Preparation for implementation – Operator and its State

Presented to: ICAO Operational Data Link Seminar
(Accra, Ghana)

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Overview

- **From Inter-Regional GOLD to the ICAO GOLD Manual (Doc 10037) and PBCS Manual (Doc 9869)**

- **Operator Preparation, Maintenance and Flight Planning for CPDLC and ADS-C**

- **Flight Crew Procedures and Training to Use CPDLC and ADS-C**

- **Final Remarks**

From Inter-Regional GOLD to the ICAO GOLD Manual (Doc 10037) and PBCS Manual (Doc 9869)

Inter-Regional – **G**lobal **O**perational Data **L**ink **D**ocument (**GOLD**)

ICAO HQ – **G**lobal **O**perationa**L** **D**ata Link (**GOLD**) Manual

There is GOLD in the ICAO Regions

- ✓ **5 September 2008 – North Atlantic (NAT) / Asia-Pacific (APAC) regions establish an ad-hoc working group to develop the Global Operational Data Link Document (GOLD)**

    - GOLD contains common guidance for CPDLC and ADS-C

- ✓ **14 June 2010 – NAT and APAC endorse the GOLD, 1st Edition, to replace regional guidance material**

- ✓ **26 April 2013 – European (EUR) Region endorse the GOLD, 2nd Edition, to replace regional guidance material**

AFI and SAM Regions Adopt GOLD

- ✓ **17-18 May 2010** – **SAT/FIT/5 – 5th South Atlantic (SAT) FANS Interoperability Team meeting, Lisbon, Portugal (Conclusion 7)**

- ✓ **10-14 Oct 2011** – **SAM/IG/8 – 8th South American (SAM) Implementation Group meeting, Lima, Peru (Regional Project RLA/06/901, convenient because of SAT/FIT/5)**

- ✓ **27-30 Mar 2012** – **APIRG/18 – 18th African Indian Ocean Planning and Implementation Regional Group meeting, Kampala**

   APIRG Conclusion 18/21 – Adoption of the Global Operational Data Link Document (GOLD)

   That in order to ensure regional and global harmonization of data link operations; AFI States adopt the Global Operational Data Link Document (GOLD) in replacement of the previous FANS 1/A Operations Manual.

   Note: South Africa coordinates the amendments to the GOLD for the AFI Region, as required

GOLD has been a very significant step towards the global harmonization of CPDLC and ADS-C procedures for pilots and air traffic controllers

GOLD is now in ICAO Headquarters

✓ **18 March 2008 – ICAO approves reconvening the Operational Data Link Panel (OPLINKP)**

✓ **18 October 2010 – OPLINKP reconvenes**

   – Monitored GOLD work in the ICAO Regions

✓ **17 October 2014 – Agreed to propose amendments to ICAO documents to include CPDLC, ADS-C and PBCS provisions, supported by guidance material contained in two Manuals**

   – GOLD Manual (Doc 10037)

   – PBCS Manual (Doc 9869)

