COMMUNICATIONS PANEL (CP)

1st Meeting

Montreal, Canada – 1st to 5th December 2014

Agenda Item 4: Communications Panel work programme and timelines

Airbus considerations regarding ATN/IPS implementation timeline

(Presented by Stéphane Tamalet, Airbus)

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<td>This Information Paper presents Airbus view and considerations on the roadmaps for the operational implementation of air-ground ATN/IPS-based communication services.</td>
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1. INTRODUCTION

1.1 Discussions on the roadmaps for the operational implementation of air-ground ATN/IPS-based communication services have recently taken place, and have made apparent that there are divergences of views among experts of the Aeronautical Communication Community on the preferred approach and timeline to initiate a transition toward the use of ATN/IPS for future aeronautical communications. Roughly, two different ATN/IPS implementation timeline strategies are considered:

- ASBU Block 1/2 implementation of ATN/IPS – in synchronization with the implementation of Baseline 2 operational services
- ASBU Block 2/3 implementation of ATN/IPS – in synchronization with the implementation of a future communication infrastructure (notably LDACS).

1.2 This Information Paper presents Airbus view and considerations regarding these two strategies.
2. BACKGROUND

2.1 Airbus has adopted the approach to implement the Future Air Navigation System (FANS) concepts, through incremental steps that consist in upgrading the involved Communication, Navigation and Surveillance (CNS) systems in a synchronized way to form “packages” in which are incorporated the set of functionalities needed to comply with a given internationally agreed Baseline. Such an approach offers a clear certification path and allows for different deployment options (forward fit, retrofit).

2.2 Current notable FANS packages include the FANS A+ package (which is the Airbus product supporting FANS 1/A+ capability) and the FANS B+ package (which is the Airbus product supporting ATN Baseline 1).

2.3 A new FANS A+B package has just been certified in synchronization with the Entry Into Service of the A350XWB. It will be available on A380 in early 2015. Figure 1 below illustrates the content of this FANS A+B package. It provides the aircraft operator with:

- ACARS datalink for AOC and for ATC
- ATN/OSI datalink for ATC
- A623 application, ED85A, ED89A & ED106A compliant for DCL, D-ATIS & OCL services
- AFN, CPDLC & ADS-C applications, ED122/DO306 & ED100A/DO258A compliant for DLIC, CE, CT, TC, CRD, IER & PR services integrated with FMS, RMP & TCAS
- CM & CPDLC applications ED120-2/DO290-2 & ED110B/DO280B compliant for DLIC, ACM, AMC and ACL services integrated with FMS and RMP
- VDL2, SATCOM and HFDL capability
- Data Recording capability

**Dual FANS A+B Package**

![Dual FANS A+B Package](image)

*Figure 1: Dual FANS A+B package (A350, A380 in S1_2015)*
2.4 Airbus is now about to take the industrial decision to launch the development of a Baseline 2-compliant upgrade, i.e. the FANS A+C package, on the Single Aisle family. This development will then open the path toward a later decision to launch the development of Baseline 2 compliant upgrade packages on the other Airbus Aircraft families.

2.5 Figure 2 summarizes the Airbus roadmap regarding these different packages. In the figure, please note that the “Avail.”, “Launched”, and “Planned” development status have to be understood as follows:

- **Avail.**: Airbus product certified and available for forward-fit and retrofit
- **Launched**: Airbus product development launched (investment decision taken). Milestone provides the planned date for availability in both forward-fit and retrofit
- **Planned**: Airbus product development planned (investment decision not taken yet). Milestone provides the planned date for availability in both forward-fit and retrofit

![Airbus FANS products roadmap](image)

*Figure 2: Airbus FANS products roadmap*

2.6 In its current pre-development definition, the FANS A+C package is targeted to provide the Aircraft operators with:

- ACARS datalink for AOC and for ATC
- ATN/OSI datalink over VDL2 for ATC
• A623 application, ED85A, ED89A & ED106A compliant for DCL, D-ATIS & OCL services
• AFN, CPDLC & ADS-C applications, ED122/DO306 & ED100A/DO258A compliant for DLIC, CE, CT, TC, CRD, IER & PR services integrated with FMS, RMP & TCAS
• CM, CPDLC, ADS-C applications SC214/WG78 compliant, integrated with FMS, RMP & TCAS
• VDL2, SATCOM and HFDL capability
• Data Recording Capability

FANS A+C Package

![Diagram of FANS A+C Package]

2.7 Although implemented to operate in combination with the available ACARS and ATN/OSI router, the FANS A+C package is intended to be developed along a network-independent approach, with design provision that should later allow operation of the package over future network capability such as ATN/IPS.

2.8 The production of FANS A+C package is a considerable development which will necessitate extensive modifications and extensions to the latest versions of the FMS and ATC applications software. Noticeably, the product will also incorporate any new modifications that may appear necessary on the Airborne side for the resolution of the issues currently experienced with the use of VDL2 in Europe.

