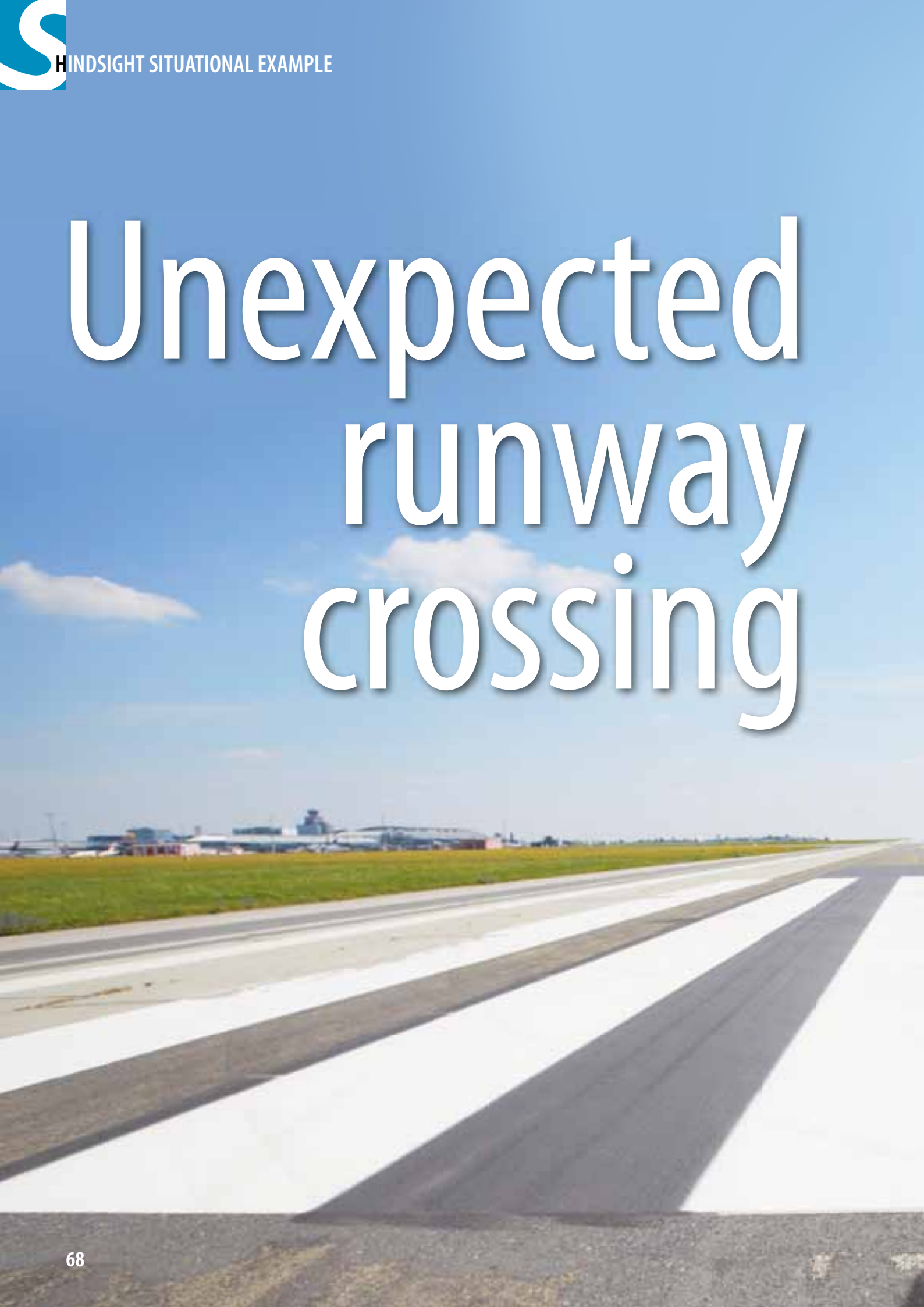
Unexpected runway crossing



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.

