Join the Safety Forum

FLIGHT SAFETY FOUNDATION
independent • impartial • international

era
european regions airline association

EUROCONTROL

Airborne Conflict

Presented by The Flight Safety Foundation, The European Regions Airline Association, and EUROCONTROL.

Serves as a Flight Safety Foundation Regional Aviation Safety Seminar

10 & 11 June 2014

EUROCONTROL Headquarters, Brussels

Share your ideas, suggestions for presentations or reserve your place of the Forum now by sending an email to:

tzvetomir.blajev@eurocontrol.int

Loss of separation

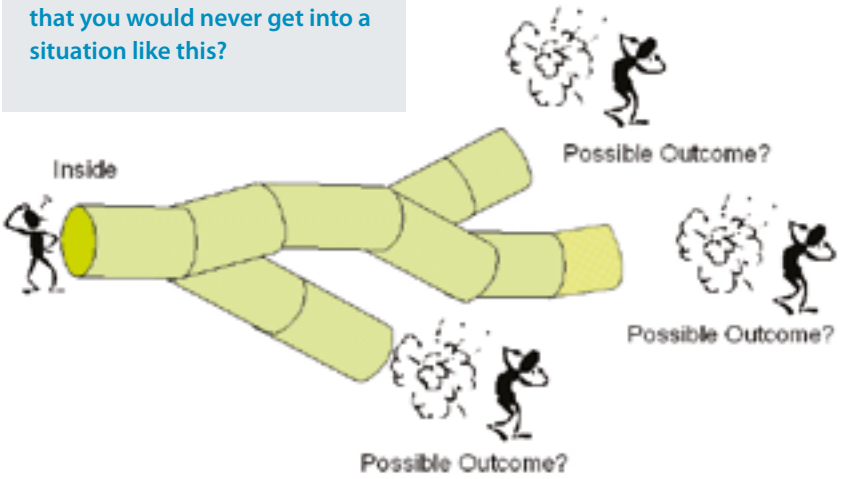
Editorial note: The situational examples have been based on the experience of the authors and do not represent either a particular historical event or a full description of such an event. The scenarios are rather exemplified facts aligned to illustrate operational safety and human performance considerations.

▸▸ page 84

Loss of separation (cont'd)

THE FACTS

Read the story as it develops, position yourself in the context without knowing the actual outcome. How confident are you that you would never get into a situation like this?



The operations room of the Area Control Centre where you work as a radar controller is gradually becoming quieter as traffic decreases at the end of the day. You're beginning of a night shift, and you're responsible for all traffic in an area that in daytime conditions is split into several sectors.

There is one other controller on duty with you during the night, plus one assistant controller. The other controller is not in the operations room however as, in keeping with local practice, that controller will be taking a rest break for most of the night until traffic numbers begin to pick up again towards the end of the shift.

What is the staffing situation in your ATC unit during night shifts?

A few minutes after the supervisor from the afternoon shift has left the operations room to go home, a technician approaches your work station and asks approval to start with maintenance work that is planned for this night. You remember that the supervisor mentioned something about scheduled maintenance before he left, so you tell the technician that they can start with the work. The technician subsequently instructs you to switch to the back-up mode of the ATC system, which you do.

You are aware that in the back-up mode you don't have all system functionalities available (compared to the normal operational mode), but as you've worked in back-up mode on other occasions without any difficulties you're not concerned about the situation at all. The main thing you need to remember is that when in back-up mode increased horizontal separation must be applied.

Are you aware of the consequences of working in back-up mode(s) at your work place?

While handling the last of the regular late flights in your area, the technician comes up again and asks if they now also can start working on the telephone system that you use to communicate and coordinate with other ATC units. You realise that in the next few minutes you'll need to use that system for a couple of routine hand-over co-ordinations with controllers in adjacent centres.

What would you do?

You explain to the technician that you need to use the telephone system for another five minutes or so, and ask him to come back later. He agrees to do so and you continue to handle your traffic. When the technician returns a little later, you don't have any more imminent co-ordinations to do so you give him permission to start work on the telephone system.