   Evolved from Inter-Regional GOLD and other region work

✓ **March 2016 – ICAO adopts / approves amendments**

❑ **Applicability date for implementation is November 2016**

   ICAO elevates GOLD status and includes PBCS

ICAO CPDLC / ADS-C Provision Amendment
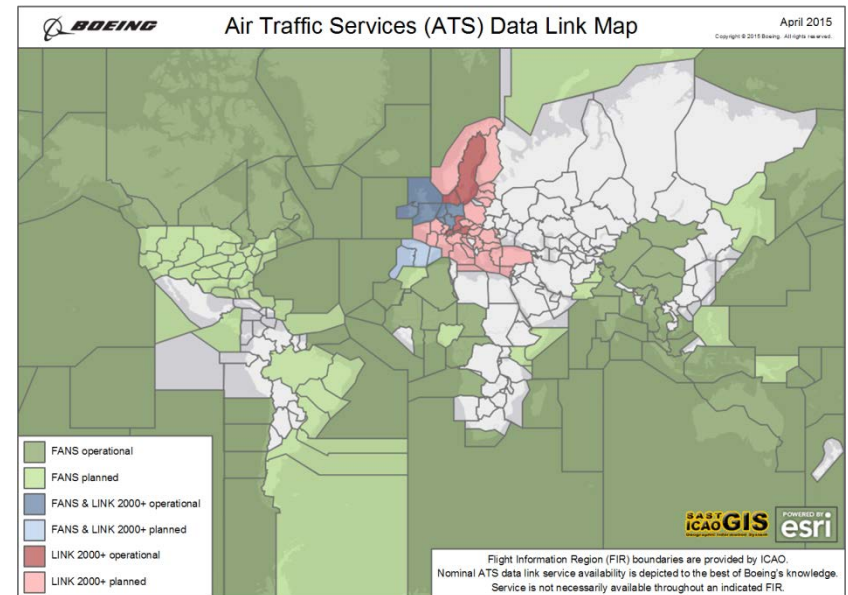
✓ **Adopted/Approved March 2016**
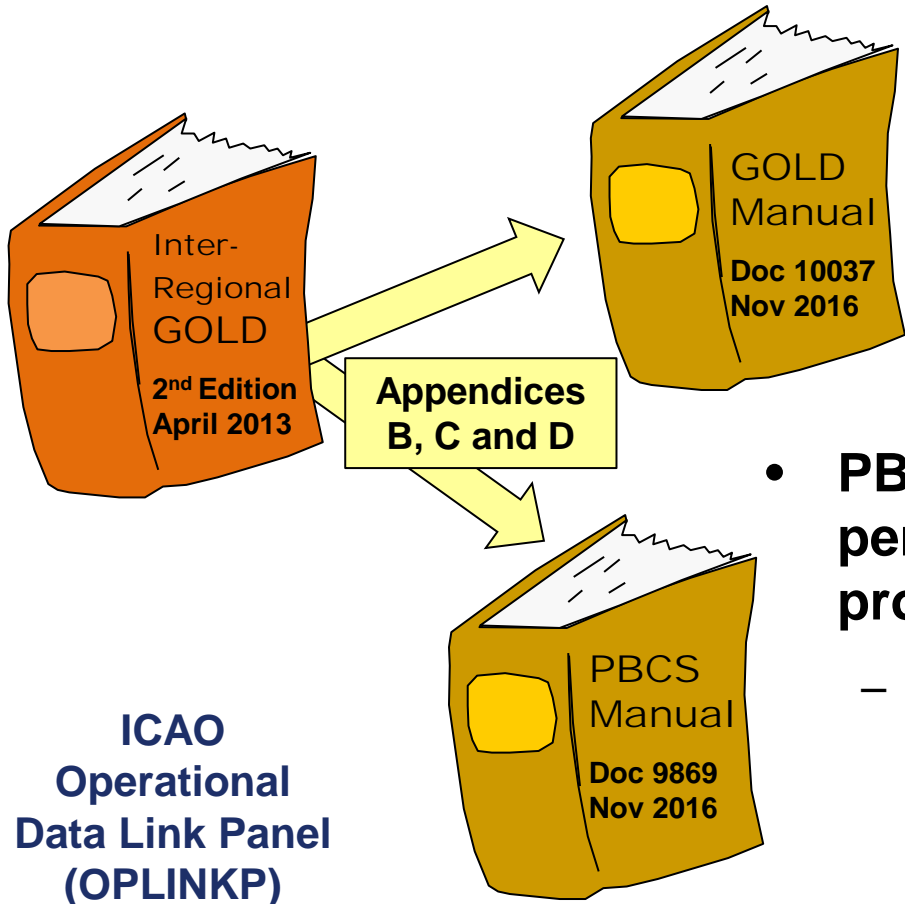
❑ **Applicable November 2016**

ICAO Doc	Description	Amdt
Annex 10	Aeronautical Telecommunications	
Volume II	Communication Procedures	90
Doc 4444	PANS–ATM	7

ICAO CPDLC / ADS-C Provision Amendment

- **Aligns the ICAO operational CPDLC / ADS-C provision with current implementation**

  - FANS 1/A is defined by **industry**

  - ATN B1 is **partial** ATN

- **Improves logon process and ADS-C reporting for new aircraft tracking provisions**

- **Provides a framework for the "next generation" data link provisions, based on RTCA / EUROCAE standards (Published early 2016) for Baseline (B2) data link**

Air Traffic Services (ATS) Data Link Map — April 2015

Legend:
- FANS operational
- FANS planned
- FANS & LINK 2000+ operational
- FANS & LINK 2000+ planned
- LINK 2000+ operational
- LINK 2000+ planned

Flight Information Region (FIR) boundaries are provided by ICAO. Nominal ATS data link service availability is depicted to the best of Boeing's knowledge. Service is not necessarily available throughout an indicated FIR.

