ICAO provisions on data link implementation

Crystal Kim
- Technical Officer, Airspace Management and Optimization Section
- Secretary of Operational Data Link Working Group (OPDLWG) and Air Traffic Management Requirements and Performance Panel (ATMRPP)

NAM/CAR/SAM ATS Data Link Implementation Workshop, Philipsburg, Sint Maarten, 18-21 April 2016
• GANP and ASBUs

• ATS Data Link Today

• ICAO SARPs, PANS and Manuals

• Amendments to Annexes and PANs applicable in Nov 2016
GANP and ASBUs
GANP – A Global Roadmap
GANP – A Global Roadmap

• The Global Air Navigation Plan

• The Roadmaps
GANP – A Global Roadmap

• The Global Air Navigation Plan

• The Roadmaps

• The Content
GANP – A Global Roadmap

• Provides certainty:
  – In equipage
  – For industry
  – For investment
  – In research and development direction
06 Regional and State Air Navigation Priorities

– ICAO regions, sub-regions and individual States through the PIRGs should establish their own Air Navigation priorities to meet their individual needs and circumstances in line with the Global Air Navigation Priorities
08 Use of ASBU Blocks and Modules

- Although the GANP has a global perspective, it is not intended that all ASBU modules are to be applied around the globe.

- When the ASBU blocks and modules are adopted by regions, sub-regions or States they should be followed in close accordance with the specific ASBU requirements to ensure global interoperability and harmonization of air traffic management.

- It is expected that some ASBU modules will be essential at the global level and therefore may eventually be the subject of ICAO mandated implementation dates.
## Relevant Modules in ASBU

### Performance Improvement Area 4:
**Efficient Flight Paths – Through Trajectory-based Operations**

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<th>Block 0</th>
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<td><strong>B0-TB0</strong>&lt;br&gt;Improved Safety and Efficiency through the initial application of Data Link En-Route Implementation of an initial set of data link applications for surveillance and communications in ATC.</td>
<td><strong>B1-TB0</strong>&lt;br&gt;Improved Traffic Synchronization and Initial Trajectory-Based Operation&lt;br&gt;Improve the synchronization of traffic flows at en-route merging points and to optimize the approach sequence through the use of 4DTRAD capability and airport applications, e.g. D-TAXI, via the air-ground exchange of aircraft derived data related to a single controlled time of arrival (CTA).</td>
<td></td>
<td><strong>B3-TB0</strong>&lt;br&gt;Full 4D Trajectory-based Operations&lt;br&gt;Trajectory-based operations deploys an accurate four-dimensional trajectory that is shared among all of the aviation system users at the cores of the system. This provides consistent and up-to-date information system-wise which is integrated into decision support tools facilitating global ATM decision-making.</td>
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Dependencies of TBO modules
ATS Data Link Today
Data Link Today
A380 AKL-DXB/02MAR16

Data Link Today

Why Data Link?

• Enhanced conformance monitoring capability in the airspace over remote and oceanic areas
• Clear messages with less risk of misunderstandings
• Additional, independent and secure channel, which reduces the strain on busy sector frequencies
• Increased capacity and the day-to-day efficiency of communications between controllers and pilots
Why Data Link?

- Air traffic is predicted to **double** in the next 15 years.
- Our collective responsibility is to **allow the aviation system** to safely realize this growth.
- **Use of data link may not be optional anymore** to increase efficiency and optimize the use of available airspace.
Why Data Link?

- When you apply separation standards that rely on data link capability and performance
  - 30 NM and 50 NM longitudinal separation,
  - RLatSM – 23 NM lateral separation,
  - RLongSM – 5 Minutes longitudinal separation

- If you lose the data link connection, you may have lost separation
✓ Is data link connection always satisfactory?

✓ Do all data link systems have same performance?

✓ Are all personnel involved well-trained?

The answer is......?????
Annexes, PANS and Manuals
Related to Data Link Implementation
Two Aspects to Data Link

• The “Service and Message”
  – “Content” and “Procedures”
  – Handled by OPLINKP (Now OPDLWG)

• The “Medium”
  – Various media and the network supporting them
  – Handled by ACP (Now DCIWG)
OPDLWG and DCIWG???

