Aerodrome layout and the potential for modifications to improve runway safety

by Captain André M. Skandsen

Pilots visit a considerable number of airports all over the world and observe and experience vastly different aerodrome layouts...

This unparalleled experience, gained through their day-to-day operations, justifies a place for them at the forefront of improving aerodrome design and ultimately – improving runway safety. Such stakeholder engagement, through pilot professionals and their associations, can be an important contribution to the continuous improvement of aviation safety in Europe and globally.

This article highlights joint Aerodrome design positions of two leading pilot associations' representatives – the European Cockpit Association (ECA) and the International Federation of Air Line Pilots' Associations (IFALPA).

Captain Andre M. Skandsen is a captain on the Bombardier Q-400 flying for Wideroe, the largest regional airline in Scandinavia. André has previous experience as a chief pilot for Wideroe, but is currently a member of the Flight Safety Committee in the Norwegian Pilots Association. He also participates actively in safety committees within ECA, IFALPA and EUROCONTROL. He is primarily focusing on runway safety, winter operations and aerodrome design.

New build airports should be designed in such a way that the runway incursion risk is minimised. Furthermore, at existing airports, the effect on runway incursions should be taken into account when runway and taxiway systems are altered.

ECA believes that pilot participation in the planning of new aerodromes and any expansion or redesign of existing ones is of upmost importance and will greatly benefit the planning process. Aerodrome design should be instinctive and logical to the pilot, let's face it: a pilot-friendly airport is likely to be a safe and efficient airport!

Taxiway crossings of runways should be avoided whenever possible. This may be achievable by the construction of "end-around" or "perimeter" taxiways. When a crossing is unavoidable, it should be done at a low energy point on the runway - at either runway end.

Obviously any aerodrome design should be such that runway crossings are not required by aircraft or vehicles transiting from one part of an airport to another. Whenever this unavoidable by design, the use of mitigation procedures like mandatory use of Stop Bars should be implemented.

Taxiway nomenclature

At present there is no worldwide standard for taxiway designation which leads to the potential for confusion. ICAO Annex 14 has only some vague recommendations of taxiway naming and offers no guidance to a systemic application of designations. A standardised nomenclature would obviously give pilots a higher situational awareness on ground, regardless of how frequently they visit the airport.

IFALPA has therefore developed and proposed the following taxiway designation system:

Rapid exit taxiways (RETs) shall be used for runway exit only and shall have "no entry" signage and illuminated stop-bars installed to prevent inadvertent use for entry.

RETs are not suitable for intersection take-offs or crossings due to the restricted view of runway from cockpit. Any intersection take-off or crossing should be done from taxiways that are perpendicular to the runway.

Example of recommended nomenclature

- Primary route taxiways should be designated using only one letter (e.g. A, T, J).
- The allocation of letter should start at one end of the airport and continue sequentially to the opposite end (i.e. from east to west or north to south)
- The letters I, O, S, and Z should not be used to avoid confusion with the numbers 1, 0, 5 and 2 the letter X should not be used since there is a potential for confusion with a closed designation.
- Different taxiways shall not have the same or a similar designation.
- Taxiways that connect to the runway should have an alpha numeric designation (e.g. A1, A2, and A3…A12). The numbering should start at one end of the runway and follow a logical sequence to the other end, whilst not leaving out any numbers and maintaining a logical sequence.
- Taxiways crossing a runway should be avoided. Where this is not possible, the taxiways shall have different names on either side of the runway. For example taxiway K on the east side of a runway will become L on the Westside. In the event that it is a link taxiway, for example K5 on the east side, both letter and number should change on the west side retaining as closely as possible the designation logic (to L4 perhaps).
- Connecting taxiways (intersections, links between major traffic routes) shall be named in such a way that they cannot be mistaken as runway entrances/exit and are logically connected to the taxiways they serve (e.g. AC connects taxiways A and C).
- Different taxiways on the same aerodrome shall not have the same or similar designations.
- Holding Points shall have unique names, starting with the word "point" so that they cannot be mistaken for taxiways. They should be logically connected to the taxiway which they serve.
- Intermediate holding points shall be designated by the word "spot" and then the number (e.g. Spot 7)
- Apron stand designators shall use a discretely different naming convention and shall not conflict with any other taxiway designators at the airport. This can best be achieved by providing gates a three digit number (e.g. 203, 785 etc...)
- The use of standard taxi routes is recommended to reduce congestion on ground frequencies and to make taxi clearances predictable.

