CAST Runway Excursion Team Study & Results

Rob Noges – Boeing

RASG-PA Runway Excursion Prevention Seminar

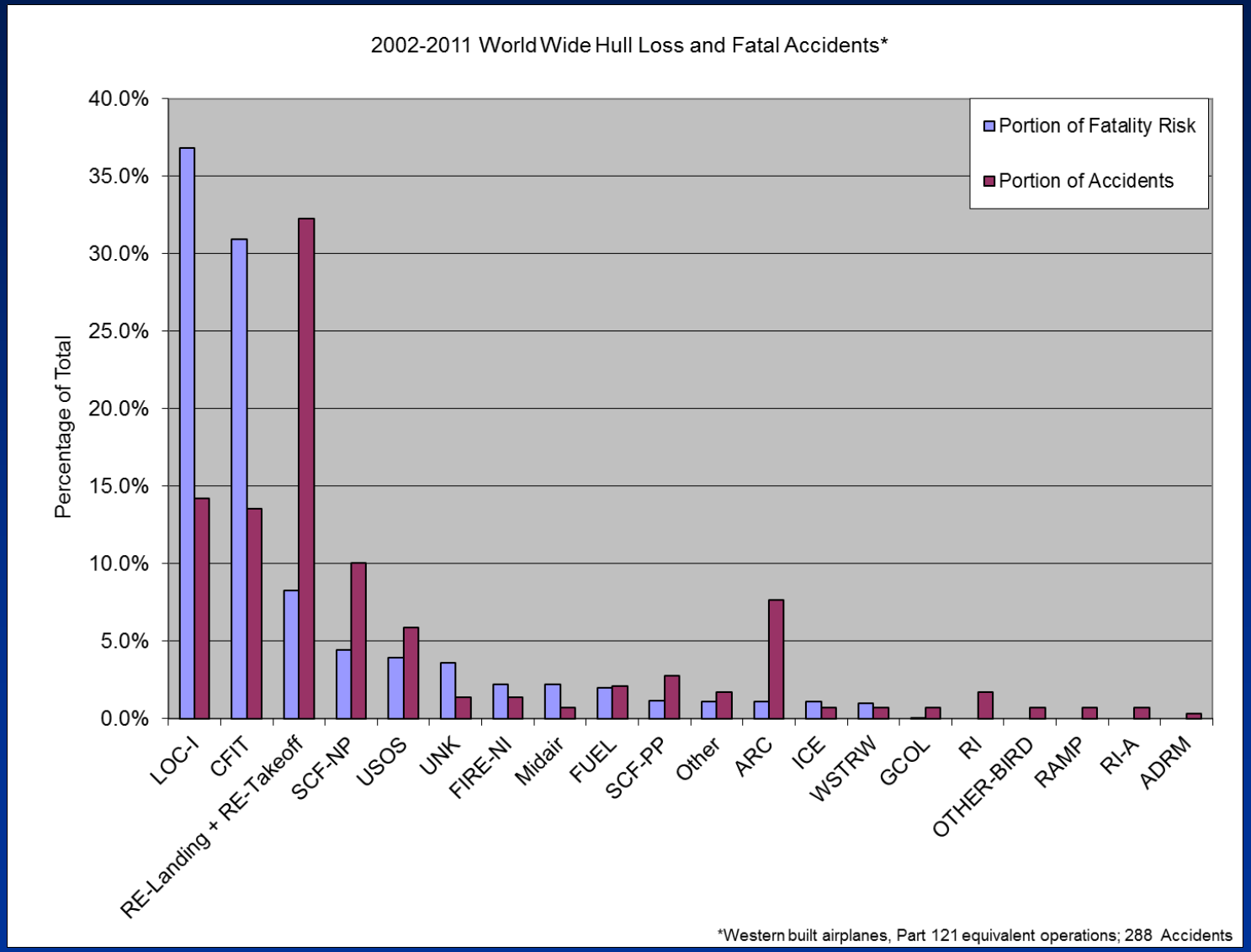
October 2014

CAST Runway Excursion (RE) Study
Overview

- Background
- Review of CAST Runway Excursion Study
- CAST Recommended Safety Enhancements
- Expected Benefits

