Thirty 36th Meeting of the
Informal South Pacific ATS Co-ordinating Group
(ISPACG/36)

FANS Interoperability Team Meeting
(FIT/29)

Virtual Meeting
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Agenda Item 8: Information Papers

ATS B2 OVERVIEW and Airbus UPDATE

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SUMMARY

1. INTRODUCTION

1.1 Air Traffic Services Baseline 2 (referred to as B2 in the rest of this document) is a technology supported by the Aeronautical Telecommunications Network (ATN), currently considered as the long-term target by ICAO for worldwide harmonisation of Air Traffic Control datalink.

1.2 B2 comprises a new (enhanced) version of the CPDLC message set as well as ADS-C exchanges, over the ATN network, in order to improve current ATM services and introduce new ones (e.g. 4DTRAD, D-TAXI…).

2. DISCUSSION

Transition from ACARS towards ATN

2.1 ATN is the ICAO-endorsed network dedicated to Aeronautical use for Datalink Safety services.

2.2 By design, the ATN network provides end-to-end message assurance (technically referred to as “Logical Acknowledge” or “L-ACK”) which provides the guarantee that a given message was delivered to the actual end user (e.g. Pilot or Controller screen). This is a significant operational improvement over the ACARS network.

2.3 Currently, the major blocking point for widespread use of the ATN network is the fact that it can only be accessed over VHF Datalink Mode 2 (VDL2) media, thus limiting its availability to areas of coverage. However, work is currently in progress to allow access to the ATN network via SATCOM media, which would then allow for a worldwide coverage similar to the ACARS technology.

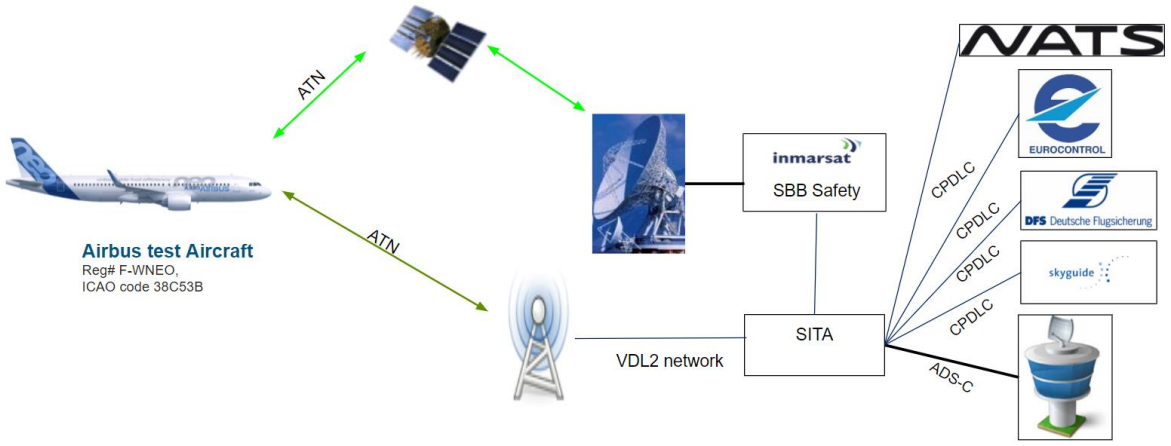
a) Timeframes for the airborne availability of the "ATN over SATCOM" link will vary depending on the SATCOM Service Provider considered, as well as the OEM.
b) Airbus plans to certify a first capable solution, for the A320 & A330 fleets, by end 2022/beginning 2023.

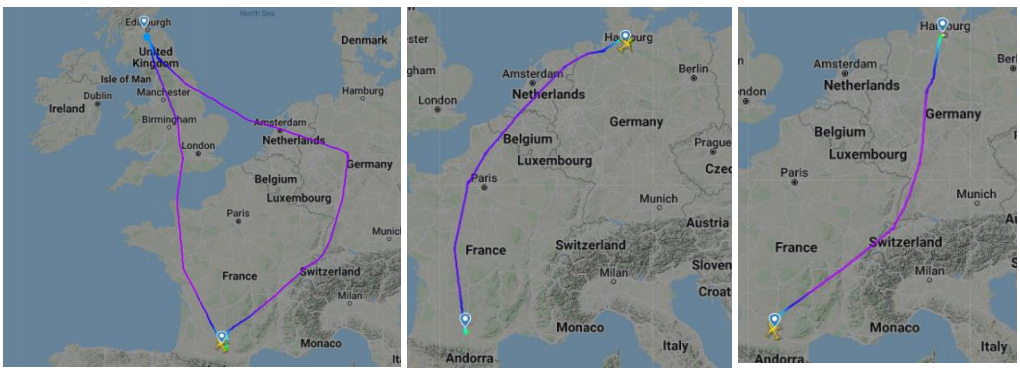
2.4 Airbus solution uses the **IRIS system** via the Inmarsat Swift Broadband-Safety (or SB-S) constellation to connect to the ATN network.

