

Safety Letter



Level Bust: a Shared Issue?

What is a "level bust"?

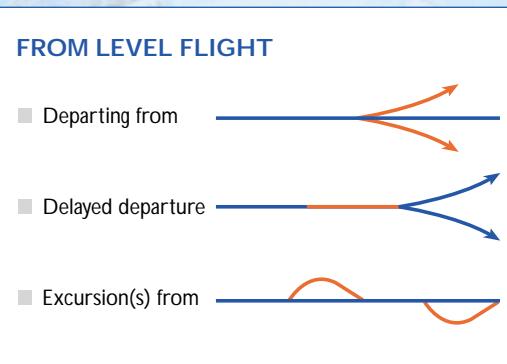
HEIDI definition (EUROCONTROL Harmonisation of European Incident Definitions Initiative for ATM-Released EATMP Deliverable):

"Any deviation from an assigned altitude or flight level in excess of 300 feet."

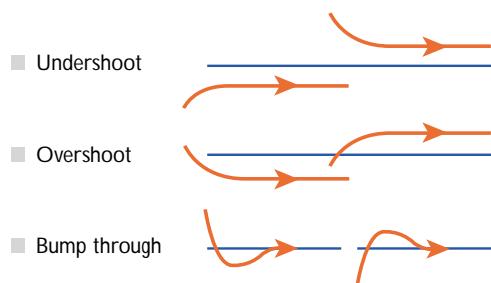
In fact probably as old as aviation but still a problem. Actually a problem of increasing concern.

The ASRS-Aviation Safety Reporting System operated by the NASA has published data and the FAA and US airlines have set-up programmes to reduce level bust as far back as 1970.

Yet the problem remains, 35% (*) of the reports to ASRS are level busts...(*) it should be noted that that levels busts may be subject to higher reporting rates than other occurrences.



CLIMBING / DESCENDING TO LEVEL



UK SRG- (Safety Regulation Group) initiative, the Level Bust Working Group - LBWG

The UK SRG Level Bust Working Group has collected data since 1997 and has produced detailed results as well as recommended actions. (A detailed report can be found on the UK CAA Web site: www.Srg.caa.co.uk/srg/srg_news.asp)

The findings which are confirmed by other initiatives such as a Swedish CAA study are widely reproduced in the following parts of this Safety Letter.

Editorial

UK SRG, the Swedish CAA, UK-NATS and a number of major Airlines in Europe and the USA have made the " level bust " issue one of their top priorities whilst other organisations have not shown similar concern. Differences in working methods, procedures or local specificities are unlikely to explain such drastic differences.

Variations in the priority given to level busts among ATM service providers, CAAs and Airlines reveal differences in awareness and reporting.

The high numbers of level bust reports coupled with the fact that some level busts leave very little time for controller intervention, should trigger initiatives to assess and remedy this problem across Europe.

This Safety Letter describes the level bust issues with the aim of raising awareness among all parties concerned.

Reporting of Level Bust occurrences by pilots and controllers should be encouraged as they have the potential to reveal systemic deficiencies.

Jean-Luc GARNIER
Head of SQS

An Airline Experience

Interview with Bertrand De Courville
Air France Flight Safety Manager

How high is the level bust issue on your list of safety concerns?

Prevention of CFIT, Mid-air collision, Runway collision (landing or take-off) and Loss of control in flight are our first goal. Risk of mid-air collision is closely monitored through altitude deviation (altitude bust) events and crew response to TCAS RA. The level bust issue is a top priority for us.

How do you deal with this problem within your airline?

Our first step was to improve the "visibility" of altitude bust events. This was done in 1998 through a conference and questionnaires sent to all pilots. The number of reported events increased and we were able to identify the main families of scenarios. All this work remind our crews that, even without past mid-air collision, the risk is there. Articles about altitude deviations are now published in each issue of our Safety Magazine.

What causes have you identified?

We observed a wide range of scenarios from call-sign confusions to auto pilot anomalies. Distractions due to company calls, check list, public address announcement to passengers play a role as well as altimeter setting or severe windshear during cruise. But we also collect events related to non standard or inadequate ATC phraseology e.g. complex instructions involving speed, altitude and heading at the same time.

What remedial actions do you promote for reducing the number of level bust?

We found strength and weaknesses in our "defences". Among the strengths, we believe that our standard tasks sharing, mandatory call-outs and crew cross checks is sufficient. For example every change of selected altitude must be announced and cross checked by the other crew member. Weaknesses are our distraction scenarios. This has led our Operations Department to modify our crew duties during climb and descend. On the ATC side we may add that reporting involve ATC reporting as well, stand alone altitude clearances is a way to reduce the risk, multiple step climbs increase the risk of ATC clearance such as "clear to nine zero" are dangerous and should be forbidden.

The key characteristics of the problem

■ The annual number of reported level bust occurrences increased steadily until 2000, when a reduction was noted.