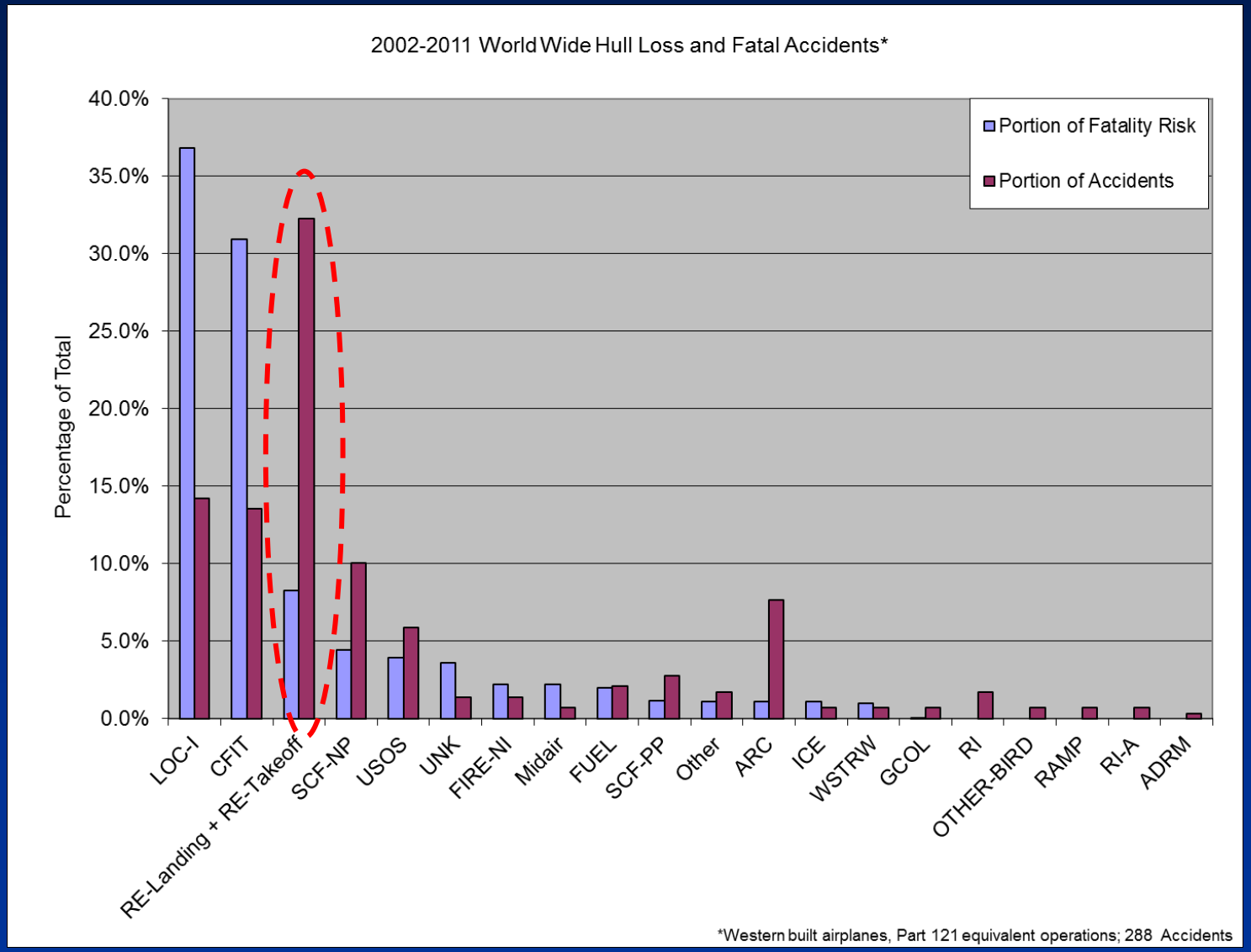
CAST RE Study

All Accident Categories, 2002-2011



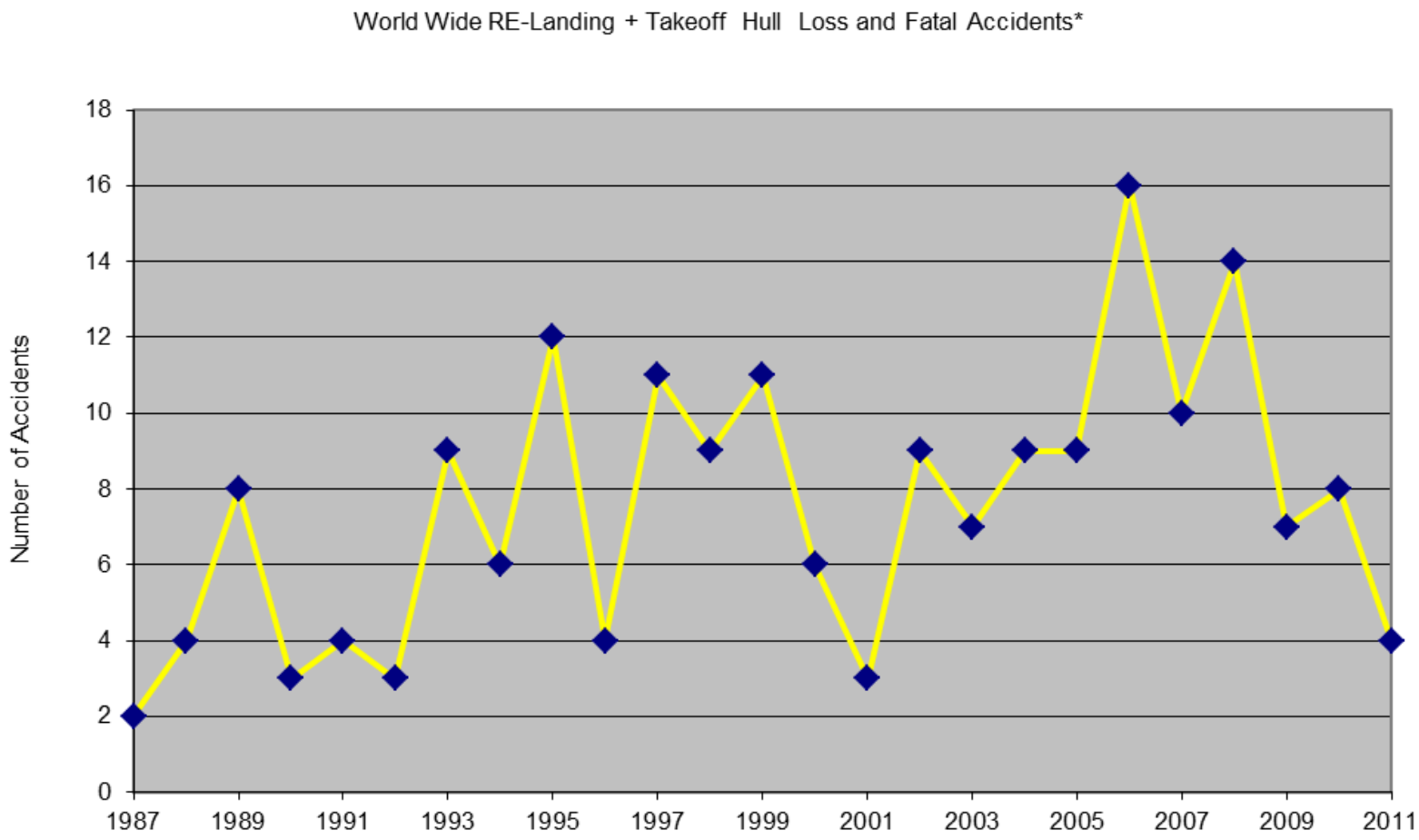
CAST RE Study

All Accident Categories, 2002-2011



CAST RE Study

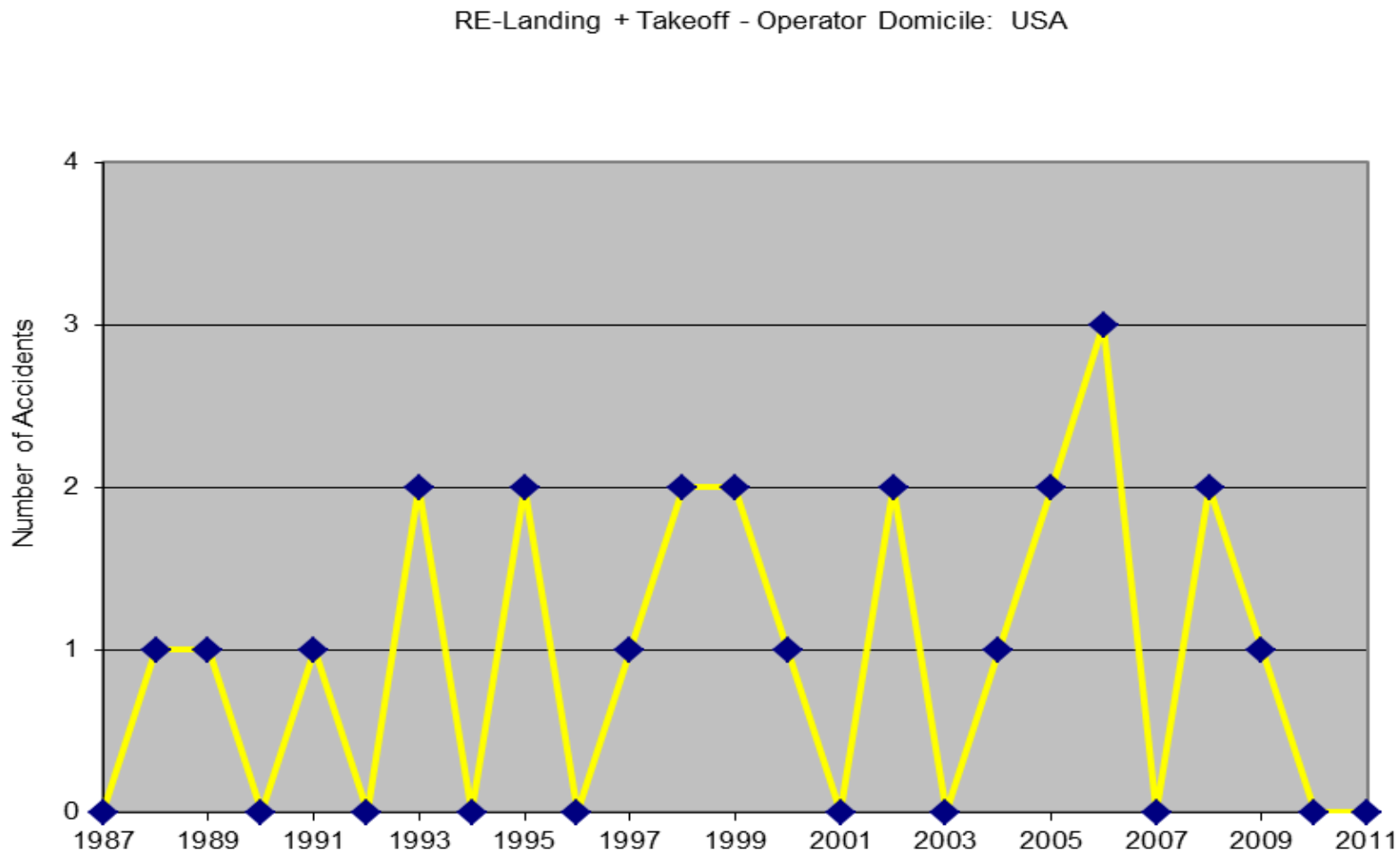
