Overview of the project and technical results P3: prevention of runway excursions

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2017, B747-400 at Maastricht Airport
Veeroff during takeoff roll

Landing overrun, Milan Bergamo , Aug 5th 2016

Background

- European Action Plan Prevention of Runway Excursions provides recommendations to reduce runway excursions in Europe;
- Action Plan also identified areas were research is needed to further reduce runway excursion risk;
- Project P3 *Prevention of Runway Excursions* addresses some of these areas.

Objectives P3

1. Improve methods for analysing aircraft ground control on slippery runways under crosswind;

2. Quantify impact of water/slush covered runways on braking performance for modern tires and anti-skid systems;

3. Develop new methods to identify veer-off risk using operational flight data;

4. Explore new concepts for prevention of excursions and reduction of consequences of runway excursions.

1. Aircraft ground control on slippery Runways under crosswind

- Exploration of shortcomings in aircraft ground models;
- Tests with aircraft tyre on wet/flooded surfaces under yaw;
- Analysis of aircraft aerodynamics under high side slip angles;
- Comparison of desktop simulation models with full motion simulators experiments for different crosswind and runway conditions.

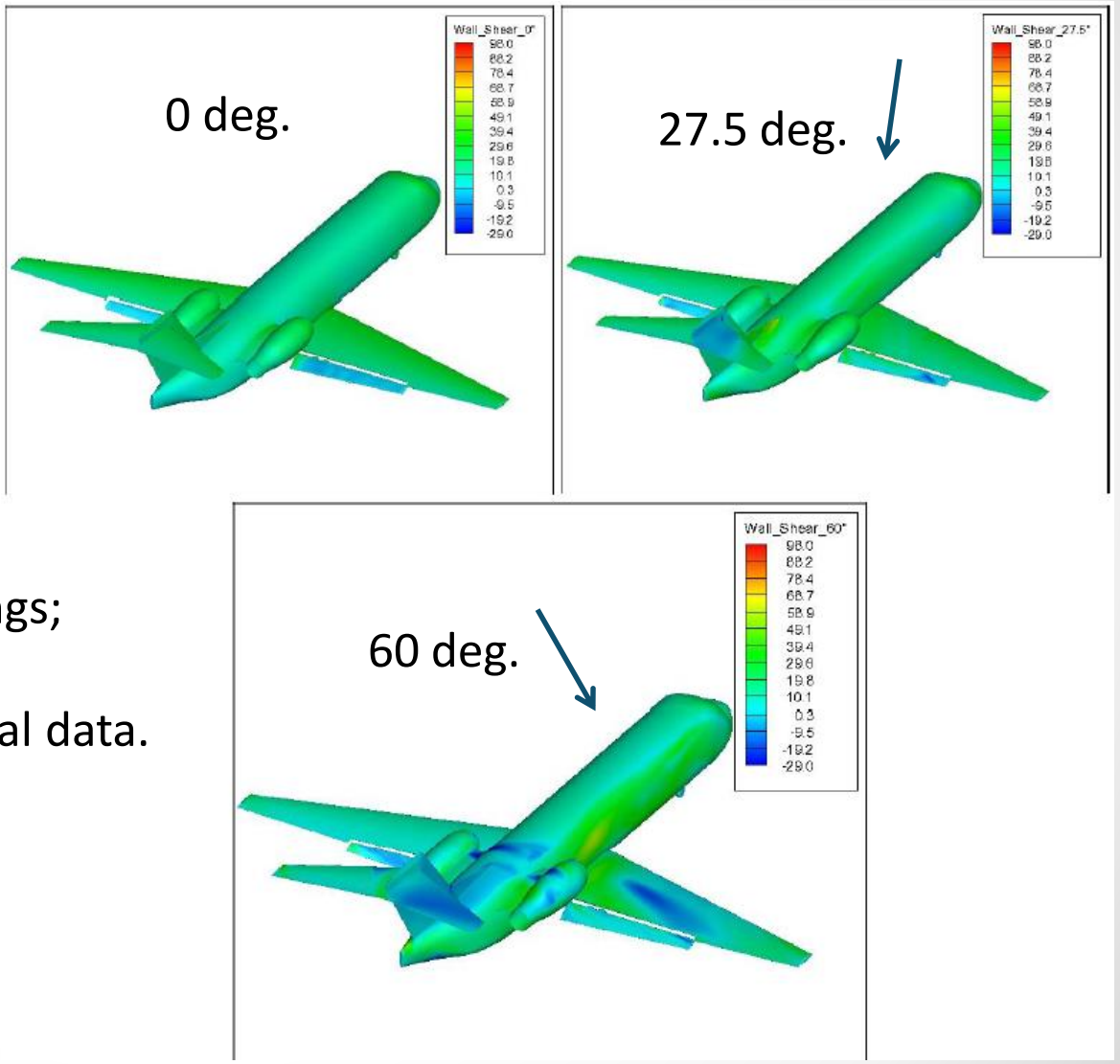
Example: yawed tyre tests

Large test vehicle

Citation main gear tyre

Testing on flooded surface

Aerodynamics under high side slip



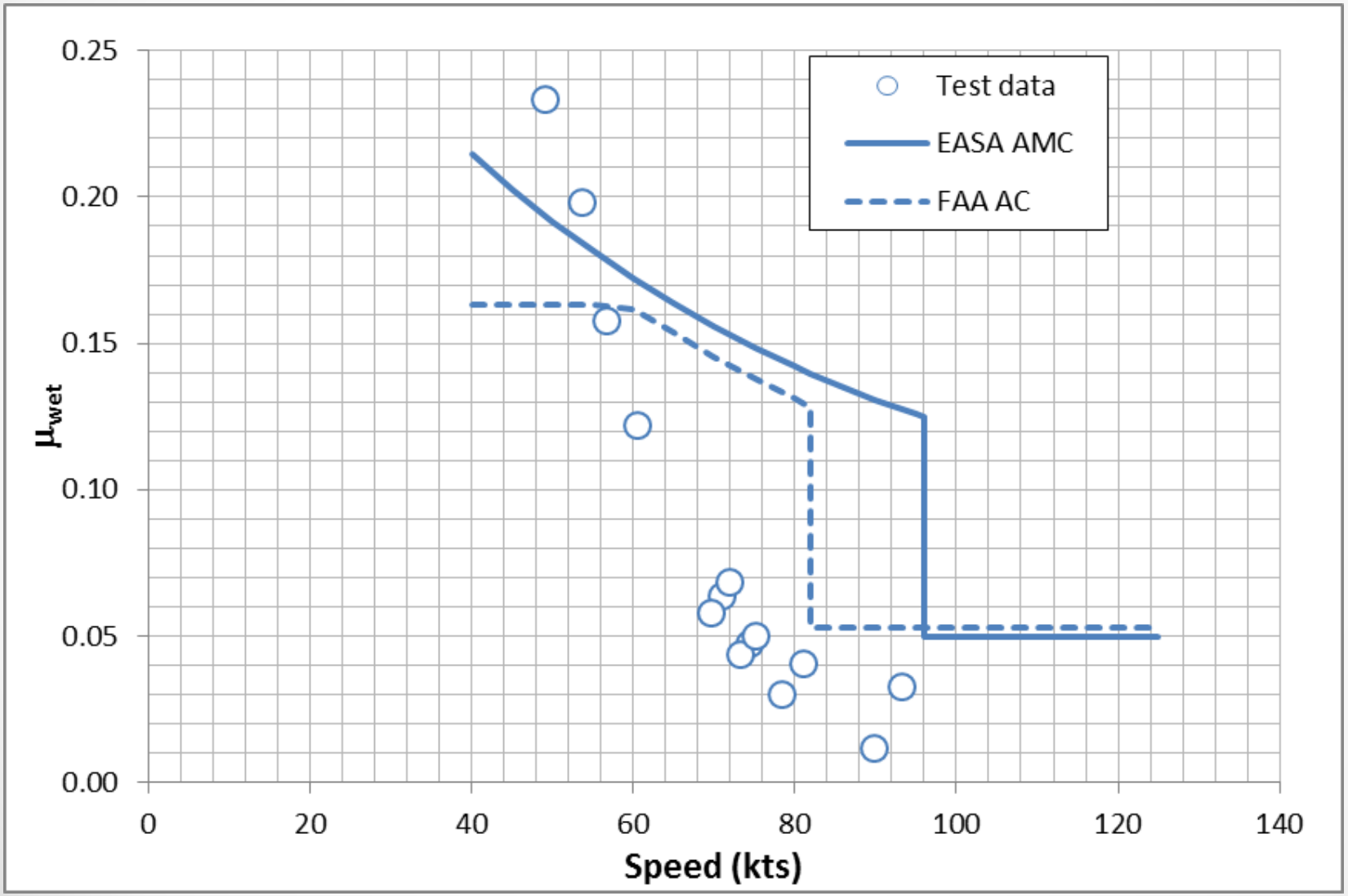
- Important for crosswind landings;
- Mainly simulations;
- Limited analysis of experimental data.

