FLIGHT SAFETY FOUNDATION

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Reducing The Risk of Runway Excursions

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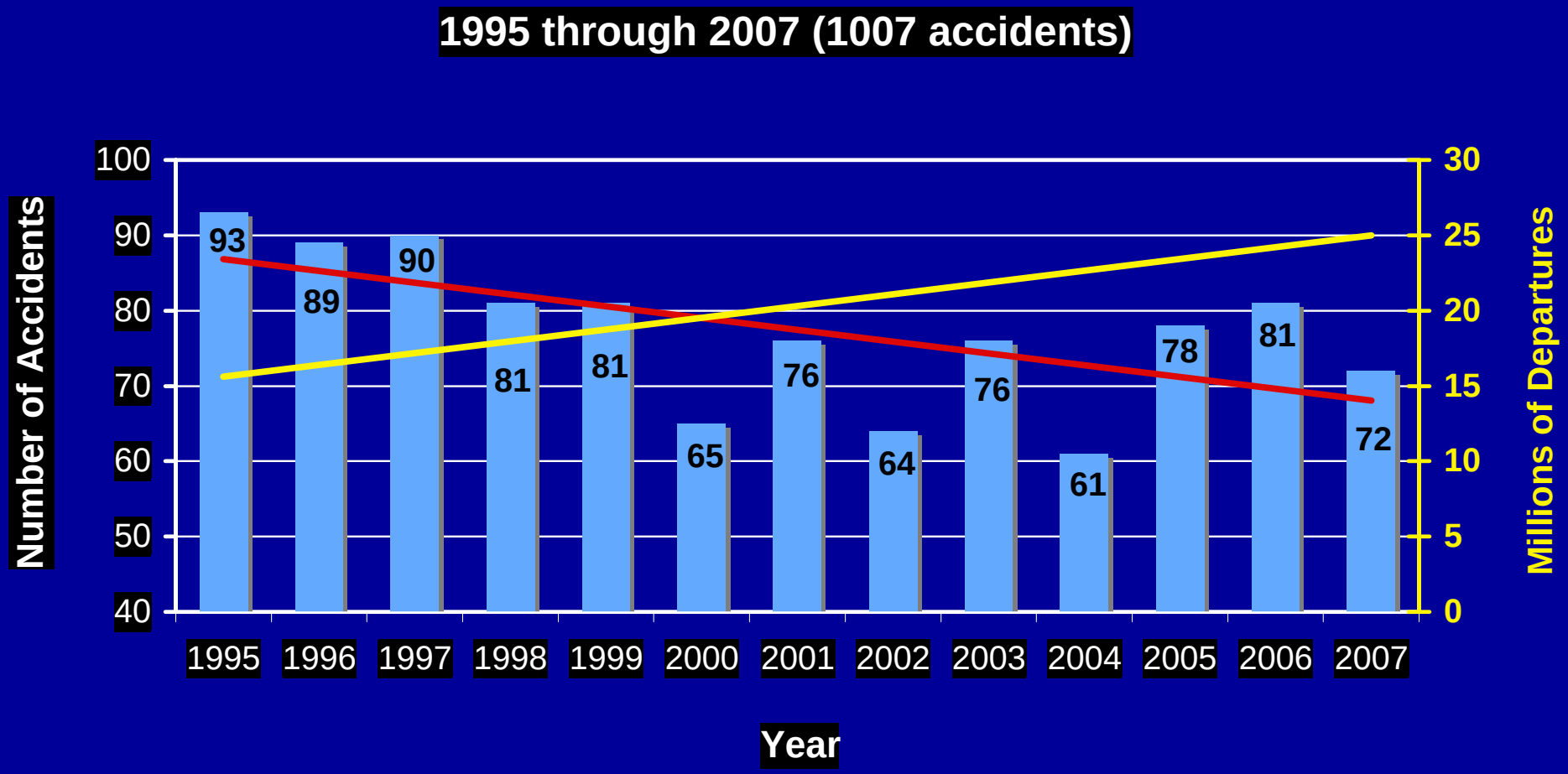
Director of Technical Programs

ALAR Updated Data

- 1995 through 2007
  (original 1985-1996)
- All ALA accidents versus only fatal accidents
  (1,007 versus 287 data points)
- Fitment of safety equipment less of a factor
- More precision approaches (Less NPA)
- Top factors still there – slightly different order
- Best News: ALA rate down, fatal rate down

Approach-and-landing Accidents




(a)

Participants

- EASA
- CANSO
- IFALPA
- FAA/CAST
- LVNL
- Boeing
- DGAC France
- Flight Safety Foundation
- IFATCA
- NLR
- ALTA
- Airbus
- Embraer
- ACI
- IATA
- ERA
- Eurocontrol
- AAPA
- US NTSB
- AEA
- Honeywell
- ALPA

Runway Safety Issues

- Runway Incursions
- Runway Confusion
- Runway Excursion

1977 - KLM / Pan Am

Los Rodeos Airport, Tenerife, Canary Islands


USAir Runway Incursion Accident – Los Angeles: Controller cleared aircraft to land with another aircraft on the runway.
February 1991


SAS
October 2001
Milan, Italy

Runway Incursions

- Part of the new breed of safety challenge
  - Not a lot of accidents
  - Numerous incidents

- Basic Risk Management:
  Risk = (Probability) X (Severity)

Runway Excursion:

When the wheels of an aircraft on the runway surface depart the end or the side of the runway surface.

Runway excursions can occur on takeoff or on landing.

