International Civil Aviation Organization

**Communication Navigation and Surveillance/ATM
Sub-Group (CNS/ATM/IC SG6)**

**Sixth Meeting
(Cairo, Egypt, 31 January – 02 February 2012)**

Agenda Item 5:   Regional Air Navigation Planning and Implementation Issues

MODE "S" OPERATION IN THE MID REGION

(Presented by Bahrain)

SUMMARY
The aim of this working paper is to discuss Mode S requirements and the problems associated with incorrect settings. Action by the meeting is at paragraph 3.

1.   **INTRODUCTION**

1.1   The Implementation of the Mode S Secondary Surveillance RADAR is in progress in the MID Region as part of the improvements of surveillance systems within the CNS/ATM System elements.

1.2   The reporting of Aircraft Identification commonly referred to as Flight ID is an ICAO requirement for Mode S, level 2 and above transponders. It permits direct radar identification by a controller and has the capability to relieve the shortage of Mode A codes. Correct setting of Aircraft Identification is also essential for the correlation of radar tracks with flight plan data in the air traffic management and airport operator ground systems.

2.   **DISCUSSION**

2.1   The Mode S provides accurate data link capabilities between aircraft and ATC opening the way to support ADSC,ADSB, CPDLC... and in accordance with ICAO Doc 8168 [PANS-OPS] Vol. I, Part III, flight crew of aircraft equipped with Mode S having an aircraft identification feature shall set the aircraft identification in the transponder. This setting shall correspond to the aircraft identification specified in item 7 of the ICAO flight plan, or, if no flight plan has been filed, the aircraft registration.

2.2   Direct recognition of the aircraft identification of a Mode S equipped aircraft in a radar label provides verification of radar identity for the purpose of providing a radar service. This is in accordance with ICAO SARPs. However, within the ATM system, automatic correlation of the downlinked aircraft identification with the aircraft identification entered in the ICAO flight plan is needed to confirm the identity of flights.

2.3   Correlation between the flight plan and the aircraft radar return is established and maintained based on a match between the downlinked Mode S aircraft identification and the aircraft identification in the flight plan. Correlation may be effected, in accordance with current procedures, by assigning a discrete Mode A code (from the ORCAM Allocation Table). The Mode S capability of the flight will be systematically detected and correlation maintained by the Mode S protocol.

2.4   Bahrain ATM published AIC 008/11 Effective 11th August 2011 as at **Appendix A** to this working paper which provides guidance to ensure consistency regarding 24-bits aircraft addresses and the reporting of aircraft identification relevant to the operational introduction of Mode S Elementary and Enhanced Surveillance within Bahrain FIR. Despite this publication and specific NOTAM requirements, Bahrain Air Traffic Control continues to face serious difficulties with many aircraft, under positive radar control, with incorrect Mode S settings. These problems appear to arise from flight crew lack of understanding of MODE S requirements and their lack of ability to correct improper MODE S settings while in flight.

3.   **ACTION BY THE MEETING**

3.1   The meeting is invited to:

  a) note the information contained in this working paper;

  b) request IATA to contribute more efficiently to educate airline operators with Mode S requirements; and

  c) request member States to notify airlines and users in their respective States to comply with the MODE S requirements in the Bahrain FIR.

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MODE S operation in OBBB FIR

1. INTRODUCTION

The provision of air traffic services (ATS) using SSR Mode S in Bahrain FIR airspace will rely on a unique ICAO 24-bit aircraft address for selective interrogation of individual aircraft. The 24-bit aircraft address is also an essential element of the airborne collision and avoidance system, ACAS II. In addition, Mode S surveillance requires the reporting of aircraft identification as stated in NOTAM *OBBB A0499/11.* (Note 1)

The aircraft address shall be one of 16 777 214 twenty-four-bit aircraft addresses allocated by ICAO to the State of Registry or common mark registering authority and assigned as prescribed in the ICAO Annex 10.

All Mode S equipped aircraft engaged in international civil aviation are required to have an aircraft identification feature as prescribed in ICAO Annex 10.

This circular provides guidance to ensure consistency regarding 24-bit aircraft addresses and the reporting of aircraft identification relevant to the operational introduction of Mode S Elementary and Enhanced Surveillance. In particular:

- Adherence to the world-wide scheme for assignment of ICAO 24-bit Aircraft Addresses.

- Correct setting of Aircraft Identification by flight crew

2. THE ICAO 24-BIT AIRCRAFT ADDRESS

Instances occur of incorrect 24-bit aircraft addresses being installed/hard-wired on individual aircraft. This has happened not only on first installation of a Mode S transponder but also when a major modification has been made to the Mode S equipment, and following a change of State of Registration. Incorrect installation, such as setting the address to all zeros, or, inadvertent duplication of an address can pose a severe risk to flight safety. In particular, the airborne collision avoidance system, ACAS II, performs on the assumption that only a single, unique 24-bit aircraft address per airframe exists. The performance of ACAS II can be seriously degraded and in some instances <u>disabled</u> if an incorrect or duplicate address is installed on an aircraft.

Incorrect or duplicated 24-bit aircraft addresses will also undermine the effectiveness of surveillance services based on SSR Mode S.

It is essential that aircraft operators comply with the aircraft address assignment procedures of the State regulatory authority to which blocks of addresses have been allocated by ICAO.

> *Note: telephony designators for aircraft operating agencies are contained in ICAO Doc 8585.*

The world-wide addressing scheme has been designed so that, at any one time, no address is assigned to more than one aircraft. Only one address can be assigned to an aircraft and it cannot be changed except under exceptional circumstances authorised by the State regulatory authority concerned.

When an aircraft changes it's State of Registry, the previously assigned address is to be relinquished and a new address assigned by the new registering authority.

It is essential that the aircraft address is periodically verified using ramp tests. Such checks must also be conducted when a major maintenance check has taken place and when the aircraft has changed registration, to ensure that a newly assigned address has been properly set

3. CORRECT SETTING OF AIRCRAFT IDENTIFICATION

To comply with airborne equipment requirements, Mode S transponder equipped aircraft must incorporate an Aircraft Identification Feature. Correct setting of aircraft identification is essential for the correlation of radar tracks with flight plan data in the ATM and Airport Operator ground systems. Initial operational trials using SSR Mode S have shown that many aircraft are transmitting incorrect aircraft identification, e.g. J**916**5 instead of JZR1**6**5. Such erroneous settings of aircraft identification prohibit automatic flight plan correlation and, if perpetuated, will severely limit the effectiveness of Mode S to relieve the shortage of SSR codes.

In accordance with ICAO Doc 8168 *[PANS-OPS]* Vol. I, **Part III**, flight crew of aircraft equipped with Mode S having an aircraft identification feature shall set the aircraft identification in the transponder. This setting shall correspond to the aircraft identification specified in item 7 of the ICAO flight plan, or, if no flight plan has been filed, the aircraft registration.

> *Note1: All Mode S equipped aircraft engaged in international civil aviation are required to have an aircraft identification feature*

> *Note 2 : No zeros, dashes or spaces are to be added when the Aircraft Identification consists of less than 7 characters.*

4. FURTHER INFORMATION or Guidance may be obtained from:

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