- In 2014, the Communications Panel (CP) was formed by the merging of the OPLINKP and ACP.
- The CP has two “specific” Workings Group
  - *Operational Data Link Working Group*
    - Former OPLINKP, dealing with Operational Issues
  - *Data Communications Infrastructure Working Group*
    - Former ACP, dealing with Technical Issues
For Services and Messages ....

• Annex 10 Volume II is the key “standard”
  - Composition of data link messages
  - Display of data link messages
  - CPDLC procedures

• Supported by PANS-ATM and Manuals
Chapter 4 General Provisions for Air Traffic Services

- 4.11 Position Reporting
  - 4.11.4 Transmission of ADS-C reports
  - 4.11.5 Contents of ADS-C reports
- 4.15 Data Link Communications initiation Procedures
PANS-ATM (Doc 4444)

Chapter 5 Separation methods and minima

Chapter 13 ADS-C Services

• ADS-C Ground system capabilities
• ADS-C related aeronautical information
• Use of ADS-C in the provision of ATC service
• Use of ADS-C in the application of separation minima
Chapter 14 CPDLC

- Establishment of CPDLC
- Exchange of operational CPDLC messages

Appendix 2 Flight Plan, Item 10
Appendix 5 CPDLC Message Set
Global Operational Data Link (GOLD) Manual
(Doc 10037, Edition 1)

- Supersedes regional GOLD V.2 dated 26 April 2013
- RCP/RSP specifications and post-implementation monitoring removed from regional GOLD and moved to PBCS Manual
- Additional changes made to ensure that No conflicts with provisions in Annex and PANS including and up to 2016 amendment
- To be published in July/August 2016
Chapter 1. Overview of data link operations
Chapter 2. Administrative provisions related to data link operations
Chapter 3. Controller and radio operator procedures
Chapter 4. Flight crew procedures
Chapter 5. Advanced ATS supported by data link
Chapter 6. State aircraft data link operations

Appendix A CPDLC message elements and standardized free text message elements
Appendix B Regional/State specific information
Appendix C Operator/aircraft specific information
For the Media...

• Annex 10 Volume III is the key “standards” document.
• Supported by a number of ICAO Manuals
ICAO Manuals on Data Link Media (1)

- For the ATN, there are two key documents
  
  - **Doc 9880**: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols
  
  - **Doc 9896**: on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocols
Doc 9880

- Air-Ground Applications
  - CPDLC, CM, ADS-C (tbd), FIS (tbd)
- Ground-Ground Applications
  - AMHS, AFTN/AMHS Gateway
- Upper-Layer Communications Services; Internet Communications Services
- Directory Services, Security and Identifier Registration
Doc 9896

• Detailed Tech Specs
  - Network, Transport and Security

• IPS Applications
  - VOIP
  - Including convergence functions for legacy (OSI) applications

• Guidance Material
ICAO Manuals on Data Link Media (2)

- For individual media:
  - Doc 9776: Manual on VHF Digital Link (VDL) Mode 2
  - Doc 9925: Manual on Aeronautical Mobile (Route) Service
  - Doc 10044: Manual on Aeronautical Mobile Airport Communications System (AeroMACS) (to be published in 2016)
Doc 9776

• 2nd Edition in 2015
  – Has multi-frequency support for NextGen/SESAR
  – Solves congestion-based problems to date.

• Is OSI-based and is part of LINK2000.
Doc 9925

• **First Edition**
  – INMARSAT Classic, ACARS-based plus supports OSI but never used.
  – Iridium, ACARS-based

• **2nd Edition - late 2016**
  – SwiftBroadband (SBB)
  – Supports ACARS and IPS
Doc 1044 (AeroMACS)

• First Edition due late 2016
  – A10 SARPS become applicable at that time.