Worldwide Runway Excursions, 1987-2011



*Western built airplanes, Part 121 equivalent operations

CAST RE Study

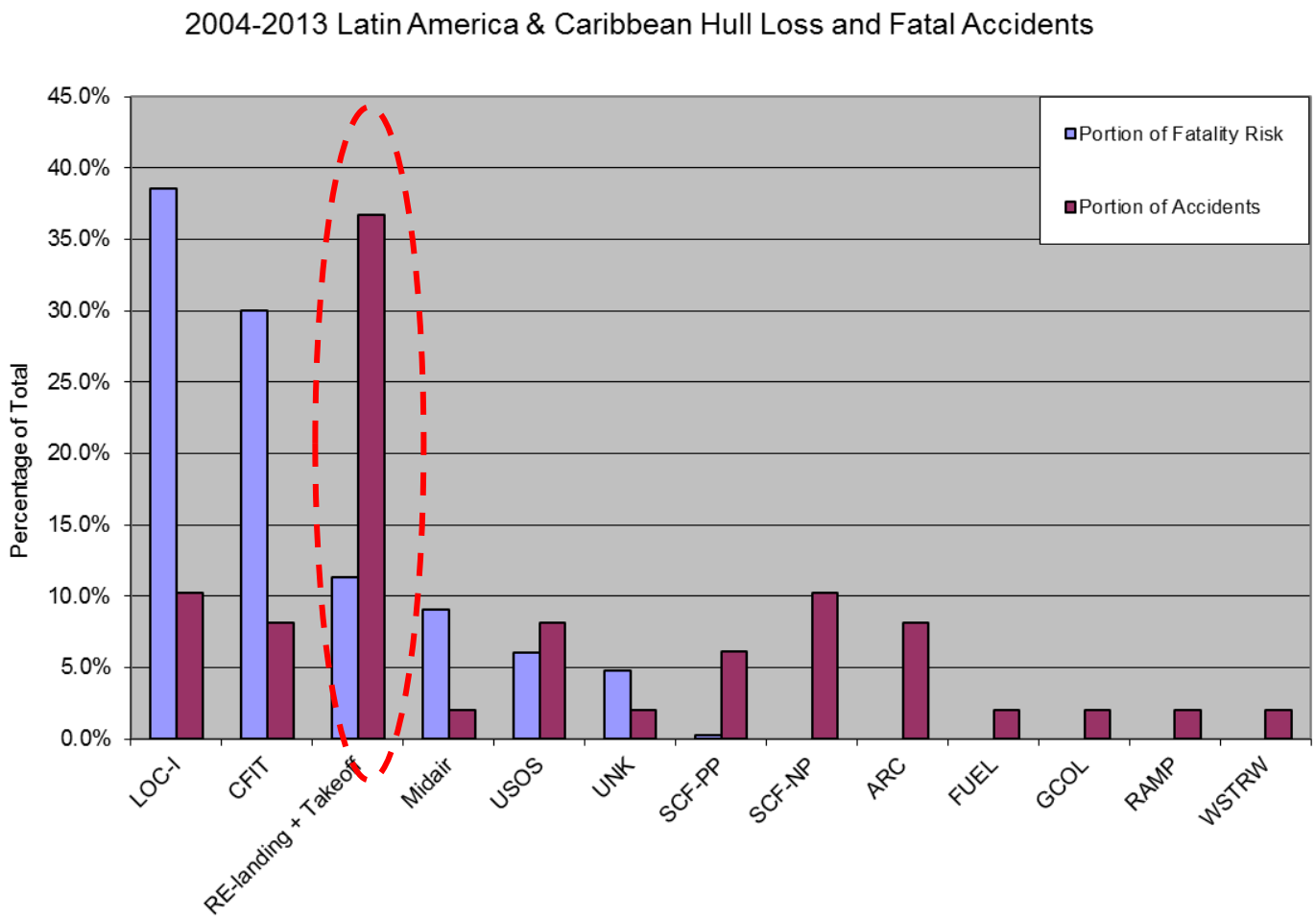
Part 121 Runway Excursions, 1987-2011



*Western built airplanes, Part 121 operations

CAST RE Study

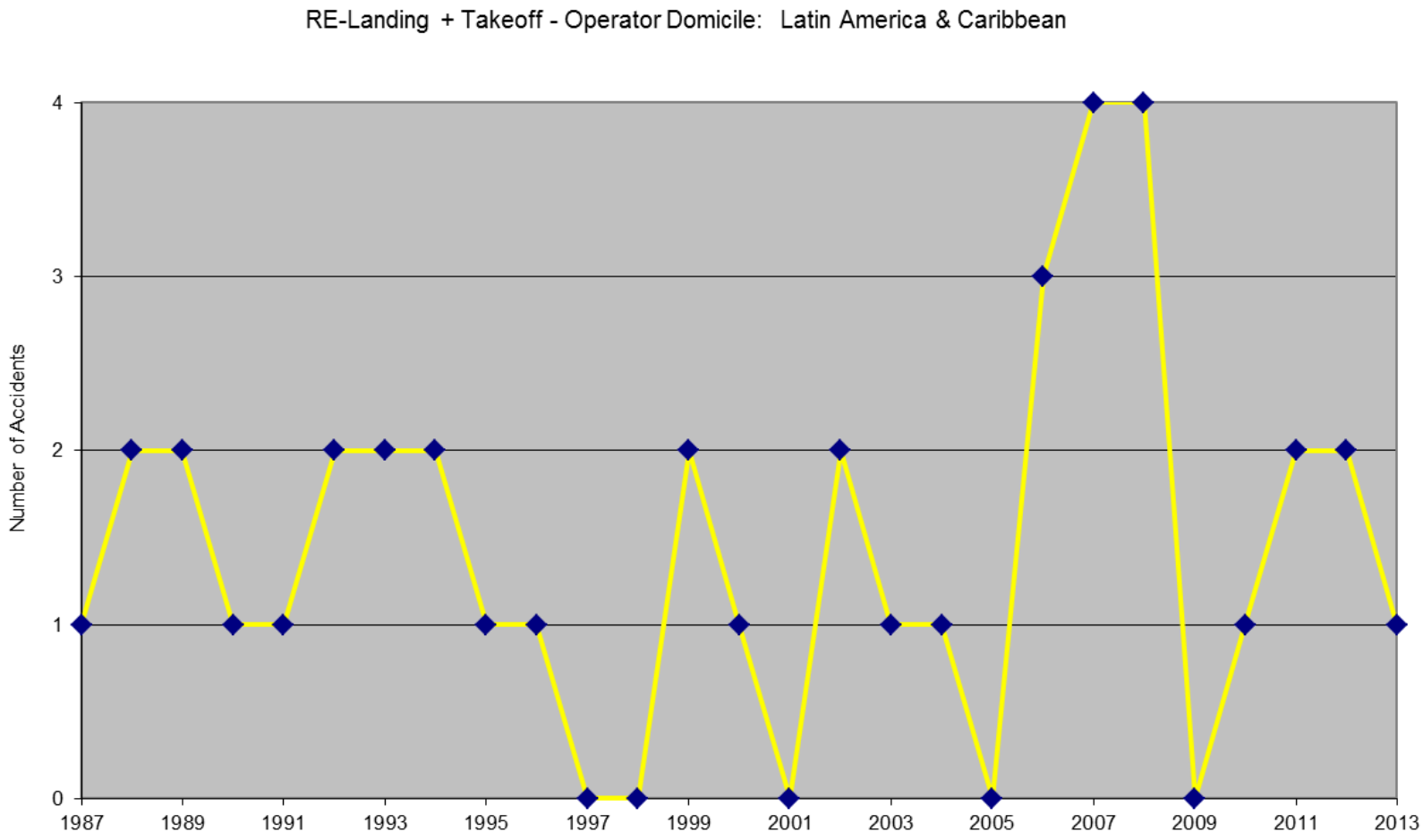
