

**8/2007****Applicability: All AOC Holders****LEVEL BUST PREVENTION – BEST PRACTICE****1 Introduction**

- 1.1 Analysis of Mandatory Occurrence Reports shows that the number of reported level busts continues to rise. This FODCOM contains operational best practice specifically targeted at areas of operations relevant to level bust prevention.
- 1.2 The information contained in FODCOM 13/2005 has been revised and updated by the United Kingdom Level Bust Working Group, an industry/regulator group run jointly by the CAA and NATS. The changes include a replacement paragraph (4.3) relating to the monitoring of climbs and descent, a rewrite of the radiotelephony (RTF) training and discipline paragraph (5), a new paragraph addressing similar call signs and simultaneous transmissions (8.3), and finally a new paragraph relating to minimum safe altitudes (9).
- 1.3 A level bust is defined as *'a deviation of 300 feet or more from an assigned level'*. A "late re-clearance", where the Air Traffic Controller has anticipated the altitude/flight level overshoot, and Airborne Collision Avoidance System (ACAS) Resolution Advisory action are not classified as level busts.
- 1.4 The points of best practice detailed below address level bust concerns through flight crew training and Standard Operating Procedures (SOPs). Most level busts occur below FL120 in busy terminal airspace and this area needs most attention in terms of RTF discipline and the development of, and adherence to, SOPs. Operators should take responsibility for raising the profile of level busts within company operations. One way of achieving this is by incorporating these items into refresher training.
- 1.5 While the guidance published in this FODCOM addresses multi-crew operations, many of the considerations highlighted are applicable to single pilot operations.
- 1.6 Further information on the scale of the problem together with causal factors and preventative measures can be found on [www.levelbust.com](http://www.levelbust.com).

**2 Altimeter Setting Procedures**

- 2.1 Flight crew training should include altimeter setting procedures and their importance in relation to level bust prevention. The Eurocontrol Level Bust Toolkit ([www.levelbust.com](http://www.levelbust.com)) contains useful training information on altimetry. SOPs should be clear on altimeter setting procedures, particularly the use of QFE and QNH; this policy should be clearly described in operations manuals and should cover all phases of flight. A suggested generic SOP covering altimeter setting procedures is shown at **Attachment 1**. Specific procedures for the United Kingdom are contained in the Aeronautical Information Publication (AIP), En-route section 1.7, Altimeter Setting Procedures.

**3 Receipt of Air Traffic Control (ATC) Clearances and Actions to be taken**

- 3.1 Flight crew training should emphasise the necessity, whenever possible, of having both pilots listening on the radio in use when an ATC clearance is being received and both recording the clearance. Training should also cover the procedure for setting and cross-checking the cleared level in the 'altitude select' window. Pilots should have a good understanding of the logic of autopilot level-change modes, which will increase awareness of expected autopilot performance during climb and descent monitoring. SOPs will specify the appropriate level change mode for the phase of flight. Training in facilitation techniques can be utilised in the pre-flight brief to confirm a pilot's understanding of the departure clearance.

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- 3.2 SOPs should require that both pilots are present when the departure clearance is received; ATC clearances should only be requested when two flight crew members are available to listen. The person designated to request and read back the clearance (preferably the non-handling pilot (PNF)) should also be tasked with recording it. Other flight crew members should also record the clearance provided that this does not interfere with other tasks. If necessary the pilot should ask ATC to delay transmitting the clearance ('Standby') if he can involve another flight crew member who may be off frequency at that particular moment.
- 3.3 SOPs should also include the procedure for setting and cross-checking a cleared altitude/level. For example, upon receiving the clearance, a designated pilot (handling pilot (PF) when the autopilot is engaged and PNF on all other occasions) should adjust the altitude shown in the 'altitude select' window on the flight control panel (or equivalent) to the new cleared altitude/level. Whichever pilot did not make the adjustment, reads out what is displayed. When the cleared altitude/level is also displayed elsewhere (on the electronic attitude display indicator, for example), which reflects what the flight management system considers has been set, the pilot making the response should also read what is displayed remotely. Furthermore, a check should be made of the appropriateness of the selected autopilot level change mode.
- 3.4 Adjusting the altitude cleared altitude/level in the 'altitude select' window on the flight control panel, and initiating a climb or descent, should be considered as separate actions. This permits an assessment of the amount of altitude change required and also highlights the risk of an autopilot and/or an aircraft high-performance induced level bust.

