



NTSB National Transportation Safety Board

NTSB Priorities – Business Aviation

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Board Member

**Air Charter Safety Foundation
NTSB Ashburn Training Center
March 16, 2011**

NTSB Mission

The NTSB is an independent US federal agency charged with determining the probable cause(s) of transportation accidents, making recommendations to prevent their recurrence, conducting special studies and investigations, and coordinating resources to assist victims and their families after an accident.

NTSB Priorities – Business Aviation

- Airframe Icing
- Runway Excursions
- Rest & Duty Requirements - Fatigue
- Pilot Professionalism
- Crew Resource Management
- Safety Management Systems

Why?

- Kansas City, Missouri, February 16, 1995 (fatigue)
- Volcano, Hawaii, September 25, 1999 (CRM)
- Mt Waialeale, Hawaii, June 25, 1998 (CRM)
- Aspen, Colorado, March 29, 2001 (CRM)
- Eveleth, Minnesota, October 25, 2002 (CRM)
- Jefferson City, Missouri, October 14, 2004 (SMS) (professionalism)
- Kirksville, Missouri, October 19, 2004 (fatigue)
- Montrose, Colorado, November 28, 2004 (icing) (CRM)
- Teterboro, New Jersey, February 2, 2005 (professionalism)
- Pueblo, Colorado, February 16, 2005 (icing)
- Cleveland, Ohio, February 18, 2007 (fatigue)
- Milwaukee, Wisconsin, June 4, 2007 (excursion)
- Orlando, Florida, July 11, 2007 (SMS)
- Hilo, Hawaii, February 13, 2008 (fatigue)
- Oklahoma City, Oklahoma, March 4, 2008 (SMS)
- Columbia, South Carolina, September 19, 2008 (excursion)
- Clarence Center, New York, February 12, 2009 (fatigue) (professionalism)

Airframe Icing

Airframe Icing

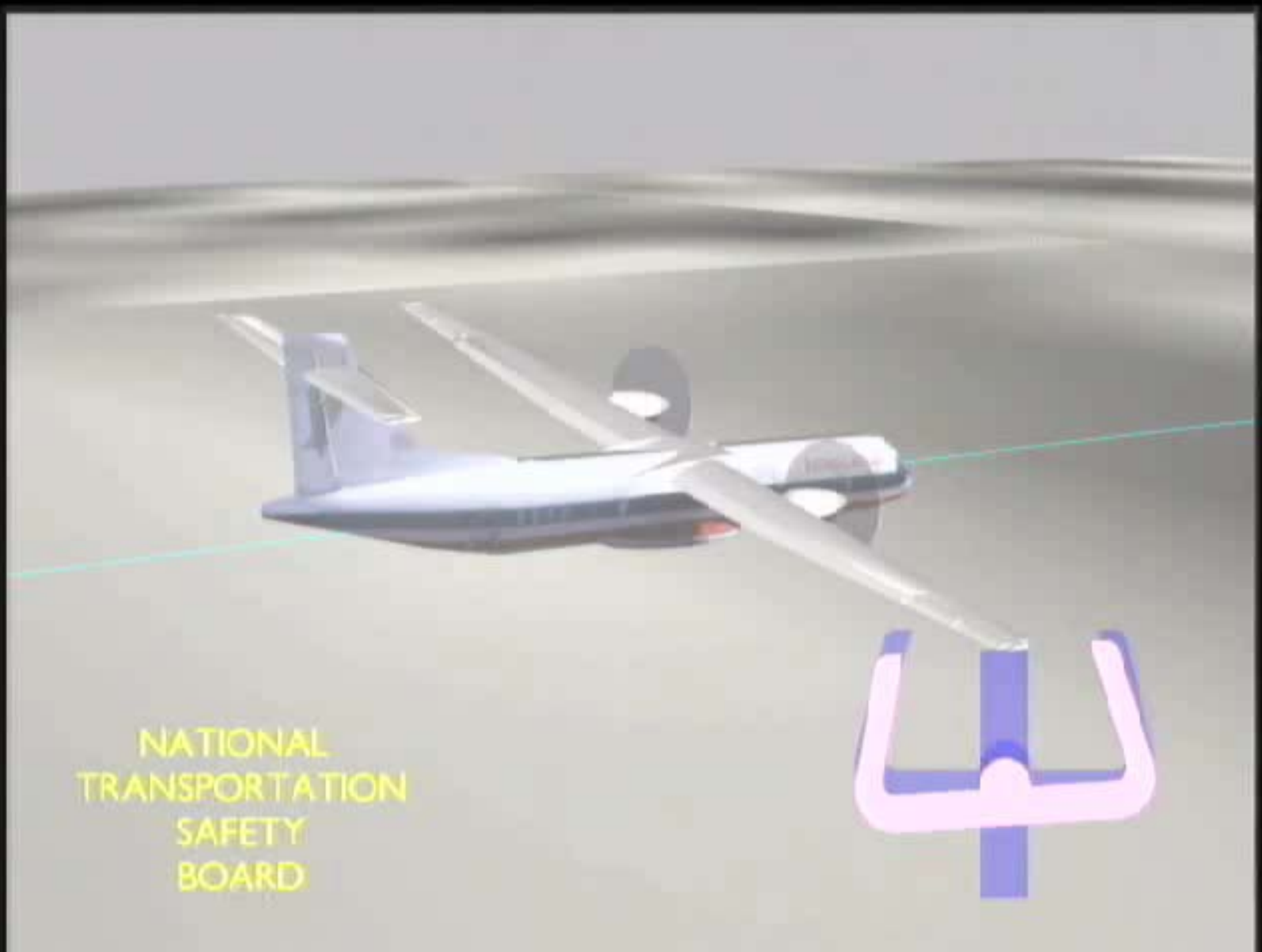
- Majority of icing conditions encountered will not be a problem for certificated aircraft – NTSB deals with the uncommon occurrences.
- NTSB recommendations on aircraft icing date back to 1981.
- Airframe Icing has been on the NTSB's Most Wanted List of safety improvements since 1997.