After a little while you receive details about a delayed flight inbound to a regional airport located in (or rather under) your airspace. In day time, traffic to that airport is handled at a dedicated working position because of the limited manoeuvring space for the interception of the ILS. You are familiar with the procedures but you never have handled an aircraft going to that airport during night hours.

What would you do?

You adjust a radar display at an adjacent working position in a way that will allow you to vector the aircraft to

the ILS for the regional airport. You also select the appropriate frequency for the communication with that aircraft. This means you'll have to divide your attention over two radar displays, and communicate with aircraft at two different working positions, during the approach of the delayed aircraft but since you expect only two aircraft in your high-level sector at that time it doesn't look like a problem to you.

You decide to make a telephone call to the Tower at the regional airport to coordinate about the inbound flight. The phone line appears to be unserviceable however, which makes you realise that this must be a consequence of the maintenance activities you approved a little earlier.

The first aircraft checks in at your main working position and you clear it to continue its climb to its requested flight level. The pilots correctly acknowledge the climb clearance, after which there is no further communication necessary with this flight. You turn your attention again to the coordination with the regional airport, this time using the telephone back-up system. To your surprise you hear a recorded message in the local language that tells you that the connection cannot be made and that you should check the number you're trying to reach.

What would you think?

You ask the assistant controller to go and look up the correct number for the Tower at the regional airport. The aircraft inbound to that airport checks in on the frequency at the adjacent working position, and just when you're moving over there the second aircraft that you were expecting checks in on the frequency at your main working position. You tell the aircraft at the adjacent position to stand by, and you move back to reply to the other aircraft which reports at the same flight level as the first flight at this working position.

Because of the back-up mode limitations, the new aircraft isn't displayed with a data label on your screen yet so you tell the pilots to change their transponder code (which will allow you to manually attach a label once the code is received). After the instruction is acknowledged you switch to the adjacent display to reply to the aircraft inbound the regional airport. You tell them what runway to expect, that it will be an ILS approach, and you clear them to continue their descent to an intermediate flight level.

Meanwhile the assistant controller has returned with the phone number for the Tower at the regional airport. In the back-up mode of the telephone system you manually dial this number, after which you hear the same recorded message as before.

What would you do?

You briefly consider asking a controller at an adjacent centre to do the coordination with the regional airport on your behalf, but since this would require the use of the same telephone system that seems to be letting you down you decide against it. Instead you ask the pilot of the inbound flight to do the coordination with the tower on your behalf on his second radio set, to which the pilot agrees. You subsequently clear the aircraft for further descent.

Next you switch your attention back to the display at your main working position, and you notice to your surprise that the two aircraft you have there are on converging tracks at the same flight level, and that the distance between them is close to the minimum you can apply in the back-up mode.

What would you do?

You instruct one of the aircraft to descend to a lower flight level. There is no immediate reply, so you once again instruct the aircraft to descend and you tell them to expedite. This is acknowledged by the crew and you provide traffic information about the conflicting aircraft while you see on your display that the aircraft indeed is starting to descend. You're satisfied that the conflict is resolved.

What would you think?

At the other working position there is a call from the aircraft inbound to the regional airport. You move to that working position, and you vaguely register an unidentified noise from the speaker at your main position.

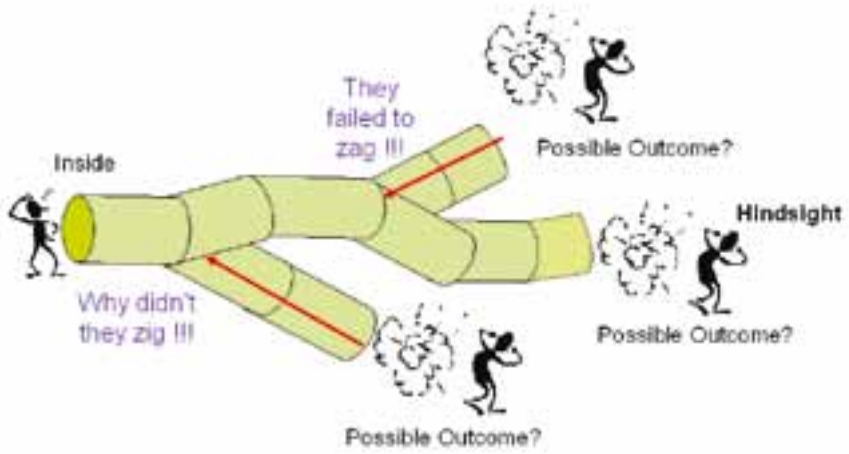
The inbound aircraft reports being in positive contact with the Tower at the regional airport, so you clear them for further descent and for the ILS approach procedure. While the crew acknowledges those clearances you again notice some noises from the speaker at the main working position.