■ The UK LBWG was established in 1997 with one of its aims to raise awareness of the level bust issue. This initially led to an increase in the number of reports as a result of more diligent reporting. However, the decrease in 2000 would indicate that the LBWG initiatives are taking effect.

■ Although most common causes of level busts are active failures on the flight deck, a significant number of underlying factors concern the ground component of the ATM system.

■ Foreign pilots may be unfamiliar with the ATM environment and more vulnerable to level busts than those operating at a given place on a regular basis.

NUMBER OF LEVEL BUST OCCURRENCE REPORTS IN UK AIRSPACE vs TRAFFIC (1996-2000)

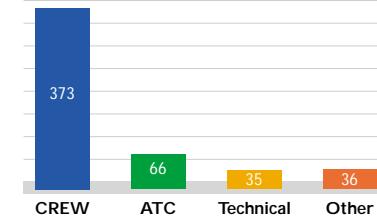


A - More reports due to industry awareness
B - The decrease in the number of reports would indicate that the LBWG initiatives are taking effect

Data source: UK CAA-SRG Mandatory Occurrence Reporting Scheme (MORS) Database and NATS UK Flight Database

LEVEL BUST OCCURRENCE REPORTS IN UK AIRSPACE DURING 1999

Breakdown into factor group
(based on UK CAA AIC 94/2000, pink 9) 19 October

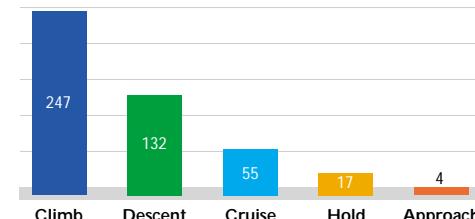


Note:
- the AIC lists the factors involved in the 455 level busts reported in 1999
- the sum of the figures in the breakdown exceeds the total of 455 level busts as each occurrence could involve more than one factor

Data source: UK CAA-SRG Mandatory Occurrence Reporting Scheme (MORS) Database

LEVELS BUST OCCURRENCE REPORTS IN UK AIRSPACE DURING 1999

Breakdown by phase of flight



Data source: UK CAA-SRG Mandatory Occurrence Reporting Scheme (MORS) Database

■ Level bust occurrences are prominent in the climb phase, descent plus cruise account for an equivalent amount. Additionally a vast proportion of level busts take place below flight level 150 which may explain some of the causes shown next page.

■ The figures provided by the ASRS are slightly different, a majority of level busts take place during the descent phase. That might have an origin in different working methods in the US.

Identified Causes

- A study by the FAA suggests that a standard flight within the USA provides for 100 opportunities for a level bust based on an average of ten flight level/altitude changes per flight.

- The UK LBWG calculated that a typical commercial aircraft would experience approximately 20,000 level changes per year.

Given that in 1999 there was approximately one level bust for every 20,000 level changes, this suggests that **each commercial aircraft will, on average, experience one level bust each year.**

IDENTIFIED CAUSES (based on UK CAA AIC 94/2000, pink 9) 19 October Causes: flight deck origin/airborne side (1999)

Non compliance with correctly read-back ATC vertical clearances	363 / 80%
Distraction/lack of monitoring	82 / 18%
Exceeding published SID levels	73 / 16%
Inadequate planning or knowledge of procedures	49 / 11%
Altimeter setting errors	42 / 9%
Technical problem/equipment malfunction	35 / 8%
Aircraft mis-management (both manual and automatic flight)	28 / 6%
Incorrect operation of auto-flight system/FMS	25 / 5%
Failure in Crew Resource Management (CRM)	23 / 5%
Workload	20 / 4%
Weather (turbulence-windshear-etc.)	17 / 4%
Callsign confusion	13 / 3%
Mistaking heading for a level	12 / 3%
Climb/descent without a clearance	9 / 2%
Language difficulties	7 / 2%
Simultaneous or blocked transmission	6 / 1%
TCAS	3 / 1%

IDENTIFIED CAUSES (based on UK CAA AIC 94/2000, pink 9) 19 October Causes: ATC origin/ground side (1999)

Pilot read-back errors not detected by ATC	35 / 8%
Issuing incorrect, inappropriate or unclear clearances	18 / 4%
Late re-clearance to level that aircraft was close to or had already passed	12 / 4%
Workload	4 / 1%

- The item of ATC issuing a wrong clearance is not a level bust as per the definition, however the consequences are similar in nature. For this reason many agencies do consider "wrong ATC instruction" in level bust studies.
- Similarly other Radiocommunications issues such as callsign confusion is also a cause. In fact in some reviews e.g. an AIR FRANCE level bust study, call-sign confusion is cited on the top of the list of causes.