2.9 With this development effort, Airbus is expecting to come out with a FANS A+C product allowing for reasonable deployment options (forward fit, retrofit) and bringing the full benefits of the Baseline 2 services in all Airspaces where the services will be operationally deployed, while maintain current FANS 1/A and ATN B1 services where transition to B2 has not yet occurred.
3. AIRBUS CONSIDERATIONS REGARDING ATN/IPS IMPLEMENTATION ROADMAP

3.1 Airbus does not envision including the ATN/IPS protocols within the FANS A+C package. The main reasons justifying this position are detailed in the following paragraphs.

3.2 The introduction of the ATN/IPS protocol stack on Aircraft would be a very cost significant development at this stage, which would significantly impact the costs of the whole FANS A+C package and affect badly the B2 business case, which is already perceived to be difficult. The costs of the ATN/IPS development would not only include the development and certification of the ATN/IPS protocols suite; it would also drain with it the following costly features:

- An additional hardware equipment would need to be fitted on Airbus Aircraft to welcome the ATN/IPS router functions beside the already certified ACARS and ATN/OSI router. This would come with the associated additional wiring necessary to support the ATN/IPS router interface with the other aircraft equipment.

- The development of air-ground TCP/IP protocols within the safety critical Aircraft Control Domain is considered by Airbus specialists as an evolutionary step that highly increase the potentiality of security threats. This implies that additional security protections will need to be developed, which cannot be simply resumed to the implementation of some cryptography-based air-ground security protocols (which deployment is already foreseen as a tremendous effort for the community), but will also imply increasing the development assurance levels of the systems with additional security assurance considerations, and lead to the addition of dedicated security firewallowing equipment.

- The triple communication stacks architecture brings also costly repercussion on the surrounding equipment (radios, existing router, ATC and AOC applications, Display and Control Units, Flight Warning computers, Centralized maintenance, …) which need to be adapted to interface with the ATN/IPS router.

3.3 Given the extent of the development to be undertaken to introduce the ATN/IPS protocols on Aircraft, and the period of time that will be necessary to fully validate the implementations in interoperation with new ground ATN/IPS infrastructures, there would be a very high risk to significantly delay the B2 deployment, and hence the true benefits expected by these developments.

3.4 The additional investment and costs linked to the development of a third ATN/IPS protocol stack on Aircraft would come with very few justifications to be presented to the customer airlines from an operational perspective. Although it is recognised that the ATN/IPS is based on the state of the art, proven, adopted by the market, and widely deployed TCP/IP protocols, they would play here in the context of the B2 services deployment supported by the use of VDL2 the limited and transparent role to encapsulate and carry end-to-end the B2 service transactions between the Aircraft and the ground end users. For this role, the TP4/CLNP ATN/OSI protocols are equivalent to the TCP/IP protocols (these are in fact tween protocols, varying only on some aspects), and using TCP/IP over VDL Mode 2 would not bring any particular benefits from an operational standpoint, and would not resolve the difficulties currently observed in Europe with the VDL2 better than possible adjustments that might be needed to be brought to current OSI/protocols.

3.5 Airbus believes that the true benefits of ATN/IPS protocols will come in synchronisation with the deployment of future wide scale air-ground Communication Systems (LDACS, Future Satcom), and with the development of future multi-mega-bits-per-second router equipment and architectures designed to take into account the future Required Communication Performances levels projected from the experience gained with the initial B2 deployments. On the other hand, if an ATN/IPS router was
developed to operate over VDL Mode 2, this router would likely become soon obsolete and unsuitable to operate over the future Communication Systems, and meet the future more stringent communication requirements.

3.6 To conclude, given the envisioned datalink networks roadmap as shown on Figure 4, Airbus assumes that the next upgrade steps regarding the evolution of the safety-related communication systems on Aircraft and the transition to ATN/IPS will progress along 2 main phases:

- A transitory phase (as shown on Figure 5), between 2018 and 2028, where the focus will be on:
  - Getting experience and first benefits of the deployment of B2 services
  - Taking full benefit of existing and matured communication networks (ACARS and ATN/OSI)
  - Possibly taking opportunity of new emerging communication means to experiment or extend FANS A and B2 services benefits in oceanic/remote airspaces (ACARS and possibly ATN/OSI over SBB/Iridium/AeroMACS)
  - Preparing the transition to ATN/IPS and Future Communication Systems, with a strong implication of all stakeholders on the definition and the trial/validation of these new systems.
  - Replacing the HF communication system by Satellite voice communication systems
Figure 5: Transitory phase

- The phase of transition to ATN/IPS (as shown on Figure 6), with the introduction of the ATN/IPS protocols on Aircraft being justified by the deployment of future IP-based Communication Systems (LDACS, Future Satcom)
4. **ACTION BY THE MEETING**

4.1 The CP is invited to note the contents of this information paper.

END