You transfer the inbound aircraft to the Tower at the regional airport and you now turn your full attention again to the traffic at your main working position. You're surprised to see only one fading radar return, and your calls to the aircraft remain unanswered.

Loss of separation (cont'd)

DATA, DISCUSSION AND HUMAN FACTORS

This section is based on factors that were identified in the investigation of this occurrence. Read the story knowing the actual outcome. Reflect on your own and others' thoughts about the case, and see how easily these might become judgmental with hindsight. Can you offer an alternative analysis?



Factors that were identified in the investigation of this occurrence included:

Single controller on duty. Although it was not an official procedure, it was common practice at the facility concerned to operate during night hours with only one controller in the operations room.

The facility managers were aware of this practice and tolerated it, for it made it easier for their staff to cope with night shifts.

The controller had worked like this in several other night shifts and he was quite happy to do so again on the night of the occurrence.

The single controller operations were tolerated on the assumption that the lack of controller redundancy would be compensated by an automated safety feature (Short Term Conflict Alert) integrated in the radar data processing system that was the heart of the controller's traffic display.

This safety feature however was not functioning at the time of the occurrence, as a consequence of the maintenance work.

The controller did not know this.

Maintenance work. The maintenance work was related to the upcoming implementation of a different structure of the sectors in the ACC's airspace, and had been scheduled for that particular night. Since it was considered a major change to the existing system configuration, more technical staff than normal were present in the operations room to assist with the maintenance activities.

This included a Systems Supervisor, who would not normally be present during a night shift (even if there was planned maintenance), and a controller with a technical management role in the maintenance process.

The presence of those two individuals was not known to the controller on duty in the operations room.

He therefore couldn't consider calling for their assistance when the problem with the back-up telephone system was developing.

Briefing materials. The controller had not read the available self-briefing document pertaining to the maintenance work before starting his shift.

The document contained little more than the announcement that there would be maintenance work during that night. There was no information concerning the implications for the ATC system, e.g. that the Short Term Conflict Alert would be unavailable, or that the automatic correlation between the radar data and the flight plan data (labels) would be lost.

This means that the fact that the controller did not read the briefing document had little or no bearing on the developments later that night.

The outgoing supervisor had not provided any information about the consequences for the ATC system, and had not informed the controller about the simultaneous maintenance work on the telephone system. He also didn't mention that there would be a Systems Supervisor and a technical management controller present in the operations room to assist with the maintenance work during the night.

Training on back-up mode operations. The controller was not familiar with the features of the back-up mode, e.g. what systems or system components would not be available compared to the normal mode. In fact most other controllers at the facility were equally unfamiliar with this.

It was established that there had been no formal training provided for working in the back-up mode at the facility.

Traffic to the regional airport. It was unusual that there was traffic for the regional airport that late in the evening. The flight had experienced a delay but was now on its way to the airport, which was its final destination.

The controller had received no prior information about this flight, so he couldn't take it into consideration when allowing the other controller to leave the operations room.

The controller set up the radar display at an adjacent working position in order to handle the aircraft according the normal procedures for the regional airport. He also selected the appropriate communication frequency at that working position. The distance between the two working positions was just over one metre.

The facility procedures stipulated that a dedicated controller should handle the traffic for the regional airport, but in view of the low amount of traffic the controller didn't arrange for the second controller to return to the operations room.

Because the approach procedure needed to be coordinated with the Tower at the regional airport, the controller wanted to contact the Tower by using his telephone system.

Telephone system. When the controller first attempted to reach the Tower at the regional airport, he used the telephone system that he had released for maintenance work shortly before.