Airframe Icing



10/31/1994 - Avions de Transport Regional, model 72-212 (ATR 72), operated by Simmons Airlines, Incorporated, dba American Eagle flight 4184, crashed during a rapid descent after an uncommanded roll excursion, in Roselawn, Indiana (Fatalities: 4 crew; 64 passengers).

Investigation found accident involved Supercooled Large Droplets, (SLD), which created ridge of ice aft of deice boots and caused ailerons to deflect, resulting in loss of control.



Airframe Icing

Why is SLD important to consider?

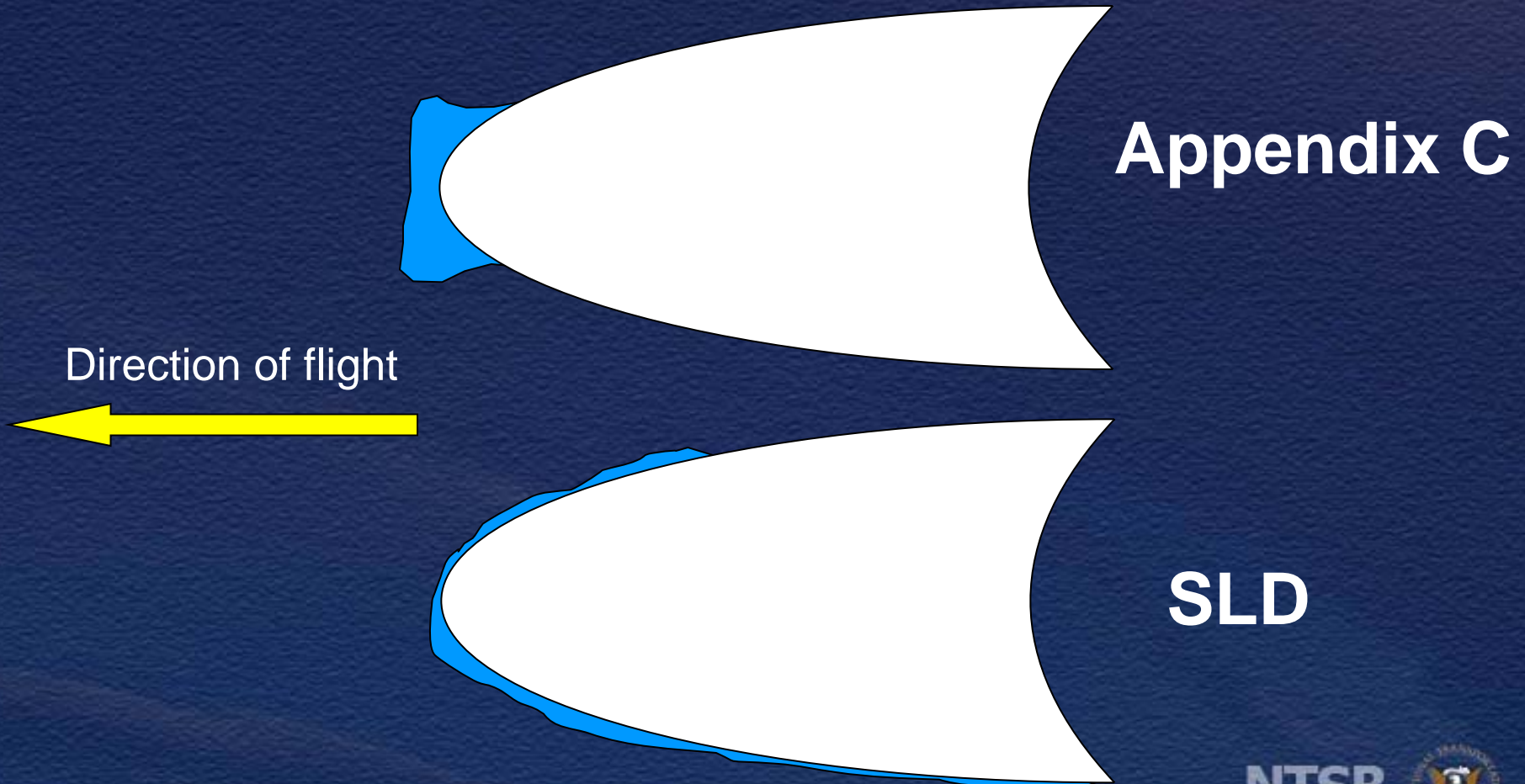
- Accretions can cause stall or control anomalies at higher airspeed than normally expected
- Ice can accrete aft of ice protection system
- Sometimes difficult to see or detect
- Pilots may not detect an unsafe condition



