

A320 – Flight Data into Practice

Adapting to new technologies

Case study: ROW/ROPs

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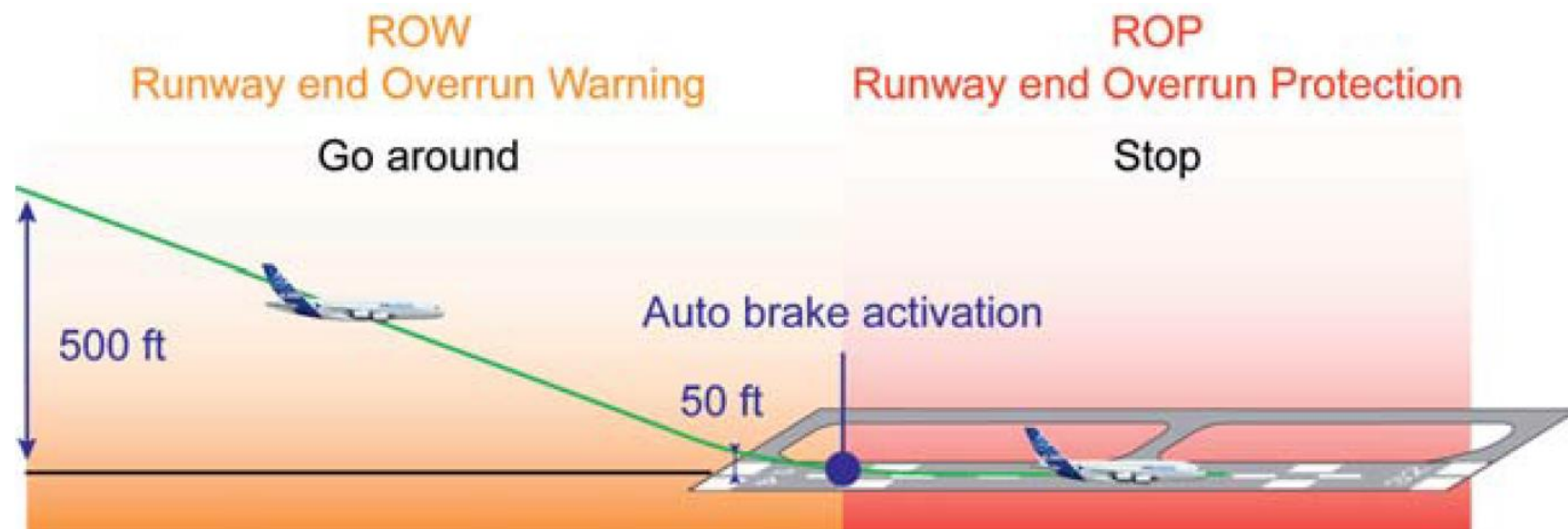
ROW/ROPS system overview