• Supports IPS
  – Manual will have provisions on Security
  – Also guidance on operation before ATN/IPS becomes operational
Amendments to Annexes and PANS
Applicable in Nov. 2016
Amendment Concerning

- Data Link Initiation Capability
- ADS-C and CPDLC
- Performance-based Communication and Surveillance
- Performance-based separation minima
- Satellite Voice Communication
Applicable in November 2016

- **Affected Documents**
  - Annexes 4, 6 (Parts I, II, III), 10 (Vol II, III), 11 and 15; PANS-ATM; PANS-ABC

- **Improvements:**
  - Harmonized data link and SATVOICE procedures allowing for seamless operations
  - Enhanced communication capabilities for flight operations in remote and oceanic areas

- **Expected Benefits:**
  - Reduction in data link connectivity errors between aircraft and ATS facilities and/or reduction in data link communications error
  - Safer application of reduced separation in the oceanic airspace for aircraft equipped with CPDLC and ADS-C.
  - Transition towards the implementation of a converged data link solution in the future without impacting technical interoperability of current implementation
PBCS Framework

• **Prescription of RCP and RSP** for air traffic services that are predicated on communication and surveillance performance \((\text{Annex 11})\);

• **Approval of aircraft and operators** for a communication and/or surveillance capability including aircraft equipage for operations where RCP and/or RSP specifications have been prescribed \((\text{Annex 6})\);

• **indication of an aircraft’s communication and surveillance capability and performance** in the form of RCP/RSP specifications in the flight plan \((\text{PANS-ATM})\);

• **monitoring programmes to assess actual communication and surveillance performance** against RCP and RSP specifications \((\text{Annexes 6 and 11})\);

• **corrective actions**, as applicable, for the appropriate entity \((\text{Annexes 6 and 11})\).
Performance-based Communication and Surveillance Manual (Doc 9869)

- Developed based on the RCP Manual (Doc 9869), GOLD, SVGM and other regional material
- Expanded the scope to include:
  - PBCS concept and surveillance capability
  - RCP and RSP specifications;
  - information and guidance provided from several workshops held in the regions; and
  - material from PIRG meetings and their contributory groups
- To be published in July/August 2016
Performance-based Communication and Surveillance Manual (Doc 9869)

Chapter 1. Definitions
Chapter 2. PBCS concept
Chapter 3. Developing RCP/RSP specification
Chapter 4. Applying RCP/RSP specification
Chapter 5. Complying with RCP/RSP specification

Appendix A. PBCS implementation plan- checklist
Appendix B. RCP specifications
Appendix C. RSP specifications
Appendix D. Post-implementation monitoring and corrective action (CPDLC and ADS-C)
Appendix E. Post-implementation monitoring and corrective action (SATVOICE)
Performance-based Separation

Filling in the Gaps between Radar and Procedural Separations
Lateral Separation

- **NAVIGATION**: RNP 4 or RNP 2
- **COMMUNICATION**: RCP 240
- **SURVEILLANCE**: RCP 180

- Lateral deviation change event with a maximum of 5 NM threshold and a waypoint change event

Not less than 30 NM (55.5 Km)
Longitudinal Separation

- **NAVIGATION**: RNP 10, RNP 4 or RNP 2
- **COMMUNICATION**: RCP 240
- **SURVEILLANCE**: RSP 180
- Cruising, climbing or descending on the same or crossing track

Not less than 10 Minutes
Longitudinal Separation

- **NAVIGATION**: RNP 10, RNP 4 or RNP 2
- **COMMUNICATION**: RCP 240
- **SURVEILLANCE**: RSP 180
- Cruising, climbing or descending on the same or crossing track

Not less than 10 Minutes
Summary & Conclusions

• ATS Data Link is a fundamental enabler for realizing the concept of future operations (FF-ICE, TBO and SWIM)

• However, further work is needed to ensure seamless and safe implementation of ATS Data Link

• There are a number of ICAO Annexes, PANS and Manual concerning ATS Data Link (Service/Message and Media) and they are evolving.

• There is an increasing need of application of performance-based ATM operations predicated on data link capabilities and performance
Questions?