



International Civil Aviation Organization

**TWELFTH MEETING OF THE SOUTH EAST ASIA
AND BAY OF BENGAL SUB-REGIONAL ADS-B
IMPLEMENTATION WORKING GROUP
(SEA/BOB ADS-B WG/12)**

Guangzhou, China, 08 – 10 November 2016



Agenda Item 7: Any other Business

ADS-B EQUIPAGE FLIGHT PLAN SUPPLEMENTARY INDICATION PROPOSAL

(Presented by the Secretariat)

SUMMARY

The attached Information Paper for the Second Meeting of the Surveillance Panel (SP/2) held in Montréal, Canada from 11 to 19 October 2016. Its information is relevant to our discussion.



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INFORMATION PAPER

SECOND MEETING OF THE SURVEILLANCE PANEL (SP/2)

Montréal, Canada, 11 to 19 October 2016

Agande item 6: Any other business

ADS-B equipage Flight Plan supplementary indication proposal

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SUMMARY

This information paper provides a consolidated proposal for supplementing the existing ADS-B equipage indication in the flight plan. This paper is “as revised” following discussion by the SP/2 AIRB WG/2 meeting in October 2016.

The members of the Surveillance Panel are invited to:

- a) Note the content of the paper
- b) Note the coordination status
- c) Note the proposed recommendations contained in the IP

Proposal for use of ICAO flight plan items to indicate ADS-B capability

1. Introduction

During the introduction of ADS-B it has become clear that flight plan indications of ADS-B capabilities are needed for several reasons, including knowledge of ADS-B performance in relation to the local requirements, controller expectations for surveillance tracking of aircraft when transitioning in and out of areas with different surveillance sensor coverage, decision support for setting-up ADS-B based applications.

It has also become clear that the current FPL 2012 ADS-B capability indications are not sufficient for the mentioned purpose in all States, therefore, local instructions have been published requiring operators to add supplementary ADS-B capability indications in item 18, either using the RMK/ or the SUR/ indicator.

The additional information has been needed since the current ADS-B capability descriptors in Item 10b do not allow to indicate explicitly the ADS-B approval baseline. It is noted that for ADS-B Out, the following baselines currently exist:

- European EASA AMC20-24
- Australian CASA's Civil Aviation Order 20.18 (Appendix XI),
- USA 14 CFR 91.227 (FAA AC20-165B) and,
- European EASA CS ACNS.D.ADSB (EU Regulation 1207/2011)

Additional approval baselines for ADS-B In (supporting specific ADS B In applications) are available and more are expected.

The ICAO Surveillance Panel's Airborne Surveillance Working Group, during its first meeting in April 2015, acknowledged the need for a harmonised indication of the ADS-B capabilities in the FPL through regional implementation (Doc 7030), global agreement via the ATMRPP (near-term), and/or integration in the new flight plan format (FF-ICE) under development by the ATMRPP (long-term solution).

In response to these recommendations, this IP provides a proposal for use of ICAO flight plan items to indicate ADS-B capabilities. The proposed approach aims at global harmonisation and interoperability.

2. Background

The Position Paper on the integration of mixed traffic in ADS-B Out operations, which was approved by the EUROCONTROL Cascade Deployment Task Force (CDTF) in December 2012¹, investigated the issue of mixed traffic for ADS-B Out operations in Europe. It provided recommendations to cope with mixed traffic in the short, medium and long-term. One of its main recommendations was related to the indication of ADS-B capabilities in the ICAO flight plan:

“The stakeholders should co-ordinate on the use of the ICAO flight plan Items 10b and 18 to reflect the ADS-B approval status of an aircraft for ADS-B Out operations either for AMC 20-24 or IR 1207/2011 (CS-ACNS), as well as possible provisions for future extension (e.g. for ADS-B In)”

In the same timeframe, while implementing the ICAO FPL2012 provisions, the FAA recognised the shortcoming of the current ADS B equipage indications in the item 10b of the flight plan, which does not distinguish between the different versions of ADS-B. This resulted

¹ WP2.4 ed. 0.96

in the U.S.'s use of item 18 of the FPL to provide indication of the capability of the ADS-B equipment on board of the aircraft by inserting SUR/260B for qualified 1090 ES equipped aircraft and SUR/282B for UAT capability eligible to receive ADS-B based ATC services in U.S. airspace.