2. Braking performance on flooded runways

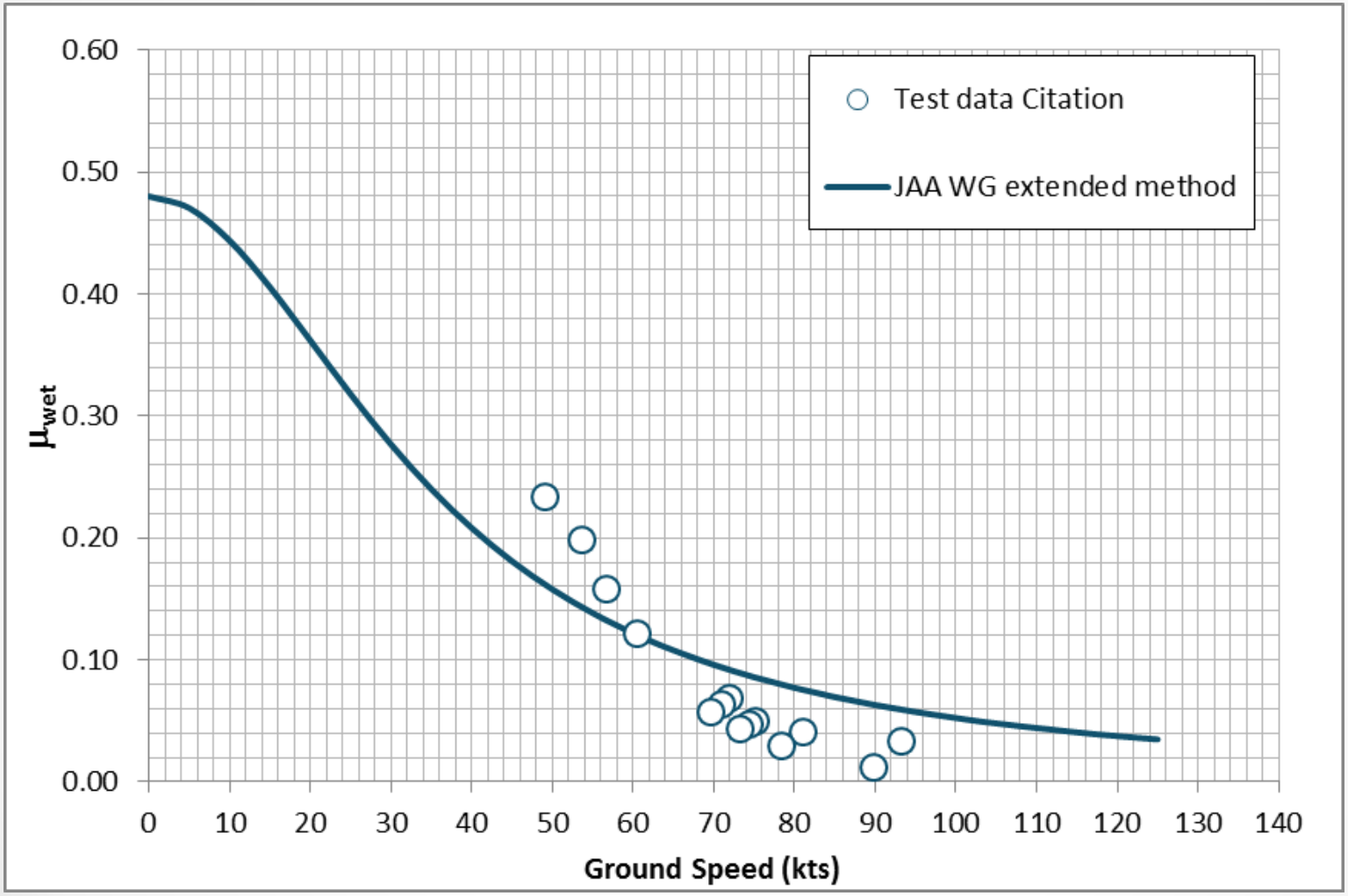
- Inventory of current knowledge and test data;
- Flight tests conducted on flooded runway with a Citation and A400M aircraft;
- Exploration of improved models for braking performance on flooded runways.

