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Doc 9924

Aeronautical Surveillance Manual

Third Edition, 2020



Approved by and published under the authority of the Secretary General

INTERNATIONAL CIVIL AVIATION ORGANIZATION

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FOREWORD

Air traffic is growing at a significant rate and at the same time, there are increasing demands for more operating flexibility to improve aircraft efficiency and to reduce the impact of air travel on the environment. Aeronautical surveillance systems are major elements of modern air navigation infrastructure required to safely manage increasing levels and complexity of air traffic.

This manual has been produced by the Aeronautical Surveillance Panel (ASP) as a reference document consolidating the updated guidance material previously published in other manuals with new material covering more recent or emerging techniques. The chapters provide the reader with a basic understanding of various systems and how they are used for air traffic surveillance while the appendices contain detailed information on some specific systems and related topics.

Comments on this manual from States and other parties outside ICAO concerned with surveillance system development and provision of services would be appreciated and should be addressed to:

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EXPLANATION OF TERMS

Acquisition squitter. The spontaneous periodic transmission by a Mode S transponder (nominally once per second) of a specified format, including the aircraft address, to permit passive acquisition.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Note.— In the context of aeronautical surveillance, the term “aircraft” should be understood as “aircraft or vehicle (AV)”.

Aircraft address. A unique combination of twenty-four bits available for assignment to an aircraft for the purpose of air-ground communications, navigation and surveillance.

Note.— SSR Mode S transponders transmit extended squitters to support the broadcast of aircraft-derived position for surveillance purposes. The broadcast of this type of information is a form of automatic dependent surveillance (ADS) known as ADS-broadcast (ADS-B).

Aircraft identification. A group of letters, figures or a combination thereof which is either identical to, or the coded equivalent of, the aircraft call sign to be used in air-ground communications, and which is used to identify the aircraft in ground-ground or air traffic services communications.

*Note.— The aircraft identification is also referred to as **flight identification**.*

All-call. An intermode or Mode S interrogation that elicits replies from more than one transponder.

All-call (Mode A/C-only). An intermode interrogation that elicits replies from Mode A/C transponders only. Mode S transponders do not accept this interrogation.

All-call (Mode S-only). A Mode S interrogation that elicits all-call replies from Mode S transponders that are currently not in the lockout state.

All-call (stochastic). A Mode S-only all-call that elicits all-call replies from only a random subset of the Mode S transponders that are currently not in the lockout state.

Antenna diversity. An installation that consists of top and bottom mounted antennas that is used in SSR, ACAS and ADS-B systems to improve the transmission and reception capabilities.

Altitude. The vertical distance of a level, a point or an object considered as a point, measured from mean sea level (MSL).

Antenna (electronically scanned, E-Scan). An SSR antenna consisting of a number of planar arrays or a circular array of radiating elements. A beam former unit allows it to electronically steer the beam to the desired azimuth angle by applying phase shifting. The antenna elements may either be active or passive, depending on the order in which the beam former and transmitters are set up.

Antenna (hog-trough). An SSR antenna comprising a horizontal linear array of radiating elements installed in an extended corner reflector assembly (resembling in shape a hog-trough). The linear array is usually of sufficient