

RTCA SC-209 / EUROCAE WG-49

ATCRBS / MODE S TRANSPONDER MAINTENANCE

JOINT MEETING #10

**Malakoff France
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**SARPs CP to Clarify Long Term Duty Cycle for Mode A/C Transponder
Reply Rate**

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SUMMARY

At the January 2010 ICAO ASP TSG meeting, TSG WP08-08 was presented and discussed by the TSG. That Working Paper identified issues with the current reply rate requirements in the SARPs. As a result, the TSG requested a proposal to clarify the reply rate requirements in the SARPs for discussion and potentially adopt changes to clarify current requirements.

1. Introduction

At the January 2010 ICAO ASP TSG meeting, TSG WP08-08 was presented and discussed by the TSG. That Working Paper identified issues with the current reply rate requirements in the SARPs. As a result, the TSG requested a proposal to clarify the reply rate requirements in the SARPs for discussion and potentially adopt changes to clarify current requirements.

2. Discussion

After review of the relevant SARPs sections pertaining to reply rate and reply rate limiting, the requirements are correct but confusing if not reviewed collectively. An explanation in a note to elaborate on the intent of the continuous and peak reply rate requirements and the reply rate limit requirements would be appropriate to minimize confusion. The following highlighted text is a recommended addition to the SARPS to address the concerns reported in TSG WP08-08.

3.1.1.7.9 *REPLY RATE*

3.1.1.7.9.1 All transponders shall be capable of continuously generating at least 500 replies per second for a 15-pulse coded reply. Transponder installations used solely below 4500 m (15 000 ft), or below a lesser altitude established by the appropriate authority or by regional air navigation agreement, and in aircraft with a maximum cruising true airspeed not exceeding 175 kt (324 km/h) shall be capable of generating at least 1 000 15-pulse coded replies per second for a duration of 100 milliseconds. Transponder installations operated above 4500 m (15000 ft) or in aircraft with a maximum cruising true airspeed in excess of 175 kt (324 km/h), shall be capable of generating at least 1200 15-pulse coded replies per second for a duration of 100 milliseconds.

Note.— A 15-pulse reply includes 2 framing pulses, 12 information pulses, and the SPI pulse.

Note.— The reply rate requirement of 500 replies per second establishes the minimum continuous reply rate capability of the transponder. As per the altitude and speed criteria above, the 100 or 120 replies in a 100 millisecond interval defines the peak capability of the transponder. The transponder must be capable of replying to this short term burst rate, even though the transponder but may not be capable of sustaining this rate. If the transponder is subjected to interrogation rates beyond its reply rate capability, the reply rate limit control of 3.1.1.7.9.2 acts to gracefully desensitize the transponder in a manner that favors closer interrogators. Desensitization eliminates weaker interrogation signals.

3.1.1.7.9.2 *Reply rate limit control.* To protect the system from the effects of transponder over-interrogation by preventing response to weaker signals when a predetermined reply rate has been reached, a sensitivity reduction type reply limit control shall be incorporated in the equipment. The range of this control shall permit adjustment, as a minimum, to any value between 500 and 2000 replies per second, or to the maximum reply rate capability if less than 2000 replies per second, without regard to the number of pulses in each reply. Sensitivity reduction in excess of 3 dB shall not take effect until 90 per cent of the selected value is exceeded. Sensitivity reduction shall be at least 30 dB for rates in excess of 150 per cent of the selected value.

3. Conclusions

The existing requirements in sections 3.1.1.7.9.1 can be changed as recommended above for clarification of reply rate requirements. The recommended change is the addition of a note so that the core requirement maintaining the relationship between continuous reply rate and peak reply rate is achieved.

4. Action

The Joint Session of RTCA SC-209 and EUROCAE WG-49 is invited to review the information in this Working Paper and recommend changes to be made to the reply rate requirements in the MOPS to clarify existing MOPS sections regarding reply rate.