They consist of two types of events:

Veer-Off: Excursion in which an aircraft departs the side of a runway

Overrun: A runway excursion in which an aircraft departs the end of a runway


TRANSBRASIL
PCM


N821AA


American

The Players

- Aircraft Manufacturers
- Operators
  - Aircrews
  - Management
- Airports
- ATC
- Regulators

Operators

- Stabilized approach criteria
- True no-fault go-around policy
- Training
- Decision making
  - On approach
  - On the runway


KOREAN AIR

Airports

- Airport design
- Lighting
- Approach aids (e.g. ILS, VASI, PAPI)
- Runway design (crown, grooved, porous)
- Runway markings and signage
- Runway clearing/cleaning
- Runway condition measurement
- Runway end safety areas
- Airport ARFF


Gallo

ATC

- Stabilized approach assistance
- Pertinent and timely information
  - Weather
  - Runway condition

Runway

Safety

Data

Confusion

Incursion

Excursion

Runway Safety Accident Data

1995 – 2010

	Number	(average)	
Incursions:	11	(.7/year)	1.0/year
Confusion:	6	(.3/year)	
Excursions:	650		40.6/Year

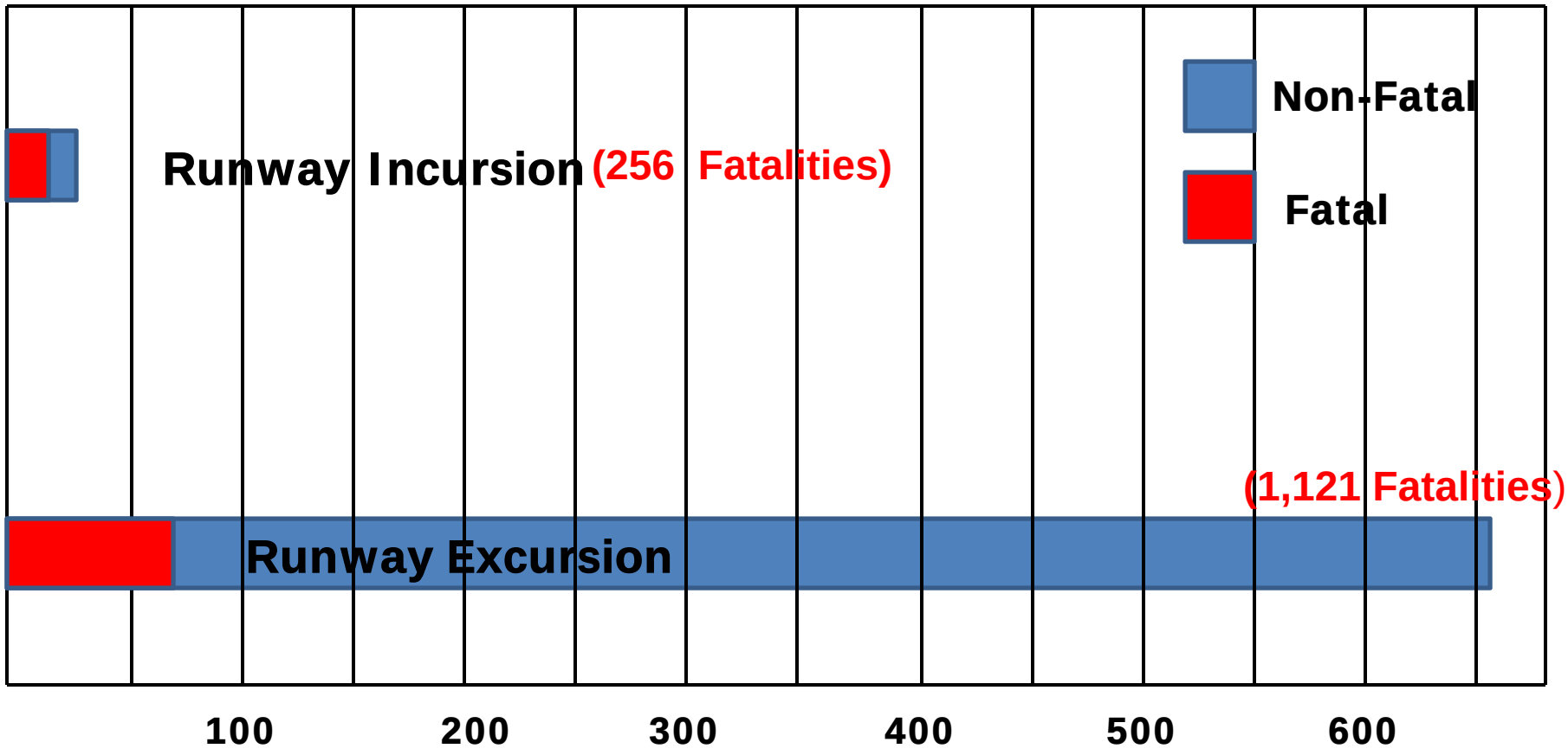
Runway Safety Data
1995–2010
Runway Excursion Data