All Accident Categories, Latin America & Caribbean 2004-2013



*Western built airplanes, Part 121 equivalent operations; 49 Accidents

CAST RE Study

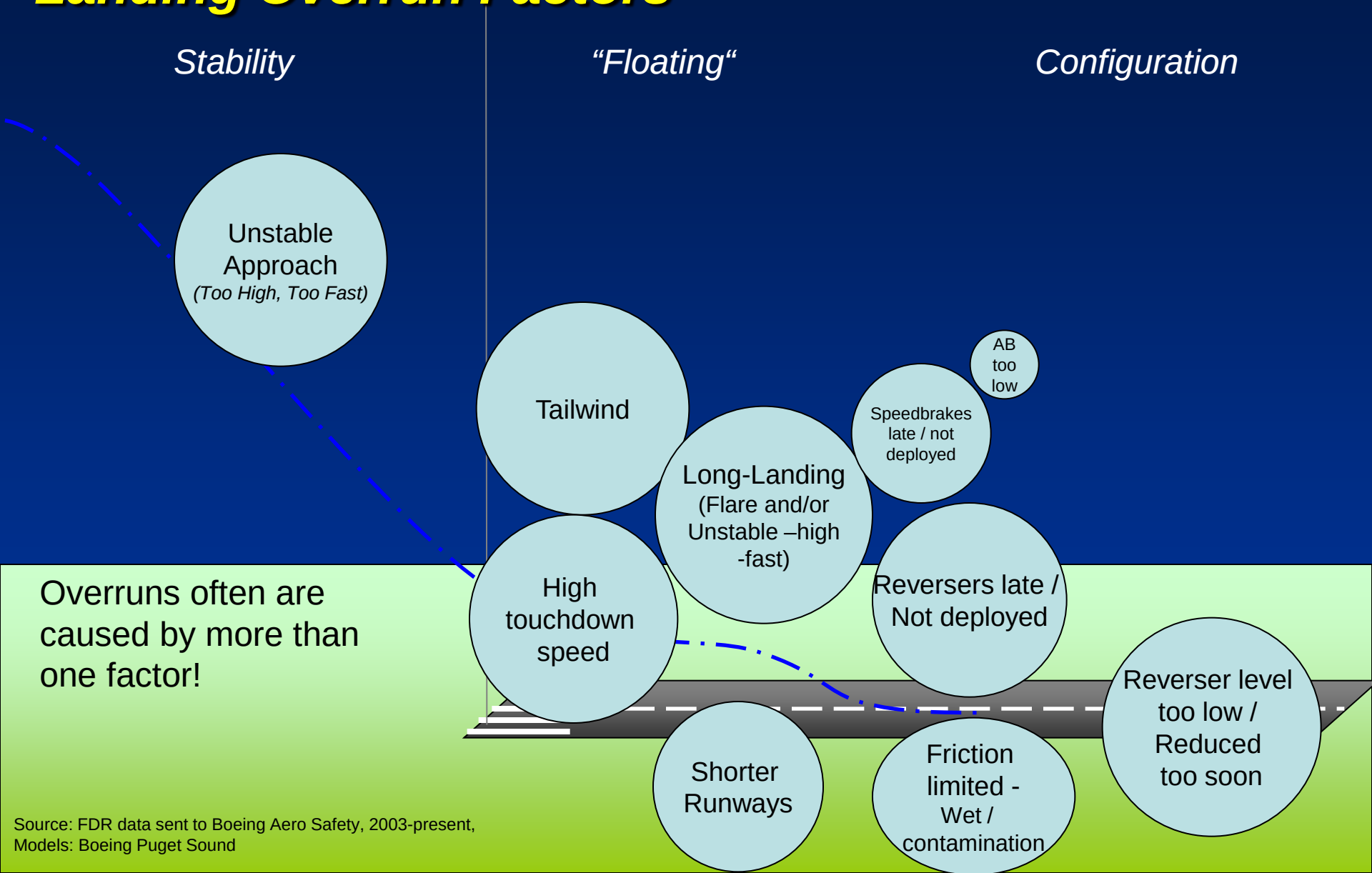
Latin America & Caribbean Runway Excursions, 1987-2013



