



Preventing Runway Excursions

Technical solutions

From the Design and Manufacturing Sector

By Claude Lelaie

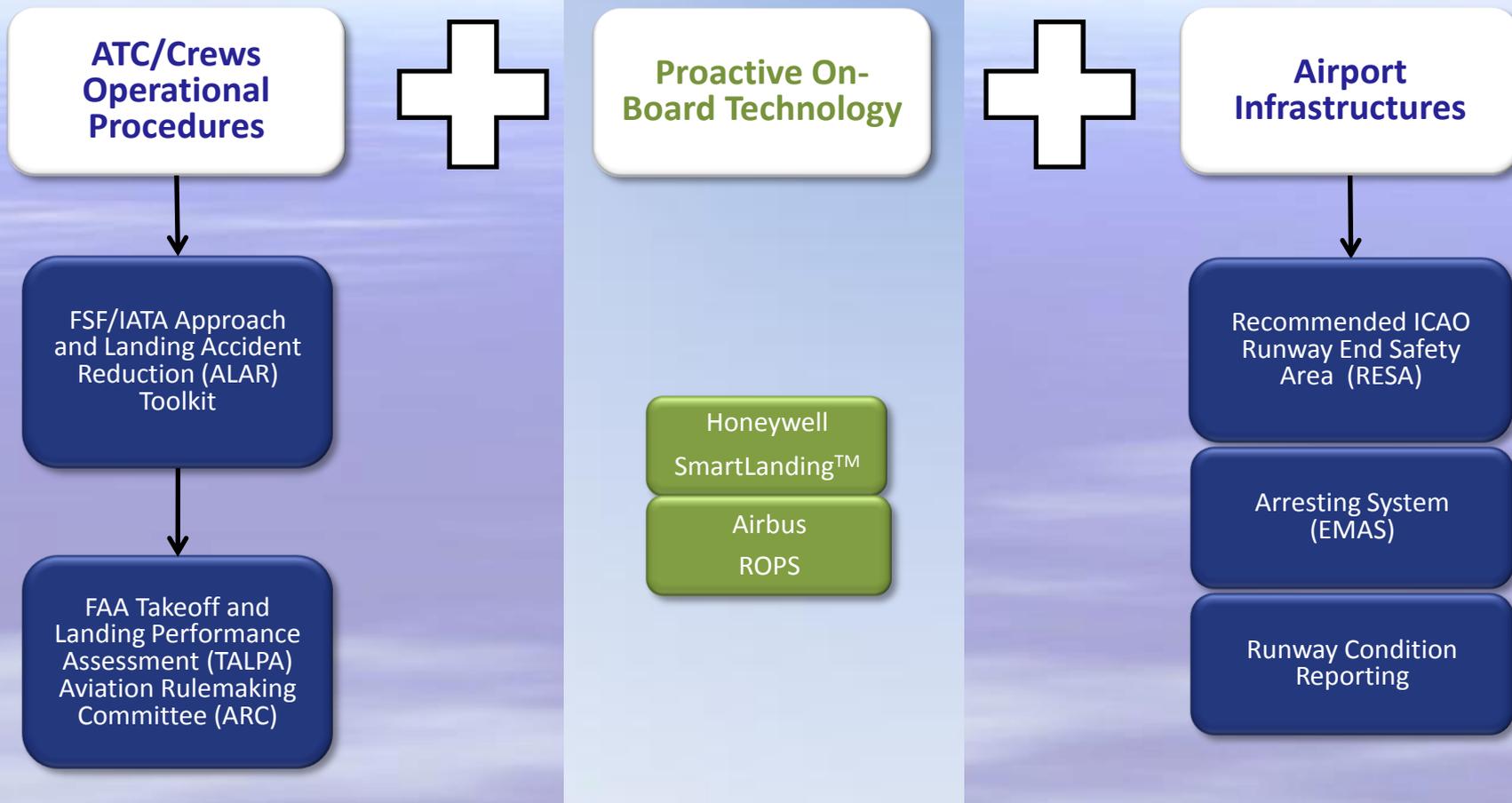


Today, main cause of accidents is **Runway Excursion**

Main factors of Runway Overrun at landing

- No approved in-flight realistic operational landing distance
- Stabilization not achieved at 1000/500 ft
- Wind shift at low altitude
- Approach becoming unstable at low altitude
- Long flare
- Long derotation
- Late selection of engine thrust reversers
- Runway friction coefficient lower than expected
- Late/weak manual braking (w/o or after AB disc)
- Failure affecting the landing distances

