"REDUCING LEVEL BUST"

"seeking solutions today for tomorrow's challenges"

Level Bust – A Global Issue

On 11 November 1996, an IL76 inbound to Delhi at FL150 was advised of an outbound Saudi B747 at FL140. The radio operator onboard the IL76 acknowledged the traffic advisory and asked how far away the Saudi aircraft was. ATC replied "traffic is at 8 miles now FL140". Meanwhile the pilot and co-pilot were discussing the traffic information and it is suggested that the co-pilot only heard the last part of the ATC transmission "… now FL140" and interpreted it as a clearance to descend. Suddenly realising that the pilots had begun to descend, the radio operator shouted out "keep at FL150, don't descend! ". The, by now highly anxious, crew began to initiate a climb. 349 people died as a result of the subsequent collision; the worst disaster in India's civil aviation history.

This was an accident caused by a classic Level Bust incident resulting from poor communication and a lack of coordination on the IL76 flightdeck.

A Level Bust is any deviation from an assigned altitude or flight level. Level Busts rarely result in a mid-air collision, but it is true to say that many CFIT (controlled flight into terrain) accidents are also the result of a Level Bust.

The Saudi Arabian 747 collided with an Ilyushin aircraft whose crew had failed to maintain their assigned altitude. This is the worst mid-air collision in the history of aviation.

Editorial

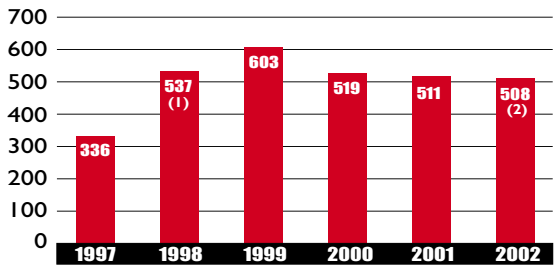
The European air transport industry has made considerable progress in driving down accident rates over the past three decades and we can be justifiably proud that air travel is now the safest method of public transport in Europe. Nevertheless, EUROCONTROL continues to pursue a series of initiatives aimed at reducing the absolute number of air accidents still further.

The Level Bust issue is of growing concern now to the aviation industry. The deviation of an aircraft from its assigned flight level, for whatever reason, clearly jeopardises safety. The developing safety culture within the European air transport industry, and increasing numbers of incident reports generated by pilots and controllers, has helped to raise awareness of this issue. Research by NASA, the FAA, the Flight Safety Foundation and latterly the UK CAA, has helped to improve our understanding of the causes of Level Busts and the actions needed to reduce them. While technological developments, such as ACAS, have helped to reduce the risks associated with a Level Bust, the absolute number of reported Level Bust incidents has not declined significantly.

EUROCONTROL is now running workshops to raise the awareness of the Level Bust issue. Operators, service providers, manufacturers, regulators and international organisations are being brought together to develop practical and effective solutions for reducing their number and to mitigate the risks associated with them.

George Paulson
Director Safety, Airspace, Airports, & Information Services - EUROCONTROL

Level Bust reported incidents (3)



(1) The jump in reported incident 1998 is likely to be result of increase industry awareness