Tests with Citation and Airbus A400M

EASA AMC & FAA AC methods – Citation



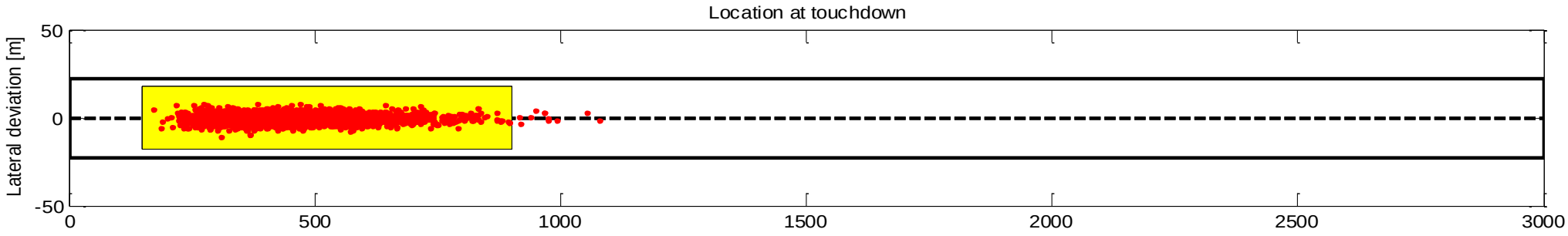
Example improved model in P3 - Citation

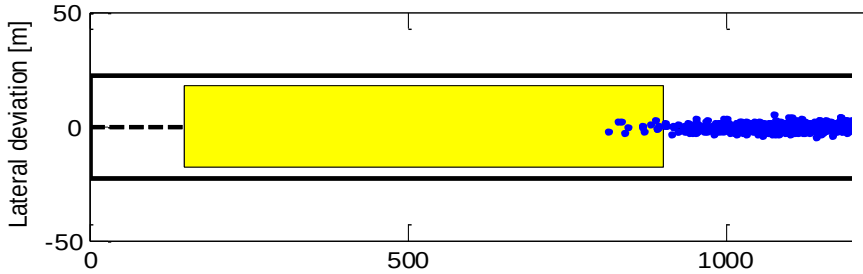


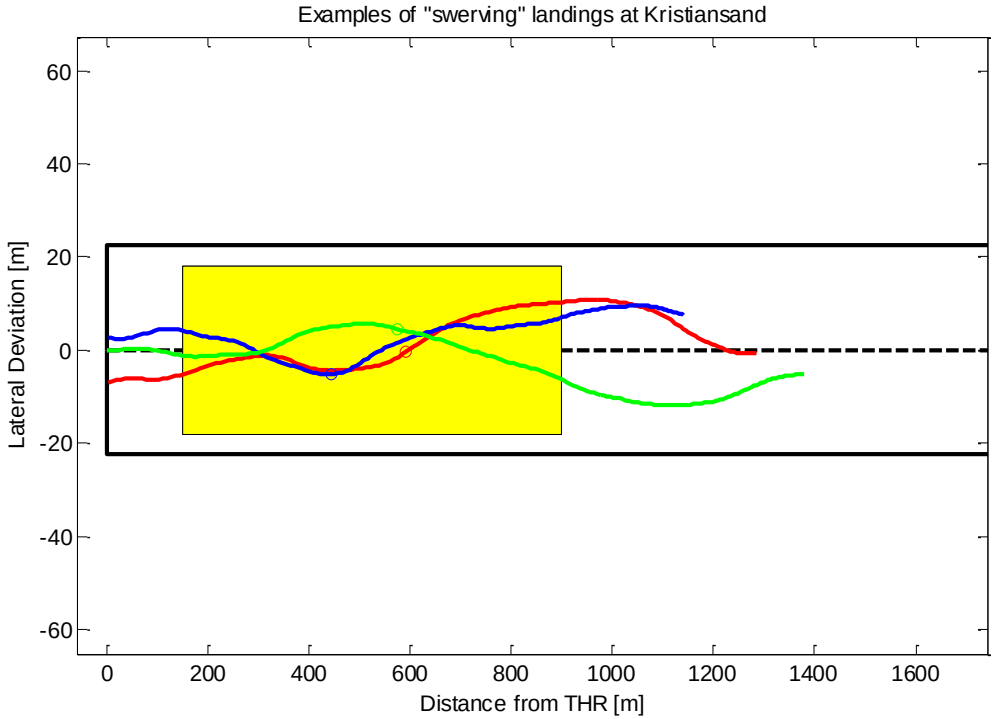
3. Methods to identify veer-off risk using operational flight data

- Analysis of historical veeroff accidents;