CAUSES: PROCEDURES

- Complexity of SIDs (step climb SIDs especially)
- Density of traffic (Hearback time used to do other task)
- Long/complex Clearances (Clearances to be issued in several goes)
- "Expect Level" clearances (issued to help pilot profile planning)

CAUSES: OTHER FACTORS

- Callsign confusion
- FMS equipment modes
- Simultaneous transmissions

It ought to be mentioned that ACAS/TCAS monitoring programmes as well as the EATMP RVSM altitude deviation monitoring programme indicate that altitude deviations due to excessive reaction by pilots to RAs-Resolution Advisories contribute to level busts.

UK SRG Initiative

Interview with the
Level Bust Working Group
Chairman

How high is the level bust issue on your list of safety concerns?

Both UK SRG and NATS consider that level busts are one of the most important safety issues.

What first brought the problem to your attention?

Safety reports filed in the UK first indicated the emergent trend of level busts in the early nineties, so the LBWG was established to address the problem at an early stage.

Why did you take a collaborative approach to fighting level busts?

The level bust problem involves both the aircraft operators and ATM service providers so it was important that expertise from both these areas was used to ensure that solutions are appropriate and effective.

How are you currently tackling level busts?

As problem areas change, and new areas of concern emerge, the LBWG will focus resources in order to address these effectively.

How do you view the reduction of level busts reports in 2000?

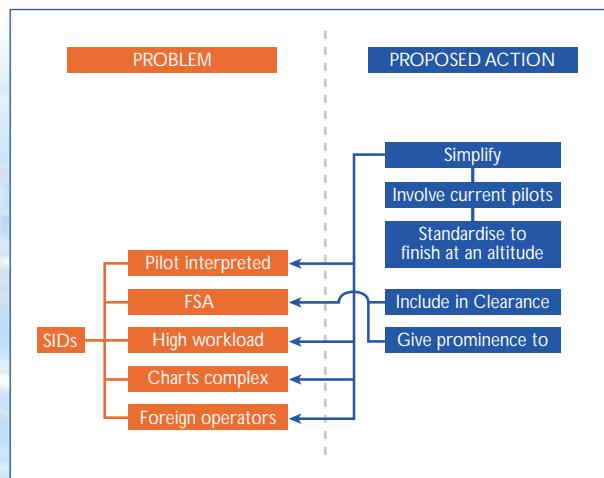
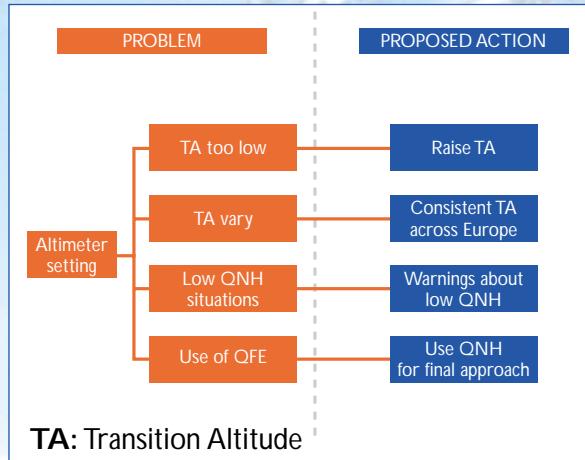
We are encouraged by the reduction, however, it is important to continue current initiatives and guard against complacency.

Suggested Remedial Actions

- Among the proposed remedial actions by UK SRG Level Bust Working group, a number have to do with the issue of the complexity of SIDs and include:

- simplifying the vertical profiles of SIDs;
- standardising the final altitude of SIDs;
- giving prominence to the FSA-First Stop Altitude;
- improving the charts to increase their readability.

This overall should help particularly foreign operators who are not familiar with a given airport.



- A number of causes are related to altimeter setting procedures, therefore the following initiatives are being considered:
 - institute a consistent TA-Transition Altitude across Europe (an initiative to this end is currently under way in EUROCONTROL);
 - provide warnings to pilots about low QNH;
 - stop the use of QFE pressure datum on final approach
 - review operators' altimeter setting procedures

Final words

Amazingly, the issue of level bust is not addressed consistently in the various ECAC States. Some make it a high safety priority, others do not see it as a major issue. Awareness and reporting rates may explain such differences. New technology such as ASMT-Automated Safety Monitoring Tools could provide valuable support by systematically detecting level bust occurrences.

It might be worth knowing that the EATMP RVSM programme has launched a monitoring of altitude deviations which show that a significant proportion of these (between FL250 and FL290) are due to operational errors in following TCAS RAs.

The specific TCAS issues will be dealt with by ACAS seminars and a TCAS Safety Letter as indicated below.

Events

- Safety Group 14 Meeting 13-14 November 2001, Brussels
- SISG 9 Meeting 19-20 September 2001 Brussels
- ACAS Seminars:
 - 13-14 June 2001 Malmö
 - 27-28 September 2001 Lisbon
 - 6-7 November 2001 Bucarest
- TOKAI-SHIELD Workshop June 2001

Next Safety Letter Issues

- EATMP "Safety Occurrences Principle"
- Reporting Systems
- ACAS/TCAS

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