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In this issue

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www.bea-fr.org
www.bst.gc.ca
www.bfu-web.de
www.aaib.gov.uk
www.atsb.gov.au

Editorial

In November 1996, the worst mid-air collision in aviation history occurred near New Delhi, India, in which two titans- a Boeing 747 and an Ilyushin IL-76 collided killing 349 persons on board. This accident was caused by a classical level bust incident.

In this issue, we discuss level busts, their criticality and the means of preventing them.

We have been talking about runway incursions. We have some news on the developments at airports for prevention of incursions.

As always, we look forward to your feed-back, suggestions and contributions which can be sent to our office address given in this page. Happy reading and many more safe landings.

Mid-air Collision at Charki Dadri

On November 12,1996, at about 6:30 pm local time, a Saudi Arabian Boeing 747-100 (Flight SV-763) with 312 onboard, took off from Indira Gandhi International Airport, New Delhi on a scheduled flight to Dhahran. At the same time, a Kazakhstan Airlines Ilushin-76 (Flight KZA-1907) on a non-scheduled flight from Chimkent, Kazakhstan with 37 onboard, was on approach to land at New Delhi airport.

After takeoff from New Delhi, Delhi approach had instructed the Saudi jet to climb and maintain FL-140(14,000 ft). The Kazakh jet had been instructed by Delhi approach to descend and maintain FL-150(15,000 ft).

Suddenly at 6:40 pm local time, the blips of the two aircraft disappeared from the radar screen, as the two aircraft had collided. The collision occurred over Charki Dadri, a village 80 km west of New Delhi, in Haryana. Two balls of flame plummeted toward Earth, spewing streams of black smoke. The fuselage of the Saudi airliner dug a trench about 180ft long and 15ft deep into unplanted farmland. The Kazakh plane fell in Birhod village, about seven miles from here.

A U.S. C-141 cargo plane was on approach to the New Delhi airport, on a support mission for the U.S. embassy. The pilot saw the accident from just below 20,000 ft, about 50 miles northwest of the Indira Gandhi International Airport. The pilot describes the mid-air collision: "We noticed out of our right hand side a large cloud lit up with an orange glow, from within or below the cloud, we are not sure. At first we thought it would be lightning, which is very common, but the glow stayed and became brighter in intensity, and lit up the area very bright, so we ruled out lightning." The officer then described watching the two fireballs descending to earth. The pilot said it was dusk at the time, and said he observed "no weather" and only routine traffic in the area. "You could begin to see the lights of the cities - a typical evening."

The two planes were at a distance of 13 miles at the time of the last communication with the ATC. Since the Kazakh commander had been appraised of the position of the Saudia Boeing 747, the reason for the collision remains unanswered. The ATC had informed the Kazakh IL-76 pilot that a Saudia airliner was flying at “12 o'clock'' position at 14 miles latitudinal distance.

Saudi Arabian Airlines Boeing 747-186B

Kazakhstan Airlines IL-76

Indian government ordered a court of inquiry to looking into the accident.

Two years later in 1998, the court of Inquiry blamed the Kazakh pilot, Commander Gennady Cherapanov and exonerated the Saudia crew of any fault. The Kazakh Airlines pilot's failure to understand instructions from air controllers was one of the main causes of collision, the investigation concluded. Even though the Inquiry was very critical of air traffic control co-ordination in India in general, it found that correct instructions were given to both aircraft before they hit each other head-on. The report said *"the root and approximate cause of the collision was the unauthorized descending by the Kazakh aircraft to FL-140 and failure to maintain the assigned FL-150."*

The Kazakh Airlines aircraft was instructed by air traffic control to descend to FL-150 but was flying instead at FL-140, which was the altitude assigned to the departing Saudi Arabian flight. Vertical separation of 1,000 ft for the crossing of the two aircraft as assigned by the Delhi Air Traffic Control was adequate and met the ICAO standards of safety, the report pointed out. It also said that turbulence in a cloud layer encountered by both planes 30 seconds before the accident were not severe enough to cause the Kazakh plane to drop from FL-150 to FL-140, as had been argued by Kazakh Airlines shortly after the accident.