- 34 % of jet accidents
- 24 % of turboprop accidents

Runway Safety Fatality Data
1995–2010

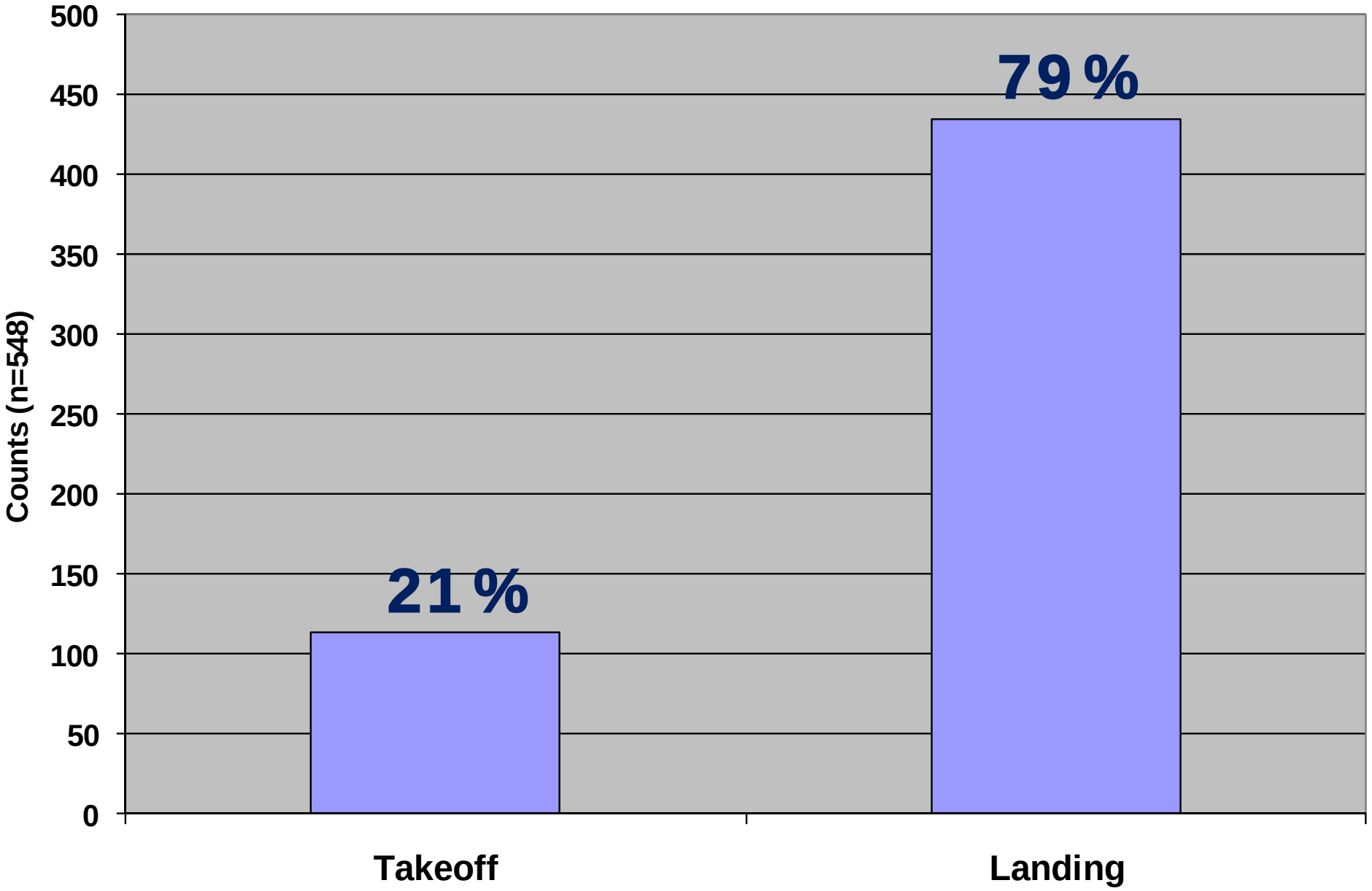
	Number of Fatal Accidents	(Onboard Fatalities)
Incursions:	6	(129)
Confusion:	4	(136)
Excursions:	65	(1,121)