ANSPs such as Australia and Canada, which saw the initial ADS-B deployments, used the RMK/ indicator in Item 18 followed by the text ADSB (i.e. RMK/ADSB) to indicate that the aircraft are eligible to receive ADS-B based ATC services in respective airspace.

3. Current ADS-B flight plan indications

The flight Plan 2012 requirements, covered by the Amendment 1 to ICAO PANS ATM (Doc 4444) which became applicable in November 2012, modified the Surveillance capability descriptors. This included the introduction of generic ADS-B descriptors in Item 10b². The Amendment also expanded Item 10b to be able to contain up to 20 characters, while it previously only could contain two characters.

An overview of the updated Surveillance equipment and capabilities, following Amendment 1 to PANS-ATM (Doc 4444) is presented in Annex 1. The specific Item 10b provisions introduced for ADS-B over 1090 MHz are:

B1 = ADS-B with dedicated 1090 MHz ADS-B 'out' capability

B2 = ADS-B with dedicated 1090 MHz ADS-B 'out' and 'in' capability

Capability is defined as comprising the following elements:

- a) presence of relevant serviceable equipment on board the aircraft;
- b) equipment and capabilities commensurate with flight crew qualifications; and
- c) where applicable, authorisation from the appropriate authority.

In addition to the changes in Item 10, Amendment 1 to PANS-ATM also introduced the SUR/ indicator in Item 18 of the flight plan. The SUR/ indicator allows for up to 50 characters. It currently has no globally harmonised codes/descriptors identified to be used in correlation with the Item 10b indicator (however local codes are already in use in some areas in which ADS-B is being used operationally).

4. Proposed supplementary ADS-B flight plan indications

The proposal for harmonised supplementary FPL 2012 ADS-B flight plan indications is based on using the SUR/ indicator in Item 18. This approach minimises the impact on the current FPL 2012 format and flight plan processing systems while allowing for expansion and flexibility. It is therefore proposed to provide additional information for both ADS-B Out and ADS-B In capabilities (i.e. approval baselines). This would also be in line with other capability indications, such as Navigation and Communication indications using the PBN/, NAV/ and COM/ indicators in Item 18.

This proposed method builds on the existing indications and suggests expanding the detailed information in Item 18. It introduces a structure to be used together with the SUR/ indicator. It also proposes specific ADS-B codes/descriptors to reflect current identified relevant ATS information.

The philosophy behind the proposed method is that information provided in item 18 will generally be read by ATS automation systems, with appropriate relevant information being

² Provisions for Communication and Navigation are available in Item 10a of the Flight Plan.

provided or displayed to controllers as determined by the cognizant ANSP. Though the authors intended to create indications that are mnemonic and which could be displayed to the controller if desired, there is no intent to require this information to be displayed “as is” to any controller or pilot.

The proposed indicators can be used further in the development of a complete set of indicators for the new FPL format (FF-ICE). Finally, it is also proposed to link the expected presence of the SUR/ indicator in Item 18 to the presence of ADS-B descriptors in Item 10b. Potential redundancy is noted between the L and B1, U1, V1 descriptors (i.e. the ADS-B descriptors). However, it is proposed that the ADS-B capability is always indicated using the ADS-B descriptors in Item 10b (i.e. B1 and B2 for ADS-B over 1090MHz).

4.1 ADS-B Out flight plan indications

The ADS-B Out baselines can currently be divided into three groups correlated to the Airworthiness Approval or compliance of the equipment:

- The EASA AMC20-24 together with the Australian CASA’s Civil Aviation Order 20.18 (Appendix XI), based on ADS-B Versions 0 and 1
- The USA FAA AC20-165B (14 CFR 91.227), based on RTCA DO-260B/DO-282B ADS-B Version 2 systems
- The European EASA CS-ACNS.D.ADSB, based on EUROCAE ED-102A ADS-B Version 2 systems.