*Western built airplanes, Part 121 equivalent operations

CAST RE Study

Landing Overrun Factors

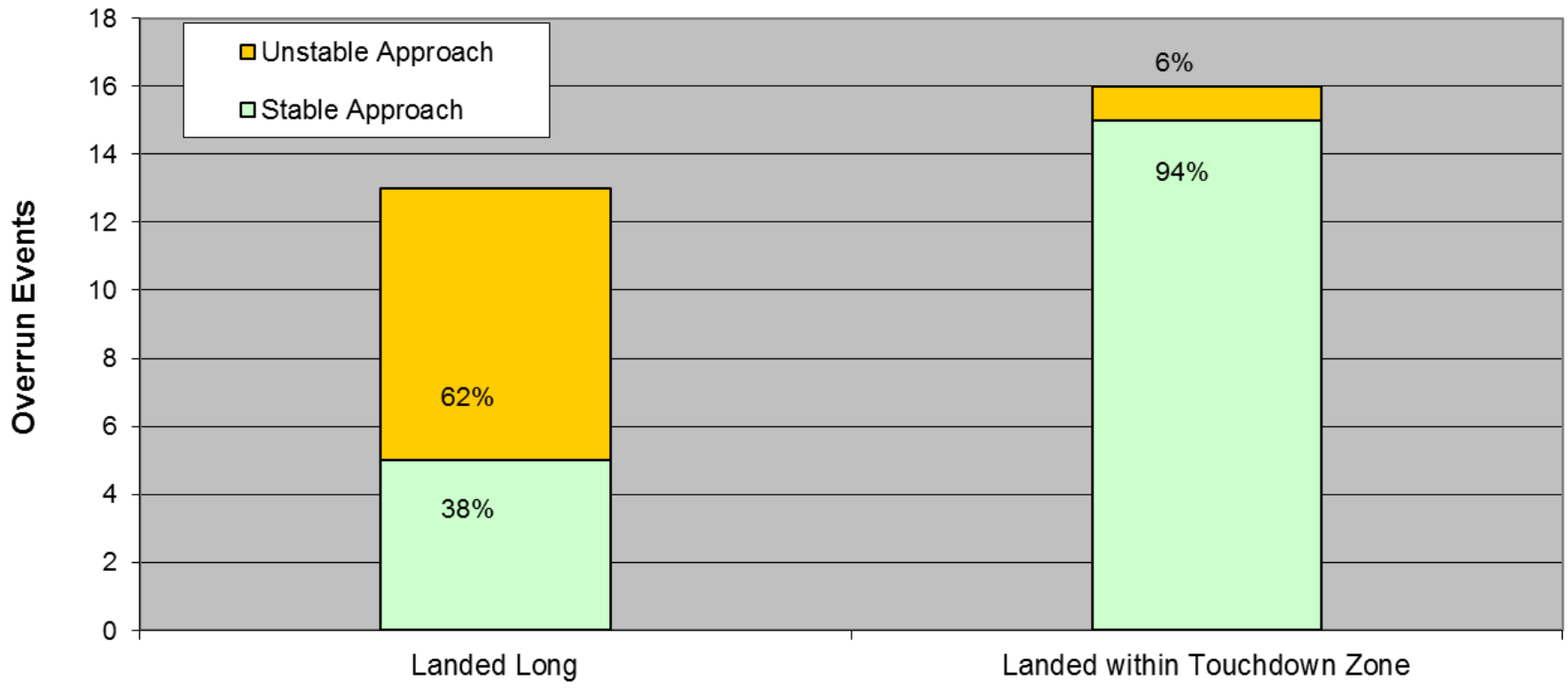


Overruns often are caused by more than one factor!

Source: FDR data sent to Boeing Aero Safety, 2003-present,
Models: Boeing Puget Sound

