

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

**ADS-B 1090ES MOPS Maintenance**

**Meeting #29**

**RTCA, Washington, D.C.**

**21 - 24 July 2009**

**Proposed Backward Compatible Alternative  
for Additional NIC for ES Surface Position Format**

**Eric Potier  
Eurocontrol**

| <b>Summary</b>  |
|---|
| This Working Paper proposes a backward compatible alternative adding more containment radius values for the surface position. |

## 1 Introduction

WP29-14 presented 4 different alternatives for encoding additional values of NIC associated to the surface position. During the review of these different alternatives the issue of backward compatibility has been raised. This Working Paper complements WP29-14 by proposing another alternative providing backward compatibility with version 1 of ES.

## 2 Alternative 5 supporting backward compatibility

### **Alternative 5: Addition of a second bit in NIC supplement to encode more values in type code 8 while keeping backward compatibility**

| TYPE Code | Subtype Code | NIC Supplement bit 1 = existing NIC supplement -A field) | NIC Supplement-C (bit 20 in OSM) | Format (Message Type)       | Horizontal Containment Radius Limit ( $R_C$ ) | Navigation Integrity Category (NIC) | Version 1 receiver                     |
|-----------|--------------|--|----------------------------------|-----------------------------|---|-------------------------------------|--|
| 5         | Not Present  | 0  | 0                                | Surface Position (§B.2.3.3) | $R_C < 7.5$ m                                 | NIC = 11                            | $R_C < 7.5$ m                          |
| 6         |              | 0  | 0                                |                             | $R_C < 25$ m                                  | NIC = 10                            | $R_C < 25$ m                           |
| 7         |              | 1  | 0                                |                             | $R_C < 75$ m                                  | NIC = 9                             | $R_C < 75$ m                           |
|           |              | 0  | 0                                |                             | $R_C < 0.1$ NM (185.2 m)                      | NIC = 8                             | $R_C < 0.1$ NM (185.2 m)               |
| 8         |              | 1  | 1                                |                             | $R_C < 0.2$ NM (370.4 m)                      | NIC = 7                             | $R_C \geq 0.1$ NM (185.2 m) or unknown |
|           |              | 1  | 0                                |                             | $R_C < 0.3$ NM (555.6 m)                      | NIC = 6                             |  |
|           |              | 0  | 1                                |                             | $R_C < 0.6$ NM (1111.2 m)                     | NIC = 6                             |  |
|           |              | 0  | 0                                |                             | $R_C \geq 0.6$ NM (1111.2 m) or unknown       | NIC = 0                             |  |

This solution provides the same encoding capability than Alternative 4 of WP29-14. The new values are compatible with the different values currently proposed for RAD and for airborne position.

It is fully backward compatible with version 1. For a Type code 8, a version 1 receiver will not analyze the NIC supplements or will declare unknown if NIC supplement =1 (unexpected value) and will correctly consider all new containment radius as greater or equal than 0.1 NM (185.2 m) or unknown.

It is proposed to use Bit 20 in the Operational Status Message for NIC Supplement-C

**Aircraft Operational Status ADS-B Message “ME” Field Format**

| MSG BIT #  | 33 - 37     | 38 - 40       | 41 - 52                          | 53 - 56       | 57 - 72                          | 73 - 75                 | 76            | 77 - 80              | 81 - 82      | 83 - 84                          | 85                      | 86      | 87           | 88           |
|------------|-------------|---------------|----------------------------------|---------------|----------------------------------|-------------------------|---------------|----------------------|--------------|----------------------------------|-------------------------|---------|--------------|--------------|
| “ME” BIT # | 1 - 5       | 6 - 8         | 9 - 20                           | 21 - 24       | 25 - 40                          | 41 - 43                 | 44            | 45 - 48              | 49 - 50      | 51 - 52                          | 53                      | 54      | 55           | 56           |
| FIELD NAME | TYPE=31 [5] | Subtype=0 [3] | Capability Class (CC) Codes [16] |               | Operational Mode (OM) Codes [16] | MOPS Version Number [3] | NIC Supp. [1] | NAC <sub>P</sub> [4] | GVAQ [2]     | Source Integrity Level (SIL) [2] | NIC <sub>BARO</sub> [1] | HRD [1] | SIL Supp [1] | Reserved [1] |
|            |             | Subtype=1 [3] | CC Codes [12]                    | L/W Codes [4] |                                  |                         |               |                      | Reserved [2] |                                  | TRK/HDG [1]             |         |              | Reserved [1] |
|            | MSB<br>LSB  | MSB<br>LSB    | MSB<br>LSB                       | MSB<br>LSB    | MSB<br>LSB                       | MSB<br>LSB              |               | MSB<br>LSB           | MSB<br>LSB   | MSB<br>LSB                       |                         |         |              |              |

**Table 2-61: Surface Capability Class (CC) Code Format in Version 2 Transmitting Subsystems.**

|                   |                                    |    |            |                |                                    |    |               |               |                               |                                |
|-------------------|------------------------------------|----|------------|----------------|------------------------------------|----|---------------|---------------|-------------------------------|--------------------------------|
| <b>Msg Bit #</b>  | 41                                 | 42 | 43         | 44             | 45                                 | 46 | 47            | 48            | 49 – 51                       | 52                             |
| <b>“ME” Bit #</b> | 9                                  | 10 | 11         | 12             | 13                                 | 14 | 15            | 16            | 17 – 19                       | 20                             |
| <b>Content</b>    | <b>Service Level</b><br>MSBs = 0 0 |    | <b>POA</b> | <b>1090 IN</b> | <b>Service Level</b><br>LSBs = 0 0 |    | <b>B2 Low</b> | <b>UAT IN</b> | <b>NAC<sub>v</sub></b><br>[3] | <b>NIC Supplement-C</b><br>[1] |

***Notes for Table 2-61:***

1. **1090ES IN = Aircraft has 1090ES Receive Capability**
2. *POA = “Position Offset Applied”*
3. *B2 Low = 1 if Class B2 Ground Vehicle is transmitting with less than 70 watts*
4. **UAT IN = Aircraft has UAT Receive Capability**
5. **NAC<sub>v</sub> = Navigation Accuracy Category for Velocity**
6. **NIC Supplement-C = Supplement used on the Surface**

### **3 Action**

The meeting is invited to consider alternative 5 for encoding additional containment radius in the Extended Squitter surface position format and reserved bit 56 of the Aircraft Operational Status Subtype =1 to contain a second bit for NIC supplement.