It is proposed that ADS-B Out capability is indicated using either B1 or B2 in Item 10b followed by specific ADS-B Out descriptors in Item 18 SUR/, as follows:

ADS B Out Airworthiness Approval / Compliance	Item18 SUR/ descriptor ID	Comment
EASA AMC20-24 or CASA CAO20.18	EA0	Originally intended for Version 0 or 1 systems
EASA CS-ACNS.D.ADSB	CS2	ED-102A Version 2 systems
USA 14 CFR 91.227 / FAA AC 20-165 (all versions)	AC2	DO-260B/DO-282B Version 2 systems

If an aircraft is certified to meet more than one of the above baselines, then all valid certified capabilities should be listed. For example, many Airbus/Boeing aircraft have been certified to meet the superset of EASA CS-ACNS.D.ADSB and FAA AC 20-165 requirements. For such aircraft, “SUR/CS2AC2” should be listed in item 18.

It is recommended, for consistency, that the same descriptors are considered for indicating the ADS-B Out capabilities in the new ICAO FPL format (FF-ICE)

4.2 ADS-B In flight plan indications

Several airborne applications based on ADS-B surveillance (ADS-B In applications) are currently being deployed for operational use. These include applications intended to enhance airborne traffic situational awareness, own visual separation in approach, as well as applications facilitating aircraft spacing or level changes in areas in which surveillance is not provided.

Some of these applications (e.g. traffic situational awareness) do not require that the ATS has any knowledge of such airborne capability. However, from an operational perspective it is still may be beneficial to have flight plan indications of these capabilities; therefore they can be included in the FPL as optional indicators.

Additional ADS-B In applications are being developed, for which ATC has to have the knowledge of the aircraft capabilities; hence these operations are expected to require flight plan indications to be deployed efficiently. This underlines the need for an expandable and flexible solution for flight plan indications of ADS-B capabilities. The proposed list of indications below includes both current and future expected ADS-B In applications. However, any near-term ICAO FPL harmonization of item 18 SUR/ indicators should only define such indicators for current ADS-B In applications.

ADS B In capability is defined as comprising the following elements:

- a) presence of relevant serviceable equipment on board the aircraft;
- b) equipment and capabilities commensurate with flight crew qualifications; and
- c) equipment is compatible with the MOPS version required for the operations
- d) where applicable, authorisation from the appropriate authority

It is proposed that ADS-B In capability is indicated using B2³ in Item 10b followed by specific ADS-B In descriptors in Item 18 SUR/, as suggested in the table below

Capability	Supported application	Item18 SUR/ descriptor	Comments
Traffic situational awareness	Airborne traffic situational awareness (AIRB)	SA1	Optional capability indication in FPL
	Own Visual Separation in Approach (VSA)	SA2	
	Traffic Situational Awareness on the Surface (SURF)	SA3	
Enhanced traffic situational awareness	Traffic Situational Awareness with Alerts (TSAA)	ES1	
Assisted Own Visual Separation on Approach	CDTI (Cockpit Display of Traffic Information) Assisted Visual	CV1	RTCA DO-317B / EUROCAE ED-194A

³ B2 also includes ADS-B Out capability, which should be specified using respective ADS-B Out descriptors.

	Separation” (CAVS)		
Interval Management	Flight Deck based Interval Management for Spacing (FIM-S)	IM1	RTCA DO-361 / EUROCAE ED-236
	Advanced Interval Management (A-IM)	IM2	Under development (to be omitted from near-term ICAO FPL item 18 SUR/ indicators)
In Trail Procedure	In trail Procedures (ITP)	IT1	RTCA DO-317A / EUROCAE ED-194 (including subsequent versions)
Spacing for paired approaches	Paired Approach (PA)	PA1	Under development (to be omitted from near-term ICAO FPL item 18 SUR/ indicators)
Pairwise Trajectory Management	Pairwise Trajectory Management (PTM)	PT1	Under development (to be omitted from near-term ICAO FPL item 18 SUR/ indicators)

It is recommended, for consistency, that the same descriptors are considered for indicating the ADS-B In capabilities in the new ICAO FPL format (FF-ICE). As noted earlier, any FPL format should be designed to allow easy expansion of new indicators for additional ADS-B-In capabilities as they become available.

5. Impact considerations

The use of flight plan indications depends on the operational procedures and local implementation.

Flight planning systems and/or Flight planning instructions will need to be updated to support operators in generating the flight plans with the proposed Surveillance capability indications, e.g. Computerized Flight Plan Service Providers (CFPSP).

