



# Runway Situation Awareness Tools

The Boeing Company

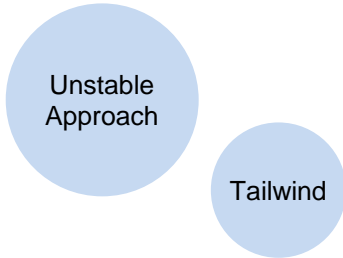


## Runway overrun excursions

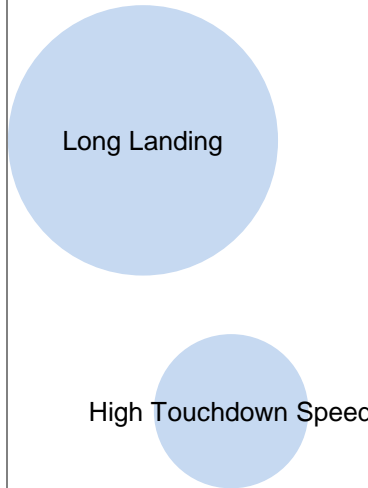
- Runway excursions are the *first* leading cause of aviation accidents and the *third* leading cause of transport airplane fatalities
- Boeing Safety
  - A top issue
- U.S. NTSB
  - Runway safety - top 10 issue since 1991
- Flight Safety Foundation
  - A top issue
- IATA
  - Recognized accident issue
- ICAO GRSS in May 2011
  - A top issue

# Overrun Contributing Factors

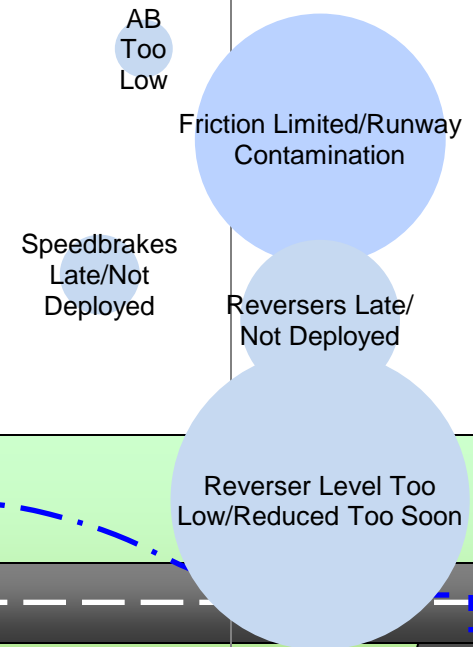
## Stability



## Touch-down



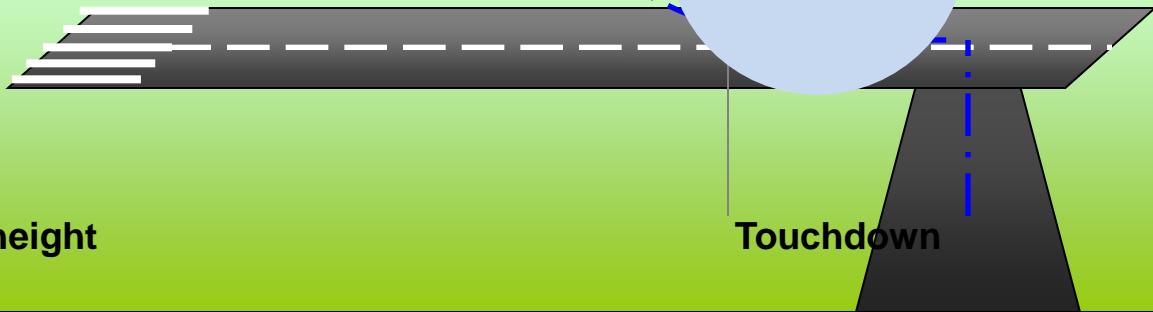
## Configuration



Overrun excursions often are caused by more than one factor!