Among the factors contributing to the unauthorized descent of the Kazakh aircraft, the report cited the pilot's *"inadequate knowledge of English language,"* which resulted in misinterpretation of air traffic controllers' instructions. The report also charged the Kazakh pilots with "poor airmanship," lack of proper crew resource management skills on the part of the pilot-in-command and the *"casual attitude of the crew."*

The investigation report noted that there was no secondary surveillance radar in New Delhi, and said that although the airport's single air corridor did not contribute to the accident, unilateral routes would enhance traffic handling capacity. It also noted that neither plane was equipped with airborne collision avoidance systems, not obligatory under Indian civil aviation law at that time.

Level Busts

Dr.M.S.Rajamurthy

The Charki Dadri midair collision discussed above exemplifies the impact of non-adherence to assigned flight level on flight safety and the tragic consequences.

Level busts are a global phenomenon and is of growing concern to the industry. Unlike the Charki Dadri accident, Level busts rarely result in mid-air-collision, but many CFIT accidents are also the result of level bust.

Statistics indicate that once in every half hour, somewhere in the world, an aircraft is busting a cleared level. Once each day, the loss of separation results in aircraft passing within a mile of each other. Level busts are two to three times more than those reported. While bust events are 1.01per1000 departures in Europe, corresponding figures for America and Africa are 1.17 and 1.65 respectively.

LEVEL BUST DEFINITION:

A Level Bust is defined as *any deviation of 300 ft or more from the assigned level.*

As per Eurocontrol (HEIDI- Harmonization of European Incident Definition Initiative for ATM) Level bust is *"Any unauthorized vertical deviation of more than 300 ft from an ATC flight clearance" In case of RVSM vertical deviation should be within 200ft.*

Level bust can take one of following three forms:

1. An aircraft in level flight climbs or descends without clearance.

2. An aircraft climbing or descending fails to level off accurately at the correct level (either passing through and continuing the climb or descent, or passing through and then returning to the correct level) (see figures below).

3. An aircraft leveling off at the correct level or altitude, but with an incorrect altimeter setting.

LEVEL BUST RISK FACTORS:

The risk factors associated with Level busts can be categorized as follows.

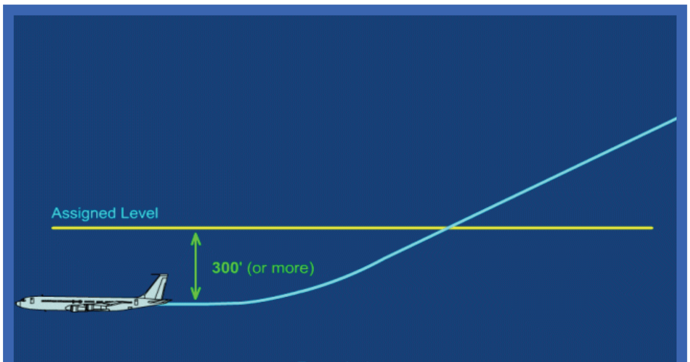
1.Airspace and procedures

Complex multi-level SID and/or STAR, Low level off altitudes in SIDs, Sectors design forcing stepped profiles, Complex & non-standard charts design will all increase the opportunities for busting levels.

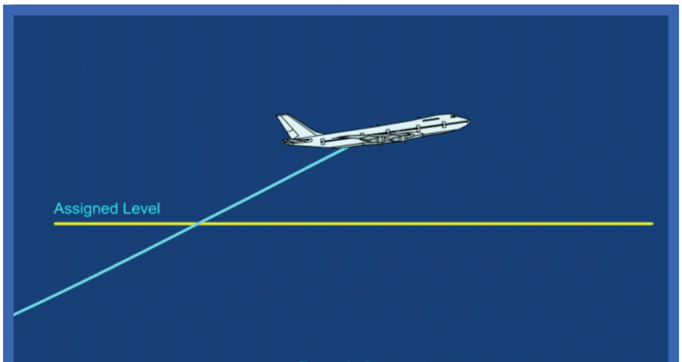
Departure routes beneath Arrival routings and Holds, and Arrival routes above departure routings increase potential consequences.

