# INTERIM SID DESIGN CONSIDERATIONS FOR AIRSPACE PLANNERS AND INSTRUMENT FLIGHT PROCEDURE DESIGNERS WHEN DESIGNING SIDS THAT END AT A FLIGHT LEVEL

**24 January 2014**

## 1. Introduction

1.1 Standard ICAO procedures state that below the Transition Altitude (TA) the reference for the vertical position of the aircraft shall be expressed in terms of altitude based on the latest QNH. Above the TA the vertical position of the aircraft shall be expressed in terms of a Flight Level (FL) based upon the Standard Altimeter Setting of 1013.2 hPa (SAS). This is normally achieved by aircrew adherence to their company Standard Operating Procedures (SOP); but these differ by operator. Many operators' SOPs will dictate waiting until an aircraft passes through the TA before requiring a change from the QNH to SAS. However, standard practice for a significant number of operators, when departing on a SID that has a FL as its end level restriction, provided that there are no intermediate constraints based on QNH, is to set SAS at the point of aircraft acceleration shortly after departure, typically around 1,000ft/1,500ft amsl, well before the aircraft passes through the TA.

1.2 Airspace planners and procedure designers must therefore consider the effects of large pressure variations and the impact on interacting procedures of these differing SOPs. This will ensure that the correct vertical separations involved with altitude/Flight Level constraints adjacent to other procedures and the lower limits of Controlled Airspace are maintained and reduce any inherent built-in 'level-bust'.

1.3 The following guidance has been developed amplifying SID design, which has a FL constraint, to ensure that the affects of low pressure on interacting procedures are considered and that level attainment waypoints are achievable.

## 2. Guidance

2.1 The following design scenarios should be taken into account when designing SIDs with altitude and FL waypoints:

**Scenario 1**

SID DESIGN CONSIDERATIONS WHEN FLIGHT LEVEL WAYPOINTS ARE REQUIRED

SID designs with waypoints where level attainment points are published as altitude constraints that are immediately followed by waypoints where level attainment points are published as a Flight Level, can cause problems if variances in pressure settings

between QNH and the SAS have not been considered. Therefore, SIDs with a mix of altitude and Flight Level attainment points where variances in QNH from SAS could lead to planned vertical separations not being met require careful consideration and design.

When designing a SID that contains a vertical profile that terminates at a FL, the design should not normally contain intermediate stop, 'At' or 'Below', altitudes, unless ATC mitigations can be provided, for example:

**Example 1 – No additional ATC mitigations required. SID design profile without stop (hard) altitudes below a TA of 6000ft:**

Not below WP – Not below WP – FL WP above TA.

| WP1 | WP2 | WP3 |
|---|---|---|
| 3000 | 4000 | FL 90 |

**Example 2 – Additional ATC mitigations required. SID design profile with stop (hard) altitudes to be avoided where possible, a TA 6000ft:**

Not below WP – At WP below TA – FL WP above TA.

| WP1 | WP2 | WP3 |
|---|---|---|
| 3000 | 4000 | FL 90 |

**Scenario 2**

SID DESIGN CONSIDERATIONS WHEN REQUIRING VERTICAL CONSTRAINTS CLOSE TO THE TRANSITION ALTITUDE

To account for operators that follow the ICAO practice of setting the SAS at the Transition Altitude, SIDs should be designed to avoid a 'built in' level bust scenario. Therefore, for those SIDs which require to terminate with a waypoint at a FL close to the Transition Altitude, a vertical allowance sufficient to cater for extreme variances in pressure setting that may occur between QNH and the SAS should be considered.

Example: Design issue to be considered:

TA at 6000ft.
SID terminates FL070.
QNH is 979; 34 hPa difference to SPS.
Aircraft climbing to FL070 and sets SAS whilst passing 6000ft.
At 6000ft, 1020ft (approx) is added on to the altimeter and aircraft is already above FL070, perhaps before the crew realise the consequences of a level bust.

**Scenario 3**

SID DESIGN USING COURSE TO ALTITUDE PATH TERMINATOR

For departures using an initial Course to Altitude (CA) path terminator consideration by all parties must be given to obstacle clearance, noise abatement, NPR

requirements and the potential for crews to change to SAS at the point of aircraft acceleration shortly after departure, typically around 1,000ft/15000ft amsl.