Airframe Icing

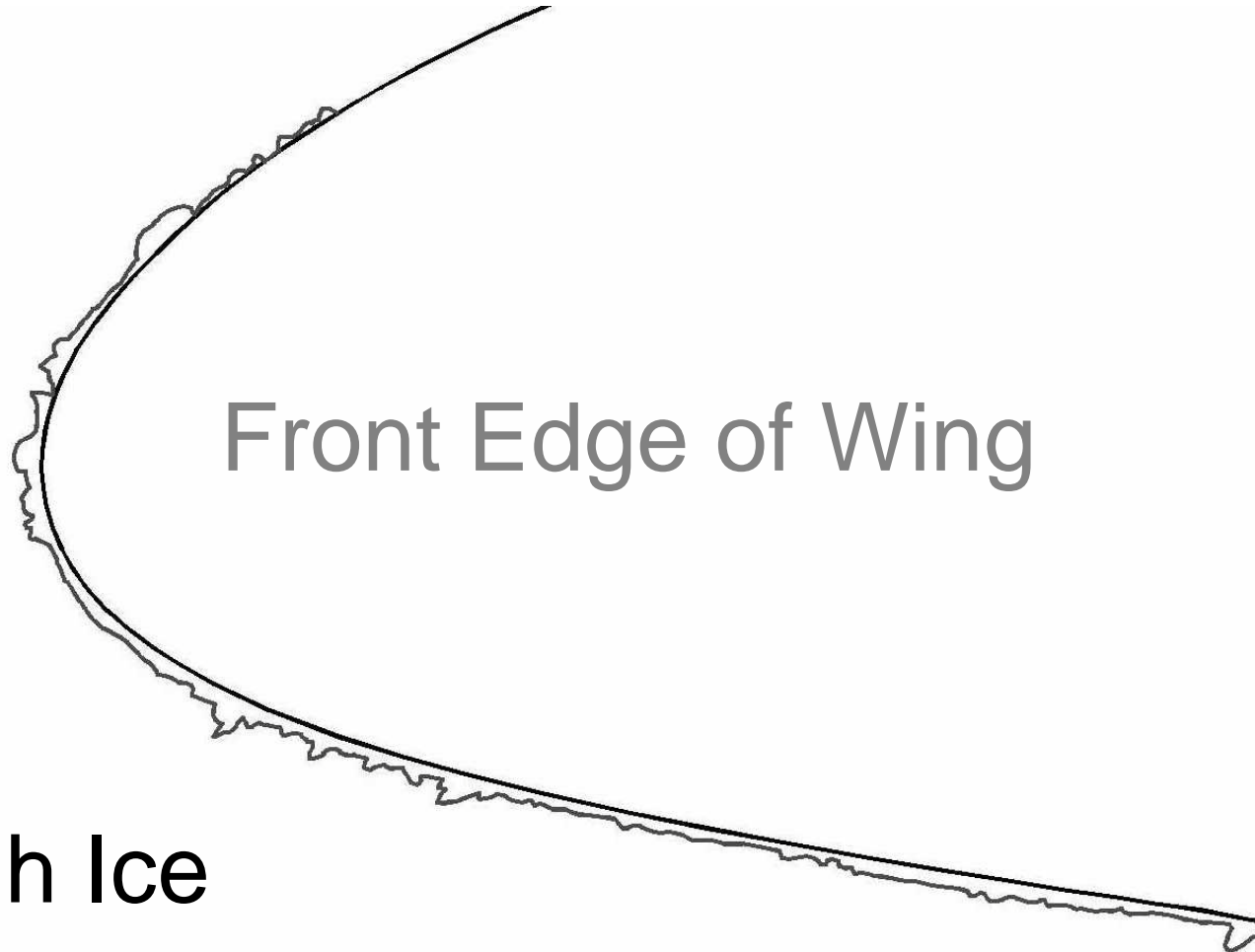
Effect of SLD on ice accretion:

Wing leading edge cross section

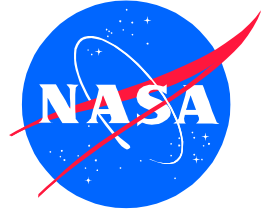




Resultant Ice Shapes

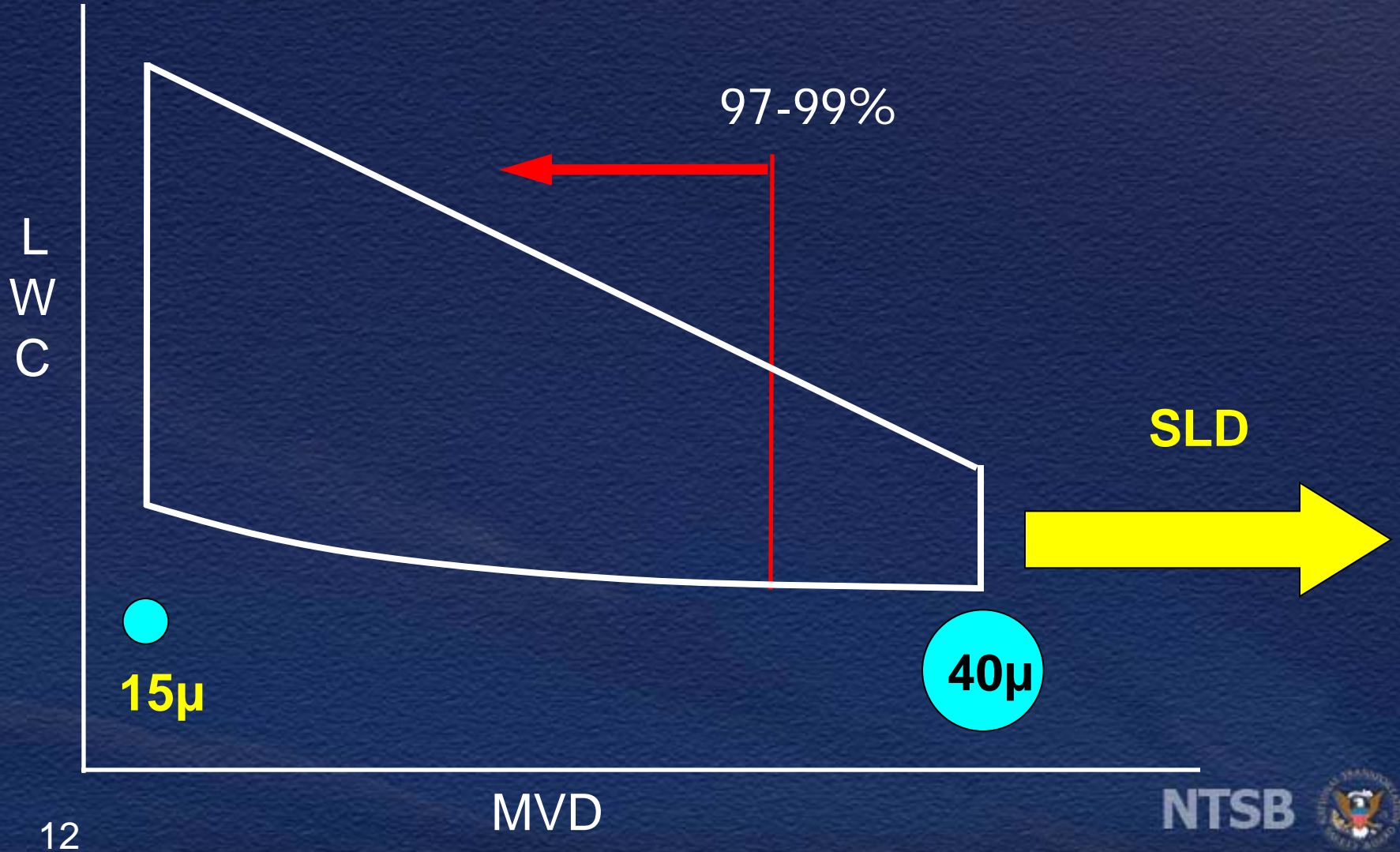


Rough Ice