Decision height

Touchdown



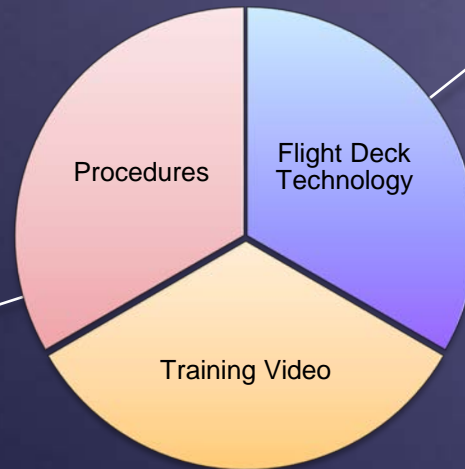
# Boeing and Embraer: overrun solution

## Runway Situation Awareness Tools



### For every landing

- Perform a landing distance calculation
- Calculate and brief a go-around point
- Use appropriate Speedbrake/Thrust Reverser callouts



### Technology

- Enhanced approach planning tools
- Aural and visual runway positional awareness and alerting
- Stability guidance and alerting
- Predicted runway stop location display
- Overrun alerting

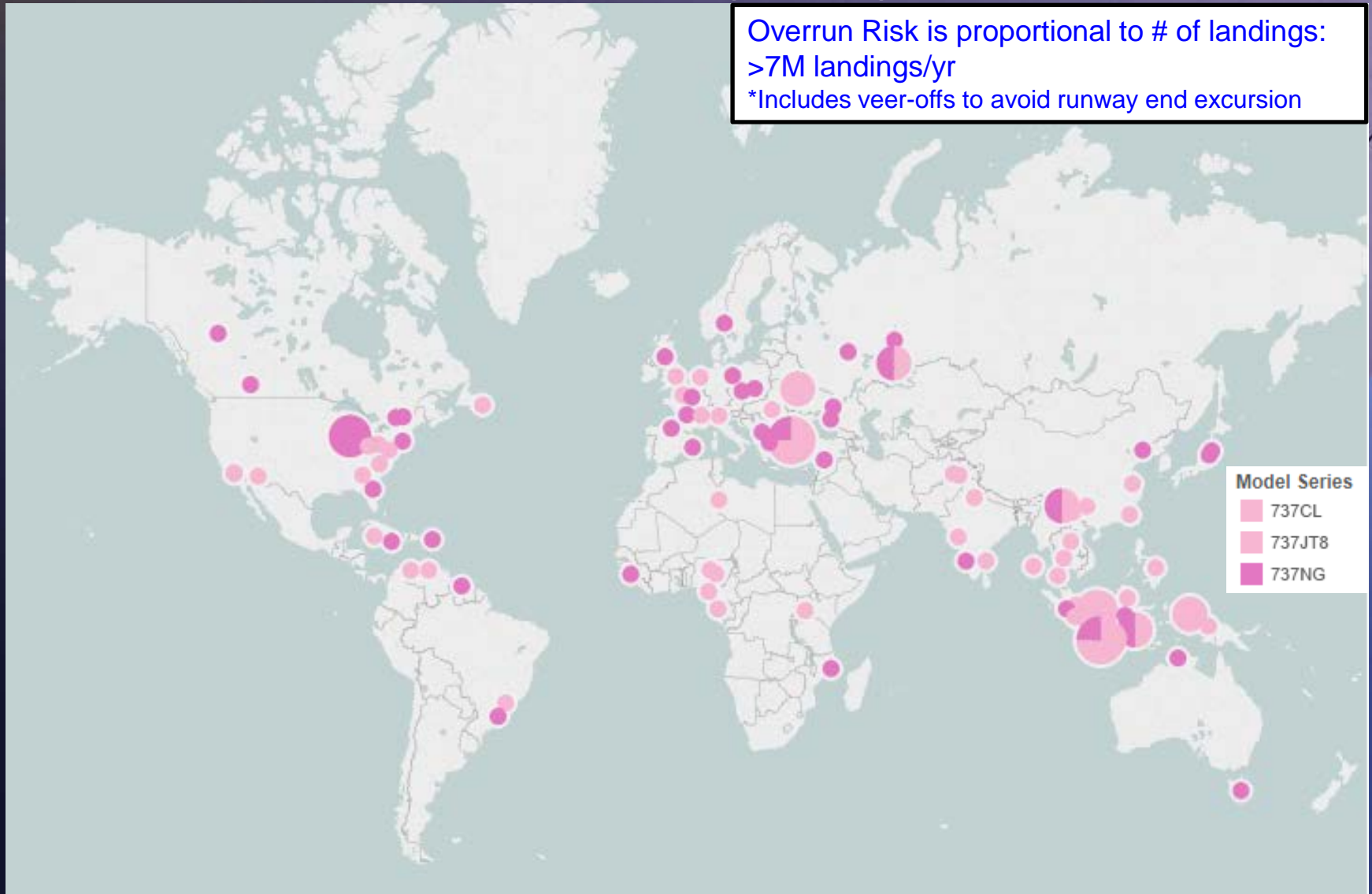
### Approach and Landing Training video

- Flying a stable approach
- Runway contamination or friction
- Checking runway length available versus required
- Reported conditions that vary from actual
- Approach speed additives and effect
- Proper, timely use of all deceleration devices



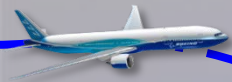
# 737 Excursions: A Global Perspective

Known Runway End Excursions during landing: 1991-2016



# Planning – Tablet app QRH Landing distance

## Approach planning



Displayed landing distance – dry or contaminated runways

Assessment of runway available versus required

## Approach

## Flare

## Deceleration

**NORMAL** [Reset] [Close]

ADVISORY INFORMATION

Flaps 15   Dry   Autobrake 1   Two Reversers   Auto Speedbrakes

Gross Weight	65000 KGS	[-] [ + ]
Airport Pressure Altitude	1000 FT	[-] [ + ]
Wind (+ Head Wind / - Tail Wind)	0 KTS	[-] [ + ]
Runway Slope	0 %	[-] [ + ]
Temperature (ISA Baseline)	0 °C	[-] [ + ]
Approach Speed Additive to: VREF 15	5 KTS	[-] [ + ]

Required Landing Distance: **3425 M**

Touch Down 455 M   Stop Point 3425 M

Tap to expand Landing Distance Available   Landing Distance Available 4000 M

Notes:  
Reference distance is for sea level, standard day, no wind or slope, 2 engine detent reverse thrust, and auto speedbrakes.  
MAX MANUAL assumes maximum achievable manual braking.  
Actual (unfactored) distances are shown.  
Includes distance from 50 ft above threshold (305m flare distance).

