

# A320 – Flight Data into Practice

Adapting to new technologies

Case study: ROW/ROPs

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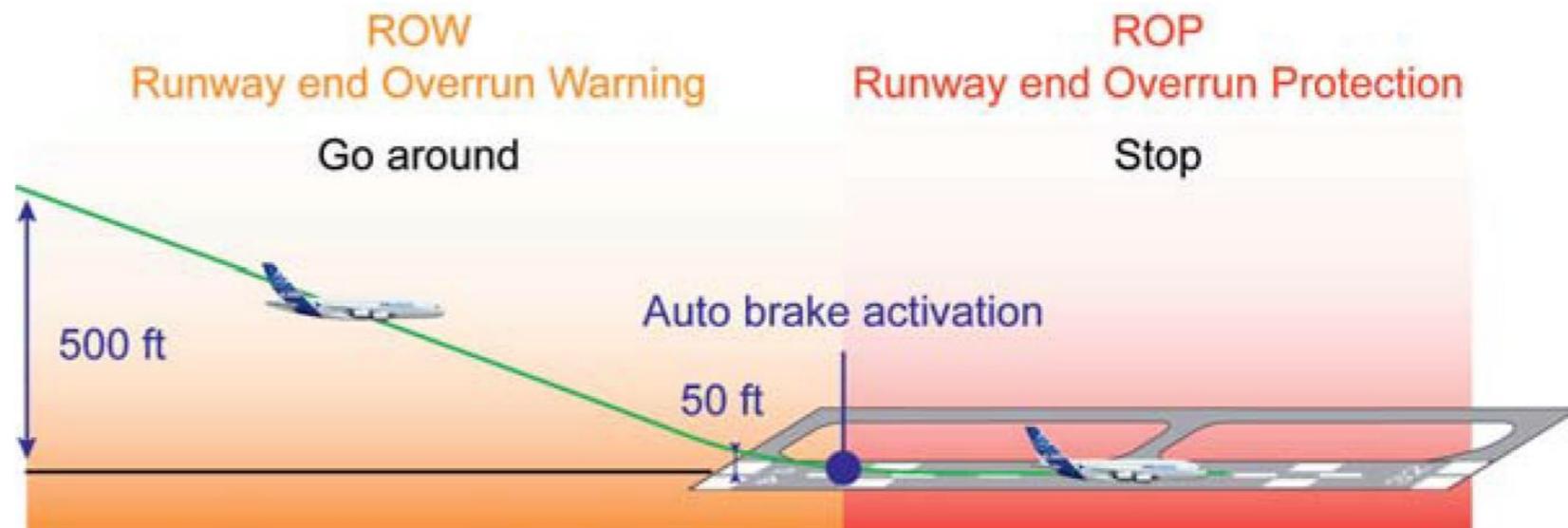
# ROW/ROPS system overview

