

**Level Busts – Learning the Hard Way, by Level Bust Team Leader Peter Riley, Division of Safety, NATS (Feb 2008)**

**My own scary level bust moment** came back in 1994 when I was a military supervisor at a large transport / refuelling base in central England (narrows it down a bit), operating temporarily in the Military Area Services Ops Room (MASOR) at the then LATCC (Mil) at West Drayton. The ops room at the aerodrome was being refurbished so it had been agreed to provide ATC services using the Area facility.

**Turning and burning....still, we were all professionals....**

On one particular Friday, during this arrangement, I was supervising while another detached controller was working providing an Approach Radar service to a VC10 (clue there) inbound to base from the North West. The controller had been pretty busy firing out instructions, but was 'turning and burning' and, in my opinion was coping admirably with the pace of the RT, to which he himself was contributing. Still, we were all professionals - and now things had quietened down a bit, he only had one aircraft to talk to. Who said supervising was difficult!

The controller had initially cleared the aircraft down to FL50 (Radar Advisory Service) and the aircraft was established in the descent with about 40nms to run to the Brize (oops – give away) overhead, when the Lyneham landline rang. I took the call on what turned out to be an outbound C130 on a North Easterly track towards the Daventry Radar Corridor requesting FL100. It also turned out to be a late prenote that became a handover, and the traffic was a 'dead ringer' crossing confliction on the Brize inbound. The controller seeing the developing situation took the line and agreed with Lyneham to get the C130 to stop its climb at FL60. He then instructed the VC10 to stop descent at FL70 and, he believed, heard the readback for this.

All sorted then...or so we both thought.

**.....Imagine our surprise, therefore....**

Imagine our surprise, therefore when the VC10, despite having additional traffic information passed to it on the crossing track now at FL60, continued its descent through FL70. The controller, somewhat understandably confused by the continued descent of the VC10, queried the pilot on his apparent excursion from the stop off level. The pilot advised that he was on his way down to FL50 as briefed and then, rather unhelpfully, offered to stop at FL60. In hindsight the requirement was for immediate avoiding action and a discussion of this nature later. As it happened it was by now all getting too late and, providentially, the aircraft missed each other, although not without the pilots seeing each other through cloud....(that's not a gap in the cloud)...

Now I reckon that left only one thin piece of Swiss Cheese (big sky theory) between us, some grieving relatives, a lifetime of guilt and a guaranteed courtroom appearance. So how had we come so perilously close to a

disaster that would undoubtedly have been one of the worst mid air collisions in the country's history??

The readback that the controller thought he had got turned out to be the other aircraft acknowledgement heard on the (still open) landline with Lyneham. The controller was expecting to hear a readback from the VC10 and missed the fact that the communication he did in fact hear was from a different source. This phenomenon is described, by people who know about these sorts of things, as expectation bias.

Safety nets? There was no TCAS fitted to the aircraft in 1994 and no Short Term Conflict Alert (STCA) on the transponder codes we were using for the Brize task – which had not been 'adapted in' to the LATCC system for this purpose. (Not that STCA would have helped much anyway in these circumstances as the conflict was only appreciated as separation was lost). It turned out the crew, who were very busy, never heard the stop descent instruction and didn't query their clearance apparently through an occupied level. That said, the (very experienced) VC10 pilot subsequently took a much greater interest in matters ATC, describing the event as the closest he had come to a near death experience during his lengthy flying career (which we had nearly ended).

### **...some choice personal observations...**

Thirteen years later I still recall vividly the detail of the callsigns and indeed the time of the event (1021hrs) as if it were yesterday. I also recall that the Air Officer Commanding subsequently had some choice personal observations on the controlling team's performance on that day, one of which was that the supervision had allowed the controller and the RT to become too busy. This left a lasting impression on the rest of my controlling and supervisory career in the military and subsequently as a safety manager within NATS.

However, more recently I have also been blessed with the opportunity to partially atone for earlier misdemeanours through my involvement as the Level Bust Workstream Lead within NATS.

.....and what have I learned as a result?

### **...the spy in the sky...**

Firstly, that the two biggest causes of level busts remain the guy in the left seat and the guy in the right seat! Truth be told, very often in a level bust (about 33% according to the NATS causal factor scheme) the pilot says he will do something - then (for whatever reason) does something else. In London Terminal Control, now at Swanwick, and most recently at Manchester Centre, NATS has the ability to display the pilot's selected flight level from the MCP as a down-linked Mode S parameter on the controller's radar display. Think of it as the spy in the sky...So if you dial up something on the MCP other than the level you have been cleared to, the controller has an opportunity to spot the level bust before it happens – and you may be

challenged. This safeguard has proven very effective and is also to be introduced into the new Prestwick Centre when it goes operational, planned for 2010.

However, we are still trying to understand what exactly goes on in the cockpit to cause level bust events which are described in an accurate (if not exactly catchy) Human Factors description as 'correct pilot readback followed by incorrect action'. To that end NATS intends to introduce a post incident questionnaire in Spring 08, which may help provide some of the answers. Our intention is for it to be not too onerous in terms of completion. (And should you be unlucky enough to have a level bust, we would of course be grateful for your support in the completion of this questionnaire).

