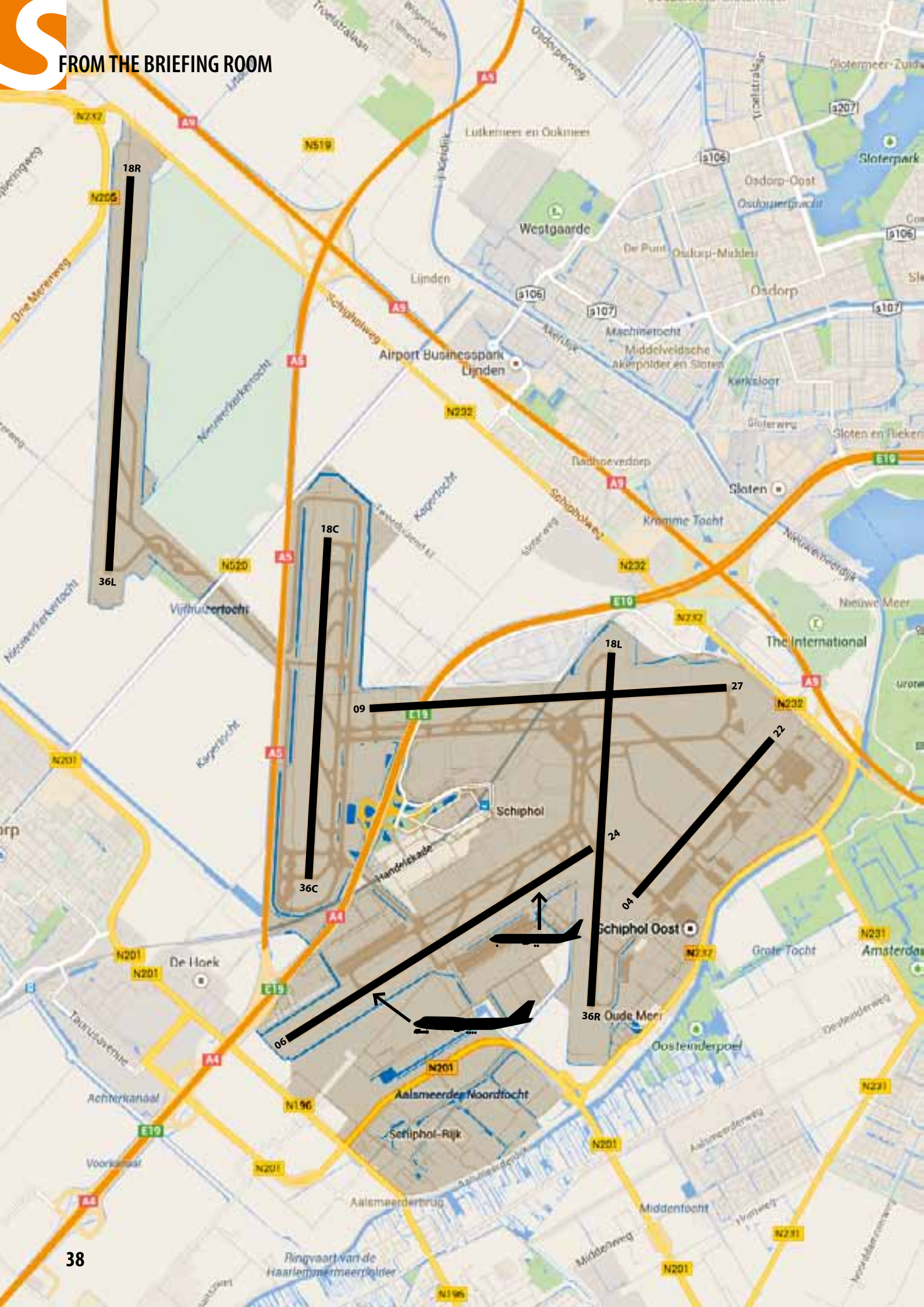

18R
36L
18C
36C
18L
36R
09
27
24
06
22
04
Schiphol
Schiphol Oost
Schiphol-Rijk
Airport Businesspark Lijnden
Westgaarde
Osdorp
Osdorp-Oost
Sloten
Sloterpark
Lijnden
Lutkemeer en Oukemeer
Machinetocht
Middelveldsche Akerpolder en Sloten
Kromme Tocht
Nieuwe Meer
The International
Oosteinderpoel
Aalsmeerder Noordtocht
Aalsmeerderbrug
Middentocht
Ringvaart van de Haarlemmermeerpolder
Vijfhuizertocht
Nieuwekerkertocht
Kagertocht
Handelskade
Achterkanaal
Voorkanaal
Groote Tocht
De Hoek
Amsterdam
N232
N201
N231
N520
N519
N196
A4
A5
A9
E19

Runway safety at Amsterdam Schiphol

by Job Brüggen and Jan Smeitink

"Mind your step!"