## Runway end Overrun Warning

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

## Runway end Overrun Protection

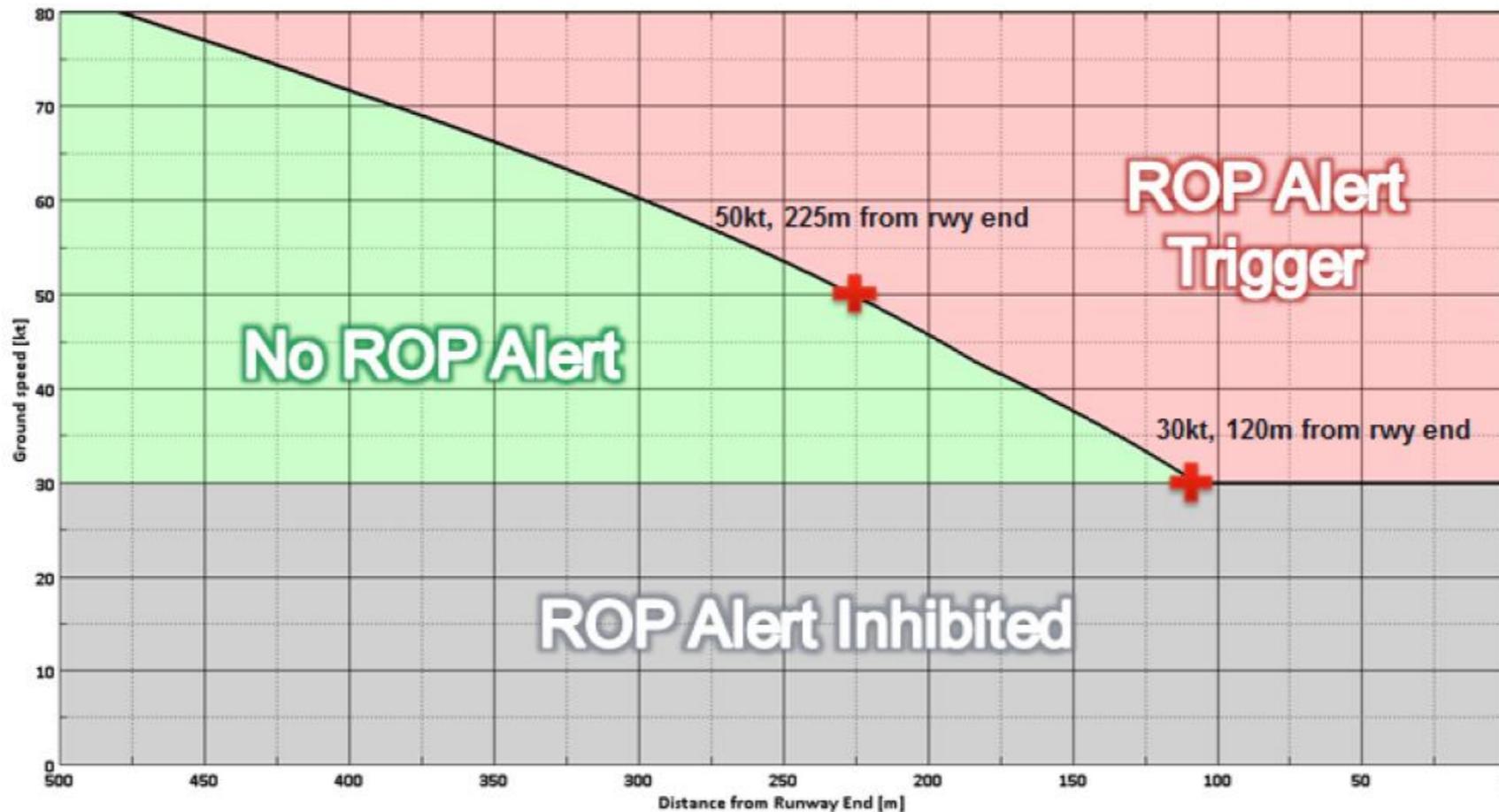
The function works from start of braking until the aircraft stops