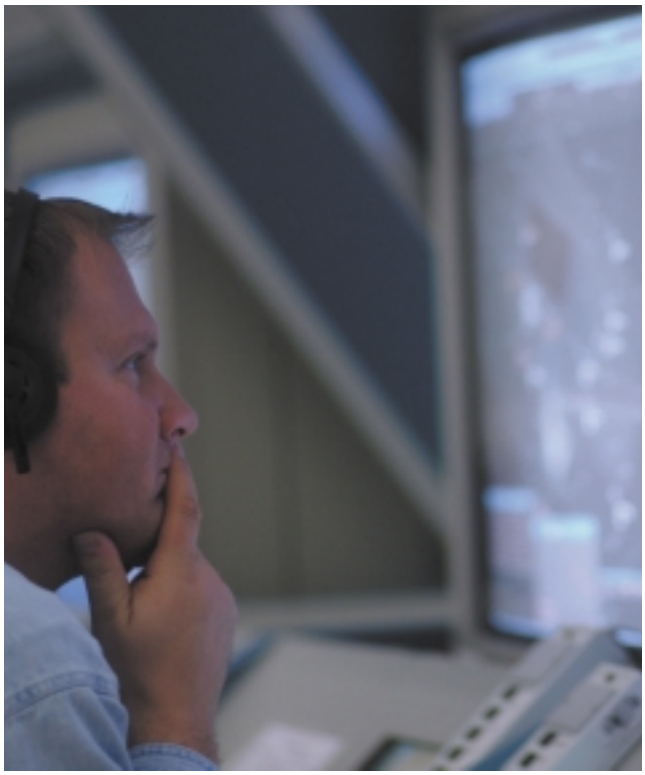
(2) The figure for 2002 is projected (249 incidents were recorded in the period until 26 June 2002)

(3) Reports collected within UK FIR only

The UK CAA "on the level" project categorised incidents under the following five headings

- **Standard Instrument Departures (SIDs).** Level Busts resulting from pilots climbing above SID step altitudes due to misunderstanding information presented on charts.
- **Auto-pilot Problems.** Level Busts resulting from problems experienced with auto-pilot system (High rates of climb or descent and inattention by pilots were contributory factors in many cases).
- **Altimeter Setting.** Level busts resulting from flight crew failing to select the correct altimeter barometric setting.
- **Pilot Handling.** Level Busts resulting from a mixture of flight crew related errors, including manually flying the aircraft through the cleared level, levelling the aircraft too late and entering the incorrect value in the Mode Control Panel.
- **Standard Operating Procedures (SOPs).** Issues associated with SOPs, such as non-adherence to or inadequate SOPs, were frequently cited in reports. These included making Public Address calls during climb or descent, carrying out paperwork during the climb or descent, confusing ATC terminology, and multiple ATC clearances.

Much has already been done to reduce the number of Level Busts by making crews more aware of the dangers, by promoting good CRM (Crew Resources Management) and promoting standard operating procedures, system design and communications procedures. These all minimise the chance of a Level Bust and mitigate the risk of one leading to an accident. However, despite these efforts, the incidence of Level Bust is still unacceptable in an industry striving to reduce accident rates. To find ways of reducing their numbers we need to understand fully the various causal factors. Not surprisingly, the causal factors behind Level Busts are often those that contribute to other categories of accident i.e. poor communication, distraction, lack of standard operating procedures, cockpit & controller workload, pilot handling, etc.



None of the above will come as any surprise to experienced pilots. However, good flight deck discipline and CRM usually ensure that misunderstandings are resolved quickly with safety errors being picked up by fellow crew members.

Examples of Level Bust situations

Weather
On climb out from Brussels, one aircraft encountered heavy rain and updraft during level off causing altitude deviation of 230 feet.

Callsign confusion (ATC error)
During climb from FL310 to FL330 flight 478 was recleared to FL370, which was read back and accepted. Passing FL350, ATC requested maintain FL330 and advised that clearance to climb should have been for flight 578.

Callsign confusion (crew error)
On climb out from Glasgow, a crew thought their aircraft had been cleared from FL70 to FL140 and read back the clearance. On passing FL78, ATC told the crew to stop at FL80, informing them that they had taken someone else's clearance.

Flight deck workload?
Approaching Munich, a flight was informed of a change to landing runway and cleared to descend to 4000 feet on intercept heading. The crew descended through 3700 Feet before climbing to 4000 feet.

