European Aviation Safety Agency

**Deviations request #71 for an ETSO approval for CS-ETSO applicable to Airborne Weather Radar (ETSO-2C63c)**
**Consultation Paper**

## 1. Introductory note

The hereby presented deviation request shall be subject to public consultation, in accordance with EASA Management Board Decision No 7-2004 as amended by EASA Management Board Decision No 12-2007[1] products certification procedure dated 11. September 2007, Article 3 (2.) of which states:

"Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency."

## 2. ETSO-2C63c#1 – Airborne Weather Radar

Deviate from EUROCAE/ED-38 paragraph 2.2.3, Pulse Duration, and use a pulse compression technique in lieu of limiting the pulse duration. Potential side-lobe effects need to be assessed.

**Requirement:**
EUROCAE ED-38 2.2.3
For range scales in excess of 30 nautical miles, duration of the pulse shall not exceed a time equivalent to 2.5% of the range scale in use.

**Industry:**
In lieu of limiting pulse duration, the equipment will utilize pulse compression techniques to control range resolution.

An Equivalent Level of Safety (ELOS) is provided by the use of pulse compression techniques. In employing pulse compression, the equipment will maintain the same range resolution as traditional constant frequency radars, while achieving enhanced system sensitivity.

**EASA:**
The pulse compression technique is known to allow lower pulse power, higher maximum range combined with a good range resolution by having the disadvantage of bad minimum range and time-side-lobes.

For the minimum range the requirement ED-38 2.2.2 sets a minimum detection range of 2 nm which still needs to be met.

Time-side-lobes could modify the target shape, which is not a big issue for this application, but care has to be taken not to introduce ghost targets. As such the applicant

[1] ) http://easa.europa.eu/management-board/meetings/2007/04/MB%20Decision%2012-2007%20amending%20the%20certification%20procedure.pdf

must ensure side-lobe levels and potential resulting artefacts do not introduce ghost targets.

We accept the deviation under the conditions specified above and expect that evidence for meeting the conditions is provided as part of the ETSO data package.

### 3. ETSO-2C63c#2 – Airborne Weather Radar

Deviate from EUROCAE ED-38 paragraph 2.2.8, Frequency of Antenna Scan, and allow a less frequent scanning of the volume for ranges grater than 25 nm.

**Requirement:**
EUROCAE ED-38 2.2.8
The scan system shall be such that each point is illuminated by the radar beam at least twice every ten seconds.

**Industry:**
The frequency of antenna scan shall be such that when the radar display range is set for 25 nautical miles or less, any point within the horizontal scan of the antenna is illuminated by the radar beam at least twice every ten seconds.
When the radar display range is set for longer ranges, any point within the horizontal scan of the antenna may be illuminated by a lesser rate which can be inversely proportional to that allowed for the 25 miles range setting.

Equivalent Level of Safety (ELOS) is provided that the equipment meets both the RTCA/DO-173 and RTCA/DO-220 performance requirements for Frequency of Antenna Scan, the latter of which is a newer revision of Minimum Performance Specifications for Airborne Weather Radars than EUROCAE ED-38.

**EASA:**
We accept the proposed deviation. RTCA/DO-173, referenced by the FAA TSO-C63c, paragraph 2.2.2.4 is allowing the proposed less frequent scanning in areas beyond 25 nm. We agree that an area at greater distance may be scanned less frequent as the time to determine and to react to weather conditions is greater. The less frequent scanning need corresponds as well by the smaller size of objects on the display at greater distances. In general it is accepted that the uncertainty of resolution and detection probability of the radar is decreasing with distance.