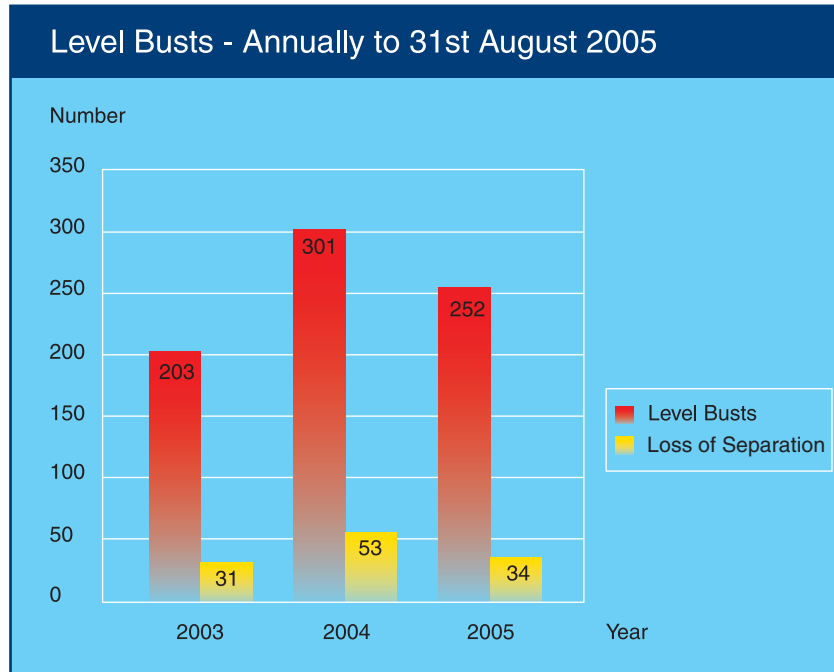


LEVEL BUST

The chart below is taken from the UK CAA "Level Best" web-site⁶. It depicts the number of level bust incidents reported annually to UK CAA. At first

incident described below was indeed a near miss for the 677 passengers and crew of the aircraft involved. The account of the incident is based on

The DC-10 had two pilots on the flight deck: the FO, who was receiving training for upgrade to captain, was in the LH seat; the captain was in the RH seat; a flight engineer was also positioned on the flight deck.



The Tokyo Area Control Centre (ACC) was controlled by three ATCOs: the radar controller (the ATCO), who was receiving familiarisation training on the sector; the watch supervisor and an ATC coordinator.

At 1541, the B747 reported that they were passing 11,000 feet for FL390. The ATCO cleared them direct to the YAIZU NDB and to stop their climb at FL350. The altitude restriction was due to another aircraft, American Airlines 157, which was cruising at FL390, and was being controlled by another sector.

sight, it seems that the number of level busts is falling, but unfortunately, that is not the case, for the data for 2005 represents only the first 6 months of that year. In fact, there was a 40% increase in the number of incidents reported in 2005 compared with the same period for 2004, and a 100% increase compared with the same period in 2003.

article which appeared in the Flight Safety Foundation Digest for March 2004⁷. The incident demonstrates the importance of pilots following TCAS Resolution Advisories (RAs), but it also emphasises the important role of the ATCO in preventing dangerous situations from developing in the first place.

Factual Information

Boeing 747 JA8904, call sign Japan Air 907, was climbing to cruising level en route from Tokyo to Okinawa. McDonnell-Douglas DC-10 JA8546, call sign Japan Air 958 was cruising at FL370 en route to Tokyo from Korea.

There were four pilots on the B747 flight deck: the captain was in the LH seat; the First Officer (FO) was on the jump seat behind the captain; and two trainee pilots receiving training for upgrade to FO occupied the RH seat and the RH jump seat.

The B747 captain told investigators that at this time he could see a contrail at 11 o'clock: "it was at a higher altitude and approximately 40nm from our position," the captain said, "I talked with the trainee pilot about how close the traffic would become before being displayed on the navigational display. The traffic was displayed when it reached 25nm. From the TCAS the altitude was determined FL370. The cockpit crew discussed that we should keep an eye on the traffic."

Between 1543 and 1552 the ATCO handled 14 aircraft and made 37 radio transmissions under the guidance of the watch supervisor. The ATCO told the investigation that, "the traffic volume at the time of the on-the-job training was at about the level I could handle."

At 1546, the B747 was on a westerly track, east of YAIZU climbing through 21,600 feet. The flight was cleared to climb to FL390.

In spite of the first impression given, this chart does not necessarily indicate that the number of level busts is rising. But it does demonstrate the success of efforts made in encouraging pilots and ATCOs to report level busts, even if no loss of separation resulted, even if no one else knew about them.

