Altitude Deviation or Level Bust What's in a name?

There are several problematic issues when exploring why these events happen. **By Anne Isaac, NATS, UK**

The first is often that organisations classify them as adverse event outcomes, rather than examining the many causal elements which should be considered as leading to these events; in other words a level bust or altitude deviation is the outcome of several adverse or erroneous activities, not the effect. How an organisation views these events may well dictate what is learnt and ultimately what mitigations are developed.

The second, rather more subtle issue concerns the world view adopted by the pilots and the controllers, since these are typically the only players in this 3 dimensional game. An ATCO's world view is based on a fast moving, dynamic sequence of multiple targets, all of which are important in their controlling strategy – it is for this reason that the majority take level bust events extremely seriously. The potential for several of their multiple targets being 300 feet from their assigned level is not only a risk, but increases their workload incrementally. In contrast a flight crew's world view is focussed on their own aircraft and its crew, passengers and cargo, effectively and safely arriving at the destination without straying into uncontrolled airspace and getting too close to buildings, high ground and other vehicles and aircraft. Therefore deviating by 300 feet from an assigned level is possibly considered just that – an altitude deviation, and if there was little chance of getting close to another aircraft, their perceived risk is low. Discussions with many airlines would reinforce that many of these deviations, although undesirable, are usually not high on the safety risk register. It is for this reason that we may have a rather larger problem to fix than the elements which lead to these undesired events.

Thus far it has been tempting, and often just plain practical, to try and tackle these events from either the pilot or controller's point of view; rarely do we seem to try and get a 'holistic' world view which takes into account the tasks and requirements of both professional groups. Clearly both groups are subject to similar human performance limitations and therefore it is not surprising that these events happen with predictable regularity. There have also been many learned reports and research papers detailing the causal factors of these events and lots of sound advice to help both ATCOs and pilots to avoid these situations. Many of these are familiar to us all:

- Altimeter setting errors
- Distractions – in the ops room or on the flight-deck
- Mishandling of the FMS
- Correct pilot readback followed by incorrect action
- An incorrect and unchallenged controller instruction
- An unchallenged incorrect pilot readback

The list is lengthy and typically partitions the responsibility to one or other professional group; so what could we learn if we took an approach which considered that these events were the result of simultaneous and consecutive error chains?

Some years ago, there was just such an opportunity to look at situations that were associated with this type of event from both sides of the radio/telephony, with the following results[1].

From an ATC perspective, incidents regarding level busts were associated with planning, coordination and communication. From the flight deck, errors that resulted in altitude deviations were associated with mis-handling, mode setting, communication and navigation.

Anne Isaac

leads the Human Performance development work in the pilot/controller interface in NATS, UK.
She gained her PhD in Cognitive Neuropsychology at Otago University in New Zealand. Her previous work has been in the development of incident investigation tools and techniques in European ATM, the introduction of TRM into the ATC environment and the introduction of Day to Day Safety Surveys techniques into NATS. She has written several book chapters, academic papers and the book Air Traffic Control: the human performance factors.

Both sets of errors were categorised at a high level as either a human information processing error (including decision-making, planning and execution), communication or an equipment malfunction.[2]

Error types	Flight-Deck errors	Ops. Room errors
Human Information Processing Error	14	66
Communication	5	24
Equipment Malfunction	1	1

Results indicated that the main problems for both professional groups were associated with information processing. For the ATCO it was in the monitoring and processing of clearances. For the pilots the issues were associated with executing a plan and flying that profile. In terms of communication, both groups demonstrated errors in the giving and receiving of clearances, and in monitoring compliance. The flight crews tended to have more robust cross checking built in to their SOPs, which possibly allowed these errors to be managed more effectively.

Having established the common error types, extensive further work was done by monitoring on the flight deck and in the ATC operational environment to establish the nature of simultaneous error leading to these level bust/altitude deviation events. It was established that both working environments could be degraded in nine ways which could lead to three problems; risk acceptance (associated with assumptions), out of the loop (associated with situation awareness) and high stress levels (associated with workload and uncertainty). The nine situations can be listed as follows:

- Risk acceptance due to (1) mutual confidence and underestimating risk;
- Out of the loop leading to or caused by (2) overload, (3) boredom, (4) preoccupation and (5) inexperience/ (6)over experience;
- Stress levels caused by (7) task overload, (8) unfamiliar situations and (9) surprise.

In this work it was also established that errors usually occurred during the first 15 minutes of an ATCO's shift and, in comparison, the majority of flight-deck errors occurred in the first AND last 15 minutes of the flight. This may be due to the differences in the distribution of workload, or in the way the flight-deck crews and controlling teams divide their tasks and responsibilities.

Typically, such research activity starts to explain the mutual reliance which one professional group has on the other and the need for them to better collaborate in lesson learning. It is clear that until each side of the R/T understands how the other views these events - as altitude deviations or as level busts - and what we can collectively do to reduce the risk, we may still be writing about the subject in another 15 years! I hope not, since it has been proved that for every level bust that is reported there are 40 'altitude deviations' which are not – so what is in a name?

Editorial Comment

Anne observes that the majority of flight deck errors found in the level bust research she quoted occurred in the first and last fifteen minutes of a flight and speculated as to why this might be so. We asked an experienced airline captain what they thought and there was no doubt – it was the combination of higher workload and the greater rate of vertical re-clearance which typically characterised both the initial climb and the intermediate and final approach. Our captain then went on to speculate in turn by suggesting that perhaps the prevalence of increased ATCO error rates during the first 15 minutes of their shift was a consequence of the higher workload that must typify the first sector takeover. He also agreed with Anne's point about the effect of the different focus of flight crew compared to controllers on the perceived 'importance' of level busts… ■

1- This research was undertaken in New Zealand
2- This categorisation was established in order to compare the flight-deck elements with the ATC elements and would not reflect today's more advanced approaches