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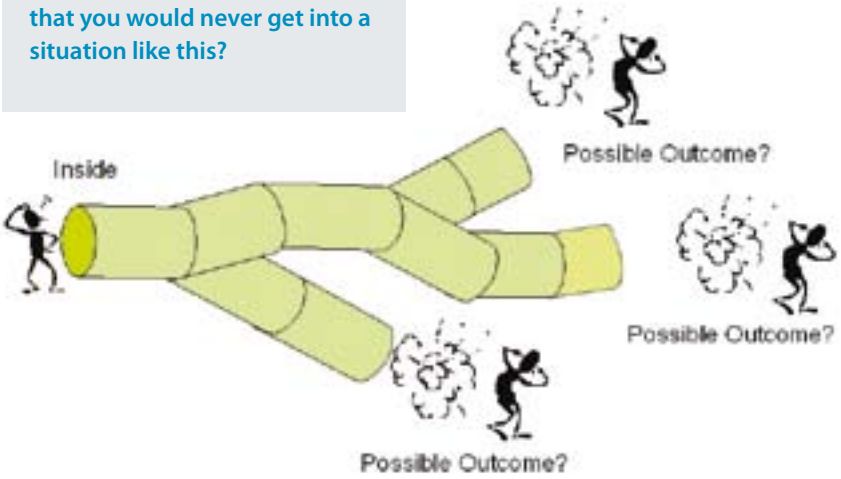
THE FACTS

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?



You're a controller in an Air Traffic Control tower at a busy regional airport. You're part of a three-person team, comprising a controller with responsibility for traffic taking off and landing on the runway, a controller (you) with responsibility for all ground traffic and an assistant controller in a supporting role to both controllers.

The airport where you work has one runway, one main terminal and several other aprons used for aircraft handling and parking. The view of the runway and the terminal area from the control tower is good. Also, most of the taxiways to and from the various aprons can be observed without difficulty.

The exception is taxiway Yankee, connecting one of the aprons with runway intersection Yankee and leading over a high point in the terrain and the part beyond the high point is not visible from the tower. Traffic in either direction on taxiway Yankee is also unable to see the part of the taxiway on the other side of the high point. Because of this limitation there is a local procedure for all ground traffic, including vehicles, to first ask permission from ATC before using taxiway Yankee.

It's a fine morning and you're about halfway down your shift. The traffic is progressing nicely, with nothing more than the usual small issues that need to be resolved by a controller during a working day. The other controller is managing his runway traffic, including two training aircraft in the local traffic circuit, and you're feeding him with some departures while taking the arrivals from him after landing.

You receive a call from an airport vehicle (Airport Two), but the quality of the radio reception is not very good. This is a known feature of the radio system the airport operator uses.

What would you do?

You're pleased with yourself for being able to determine that the vehicle driver is asking permission to use taxiway Yankee, and since there is no other traffic on that taxiway you give the driver permission to use Yankee. Airport Two acknowledges this, but as the quality of the connection again is not very good you can't make out every word the driver says.

What would you do?

You don't ask Airport Two to repeat its transmission, because you're quite sure it was a correct acknowledgement of the permission to use taxiway Yankee.

A few seconds later you overhear the pilot of an aircraft that just became airborne commenting to the Tower controller about a vehicle that crossed the runway in front of the aircraft during their take off roll. The Tower controller is as surprised as you are, for you both are unaware of any vehicle intending to cross the runway.

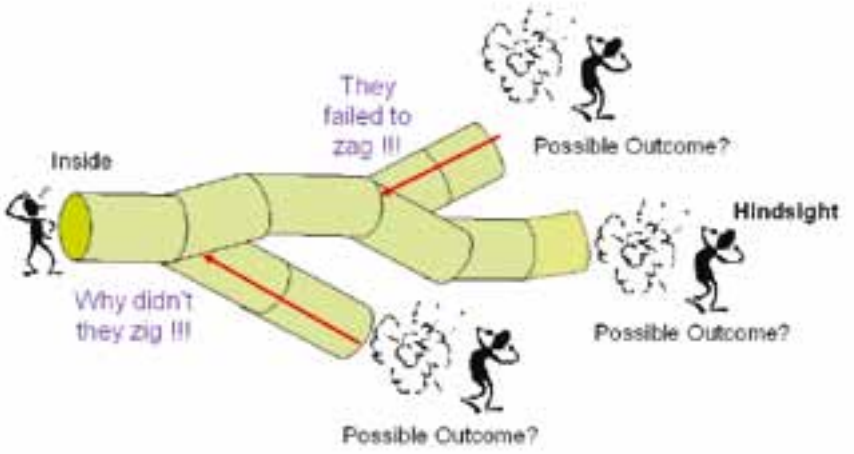
What would you think?

