Civil Aviation Authority

SAFETY NOTICE

Number: SN–2014/004

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Level Busts: Hazards and Defences

This Safety Notice contains recommendations regarding operational safety.

Recipients must ensure that this Notice is copied to all members of their staff who need to take appropriate action or who may have an interest in the information (including any 'in-house' or contracted maintenance organisations and relevant outside contractors).

Applicability:	
Aerodromes:	Not primarily affected
Air Traffic:	All ATS
Airspace:	Not primarily affected
Airworthiness:	Not primarily affected
Flight Operations:	All AOC Holders, PAOC Holders and General Aviation Pilots
Licensed/Unlicensed Personnel:	All Pilots

1 Introduction

1.1 The United Kingdom continues to experience high numbers of level busts. Recently, many have coincided with prolonged periods of low atmospheric pressure in the UK.

1.2 Investigations have shown that a large proportion of these level busts are caused when the flight crew does not change from QNH to Standard Pressure Setting (1013.2 hPA) prior to passing through the transition altitude.

1.3 A level bust is defined as 'a deviation of 300 ft or more from an assigned level'. In Reduced Vertical Separation Minima airspace this limit is reduced to 200 ft. A 'late re-clearance', where the Air Traffic Controller has anticipated the altitude/flight level overshoot, and Airborne Collision Avoidance System Resolution Advisory events are not classified as level busts.

1.4 The purpose of this Safety Notice is to:

- alert industry to the heightened risk of level busts during periods of low atmospheric pressure;
- highlight the main causes of level busts and defences to employ against them;
- provide advice and guidance on best practice procedures to avoid level busts; and
- encourage operators to review their Standard Operating Procedures (SOPs) to ensure their defences are robust, and the risks of level busts are captured in their Risk Assessment.

2 Altimeter Setting Procedures

2.1 The Altimeter Setting Procedures in use in the UK generally conform to those contained in International Civil Aviation Organization (ICAO) Doc 8168 – PANS-OPS and Doc 4444 – PANS-ATM but there is a subtle difference. **UK AIP ENR** 1.7 paragraph 5.1.4 states '…when cleared for climb to a Flight Level, vertical position will be expressed in terms of Flight Level…' whilst ICAO PANS-OPS, Volume 1, Part III, Section 1, Chapter 2, paragraph 2.1.4.1 states '…Vertical position at or above the transition level shall be expressed in terms of flight levels…' Specific procedures for the United Kingdom are contained in the UK Aeronautical Information Publication (AIP) En-route section 1.7 'Altimeter Setting Procedures' (ENR 1.7).

2.2 Recent level busts have been attributed to incorrect altimeter setting during the climb out. Some flight crew have not changed from the aerodrome QNH to the Standard Pressure Setting before the aircraft climbs through the transition altitude, resulting in a level bust of the cleared flight level.

Note: Transition altitudes in the UK are considerably lower than in some other parts of the world (see UK AIP ENR 1.7 paragraph 4 for full listing).

2.3 An example: if the QNH was **983 hPa**, failure to set standard setting (1013 hPa) would result in an aircraft climbing **900 feet above** its cleared level.

3 Prevailing Low Atmospheric Pressure Conditions

3.1 In periods of low atmospheric pressure a pressure setting in hectopascals (hPa) can also be confused with a setting in inches of mercury (inHg). **Experience demonstrates that this is particularly true of non-UK flight crew. For example, 992 hPa can be misinterpreted to mean 29.92 inHg.**

4 Differing Regional and National Transition Altitudes

4.1 Differing regional and national transition altitudes require the establishment and consistent application of robust flight crew altimeter setting procedures as a means of preventing level busts. Flight crew self-checking and monitoring skills are essential in the pursuance of vertical situation awareness.

5 Causes of Level Busts

5.1 The following **hazards can and do** result in a level bust:

- Low atmospheric pressure setting.
- Low transition altitude particularly where initial Standard Instrument Departure (SID) clearance is to a flight level.
- Periods of high cockpit workload – take-off and climb, SIDs particularly with a stepped climb.
- Distractions - technical fault, weather avoidance, multiple frequency changes.
- Interruption of checklist flow.
- Deviation from SOPs or defined task sharing.
- Inadequate cross-checking due to ineffective pilot monitoring and/or ineffective cockpit warnings when passing transition altitude/level without changing altitude setting.
- Clearances to FL 100 and FL 110 or FL 200 and FL 220 being transposed.
- Expectation of a particular level '…because we are always given FL xxx'.
- Go-arounds necessitating high energy change of flight profile, new cleared altitudes or flight levels, changes of radio frequency and possibly altimeter subscale setting.

6 Defences against Level Busts

6.1 The following defences should be employed to prevent level busts:

- Review of company SOPs to ensure that changes to altimeter setting and cleared altitude/flight level are rigorously made and cross-checked.
- Disciplined use of company SOPs unless crew have specifically briefed otherwise.
- Prioritised workload to ensure uninterrupted time to change from QNH to Standard Pressure Setting (1013 hPa).
- Daily briefing of potential hazards for all phases of flights specific to the route flown.
- Specific briefing of the inherent level bust potential when the atmospheric pressure is below 1000 hPa and the QNH readback requirement of including units when value is below 1000 hectopascals (**CAP 413**, Chapter 2, paragraph 2.68). Operators should consider including this in their SOPs.
- Both flight crew listening to, and confirming setting of, all level changes and associated pressure settings.
- Adherence to standard phraseology (see **CAP 413**, Chapter 3, paragraph 3.9).
- Challenging of Air Traffic Control if there is any doubt of callsign or of cleared level.
- Monitoring automation constantly – ensuring aircraft will level off at cleared level.
- Considering the final 1,000 ft prior to the cleared altitude or flight level as a critical stage of flight.
- Being prepared for a go-around from every approach.
- Preparing for the unexpected – nobody expects a level bust.

7 Best Practice

7.1 **Always be aware** that a level bust could happen.

7.2 **Brief the hazards** that can affect a flight every day.

7.3 **Use all the defences** as mitigation strategies so that a level bust does not happen.

8 Reporting of Level Busts

8.1 It is important to report all level bust events promptly as a Mandatory Occurrence Report for several reasons:

- Submitting a report immediately after the event allows the reporter to relay the facts accurately.
- It allows the causal factors of the level bust to be understood
- Prompt action can be taken to prevent similar occurrences by promulgating Best Practice safety information widely and swiftly to other flight crew and Air Navigation Service Providers.
- Further reports will show whether corrective actions have been successful.

9 Further Reading

9.1 The following documents/links provide further information:

- ICAO Doc 4444 Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)
- ICAO Doc 8168 Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS), Volume 1 - Flight Procedures
- CAA **CAP 413** Radiotelephony Manual
- CAA **CAP 493** Manual of Air Traffic Services Part 1
- UK AIP ENR 1.7, Altimeter Setting Procedures
- Information Notice **IN-2014/033** Transition Altitude Update
- **Eurocontrol Skybrary**

10 Queries

10.1 Any queries or requests for further guidance from AOC or PAOC holders as a result of this communication should be addressed to the assigned Flight Operations Inspector in the first instance.

10.2 Otherwise, queries should be addressed to the **FOD.Admin@caa.co.uk** e-mail address.

11 Cancellation

11.1 This Safety Notice will remain in force until 28 February 2015.