SAFETY LETTER

EATM Safety Enhancement

"En route to reducing Level Bust"
Eurocontrol Task Force

Level Busts - *"A cross industry challenge"*

The Level Bust issue is as old as procedural flying. As we strive to improve the safety of air navigation in Europe, greater effort must be made to reduce the likelihood of Level Bust incidents and to reduce the severity of the consequences.
Eurocontrol began its current initiative last year with the publication of a Safety Letter on the subject, leading to two "Level Bust Workshops" held in Brussels and Palma de Majorca. The current Safety Letter outlines the workshop conclusions and aims to further discuss the evidences presently available on the persistent problem of Level Busts in Europe.

Level Busts - *"What is the risk?"*

Over the next decade, air traffic in Europe is predicted to increase - the current trend is 3% growth per annum - the skies are becoming more crowded. The design and performance of modern aircraft, precision navigation, impressive climb and descent rates, means that when positional errors occur, conflicts with other traffic result in aircraft being in much closer proximity. This can significantly increase the threat of a mid-air collision. Thankfully, Airborne Collision Avoidance Systems (ACAS), ATC conflict alert systems, and other system improvements have significantly reduced the risks of collision.

Editorial

The Eurocontrol Level Bust Task Force (LBTF)

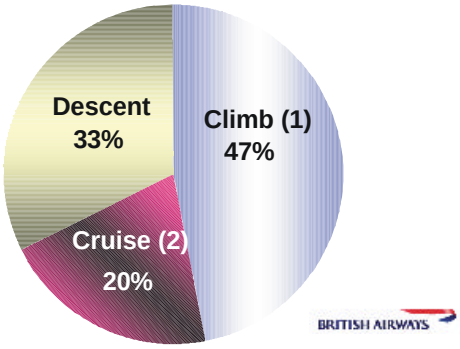
Our understanding of the extent of the Level Bust problem is incomplete because of the lack of available data. Nevertheless, the risks associated with Level Busts are real and pressing. Eurocontrol is determined to address this issue by establishing a cross-industry Task Force to reduce Level Busts occurrences. The TF will work within the existing structure of the Eurocontrol Safety Improvements Sub Group (SISG) which includes representatives from ANSPs, airlines, and European institutions. The LBTF aims to develop an action plan and a Level Bust Toolkit to be published and distributed in 2004.

Level Busts - *"Definition"*

"Any unauthorised vertical deviation of more than 300 feet from an ATC flight clearance." (Eurocontrol HEIDI definition)

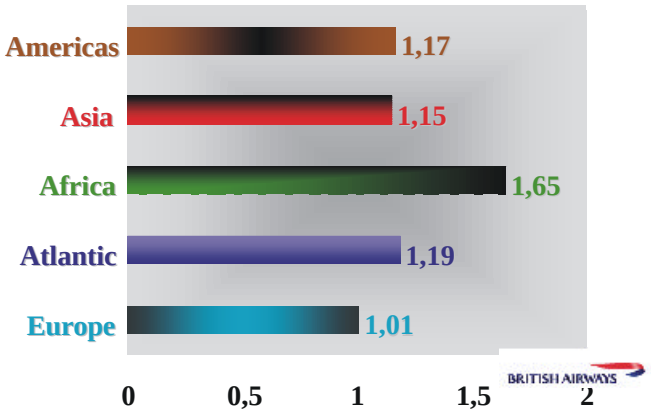
European Air Traffic Management Programme
EATMP

Level Bust per Phase of Flight



1. Late clearances major factor in the Climb phases
2. Autopilot and Turbulence major factors in the Cruise phase

Event by Region per 1000 Departures



"What are the factors which cause a Level Bust?"

Several elements have been identified as Level Busts causal factors including the adherence to SOPs, the terminal chart design, the instrument flight procedures (SIDs & STARs), the RT phraseology and discipline, and finally callsign confusion. Most Level Bust events are caused by a combination of few elements intervening together, and often associated with human factors and as human performance limitations.

Level Busts reported by NATS ATC in UK airspace

1999	308
2000	308
2001	281
2002	293

Level Busts reported by NATS in UK airspace January 2000 / December 2002

	Percent of flights	Percent of Level Busts
Air Transport	92.3 %	78.8 %
Private / Exec	6.3 %	13.8 %
Military	1.4 %	7.3 %

"How big is the Level Bust problem?