After some discussion you arrive at the conclusion that the only vehicle it may have been is Airport Two. You contact the driver and ask him whether he has just crossed the runway, and to your surprise Airport Two confirms that he has done so. The driver adds that, while crossing the runway, he was a bit scared to see an aircraft in its take off roll on the runway coming at him.

You decide to stop discussing the matter via the R/T, and ask the driver of Airport Two to contact you by telephone at his first convenience in order to sort things out.

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:

Communication procedures. At this airport the R/T communication procedures for vehicle drivers were not adhered to very strictly. Drivers that wanted to use the Yankee taxiway would use phraseologies that varied from "request to use Yankee" to "for Yankee", and all possible variations in between. If a vehicle driver wanted to cross the runway at intersection Yankee, the phraseology usually was "request to cross at Yankee" although variations had begun to appear here as well.

The driver involved in the incident was in fact requesting permission from ATC to cross the runway at intersection Yankee. His words were "request to cross Yankee", to which he received the reply "Yankee approved".

Radio quality. Some time before the incident the airport operator had installed new radio equipment in their vehicles. Whilst meant as an improvement, the new equipment was found to have a number of "teething troubles" that affected the quality of the communications.

On the ATC side the controllers had quickly become accustomed to the deterioration in the quality of the communications from the airport vehicles. Where at first they often had to ask the drivers to repeat their transmissions ("say again"), they now usually were able to understand the content of the messages in the first call.

But even before the installation of the new radio equipment there had been issues with the quality of transmissions from vehicles that were located at the apron side of taxiway Yankee. A study had indicated that these problems could be resolved by installing an extra radio antenna in that part of the airport, but at the time of the incident this had not yet been done.

The controllers were aware of this problem, and had learned to expect a poorer quality in transmissions from vehicles located at the platform side of Yankee.

The combination of the poor quality of the received transmission and the reference to Yankee by the driver may have increased the controller's impression that the vehicle was asking permission to use taxiway Yankee from the apron side.

Visual confirmation of position. At the time of the incident the local ATC procedures did not have any provisions for visually confirming the position of a vehicle before issuing it with an approval to proceed.

The controller who was responsible for the ground traffic that day had made it a personal technique however to always try and verify the position of vehicles that he was communicating with.

In fact, he had looked at the visible part of taxiway Yankee when Airport Two called him, and when

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HUMAN PERFORMANCE - TEM ANALYSIS

he didn't see a vehicle there this confirmed his belief that the driver was asking permission to use the taxiway from the platform side (which he couldn't see from the control tower). He had not noticed the vehicle on the opposite side of the runway near Yankee intersection.

Naming of taxiways and intersections. The fact that at this airport the name Yankee was used for a taxiway as well as for a runway intersection played an important role in this incident. Without additional safeguards the potential for confusion was high.

The only way to distinguish between Yankee as a taxiway and Yankee as a runway intersection was by specifically adding the words "taxiway" or "intersection". This was not routinely done in vehicle R/T communications at the time of the incident.

When the driver of Airport Two phrased his request to cross the runway at intersection Yankee as "request to cross Yankee", the combination of the (known) poor radio quality and the absence of a vehicle at the visible side of taxiway Yankee made it plausible for the controller to believe that the request was from a vehicle at the apron side to use taxiway Yankee.

Note: This section is offered as an alternative way of analysing the occurrence. For more information about the Threat and Error Management (TEM) framework, see: http://www.skybrary.aero/index.php/Threat_and_Error_Management_(TEM)

In the scenario the following **Threats** can be identified from the controller's perspective (in no particular order): poor quality of radio equipment in airport vehicles; taxiway partly obscured from view; ambiguous communication from the vehicle driver; same name used for different locations at the airport; poor radio signal near the apron at the end of taxiway Yankee. Those Threats were not all managed adequately by the controller.