a) IRIS is a Data Link Service satellite system funded and promoted by the European Space Agency (ESA). It is based on Inmarsat SwiftBroadband-Safety technology that is already approved for Air Traffic Service (ATS) oceanic use (FANS 1/A Technology over ACARS network), and is soon to be extended for use in continental airspace for the provision of Data Link ATS services over ATN network (referred to as ATN B1 and ATS B2).

b) Airbus Flight test campaigns occured successfully in late 2021 and 2022 over Europe and has included ATN B1 and B2 operational exchanges with European ANSP (Skyguide, DFS, NATS and MUAC). FANS 1/A over ACARS were also tested ith AIrbus ATC Simulated center.

c) Measures performed over more than 15 flights are well within the values for Required Communication Technical Performances as per ED-228A RCP130/A1 and for Required Surveillance Monitored Performance as per ED-228A RSP160/A1





Examples of flight trajectories performed during ATN Over SATCOM

Current status of B2 implementation in Europe

2.5 Airbus has certified, in 2019, a first avionics datalink product for the A320 & A330, supporting the B2 technology, as well as FANS 1/A+ and ATN B1 technologies, in a seamless fashion.

a) This product has been forward fitted or retrofitted on close to 100 A320 airframes as part of a European SESAR demonstration project, focusing on the new ADS-C capacities offered by the B2 technology (for high-density continental use).
b) Furthermore, a number of A320 & A330 operators, not part of this SESAR demonstration, have already taken deliveries of new aircraft equipped with this new product which offers a FANS/ATN dual-stack for the first time on these airframes (necessary to satisfy NAT & EU Datalink mandates).

2.6 Currently, only Eurocontrol Maastricht Upper Area Control Center (MUAC) has implemented the B2 technology in their operational environment. Trained controllers have access to a limited part of the B2 CPDLC message set (the B2 equivalent of the ATN B1 message set in use), and have access to the display of some B2 ADS-C data on their screens.

Pictures courtesy of Eurocontrol Maastricht Upper Area Control Center (MUAC)

2.7 Other European ANSPs (NATS UK, DFS Germany, ENAV Italy) have a "shadow mode" implementation of B2 ADS-C in order to collect the data from capable flights, but these data are not yet used operationally/displayed to ATCos.

2.8 Additional ANSPs have lately implemented either an operational or shadow mode ADS-C B2 capacity: DGAC France, Skyguide Switzerland, BULATSA Bulgaria, Hungaro Control Hungary…

2.9 A European Commission mandate will be enforced by January 2028: all new aircraft delivered with a Certificate of Airworthiness after that date, and planning to operate above FL285 in the European airspace, will have to support at least the B2 ADS-C capacity.

What benefits can you expect as an Oceanic ANSP?

2.10 Although the extended CPDLC message set offered by the B2 technology will provide some improvements to existing datalink services (e.g. new message "AT [position] CLEARED TO [position] VIA [route clearance]" to strategically alter a route between 2 unchanged waypoints) and will allow implementing future new services (e.g. 4D Trajectory-Based Operations), the major immediate benefit that can be expected by Oceanic Air Traffic Controllers will clearly be the B2 ADS-C capacity.

2.11 B2 ADS-C includes, in particular the Extended Projected Profile (or EPP) frame. As the name indicates, this frame allows downlinking a very complete set of Flight Management System data providing ATCos with avionics-based predictions over up to 128 points ahead of the A/C, as well as additional information such as the current A/C gross weight and currently engaged guidance modes.

2.12 This data can allow the ground system to "re-build" the FMS predicted four-dimensional trajectory of the A/C: lateral & vertical significant points (including offset transitions, start of climb/top of climb, top of descent…), altitude/speed/time predictions at each ATC waypoint but also FMS internal point (speed changes…). It is a very significant step-up from the current FANS 1/A ADS-C capacity "Predicted Route" frame which only provides partial predicted data for the NEXT and NEXT+1 waypoints.

A picture being worth a thousand words, below is a comparison of the data set available in the FANS 1/A ADS-C Projected Route group vs the B2 ADS-C Extended Projected Profile.

2.13 The EPP can thus provide advanced short and long-term conformance monitoring, including not only the lateral route set into the FMS, but also any pre-planned speed or altitude change prepared by the flight crew. It can also significantly assist the management of traffic flows in a given airspace, thus helping to support User Preferred Routes concepts. An example of a decoded B2 ADS-C Extended Projected Profile & Speed Schedule Profile is shown below as an illustration.