Japanese Near Miss

The term "near miss" has now been replaced by the more accurately descriptive term "AIRPROX" but the

⁶ www.levelbust.com/

⁷ Bracing the Last Line of Defense Against Midair Collisions. See www.flightsafety.org/home.html

At 1547, the ATCO instructed Flight 157 to descend to FL350, but as the aircraft was not yet on frequency he received no response.

At 1548, the DC-10 checked in at FL370. At that time it was on an easterly track, west of YAIZU.

Shortly afterwards, Flight 157 checked in at FL390 and was cleared to FL350. This instruction was acknowledged and the aircraft began to descend.

Near YAIZU, the B747 began a climbing left turn from a heading of 270° to 207°. At about the same time the DC-10 was heading 095° and the FO told the captain that he could see traffic at 10 o'clock to 11 o'clock position. At that time the B747 was displayed on the DC-10's TCAS, climbing.

"The traffic was displayed on the TCAS screen beyond the 10-mile arc at between 12 and 13 nm," the DC-10 captain said. "As we saw the other aircraft turning over YAIZU a TCAS 'Traffic, Traffic' Traffic Advisory (TA) sounded while we were about 10nm distant at FL370. From the TCAS the other aircraft's altitude was determined to be also FL370. The Pilot Flying (PF) disengaged the autothrottles in anticipation of an RA.

The ATC watch supervisor was providing comments to the ATCO about the tasks he had to perform and was discussing the traffic situation with the ATCO at 1554:18, when a conflict alert was displayed on the ATCO's radar screen.

The ATCO could not remember at what time he received the hand-off of the DC-10 from the adjacent sector, but he first became aware of its presence when the conflict alert operated and the letters 'CNF' flashed in the data blocks of the DC-10 and the B747.

The ATC watch supervisor said, "I was in a flurry because I had forgotten about the presence of [the DC-10]. At that time I deemed that the best action was to [issue an instruction to the DC-10 crew to] descend."

The ATCO, however, instructed the B747 to descend to FL350. The B747 crew acknowledged the instruction giving also their call sign and told the ATCO, "Traffic in sight." Even so, neither the ATCO nor the watch supervisor noticed that it was the B747, not the DC-10 that acknowledged the descent instruction; indeed, the watch supervisor stated that she was convinced at the time that the ATCO had issued the instruction to the DC-10.

As the B747 crew had been instructed to descend during a climb, the captain disengaged the autopilot and autothrottles and reduced power to idle while commencing the descent. The aircraft climbed to around FL371 due to its inertia before beginning to descend.

At 1554:34, just 16 seconds after the conflict alert was displayed on the ATCO's screen, the DC-10 received an RA calling for descent at 1,500 ft/min. One second later, the B747 received an RA calling for a 1,500 ft/min climb.

On the DC-10, the autopilot was disengaged, idle power was set, and the nose was lowered to increase the rate of descent.

On the B747, the aircraft had begun to descend when the climb RA was received, and the captain decided to continue the descent. "At that time, I observed the other aircraft approaching from the forward right at about the same altitude, but I had already initiated the descent and, judging that the best way to avoid a collision at that altitude would be to continue descending contrary to the TCAS command, I continued descending to FL350, the captain said. "Further, I also considered the risk of stalling if we pitched up, given the insufficient thrust, leading to an even more dangerous situation."

Investigators calculated that the B747 had a margin of about 65kt over the stall speed, and considered that the aircraft, "would have been able to gain

altitude to some extent using this air-speed margin for climb by transforming kinetic energy into potential energy."

Observing that the DC-10 was not descending, during the next few seconds the ATCO twice instructed the crew to turn right for separation; however, the crew did not respond to either instruction, and probably did not hear them due to the cockpit workload at that time. The watch controller then took over radio communications and instructed "JAL957" to begin a descent; at that time, there was no aircraft with that call sign in the sector's airspace.

At 1554:49 as the DC-10 was descending through FL369, the crew received an "increase descent" RA, calling for a descent of 2,500 fpm. To achieve this, the captain extended the speed brakes while the FO lowered the nose further. The FO told the investigators, "I felt as if the other aircraft was rapidly rushing towards us and I wondered why, since our aircraft was following the TCAS descent command."

Between 1554:51 and 1555:11 the B747 descended from 36,900 feet to 35,500 feet and the DC-10 descended from 36,900 feet to 35,700 feet.

At 1555:06 the B-747 crew received an "increase climb" RA calling for 2,500 fpm climb but the captain continued the descent.

The DC-10 captain could see the top of the B747's fuselage and judged that it was increasing its descent rate. The pilots had no time to communicate and both pulled back on the yokes together. The B-747 passed beneath them.

