

Level Busts

Aircraft not maintaining the heights assigned by Air Traffic Control is a growing problem worldwide. Richard Profit, Director of the Safety Regulation Group, outlines the situation and what is being done about it.

Commercial aviation in the United Kingdom enjoys a deserved world-wide reputation for the highest standards of safety and efficiency. Over the past 20 - 30 years aircraft design, technical developments, fail safe systems, built in redundancy and automatic checking routines have steadily reduced the number of aircraft and air traffic service system failures to the extent that reliability has never been better. The end result is that flying has become much safer than it was 30 years ago in terms of accident rates (accidents per million hours flown). However, the number of commercial passenger aircraft hours flown is steadily increasing each year. This means that even if the current low accident rates are maintained, there is likely to be a greater total number of accidents each year - simply because the total number of flights is increasing steadily year on year. Although the risk does not change as far as the individual passenger is concerned, there could be a perception that flying is becoming more dangerous and every effort needs to be made to reduce the current accident *rate* if public confidence is to be maintained at a high level.

Some accidents still occur that are due to 'systems' or 'technology' failures, but less frequently than in the past. However, as the technical factors in aviation accidents are slowly overcome, to achieve a reduction in accident rates it is necessary to focus on the main group of other contributory and causal factors - the human factor elements. These are associated with the people who work in the air transport business - the pilots, air traffic controllers, maintenance personnel, design teams and the managers of all of these groups, together with the many other people who work to ensure that the general public can fly safely.

Human Factors, as significant players in accidents and incidents, are never more pertinent than in the area of "Level busts". This phrase has come to be the accepted parlance to describe those occasions when an aircraft has failed, by 300ft or more, to maintain the height allocated to it by Air Traffic Control.

In 1995 the Safety Regulation Group noted that there were "235 level violations recorded in UK airspace in 1994. Of these, 22 were aircraft proximity hazards involving a serious loss of separation of which 5 were assessed as having had an actual risk of collision"¹. Although some of these incidents had solely technical causes, two categories stood out as the most significant factors. These were pilot/systems interface problems and pilot/air traffic controller interface problems - Human Factor problems. The former category included errors in altimeter and/or autopilot setting procedures together with other errors involving the monitoring of flight deck displays. The

¹ Civil Aviation Authority Safety Regulation Group - 'A Flight Safety Review - Level Violations Recorded in UK Airspace Between 1 January and 31 December 1994, November 1995.

second revolved around communications difficulties between controllers and pilots, including misunderstandings, incorrect readbacks missed by controllers, clearances being taken by the wrong flight and suspect cockpit resource management.

Since that review of the 1994 occurrences, the increase in reported incidents caused such concern that the CAA's Safety Regulation Group formed a Level Busts Working Group to target the problem more effectively. That group is leading efforts to reverse the trend and reduce the number of level busts. So far, representatives from British Airways, British Midland, British Regional Airlines and air traffic controllers have worked alongside Safety Regulation Group, National Air Traffic Services and Department of Airspace Policy personnel in an effort to tackle the level bust hazard. This initiative is already bearing fruit in that procedures are being reviewed and changed, air traffic controllers have been briefed, articles (such as this) aimed at raising awareness have been published and the causes of the problem are being better defined.

The problem

Imagine an aircraft climbing to its pre-assigned level (height). For any one of a number of reasons the aircraft overshoots that level and infringes the next one up. Rather like the tired driver drifting across the centre of a quiet road, the chances are that no harm will be done if there is no other traffic around and no-one will be any the wiser, other than the driver concerned. Similarly with a level bust, if there was no actual risk of collision and the pilots and controllers concerned decided not to file a report, those involved will be the only ones to learn the lessons. The trouble is that the consequences of a collision between two aircraft exceed by far the consequences of a collision between two cars.

How such an incident is viewed by those involved can have a significant effect on whether or not it ever gets reported. If a level bust involves only one aircraft, then it can reasonably be argued that there was no risk of collision. With this mind set we are unlikely to hear about any level busts which did not involve at least a loss of air traffic control separation, since the pilots and controllers involved see it as something to 'put down to experience', after all there was no actual risk, was there? There is anecdotal and statistical evidence to suggest that many level busts go unreported for this sort of reason, or perhaps because the effect of reporting a level bust may well be some form of investigation with a consequent threat to the career prospects of those investigated. Unfortunately, if no reports are filed then the rest of the aviation community are unable to learn from that experience too.