Extended projected profile:
Computation time: 15-12-2020 08:52:59
Number of waypoints : 22

Waypoint:
Latitude: 52 DEG 1' 10.5" N / Longitude: 0 DEG 44' 0" W / Level=qNE Altitude=13250 feet
Name: WOBUN
Estimated time: 08:55:45
Estimated speed: 310 kt
Lateral type: flyby=turn Radius: 8.6 Nautical miles; flight Plan Way Point

Waypoint:
Latitude: 52 DEG 14' 50.600002" N / Longitude: 0 DEG 51' 8.2" W / Level=qNE Altitude=17040 feet
Name: WELIN
Estimated time: 08:57:57
Estimated speed: 310 kt
Lateral type: flyby=turn Radius: 9.7 Nautical miles; flight Plan Way Point

Waypoint:
Latitude: 52 DEG 29' 12.6" N / Longitude: 1 DEG 5' 27.9" W / Level=qNE Altitude=20760 feet
Name: AKUPA
Estimated time: 09:00:26
Estimated speed: 310 kt
Lateral type: flyby=turn Radius Not Available; flight Plan Way Point

Waypoint:
Latitude: 52 DEG 33' 32.799999" N / Longitude: 1 DEG 9' 49.900002" W / Level=qNE Altitude=21740 feet
Name: TIMPO
Estimated time: 09:01:09
Estimated speed: 310 kt
Lateral type: flyby=turn Radius Not Available; flight Plan Way Point

Waypoint:
Latitude: 52 DEG 42' 1.4" N / Longitude: 1 DEG 18' 25.300001" W / Level=qNE Altitude=23450 feet
Name: ELVOS
Estimated time: 09:02:32
Estimated speed: 310 kt
Lateral type: flyby=turn Radius Not Available; flight Plan Way Point

Waypoint:
Latitude: 53 DEG 3' 14.5" N / Longitude: 1 DEG 40' 11.7" W / Level=qNE Altitude=26850 feet
Name: TNT
Estimated time: 09:05:52
Estimated speed: 310 kt
Lateral type: flyby=turn Radius: 37.5 Nautical miles; flight Plan Way Point

Waypoint:
Latitude: 53 DEG 38' 49" N / Longitude: 2 DEG 2' 29" W / Level=qNE Altitude=30360 feet
Estimated time: 09:10:30
Estimated speed: 0.822 Mach
Vertical Type: topOfClimb=0; topOfDescent=0; startOfClimb=0; startOfDescent=0; startOfLevel=0; startOfSpeedChange=0; endOfSpeedChange=0; speedLimit=0; crossOver=1

Waypoint:
Latitude: 53 DEG 44' 38.799999" N / Longitude: 2 DEG 6' 12.1" W / Level=qNE Altitude=31030 feet
Name: POL
Estimated time: 09:11:15
Estimated speed: 0.822 Mach
Lateral type: flyby=turn Radius Not Available; flight Plan Way Point

Waypoint:
Latitude: 53 DEG 51' 48.900002" N / Longitude: 2 DEG 11' 5" W / Level=qNE Altitude=31820 feet
Name: NELSA
Estimated time: 09:12:10
Estimated speed: 0.822 Mach
Lateral type: flyby=turn Radius Not Available; flight Plan Way Point

Waypoint:
Latitude: 54 DEG 0' 58.900002" N / Longitude: 2 DEG 17' 23.200001" W / Level=qNE Altitude=32740 feet
Name: RIBEL
Estimated time: 09:13:22
Estimated speed: 0.822 Mach
Lateral type: flyby=turn Radius Not Available; flight Plan Way Point

Waypoint:
Latitude: 54 DEG 9' 22.5" N / Longitude: 2 DEG 23' 11.8" W / Level=qNE Altitude=33480 feet
Name: ERGAB
Estimated time: 09:14:27
Estimated speed: 0.822 Mach
Lateral type: flyby=turn Radius Not Available; flight Plan Way Point

Waypoint:
Latitude: 54 DEG 15' 48.200001" N / Longitude: 2 DEG 27' 40" W / Level=qNE Altitude=34000 feet
Estimated time: 09:15:17
Estimated speed: 0.822 Mach
Vertical Type: topOfClimb=1; topOfDescent=0; startOfClimb=0; startOfDescent=0; startOfLevel=1; startOfSpeedChange=0; endOfSpeedChange=0; speedLimit=0; crossOver=0

