RTCA Special Committee 186, Working Group 3
EUROCAE WG-51, SG-1

ADS-B 1090ES MOPS Maintenance

Meeting #28

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Alternative proposal for coding of R_C 0.3 NM

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Summary
During WG3 Meeting #27 and SG1 Meeting #4, agreement was reached on the need to provide for a NIC encoding of a horizontal position integrity containment bound of 0.3NM. Wp28-27 proposes different encoding options. This paper complements WP28-27 with a 3rd encoding alternative providing backward compatibility.

1 Introduction

As discussed in WP26-07, the current encoding of horizontal position integrity containment bounds (Rc) into NIC codes is fairly coarse in the range of 0.2NM to 0.5NM compared to the level of detail needed for applications such as ADS-B-RAD. A particular case is the need for the expression of a containment bound of 0.3NM, required to support 3NM separation services (TMA) as established in Annex G_1 of the ADS-B-RAD SPR/INTEROP document (ED126, DOyyy).

WP28-27 proposed two options for backward compatibilities issues exist.

This paper proposes a third alternative which keeps backward compatibility and brings the advantage of using the NIC supplement available in the airborne position squitter.

2 Proposed encoding

It is proposed to use the new NIC supplement field available in the Airborne Position message (named NIC supplement_2) as follows:

NIC Value	Containment Radius (R_C) and Vertical Protection Limit (VPL)	Airborne		
		Airborne Position TYPE Code	NIC Supplement_1 *Operational Status*	NIC Supplement_2 *Airborne position*
0	R_C unknown	0, 18 or 22	0	0
1	R_C < 20 NM (37.04 km)	17	0	0
2	R_C < 8 NM (14.816 km)	16	0	0
3	R_C < 4 NM (7.408 km)	16	1	1
4	R_C < 2 NM (3.704 km)	15	0	0
5	R_C < 1 NM (1852 m)	14	0	0
6	**R_C < 0.6 NM (1111.2 m)**	**13**	**1**	**0**
	R_C < 0.5 NM (926 m)	**13**	**0**	**0**
	R_C < 0.3 NM (555.6m)	**13**	**0**	**1**
7	R_C < 0.2 NM (370.4 m)	12	0	0
8	R_C < 0.1 NM (185.2 m)	11	0	0
9	R_C < 75m *and* VPL < 112 m	11	1	1

3 Compatibility with receiver Version 1

NIC Value	Containment Radius (R_C) and Vertical Protection Limit (VPL)	Airborne			
		Airborne Position TYPE Code	NIC Supplement_1 *Operational Status*	NIC Supplement_2 *Airborne position*	RX version 1
0	R_C unknown	0, 18 or 22	0		
1	R_C < 20 NM (37.04 km)	17	0		R_C < 20 NM
2	R_C < 8 NM (14.816 km)	16	0		R_C < 8 NM
3	R_C < 4 NM (7.408 km)	16	1		R_C < 4 NM
4	R_C < 2 NM (3.704 km)	15	0		R_C < 2 NM
5	R_C < 1 NM (1852 m)	14	0		R_C < 1 NM
6	R_C < 0.6 NM (1111.2 m)	13	1		R_C < 0.6 NM
	R_C < 0.5 NM (926 m)	13	0		**R_C < 0.5 NM**
	R_C < 0.3 NM (555.6m)	**13**	**0**		
7	R_C < 0.2 NM (370.4 m)	12	0		R_C < 0.2 NM
8	R_C < 0.1 NM (185.2 m)	11	0		R_C < 0.1 NM
9	R_C < 75m *and* VPL < 112 m	11	1		R_C < 75m *and* VPL < 112 m

4 Different possibilities with a receiver version2

Only use NIC supplement_2 available in the airborne position message.

NIC Value	Containment Radius (R_C) and Vertical Protection Limit (VPL)	Airborne			
		Airborne Position TYPE Code	NIC Supplement Code Operational Status	NIC supplement Code Airborne position message	RX version 2
0	R_C unknown	0, 18 or 22		0	
1	R_C < 20 NM (37.04 km)	17		0	R_C < 20 NM
2	R_C < 8 NM (14.816 km)	16		0	R_C < 8 NM
3	R_C < 4 NM (7.408 km)	16		1	R_C < 4 NM
4	R_C < 2 NM (3.704 km)	15		0	R_C < 2 NM
5	R_C < 1 NM (1852 m)	14		0	R_C < 1 NM
6	**R_C < 0.6 NM (1111.2 m)**	**13**		**0**	**R_C < 0.6 NM**
	R_C < 0.5 NM (926 m)	**13**		**0**	
	R_C < 0.3 NM (555.6m)	**13**		**1**	**R_C < 0.3 NM**
7	R_C < 0.2 NM (370.4 m)	12		0	R_C < 0.2 NM
8	R_C < 0.1 NM (185.2 m)	11		0	R_C < 0.1 NM
9	R_C < 75m *and* VPL < 112 m	11		1	R_C < 75m *and* VPL < 112 m

This implementation provides the advantage of a direct access to the R_C listed in the right column by just receiving the airborne position

If there is a need to have access to **R_C < 0.5 NM** the receiver must use NIC supplement_2 in addition to NIC supplement_1.

NIC Value	Containment Radius (R_C) and Vertical Protection Limit (VPL)	Airborne			
		Airborne Position TYPE Code	NIC Supplement1 *Operational Status*	NIC supplement2 *Airborne position*	RX version 2
0	R_C unknown	0, 18 or 22	0	0	
1	R_C < 20 NM (37.04 km)	17	0	0	R_C < 20 NM
2	R_C < 8 NM (14.816 km)	16	0	0	R_C < 8 NM
3	R_C < 4 NM (7.408 km)	16	1	1	R_C < 4 NM
4	R_C < 2 NM (3.704 km)	15	0	0	R_C < 2 NM
5	R_C < 1 NM (1852 m)	14	0	0	R_C < 1 NM
6	R_C < 0.6 NM (1111.2 m)	**13**	**1**	**0**	**R_C < 0.6 NM**
	R_C < 0.5 NM (926 m)	**13**	**0**	**0**	**R_C < 0.5NM**
	R_C < 0.3 NM (555.6m)	**13**	**0**	**1**	**R_C < 0.3 NM**
7	R_C < 0.2 NM (370.4 m)	12	0	0	R_C < 0.2 NM
8	R_C < 0.1 NM (185.2 m)	11	0	0	R_C < 0.1 NM
9	R_C < 75m *and* VPL < 112 m	11	1	1	R_C < 75m *and* VPL < 112 m

5 Recommendations

The meeting is invited to review the advantages of the R_C<0.3NM encoding alternative proposed in this WP, i.e., the backward compatibility and quick access to R_C determination by the use of the NIC supplement_2 available in the airborne position and to consider the proposed alternative for the encoding of R_C<3NM in version 2 of 1090 MOPS.