2.Crew Preparation

- Incomplete briefings present opportunities to forget clearances
- Low QNH reduces the level-off room



Example 1
Aircraft climbs or descends through assigned level, and levels off



Example 2
Aircraft climbs or descends through assigned level, and continues climb/descent

• Adverse weather on departure/arrival gets the crew to thinking horizontally
• Inadequate route planning & NOTAM services means crew might miss recent changes to departure/arrival airspace
• No formal training on level bust avoidance will impact level bust risks and defenses
• Not encouraging reporting of level bust decreases awareness of level bust incident rates.

3. **Air Ground Communications**

Confusion and miscommunication is more likely when:
• Headsets are not being worn
• Only one pilot is listening to and recording clearances
• Unfamiliar languages are used (air-ground, or in cockpit)
• Non-standard RTF is used
• Multiple clearances are issued
•There are undetected simultaneous transmissions
• Aircraft on frequency with similar call-signs
•Many and frequent level changes issued by ATC
• ATC clearances are issued late

4. **Deviation from SOPs**

• No altitude call-outs ("passing" and "Xft to go")
• No altimeter setting cross-checks or monitoring undertaken
• Reliance on manual level-capture
• High rates of climb and descent employed within last 1500ft
• Addressing unnecessary cabin issues below 10,000ft

5. **Not working together**

Teamwork can fail when:
• CRM/TRM skills are not applied
• Operating under stress (personal, operational, or commercial)
• There is distraction
• High workload is demanded

6. **Aircraft**

• Autopilot failure to capture the selected altitude
• Altitude keeping performance

LEVEL BUST EXAMPLES

1.**Weather:** On climb out from Brussels, one aircraft encountered heavy rain and updraft during level off causing altitude deviation of 230 ft.

2. **Call sign confusion by ATC**: During climb from FL310 to FL330 flight 478 was recleared to FL370, which was read back and accepted. Passing FL350, ATC requested maintain FL330 and advised that clearance to climb should have been for flight 578.

3. **Call sign confusion by crew:** On climb out from Glasgow, a crew thought their aircraft had been cleared from FL70 to FL140 and read back the clearance. On passing FL78, ATC told the crew to stop at FL80, informing them that they had taken someone else's clearance.

4. **Flight deck workload:** Approaching Munich, a flight was informed of a change to landing runway and cleared to descend to 4000 ft on intercept heading. The crew descended through 3700ft before climbing to 4000 ft.

5. **Autopilot failure:** On one flight descending to FL130,the autopilot failed to level the aircraft. The autopilot was disconnected and aircraft leveled at FL126.

6. **Incorrect altimeter setting/flight deck workload:** Departing London Heathrow, an aircraft was cleared to 6000 ft (QNH 988). The crew requested climb to avoid weather and were cleared to FL120. Approaching level-off, the crew received a TCAS RA "Descend". When clear of the conflicting traffic, the crew realized that they had forgotten to set standard pressure setting. The traffic had passed 700 ft above them. (in this situation 12,000 ft was actually FL127)

7. **Clearance misheard:** Approaching Vienna, an aircraft was cleared to descend to 3000 ft for the ILS 29. The Pilot misheard the clearance and selected 2000 ft on the MCP. The aircraft descended 600 ft below assigned altitude before climbing back to 3000 ft.

8. **Late reclearance:** An aircraft was cleared by Lisbon to descend to FL270 and subsequently recleared to stop descent at FL300 whilst passing FL302 with a high rate of descent. The aircraft was leveled by FL298.

A study by Air France found that there were 3 –4 causal factors leading to level bust and that the absence of only one of these factors makes the accident nearly impossible! They also found that the human Factors was the main causal factor for level bust.

Much has already been done to reduce the number of Level Busts by making crews more aware of the dangers, by promoting good CRM (Crew Resources Management) and promoting SOPs, system design and communications procedures. All these minimize the chance of a Level Bust and mitigate the risk of one leading to an accident.

Improved radar coverage and improvements in secondary radar and ATM, coupled with widespread use of Aircraft collision Avoidance Systems (ACAS), have also reduced the risk of a level bust.

However, despite these efforts, the incidence of Level Bust is still unacceptable in an industry striving to reduce accident rates.

RECOMMENDATIONS:

Studies have led to the following recommendations for operators and the Air traffic controllers for preventing level bust.