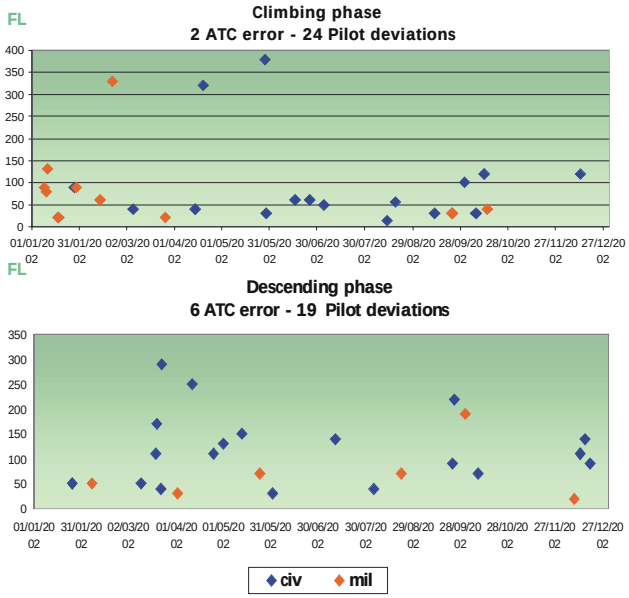
Level Busts and theirs statistics show that it i worldwide concern. However, our understandi of the number of Level Busts throughout Europ incomplete because of the lack of available data. addition, the variations in the incidence of Le Busts between airlines show that by adopting b practices (SOPs, reinforced training) the chances a Level Bust can be reduced. Particular attenti must be given to incidents involving milit aircraft, which are proportionately greater th those involving civilian aircraft.

A number of national authorities performed stud on the Level Bust issue, but the most consist work has been carried out in the UK over the past years. Even though professionals have been aw of the problem for many years it was only with t advent of an incident reporting system a subsequently automatic detection of loss separation that the UK authorities becar conscious of the scale of this problem. In 20 there were nearly 300 ATCO reported Level Bus Comparison of this data with the incident report systems in place at a number of airlines has sho that the true number of Level Busts is probably 2 3 times higher than ATCO reports suggest.

Two airlines, Air France and Finnair, have bo initiated programmes to reduce the number incidents. In Sweden the majority of the report Level Bust are below FL130. The respective figu are: 55 ((2000) - 77 (2001) - 51 (2002).

Greater efforts must be made to improve the le of safety reporting in Europe so that we can ident and understand clearly the key safety issues. Bet cooperation between ATCOs and operators essential.

Level Bust in Sweden - 2002



"Human factors"

A considerable number of Level Busts are the result of communication errors between pilots and controllers; heading and altitude confusion, call-sign confusion, incorrect read-back or hear-back. (The current European figure in the mis-hear and hear-back/read-back error category is 12%).

A study conducted by the FAA* has highlighted that the complexity of a message can impact the accuracy of communication errors in ATC. It shows that the number of errors doubles for messages with more than four instructions.

Some knowledge about human memory can help to explain those findings.

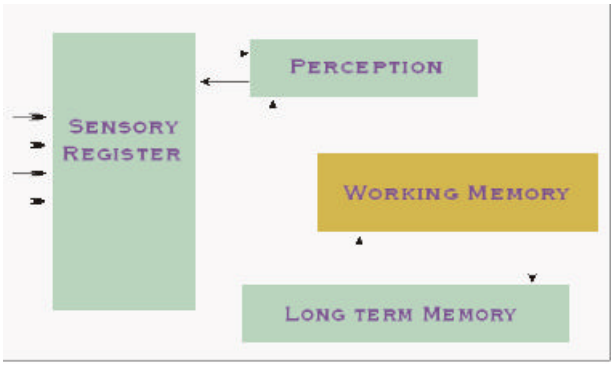
Working Memory Chunking

In verbal communication, which is the most used mode between pilots and controllers, any information goes first to the so called 'verbal acoustic loop' before it is processed by the brain.

This is known as sensory memory. This loop has its limitation in storage capacity. It can contain 7, plus or minus 2, pieces of information depending on the context and environment. In the aeronautical context one digit of a number or one alphanumeric character can be seen as a piece of information that is exchanged between pilots and controllers. However, it is also well known that workload and stress reduce this storage capacity.

