Runway excursions: cleared to land ...ready or not!

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Historically there are 30 runway excursion accidents per year, which cost the industry approximately $ 1 billion.

The reasons aircraft end up in unplanned areas at airports are many and various. When a thoroughly robust investigation of events at airports is undertaken, it becomes clear that all the humans present in the aviation infrastructure can contribute to events from small mishaps to catastrophic loss of life 'accidents'.

Data from a EUROCONTROL publication[2] in 2003 reported that runway incursions and excursions are reported in terms of:

- ATC operational errors or deviations,
- Pilot deviations,
- Vehicle/ pedestrian deviations.

In some countries, notably Australia, they also include animal involvement in runway safety events.

The study also made the claim that, unlike many models of attribution (one party being at fault), runway incursion events were a result of multiple involvements and the statistics indicated that of the overall attributable deviations:

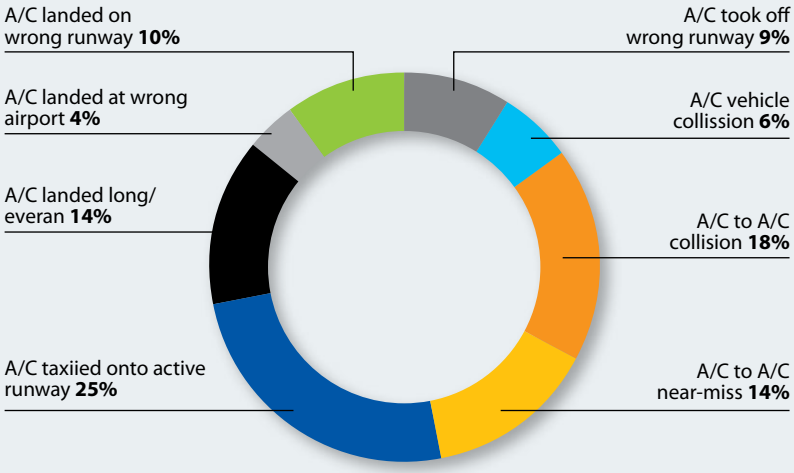
56% were due to pilot deviation,
23% were attributable to the ATM system,
21% were owing to vehicles, animals or pedestrians

However, when you start to analyse runway safety events in a holistic way, it is often difficult to identify where one professional group does not influence all the others; they represent a complex and highly coupled safety system.

As shown below, in the 11 years from 1996 to 2007, the world-wide aviation statistics[3] indicate that there were 7 Runway Incursion accidents with a loss of 282 lives and 220 Runway Excursion accidents with a loss of 458 lives.

Runway excursions can result from either take off or landing scenarios with the aircraft leaving the runway at the side or overrunning the end.

1- Thanks also to Andrew McCarney, Controller, Southampton Airport and Barney Wainwright, Captain, Flybe, for their contribution.
2- Aerodrome Resource Management: Report on Runway Incursions. Internal Report Eurocontrol, 2003
3- Worldwide Statistics on Runway Incursions and Excursions, IATA, 2009



Recent data from Honeywell indicates the following common Runway Incursion and Excursion events

A leading contributor to overruns is an inappropriate aircraft energy state on approach caused or contributed by:

- ATC errors
- poor planning and late 'let-down' by pilots
- poor pilot technique
- landing long
- floating on landing flare
- tailwind
- 'saving fuel' policies

Since it is a collective responsibility to cause or aggravate an adverse safety event, it should also be a collective responsibility to mitigate and manage the consequences of these events.

Although these single issues/errors are clearly interesting (but not surprising), they only give an idea of 'what' happened, but are not informative with regard to 'why' these events occurred. "ATC errors" is hardly a useful category in the aftermath of a serious runway incursion or excursion. It also leaves the investigation of the chronology, with regard to 'who' and 'when' things happened, open to interpretation.

Knowledge with regard to the context which surrounds both incursion and excursion events is vital if we want to improve mitigations for pilots, controllers and vehicles/persons.

As documented by many sources, one of the main causal factors associated with runway excursions are unstable approaches. But if we're honest, from ATC, we know unstable approaches are an issue but we don't really know how big an issue they actually are, at any specific location.

For ATC, the only real indicator as to the scale of the issue is provided by the recorded number of missed approaches, for which the pilot indicated that it was due to being unstable. In these occurrences, the pilots have correctly resolved the situation by recognising and acknowledging the unstable situation and mitigating it by carrying out the missed approach. Pilots can be under considerable pressure these days from various sources to continue approaches, such as economic, legal and commercial, so the fact that the decision was made to break off the approach indicates that a good safety culture/CRM exists and the pilots felt under no pressure to continue.

