Head of ROPS Programme
Fabrice VILLAUMÉ

Available On-Board Technologies For Runway Excursions Prevention

AIRBUS

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

Airbus is a Pioneer

AIRBUS

Runway Overrun Prevention System
Design principles

ROPS
Runway Overrun Prevention System

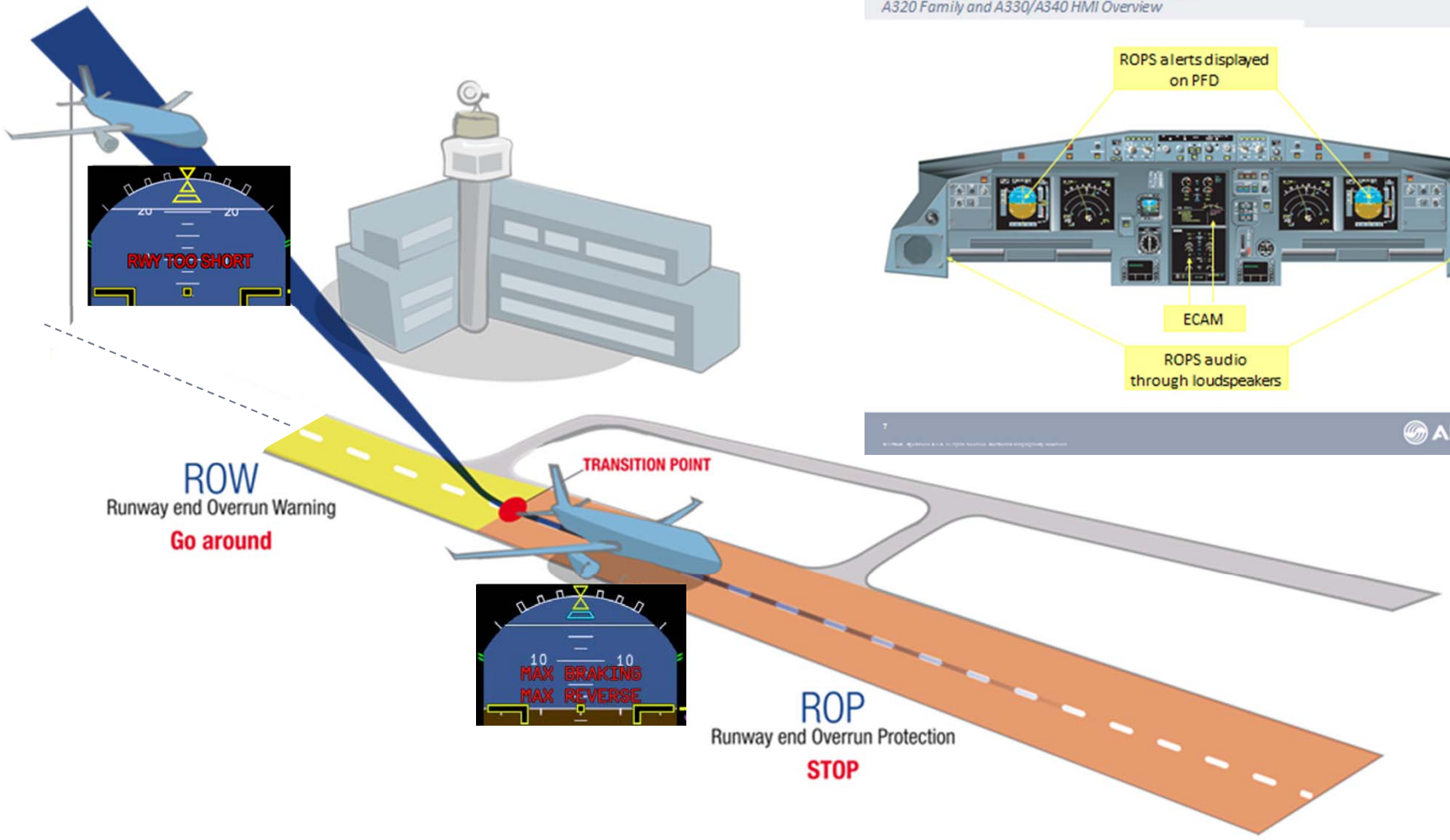
- A technology designed to monitor continuously total energy and aircraft landing performance vs. runway end, from short final up to aircraft stop
  - Have I right now enough meters in front of me to stop safely my aircraft before the end of the runway?
  - "Right speed, right path, right touchdown point" : 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

AIRBUS

Runway Overrun Prevention System

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

ROPS
Runway Overrun Prevention System



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Runway Overrun Prevention System

