
International Civil Aviation Organization


ASBU/SIP/Lima/2012-WP/28B

Aviation System Block Upgrades

Module N° B0-40/PIA-4

Improved Safety and Efficiency through the initial application of Data Link En-Route

Workshop on preparations for ANConf/12 – ASBU methodology
(Lima, 16-20 April 2012)

Module N° B0-40


Improved Safety and Efficiency through the initial application of Data Link En-Route

| Summary | Implementation of an initial set of data link applications for surveillance and communications | | | | | | | | | | | | |
|---|--|--------|--|---------------------|-------|-----------------------|-------|-----------------------------|-------|----------------------|-------|----------------------|-------|
| Main Performance Impact | KPA-02 Capacity; KPA-04 Efficiency; KPA-10 Safety | | | | | | | | | | | | |
| Operating Environment/Phases of Flight | En-route flight phases, including areas where radar systems cannot be installed such as remote or oceanic airspace. | | | | | | | | | | | | |
| Applicability Considerations | Requires good synchronisation of airborne and ground deployment to generate significant benefits, in particular to those equipped. Benefits increase with the proportion of equipped aircraft. | | | | | | | | | | | | |
| Global Concept Component(s) | IM – Information Management SDM – Service Delivery Management | | | | | | | | | | | | |
| Global Plan Initiatives (GPI) | GPI-9 Situational awareness GPI-17 Implementation of data link applications GPI-18 Electronic information services | | | | | | | | | | | | |
| Main Dependencies | (excerpt from dependency diagram to be included in V3). Predecessor of: B1-40 (but can also be combined with it) | | | | | | | | | | | | |
| Global Readiness Checklist | <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 80%;">Status</th><th></th></tr> <tr> <td>Standards Readiness</td><td>Ready</td></tr> <tr> <td>Avionics Availability</td><td>Ready</td></tr> <tr> <td>Ground Systems Availability</td><td>Ready</td></tr> <tr> <td>Procedures Available</td><td>Ready</td></tr> <tr> <td>Operations Approvals</td><td>Ready</td></tr> </table> | Status | | Standards Readiness | Ready | Avionics Availability | Ready | Ground Systems Availability | Ready | Procedures Available | Ready | Operations Approvals | Ready |
| Status | | | | | | | | | | | | | |
| Standards Readiness | Ready | | | | | | | | | | | | |
| Avionics Availability | Ready | | | | | | | | | | | | |
| Ground Systems Availability | Ready | | | | | | | | | | | | |
| Procedures Available | Ready | | | | | | | | | | | | |
| Operations Approvals | Ready | | | | | | | | | | | | |

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Module N° B0-40 - Baseline



- Prior to this module, air-ground communications used voice radio (VHF or HF depending on the airspace)
 - Known limitations in quality, bandwidth and security and areas with no radar surveillance.
- High density airspace controllers spend 50% of their time talking to pilots on the VHF voice channels where frequencies are a scarce resource
 - This represents a significant workload for controllers and pilots

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Module N° B0-40 – Change Brought by the Module




- **Element 1 → ADS-C over Oceanic and Remote Areas**
 - ADS-C provides an automatic dependent surveillance service over oceanic and remote areas, through the exploitation of position messages sent automatically by aircraft over data link at specified time intervals (ADS-Contract).
- **Element 2 → Continental CPDLC**
 - The applications allow pilots and controllers to exchange messages with a better quality of transmission.

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| Module N° B0-40 –Intended Performance Operational Improvement | |  | |
|---|--|---|--|
| Element 1 | | Element 2 | |
| ADS-C over Oceanic and Remote Areas | | Continental CPDLC | |
| Capacity | Reduced separations allow increasing the offered capacity. | Capacity | Reduced communication workload & better organisation of controller tasks allow to increase sector capacity |
| Efficiency | Routes/tracks and flights can be separated by reduced minima, allowing to apply flexible routings and vertical profiles closer to the user-preferred ones. | Safety | Increased situational awareness; reduced occurrences of misunderstandings; solution to stuck mike situations |
| Flexibility | permits to make route changes easier | CBA | The European business case has proven to be positive due. |
| Safety | Increased situational awareness; better support to SAR | | |
| CBA | The business case has proven to be positive | | |
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| Module N° B0-40 – Necessary Procedures (Air & Ground) | |  | |
|--|--|---|--|
| <ul style="list-style-type: none"> Procedures have been described and are available in ICAO documents: Manual of Air Traffic Services Data Link Applications (Doc 9694), GOLD Global Operational Data Link Document | | | |
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Module N° B0-40 – Necessary System Capability