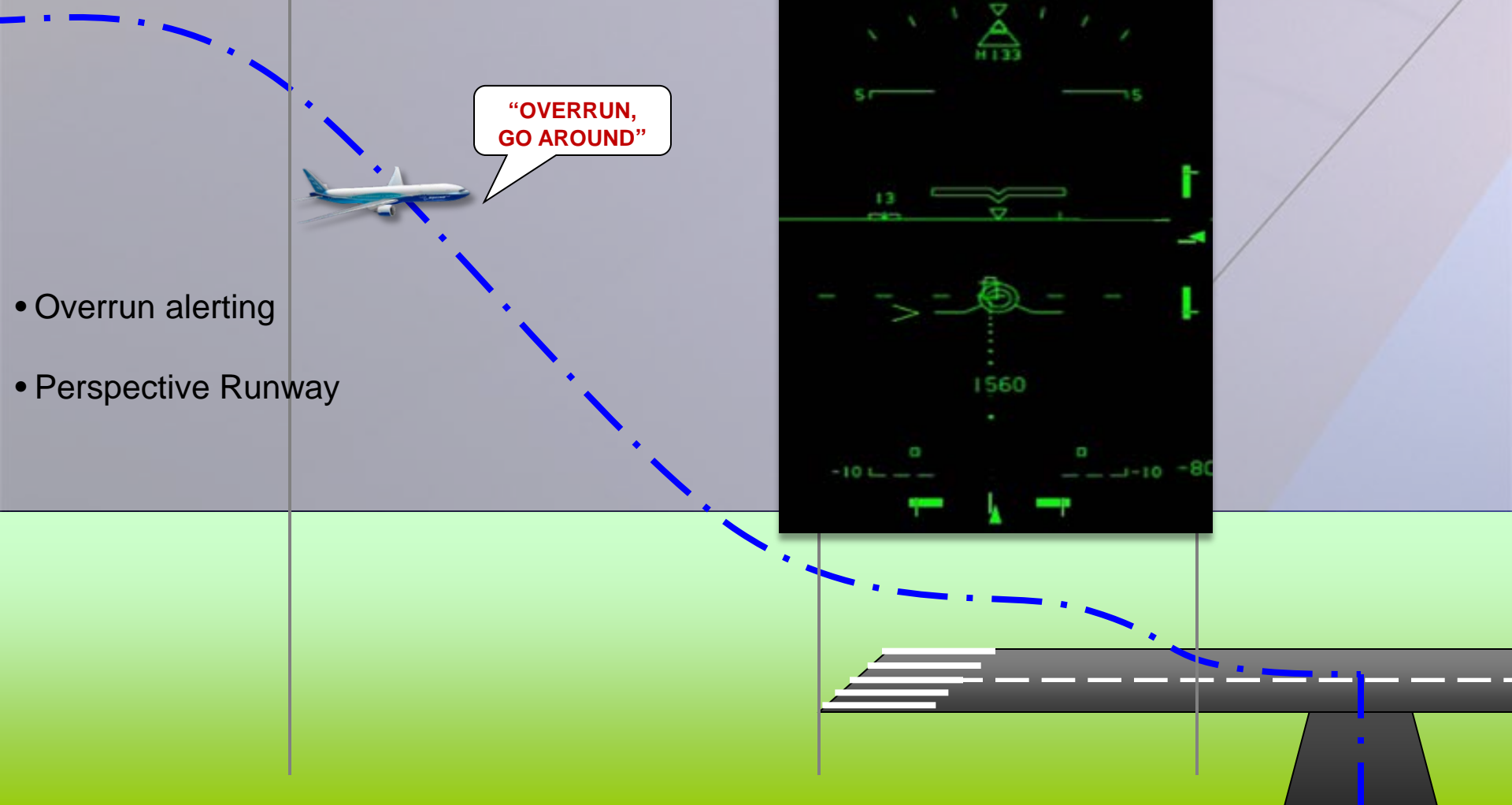
# Approach - RSAT

## Approach planning

## Approach

## Flare

## Deceleration



- Overrun alerting
- Perspective Runway

# Flare - RSAT

## Approach planning



## Approach



## Flare

- Landing and flare guidance
- Runway positional awareness

## Deceleration

“X THOUSAND REMAINING”

“OVERRUN, GO AROUND”



# Landing and Rollout - RSAT

**Approach  
planning**

**Approach**

**Flare**

**Deceleration**

- Runway positional awareness
- Overrun alerting
- Speedbrake alerting

**“X THOUSAND  
REMAINING”**

**“SPEEDBRAKE,  
SPEEDBRAKE”**

**“MAX BRAKES,  
MAX REVERSE”**



# Runway Alerting and Awareness System (RAAS)

## - Primarily Runway Incursion Reduction

Capability/Feature	Boeing RAAS
Approaching Runway (on Ground)	Callout
Approaching Runway (in Air)	Callout
On Runway	Callout
Extended Holding	Callout
Distance Remaining (Landing & Rollout)	Callout
Distance Remaining (Rejected Takeoff)	Callout
Runway End	Callout
Taxiway Takeoff	Caution
Short Runway Landing	Caution
Short Runway Takeoff	Caution



Questions?