The fact that the controller did not ask Airport Two to repeat its request after the first unclear transmission, but assumed that he understood what was being asked, can be regarded as an **Error.** Also the very short reply ("Yankee approved", rather than for example "using taxiway Yankee approved") given by the controller to the request from Airport Two can be seen as a procedural Error. Those Errors were not managed by the controller.

The unmanaged Threats and Errors are linked to an **Undesired State,** i.e. Airport Two crossing the runway rather than using taxiway Yankee as believed by the controller. The Undesired State was not managed by the controller, and thus resulted in a runway incursion as end-state.

Prevention Strategies and Lines of Defence

If the controller and the vehicle driver had applied more **formal and standardised communication procedures,** the incident may not have happened. Just by adding the words "..,the runway at…." the intention of the driver would have become less ambiguous (the request in that case would have read "request to cross the runway at Yankee"). And when the controller doubted even a part of the unclear transmission from the driver, he should have asked him to "say again" – if necessary multiple times, until all doubts were removed.

The **communication procedures** for vehicles could be improved by requiring drivers to always state their position and their intention as clearly as possible when making requests to ATC.

For vehicles requesting to use taxiway Yankee at this airport, the phraseology could become "at apron side, request use of taxiway Yankee towards the terminal side" (or words to that effect).

A request to cross the runway at intersection Yankee could be phrased as "south of the runway, request runway crossing at intersection Yankee towards the terminal".

By being this explicit the ambiguity is greatly reduced with little or no chance of misunderstanding.

An even better way to avoid potential misunderstandings would be to rename either the intersection or the taxiway, so that only one of the two is named Yankee. Obviously the new name chosen should not conflict with the name of another location at the airport, i.e. it should be a unique name.

When at an airport the name Yankee is only associated with a runway intersection, even in distorted communications this name will not easily lead to confusion with a taxiway that for example is named Foxtrot.

The name change combined with improved communication procedures would form a robust safety enhancement at this airport.

If over time the discipline in communications between vehicles and ATC were to become less, the difference in names for the intersection and the taxiway will still exist as a safety barrier.

In the scenario the controller had made it a personal technique to always try and visually confirm the position of a vehicle that contacted him with a request. This should be more than a personal technique: it should be standard practice for all controllers at the airport. Where visual confirmation is not possible and ground radar is not available, the installation of appropriately sited CCTV cameras should be considered. Controllers should be especially alert in situations where vehicles (and aircraft) may be at positions for which there is no direct view from the tower.

With respect to the problems with the quality of the radio equipment in the vehicles of the airport authority, it should be noted that user knowledge of the problem is no substitute for removing the problem.

The individual controllers at this airport probably can't change the situation during their shift, but ATC management may be in a position to demand that the airport authority fix the problem with some urgency.

If the airport authority had conducted a more thorough field acceptance test before starting to use the new radio equipment operationally, the poor quality might have been identified and remedied before causing a safety problem. Where the signal quality could be improved by placing an extra antenna, this should have been done.

Last but not least the controller in the scenario did well to ask the driver of Airport Two to contact him by phone in order to sort things out. The alternative would have been to continue discussing the incident via the R/T (which was of poor quality to begin with), which would potentially have caused a further disruption of operations at the airport. This is unwanted at any time, but in particular after an incident.

KEY POINTS

A combination of poor radio transmission quality, poor communication procedures and the use of similar names for a runway intersection and a taxiway resulted in a runway crossing by a vehicle while an aircraft was on its take off roll on that same runway. The crossing was not noticed from the tower but the pilots of the departing aircraft commented on it after they were airborne. It took the tower crew some time to understand what had taken place.

This scenario highlights the importance of:

- communication procedures for airport vehicles;
- R/T discipline for communications between ATC and vehicles;
- avoiding ambiguity when naming locations such as intersections and taxi tracks at airports;
- avoiding assumptions;
- visual or other confirmation of the position of aircraft and vehicles from the control tower.