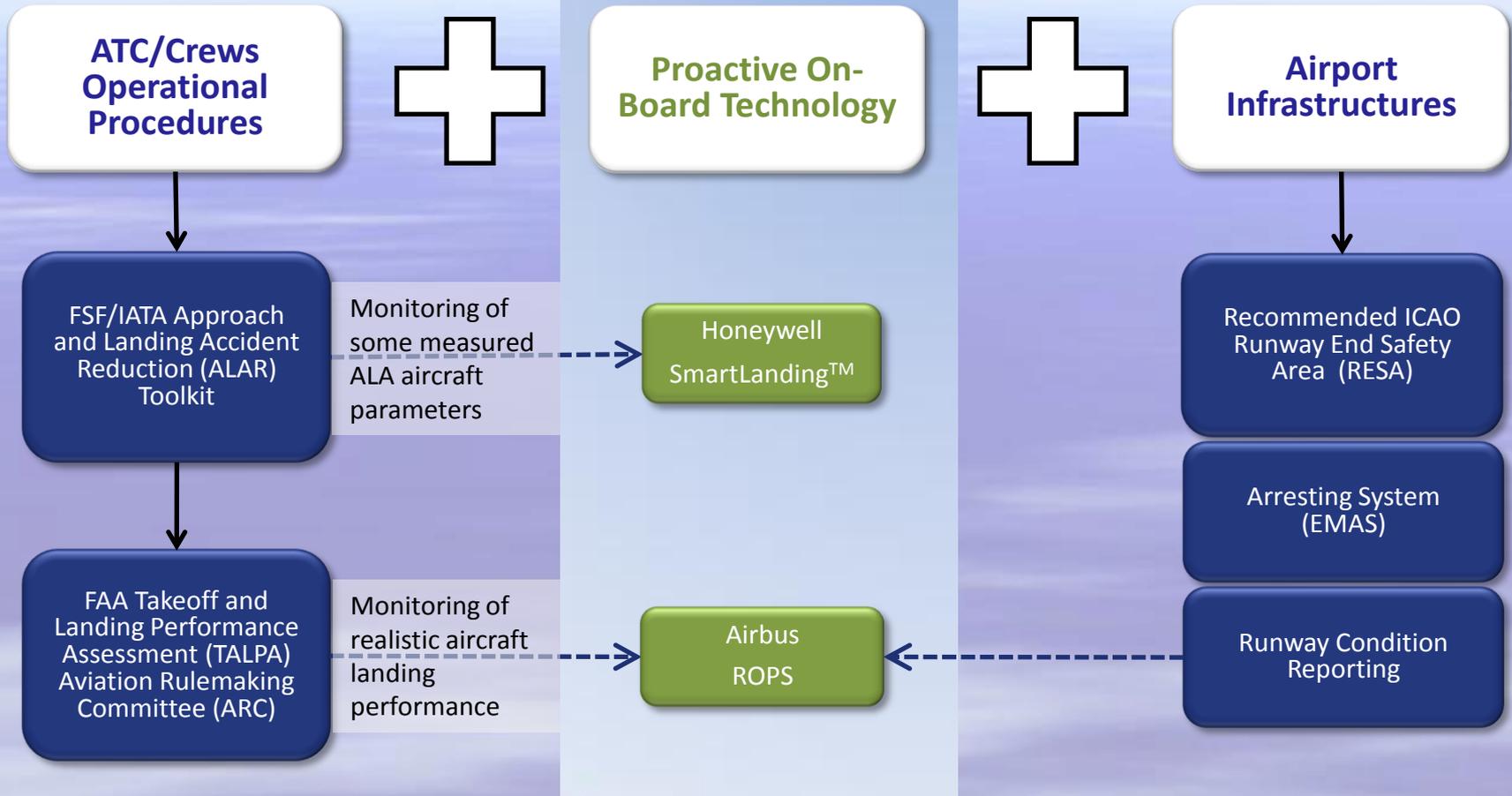
A vast majority of overruns at landing is avoidable



**For Runway Excursion Risk, only a combined prevention approach should be effective
As it was for CFIT and Mid-Air collisions**



