ICAO SARPS AND GUIDANCE DOCUMENTS ON SURVEILLANCE SYSTEMS

MEETING/WORKSHOP ON AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B) IMPLEMENTATION (ADS-B/IMP)
(Lima, Peru, 13 to 16 November 2017)

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SAM CNS REGIONAL OFFICER
DEFINITION OF SURVEILLANCE SYSTEMS

ICAO SARPS AND DOCUMENTS

CONTENTS - ANNEXES AND DOCUMENTS

DEVELOPMENT OF NEW ANNEX AMENDMENTS AND NEW DOCUMENTS
A surveillance system may consist of a series of technologies that use various ground and on-board emitter sensors (e.g., primary surveillance radar (PSR), SSR, automatic dependent surveillance (ADS), multilateration technologies) together with data-merging systems at the air traffic control centre (ATCC). The techniques to be used will depend on air traffic service provider (ATS) requirements, the suitability of technologies, and environmental demands (e.g., oceanic, continental or high traffic density).
ICAO SARPS AND DOCUMENTS

SURVEILLANCE SYSTEMS

SARPS

Annex 10 Aeronautical telecommunications
  Volume I, Volume III and Volume IV
Annex 6 Operation of aircraft
Annex 11 Air traffic services
Annex 14 Aerodromes

DOCUMENTS

4444 Procedures for air navigation services
1057 Manual on competence-based training and evaluation of experts in electronic systems for air traffic safety.
8071 Volume III Testing of surveillance radar systems
9476 Manual on surface movement guidance and control systems
9830 Manual on advanced surface movement guidance and control systems (A-SMGCS)
9718 Handbook on radio frequency spectrum requirements for civil aviation
SURVEILLANCE SYSTEMS

ICAO SARPS AND DOCUMENTS (cont.)

- Doc 9816 — Manual on VHF Digital Link (VDL) Mode 4
- 9863 Airborne collision avoidance system (ACAS) manual
- 9869 Performance based communication and surveillance (PBCS)
- Doc 9861 — Manual on the universal access transceiver (UAT).
- 9871 Technical provisions for Mode S services and extended squitter
- 9924 Aeronautical surveillance manual
- 9994 Manual on airborne surveillance applications
- Circular 326/AN188.
ANNEX 10 VOLUME I
Second edition - July 2006
Amendment 90 - 11 November 2016

Aspects related to GNSS:

Chapter 3: Section 3.7 GNSS requirements
Appendix B: GNSS technical specifications
Annex D: Information and guidelines for the implementation of GNSS standards and recommended practices
Annex 10 Volume III
Second edition - July 2007
Amendment 90 - 11 November 2016
State letter SG ICAO AN 7/62.1.2-17/18 of 30/3/2017

Aspects related to surveillance:

PART I: Digital data communication systems

Chapter 5: Mode S SSR data air-ground link
Chapter 6: Air-ground VHF digital link (VDL)
Section 6.9: VDL 4

Chapter 9: Aircraft addressing system
Chapter 12: Universal access transceiver (UAT)
ANNEX 10 VOLUME IV
Fifth edition July 2014 Includes Amendment 89
Proposal of amendment ICAO State letter SG
AN/7/65.1.1-17/24 of 6/3/2017

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Seventh edition - July 2016  Amendment 13
(10-11-2016)

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Doc 4444 Procedures for air navigation services: Air traffic management
Proposal for amendment State letter SG AN/13/2.5-17/85 3/8/17

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8.1 ATS SURVEILLANCE SYSTEMS CAPABILITIES

8.1.1 ATS surveillance systems used in the provision of air traffic services shall have a very high level of reliability, availability and integrity. The possibility of system failures or significant system degradations which may cause complete or partial interruptions of service shall be very remote. Backup facilities shall be provided.

8.1.3 ATS surveillance systems should be capable of integration with other automated systems used in the provision of ATS, and should provide for an appropriate level of automation with the objectives of improving the accuracy and timeliness of data displayed to the controller and reducing controller workload and the need for verbal coordination between adjacent control positions and ATC units.

8.1.4 ATS surveillance systems should provide for the display of safety-related alerts and warnings, including conflict alert, minimum safe altitude warning, conflict prediction and unintentionally duplicated SSR codes and aircraft identification.

