



INTERNATIONAL CIVIL AVIATION ORGANIZATION

SECOND MEETING OF THE APIRG COMMUNICATIONS, NAVIGATION AND SURVEILLANCE SUB-GROUP (CNS/SG/2)

(Dakar, 22-25 May 2007)

Agenda Item 6 : Aeronautical Surveillance

USE OF THE X BIT BY UAVS AND IC CODES BY MOBILE INTERROGATORS

(Presented by the Secretariat)

Summary

This paper identifies two surveillance-related problems that need to be addressed by States and their military authorities. One is the use of the X pulse in Mode A reply of SSR transponders and the other one is the use of IC code by mobile Mode S interrogators (e.g. those installed on certain military ships or aircraft).

1. Use of X pulse

1.1 It has been reported to the Aeronautical Surveillance Panel (ASP) of ICAO that in some cases, the X pulse in Mode A reply by secondary surveillance radar (SSR) transponders is being used to distinguish unmanned aerial vehicles (UAVs) from other aircraft. As stated in Annex 10, Volume IV, Chapter 3, Paragraph 3.1.1.6.2 and the following note, the position of the X pulse has been specified as a technical standard to safeguard possible future use. The actual evolution of the SSR has been through Mode S and as a result, no use of the X pulse has been/will be necessary.

1.2 Moreover, the presence of a pulse in the X pulse position has the effect of invalidating Mode A replies in systems used by some States. As such, any air vehicle transmitting the X pulse (e.g. a UAV) may therefore not be visible to the ground surveillance radar (use for air traffic control (ATC)) if this method of operation is adopted. This is a flight safety issue.

1.3 As such, the X pulse should not be used for the identification of UAVs or any other purposes. A proposal to amend Annex 10 for the purpose of forbidding the use of X pulse is being prepared. Furthermore, a number of technical options (based on Mode S) are available to enable the distinction between UAVs and other aircraft. Based on requests from States and international organizations, ICAO will consider the further development of the aforementioned technical options.

2. Use of IC by mobile platforms

2.1 It has also been reported that Mode S interrogators installed on some mobile platforms (including those operating in high seas) use interrogator codes (ICs) other than zero. Such operations (even on high seas), specially when not properly coordinated with civil aviation authorities, could severely interfere with ground-based Mode S radars used for civil and military ATC and defence operations.

2.2 The current provision in Annex 10 concerning mobile platforms is shown below:

3.1.2.11.7 MOBILE INTERROGATORS

Recommendation.— *Mobile interrogators should acquire, whenever possible, Mode S aircraft through the reception of squitters.*

Note.— *Passive squitter acquisition reduces channel loading and can be accomplished without the need for coordination.*

2.3 By default, mobile Mode S interrogators (e.g. military ships or aircraft) should not be allocated a distinct interrogator code. They should instead use a special mode of target acquisition, using interrogator code II=0, defined in ICAO Annex 10 Volume IV Chapter 3. Alternative means are possible to acquire targets thus avoiding the need for the interrogator to use lockout protocol. For example, acquisition squitter (as per the above-mentioned Recommendation) and angle of arrival techniques can be used to determine the azimuth angle and address of aircraft. Also, with greater use of extended squitter, fewer interrogations would be required.

3. Action by the meeting

3.1 The meeting is invited to:

- a) request ICAO Regional Offices to make the issues discussed in this paper known to States and through them to their military authorities; and
- b) ask States (and their military authorities through them) them to provide ICAO with further comments/input relating to means of identifying UAVs and operation of Mode S interrogators on mobile platforms.

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