- Development of several algorithms to analyse flight data for runway veeroff risk factors;
- “Real” operator data used to test developed algorithms;
- Application of machine learning techniques.
- FDM workshop: Runway Veeroff Risk Monitoring Tools

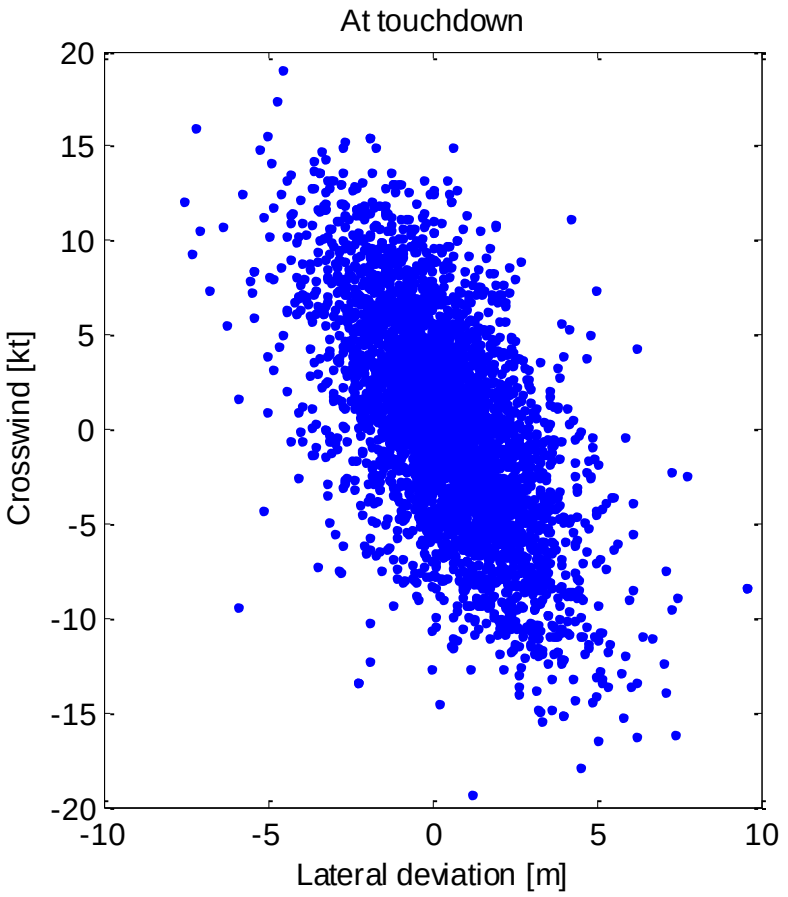
Example: Touchdown dispersion and ground trajectory