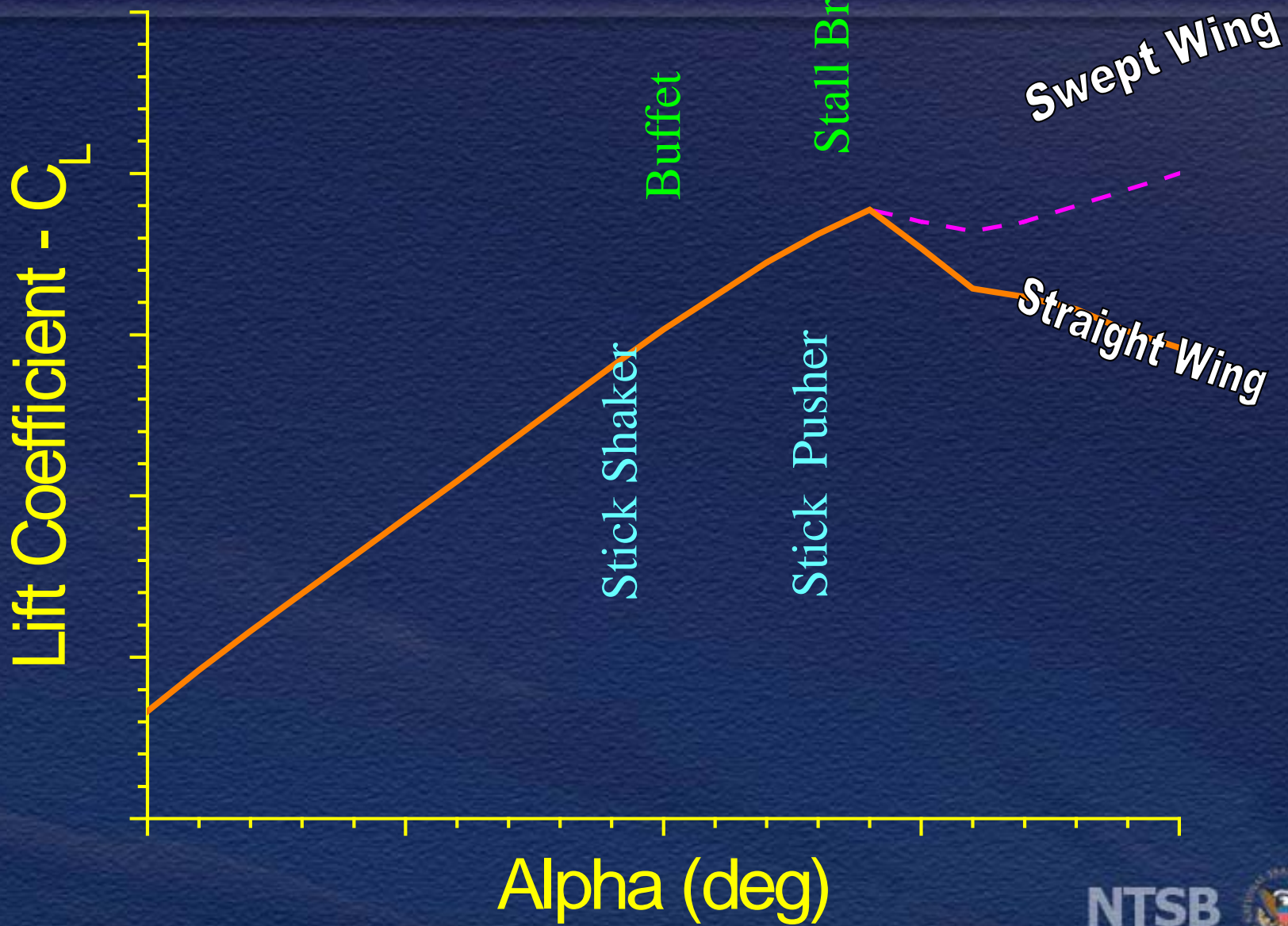


Airframe Icing

Part 25 Appendix C
Continuous Maximum Icing

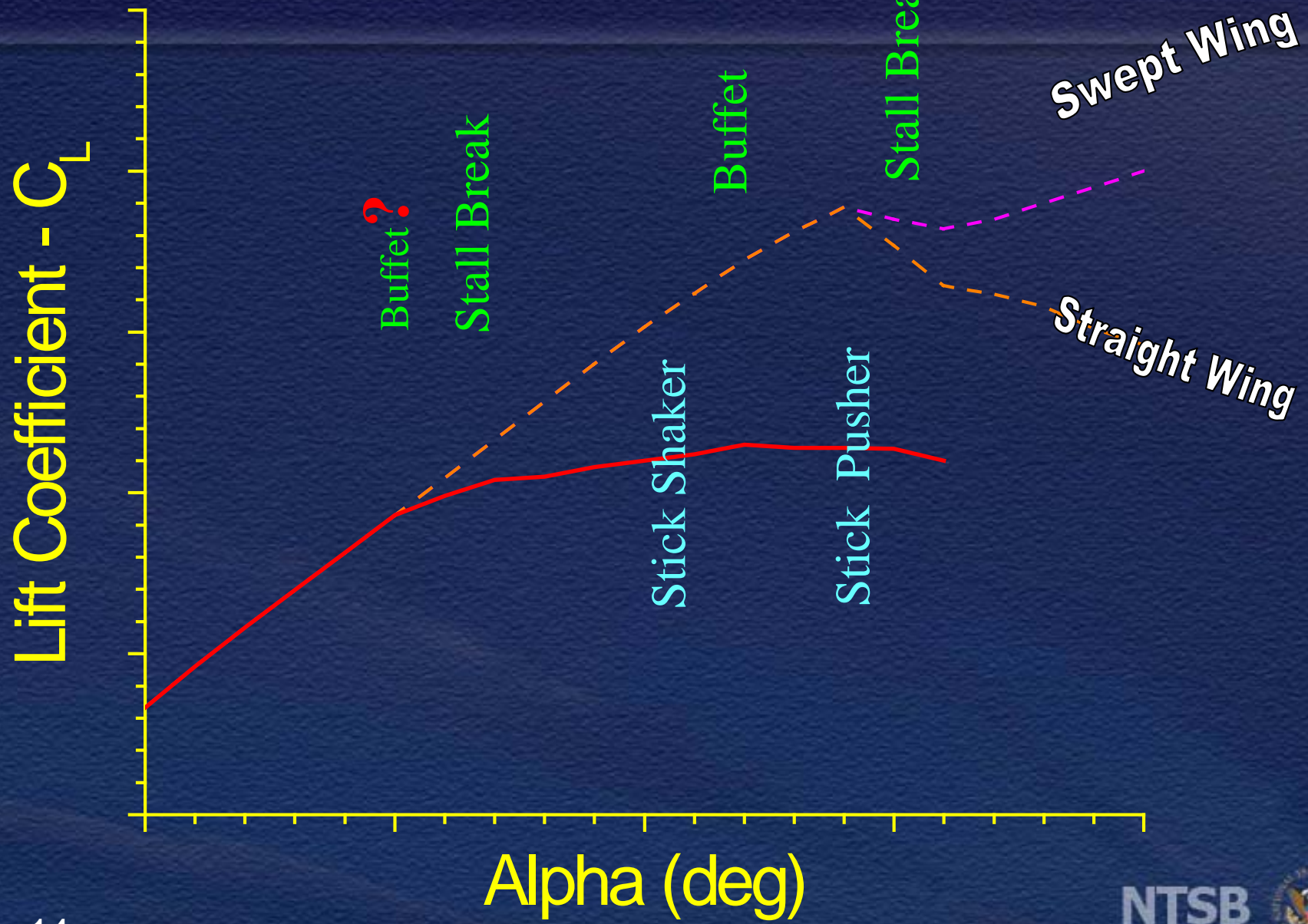


Airframe Icing