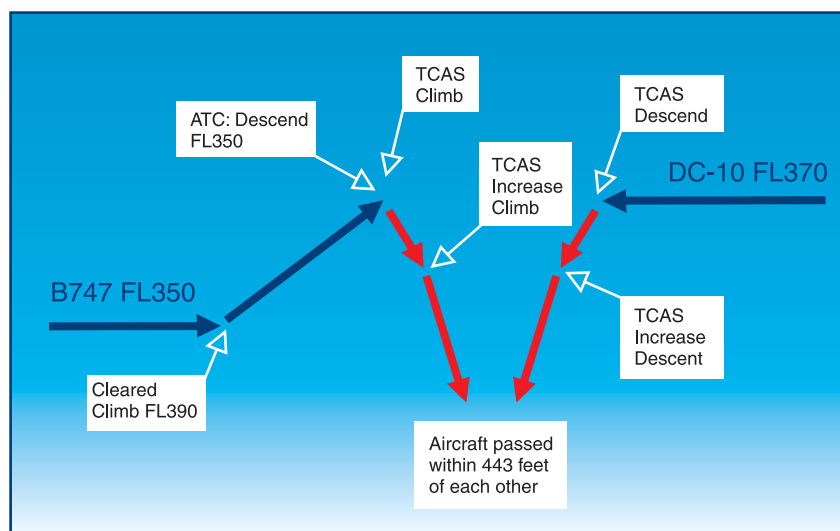
Analysis of recorded data indicates that the aircraft passed within horizontally 135 metres (443 feet) of each other. If the B747 had climbed in response to the initial RA, and had continued to climb, it is estimated that the aircraft would have been separated by 1,600 feet vertically when they passed each other.

Analysis

The decision of the B747 captain to follow ATC instructions instead of the TCAS RA was a major cause of this incident. ATC were not informed by either crew that they had received an RA, nor did the DC-10 crew inform ATC that they were following their

the fact that the ATCO and supervisor were in discussion may have distracted their attention from the approaching conflict, which should have been evident from the indications on the radar screen.

Both the ATCO and the watch supervisor were taken by surprise when



RA. This omission increased the uncertainty on the part of the controllers, and the ATCO continued to issue instructions which contradicted the TCAS (although they could not have known that).

Subsequently, ICAO ruled⁸ that pilots must follow TCAS RAs regardless of contrary ATC instructions; if for any reason it is not possible to follow the RA, aircraft must remain level rather than take action in the opposite direction to that indicated by the RA. ICAO also requires pilots to notify ATC as soon as possible.

American Airlines 157 was cleared to descend before the aircraft was on frequency. This error had no direct influence on subsequent events.

Both the ATCO and the watch supervisor 'forgot' the presence of the DC-10, even though it had checked in on frequency only a few minutes before.

These two events may indicate that the ATCO was overloaded at the time. Also,

the conflict alert was signalled. Having decided to descend the DC-10, the ATCO accidentally issued the descent instruction to the B747. Neither the ATCO nor the supervisor noticed this error, nor did they notice that the B747 accepted the clearance. In spite of subsequent events, neither controller suspected that this error had occurred.

When the watch supervisor took over control, she issued an instruction to JAL957, even though there was no aircraft with that call sign on frequency. This may have been a sub-conscious combination of the call signs "907" and "958" which belonged to the B747 and the DC-10, resulting from the obvious pressure of the situation. This event was probably too late to have any effect on the outcome of the situation; nevertheless, it is worth noting that this was the second occasion when a controller used an unintended call sign.

Lessons Learned

- In high-pressure situations, take time to ensure that instructions issued are appropriate. Three obvious errors of this type occurred:
 - A clearance was passed to an aircraft which was not on frequency
 - A clearance was twice passed to aircraft using the wrong call sign
- Avoid distractions, especially in high-pressure situations. Sound briefing before and de-briefing after a period of duty is usually more effective and less distracting than discussion during the duty period
- Always take time to up-date your situational model when a new aircraft comes under your control. Attempt to visualise any conflict that may arise with other traffic in the future before moving on to other tasks
- See also 121.5 Safety Alerts - Safety Occurrences during On-the-Job Training on Page 10.

The EUROCONTROL Level Bust Toolkit has been developed as a result of the EUROCONTROL Level Bust Initiative. It contains much important information and advice to help combat the level bust threat. The EUROCONTROL Level Bust Toolkit may be obtained on CD ROM by contacting the Coordinator Safety Improvements Initiative, Mr Tzvetomir Blajev, on tel: +32 (02) 729 3965 fax: +32 (02) 729 9082 tzvetomir.blajev@eurocontrol.int.

⁸ See ICAO Doc 8168 - Procedures for Air Navigation Services - Operations (PANS-OPS)