Timeline for AIRBUS Fleet

ROPS
Runway Overrun Prevention System

Research
Oct. 1998 - Feb. 2002

1st Prototype
April 2004

A380
October 2009

A320 Family
July 2013 (EASA)
& Nov 2013 (FAA)

A330/A340
Q4 2014 / Q1 2015

A350XWB
Baseline @ EIS
Q4 2014

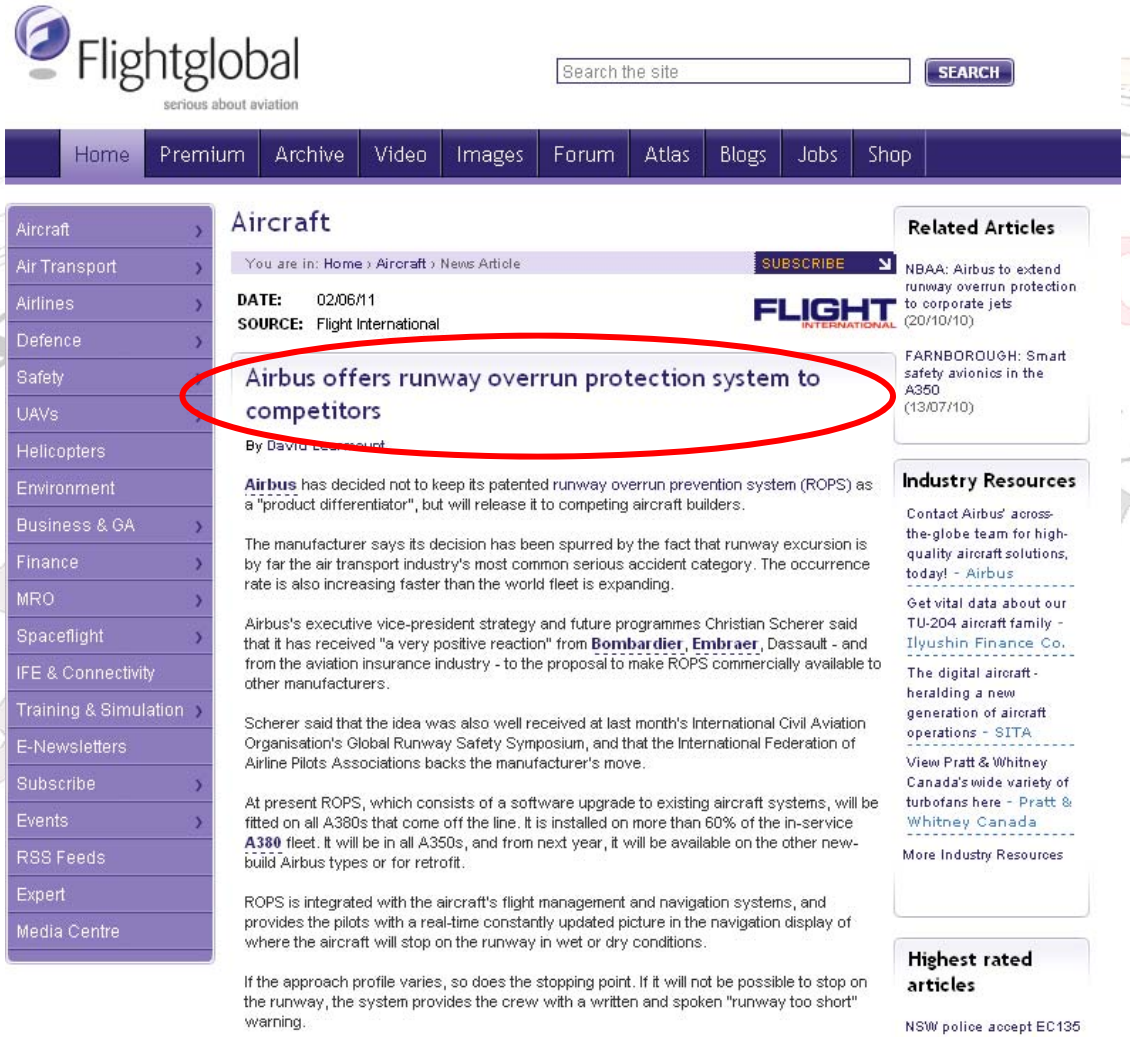
In operations
Linefit and retrofit solutions

In operations
3 overruns already prevented

AIRBUS

Airbus is proactive

ROPS Runway Overrun Prevention System



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FLIGHT INTERNATIONAL

Airbus offers runway overrun protection system to competitors

By David Learmount

Airbus has decided not to keep its patented runway overrun prevention system (ROPS) as a "product 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 is expanding.

