International Civil Aviation Organization

SIXTH MEETING OF MODE S AND DOWNLINKED AIRCRAFT PARAMETERS WORKING GROUP (MODE S AND DAPS WG/6)

Bangkok, Thailand, 28 – 30 March 2023

Agenda Item 4: Mode S monitoring and analysis

THE PROBLEM OF LOW EFFICIENCY OF VERTICAL INTENT FLAG IN DAPS

(Presented by China)

SUMMARY

This paper describes the low efficiency of flags related to vertical intent in DAPs and gives some suggestions for using vertical intent data.

1. INTRODUCTION

1.1 According to the data monitoring, the efficiency of MCP/FCU mode and target altitude source in BDS 4,0 is very low. In this case, it is difficult to determine the target altitude indicating the aircraft’ s real vertical intent.

1.2 In the application of vertical intent data, we should make a clear distinction between target altitude and selected altitude.

2. DISCUSSION

The problems of target altitude implementation

2.1 The target altitude is described in DOC.9871 as below:

> *Target altitude shall be the short-term intent value, at which the aircraft will level off (or has levelled off) at the end of the current manoeuvre. The data source that the aircraft is currently using to determine the target altitude shall be indicated in the altitude source bits (54 to 56) as detailed below.*
>
> *Note.— This information which represents the real “aircraft intent,” when available, represented by the altitude control panel selected altitude, the flight management system selected altitude, or the current aircraft altitude according to the aircraft’s mode of flight (the intent may not be available at all when the pilot is flying the aircraft).*

2.2 Doc.9871 explains the logic of calculating the target altitude. And D.2.4.4.1.3 state the problem that target altitude is difficult to implement.

D.2.4.4.1.3 Target altitude implementation difficulties

It is recognized that all information to determine which altitude is the target altitude or which mode of flight is currently used may not always be available to the transponder in the current airborne implementation. In addition it may be very dependent on the platform. It is therefore preferable to set to 0 the corresponding bits of register 40_{16} rather than sending wrong information.

2.3 According to the results of data monitoring in the past few years, the MCP/FCU mode bit and target altitude source bit are mostly 0, which is consistent with the measures suggested by Doc.9871.

2.4 Based on the above situation, the difficult implementation of the target altitude, resulting in the inability to determine the real vertical intent of the aircraft, may not improve in the short term.

Cases of inconsistent selected altitude and target altitude

2.5 In December 2019, an aircraft was flying at an altitude of 8,400 meters. The controller issued a CFL altitude of 8,100 meters, and the pilot correctly selected the altitude of 8,100 meters. The plane was instructed to descend from 8,400 meters to 8,100 meters, but the aircraft continued to climb. After investigation, the reason was that the pilot set the descent rate to the ascent rate, and the flight control system eventually controlled the plane to continue to climb, away from the instruction of 8,100 meters. The pilot selected altitude and clear flight level mismatch alert functions used at that time failed to detect such conditions in advance.

Suggestions for vertical intention data application

2.6 The DAPs IGD manual makes several recommendations for the application of selected altitude. Due to the difficulty in determining target altitude which represents the real vertical intent, attention should be paid:

a) In the application of pilot selected altitude and clear flight level mismatch alert, users should be aware that the selected altitude does not represent the real vertical intent of the aircraft. Even if the pilot selected altitude and CFL are consistent, there is still the possibility of deviation from the clear flight level.

b) Carefully consider the difference between track prediction based on selected altitude and target altitude, especially for safety net applications. Because in some cases, there's a huge difference between the two predictions.

3. ACTION BY THE MEETING

a) note the information contained in this paper; and

b) discuss any relevant matter as appropriate.

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