia Pacific, Africa and Latin America, and in Europe with OLDI ensuring global interoperability of systems and data.
- AIM migration has been achieved for ASECNA, Taiwan, France and South Africa.
- Flex Tracks and User-Preferred Routing are already available allowing enhanced en-route trajectories.

3.2. There is a need for education and sharing the experience of early implementers. The implementation of Block 1 is largely dependent on SESAR and NextGen validations. Thales is actively involved in SESAR and contributes to NextGen initiatives related to Block 1 modules, and its product roadmaps are aligned with the ICAO Aviation System Block Upgrades enabling timely implementation of Bock 1 elements.

- Development of D-TAXI solution for SESAR.
- Delivery of a first SWIM prototype to Eurocontrol
- Development of advanced flight data processing system, including flight object concepts.
- Free routing is available and is already in operation over large continental and oceanic areas to achieve optimum capacity and flexible flights.
- Development of trajectory management in both SESAR and NextGen and participation in SESAR i4D live trials and SE2020 NextGen studies.

3.3. Through the Blocks 0 and 1, ANSPs across the globe will have access to key safety and efficiency capabilities based on advanced SESAR and NextGen capabilities and will be able to implement what they see fit.

4. Action Suggested

4.1. The meeting is invited to:

a) Take note of the information provided in this information paper; and

b) Evaluate the current technologies available for ASBU implementation, considering the blocks structure.

- END -