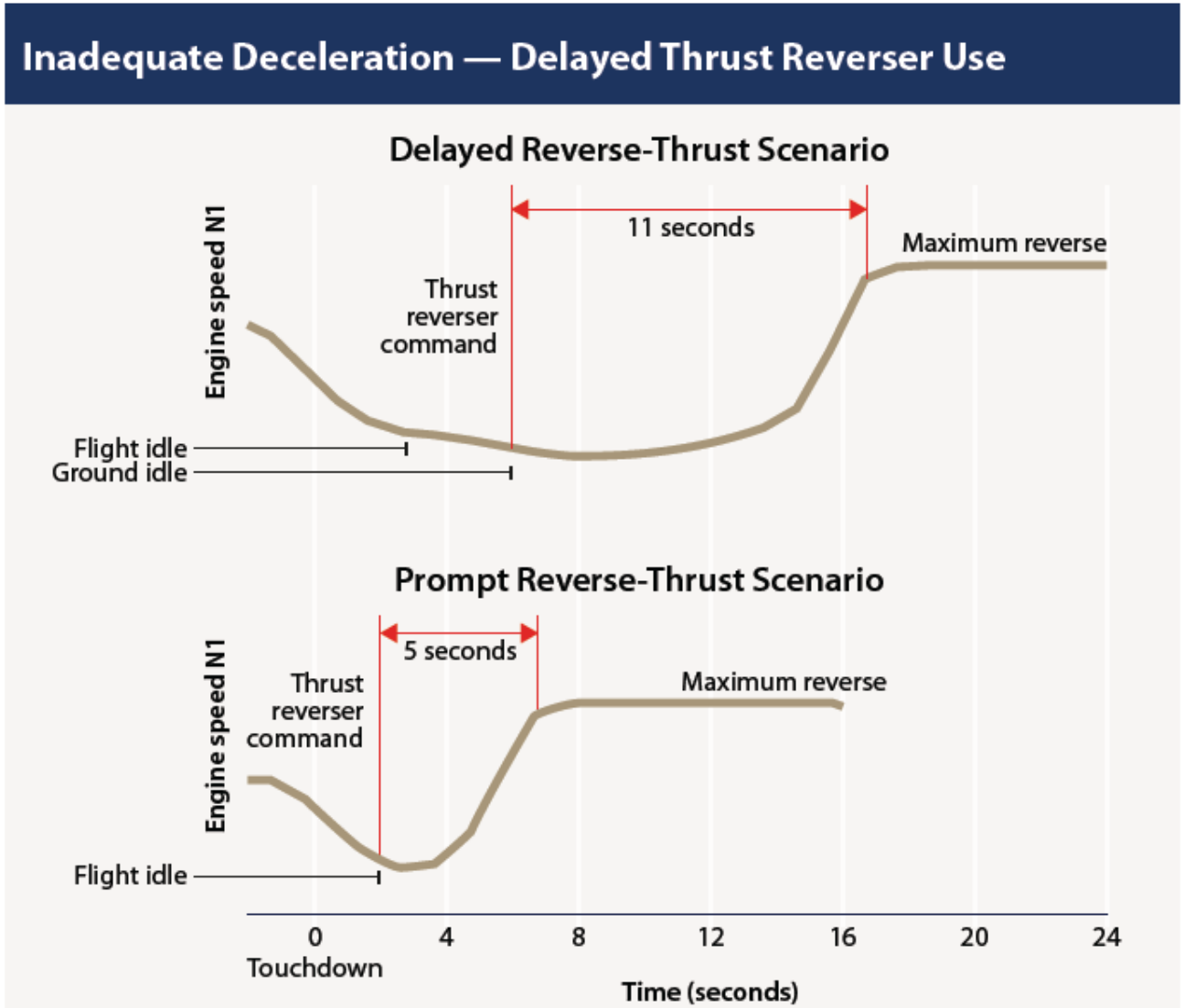
CAST RE Study

Correlation of Stabilized Approach vs. Touchdown Point



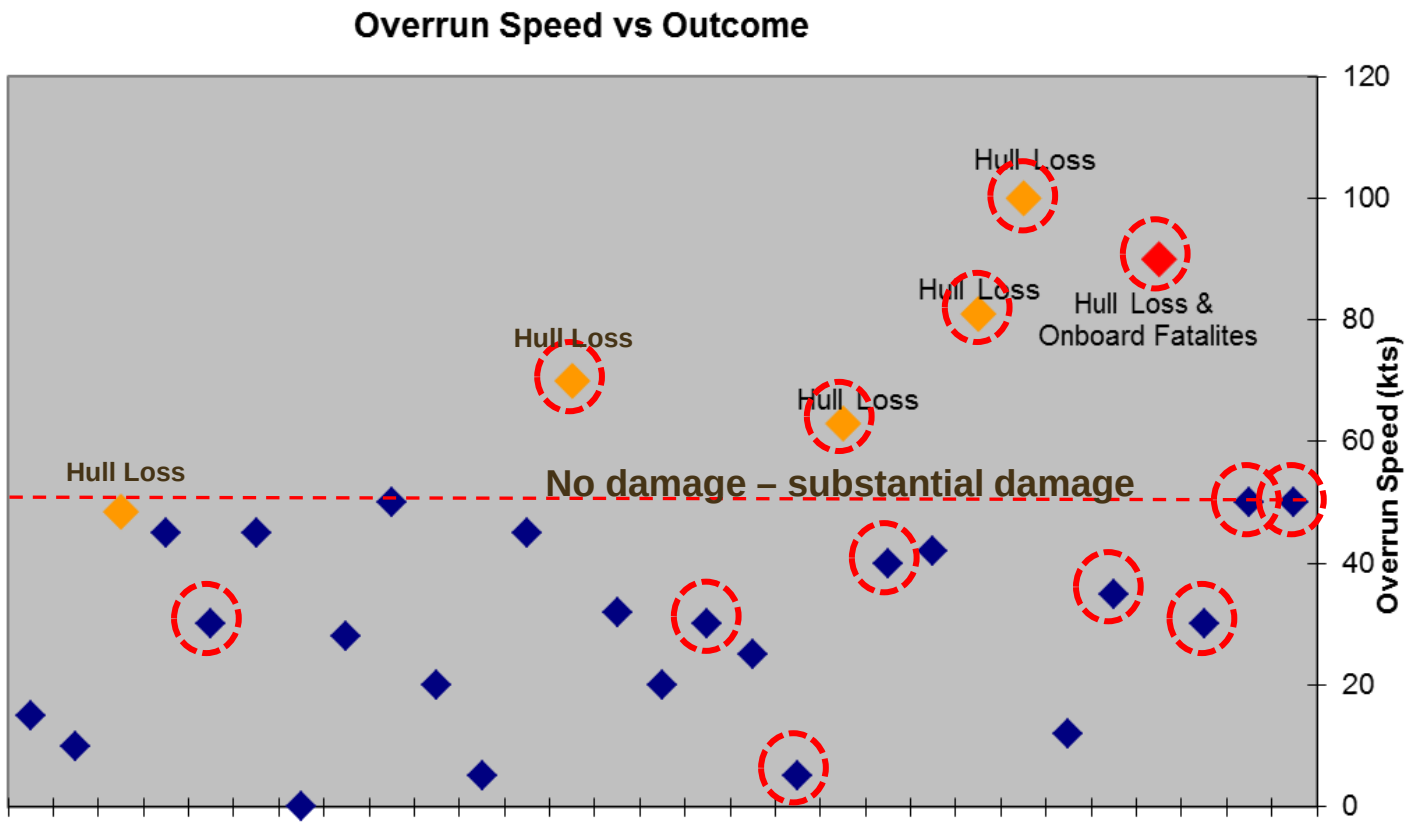
CAST RE Study

Effect of Delayed Reverse Thrust Use



CAST RE Study

Overrun Speed vs. Outcome Severity



Landed Long

No damage – substantial damage

CAST RE Study
Charter and Expectations

- CAST identified runway excursion (RE) as area of ongoing concern in both U.S. and worldwide accident data trends
- Numerous analytical studies have been performed over the past decade on the subject of RE
- CAST chartered the RE Study in spring 2012 to:
  - review existing industry reports
  - summarize findings and recommendations
  - develop cost-beneficial CAST Safety Enhancements that encompass the most effective mitigations

CAST RE Study
Process

Review Industry RE Reports/Studies
- Capture and consolidate recommended actions

Assess the Recommended Actions
- Feasibility
- Risk reduction potential

Present to CAST for Approval

Develop CAST SEs
- Recommended Actions
- Define responsible organizations
- Develop schedule
- Cost Estimates
- Assess risk reduction