The controller remembered that maintenance was in progress on the telephone system, so he correctly used a back-up function of the same system to try and call the regional airport.

For this function he had to work his way through several menu layers of the telephone system display screen.

The telephone system had been introduced a few years earlier and in the controller's experience it had always functioned well. He therefore considered it a reliable system.

Loss of separation (cont'd)

Unknown to the controller however, or to anyone else in the organisation, there was a flaw in the telephone system software that caused a discrepancy in the numbers being dialled (or more correctly in the frequency of the tones generated by the system which correspond with numbers).

The number that was programmed for the regional airport in the system was correct, but because of the software flaw the number that was actually contacted was a wrong one. The response from that number was the recorded message advising the caller to verify the number.

When the controller later manually selected the (again correct) number for the regional airport, the software flaw in the telephone system led to the same result.

The controller could have used a cell phone at the desk of the supervisor to contact the regional airport, but he was not aware of this option.

DATA, DISCUSSION AND HUMAN FACTORS

Note: This section is offered as an alternative way of analysing the occurrence. Key words from the Human Error in ATM (HERA) methodology are presented with a brief explanation of how they relate to the occurrence.

Lack of knowledge. The controller did not have all required knowledge about the consequences of working in the back-up mode. He furthermore did not know that potentially useful support staff was present in the operations room.

Risk recognition failure. As a direct result of his lack of knowledge about the consequences of working in the back-up mode, the controller was unable to recognise the risks associated with operating a second working position.

Preoccupation. When the first attempts to communicate with the Tower at the regional airport were unsuccessful, the controller became preoccupied with solving that problem. Consequently he gave less attention to other tasks. (Note: this phenomenon is also known as "tunnel vision".)

Monitoring failure. While busy vectoring the delayed aircraft to the regional airport, and while working to solve the communication problem with the Tower at the regional airport, the controller didn't adequately monitor the traffic on his main display.

Incorrect assumption. When the controller saw that the aircraft he ordered to descend was actually doing so, he incorrectly assumed that the conflict with the other aircraft was resolved.

Spatial confusion. When providing traffic information to the descending aircraft about the position of the conflicting aircraft, the controller used "two o'clock" where it should have been "ten o'clock". This particular confusion is not uncommon for persons in stressful situations.

Contextual conditions (in no particular order).

- Poor briefing materials
- Unfamiliar task in routine operations
- Inadequate recurrent training
- Alarms/alerts – unavailable
- Maintenance work on multiple systems
- Single controller night shift operation

- Management decisions in staffing and facilities
- Management decisions in safety policies
- Support from other units

Prevention strategies and safety barriers

If the controllers at the facility where the event took place had received a more thorough training on the consequences of working in the back-up mode of the ATC system, it would have been easier for the controller to recognise the risk posed by the combined conditions that night.

The ANSP should have had a policy in place governing maintenance work on multiple operational systems at the same time. A simple yet effective countermeasure would be to have a minimum of two controllers present in the operations room at all times during such periods.

If safety net functions of the ATC system (e.g. STCA) are temporarily not available, controllers should be made aware of this at their working position in a clear and direct manner.

Whenever an ATS unit is conducting planned maintenance activities that involve operations in a back-up mode, all adjacent units should be notified in advance. Communication plans should be in place (and tested!) to enable coordination between the units during the period of maintenance.

KEY POINTS

The consequences of performing maintenance work on multiple systems during a night shift were not fully understood at the organisational level. This resulted in a situation where a single controller in the operations room had to find a work-around for an unexpected problem, which prevented him from allocating sufficient attention to the traffic situation.

Although the controller thought he had adequately resolved a conflict between two aircraft at the same level, unbeknown to him it had required a TCAS Resolution Advisory to be triggered onboard both aircraft to ensure safe separation. One of the crews responded to the Resolution Advisory while the other crew followed the controller's instruction. This resulted in both aircraft descending towards the same point in space where they arrived at the same time.

This scenario highlights the importance of:

- **a cautious approach with respect to maintenance activities on operational systems;**
- **minimising single controller operations;**
- **recognising the safety implications of changing circumstances;**
- **avoiding assumptions.**