Fatal and Non-Fatal Runway Accidents
1995 Through 2010

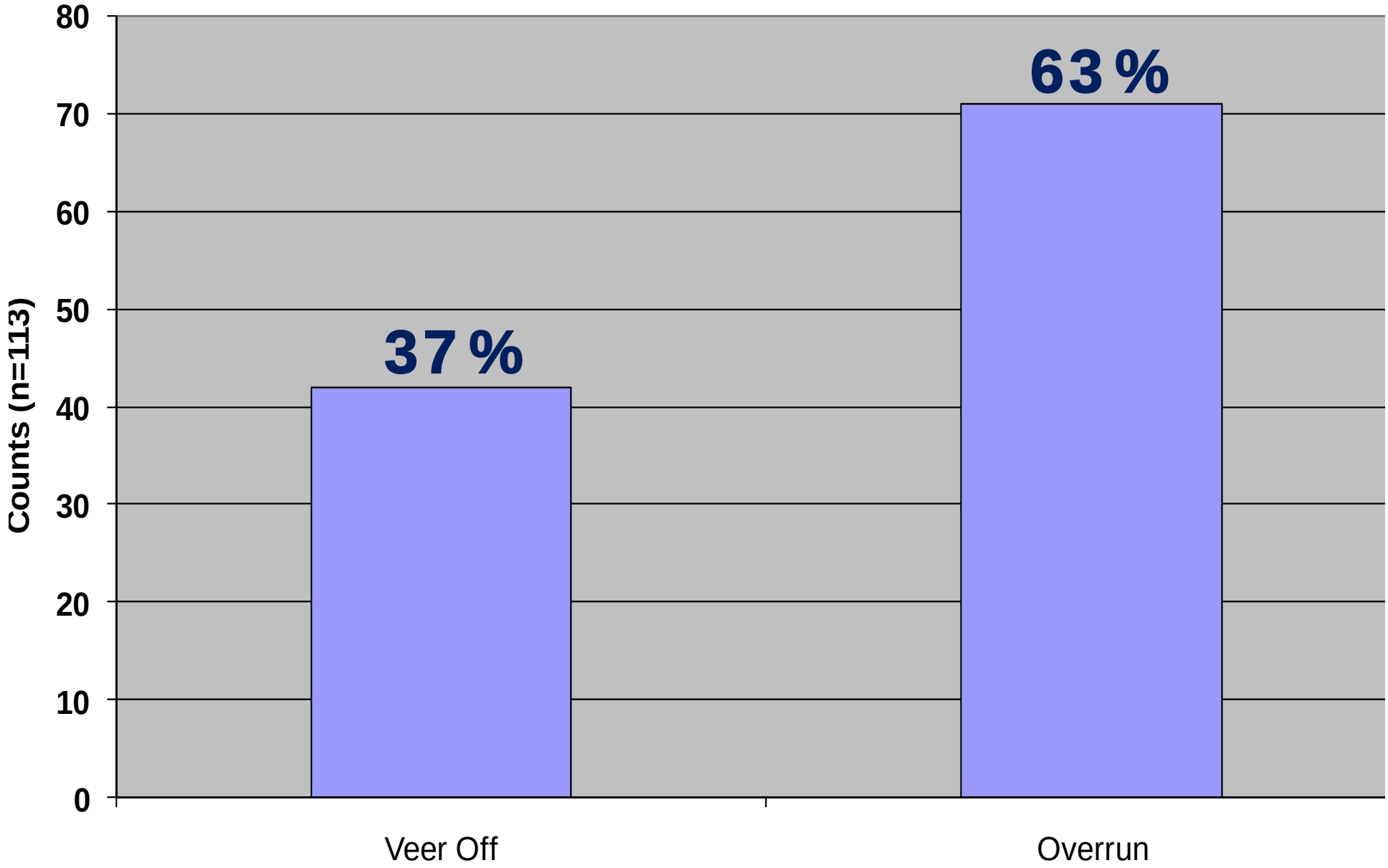


KALITTA AIR

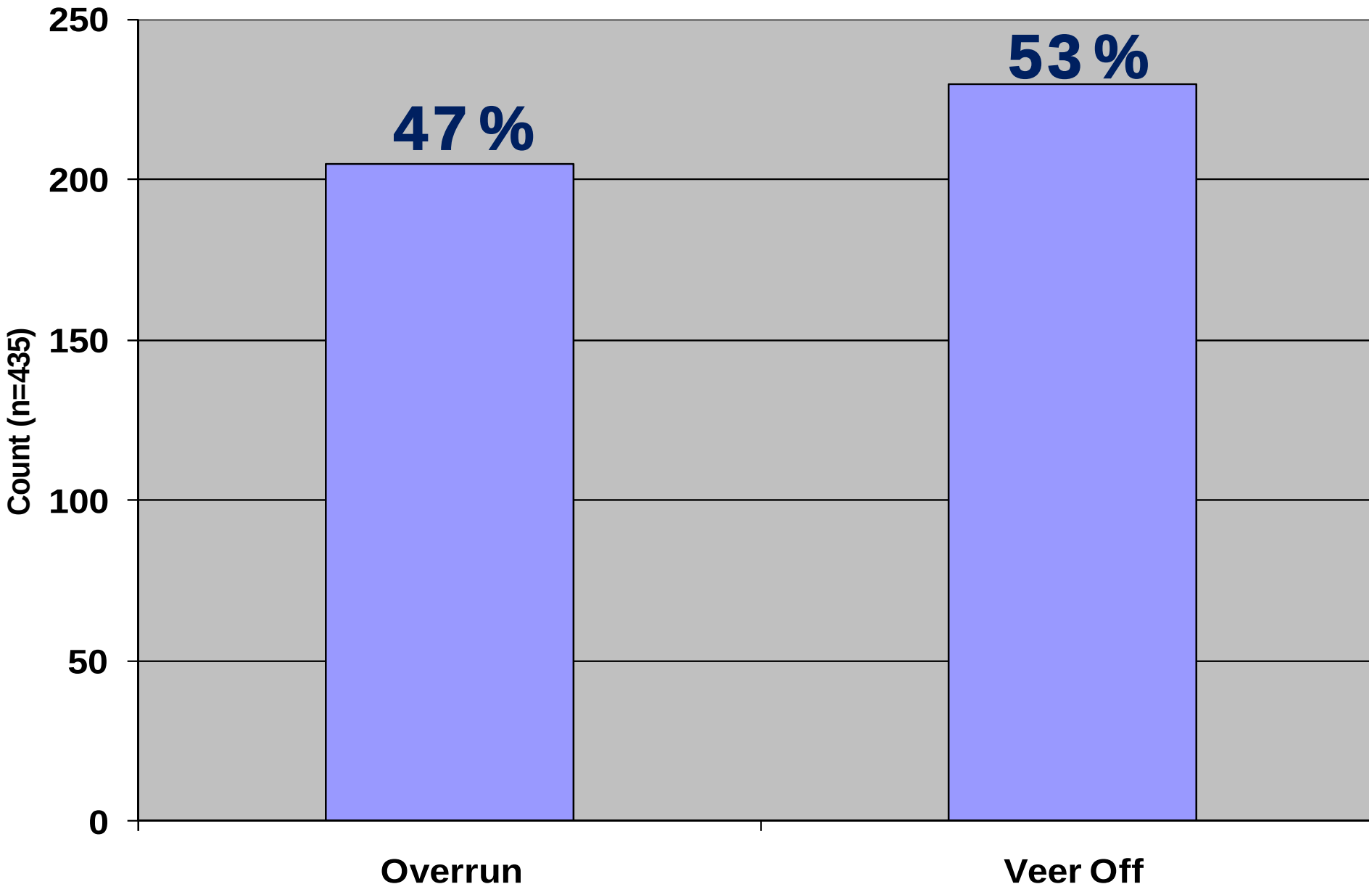