Operators:

- SOPs
- Reduce flight deck workload by avoiding all activity not directly related to the safe conduct of flight (during climb and descent)
- Ensure clear procedures for altimeter cross-checking and approaching level calls
- Always confirm a clearance if any doubt exists
- Always report the level cleared to when checking in on a new frequency while in climb or descent
- Always follow TCAS RAs

Air Traffic controllers:

- SOPs - Avoid giving heading and height clearance in the same transmission
- Radio Phraseology

–Use ICAO standard phraseology
– Use standard phraseology "flight level one hundred" to refer to FL100
–Use the word "degrees" after all headings
–Improve the level of safety reporting

REFERENCES:

1. "Reducing Level bust" "seeking solutions today for tomorrow's challenges", Safe management, Eurocontrol, Nov.2002
2. Level Bust—risk factors, Eurocontrol 2007
3. Level Bust—posters, Eurocontrol 2007

Runway Incursion Prevention Technologies

On April 1, 2008, Washington Dulles became the 12th U.S. airport to get ASDE-X system to give tower ground controllers a more complete picture of ground movements to help them prevent runway incursions among other benefits.

ASDE-X is the acronym for Airport Surface Detection Equipment - model X, ASDE-X fuses ground surveillance data collected from a number of sources, including radar, Automatic Dependent Surveillance – Broadcast (ADS-B) and aircraft transponder multilateration, to provide air traffic controllers with a real-time, highly accurate location and identity of all aircraft and vehicles on the airport surface. Additionally, the system's advanced conflict detection and alerting technology, Safety Logic, uses complex algorithms to detect and alert controllers to potential aircraft and vehicle incursion situations. It presents the resulting information graphically on color monitors located in the tower.

FAA has awarded the ASDE-X contract to Sensis to install at 35 airports across the U.S.

For customers outside U.S., Sensis has a solution similar to ASDE-X called A-SMGCS. Advanced- Surface Movement Guidance & Control System (A-SMGCS) is a comprehensive system that fuses the data from several surveillance sources to provide a complete picture of the airport surface. Sensis A-SMGCS is operational at Indira Gandhi International Airport, New Delhi, India and is being deployed at Brisbane, Melbourne and Sydney Airports, Australia and at Hong Kong International Airport, China.

The FAA and the Massachusetts Port Authority (Massport) have partnered to install runway status lights at Boston Logan to test the technology's ability to warn pilots about potential runway incursions. Boston will be the first location in the country to test the status lights for intersecting runways.

The Runway Status lights system uses a series of red lights embedded in the pavement to warn pilots if it is unsafe to cross or enter a runway. Pilots approaching an equipped runway will see red lights illuminated if the airport's ground surveillance radar detects traffic on or approaching that runway. Clearance to cross or enter will be given by controllers in the usual way, and pilots must verify their clearance before proceeding even after the warning lights are no longer illuminated. The lights are used by surface vehicle operators in the same way.

The lights are in place at Dallas/Fort Worth & San Diego at non-intersecting runways, where they have been proved to work without reducing capacity or increasing controller workload.

The concept for the status lights was developed at the Massachusetts Institute of Technology's Lincoln Laboratory.

Web Watch

http://www.eurocontrol.int/safety/gallery/content/public/Level_bust/menuindex.html
The Level Bust Tool Kit can be downloaded from this site. It has considerable detail of relevance to the pilot community, as well as other agencies and players who make our business a safe one. A must for the flight deck crew.

PHOTO OF THE MONTH

Heart stopping takeoff!!

Phuket, Thailand, January 10, 2006.

A Vaso Airlines Ilyushin IL-86 takes off with hardly any runway left.

See where the 1000 ft marker sign is and where the plane is! No more runway left means "must rotate!" The pilots know exactly where to rotate!!

The Confidential Aviation Hazard Reporting System (CAHRS) provides a means of reporting hazards and risks in the aviation system before there is loss of life, injury or damage. It is open to anyone who wishes to submit a hazard report or safety deficiencies confidentially and non-punitively. Reports help to identify deficiencies and provide safety enhancement in areas of aviation. CAHRS forms can be collected at different location of KAC (i.e. Flight Dispatch) Premises. Completed forms can be dropped in FS&QA allocated box at Flight Dispatch or e-mailed to kwioeku@kuwaitairways.com or faxed to 00965-4749823 or mail to Flight Safety and Quality Assurance office, Operations Department, P.O. Box 394, Safat 13004, Kuwait Airways –Kuwait.