## 4 Monitoring Progress in a Climb or Descent

- 4.1 Flight crew training should emphasise that whenever an aircraft is climbing or descending, the PF should carefully manage the automatics and monitor the progress of the climb or descent. In particular, the PF should monitor aircraft performance within 1000 ft of the cleared altitude/level to ensure that it does not fly through the cleared altitude or flight level. All distractions should be avoided during the last 1000 ft prior to the selected altitude/flight level so that the transition to level flight can be fully monitored.
- 4.2 Operators' SOPs should require that progress be monitored by means of calls initiated by PF, preferably by means of a challenge, such as 'Altimeters'. The response to this might be, 'Passing flight level one hundred for two two zero, Standard set', or 'One (thousand) to go'. If the PF does not make the challenge, the PNF should be tasked with making it at some specified point thereafter, e.g. 200 ft later - but not earlier than this, otherwise any benefit of the 'challenge/response' system will be lost. In most aircraft, this 'safeguard' should occur before the altitude alert system activates. In aircraft where there is no automatic alert, when approaching a selected altitude or flight level, the discipline described above is particularly important. In aircraft where the altitude alert activates at exactly 1000 ft before the selected altitude, consideration should be given to inserting a call at another useful time, for example, 'Five hundred to go' call. (The aim throughout this exercise is to promote a coherent crew discipline which functions independently of any automatic device.)
- 4.3 Consideration should be given to encouraging Flight Mode Annunciation (FMA) change calls as a matter of routine if appropriate to the aircraft type, such as where visual or tactile clues are sparse (e.g. no feed-back movement of side stick and thrust levers). However, the calling of every change of FMA may lead to distraction at times of high workload and/or busy radio traffic and this should be taken into account when developing SOPs.

## 5 RTF Training and Discipline

- 5.1 Flight crew training should include RTF and an assessment of RTF standards and discipline should be included during Operator Proficiency Checks (OPC) and annual line checks. The Type Rating Examiner (TRE) should debrief flight crews on the standard of RTF phraseology against the standards and best practice of CAP 413 *Radiotelephony Manual*.
- 5.2 SOPs should reflect standards of radio procedures required by the operator.
- 5.3 Trainers who play the part of Air Traffic Controllers in Simulators should consult CAP 493 *Manual of Air Traffic Services* to ensure that they use the correct phraseology. The Supplement to CAP 413, '*A Quick Reference Guide to UK Phraseology for Commercial Air Transport Pilots*' together with the NATS DVD entitled '*Communication Error*' should be fully utilised to enhance RTF training.

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5.4 SOPs should implement a strict 'no unnecessary calls' procedure. Non-essential calls should be discouraged in the climb and descent. This policy should ensure that there is maximum concentration by both pilots especially below FL120, which statistically is the area where most level busts occur.

## 6 Crew Resource Management (CRM) and SOPs

6.1 Flight crew training for level bust awareness should be included in the theoretical knowledge instruction component of multi-crew cooperation and crew resource management (CRM) training. Additional material may be found on [www.levelbust.com](http://www.levelbust.com).

6.2 Particular emphasis should be placed on the importance of adherence to SOPs in busy ATC environments when there is pressure to short cut them. Adherence to robust SOPs is an effective method of preventing level busts.

## 7 Understanding and Interpreting Charts Used by Flight Crews

7.1 Some level busts have been traced to the misinterpretation of flight profiles - typically Standard Instrument Departure and Standard Arrival procedures - published in charts provided by commercial organisations. Flight crew training should include in-depth familiarisation for crews with the presentation of contents and layout of charts used by the operator. This would ensure that the layout of check altitudes, tracks etc. would become 'second nature' to pilots.

7.2 Operators should liaise with chart providers to standardise and clarify departure, arrival and approach charts in respect of the display of stop heights and cleared levels. Such charts, although published by external organisations, form part of the operators' operations manuals and therefore, responsibility lies jointly with both providers and operators.

7.3 SOPs should include the use of charts in briefing, preparing and flying approaches and departures, particularly with reference to stop heights and step climbs.

"Brief the profile, understand the profile, and fly the profile. Don't fall up the stairs".

## 8 Understanding ATC Instructions

8.1 Flight crew training should include the most commonly encountered phraseology and procedures used by ATC within **all** the areas of operation approved for use in the operator's Air Operator Certificate. This should include reference to any colloquial phraseology encountered on their route network.

8.2 Flight crews should be trained so that if there is ever any doubt about the meaning of an ATC clearance or instruction they should seek clarification from ATC. When questioning a clearance pilots should be taught to use open questions. An open question can be defined as one that is likely to receive a long answer. Closed questions that can be answered with one word such as "yes" or "no" must not be used. An open question such as "What did he say?" is better than a closed question such as "Did he say 270?".

8.3 Training should address actions required when confusion occurs over similar call signs or simultaneous transmissions. When pilots are aware of similar call signs they should inform ATC and remain extra vigilant with their RTF. Similarly, ATC should be informed if a pilot hears a blocked or simultaneous transmission or an erroneous read back.

## 9 Minimum Safe Altitude

9.1 Flight crews must know the minimum safe altitude and be aware of how any climb or descent clearances relate to terrain and obstacle clearance and challenge any clearance which contravenes a safe descent through minimum safe altitude.