Present SEs for CAST approval
- Approved SEs placed on the SkyBrary web site

Develop Report for CAST approval

CAST RE Study

Source Reports Reviewed

TALPA ARC

Airport/Part 139 WG
Part 25 WG

European Action Plan

EAPPRE Condensed &
Full Report

NLR
(National Aerospace Laboratory Netherlands)

NLR-CR-2010-259

EuroControl

International RE
Report

IFALPA
(International Federation of Air Line Pilots' Associations)

Runway Safety Report

CAA

Sig 7 Task Force RPT
RE Task Force Update

FSF
(Flight Safety Foundation)

Reducing Risk of RE

ATSB
(Australian Gov.Safety Bureau)

RE Reports Part 1 & 2

ACRP
(Airport Cooperative Research Program)

Reports 3 & 50

FAA – Accident Investigation
RE Report
Recommendations

Boeing

RE Accident Summary

CAST RE Study
Recommendations Refinement

Review of 15 Industry Runway Excursion Reports:

→ 273 Recommended Actions

→ 75 Intervention Strategies

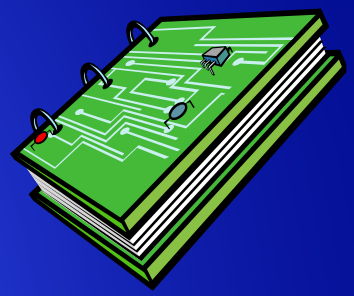
→ 16 SE Concepts

→ 7 Final SEs + 1 R&D Plan

CAST Recommended RE Safety Enhancements

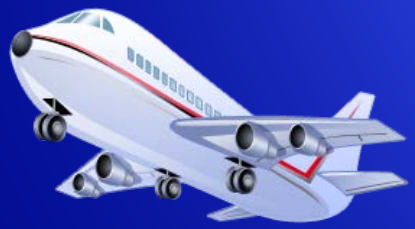
Recommended Safety Enhancements

SE 215 Landing Distance Assessment



- **Regulatory actions**
  - Guidance material from Flight Standards, Aircraft Certification, and Airports
  - Air Traffic Control Procedure Changes

- **Airplane Manufacturers**
  - Airplane performance data to support standardized landing distance assessment



- **Airport Operators**
  - Changes to runway friction measurement and reporting terminology

- **Air Carriers**
  - Implementation in SOPs

Recommended Safety Enhancements

SE 216 and SE 217 Flight Crew Procedures and Training

- **Landing Training**
  - Focus on stable approach, flare, and touchdown
  - Tailwind, crosswind, and contaminate runway scenarios
- **Takeoff Performance**
  - Ensuring correct data communication from dispatch to flight crew
  - Special precautions when using EFBs
- **Training for the RTO Decision**
  - Scenario-Based
  - When and when NOT to RTO

Recommended Safety Enhancements

SE 218 and SE 222 Airplane Design

- **Runway Overrun Awareness and Alerting Systems**
  - **Manufacturer development on new and existing designs**
  - **Air carrier implementation as feasible and cost-beneficial**

- **Airplane-based Runway Friction Measurement and Reporting**
  - **Complete research underway in FAA on prototype systems**

Recommended Safety Enhancements

SE 219 Air Traffic and Airport Operations Procedures

- **Changes to ATC Procedures**
  - **Runway selection and arrival/departure configuration based on tailwind levels**
  - **Reporting of most adverse wind on arrival or departure runway**
  - **Training for controllers on factors that contribute to RE**

Recommended Safety Enhancements

SE 220 and SE 221 Airport Operator Actions

- **Airports**
  - **Increase implementation of distance-remaining signs**

- **EMAS installation at critical airports**
- **Improve Runway Safety Areas (where needed)**
- **Use of grid maps for reporting events**
- **Dedicated airport radio frequency for communication after an RE event**

Landing Excursion Mitigation – Part 121 Fleet

Overall Awareness of RE Landing RISK in Policies and Procedures
(Regulators, Air Traffic Control, Airports, Operators, Manufacturers)

SE 215, 216 & 219

Landing Distance Assessment

SE 215

Enhance approach and landing stability, flare and touchdown: ATC and Crew Training

SE 216 & 219

SE 198

Timely and accurate field condition reports (winds and runway surface conditions) & ATC tailwind limits

SE 215 & 219

Enhance Crews Situational Awareness of Airplane Position and Stopping Performance on Runway

– Distance to go signs

SE 220

Crews knowledge and use of airplane stopping devices

SE 216

Airplane systems that enhance the flight crews ability to land and stop the airplane: (e.g., unstabilized approach alerts, flare guidance, deceleration guidance, and features that enhance the crews situational awareness of the airplanes position on the runway;

Systems that quantify braking performance on slippery runways.

Field Conditio eporting, RSA

SE 215

SE 221

SE 218 & 222

Takeoff Excursion Mitigation – Part 121 Fleet

Overall Awareness of RE Takeoff RISK in Policies and Procedures
(Air Traffic Control, Operators)

SE 217 & 219

Timely and accurate wind and runway information (takeoff decision)