Autopilot failure
On one flight descending to FL130,the autopilot failed to level the aircraft. The autopilot was disconnected and aircraft levelled at FL126

Incorrect altimeter setting/flight deck workload
Departing London Heathrow, an aircraft was cleared to 6000 feet (QNH 988). The crew requested climb to avoid weather and were cleared to FL120. Approaching level-off, the crew received a TCAS RA "Descend". When clear of the conflicting traffic, the crew realised that they had forgotten to set standard pressure setting. The traffic had passed 700 feet above them.
(in this situation 12,000 feet was actually FL127)

Clearance misheard
Approaching Vienna, an aircraft was cleared to descend to 3000 feet for the ILS 29. The Pilot misheard the clearance and selected 2000 feet on the MCP. The aircraft descended 600 feet below assigned altitude before climbing back to 3000 feet.

Late reclearance
An aircraft was cleared by Lisbon to descend to FL270 and subsequently recleared to stop descent at FL300 whilst passing FL302 with a high rate of descent. The aircraft was levelled by FL298.

TCAS II Bump-up
Induced deviation from clearance

A TCAS II resolution advisory (RA) can be issued where an aircraft is climbing, or descending, with a high vertical rate to a cleared level that is 1000ft from an adjacent aircraft. An RA issued in the adjacent aircraft could cause the aircraft to deviate from its cleared flight level. This is sometimes referred to as an "operationally unnecessary" or "nuisance" RA, but it is entirely justified. If the aircraft that is climbing or descending does not successfully level off at its cleared flight level the risk of collision is very real.

Some recent altitude busts, where aircraft failed to level off at their cleared flight level, are shown in the table above.

So it is important that pilots follow the RA. Logic modifications mean that the majority of RAs issued in these situations do not now require a move off level by the level aircraft, or a reversed vertical rate by the climbing/descending aircraft. However, occurrence of RAs can be minimised if pilots adjust their rate of climb/descent to 1500 feet per min. when they are approaching an altitude 1000 feet above, or below, their cleared level

At a number of airports, departure routes (SIDs) climb under holding stacks or arrival routes. Where possible, Terminal Areas should be designed to avoid the types of interaction between departing and arriving traffic that make level bust incidents more hazardous.

The 1st Level Bust Workshop - Way Forward

A 1st Workshop organised in Brussels on 10 and 11 October 2002 brought together operators, service providers, manufacturers and institutions to develop practical and effective solutions for reducing the number of Level Bust occurrences.

The participants in this workshop recommended:

- Continued efforts to raise awareness of the level bust issue;
- Promotion of safety data collection, analysis, sharing and lesson dissemination;
- Support for the ongoing activities of the EUROCONTROL ANT which is addressing level bust issue;
- Establishment of a cross-industry action forum to coordinate activity aimed at reducing level busts.

In the discussion 5 key areas for action have been identified:

- Adherence to SOPs;
- Terminal Chart Design;
- Design of Instrument Flight Procedures (SIDs & STARs);
- RT Phraseology and RT Discipline;
- Callsign confusion.

More information concerning the 1st workshop and more about Level Bust can be found at: http://www.eurocontrol.int/safety/LevelBust_LevelBust.htm.

Second Eurocontrol Level Busts Workshop

Palma de Majorca (Spain) - 27 & 28 November, 2002

To further elaborate recommendations a second workshop is being organised in Palma de Majorca (Spain) with AENA support.

Hotel arrangements, location and registration form are at:
http://www.eurocontrol.int/eatmp/events/reducinglevelbustreg.html

Workshop Programme

Day 1 (10.30 – 17.00)

- Registration
- Opening Remarks
- **Session 1 – Assessing the risks**
  A review of the background to the Level Bust issue and an assessment of the associated risks
- **Session 2 – Understanding the causes of Level Busts**
  A review of the work carried out by institutions and service providers to identify the causal factors behind the Level Bust issue, and the effectiveness of subsequent remedial actions

Day 2 (09.30 – 15.00)

- **Session 3 – Human Factors**
  An understanding of human performance limitations is a key element of all the initiatives being considered to reduce the level busts. This session focuses on the human factors.
- **Session 4 – Implementing solutions**
  An interactive session to identify the most effective ways of reducing Level Busts and the associated risks, and the most appropriate mechanisms for implementing them.
- **Recommendations and the way forward**
  will be drawn from the Workshop conclusions.

For registration:

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