8.1.5 States should, to the extent possible, facilitate the sharing of information derived from ATS surveillance systems in order to extend and improve surveillance coverage in adjacent control areas.

8.1.8 PSR systems should be used in circumstances where other ATS surveillance systems alone would not meet the air traffic services requirements.

8.1.12 The provision of ATS surveillance services shall be limited to specified areas of coverage and shall be subject to such other limitations as have been specified by the appropriate ATS authority. Adequate information on the operating methods used shall be published in aeronautical information publications (AIP), as well as operating practices and/or equipment limitations having direct effects on the operation of the air traffic services.
DOC 1057  Manual on competence-based training and evaluation of experts in electronic systems for air traffic safety
A description is provided of methods for assessing the technical and operational performance of surveillance systems in general and, in the current version, of surveillance radar systems, especially with advanced primary radar signal processing (such as mobile target detection (MTD) Doppler processing, digital plot extraction and tracking) and advanced SSR techniques [such as monopulse azimuth processing and selective (Modo S) interrogation].

CONTENTS OF THE DOCUMENT

a) Organization of surveillance sensor systems;
b) Sensor system performance test methodology;
c) Test application;
d) Detailed radar test methods (testing of individual parameters);
e) Impact of test results on the operational use of radar systems;
f) Impact of transponder characteristics on radar performance
The manual has been developed to facilitate the application of specifications related to surface guidance and control systems (SMGC) that appear in the various Annexes and in the PANS-RAC.

4.6 The role of surface movement radar (SMGC)
DOC 9830 First edition 2014
This manual is a guidance document to enable manufacturers, operators and certifying authorities to develop and introduce A-SMGCS based on local circumstances and taking into account global interoperability requirements for international civil aviation operations.
This handbook contains the ICAO strategy and policy statements relevant to the aviation requirements for radio frequency spectrum, as approved and amended by the ICAO Council.

The handbook is intended to assist States and ICAO in preparing for ITU conferences.

Chapter 8 contains the ICAO spectrum strategy and addresses future requirements of frequencies for civil aviation.
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<td>Primary surveillance radar</td>
<td>Long term</td>
<td>Secure the continuing availability of the 2 700–2 900 MHz frequency band, which is allocated to the aeronautical radio navigation service, for use by primary surveillance radar on a global basis.</td>
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<tr>
<td></td>
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<td></td>
<td>Where mobile systems are in use (e.g. WIMAX and LTE) in adjacent frequency bands, secure protection of radar stations from harmful interference from mobile systems operating in adjacent bands.</td>
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<td>Primary surveillance radar</td>
<td>Long term</td>
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## ICAO Spectrum Strategy for Aeronautical Airborne (Stand-Alone) [Radar] Systems

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<td>Secure the continuing availability of the 8 750–8 850 MHz frequency band, which is allocated to the aeronautical radio navigation service, for use by airborne Doppler radar and ground mapping radar on a global basis.</td>
</tr>
<tr>
<td>9 300–9 500 MHz</td>
<td>Airborne weather radar</td>
<td>Long term</td>
<td>Secure the continuing availability of the 9 300–9 500 MHz frequency band, which is allocated to the aeronautical radio navigation service, for use by airborne weather radar and ground-based radar on a global basis.</td>
</tr>
<tr>
<td>13.25–13.4 GHz</td>
<td>Airborne Doppler and ground mapping radar</td>
<td>Long term</td>
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The material contained in this manual supplements ACAS standards and recommended practices (SARPS) and procedures contained in Annex 10 — Aeronautical Telecommunications, Volume IV — Surveillance radar and collision avoidance systems, Procedures for Air Navigation Services — Air traffic management (PANS-ATM, Doc 4444) and Procedures for air navigation services — Aircraft Operations (PANS-OPS, Doc 8168).

This manual includes a detailed description of ACAS and associated technical and operational issues in order to facilitate correct operation and operational surveillance, as well as training of personnel.
The material contained in this manual supplements ACAS standards and recommended practices (SARPS) and procedures contained in Annex 10 — Aeronautical Telecommunications, Volume IV — Surveillance radar and collision avoidance systems, Procedures for Air Navigation Services — Air traffic management (PANS-ATM, Doc 4444) and Procedures for air navigation services — Aircraft Operations (PANS-OPS, Doc 8168).