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## 10 Further Information

10.1 Further information on the topics outlined above can be found from the following sources:

- a) CAP 413 *Radiotelephony Manual*
- b) Eurocontrol Level Bust Toolkit, available at [www.levelbust.com](http://www.levelbust.com)
- c) CAP 493 *Manual of Air Traffic Services*
- d) NATS Level Bust Video
- e) AIC Pink 107/2000 *RTF Callsign Confusion*
- f) AIC Pink 55/2000 *VHF Aeronautical Voice Communications Channels – problems created by simultaneous or continuous transmissions*
- g) Supplement to CAP 413 – *A Quick Reference Guide to UK Phraseology for Commercial Air Transport Pilots.*
- h) NATS Communication Error DVD

## 11 Cancellation

11.1 This FODCOM replaces FODCOM 13/2005 which is now cancelled.

## 12 Recommendation

- 12.1 **Operators should ensure that Standard Operating Procedures contain the points of best practice for the prevention of level busts outlined in this FODCOM.**
- 12.2 **Operators should raise flight crews' awareness of the level bust problem by incorporating the points of best practice outlined in this FODCOM into recurrent training and checking.**

## 13 Queries

13.1 Any queries as a result of this FODCOM should be addressed to Head of Flight Operations Policy Department at the following e-mail address: [FOD.Admin@srg.caa.co.uk](mailto:FOD.Admin@srg.caa.co.uk).

15 March 2007

***Recipients of new FODCOMs are asked to ensure that these are copied to their 'in house' or contracted maintenance organisation, to relevant outside contractors, and to all members of their staff who could have an interest in the information or who need to take appropriate action in response to this Communication.***

**Review FOP(C) March 2008**

## ALTIMETER SETTING PROCEDURES

- 1 Flight crew training should include altimeter setting procedures and their importance in relation to level bust prevention. Standard Operating Procedures (SOPs) should be clear on altimeter setting procedures, particularly their use of QFE and QNH; this policy should be clearly described in operations manuals and should cover all phases of flight. The SOPs should incorporate the following:
  - a) Pre-flight serviceability tests e.g. setting airfield QNH and comparing altimeter readings to airfield elevation.
  - b) Flight crew altimeter-setting procedure, including:
    - (i) the altimeter setting to be used for each phase of flight and flight crew awareness of the Transition Altitude and Level for the airspace in which they are operating e.g. PF calls 'set QNH' or 'set standard' at appropriate times;
    - (ii) a departure brief which must include the point at which 1013 is to be set when the SID clearance limit is a flight level especially when the pressure is low. The brief should emphasise the need for vigilance if the airspace is busy and/or a high rate of climb is expected;
    - (iii) the correct challenge and response, for altimeter cross-check(s), particularly during climb, descent and approach and when nearing an assigned altitude/level e.g. 'One (1000 ft) to go'. Routine altimeter checks in the cruise;
    - (iv) alternative settings and procedures, if appropriate, for use when QFE is either not available or cannot be used e.g. at high-altitude aerodromes;
    - (v) the manner of checking and use of any radio altimeter(s) e.g. 'Radar Altimeter alive' could be associated with a final check that the QNH is set;
    - (vi) special precautions to be taken if an altimeter is suspect or becomes unserviceable in flight, e.g. an awareness of autopilot and altimeter cross-connection and any available redundancy;
    - (vii) confirmation that under normal conditions, a standard procedure is used for altimeter setting that is driven by PF and monitored by PNF;
    - (viii) the annotation of checklists with the actual settings to be used e.g. QNH/QFE xyza set'. Phrases such as 'altimeters set' should not be used;
    - (ix) the correct report of actual altitude/level to ATC; such reports should *not* be made before reaching or leaving a particular altitude/level e.g. delay the report until altitude capture is complete;
    - (x) provision for one altimeter to be set to the appropriate QNH, when flying at or near to the Minimum Safe Altitude; this has particular relevance to single-pilot unpressurised aircraft;
    - (xi) a check of aerodrome elevation during the approach phase; this is to be cross-checked to establish the difference between QFE and QNH, when QFE is used for landing;
    - (xii) the procedure for indicating decision heights for landing, e.g. a figure in the navigation log, altimeter 'bugs' and/or landing data cards;
    - (xiii) the requirement for crews to inform ATC prior to commencing a radar approach procedure if they intend to use QNH settings throughout;

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- (xiv) the call to be made by monitoring pilots during instrument approaches e.g. at the outer marker, 100 ft above DH etc. The calls and responses required for approaches in Category II or III weather minima conditions will need to be specified in greater detail.
- (xv) RVSM standard altimeter checks should be included and crew training should emphasise that vigilance and discipline are essential in conducting these checks.