When the additional ADS-B Capability information is needed by ATS, Ground system processing will need to be updated to ensure that the additional Surveillance capability indications (e.g. content in the SUR/ indicator in the FPL 2012 format or additional indicators in future FPL FF-ICE format) can be used, as appropriate. It should be noted that there is no ground system impact in a scenario where the additional ADS-B Capability information is not needed by ATS.

6. Coordination status

For global harmonization, either by the use of Item 18 SUR/ indicator in correlation with the Item 10b within the FPL2012 format or within the new ICAO FPL (FF-ICE) format, the ADS-B related flight plan indications will require publication in local and regional documentation and become part of global ICAO documentation, e.g. Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444)

In order to ensure consistency it is required that these indications are included, in some form, in the new ICAO Flight Plan FF-ICE format.

The current proposal has been submitted to a sequence of reviews by several stakeholders (Air Navigation Service Providers, Airline operators, IATA, FPL system providers, etc.) including coordination at the level of the ICAO AIRBWG. During this process, several comments and suggestions have been received.

The proposal is widely supported, however, the modifications proposed to the current FPL 2012 format SUR/ indications must be globally coordinated and business justified. While recognizing the less optimal solution of mixing free text with predefined items in the SUR/ indicator, the following main recommendations were developed:

- The change of the current non-standard SUR/ codes to a global standard are expected to be supported by most systems (subject to potentially required updates) and
- To reach global acceptability the supplementary proposed ADS-B FPL indications should not impose ATM system changes for those ANSPs that do not have the need to know the information

The main conclusion of the coordination process is the recommendation that harmonization and availability of the ADS-B capability indication is required both as a global change requiring the amendment of Doc. 4444 for the FPL2012 requirements as well as an input in the new ICAO FPL format (FF-ICE) being developed currently.

APPENDIX 1 - PANS-ATM Flight Plan Indications

This appendix provides an overview of Surveillance equipment indications and updates in the ICAO flight plan per Amendment 1 to PANS-ATM, Doc 4444.

A1.1 Item 10b Surveillance equipment descriptors

- N No surveillance equipment is carried for the route to be flown, or is unserviceable
- A Mode A (4 digits — 4 096 codes)
- C Mode A (4 digits — 4 096 codes) and Mode C
- X Mode S without both aircraft identification and pressure-altitude capability
- P Mode S, including pressure-altitude transmission, but no aircraft identification capability
- I Mode S, including aircraft identification transmission, but no pressure-altitude capability
- S Mode S, including both pressure-altitude and aircraft identification capability

A1.1.1 Item 10b Surveillance equipment descriptors introduced by Amendment 1

- E Mode S, including aircraft identification, pressure-altitude and extended squitter (ADS-B) capability
- H Mode S, including aircraft identification, pressure-altitude and enhanced surveillance (EHS) capability
- L Mode S, including aircraft identification, pressure-altitude, extended squitter (ADS-B) and enhanced surveillance (EHS) capability
- B1 ADS-B with dedicated 1 090 MHz ADS-B “out” capability
- B2 ADS-B with dedicated 1 090 MHz ADS-B “out” and “in” capability
- U1 ADS-B “out” capability using UAT
- U2 ADS-B “out” and “in” capability using UAT
- V1 ADS-B “out” capability using VDL Mode 4
- V2 ADS-B “out” and “in” capability using VDL Mode 4
- D1 ADS-C/FANS 1/A
- G1 ADS-C/ATN

A1.1.2 Item 10b Surveillance equipment descriptors removed by Amendment 1

- D ADS capability (D is not allowed after Nov 2012)

A1.2 Item 18 Surveillance indicator introduced by Amendment 1

- SUR/ Surveillance application/capability not in specified in Item 10b

A1.3 Instructions for including a capability in Item 10b

Capability is defined as comprising the following elements:

- a) presence of relevant serviceable equipment on board the aircraft;
- b) equipment and capabilities commensurate with flight crew qualifications; and
- c) where applicable, authorisation from the appropriate authority.