International Coordinating Council of Aerospace Industries Associations



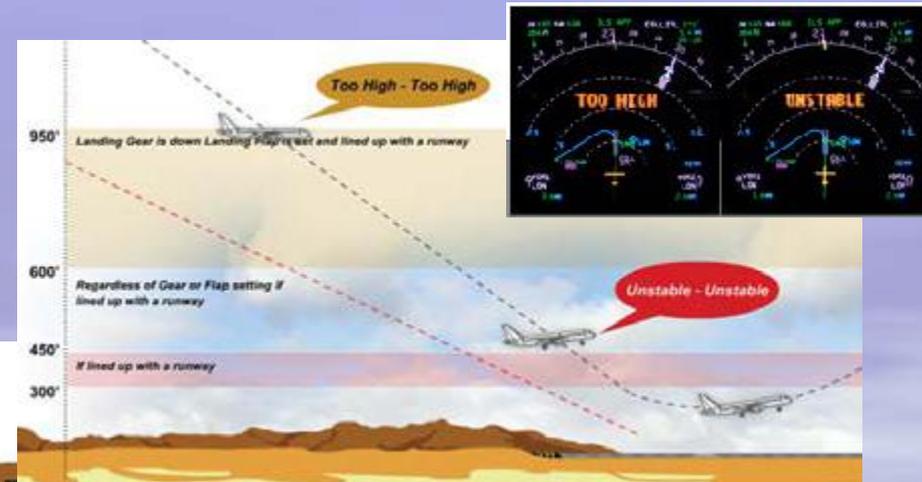
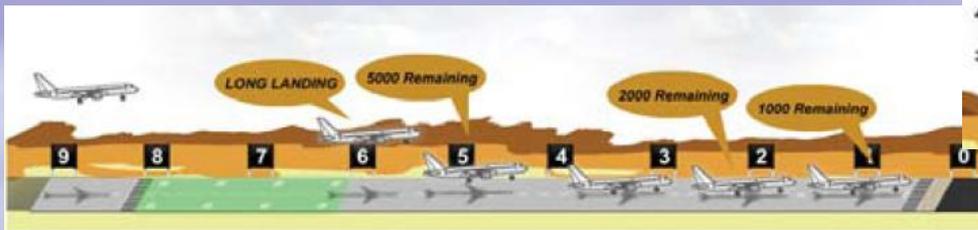
**Like E-GPWS & TCAS, on-board technology will be key to mitigate Runway Excursion Risk
But clear different design intents exist**

Smartlanding™ is a Honeywell function of the E-GPWS:

- Monitoring A/C speed and position vs. runway threshold
- Providing visual/aural annunciations to enhance crew awareness of unstabilized approach
- Based on tuning defined by Honeywell (speed, glideslope) or set by airlines (long landing distance)

Smartlanding™ main monitorings:

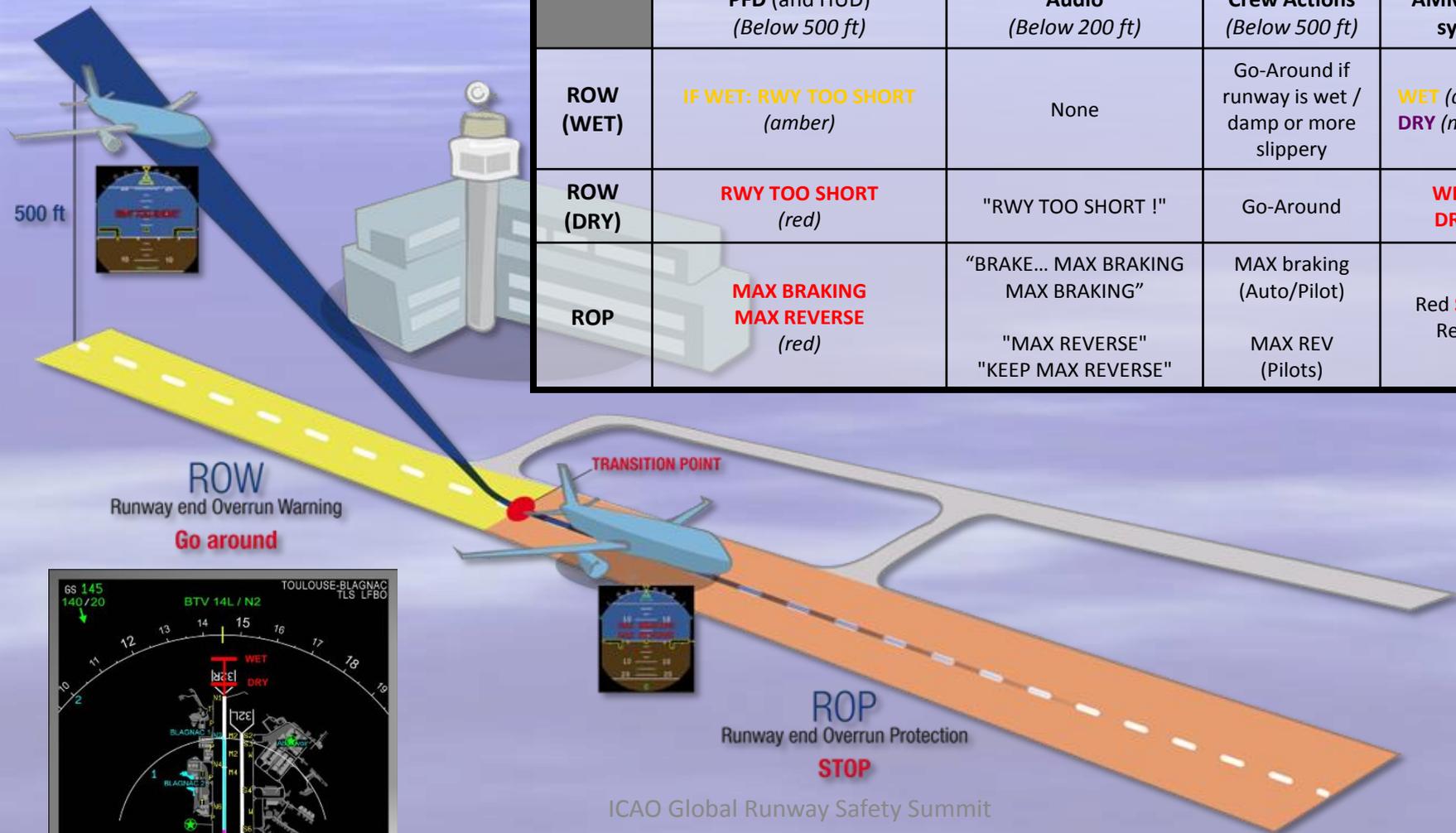
- « TOO FAST » alert,
- « TOO HIGH » alert,
- « UNSTABLE » alert,
- « LONG LANDING » alert, ...



As considered as a “non interferent” function, no demonstration is requested by FAA on Smartlanding™ tuning relevance

A bit more on Airbus Runway Overrun Prevention System (ROPS)

	PFD (and HUD) (Below 500 ft)	Audio (Below 200 ft)	Crew Actions (Below 500 ft)	AMM ND line symbols
ROW (WET)	IF WET: RWY TOO SHORT (amber)	None	Go-Around if runway is wet / damp or more slippery	WET (amber) DRY (magenta)
ROW (DRY)	RWY TOO SHORT (red)	"RWY TOO SHORT !"	Go-Around	WET (red) DRY (red)
ROP	MAX BRAKING MAX REVERSE (red)	"BRAKE... MAX BRAKING MAX BRAKING" "MAX REVERSE" "KEEP MAX REVERSE"	MAX braking (Auto/Pilot) MAX REV (Pilots)	Red STOP bar Red path





A bit more on Airbus Runway Overrun Prevention System (ROPS)

- EASA consideration for ROPS certification
 - Request to demonstrate the relevance of ROPS alerts and protections (no unprotected area, no undue conservatism)
 - Principle: “If no ROW alert before decision point
Then, thanks to ROP, no runway excursion
While no significant increase of go-around rate”
- Translation into ROPS design objectives
 - Continuous real time performance computation of predicted and remaining realistic operational landing distance
 - Compare in real time with runway end
 - Trigger, only when necessary, simple and clear alerts with simple SOP
 - Guarantee both reliability and not excessive margins
 - Ensure consistency with FAA TALPA rule and computation philosophy
 - Avoid any additional tuning by airline
 - In obvious complement of the necessary need to fly stable approach



Conclusion

- Despite clear different design intent, easy-to-install flight deck solutions exist
- A significant fleet coverage is needed to achieve widespread safety benefit