Available On-Board Technologies For Runway Excursions Prevention
Safety at Landing: the First Air Transportation Safety Issue

- Runway excursions at landing are still the primary source of incidents and claims (mainly hull losses or damages)

- Runway excursions at landing concern all aviation segments

- Detailed statistical analysis demonstrates that training and procedures are no more enough to mitigate this major air transport risk
Airbus is a Pioneer

On-Board Automatic Runway Condition Identification and Reporting

In-Flight Realistic Landing Distance Assessment

Runway Overrun Prevention System (ROPS)
Runway Overrun Prevention System

Design principles

• A technology designed to monitor continuously total energy and aircraft landing performance vs. runway end, from short final up to aircraft stop
  ‣ Have I right now enough meters in front of me to stop safely my aircraft before the end of the runway?
  ‣ “Right speed, right path, right touchdown point”: Not enough to prevent runway overrun risk at landing
  ‣ Design based on 25 years accidents analysis and GPWS vs. Enhanced GPWS experience

• A true guidance to assist the crew in
  ‣ The go-around decision making process
  ‣ The timely application of on-ground retardation means: reversers, braking

• A turnkey & easy-to-fit solution not requiring any airline tuning
Runway Overrun Prevention System

= Runway Overrun Warning (ROW) + Runway Overrun Protection (ROP)

Runway Overrun Warning

Go around

Runway End Overrun Protection

STOP
Runway Overrun Prevention System
Timeline for AIRBUS Fleet

- **1st Prototype**: April 2004
  - A380
  - A320 Family
    - October 2009
    - July 2013 (EASA)


- **In operations**: 3 overruns already prevented
- **Baseline**: Q4 2014
- **A350XWB**: Q4 2014

- **A330/A340**: Q4 2014, Q1 2015

**In operations Linefit and retrofit solutions**
Airbus offers runway overrun protection system to competitors

Airbus has decided not to keep its patented runway overrun prevention system (ROPS) as a "proprietary differentiator," but will release it to competing aircraft builders.

The manufacturer says its decision has been spurred by the fact that runway excursion is by far the air transport industry's most common serious accident category. The occurrence rate is also increasing faster than the world fleet expansion.

Airbus's executive vice-president and future programme chief Christian Scherer said that it has received "very positive reactions" from Bombardier, Embraer, Bell, and from the aviation insurance industry - to the proposal to make ROPS commercially available to other manufacturers.

Scherer said that the idea was also well received at last month's International Civil Aviation Organization (ICAO) Global Runway Safety Symposium, and that the International Federation of Airline Pilots Associations backs the manufacturer's move.

At present ROPS, which consists of a software upgrade to existing aircraft systems, will be retrofit to all A380s that come off the line. It is installed on more than 80% of the in-service A380 fleet. It will be in all A350s, and from next year, it will be available on the other new-build Airbus types or for retrofit.

ROPS is integrated with the aircraft's flight management and navigation systems, and provides the pilots with a real-time constantly updated picture in the navigation display of where the aircraft will stop on the runway in wet or dry conditions.

If the approach profile varies, so does the stopping point. If it will not be possible to stop on the runway, the system provides the crew with a written and spoken "runway too short" warning.
The Aviation Industry is now moving

On-board real-time performance monitoring and alerting systems that will assist the flight crew with the land/ go-around decision and warn when more deceleration force is needed should be made widely available.

European Action Plan for the Prevention of Runway Excursions
Edition 1.0

National Transportation Safety Board
Washington, D.C. 20594
Safety Recommendation

“Actively pursue with aircraft and avionics manufacturers the development of technology to reduce or prevent runway excursions and, once it becomes available, require that the technology be installed”. (NTSB recommendation to FAA A-11-28, March 2011)
At dispatch and before landing, the crew must (re-)calculate predicted landing distance accounting for aircraft conditions and environmental conditions: wind, temperature, designated runway and runway state.

Among these parameters, the runway state is the most difficult parameter to assess, because of its variability and the lack of robust, accurate and reactive measurement means at airport level.

Bad/wrong knowledge of actual runway state at landing is one of the multiple cause of several accidents that occurred in the past years.
- Runway friction coefficient lower than expected
- Contaminated runway snow, ice ... more slippery than reported

Need for a reliable, real-time, seamless runway condition evaluation
COntaminated Runway State Automatic Identification & Reporting
An on-board solution as an extension of ROPS

1. Braking Action objective assessment
2. Pilot validity cross check from deceleration feeling.
3. Automatic reporting to tower via communication means and gateway
3'. Pilot reporting to tower via radio as back-up
4. Tower report to incoming aircraft
5. Incoming aircraft to use report of Braking Action for In-Flight Landing Distance evaluation

Braking Action report in FAA TALPA-ARC standard

ATC
Airport Ground Operator
Ops
Ground server
A Three Fold Pioneering Approach

In flight landing distance assessment coupled with ROPS & CORSAIR,

In-flight realistic landing distance assessment by the crew

VFR stabilization gate
As recommended per SOP

Real-time automated actual stopping distance calculation
+ Crew alerting

Crew proactive one-shot landing performance assessment

Real-time automated proactive landing performance assessment
+ Crew alerting

In-flight landing distance assessment coupled with ROPS & CORSAIR,

A consistent approach
Covering training, procedure and cockpit technology

... Airbus is ready and active
ROPS et Al. - ICAO RRSS Dubai

June 2nd 2014

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ROPS
Runway Overrun Prevention System

FINALIST OF THE 2014 57TH AVIATION WEEK LAUREATE AWARDS

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