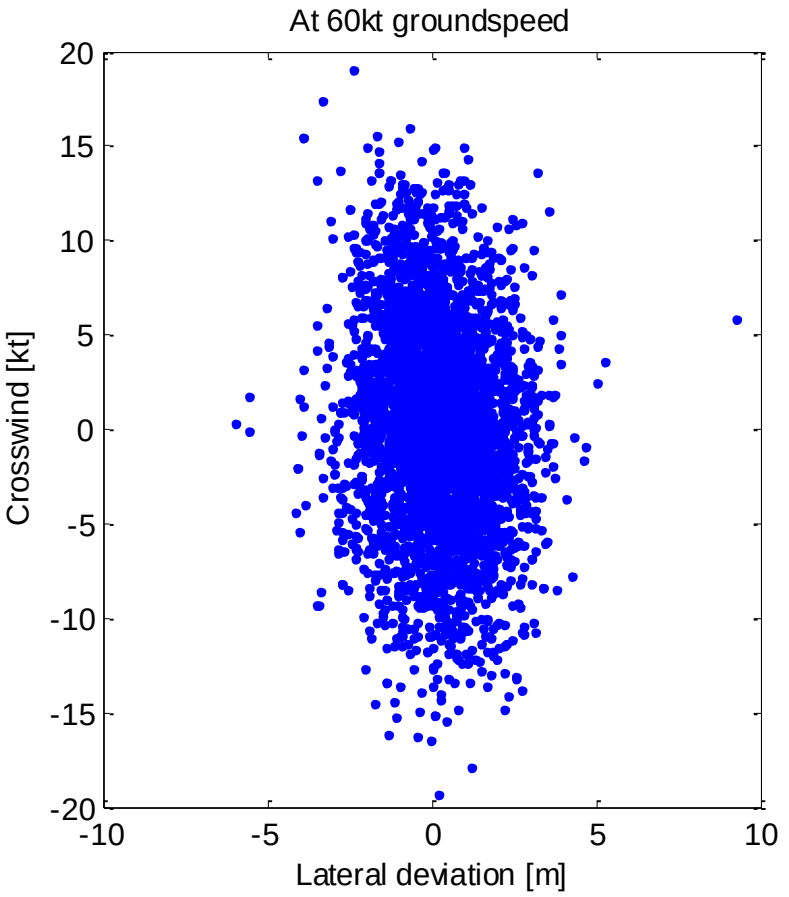






Example: Effect of crosswind on lateral deviation for regional jet



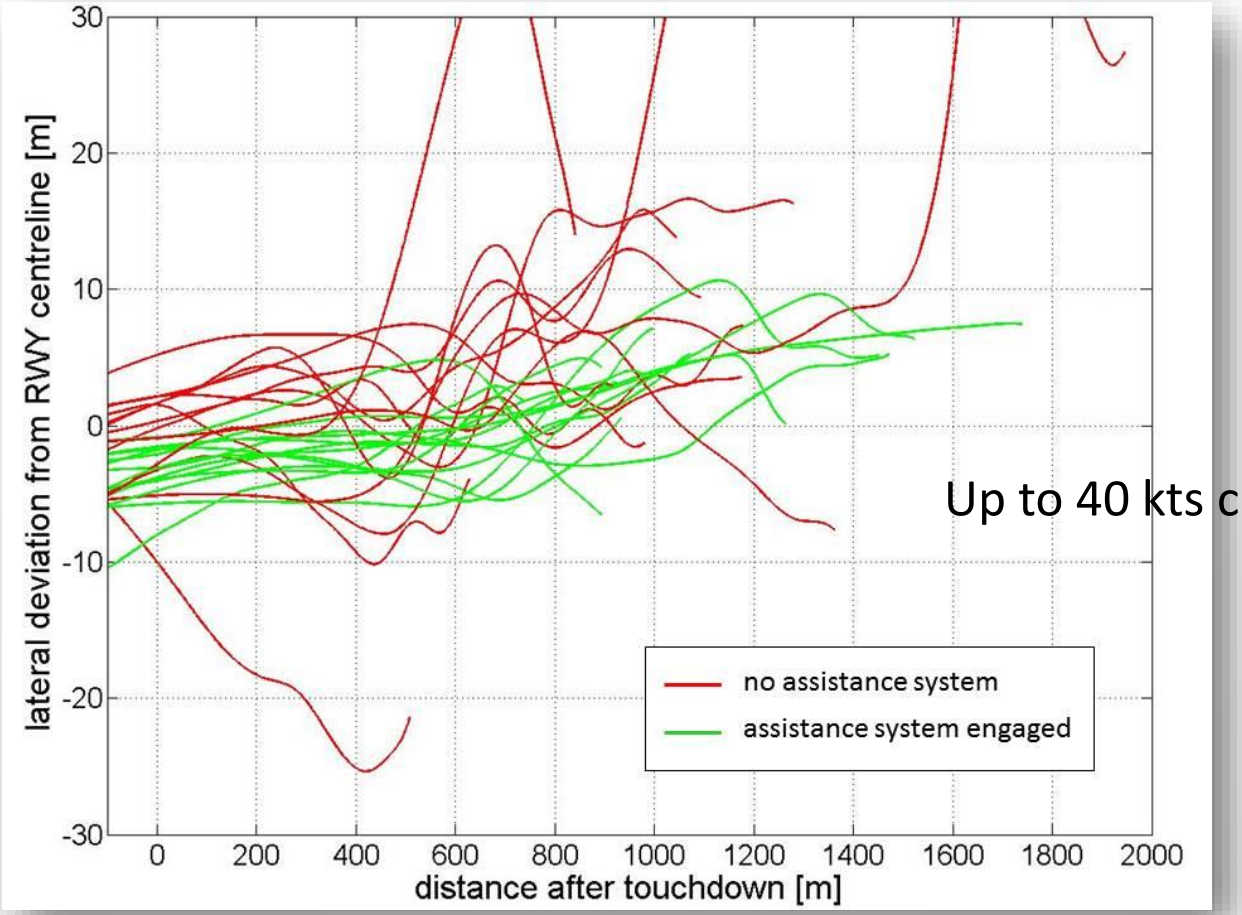


4. New concepts for excursions risk reduction

- Inventory of current developments and new initiatives;
- Feasibility study and definition of R&D needed for implementation of new concepts;
- Assess impact of the new concepts on reducing excursions.