Airbus's executive vice-president strategy and future programmes Christian Scherer said that it has received "a very positive reaction" from Bombardier, Embraer, Dassault - 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 Organisation's 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 fitted on all A380s that come off the line. It is installed on more than 60% 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.

Related Articles

NBAA: Airbus to extend runway overrun protection to corporate jets (20/10/10)

FARNBOROUGH: Smart safety avionics in the A350 (13/07/10)

Industry Resources

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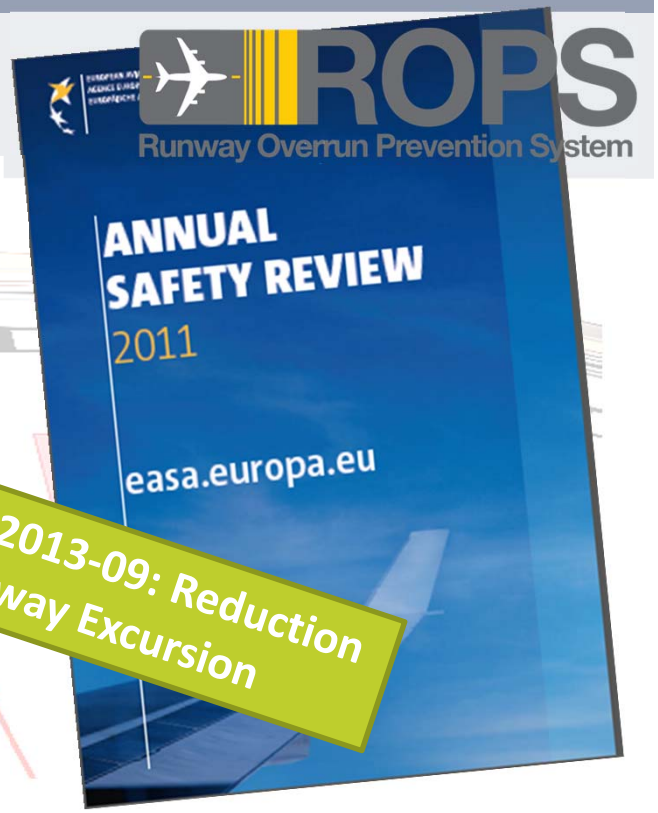
AIRBUS

The Aviation Industry is now moving

3.5.3	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.	Aircraft Manufacturer	January 2014	APPENDIX F

(Jan 2013)



EASA NPA 2013-09: Reduction of Runway Excursion

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)