Nevertheless, the brain does aggregate bits of information by a process called 'chunking' and frequently used information can be memorised and used as one 'block'.

A radio frequency used often by a controller will be one element in his working memory whereas for a pilot it may require four or five memory 'blocks'. Conversely, the pilot's memory will 'chunk' the aircraft call-sign down to one element after many repetitions, whereas the same call sign will remain at four or five elements for the controller since he is rarely using the same call sign for the chunking process to happen.



Sensory register

Consequently, the same message may well saturate the working memory of the pilot while the controller will still have some unused working memory capacity and vice-versa.

Pilots and controllers compensate for the limitations of the working memory in many ways. For example, pilots try to anticipate upcoming clearances and they pre-select the expected next frequency. Controllers in the same way may assume a heading or altitude change since the aircraft always transits the airspace in the same way each day. Unfortunately, this makes them vulnerable to another pitfall of human nature: when we expect to hear or see something - we tend to hear or see what we expect. For the same reason, catching read-back errors through hearback becomes a difficult exercise when controllers are under heavy workload.

* Cardosi 1994; Morrow, Lee, and Rodvold, 1993

The views of Bertrand De Courville - Flight Safety Manager - Air France

There are many good reasons to actively support a European Level Bust reduction programme. These include the increasing density of traffic over Europe, the RVSM system which allows less time for ATCOs and crew to detect and react to an altitude deviation, the fact that more aircraft are GPS equipped and cross or fly exactly one above each other and, finally, the ACAS system which, despite being an essential defence against mid air collision, is not an absolute protection.

In this global perspective, today in Europe we have very few dedicated Level Bust Programmes at airlines, ATC or CAA level. This situation generates insufficient visibility of events, an underestimation of the size of the problem and a reactive attitude of the safety process instead of a proactive and preventive approach.

Pan-European partnerships involving airlines, ATC, and CAAs might engender reliable answers to the problem. In particular, encouragement of common ATC and airlines data sharing and enhanced monitoring of altitude bust trends, supported by faster proactive processes and effective corrective actions, will lead to a measurable reduction in occurrences.

Experience of Level Busts: *An interview with Mike Jefferson, Head of Safety & Quality, UK (NATS)*

Q1. NATS has put considerable effort into raising awareness of the Level Bust issue. Why is the Level Bust issue so important?

Because they are the most frequent type of event experienced by NATS 296 in 2002. There is a 16% chance that there will be a loss of separation and, because of the small distances involved and the speed with which separation is eroded, the likelihood is that the separation loss will be a significant safety risk. This is an intransigent problem that shows little sign of going away.

Q2. When did you first become aware of the Level Bust problem?

In 1992, when we constructed the first NATS-wide incident database. Subsequent confirmation of this was received when SMF was implemented - alerting management to events then became, to a much greater extent, independent of human reporting.

Q3. What do you say to people who think this is only a problem in the UK?

It is possible that the nature of UK airspace, the fact that 90% of traffic is changing level, means that the Level Bust problem is most observable here. However, the problem is also recognised in the USA, and UK airlines report a large number of these events occurring outside the UK and particularly in Europe. The causes of Level Bust lie, in all but a few cases, on the flight deck - it is inconceivable that these errors would only be made in UK airspace.

Q4. What has NATS done to reduce Level Busts in the UK? Has it worked?

We have made changes to systems in terminal control to allow controllers to better differentiate between aircraft labels (through a "windowing" technique on the radar display), and we have influenced chart producers to simplify/clarify vital data on plates. Specific measures have included SID changes, changes to controller's phraseology, and continued liaison with operators in respect of individual incidents.

General measures have included raising awareness with operators directly and in collaboration with the regulator, promulgation of best practice flight deck management, and raising ATCO level of awareness.

Specific action in reaction to clear causal factors has been very effective, i.e. changes to SIDs and phraseology (FL Wun Hundred). More general measures, such as awareness and best practice, probably help to slow down the rate of increase in incidents.

Q5. How important is Eurocontrol's role in reducing Level Busts?

Eurocontrol have a significant role to play in raising awareness of the issue in the European region among service providers and aircraft operators and also in supporting the dissemination of best practice. We would hope that, through Eurocontrol's efforts, proactive and harmonised mitigation factors can be identified and widely implemented so as to avoid importing and exporting this problem across state boundaries.

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