SE 215 & 219

Takeoff Performance Planning and Thrust Setting

SE 217

RTO decision making – training and operator SOPs

SE 217

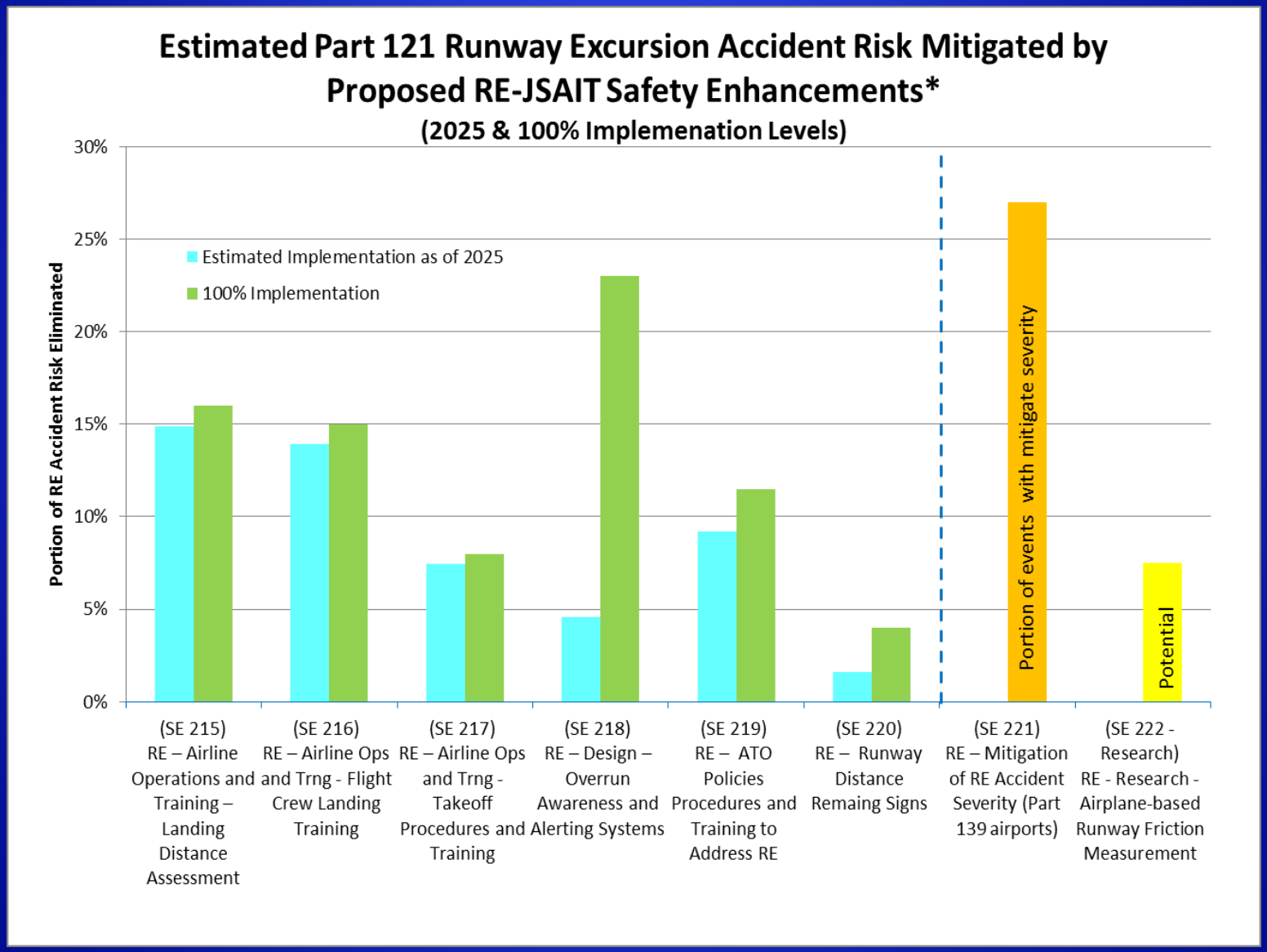
Field Conditi Reporting, R

SE 215

SE 221

Recommended Safety Enhancements

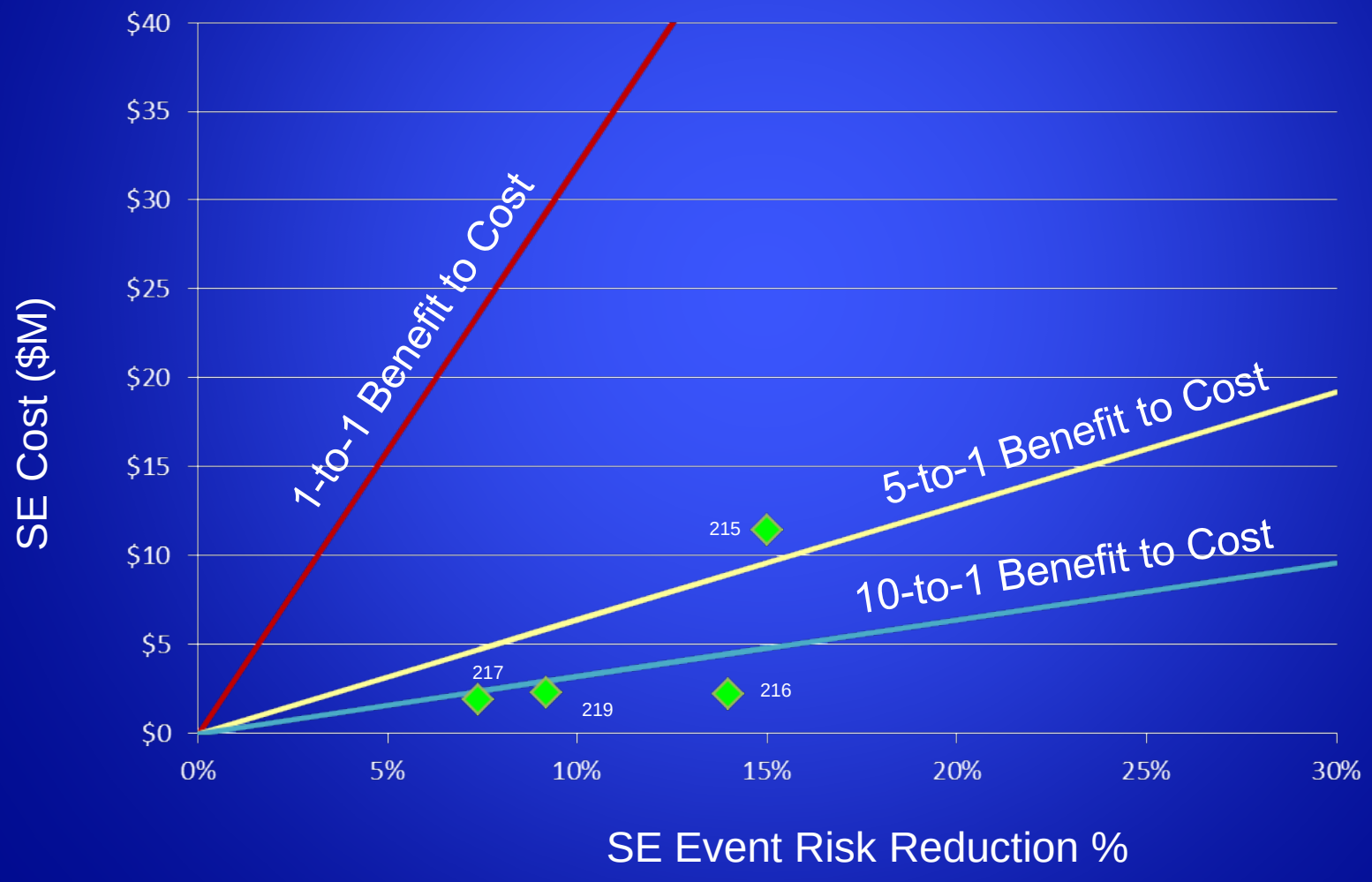
Estimated RE Risk Reduction



Recommended Safety Enhancements

Cost vs. Expected Risk Reduction

2025



CAST RE Study
Acknowledgements

- Airbus
- Airlines for America
- Air Line Pilots Association
- Austin Digital, Inc.
- Boeing
- FAA
  - Aircraft Certification
  - Airports
  - Air Traffic Organization
  - Flight Standards
- Honeywell
- Mitre
- PAI Consulting
- Rockwell-Collins

CAST RE Study

Thank You