

## AERONAUTICAL CIRCULAR CIVIL AVIATION AUTHORITY – MACAO, CHINA

**SUBJECT:**

**OPERATIONS IN AUTOMATIC DEPENDENT  
SURVEILLANCE-BROADCAST (ADS-B) PRESCRIBED AIRSPACE**

**EFFECTIVE DATE:**

16 December 2013

**CANCELLATION:**

AC/OPS/023R00

**GENERAL:**

The President of Civil Aviation Authority – Macao, China, in exercise of his power under Paragraph 89 of the Air Navigation Regulation of Macao (ANRM) and Article 35 of the Statutes of Civil Aviation Authority, approved by the Decree-Law 10/91/M, established this Aeronautical Circular (AC).

### **1 Introduction**

Automatic Dependent Surveillance - Broadcast (ADS-B) is a surveillance application that periodically transmits aircraft parameters, such as aircraft identification, pressure altitude and position integrity, via a broadcast datalink protocol to any airborne or ground-based receivers within its range. As an automatic system, ADS-B requires no flight crew or controller action for the information to be transmitted and this surveillance-type information broadcast is dependent on the aircraft's navigation system and the broadcast capability of the source transmitter.

Taking cognizance of proven potential and benefits of ADS-B, ADS-B can be used to support the application of 5NM separation minimum by ATC for enroute and terminal operations similar to radar, the ICAO Asia-Pacific Regional Group has decided to use the 1090MHz (Mode S) Extended Squitter datalink as the globally interoperable link for ADS-B operations and urged States intending to implement ADS-B based surveillance service for a defined airspace to promulgate their mandating rules for ADS-B Avionics Equipage Requirements. It can be anticipated that aircraft does not have ADS-B operational approval from its State of Registry, when flying inside an ADS-B defined airspace, will be subject to Air Traffic Service Provider 's discretion to have a lower priority to its optimum level, or will be assigned a flight level below FL290.

In this connection, the purpose of this AC is to promulgate relevant requirements and guidance for operators wishing to obtain the operational approval for ADS-B operations and the conditions to maintain their eligibility for such approval.

## 2 Applicability

This AC is applicable to operators of Macao registered aircraft who intend to operate flights in ADS-B airspace.

## 3 Definitions

- Automatic Dependent Surveillance-Broadcast (ADS-B)

A means by which aircraft, aerodrome vehicles and other objects can automatically transmit and/or receive data such as identification, position and additional data, as appropriate, in a broadcast mode via a data link. The functionalities of transmitting and/or receiving data in ADS-B are further expressed as ADS-B “Out” and ADS-B “In”, of which:

- ADS-B “Out” is defined as the capability necessary to transmit ADS-B messages;
- ADS-B “In” refers to the ability to receive and display ADS-B messages and broadcast services.

For the purpose of this AC, unless otherwise specified, the system performances required onboard the aircraft refer to ADS-B “Out” capability.

- ADS-B-NRA

Enhanced air traffic services in Non-Radar Areas using ADS-B surveillance; the ADS-B-NRA application is intended to support ATS in the en-route and terminal phases of flight in areas where radar surveillance does not exist.

#### 4 Aircraft operations in ADS-B Prescribed Airspace

For flights in defined portions of airspace where ADS-B based surveillance is applied:

- (a) the aircraft shall carry serviceable ADS-B transmitting equipment that has been certified as meeting EASA AMC 20-24, or meets the equipment configuration standards in Appendix XI of Civil Aviation Order 20.18 of the Civil Aviation Safety Authority of Australia; and
- (b) the aircraft operator must have relevant operational approval from its State of Registry.

#### 5 Acceptance Criteria

- 5.1 EASA AMC 20-24 “*Certification Considerations for the Enhanced ATS in Non-Radar Areas using ADS-B Surveillance (ADS-B-NRA) Application via 1090 MHZ Extended Squitter*” and Appendix XI of Civil Aviation Order 20.18 of the Civil Aviation Safety Authority of Australia are the endorsed documents which address the acceptance criteria for the approval of ADS-B operations.
- 5.2 Operators desiring the approval for ADS-B operations shall refer to aforesaid documents and submit a formal application to AACM, with all supporting documents at least 3 months prior to the commencement of ADS-B operations, to demonstrate that it has the competence to safely conduct the intended operations and fulfilled the requirements and considerations presented in this AC in particular to the following areas:
  - 5.2.1 Aircraft Eligibility

Operator shall demonstrate that aircraft equipment and installations meet:

    - a) the certification considerations of EASA AMC 20-24; or
    - b) the equipment configuration standards in Appendix XI of Civil Aviation Order 20.18 of the Civil Aviation Safety Authority of Australia.
  - 5.2.2 Minimum Equipment List

The Minimum Equipment List needs to reflect the functional requirements of the ADS-B system.
  - 5.2.3 Operational Safety Aspects
    - 5.2.3.1 In all cases, flight crews shall comply with the surveillance provisions, schedules and relevant procedures contained in the Aeronautical Information Publications (AIP) published by the appropriate authorities.