ICAO Manuals

Inter-Regional **GOLD**

2nd Edition April 2013

Appendices B, C and D

GOLD Manual

Doc 10037 Nov 2016

ICAO Operational Data Link Panel (OPLINKP)

PBCS Manual

Doc 9869 Nov 2016

Mature DRAFTs are available upon request

- **GOLD Manual (Doc 10037) CPDLC / ADS-C**
  - Preparation and readiness – for ANSP and Operator
  - Procedures – for Controller and flight crew

- **PBCS Manual (Doc 9869), performance-based concept that provides global framework**
  - To prescribe criteria for communication and surveillance capabilities that are applicable to the air traffic operations in relevant airspace
  - To show that the different components of the system comply with prescribed criteria
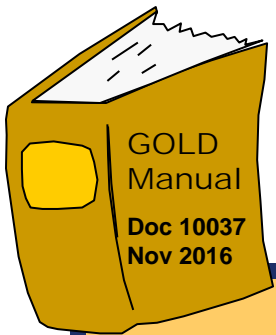
GOLD Manual (Doc 10037) Contents

GOLD Manual
Doc 10037
Nov 2016

Information	Background	Foreword
	Publications, Acronyms, Glossary	Introductory
	⭐ CPDLC / ADS-C general familiarization	⭐ Chapter 1
Guidelines	CPDLC / ADS-C service provision	Section 2.1
	⭐ Operator – aircraft preparation	⭐ Section 2.2
	Controller procedures	Chapter 3
	⭐ Flight crew procedures	⭐ Chapter 4
	⭐ Advanced ATS supported by CPDLC/ADS-C	⭐ Chapter 5
	State aircraft CPDLC / ADS-C operations	Chapter 6
Supporting Guidelines	CPDLC message sets	Appendix A
	Region/State specific information	Appendix B
	Operator/Aircraft specific information	Appendix C

Operator Preparation, Maintenance and Flight Planning for CPDLC and ADS-C

Operator Preparation Overview

- Operator should prepare to use CPDLC and ADS-C in accordance with policies established by the State of Registry or State of the Operator

- **GOLD Manual** and **PBCS Manual** provide guidance and best practices for the States to establish its policy and the operator to prepare for using CPDLC and ADS-C

- Other documentation, such as that which is specific to the aircraft type and data link equipment, will also be relevant to operator preparation (e.g. design approval, user manual, flight manual)

  So what's new? Good preparation will ensure a successful program and that CPDLC / ADS-C will provide effective ways to help pilots do their job

Operations – Policies and Procedures

- **Establish policy and procedures for flight crews and flight operations officers/dispatchers, taking into account flight manual and the minimum equipment list (MEL)**

- **Operation manuals should include**
  - CPDLC / ADS–C procedures for the specific aircraft system in accordance with
    - Operating manuals provided by the aircraft or system manufacturer (See GOLD Apx C)
    - Global guidance for flight crew procedures contained in GOLD Chapters 4 and 5
  - MEL modifications (if required)

- **CPDLC / ADS–C procedures do not relieve the flight crew of the voice communication procedures**
  - Including any required SELCAL check(s)) with ATS units along the route of flight.

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Operations – Training and Qualification

- **Establish training and qualification program for flight crews and flight operations officers/dispatchers consistent with ICAO Annex 1 and Annex 6**

- **Training and qualification program should include**

  - General data link familiarization – data link system description, including applications, network and subnetworks (GOLD, Chapter 1)

  - Operations policies and procedures (Chapter 4 and 5)

  - Flight planning requirements for CPDLC / ADS−C flights (GOLD, p. 2.3 and AIPs)

  - Implications of flights departing with unserviceable equipment or failed afterward

  - Implications of planned and unplanned service outages on data link operations

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Operations – Non-Normal

- **The operator should ensure that flight operations, the flight crews and the appropriate ANSPs are notified of failures with the aircraft equipment or the operator's AOC system related to data link operations**

- **The operator should provide flight operations officer/dispatcher and the flight crew with procedures, as appropriate, when the following occurs**

  - the operator is notified of data link system failures per paragraph 2.2.1.7; or

  - the AOC system or aircraft equipment fails such that the aircraft capability can no longer meet the performance specifications (prescribed in ICAO Doc 9869 for the intended operation.)

