How can we reduce runway excursion risk?

Gerard van Es, FSS Public Workshop 8-9 March, 2017
2 runway excursions per week!

30% of cases damage to aircraft
Trend in runway excursion accident rate

Source: NLR

Commercial transport and business jets

Small improvement in safety record
Classical risk definition

Consequences

Unacceptable risk level

Location in risk matrix airport dependent

Probability

low

high

Large portion

Small portion

Very small portion
Excursions by flight phase

Landing phase most critical

Landing 79%

Takeoff 21%
Landing overruns causal factors

- Wet/Contaminated runway: 59%
- Long landing: 39%
- Speed too high: 20%
- Incorrect decision to land: 16%
- Aquaplaning: 14%
- Tailwind: 14%
- Late/incorrect use of brakes: 11%
- Late/incorrect use of reverse thrust: 11%
- Too high on approach: 6%
Landing veeroffs causal factors

- Wet/Contaminated runway: 37%
- Crosswind: 26%
- Aircraft directional control not maintained: 14%
- Hard landing: 12%
- Nose wheel steering issues: 10%
- Tire failure: 6%
- Landing gear collapsed: 6%
Reducing the excursion risk

- Reducing probability
- Reducing consequences
Reducing probability of an excursion

Conservative/realistic a/c performance assessment

Improved procedures

Better training

Better information
Example of better information – runway condition

Assessment of runway condition – where is what on the runway?
Example improved procedures - crosswind

- Guidelines on how to deal with gusts;

- Correction of maximum crosswind for slippery runways.
Example technology – runway surface

High macro texture depth and harsh micro texture are essential for good wet braking performance.
Reducing consequences of excursions

- Use of runway strips and runway end safety areas:
  - Defined areas around the runway;
  - Minimise damage to an aircraft overrunning or veering off runway.

- Arresting systems:
  - To stop or slow down the aircraft;
  - Only for overruns, not (yet) for veeroffs.
Arresting systems

- Cables and barricades (military, tested from the late 1920s);

- Water ponds (tested in the 1960s);

- Gravel beds (tested in the 1960s);

- Foamed plastic (tested in the 1970s);

- Soft Ground Arresting Systems - EMAS (tested in the 1980s and 1990s, installed at ±112 runways);

- Crushable glass gravel beds (approved in 2012, installed at Chicago Midway & Zurich airport).
Soft ground arresting systems
B727 tests stopping on soft ground arrestor system
Does EMAS work?

11 successful cases reported since 1999
How can do what in reducing the risk levels?
Runway excursions can happen anywhere – even in Brussels!

May, 2008, Brussels Airport, runway 20
Fully engaged
Netherlands Aerospace Centre