This is repeated a zillion times a day by a friendly electronic female voice at the end of the moving walkways at Amsterdam Schiphol Airport. Surely you must have heard it. But stepping off the walkway seems simple enough, doesn't it? Should we be warned for this? Let's find out.

10 Dec 1998

On a grim day, with reduced visibility and during a traffic peak, LVNL controllers cleared a Boeing 767 for take-off on runway 24. Simultaneously, a tow with a Boeing 747 behind it was crossing this runway at the midpoint. It is a classic trap. But it happened. The co-pilot of the B767 spotted the towed aircraft across the runway ahead in time and aborted the take-off. No one was hurt. The 767 taxied back, cooled its brakes and took off normally.

Amongst the many reasons why this had gone seriously wrong (runway layout, reduced visibility, high traffic peak, non-adherence to procedures, runway stop bar lighting panel design flaws etc.) one particular issue stood out: the fact that the runway controller was on the same frequency and using the same language as the crew of the departing B767, but that the assistant controller was speaking with the driver of the tow truck on a different frequency, in the local language. It wasn't the party-line effect that saved the day here.

You may have heard of this incident before. There are good reasons for that. The Captain of the B767, obviously not amused, reported this to the aviation police. A criminal trial in 2000 against three controllers followed and eventually, in 2002, an Appeal Court convicted all three as charged, although it did not hand down a sentence. This resulted in a significant drop in the reporting of serious incidents where LVNL itself was involved. After about five years, the reporting rate had recovered but the legacy effect of the so called 'Delta Case' remains and it will take a generation of controllers to fade out the prosecution anxieties from the emotional palate.

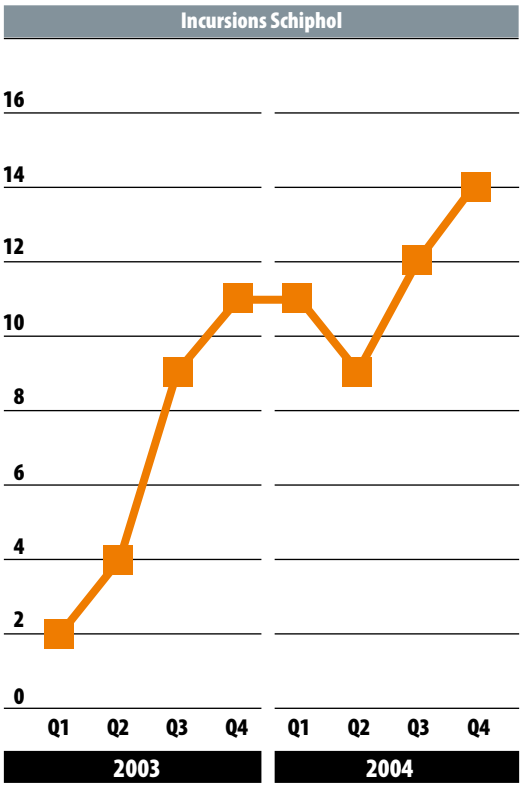
Layout of Schiphol airport

Please have a look at the layout of the airport. There are six runways. Infrastructure is all high-tech, modern, with good signage, lighting, stop bars, the works. Back in the sixties when the airport was designed, arguably good reasons existed to have a tangential system with converging runways. Always a runway with headwind! But now the terminal is in the armpit of those runways and does not leave room for expansion. The freight area is on the South-East part and aircraft must cross runway 06-24 for entering or departing. Towing movements to and from the maintenance facilities at the eastern part of the airport require the crossing of two runways. General aviation has a platform close to runway 04-22. We count 54 (fifty-four!) entries and exits to runways. Who designed this, you ask? Hey wait, there is more. Due to a strict noise regime around the airport, it is necessary to frequently change runway combinations to make sure everyone receives their fair share of aircraft noise, a policy necessitating frequent taxi route changes and changes to departure routes. Are we surprised that the airport is particularly vulnerable for runway incursions? No we are not.

