

## LEVEL BUSTS AND THE ATC SYSTEM

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Level Busts have probably been with us ever since somebody fitted an altimeter to an aeroplane and tried to stop it (the aeroplane that is) going up and down too much. Nowadays, with high performance aeroplanes carrying large numbers of goods and people over ever more densely populated towns and cities, in an ever busier air traffic environment, the necessity of understanding and adhering to ATC vertical clearances has never been more important.

Much has been written about level busts, but most of the articles I have seen mainly focus on cockpit procedures, autopilot malfunctions and suchlike. This article, however, concentrates on the Air Traffic System, explains how ATC separation is achieved in a radar environment, points out some of the pitfalls of the system and shows why level busts deserve high priority treatment.

The Air Traffic Controller's sifting process which results in the resolution of conflicts between aircraft firstly relies upon the "reading" of a flight progress board to initially determine if there might be a conflict. Secondly radar is used to refine results and identify which flights require separation by controller intervention using radar techniques. Radar, I am sure, needs no explanation, but a 'Flight Progress Board' probably does. Controllers have a note of traffic details printed on flight progress strips which are displayed in moveable holders mounted on the flight progress boards. These boards allow for the strips to be arranged so that aircraft which follow the same, or crossing, routes can be assessed by the controllers, to see whether or not they are separated. This sifting of the available data goes through a number of stages.

The first level of sifting is based upon the idea that flights which are displayed on the flight progress board as flying at vertically separated levels are not in conflict. It follows, therefore that those flights which are at the same level may be in conflict. This first level of sifting results in flights being categorised as "**not in conflict**" and "**might be in conflict**".

The second stage is to decide, again using the flight progress board, which of those flights now categorised as "**might be in conflict**" are not in conflict. The separation used for this is based on time, supplemented by the controller's experience and understanding of the particular airspace and traffic situation geometry. This second level of sifting results in more

flights being categorised as “**not in conflict**” and a lesser number being pigeon-holed as “**might be in conflict**”.

The third stage moves the focus away from the flight progress board to the radar display. Those flights which remain in the category “**might be in conflict**” are assessed to decide whether tactical intervention may be required. This stage sorts the flights into “**not in conflict**” and “**in conflict**”. This time, though, the decision is based on ‘eye-balling’ the situation to decide whether the tracks being flown by flights at the same level are such that intervention by the controller is needed or not.

The fourth stage of the process is tactical intervention to resolve the confliction. This takes the form of the controller instructing the pilot to change level, direction or speed, or any combination of the three.

Looking over this process, it becomes clear that there could be problems with the flights categorised as “**not in conflict**”. This is because the controller’s (or controllers’) attention will rightly focus upon those flights categorised as “**might be in conflict**” or “**in conflict**”, and will be less taken up with monitoring those flights which are understood by the controller to be “**not in conflict**”. To put it plainly, the controller will believe that these flights are not problematic so they may, to some extent, be ignored. It is worth pointing out that this sifting process is not a formal one, rather it goes on inside the controller’s head and the situation is constantly reviewed and up-dated along with the ever changing traffic patterns.

So, what does this mean in terms of Level Busts? First of all, when a controller assesses that a flight is not in conflict with any other, less time will be spent in monitoring its progress. That is not to say that the flight will not be watched, it will, but to a lesser extent than those flights requiring intervention. It follows that the greater the number of flights assessed as “in conflict”, then the less time is spent in monitoring the rest. This means that the controller is relying, even more than normal, on the pilot flying the aircraft in accordance with the vertical clearance. Additionally, controllers are less likely to spot a level bust early since their concentration will be elsewhere.

Simple arithmetic tells us that with 1,000 ft separation being used, a modern business jet climbing at 6,000 ft/ min will take only ten seconds to change a situation from one where separation is assured, to one where a collision is happening. Even with lower rates of climb and descent the amount of time available for the controller to notice, take in the situation and

react is minimal. When you further consider that the controller's radar display is being updated at, typically, once every 6 seconds the seriousness of the situation can be seen even more clearly.

However, the danger of a collision between the level busting aeroplane and another is only part of the picture. In a busy traffic environment the controller(s) will have prioritised tasks and be constantly reviewing these. When a level bust happens, it means that these priorities have to be instantly changed, in exactly the same way as they would in the event of a full blown emergency situation. The extent of this re-appraisal will depend on the general situation at the time, and whether or not the level bust has caused a separation loss. Even if no separation loss has occurred, there will be some increase in workload and, possibly, some dis-orientation of the controller(s) involved. This could well be a contributory factor in another incident.

The problems associated with this process are an integral part of our ATC system, and are likely to remain so as long as the ATC system stays predicated on a level allocation foundation, with people, Air Traffic Controllers, playing such a central role. For all the computerisation and technological advances of recent years, their main impact on the Air Traffic Control System has been to provide controllers with better quality information, and some late stage warnings of critical separation loss (short term conflict alert systems), and to similarly provide pilots with late-stage warning of impending collision (TCAS). Ultimately reliance is placed upon the personal skill of the controller to understand the traffic situation, sift out the real conflicts and solve them.

It is important to realise that this sifting process works the vast majority of the time. The rub is that if it fails the results could be catastrophic. So where do we go from here? In the longer term systems will undoubtedly be developed which reduce the reliance on people, and so reduce the likelihood of human error. In the short term, however, the only viable way forward is through greater understanding of the ATC system by pilots and controllers alike, so that the people involved at the sharp end of aviation are better able to minimise the risks inherent to their jobs.

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