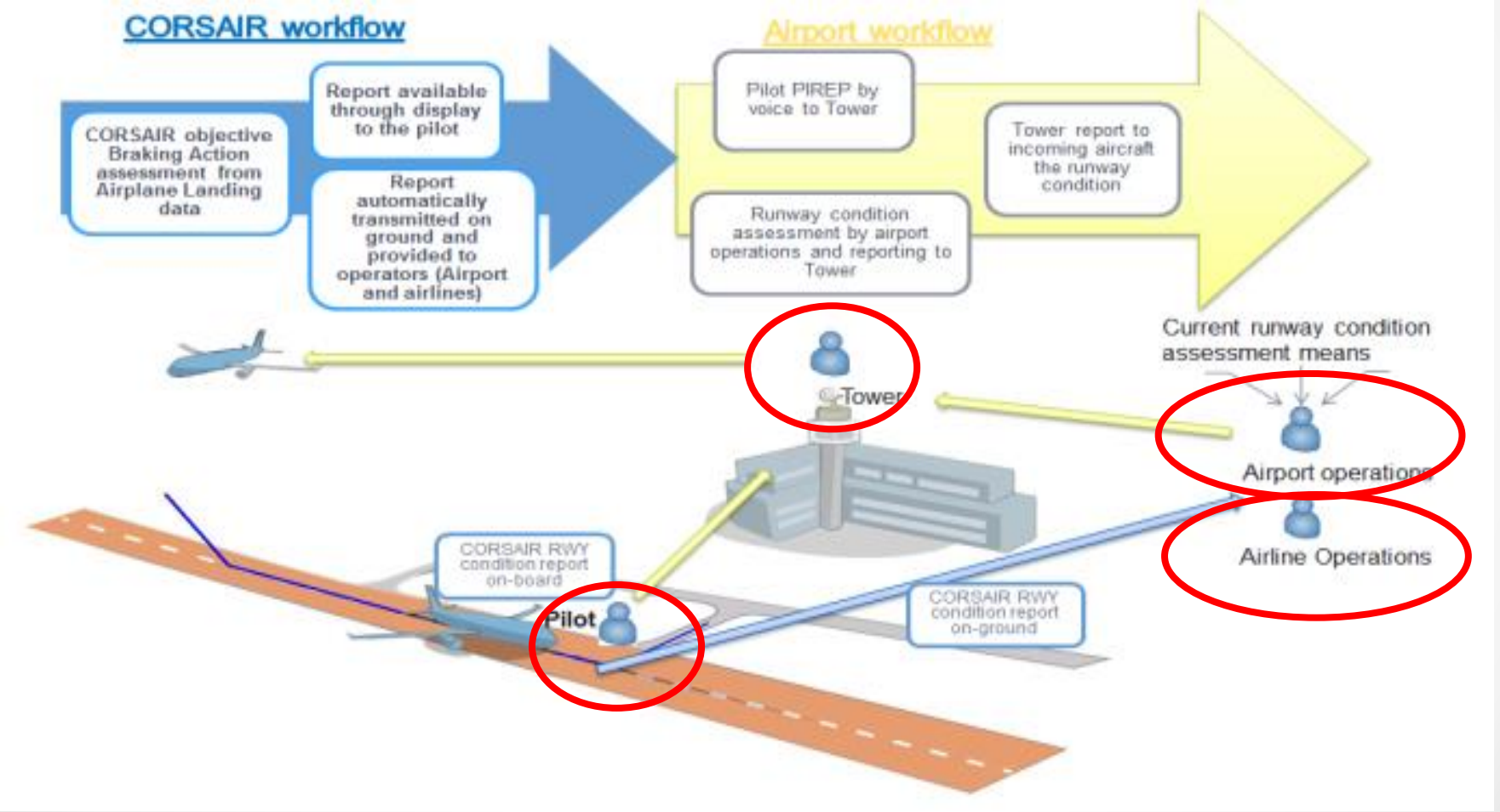
Example result: Crosswind Landing Assistance System" (CLAS)

Steerable main landing gear and CLAS implemented in A320-simulator



Up to 40 kts crosswind

Onboard and aircraft based computation of Braking Action



P3 in summary

- P3 addressed several elements that will help to reduce runway excursion risk;

- Several results can already be used.

Questions?

FUTURE SKY SAFETY

Consortium

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Office national d'études et de recherches aérospatiales
Centro para a Excelência e Inovação na Indústria Automóvel
Centro Italiano Ricerche Aerospaziali
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Future Sky Safety has received funding from the European Union's Horizon 2020 research and innovation programme, under Grant Agreement No 640597.
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