Runway end Overrun Warning

Automatically arms at 400ft AGL and works until start of braking

Runway end Overrun Protection

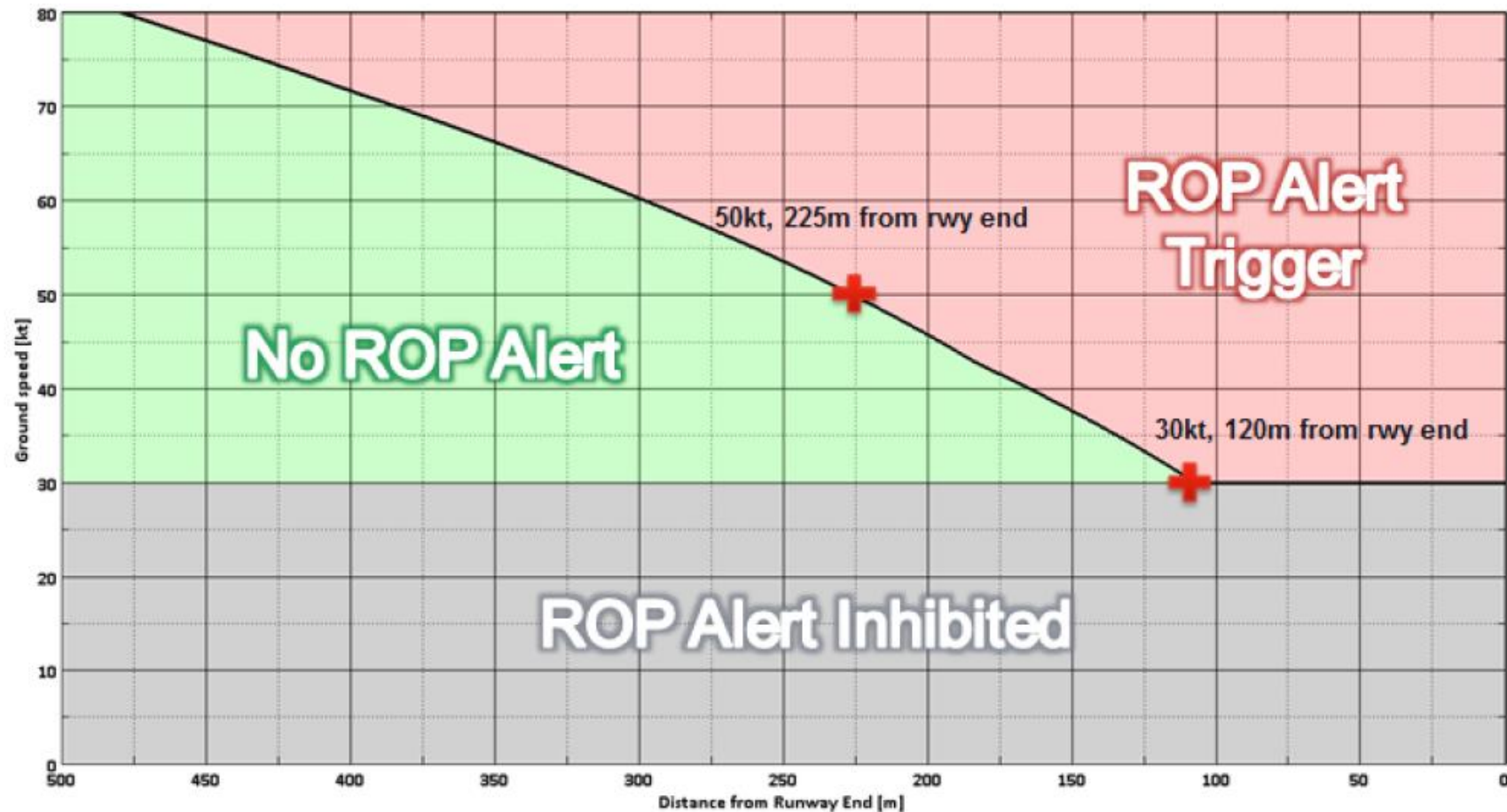
The function works from start of braking until the aircraft stops



	ND (< 500 ft)	PFD (< 500 ft)	Audio (< 200ft)	Actions
ROW (WET)	WET line DRY line	IF WET, RWY TOO SHORT	None	GA decision (crew)
ROW (DRY)	WET line DRY line	RWY TOO SHORT	RWY TOO SHORT !	GA decision (crew)
ROP	RED stop bar	MAX REVERSE	MAX REVERSE ! KEEP MAX REVERSE ! (< 80 KIAS)	Max Braking (Auto) Max REV (crew)

ROW/ROPS

After landing (ROP only):



Challenges with implementation

No ROW/ROP discrete recording on existing data frames – Unable to create reliable FDAP events.

Pilot perception

Fear of repercussions if system activated

Trust (or lack of) that the system is reliable, is it too sensitive?