Runway safety at Amsterdam Schiphol (cont'd)

Runway Incursions

And so we started tracking runway incursions. At first we needed to advertise that we wanted them to be reported, so we spread the word and asked controllers to report incursions, based on the well-known definitions / descriptions from ICAO. We had many discussions on what precisely was an incursion and what was not. Besides that, we created a new problem: the amount of reported incursions for Schiphol airport increased and the executives were not pleased. We were going the wrong way! What did we think we were doing? Actually, we thought we finally had some good data upon which we could base solid arguments and actions. We did not really bother about statistics or benchmarking with other ANSPs which could show us as 'bad performer' and argued that we'd now better start taking action.



EAPPRI

Along came the first release of the EAPPRI (European Action Plan for the Prevention of Runway Incursions[1]) document in 2003. It looked like a solid masterpiece and immediately the recommendations were distributed to various people to check. We found we were not as good as we had hoped. Perhaps that was the reason that we only partly followed the recommendations. After all, it wasn't a formal document with regulatory powers, was it? It still isn't. But we found out that you need a pretty convincing argument why you weren't following the EAPPRI recommendations when things went wrong. So when the second version appeared in 2011, we took it much more seriously and produced a gap analysis and cross-referenced our practices against all the recommendations, for the ANSP, airport, airline and oversight authorities. Much better now. We "minded our steps"!

The Schiphol Runway Safety Team (RST)

To build up the operations of the runway safety team, we considered we needed the best operational brains in this industry. From the start that required the inclusion of operational people: pilots from airlines, air traffic controllers from ANSP, including representatives from Dutch ALPA and the Dutch ATC Guild, and airport operation managers. The team was supported by representatives from the back office including infrastructure planning, safety management & incident investigation, procedural design etc. And an observer from the Regulator attends the runway safety meetings on a regular basis which we found to be particularly useful.

The mandate of the RST has always been to provide top quality safety advice. The team did this and over the years several actions have been taken that are worth listing here:

- end-around taxiways
- harmonising stop bar functionality
- improving signage
- identifying and eliminating hotspots
- improving communication procedures
- training and campaigning

Having a lot of data, covering more than ten years, gives us the luxury of simple but effective analysis. What are the main factors that contribute to an incursion? What are the vulnerable places at the airport (the hot spots)? Who from the flying operators are the likely candidates for an incursion? The runway safety team actively seeks information from the safety department of airlines that have been involved in an incursion event. The feedback from airlines that operate only infrequently to Schiphol, and may thus be most affected by its complicated layout, has proven to be especially useful in terms of increased awareness and pointers for improvements. Together with the much improved rate of reporting from staff of both the airport authority and the ANSP, it can now confidently be said that all runway incursions at Schiphol, however futile, are carefully noted and analysed. We feel nothing escapes our attention now!

You will recognise this of course. And obviously, it is all the usual stuff, no rocket science here. However, some

1- A Runway Incursion is any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft. [ICAO]

more interesting products emerged, of which we shall briefly discuss just three:

Runway incursion definition paper
This paper provides detailed guidance on the exact application of both the definition of a runway incursion and its severity classification. For this purpose, the paper contains not only risk assessment matrices but also background information and examples of occurrences to aid objective and uniform rating of events. The paper is drawn up in conformity with the ICAO definition as well as with the guidelines and recommendations in the current version of the European Action Plan and has, since its introduction in January 2012, proved to be a valuable tool. Our paper is a big help for us. Feel like you need a copy? Let us know and we will gladly send you one, free of charge.

Mapping and analysis of Incursion Events
On an annual basis all runway incursions are plotted in a map, showing the runway system at Schiphol. The use of such a map as part of a comprehensive annual report on runway safety, is a great help in objectively identifying hotspots and it provides a strangely powerful means to convince management of the need for necessary changes and their cost.

