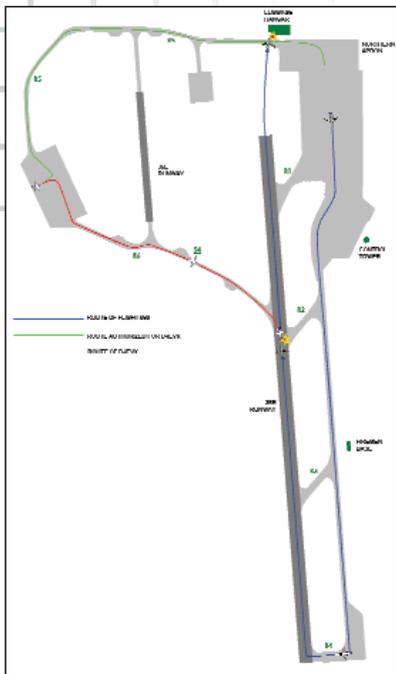


GROUND COLLISION ON THE ACTIVE RUNWAY



The Linate Airport disaster remains Italy's deadliest air accident, caused by a number of nonfunctioning and nonconforming safety standards and procedures at the airport. **Michael R. Grüniger and Capt. Carl C. Norgren** analyze the causes and general precautions for preventing runway incursions



In the morning of October 8th, 2001, Milan was covered by a thick layer of dense fog. This is not uncommon in the lowlands of the river Po.

The Cessna Citation Jet 525-A registered D-IEVX was taxiing through dense fog at Milano Linate. It was early in the morning and the crew had arrived from Cologne to pick up two passengers for a short flight to Paris Le Bourget. Low visibility procedures were in place. The arrival and departure traffic was heavy and the fog was slowing down operations during an already busy morning.

During the approach, the Runway Visual Range (RVR) reported that runway 36R was 175 / 200 / 225 meters at touchdown, mid-point and stop-end respectively. Even though the crew were only qualified for Instrument Landing System (ILS) Category (CAT) I operations, they had continued the approach and completed a successful landing.

Finding their way along Linate's taxiways was not an easy task. After vacating runway 36R the crew of D-

IEVX proceeded on taxiway R6 to the parking on the General Aviation Apron located west of the runway. The turn-around was expeditious. After the engine start, the D-IEVX received clearance to taxi. "DeltaVictorXray taxi north via Romeo 5, QNH 1013, call me back at the stop bar of the....main runway extension." The crew read back: "Roger via Romeo 5 and ...1013, and call you before reaching main runway."

The controller did not react to the small, but critical omissions in the read-back. The word 'north' was missing as well as the word 'extension'. Both of these words did probably not fit the flight crew's mental model. Taxiing via R5 meant taxiing 'the long way around', not the shortest and most expeditious route to the threshold of the departure runway 36R.

D-IEVX left the General Aviation apron. But instead of following R5 to the north, the crew followed R6 to the east. This was the shortest route and it was also the same taxiway they had arrived on.

D-IEVX reported "approaching Sierra 4," as marked on the taxiway. When the controller asked for clarification, the flight crew of D-IEVX responded: "Approaching the runway...Sierra 4." The Controller assumed D-IEVX was holding short of runway 36R on R5. He did not question the designator Sierra 4 as this designator was not normally used by the ground controllers. D-IEVX was in fact on R6.

After clarifying that no other traffic was a factor on the main apron, the ground controller cleared D-IEVX to "continue the taxi to the Main Apron, follow the Alpha Line." The flight crew replied: "Roger continue the taxi in the main apron, Alpha Line."

While on the ground frequency, D-IEVX proceeded to cross the active runway at the R6 intersection. At this moment, the Cessna entered the active runway. A runway incursion was the result.

At the same time, on the tower frequency, a Scandinavian Air Lines MD-87 was given take-off clearance on runway 36R. The RVR readings were 225 / 200 / 175 meters respectively.

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A map of Linate Airport showing the paths of the two aircraft (left). The Cessna Citation Jet and SAS MD-87 involved in the crash (right).

As the MD-87 rotated, it struck D-IEVX with a speed of 146 knots. The Citation Jet was crushed and ripped into three parts as the right hand main landing gear of the MD-87 sliced through the Citation Jet. The Citation was engulfed in fire and the two pilots as well as two passengers perished.