But even the record of missed approaches doesn't tell the whole story as unstable approaches is a big bucket of reasons into which many causal factors can be placed; ranging from ATC, pilot, procedural, airspace design, weather, other aircraft, workload (cockpit or RT loading resulting in late instruction), aircraft cabin issues ….

The risks associated with a runway excursion and the potential consequences are well documented, but the difficulty in determining the scale of the issue associated with unstable approaches, is in gaining the evidence.

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Example

Most, if not all airline SOP's, will determine a gate height (predominantly 1000' which equates to just more than 3 miles from touchdown) at which point, an aircraft is to be in a "stabilised configuration" (this configuration criteria is laid down within the airline's SOP's)

If an a/c is not in this stabilised configuration on reaching the gate, then the airlines SOPs will dictate that the flight crew should break off the approach and execute a missed approach. If not, then the information is automatically logged by the on-

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board FDM system and the airline operator will have the chance to be aware of it. The pilot can of course elect at any point of the approach to discontinue the approach, but it is at the gate, that the decision to continue must ultimately be made.

So if an a/c reaches 1000' (the gate) and the criteria have been met, the aircraft can (at the discretion of the captain) continue to make an approach to land. According to the statistics, there has been no problem. Correct?

Maybe, maybe not!

Although the stability of the approach is only officially "measured" (against the criteria) when the aircraft passes through the gate, an unstable approach is usually the result of a series of events involving various causal factors (weather, tailwind, fatigue, pressure, workload, poor planning, pilot error, ATC interaction, procedures etc.), which can occur at any stage of the approach, even as far back as the cruise phase. From the ground, we are never aware of the instances where the pilot has fought throughout the approach against these factors to finally become stable at 1100', meeting the "gate" criteria and continuing to land uneventfully!

Indeed, it is very difficult from the ground to be aware of whether an aircraft has proceeded in an unstable state beyond the gate, going on to land. Only the airlines with their FDM information will have sometimes a better view of the picture.

The only true way of affecting the rate of occurrence and therefore reducing the risk, is to work with all the parties concerned.

These avenues of work can be roughly broken down into two main areas:

- **Procedural** – looking at procedures/airspace designs which may contribute to unstable approaches
- **Educational** – increased understanding and awareness about the subject from both the ATC and airlines sides, so that each understand what, how and why things are done and the implications for the other side.

Like most things in ATM, nothing happens in isolation and as already mentioned, these events involve people from all sides; ATC, airlines and pilots. Much good work has already been produced and more is being undertaken by the likes of FSF, CANSO, DGAC and IATA. Not all the causal factors involved are efficiently addressable, but for those that are, if the chain of events can be broken at any point, a runway excursion may be prevented. The information is out there and it is perhaps a case of changing attitudes and culture that will finally make a difference.

To some degree it is a leap of faith as historically we use event occurrences to measure the frequency. As far as runway excursions are concerned, even without more information, it must be better for all concerned to believe that things can be changed now and not to wait for more occurrences.

Editorial note

Some operators do indeed use 1000 ft as a gate or check height to determine if a go around must be flown when an approach is not stabilised, but others use either 1500ft or 500ft and some set a different height depending on whether the approach is being made in VMC or IMC. Unfortunately, there are still some airlines that have not yet got any rules of this sort.

Some top tips for controllers to help minimise unstable approaches

Controllers

- Brief before a shift with regard to weather, especially unpredictable winds and serviceability of equipment (ILS)
- If you do not have precise weather radar to refer to, inform the pilots
- Be aware of the different and most frequent aircraft types and their performance characteristics, particularly with regard to phase of flight
- Always be aware that despite a good knowledge of aircraft performance, pilots will and do fly slightly differently
- All airline companies have rules regarding final decision heights – most will insist on 1000feet, but advising them of an inappropriate track or height if they appear to be displaced from final approach. If a pilot still confirms established and remains displaced, break off, establish if they are visual, or send the aircraft around
- Provide aircraft with at least two track distance updates from touchdown (downwind and base-leg)-changes in track distances cause the most problems to pilots planning approaches
- Try to maintain a standard 'square' vectoring circuit pattern-if you keep it standard, pilots are able to plan their descents.