AIRBUS

COntaminated Runway State Automatic Identification & Reporting

*An Answer to the **Runway Condition Reporting Issue***

- 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

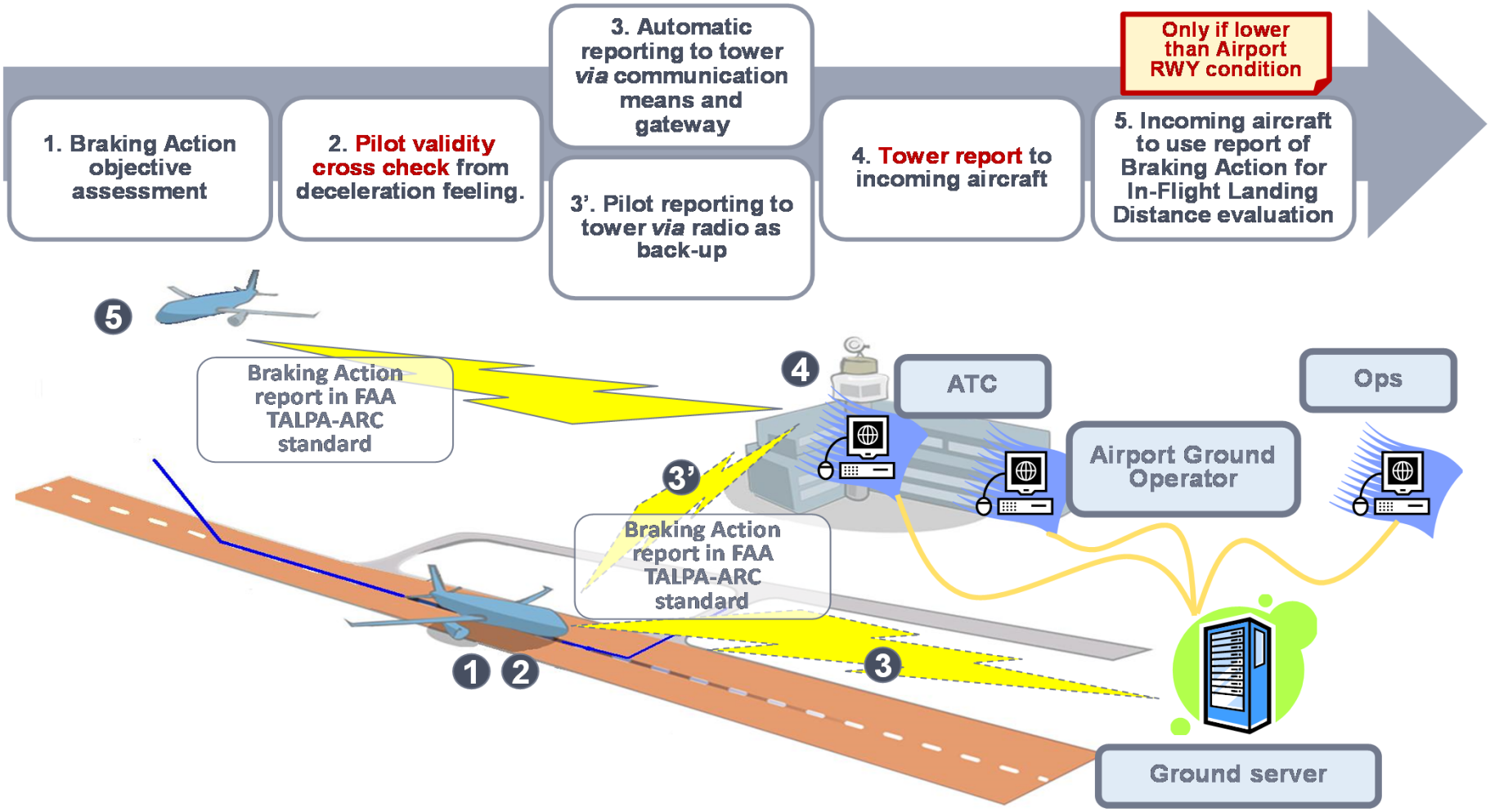
- Bad/wrong knowledge of actual runway state at landing is one of the multiple cause of several accidents that occurred in the past years
  - Runway friction coefficient lower than expected
  - Contaminated runway snow, ice ... more slippery than reported

Need for a reliable, real-time, seamless runway condition evaluation
3 recommendations issued by NTSB/ AAIB (1982, 2005, 2006) to develop on-board solutions

AIRBUS

COntaminated Runway State Automatic Identification & Reporting

An on-board solution as an extension of ROPS



A Three Fold Pioneering Approach

In Flight

On Ground

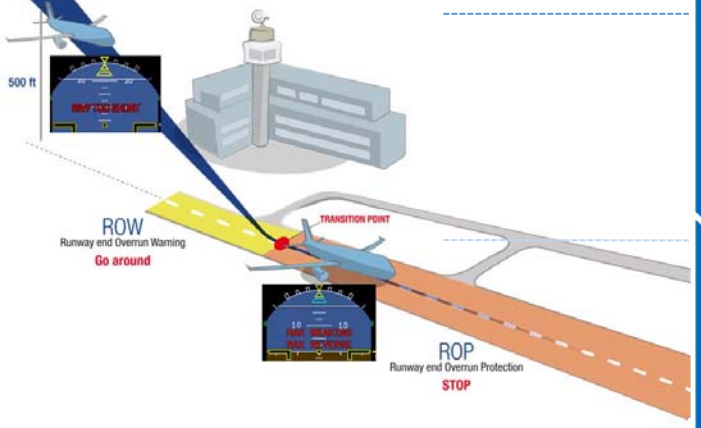
Crew proactive one-shot landing performance assessment

Real-time automated proactive landing performance assessment + Crew alerting

Real-time automated actual stopping distance calculation + Crew alerting

In-flight realistic landing distance assessment by the crew

VFR stabilization gate
As recommended per SOP



Pilot action based on simple SOP

Diversion

Go-Around

Max Braking
Max Reverse

Runway Condition Reporting

In-flight landing distance assessment coupled with ROPS & CORSAIR,
A consistent approach
Covering training, procedure and cockpit technology
... Airbus is ready and active

AIRBUS

ROPS

Runway Overrun Prevention System

FINALIST OF THE 2014 57TH AVIATION WEEK LAUREATE AWARDS