**...Level busts happen a lot...1454 prevented level busts in a 10 day period...**

I have also learned that level busts happen a lot. The NATS database currently records over 400 level busts reports in the rolling 12 month period. Fortunately, most of the time no loss of separation results. However, about 10% of the time it does and about 6 times a year (in the airspace in which NATS is providing a service) we still end up relying on the pilot and his/her TCAS resolving a level bust event which has not been detected in a timely or effective manner by ATC.

In 2006 NATS conducted a 'Prevented Level Bust Trial' which recorded (through use of a scratchpad on the controller workstations) some 1454 level busts or potential level busts in a 10 day period that were prevented by the intercession of the controller. Many of these involved the aircraft not stating its cleared level on first contact. A significant number of them involved confusion of the digits 2 and 3. So flights cleared, for example, to FL330 understood FL230 etc. Maybe it is time to go back to basics and use the correct ICAO pronunciation of the number 3 as 'TREE' – at least for levels or altitudes. In France they have addressed RT confusion with the French number one (un) by inventing a new word (Unité). Given that we use 2s and 3s for most of our cruising FLs and our VHF frequencies, perhaps we should do something similar. Certainly the change requiring FL100 to be described as FL 'one hundred' appears to have reaped some benefit as instances of FL110 / FL100 confusion are now much less frequent. A number of best practices phraseology techniques have been included in a Defensive Controlling Guide recently made available to all NATS controllers. These include tips such as avoiding 'expect' levels, stating the word 'degrees' after headings (to prevent level / heading confusion) and not using the word 'maintain' (which can be misinterpreted by some crews as an instruction to climb or descend to a level). It also says that controllers should avoid using more than 2 executive instructions in one transmission and should not transfer an aircraft with a level instruction attached to the transmission.

### **...a clear question or 'say again'...would be more helpful...**

Surprisingly often, (in the subsequent incident investigation) there is a clue on the RT that something is amiss with a level clearance. Sometimes the pilot will offer his/her own interpretation of the level cleared to in a somewhat questioning tone in the readback. Unfortunately this sort of subtlety is often missed by the controller (who may be busy thinking about the next instruction). We are now training controllers to adopt the WAYSRAYL technique, whereby they should Write (on the strip) As You Speak and Read As You Listen. However, if in doubt a clear question or 'say again' - rather than an inaccurate guess - from the pilot would be more helpful under such circumstances.

### **Step climb SIDs.....far too often crews still manage to 'fall up the stairs'...**

Standard Instrument Departures that include a stepped climb are a particular issue for level busts. On these profiles the first stop altitude is often the one which is bust. Whilst there is recognition that, as an airspace design principle, step climb SIDs should be eliminated wherever possible – because of the congestion in the London TMA we are likely to be stuck with them for some time yet. The trick, therefore, is to manage them. This includes displaying the steps in the profile properly on the charts used by aircrew, and the pilots briefing them appropriately before flight. Recently the joint CAA / NATS chaired UK Level Bust Working Group has liaised with a major chart provider to enhance the way first stop altitudes are displayed on its charts; however, far too often crews still manage to 'fall up the stairs'. NATS' statistics show this to be particularly true of business aviation aircraft which have additional pressures on their operation and who tend to use the airfields where step climb SIDs are common.

Altimetry is another big level bust issue. The relatively low Transition Altitude (TA) in the UK still appears to come as something of a surprise, and not exclusively to our American cousins. There is airspace policy, which should be fully realised in the next few years, to have a common TA inside CAS of 6000ft and 3000ft outside CAS. Most of the UK SIDs inside CAS end at 6000ft. However, some do not. At Birmingham, until the new TA is introduced, aircraft still fall foul of SIDs which end in a Flight Level. When pressures are low this can lead to a level bust when aircraft fail to set the Standard in sufficient time. Warnings (verbally and via NOTAM) have been introduced to alert crews to the danger in these circumstances. Of course it only takes 10Mbs for the confusion to result in a 300ft deviation from the assigned altitude or level – and therefore a level bust. We have a suspicion that altimetry events are more common than the statistics suggest and that there may be many more deviations which don't result in the 300ft discrepancy.

Since 2005 NATS has been sharing its data with its customers through the Safety Partnership Agreement. A league table of level bust performance, normalised per 100 000 movements, is maintained and data on 50 individual operators sent out to the carriers' flight safety departments. Some airlines are

now using this information as a key performance indicator. The data is useful to us in identifying emerging trends and as a subject for continued dialogue with the airlines.

**..It still troubles me...**

Since my own level bust experience 13 years ago, I think I now understand level busts and their causes a great deal better than I did back then. I hope that this article has helped raise your awareness on some of the issues.

However, it still troubles me that some of the things that went wrong on that Friday remain areas of concern today – expectation bias remains a ‘hot topic’ within the controlling community and the aforementioned Defensive Controlling Guide highlights the need to reduce the rate of delivery during high RT loading, listen carefully to all read-backs and to beware the quiet period after being busy – which is a common time for errors (rather more so than during high workload). It also states that controllers and supervisors should split positions early and consider other controllers’ workload thresholds. All of this sounds relevant to my own scary moment!

A wise person once said that it is good to learn from your mistakes...but it is even better to learn from the mistakes of others. I certainly learned about level busts the hard way...