- **The operator may be required to make special arrangements with an ATS unit for the purposes of undertaking trials using ATC data link equipment**

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Regional/State Monitoring Agencies

- **CPDLC and ADS–C systems are very complex systems for use by pilots and controllers**

- **To ensure smooth operations, these systems are supported by monitoring agencies that investigate reported problems**

- **These monitoring agencies function under the PBCS monitoring program provision contained Annex 11**

- **Per Annex 6, operators will need to establish policies and procedures to support PBCS monitoring program for CPDLC and ADS–C operations**

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Maintenance

- **Aircraft system configuration – communications management – configure to ensure best possible CPDLC / ADS−C performance**
  - VHF/SATCOM media transitions
  - Media type priority selection for CPDLC / ADS−C (ATS) and AOC
  - Media specifics – high speed/low speed SATCOM channel

- **Aircraft system updates – Incorporate software releases to resolve known issues and ensure best possible CPDLC / ADS−C performance**

- **Establish CSP service agreement that will**
  - Ensure communication services will satisfy established performance criteria
  - Provide notification (operator and ANSPs) when such communication services fail or degrade below acceptable performance level

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Flight Planning for CPDLC / ADS–C

- **When filing data link capability, the operator should ensure that the planned use of data link for the flight will be in accordance with regulations, policies and procedures applicable in individual States and/or flight information regions (FIRs) for the flight**

  – as published in documents such as regional supplementary (SUPPs) procedures and AIPs (or other appropriate publications).

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Flight Planning

Item 10a - CPDLC equipment and capabilities	Descriptor
CPDLC ATN VDL Mode 2 (ATN B1)	J1
CPDLC FANS 1/A HFDL	J2
CPDLC FANS 1/A VDL Mode 0/A	J3
CPDLC FANS 1/A VDL Mode 2	J4
CPDLC FANS 1/A SATCOM (INMARSAT)	J5
CPDLC FANS 1/A SATCOM (MTSAT)	J6
CPDLC FANS 1/A SATCOM (Iridium)	J7

Item 10b – ADS-C equipment and capabilities	Descriptor
ADS-C with FANS 1/A capabilities	D1
ADS-C with ATN capabilities	G1

- **In addition, Item 18 indicators**
  - REG/ followed by the aircraft registration
  - CODE/ followed by the aircraft address expressed in the form of an alphanumerical code of six hexadecimal characters
- **Used to correlate logon information with the flight plan**
- **Other information may be used**

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Flight Crew Procedures and Training to Use CPDLC and ADS–C

Flight crew procedures and training

- **When to use CPDLC – when to use voice**
  - Outside VHF, CPDLC is normally used, but pilot and controller will choose at their discretion at any given time

- **Logon, automatic transfers and end service**

- **Initiating and responding to CPDLC messages**
  - Individual review of messages before executed or sent

- **ADS-C is a controller tool - ANSP manages ADS-C connection**
  - Pilots ensure ADS-C is armed and advise ATC of suspicious connections

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Flight crew procedures and training

- **Responding to CPDLC messages – special emphasis**
  - "Expect" instructions
  - Conditional clearances, i.e. AT (time) CLIMB or CLIMB TO REACH BY (position)
  - "Loadable" route clearances and responses

- **Initiating CPDLC messages – special emphasis**
  - Use of free text – should be avoided and special assessment when used
  - Use of multi-element messagesWeather deviations
  - Weather deviations
  - CPDLC position reporting

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Flight crew procedures and training

- **Emergency procedures**

  – Preflight preparation guidance

  – Use of CPDLC MAYDAY and PAN message elements

  – Inadvertent activation of ADS-C emergency

- **Non-routine procedures**

  – Voice communications related to CPDLC failures

  – Data link initiation failure

  – Data link system failures

  – Using CPDLC to relay messages

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Advanced ATS supported by CPDLC / ADS–C

- **Reroutes**

  – AOC-initiated – dynamic airborne reroute procedure

  – ATC initiated

- **Tailored Arrival**

  – Provisions, clearance delivery and execution

- **ADS–B In Trail Procedure (ITP)**

  – Provisoins, clearance delivery and execution

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Final Remarks

Summary

- **Operators always stress the importance of global harmonization of CPDLC / ADS–C procedures**

- **The GOLD Manual provides a global basis for implementation and harmonization of data link operations**

- **The GOLD Manual is and will continue to be significant to converge data link implementations worldwide**

- **Let us all participate and contribute to improve its usefulness**

- **The more we use it and share our experiences the better it gets**

Exchanging / Sharing Information

- **ICAO Communications Panel – Operational Data Link Specific Working Group (CP-OPDLWG)**

- **ICAO planning and implementation regional groups (PIRGs), etc**

- **SAE (AEE) Data Link Users Forum**

- **FAA-sponsored Performance-based operations aviation rulemaking committee**

- **Data Link / FANS 1/A Interoperability Team Meetings**

- **Your ICAO Regional Office – Workshops, such as this one are great!**