	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**

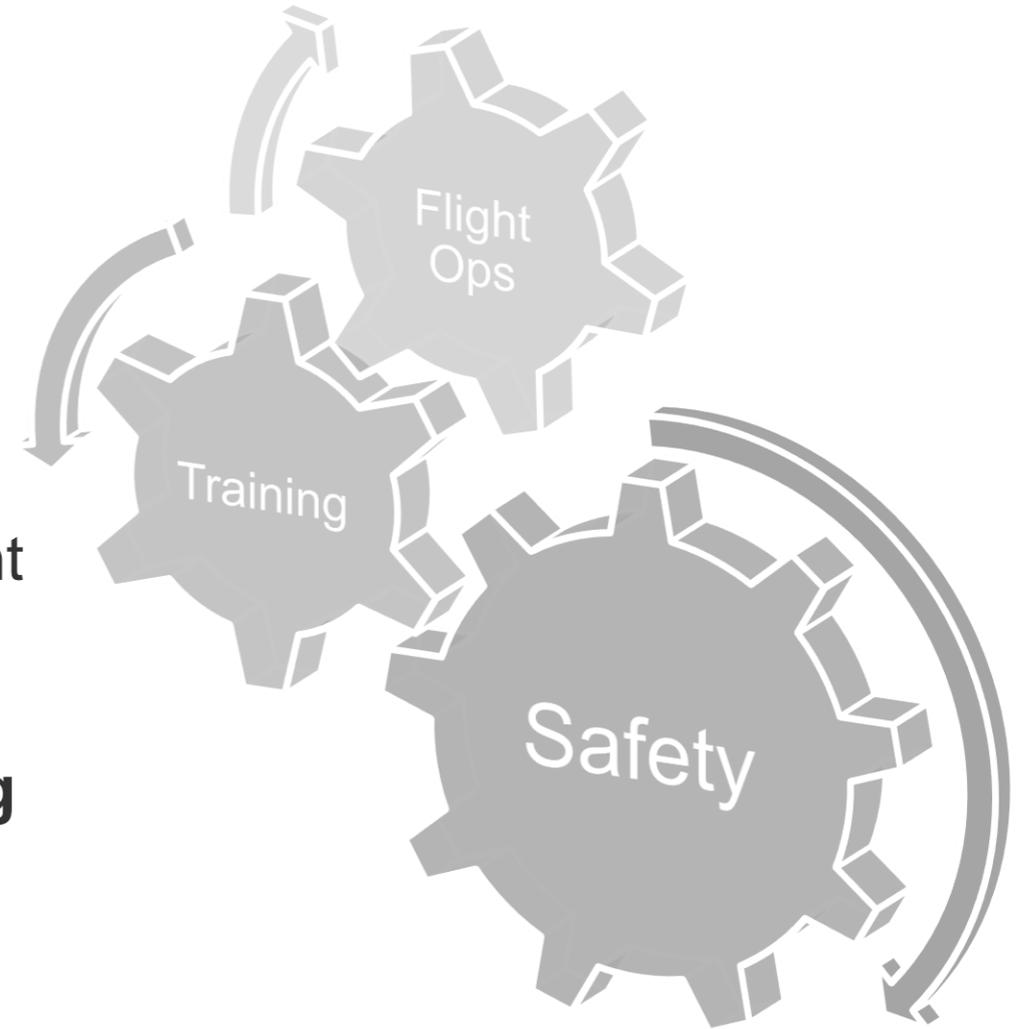
# Challenges with implementation

## 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:

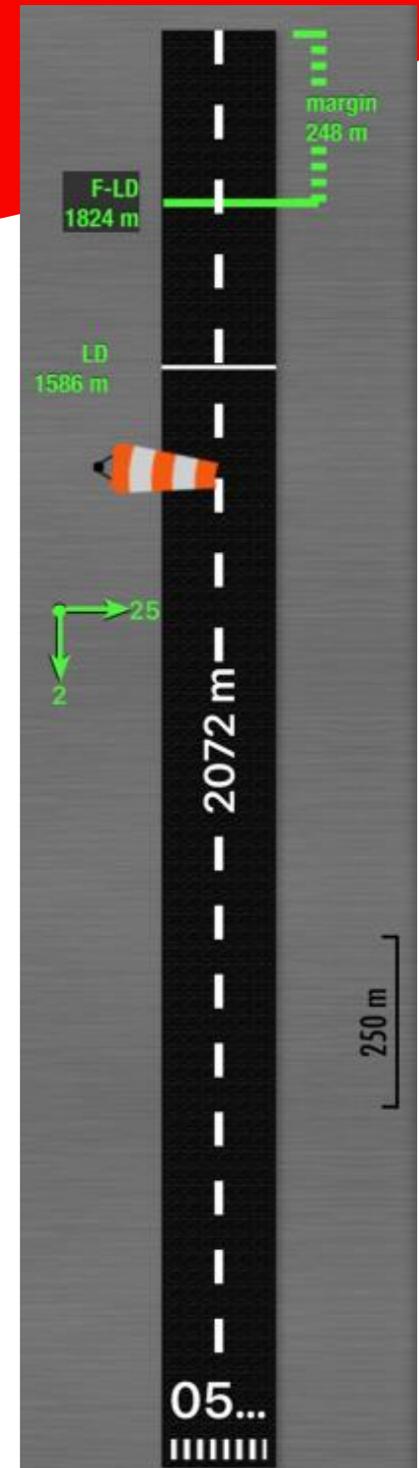
- Approximately 2,000 mt long
- 30 mt wide
- 1,500 ft elevation
- Hot and gusty conditions for most of the year

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  $3 \text{ m/s}^2$



# 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  $2\text{m/s}^2$  (MED limited) until one of the two following condition is met:

- Ground Spoilers deployed for more than 5 seconds, OR
- Aircraft pitch is below  $1^\circ$

# 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