While the map itself depicts events in absolute numbers, more detailed analyses can relate the number of incursion events on each runway to the traffic density on the runway involved. Would you guess that the incursion rate of the most vulnerable runway 04-22 is about six times higher than the best performing runway 18R-36L? Given the geography and usage, perhaps this is not a big surprise, but clearly there is room for improvement.

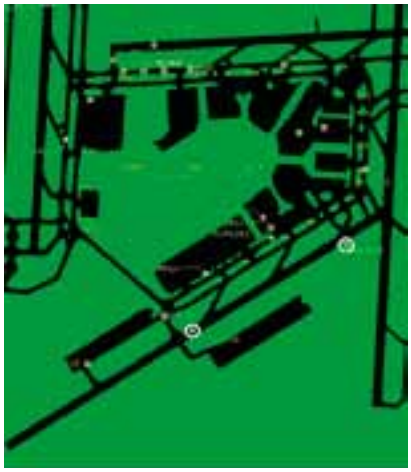
Job Brüggen is the safety manager of ATC The Netherlands (LVNL) and is particularly known for his activities in Just Culture developments. He was one of the first to demonstrate the detrimental effect of prosecution of air traffic controllers on incident reporting. In 2003 he re-created the CANSO Safety Standing Committee and chaired it for six years. He is currently leading the effort for the FAB Europe Central safety management activities. He also advises in the health care industry on safety matters with a particular focus on Just Culture and safety leadership.

Jan Smeitink is currently Airport Manager for Amsterdam Airport Schiphol and chairman of the Schiphol Runway Safety Team. Previous assignments include flight engineer on the B747-200/300 series and Investigation Manager with the Dutch Safety Board.

Runway safety at Amsterdam Schiphol (cont'd)

Runway Incursion Alerting System Schiphol (RIASS)

An especially valuable addition was the introduction of an alerting tool to warn tower controllers verbally and visually of potential collision risks. The words "Incursion, zero six! Incursion, zero six!" are sure to get the controller's attention and swift action will follow to mitigate the severity. Have a look at the radar screen of the tower controller, showing an alert (the two white circles around the labels).



Introduction of the tool was only possible after the installation of a full multi-lateration system at the airport and the introduction of a requirement for all vehicles with access to the manoeuvring area to be equipped with a transponder. The system became fully operational for all six runways on 20 December 2010 and has become one of the best trusted friends in the tower cab. It works day and night, independent of lighting, visibility, stop bar status or runway usage.

Results we can now be proud of!

Have a look at the chart below. The blue line shows the absolute numbers of runway incursions, including even the most futile incidents. You may notice that the severity of the incursions has dropped, which for us is far more important than their total number. Nevertheless, the total number is now also beginning to fall.

Recovery from the effects of unjust litigation through perseverance in attaining safety goals has paid off in the end. This achievement can be attributed to the increasing willingness to understand each other´s position, seek synergies by learning from best practices of the various parties. Obviously cultural differences between the various members of the RST do exist and they can easily lead to misunderstandings, incomprehension and reproach. But if genuine striving for continuous dialogue can be upheld, the benefit for the airport's safety performance will sooner or later be reflected in tangible figures. Schiphol's significant positive safety trend in runway incursion related events, although of recent origin, is likely to prove robust if parties continue to seek each other's expertise, for example in joint incident investigations, without prejudice. With basic conditions like that in EAPPRI being fulfilled, the next goal of an effective Runway Safety Team is to bridge differences in the organisational cultures of its stakeholders, showing respect for each other's' background, policies and points of view as a prerequisite for sustainable safety performance.

In Closing

Back to the Delta Case and 1998. Fifteen years since the rejected take-off incident, what about R/T communication with vehicles on active runways? Well, it has not been fully solved yet. One can easily be cynical about the fact that it takes 15 years to adopt an EAPPRI recommendation that appears simple enough (all vehicles on one runway on the same frequency, in one language). But when implemented in 2003, despite a significant investment in training, radios etc, it threw up both new and unanticipated human factor issues and technical problems, and was altogether rejected by controllers. Considerably more time and careful analysis was obviously required. Only in 2014 we are now fully conversant with all the ins and outs of the situation. Well, at least we think we are. There is now a comprehensive proposal for a solution based on many design exercises, simulator tests and evaluation of potential scenarios. It wasn´t as simple as it originally seemed.

Mind your step!