Management perception

Understand the risk of runway excursion during events

Need to monitor event activations

As an initial action, we mandated reporting of system activation

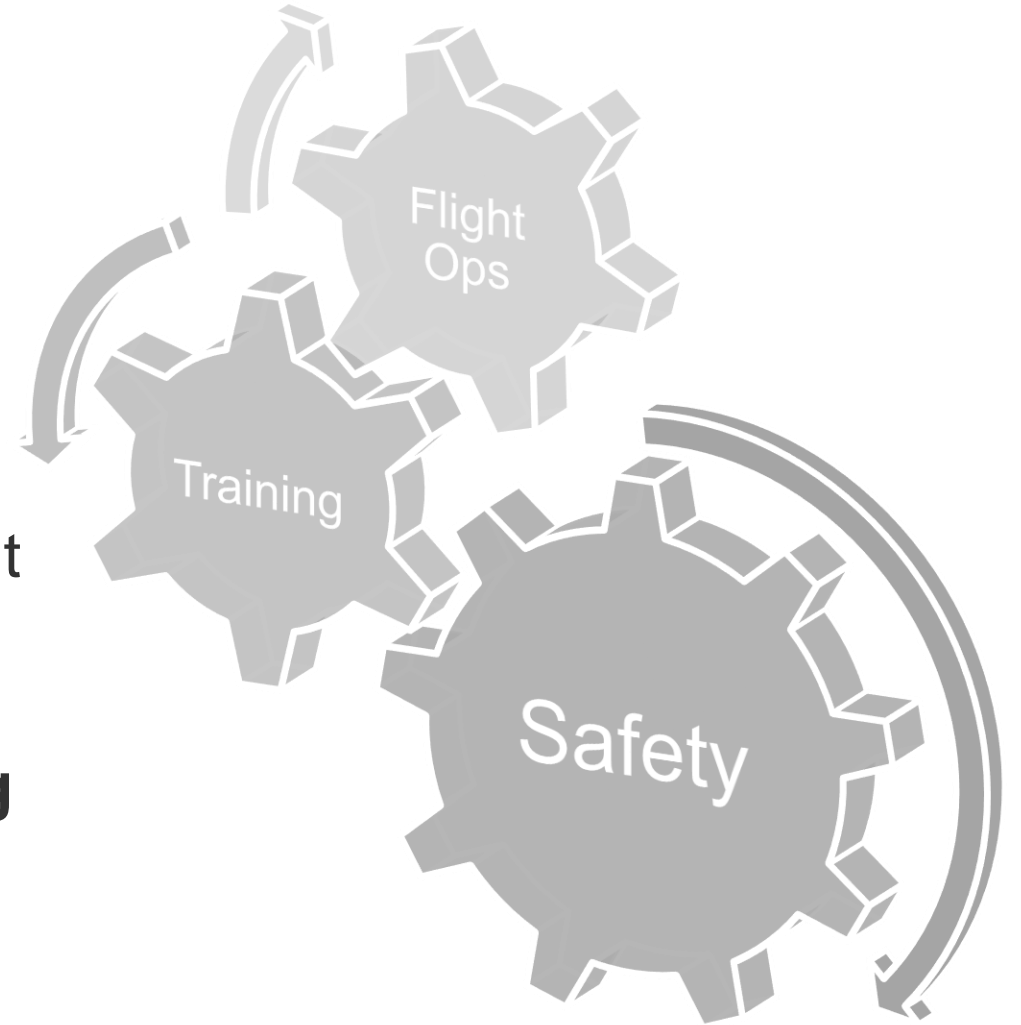
Challenges with implementation

After mandating reporting:

- Database of events for validation created
- Engagement with Airbus for technical advice
- Routine engagement with Training Department

Just Culture = Learning

Breakthrough finding: Auto Brake logic



Operational Context

The typical runway in our operation is:

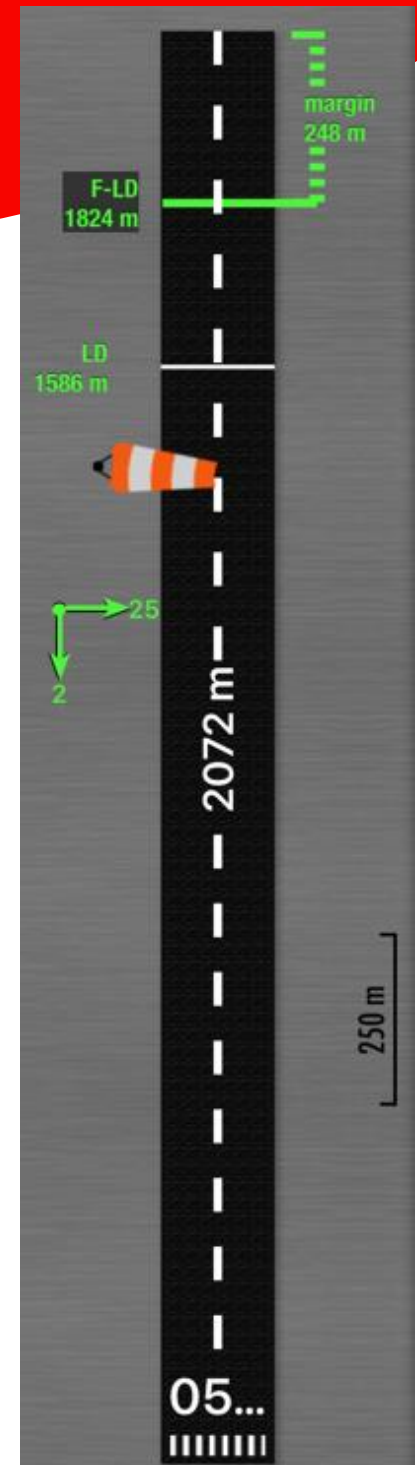
- Approximately 2,000 mt long
- 30 mt wide
- 1,500 ft elevation
- Hot and gusty conditions for most of the year

For A320 operations, landing is usually performed at or near Maximum Landing Weight and using MED auto brake function.

From the A320 FCOM:

- MED or LO autobrakes are normally selected for landing.

MED mode sends progressive pressure to the brakes 2 sec after the ground spoilers deploy in order to decelerate the aircraft at 3 m/s^2



Learning using FDM - Case Study

Event Analysis – Factors contributing to ROPS activation:

1. Correct touchdown zone (300m to 600m), but 'slow' de-rotation of the aircraft;
2. End of the touchdown zone, where the aircraft experienced wind gust including tailwind;
3. Pilots removed the autobrake and 'eased' the deceleration.