This manual includes a detailed description of ACAS and associated technical and operational issues in order to facilitate correct operation and operational monitoring, as well as training of personnel.
This Manual replaces the current Doc 9869, which only includes RCP

The PBCS manual offers guidance and information on PBCS operations and is intended to facilitate uniform implementation of the standards and recommended practices contained in Annex 6 – Operation of aircraft, Annex 10 – Aeronautical telecommunications, and Annex 11 – Air traffic services, Air traffic management (PANS-ATM, Doc 4444) and, when so required, the Regional supplementary procedures (Doc 7030).

This guidance material is intended to improve safety and maximise operational benefits, promoting the PBCS concept and its general application to the new communication and surveillance technologies in support of ATM operations.

The PBCS concept provides a framework for communication and surveillance performance management in accordance with global required communication (RCP) and surveillance (RSP) performance. The RCP/RSP specifications contained therein are initially intended for automatic dependent surveillance - contract (ADS-C), (CPDLC) and SATVOICE communications in support of ATM operations in airspace where procedural separations are being applied.

The universal access transceiver (UAT) is a broadband broadcast data link operating on 978 MHz with a channel modulation rate of just over 1 Mbps.

By design, the UAT supports multiple broadcast services, including flight information services (FIS-B) and traffic information services (TIS-B), in addition to automatic dependent surveillance — broadcast (ADS-B).
The purpose of this manual is to specify technical provisions for the formats and associated protocols used in Mode S services and extended squitter. These detailed technical provisions supplement the requirements contained in Annex 10 — Aeronautical telecommunications, Volume III (Part I — Digital data communication systems), and Volume IV — Surveillance and collision avoidance systems, and are necessary to ensure global interoperability.


The first edition of the manual specified the previous versions of extended squitter messages (versions 0 and 1).

The formats and protocols of Version 2 were developed in order to improve integrity and accuracy reporting. In order to support the identified ADS-B operational requirements not covered in Version 1, several additional parameters were included in Version 2. Furthermore, several parameters were modified and others were eliminated since they were no longer deemed necessary to support ADS-B applications.

The manual also includes guidance on implementation, as well as information on future Mode S and extended squitter services that are under developed.
Doc 9924 2nd Edition (English only)

The manual is a reference document on aeronautical surveillance for ATM purposes. The chapters contain:

a) an explanation of aeronautical surveillance;
b) the identification of operational services supported by surveillance;
c) guidance on surveillance system performance;
d) a description of the different components of an air-ground surveillance system;
e) a description of the different components of an air-air surveillance system; and
f) a discussion on issues related to deployment of surveillance systems.

Manual on the SSR Systems (Doc 9684)

Manual on Mode S Specific Services (Doc 9688)

Superseded by Doc 9924
This circular describes the comparative assessment conducted by the Separation and airspace safety panel (SASP), from which it may be concluded that, under certain circumstances, ADS-B and MLAT can be used for ATS surveillance purposes, including separation. The SASP assessment also concluded that ADS-B can be used for achieving a separation minimum of five nautical miles (5 NM).
SURVEILLANCE PANEL (SP)

Aeronautical Surveillance Working Group (ASWG)
Airborbone Surveillance Working Group (AIRB)

ASWG (ASWG/5 Japan, Tokyo, 27-30 March 2017)

- Proposal to modify Annex 7 Certificate of registration 24-bit aircraft address
- Correction military use descending form DF=19 no ADS B message
  Proposed changes: Amendment Annex 10 Volume IV, Doc 9871 and Doc 9924 (2020). This revision will take place together with other changes in RTCA/EUROCAE standards
- Use of X pulse Proposal to modify Annex 10 Volume IV (November 2018) and Doc 9924
- Clarification of military use 1030/1090Mhz Proposal to modify Doc 9924
- Updating of Doc 8071 Volume III
- Updates to Doc 9863

Next ASWG/6 meeting (Montreal, Canada, 16-20 October 2017)
SURVEILLANCE PANEL (SP)

AIRB (AIRB/3 Tokyo, Japan, 30-31 March 2017)
- Proposal to modify Doc 9924
  - Revision reference section
  - AIRB/VSA benefits
  - IM (Interval management) New chapter (3)
  - Revision SURF-IA text
Next AIRB/4 meeting, Montreal, Canada, 11-13 October 2017
Thank You