Runway Excursions - Type



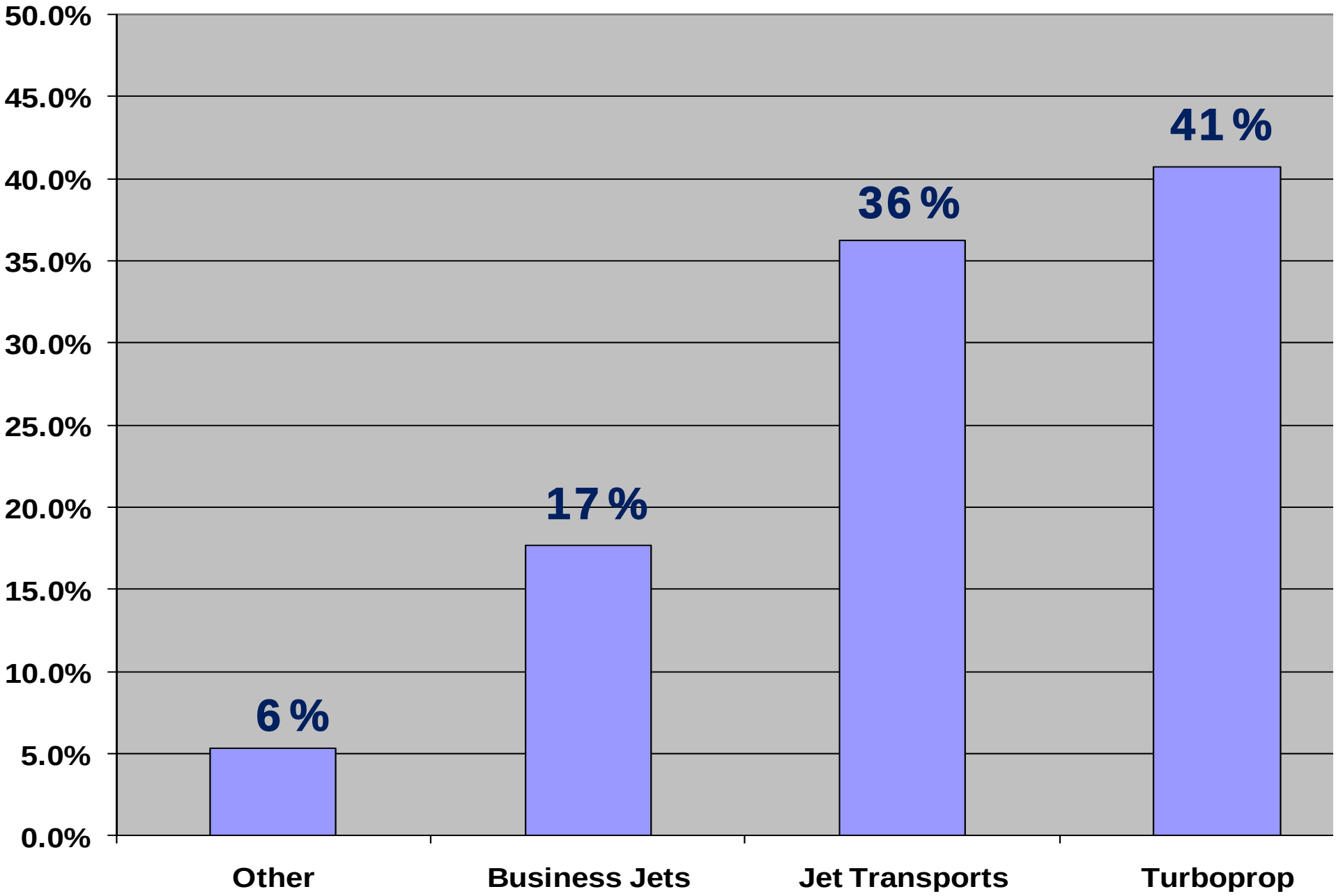
Takeoff Excursions



Landing Excursions - Type



Takeoff Excursions - Fleet Composition