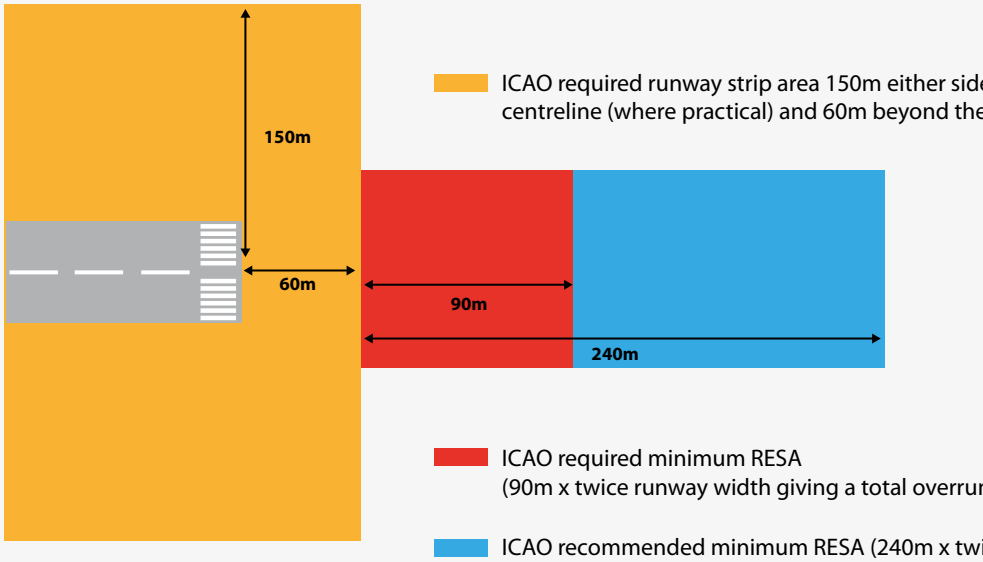
Aerodrome layout and the potential for modifications to improve runway safety (cont'd)

Runway End Safety Areas

ECA and IFALPA are of the opinion that the ICAO Annex 14 Recommendations for RESA dimensions should be adopted as a Standard. That means that the minimum requirement for a RESA would be that it would be 240 metres in length for code 3 & 4 runways and 90 metres in length for code 1 & 2 runways.

Since at some existing airports it would be impossible to establish such a RESA due to topography or other constraints, an arresting system like EMAS[1] should then be installed at the runway end to create an equivalent stopping opportunity. In Europe EMAS has already been installed at both Madrid-Barajas airport in Spain and at Kristiansand-Kjevik airport in Norway.

EMAS installation at end of RWY 22 at Kristiansand-Kjevik Airport in Norway



ICAO required runway strip area 150m either side of the centreline (where practical) and 60m beyond the runway end

ICAO required minimum RESA
(90m x twice runway width giving a total overrun of 150m)

ICAO recommended minimum RESA (240m x twice runway width giving a total overrun of 300m) IFALPA believe that this recommentation should upgraded to a Standard

RESA Dimensions Code 3 and 4 Runways

1- See http://www.skybrary.aero/index.php/Engineered_Materials_Arresting_System_(EMAS)

TWR, Big Bird calling... We've checked the RWY is clear!

Stop Bars

One of the most effective means of reducing the risk of runway incursions is the use of lit Stop Bars. A large number of major airports already have Stop Bars installed, but the policy for their use varies from airport to airport.

ECA and IFALPA believe that the Stop Bars should be installed at all taxiway/runway intersections and used at all times an aerodrome is in operation, regardless of weather conditions.

For Stop bar systems to be truly effective they must have the following elements:

- Stop bars shall be selectively switch-able by the appropriate air traffic controller.
- Stop bars shall be installed at all aerodromes where a runway crossing is possible and provided at every runway holding position serving a runway whether or not that runway is active.
- Aircraft shall never be expected to cross red stop bars unless contingency measures are in force. Contingency measures should cover all cases where the stop bars or their controls are unserviceable.

Summary

To sum up I would like to invite all ANSPs, regulators and Aerodromes to actively involve pilots in their relevant future work and projects. Pilots are able to observe and experience different airports and Air Traffic Control (ATC) systems and are able to compare their relative effectiveness – what works and what doesn't. This experience can be of great benefit in determining not only where safety can be improved but also how capacity can be safely boosted.

ECA and IFALPA are actively working for greater pilot representation in LRSTs and on other safety related teams and committees in Europe and the rest of the world. We are also training selected pilots to become members of LRSTs and are able to participate in larger committees with highly qualified Airport Liaison Representatives.

"A pilot-friendly airport is by nature a safe and efficient airport!

Reference: IFALPA Runway Safety Manual