Waypoint:
Latitude: 54 DEG 30' 1" N / Longitude: 2 DEG 37' 38.200001" W / Level=qNE Altitude=34000 feet
Name: SHAPP
Estimated time: 09:17:08
Estimated speed: 0.822 Mach
Lateral type: flyby=turn Radius Not Available; flight Plan Way Point

Waypoint:
Latitude: 54 DEG 42' 27.5" N / Longitude: 2 DEG 46' 29" W / Level=qNE Altitude=34000 feet
Name: ABEVI
Estimated time: 09:18:46
Estimated speed: 0.822 Mach
Lateral type: flyby=turn Radius: 41.200001 Nautical miles; flight Plan Way Point

Waypoint:
Latitude: 55 DEG 52' 14.3" N / Longitude: 4 DEG 26' 44.5" W / Level=qNE Altitude=34000 feet
Name: GOW
Estimated time: 09:29:54
Estimated speed: 0.822 Mach
Lateral type: flyby=turn Radius Not Available; flight Plan Way Point

Waypoint:
Latitude: 59 DEG 0' 0.8" N / Longitude: 9 DEG 59' 59.900002" W / Level=qNE Altitude=34000 feet
Name: BALIX
Estimated time: 10:00:28
Estimated speed: 0.822 Mach
Lateral type: flyby=turn Radius: 40.5 Nautical miles; flight Plan Way Point

Waypoint:
Latitude: 61 DEG 0' 0.9" N / Longitude: 19 DEG 59' 59.900002" W / Level=qNE Altitude=34000 feet
Name: 6120N
Estimated time: 10:35:29
Estimated speed: 0.821 Mach
Lateral type: flyby=turn Radius Not Available; flight Plan Way Point

Waypoint:
Latitude: 62 DEG 0' 0.7" N / Longitude: 30 DEG 0' 0.5" W / Level=qNE Altitude=34000 feet
Name: 6230N
Estimated time: 11:06:56
Estimated speed: 0.821 Mach
Lateral type: flyby=turn Radius Not Available; flight Plan Way Point

Waypoint:

Latitude: 62 DEG 0' 0.7" N / Longitude: 40 DEG 0' 0.5" W / Level=qNE Altitude=34000 feet
Name: 6240N
Estimated time: 11:38:39
Estimated speed: 0.821 Mach
Lateral type: flyby=turn Radius Not Available; flight Plan Way Point

Waypoint:
Latitude: 61 DEG 0' 0.9" N / Longitude: 50 DEG 0' 0.5" W / Level=qNE Altitude=34000 feet
Name: 6150N
Estimated time: 12:14:32
Estimated speed: 0.823 Mach
Lateral type: flyby=turn Radius Not Available; flight Plan Way Point

Waypoint:
Latitude: 59 DEG 28' 0.5" N / Longitude: 58 DEG 0' 0.4" W / Level=qNE Altitude=34000 feet
Name: SAVRY
Estimated time: 12:48:07
Estimated speed: 0.823 Mach
Lateral type: flyby=turn Radius: 35.299999 Nautical miles; flight Plan Way Point

Waypoint:
Latitude: 58 DEG 39' 12.5" N / Longitude: 60 DEG 31' 58.100002" W / Level=qNE Altitude=34000 feet
Name: IRBIM
Estimated time: 13:00:27
Estimated speed: 0.823 Mach
Lateral type: flyby=turn Radius: 33.900002 Nautical miles; flight Plan Way Point

Current gross mass: 236300 kilograms
Trajectory intent status: Lateral Flight Managed=true; Vertical Flight Managed=true; Speed Managed=true; Time Managed=false

Speed schedule profile:
Predicted gross mass at tod=189020 kilograms

Climb speed:
Speed schedule single: Nominal speed=310 kt / / min Max Speed=260 kt 320 kt
Speed schedule single: Nominal speed=0.822 Mach / / min Max Speed=0.754 Mach 0.84 Mach
Initial cruise speed at TOC: Nominal speed=0.822 Mach / min Max Speed=0.754 Mach 0.84 Mach
Final cruise speed at TOD: Nominal speed=0.818 Mach / min Max Speed=0.684 Mach 0.84 Mach

Descent speed:
Speed schedule single: Nominal speed=294 kt / / min Max Speed=234 kt 315 kt
Speed schedule single: Nominal speed=0.818 Mach / / min Max Speed=0.684 Mach 0.83 Mach

2.14 For more technical information on B2, refer to the applicable standard documents: ED-228A/DO-350A & ED-229A/DO-351A. Note that work on revisions B for these documents is currently on-going under EUROCAE WG-78 / RTCA SC-214, in particular to incorporate feedback from the European trials (e.g. new ADS-C report triggers, etc).

3. CONCLUSION

3.1 The meeting is invited to note the information provided.

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