An initial slow auto-deceleration contributed to most of the ROPS activations

MED autobrake function

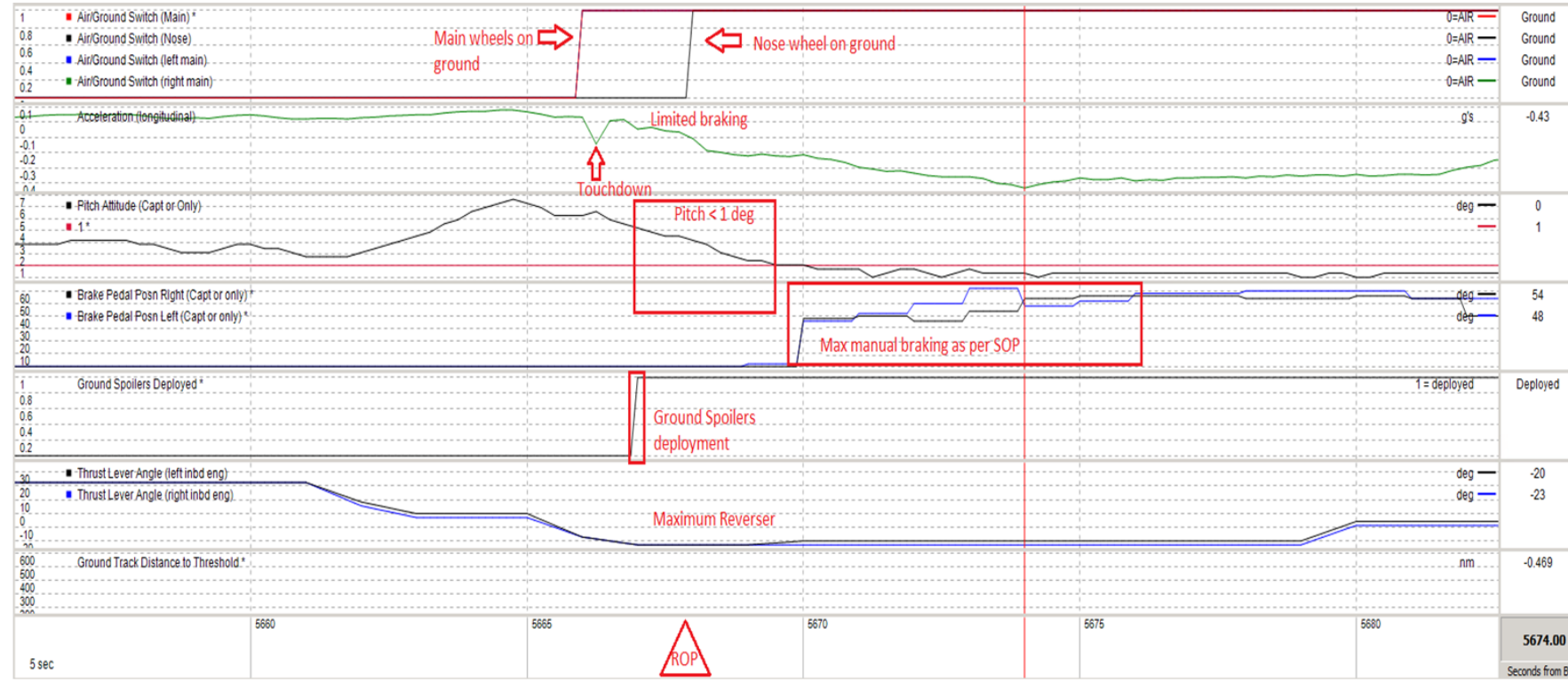
The deceleration rate is limited to 2m/s^2 (MED limited) until one of the two following condition is met:

- Ground Spoilers deployed for more than 5 seconds, OR
- Aircraft pitch is below 1°

Case study

- ROP function assumes the runway is WET
- Initial Autobrake deceleration is 0.2g until the de-rotation is finished (**Pitch Attitude below 1°**)
- In the data strips below, the de-rotation was 'slow'. ROP alert triggered.
- After an increase of deceleration ($>0.25g$), the ROP alert disappeared.

Due to the long de-rotation and low deceleration after the ROW/ROP transition, the ROP alert is confirmed.



Working with the System – Education

What we learned

- ROPs activations were valid
- The system is sensitive and will trigger in certain conditions
- The system is reliable

Preventative measures

- Reinforcing FCOM landing technique
- **Incentivise correct response to ROPs**
- Embed lessons in training syllabus

Future measures

- Upgrade data-frames to include ROPs metrics for detection
- Continue to monitor and validate events
- Update systems where available

Thank you