The MD-87 became airborne for a short while, but having lost the right-hand engine and ingested debris in the left-hand engine, the aircraft could not remain airborne. It slid along the runway and crashed into a baggage handling building, causing it to collapse. All 6 crew members, 104 passengers and 4 baggage handlers perished in the ensuing fire.

How could such a tragic accident happen? There were no technical failures. The investigation was long and detailed. This Safety Sense focuses on some aspects related to the runway incursion.

When Fog Makes Us Blind

Without a ground movement radar, the ATC controllers at Linate relied on procedural separation of aircraft on the ground. The spectacular view from the large windows in the tower was useless in foggy conditions. The controllers might as well have been below on the ground or on the other side of the planet. The radio was their only means of controlling and tracking aircraft movements. The controllers had to rely on verbal communication with the flight crews. Position reports could not be verified. The fog made the controllers blind, but not deaf, at least for the traffic on their frequency.

Although fog is not an unusual weather occurrence in Linate, the low visibility procedures were found to be weak. When fog makes controllers and pilots blind, the radio communication is the only way to coordinate ground movements. Communications must be standardized and precise.

Signals and signs must be clear and beyond doubt. The signage was found to be incomplete, in bad condition and not conforming to ICAO standards. Designators were painted on taxiways which were not known to the controllers and not published in the AIP. Taxi instructions contained descriptions and names which were not officially published in the AIP and which were of no value to non-local flight crews.

Red stop bars were permanently on and could not be turned off. Green taxiway centerline lights were permanently on. These deficiencies reduced the effectiveness of communications and caused many clues to be missed both by the ground controller and the flight crew. Each one could have saved the day. But all of them together resulted in tragedy.

When Radio Sectors Make Us Deaf

The separation of the ground controller and the tower controller frequencies left the crew of D-IEVX ignorant of the take-off clearance of the MD-87. Had they been on the same frequency, the crew of D-IEVX might have realized the danger and questioned their perceived clearance to cross the runway.

In addition to being blind due to the fog, the crew of D-IEVX was partially deaf because of the separation of radio frequencies in Linate.

When Italian and English are Spoken Together on the Same Frequency

Other aircraft were receiving taxi clearances in Italian. Such clearances included reference to D-IEVX. For the flight crew of D-IEVX, these instructions were of little meaning. Had they understood them, the crew might have questioned their actions, as they did not match the instructions given to other aircraft.

In an international context, with German crew members communicating with Italian ATC controllers in English, transmissions in the local language removed one layer of safety.

When Commercial Pressures Make Us Bend the Rules

Why the flight crew of D-IEVX decided to land in and planned to take-off from Linate that morning we will never know. The operator, the crew and the aircraft were limited to ILS CAT I operations. With RVR values around 200 meters, they were well below the 550 meters required for ILS CAT I. The aircraft should not have landed and should not have taken off in such weather conditions. Had the crew been trained to operate in low visibility conditions, they might have acted differently. 'Mission bias' probably caused them to bend the rules and they ended up weather outside their comfort zone.

The European Action Plan for the Prevention of Runway Incursions includes the following recommendations:

- Ensure that flight deck procedures contain a requirement for explicit clearances to cross any runway.
- Promote best practices for pilots' planning of ground operations.
- Pilots must be made aware of current safety significant airport information.
- If pilots have any doubts as to their exact position on the surface of an aerodrome, they should contact ATC.
- Aerodrome charts should be displayed on the flight deck during taxi. This includes when operating at the home aerodrome.
- Implement, monitor and ensure the use of the readback procedure.
- Where practicable, improve situational awareness by implementing procedures whereby all communications associated with runway operations are on a common or cross-coupled frequency.

Source:

<https://www.eurocontrol.int/publications/european-action-plan-prevention-runway-incursions-eappri-v30>

Runway Incursion Must Be Prevented

Presently, two runway incursions occur in Europe every day. The European Aviation Safety Agency (EASA) as well as all major stakeholders of the aviation industry are aware of this aviation hazard and find that the related risks are unacceptable. The European Stakeholders have launched an Action Plan to Prevent Runway Incursions (EAPPRI).

It goes without saying that the EAPPRI's and other recommendations need to be taken seriously and implemented by aircraft and aerodrome operators. Even more so when low visibility prevails.



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