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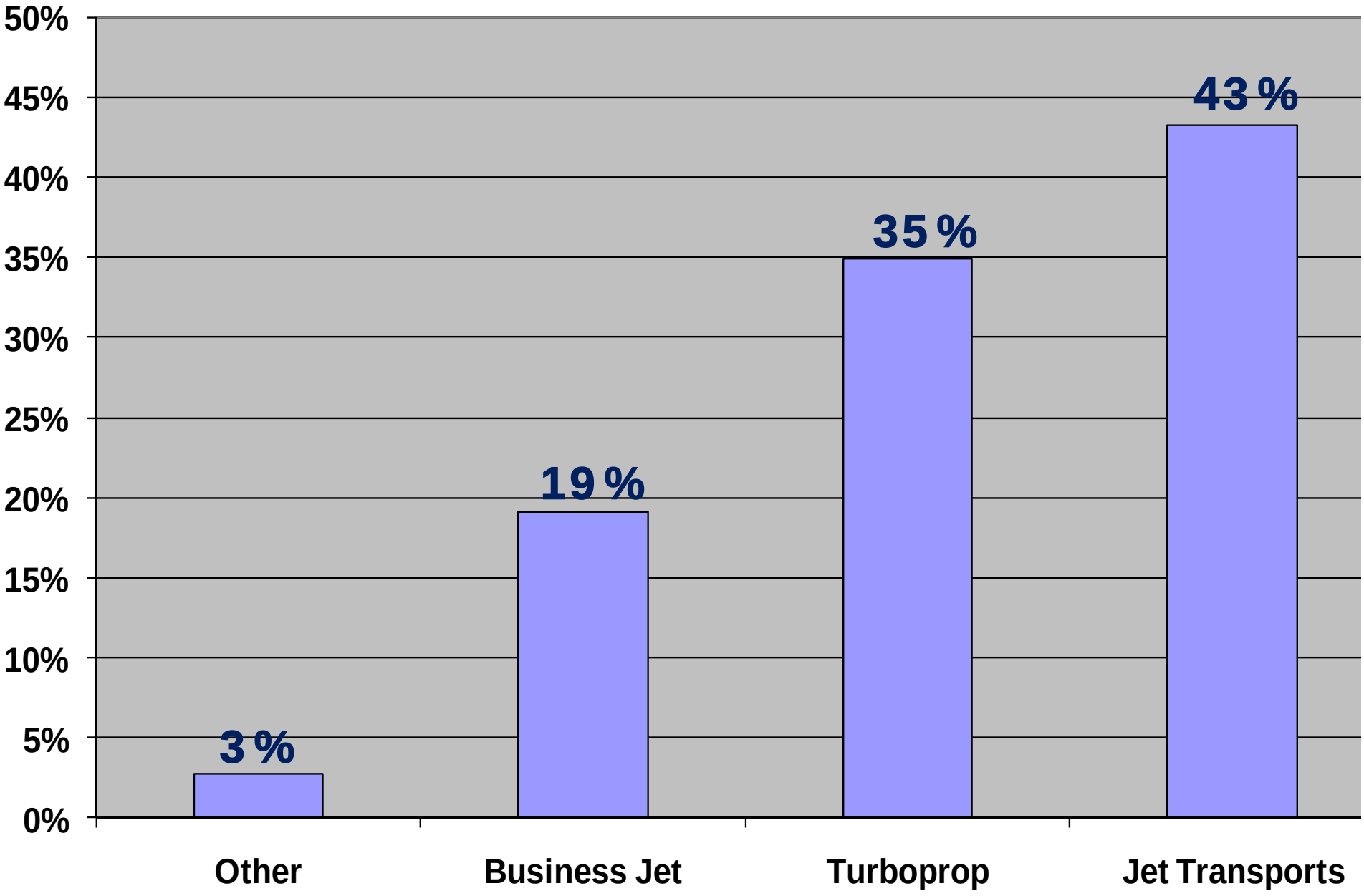
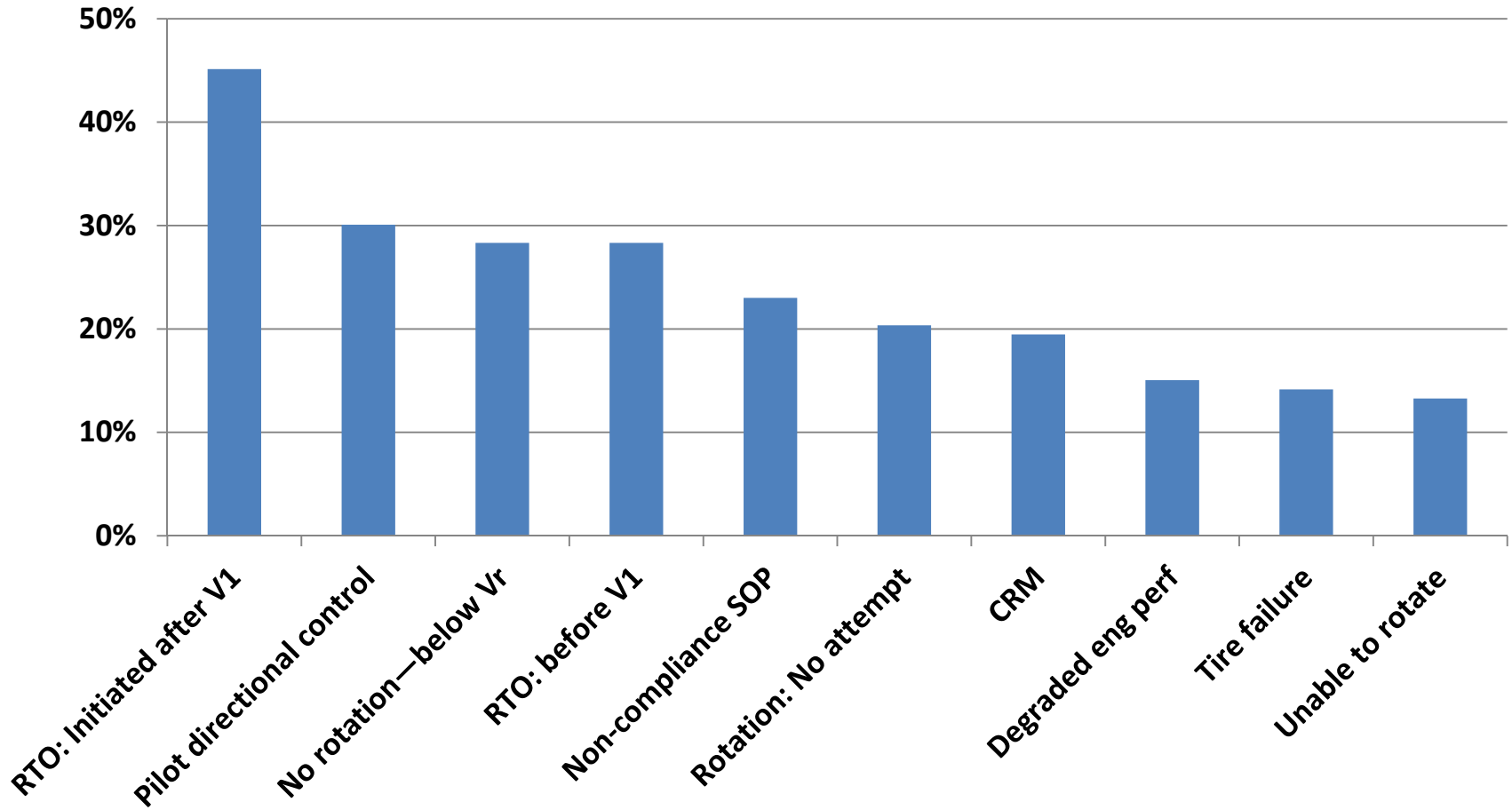