If, however, all level bust incidents can be perceived as being potential collisions, there should be a greater likelihood that more reports will be filed thus providing more information on the causal factors; after all, the mechanism which causes a level bust is exactly the same whether the result is a miss or a collision. If pilots and controllers can be given more confidence that incidents will be investigated by both the regulator and their employers with the sole aim of preventing a recurrence, then more reporting will be encouraged. This is not to say

that where personal competence is in doubt the situation should be ignored, rather the people involved should expect training to resolve the problem rather than disciplinary action. After all, to discipline rather than re-train is no more cost effective than replacing an expensive component when all that is needed is a repair job. It is, perhaps, in this area that managers can have significant influence on the safe operation of their company aircraft or the air traffic service they are providing.

Why is there a problem?

Even within the aviation community there are many misunderstandings of the nature of air traffic control, perhaps especially in a radar environment. Through reading press reports it is easy to believe that air traffic controllers, using sophisticated computer technology, monitor all flights at all times. This quite simply is not so. Even in airspace where all flights are known to the air traffic system, those aircraft whose flight paths are categorised as not in conflict with any other are watched less closely than others.

This is because controllers rely on the fact that flights have been allocated particular levels so that they can devote more attention elsewhere. After all, if a pilot has been instructed to stop a descent at 10,000ft, and has acknowledged that instruction, it is reasonable for the controller to believe that the instruction will be carried out. This reliance, or trust, that instructions will be followed is a central tenet of the current air traffic control environment and without it controllers could handle very few aircraft. There are, in many cases, 'safety net' systems to reduce the risk of collisions if an aircraft overshoots the allocated level and comes into conflict with another. The Short Term Conflict Alert System gives 'late stage' warnings of critical separation loss to controllers, and the Traffic Alert And Collision Avoidance System provides pilots with advice on manoeuvres needed to avoid close encounters. They do not, however, remove the reliance of the controller on pilots following verbal instructions passed by radio.

One area where controllers must rely upon flights rigidly adhering to their assigned level is in holding stacks. Flights, stacked one above the other, fly around radio beacons at 1,000ft intervals while waiting for clearance to start an approach to an airport in busy periods or when, for instance, poor weather precludes landing. In this circumstance controllers are unable to monitor aircraft on radar because the radar equipment is unable to distinguish one aircraft from another as they pass over and around each other while waiting their turn. The controllers have no alternative but to rely on their instructions being followed since any radar data from the holding flights is unreliable. Indeed, controllers are trained not to use radar in these circumstances. To exacerbate matters, the controllers' Short Term Conflict Alert System is least effective in the holding situation.

It can be seen, therefore, that the communication of climb and descent instructions between controllers and pilots is a safety critical area. In the longer term digital data link technology may well improve the situation. Until then verbal communication together with the manual input of vertical clearance instructions into flight management

systems, or the manual flying of aircraft in accordance with air traffic control instructions remain the only options along with the potential for human error.

The way forward

Level busts must be seen in context. In 1996, for example, there were only 8.3 level busts per 100,000 movements². It is important to emphasise that the current air traffic control system does work very safely indeed - it is equally important to minimise all recognised risk areas, not just because of high probabilities of failure, but because the consequences of that failure can be catastrophic. Thus there is no room for complacency.

The Level Busts Working Group has set in motion a series of initiatives to deal with these problems. Some of the factors which contribute to level busts are already known, but further information and analysis is needed to identify the most effective remedial action. Over the next two years an awareness campaign will be mounted in tandem with a data gathering and analysis exercise to alert pilots and controllers to known pitfalls, and to develop effective strategies to minimise the risks of an accident. These efforts will take some time to bear fruit. In the meantime, if employers of both pilots and controllers engender a blame-free atmosphere which encourages honest reporting of incidents both within and external to their own organisations, then the resulting sharing of information will enable earlier identification of long term solutions and , most importantly, raise pilot and controller awareness of this human factor problem and reduce the potential for a catastrophic accident.

² Civil Aviation Authority Safety Regulation Group 'Safety Analysis Report, Preliminary Study of Level Violations in UK Airspace, May 1997, Issue 1', data refers to take offs and landings of aircraft whose weights were greater than 40,750kg.