- **Avionics**

- Today, Data Link implementations are based on two sets of ATS Data link services: FANS 1/A and ATN B1, both will exist. FANS1/A is deployed in Oceanic and Remote regions whilst ATN B1 is being implemented in Europe according to European Commission legislation
- FANS 1/A aircraft implementations by ATN B1 ground systems and dual stack implementations in the aircraft

- **Ground Systems**

- Necessary technology includes the ability to process and display the ADS-C position messages.
- CPDLC messages need to be processed and displayed to the relevant ATC unit.
- Enhanced surveillance through multi-sensor data fusion facilitates transition to/from radar environment.

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Module N° B0-40 – Training and Qualification Requirements



- Automation support is needed for both the pilot and the controller which therefore will have to be trained to the new environment and to identify the aircraft/facilities which can accommodate the data link services in mixed mode environments.
- Training in the operational standards and procedures are required for this module
- Likewise, the qualifications requirements are identified in the regulatory requirements

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Module N° B0-40 –Regulatory/Standardization needs and Approval Plan (Air & Ground)



- **Regulatory/Standardization:**
 - Use current published requirements that includes the material given in Section 8.4. It should also be noted that new ICAO OPLINK Ops Guidance is under development
- **Approval Plans:**
 - Must be in accordance with application requirements

Module N° B0-40 – Reference Documents (1/2)



- **Standards**
 - Commission Regulation (EC) No 29/2009 of 16 January 2009 laying down requirements on data link services for the single European sky
 - EUROCAE ED-100A / RTCA DO-258A, Interoperability Requirements for ATS Applications using ARINC 622 Data Communications
 - EUROCAE ED-110 / RTCA DO-280, Interoperability Requirements Standard for Aeronautical Telecommunication Network Baseline 1 (Interop ATN B1)
 - EUROCAE ED-120 / RTCA DO-290, Safety and Performance Requirements Standard For Initial Air Traffic Data Link Services In Continental Airspace (SPR IC)
 - EUROCAE ED-122 / RTCA DO-306, Safety and Performance Standard for Air Traffic Data Link Services in Oceanic and Remote Airspace (Oceanic SPR Standard)
 - EUROCAE ED-154 / RTCA DO-305, Future Air Navigation System 1/A – Aeronautical Telecommunication Network Interoperability Standard (FANS 1/A – ATN B1 Interop Standard)
- **Procedures:** Nil

Module N° B0-40 – Reference Documents (2/2)



- **Guidance Material**
 - ICAO Doc 9694, Manual of Air Traffic Services Data Link Applications;
 - New OPLINK Ops Guidance (under development).
- **Approval Documents**
 - ICAO Doc 9694, Manual of Air Traffic Services Data Link Applications;
 - FAA AC20-140A, Guidelines for Design Approval of Aircraft Data Link Communication Systems Supporting Air Traffic Services (ATS);
 - RTCA/EUROCAE DO-306/ED-122;
 - RTCA/EUROCAE DO-305/ED-154;
 - RTCA/EUROCAE DO-290/ED-120;
 - RTCA/EUROCAE DO-280/ED-110B;
 - RTCA/EUROCAE DO-258A/ED-100A;
 - EC Regulation No. 29/2009: Datalink Services Implementing Rule;
 - New OPLINK Material under development.

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Module N° B0-40 Implementation - Benefits and Elements



Improved Safety and Efficiency through the initial application of Data Link En-Route

- **Benefits: Capacity, Efficiency, Flexibility and Safety**
 - **Elements:**
 - **ADS-C over oceanic and remote areas; FANS1/A or ATN B1**
 - **VDL Mode 2 /Continental CPDLC**
- To be reflected in ANRF**

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