APPENDIX 2 – Acronyms

Acronym	Description
AC	Advisory Circular
ADS-B	Automatic Dependent Surveillance – Broadcast
ADS-B In	Reception and processing of ADS-B data on-board aircraft
ADS-B Out	Transmission of ADS-B data from aircraft (and/or reception of ADS-B data on ground)
AIRB	Basic Airborne Situation Awareness
AMC	Acceptable Means of Compliance
ATS	Air Traffic Service
CASA	Civil Aviation Safety Authority, the Australian national aviation authority
CDTF	CASCADE Deployment Task Force
CFPSP	Computerized Flight Plan Service Providers
COM	Communication
CS-ACNS	Certification Specifications, Acceptable means of Compliance, and Guidance Material on Airborne Communications Navigation and Surveillance
EASA	European Aviation Safety Agency
FAA	Federal Aviation Administration
FIM-S	Flight deck Interval Management – Spacing
ICAO	International Civil Aviation Organization
IFPS	Integrated Initial Flight Plan Processing System
IR	Implementing Regulation
ITP	In-Trail Procedure
NAV	Navigation
NPA	Notice of Proposed Amendment
PANS-ATM	Procedures for Air Navigation Services — Air Traffic Management
PBN	Performance Based Navigation
RMK	Remark
SUR	Surveillance
SURF	Basic Surface Situation Awareness
TSAA	Traffic Situation Awareness with Alerts
VSA	Visual Separation on Approach

APPENDIX 3 – Flight plan example

Example 1 – ADS-B Out

(FPL-SIA317-IS
-A388/J-GSDHIJ1J5RWXY/B1L
-EGLL1030
-N0454F230 DVR L9 KONAN/N0483F310 UL607 FERDI/N0486F330 UL607 AMASI
UM149 BOMBI UL984 PADKA L984 SKAVI/N0489F350 L984 DIBED/K0899F350
UL984 NM UM991 OLGIN/K0900F350 B494 INSER/K0913F370 B494 MKL B491
BISNA/N0487F370 M23 MARAL/K0905F370 B450 BIBIM N644 ABDAN B371
LEMOD/N0496F370 N644 PAVLO/N0497F370 N644 DI M875 BUTOP/N0493F390
M875 KAKID M770 BUBKO/M084F390 M770 RAN/N0485F390 M770
GOLUD/M082F370 M751 VPK/N0481F370 B469 PADLI/N0479F350 B469 BIKTA
PASPU1A
-WSSS1202 WSAP
-PBN/A1L1B1C1D1O1S2 SUR/CS2 DOF/120601 REG/9VSKJ EET/EBUR0016
EDVV0035 EDUU0036 LKAA0100 EPWW0124 UKLV0145 UKBV0207 UKDV0232
URRV0257 UBBA0406 UTAK0419 UTAA0444 UTAV0516 OAKX0534 OPLR0610
VIDF0640 VABF0741 VECF0744 VYYF0921 VTBB1027 WMFC1109 WSJC1200
SEL/BPKS OPR/SIA ORGN/WSSSSIAX RMK/ACASII EQUIPPED)

Example 2 – ADS-B Out and In

(FPL-SIA317-IS
-A388/J-GSDHIJ1J5RWXY/B2L
-EGLL1030
-N0454F230 DVR L9 KONAN/N0483F310 UL607 FERDI/N0486F330 UL607 AMASI
UM149 BOMBI UL984 PADKA L984 SKAVI/N0489F350 L984 DIBED/K0899F350
UL984 NM UM991 OLGIN/K0900F350 B494 INSER/K0913F370 B494 MKL B491
BISNA/N0487F370 M23 MARAL/K0905F370 B450 BIBIM N644 ABDAN B371
LEMOD/N0496F370 N644 PAVLO/N0497F370 N644 DI M875 BUTOP/N0493F390
M875 KAKID M770 BUBKO/M084F390 M770 RAN/N0485F390 M770
GOLUD/M082F370 M751 VPK/N0481F370 B469 PADLI/N0479F350 B469 BIKTA
PASPU1A
-WSSS1202 WSAP
-PBN/A1L1B1C1D1O1S2 SUR/AC2SA1IM1 DOF/120601 REG/9VSKJ EET/EBUR0016
EDVV0035 EDUU0036 LKAA0100 EPWW0124 UKLV0145 UKBV0207 UKDV0232
URRV0257 UBBA0406 UTAK0419 UTAA0444 UTAV0516 OAKX0534 OPLR0610
VIDF0640 VABF0741 VECF0744 VYYF0921 VTBB1027 WMFC1109 WSJC1200
SEL/BPKS OPR/SIA ORGN/WSSSSIAX RMK/ACASII EQUIPPED)