Takeoff Excursions – Top 10 Factors



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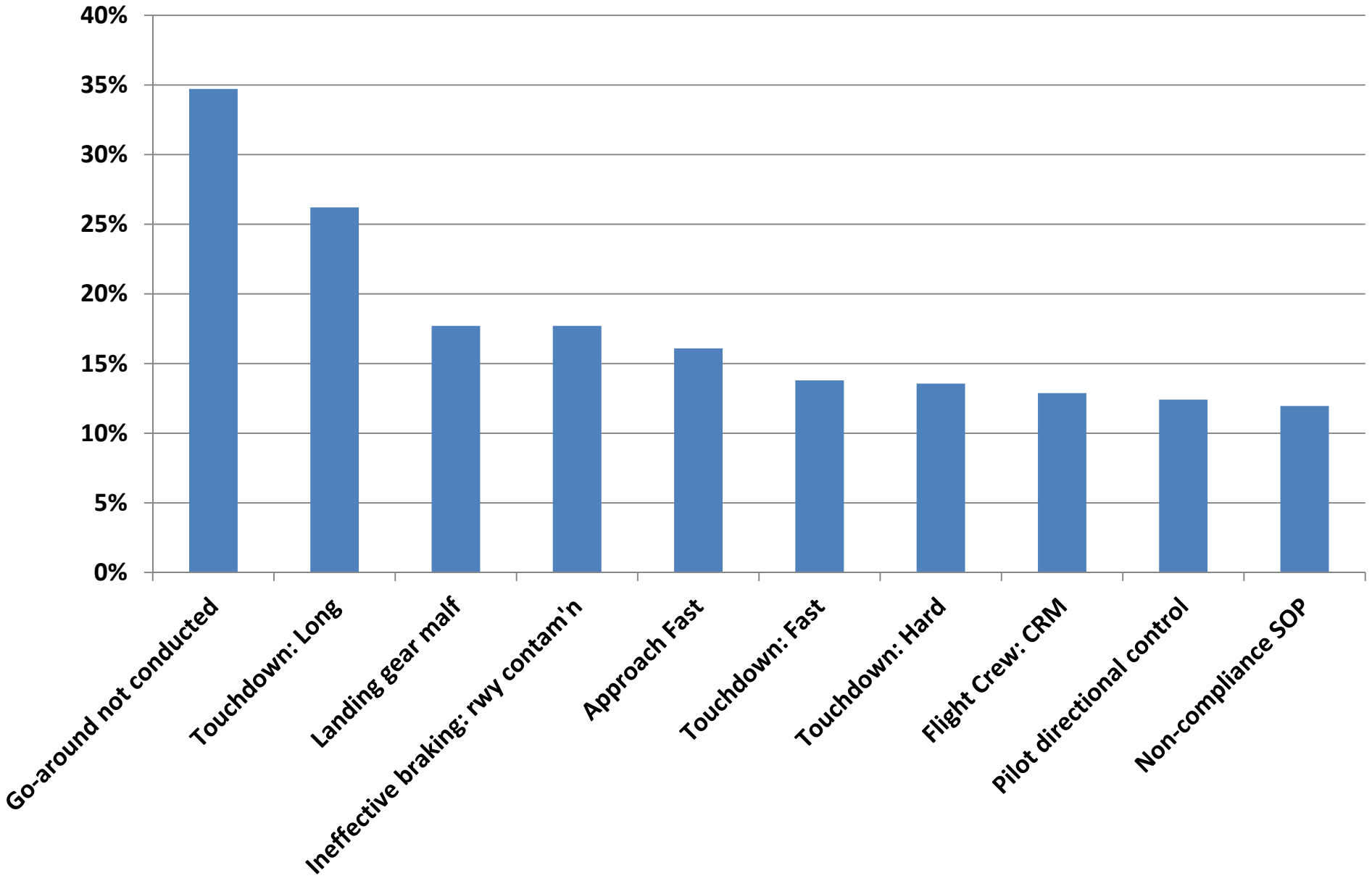
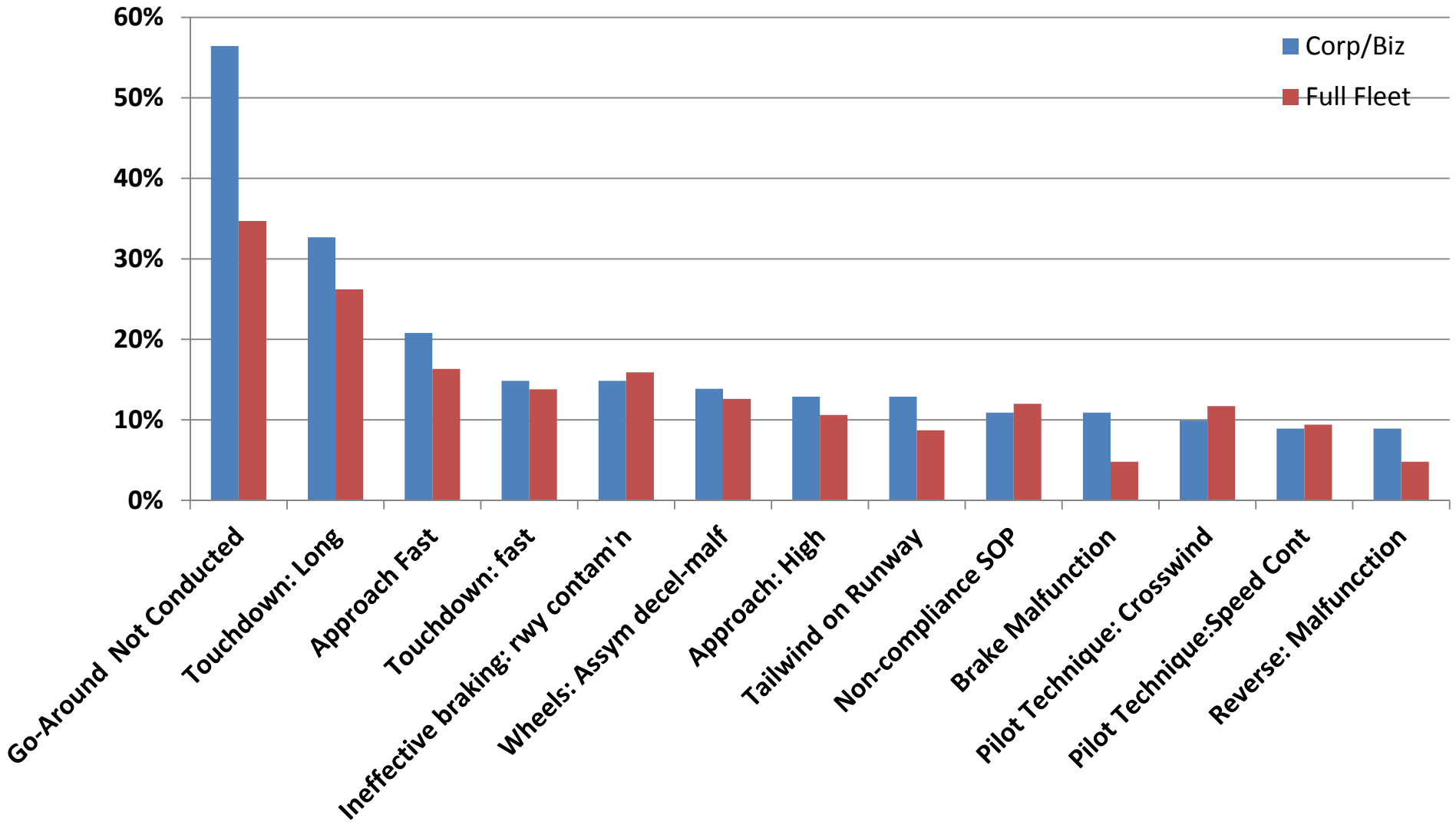