- 5.2.3.2 Direct controller-pilot VHF voice communications shall be available at all times.
- 5.2.3.3 If flight crews receive equipment indications showing that position being broadcast by the ADS-B system is in error (e.g. GPS anomaly), they shall inform the ATSP, as appropriate, using any published contingency procedures.
- 5.2.3.4 When there is not an independent Flight Deck Control selection between the ADS-B function (ADS-B on/off) and the ATC transponder function, the crew must be fully aware that disabling the ADS-B function will also lead to disable the ACAS function.
- 5.2.4 Operations Manual
- 5.2.4.1 Operator's operations manual shall include a system description, operational safety aspects, operational and contingency procedures, and training elements for the use of the ADS-B application.
- 5.2.4.2 Operators operating under Part XIII of the ANRM, who may not required to have operations manual, shall develop similar training and operational procedures to the ones described in this AC.
- 5.2.5 Training Program
- 5.2.5.1 Operators shall ensure that all personnel involved in ADS-B operations are thoroughly familiar with all relevant aspects of ADS-B applications, of which the training syllabus for flight crews shall address the following:
- general understanding of ADS-B technique and technology;
  - specific ADS-B associated phraseology;
  - general understanding of the ADS-B operating procedures;
  - characteristics and limitations of the flight deck human-machine interface, including an overview of ADS-B environment and system description;
  - need to use the ICAO defined format for entry of the Aircraft Identification or Aircraft Registration marking as applicable to the flight;

*Note 1: ICAO Document 8168-OPS/611 Volume I (Procedures for Air Navigation Services) requires that flight crew of aircraft equipped with Mode "S" having an aircraft identification feature should set the aircraft identification into the transponder. This setting is required to correspond to the aircraft identification that has been specified at Item 7 of the ICAO flight plan and consists of no more than seven characters. If the aircraft identification consists of less than seven characters, no zeros, dashes or spaces should be added. If no flight plan has been filed, the setting needs to be the same as the aircraft's registration, again, up to a maximum of seven characters.*

*Note 2: The shortened format commonly used by airlines (a format used by International Airlines Transport Association (IATA)) is not compatible with ICAO provisions for the flight planning and ATC services used by ATC ground systems.*

- f) operational procedures regarding the transmission of solely the generic emergency flag in cases when the flight crew actually selected a discrete emergency code and Special Position Identification (SPI);
- g) indication of ADS-B transmit capability within the ICAO flight plan;
- h) handling of data source errors;
- i) incident reporting procedures; and
- j) crew resources management and associated human factors issues.

5.2.5.2 Appropriate training programs shall be established for maintenance and flight operations officers/dispatchers personnel (if applicable).

#### 5.2.6 Maintenance

5.2.6.1 The continuing airworthiness of ADS-B system must be assured. As part of the operational approval process, existing established maintenance practices and maintenance program for the aircraft needs to be reviewed to ensure that it meets relevant requirements.

#### 5.2.7 Misleading ADS-B Transmissions

5.2.7.1 If an aircraft carries ADS-B transmitting equipment which does not comply with an approved equipment configuration as stated in paragraph 5.2.1, the aircraft must not fly unless the equipment is:

- a) deactivated; or
- b) set to transmit only a value of zero for the Navigation Uncertainty Category (NUC<sub>p</sub>) or Navigation Integrity Category (NIC).

*Note: EASA AMC 20-24 is used as the reference acceptance criteria for the ADS-B operational approval, applicant shall ensure that both airworthiness and operations aspects for the proposed operation has been covered in the application.*

## 6 Operational Approval

### 6.1 Overview of the Approval Process

6.1.1 The approval process which results in the issuance of ADS-B operational approval consists of the following phases:

- a) Pre-application
- b) Formal application
- c) Technical evaluation
- d) Demonstration/validation of operator maintenance and operations capability
- e) Decision on application – issuance of operational approval

6.1.2 Operator shall set up a pre-application meeting with AACM, to facilitate its details planning and work schedule for the proposed operation, prior to the submission of a formal application, in which AACM will make the operator fully aware of the regulatory requirements which must be met in order to obtain the desired operational approval.

6.1.3 After the pre-application meeting, if the operator intends to proceed with the application process, a formal application, with prescribed form – FS/APP/006 “Application for Automatic Dependent Surveillance-Broadcast (ADS-B) Operational Approval” and the documentation required below, shall be submitted to AACM at least 3 months prior to the commencement of the proposed operations.

- a) Evidence of airworthiness compliance of the aircraft;
- b) Minimum Equipment List;
- c) Operations Manual / Operating policy, procedures and checklists;
- d) Training Programs;
- e) Maintenance Program; and
- f) Compliance matrix.

*Note 1: The airworthiness compliance of the aircraft under the airframe OEM Type Certificate approval in the Aircraft Flight Manual, in an AFM supplement or other appropriate airworthiness documentation is normally accepted by the AACM.*

*Note 2: The required compliance matrix shall consist of the operator's reference to comply with the requirements of this AC and the applicable provisions of ADS-B requirements mentioned in paragraph 5.1.*

*Note 3: Application form – FS/APP/006 “Application for Automatic Dependent Surveillance-Broadcast (ADS-B) Operational Approval” is available on the AACM website at [www.aacm.gov.mo](http://www.aacm.gov.mo).*

## 6.2 Issuance of Operational Approval

6.2.1 ADS-B operational approval will be issued when both flight operations and airworthiness have satisfactory results from their technical evaluations and validation of operator maintenance and operations capability.

- a) For operator in possession of an Air Operator Certificate (AOC), operational approval will be granted through the issuance of a variation of the AOC Operations Specifications (OPS SPEC).
- b) For operator not in possession of an Air Operator Certificate (AOC), operational approval will take the form of a certificate and will identify the operator, each individual aircraft the approval covers, and any conditions applied on the operational approval.

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