Corp/Biz Aircraft vs. Full Fleet - Landing Excursions



Landing Excursion Risk Factor Interactions

- **Overrun** accidents
  - Go-around not conducted events
    - 85% Touchdown long/fast
    - 79% Unstabilized approach
    - 40% Runway contamination
  - Touchdown long/fast events
    - 85% Go-around not conducted
    - 72% Unstabilized approach
    - 50% Runway contamination
  - Unstabilized approach events
    - 97% Go-around not conducted
    - 89% Touchdown long/fast
    - 49% Runway contamination

Runway Safety Observations

- Data shows we are being effective in preventing runway incursion ***accidents,*** but the number of incidents and severity still indicates a very high risk
- Data shows runway excursions are the most common type of runway safety accident (96%) and the most common type of fatal runway safety accident (80%)
- Severity of runway excursions dependent on:
  - Energy of aircraft when departing the runway
  - Airport layout, geography, and rescue capability

Conclusions

- Unstable approaches increase the risk of landing runway excursions
- Failure to recognize the need for and to execute a go-around is a major cause of landing runway excursions
- Contaminated runways increase the risk of runway excursions
- Combinations of risk factors (such as abnormal winds and contaminated runways or unstable approaches and thrust reverser issues) have an undesirable synergistic effect on the risk of an excursion

Conclusions

- **Universal standards related to runway conditions, and comprehensive performance data related to aircraft stopping characteristics, would assist in reducing the risk of runway excursions**

- **Establishing and adhering to standard operating procedures (SOPs) will enhance flight crew decision making and reduce the risk of runway excursions**

Basics

- Stabilized approach with landing in touchdown zone
- Energy = Mass X V^2
- Effect of reverse thrust is significantly greater on a contaminated runway
- Calculations and rules are important, but so is adhering to the conditions used to calculate them:
    * e.g., abort past V1
    * Land long, land fast

Basic Plan

- 3 Critical Items for Success:

  1. Identify high risk areas (with data)
  2. Develop interventions to reduce the risk in the highest risk areas
  3. Get information out internationally
     * On a regionally tailored basis
     * In a user friendly format

FLIGHT SAFETY FOUNDATION

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Reducing the Risk of RUNWAY EXCURSIONS

REPORT OF THE RUNWAY SAFETY INITIATIVE


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Release v. 5.0
APPROACH-AND-LANDING ACCIDENT REDUCTION
TOOL KIT
UPDATE

Challenges

Approach and Landing accident Reduction

- **Excursions**
  - Success in raising awareness
- **Go-arounds**
  - Decision
    - * LOSA: 4% unstable – 3% of them go-around
    - * Airbus: 3.5% unstable – 1.4% of the go-around

9 out of 10 unstable approaches continue to land

Safe Landing Guidelines

Safe Landing Guidelines

Note: The risk of an approach and landing accident is increased if any of the following guidelines is not met. If more than one guideline is not met, the overall risk is greatly increased

1. **Fly a stabilized approach**

2. **Height at threshold crossing is 50 feet**

3. **Speed at threshold crossing is not more than Vref + 10 knots indicated airspeed and not less than Vref**

4. **Tailwind is no more than 10 knots for a non-contaminated runway, no more than 0 knots for a contaminated runway**

Safe Landing Guidelines

5. Touchdown on runway centerline at the touchdown aim point

6. After touchdown, promptly transition to desired deceleration configuration:
   - Brakes
   - Spoilers/speed brakes
   - Thrust reversers

   Note: Once thrust reversers have been activated, a go-around is no longer an option

7. Speed is less than 80 knots with 2,000 feet of runway remaining

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FSF Goal:
Make aviation safer by reducing the risk of an accident