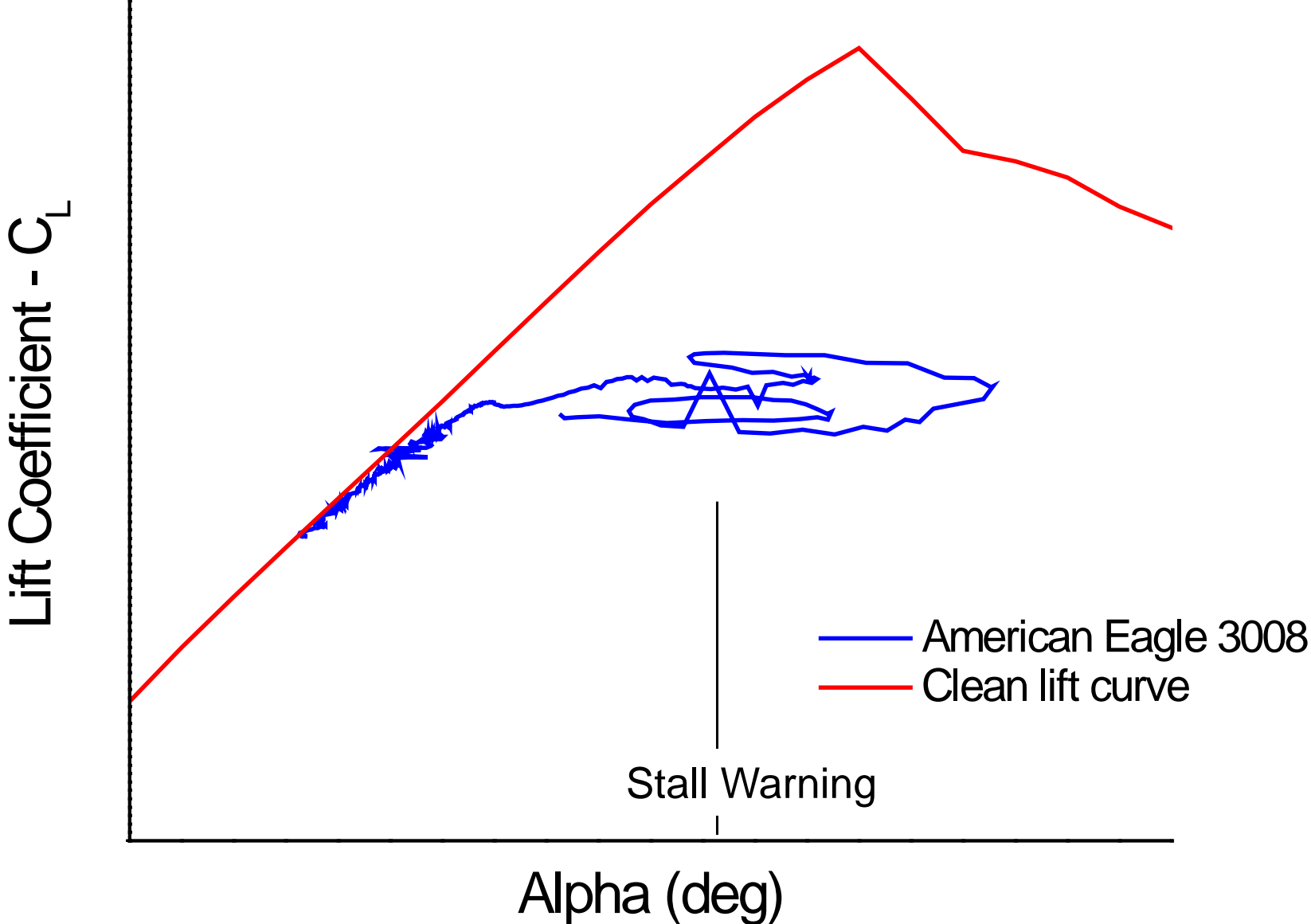




Airframe Icing



Saab 340 Lift Coefficient Extraction



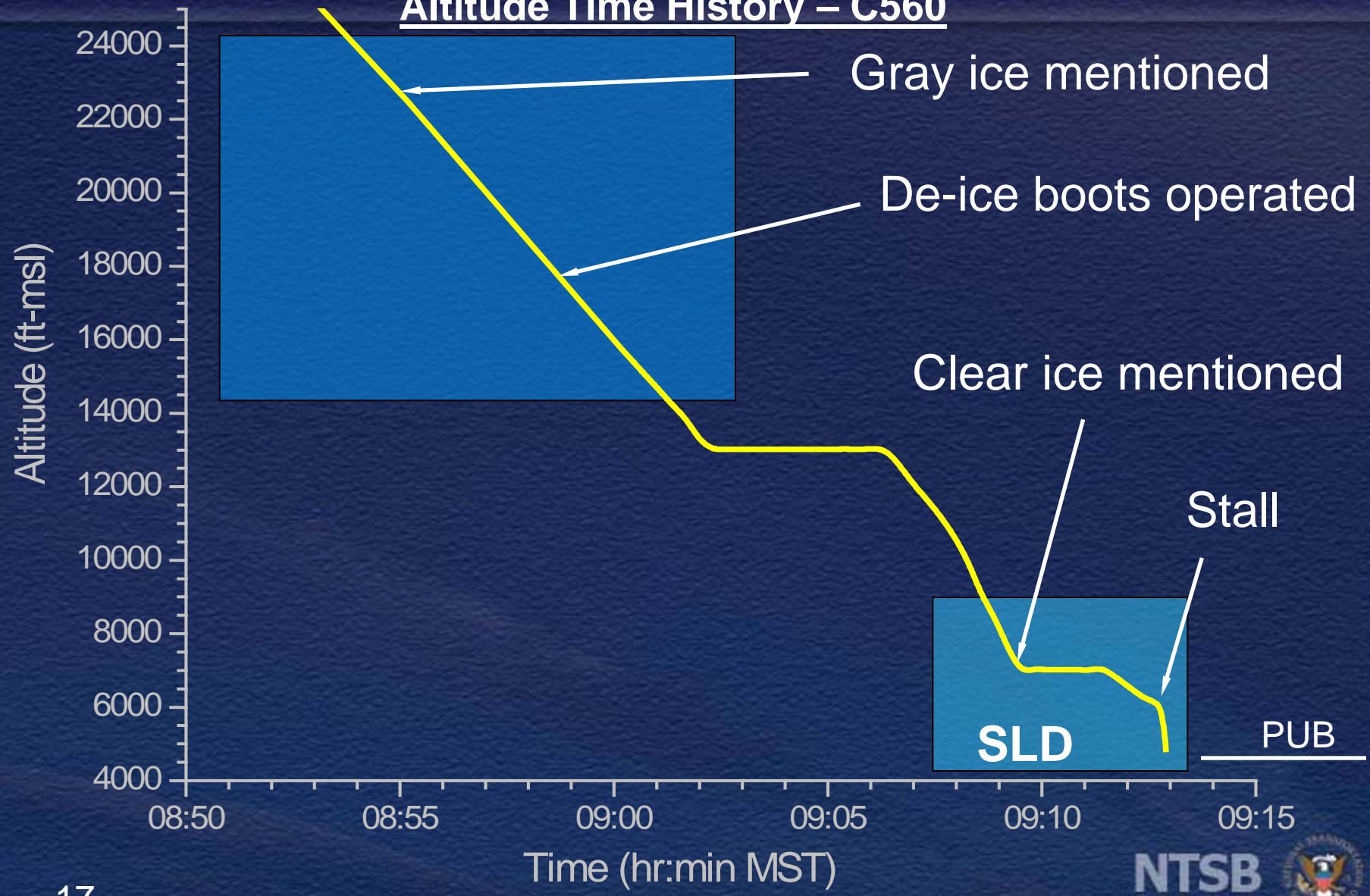
Airframe Icing



2/16/2005 - a Cessna Citation 560, N500AT, operated by Martinair, Inc., for Circuit City Stores, Inc., crashed east of Pueblo Memorial Airport, Pueblo, Colorado, while on an instrument landing system approach to runway 26R (Fatalities: 2 pilots; 6 passengers).

Airframe Icing

Altitude Time History – C560



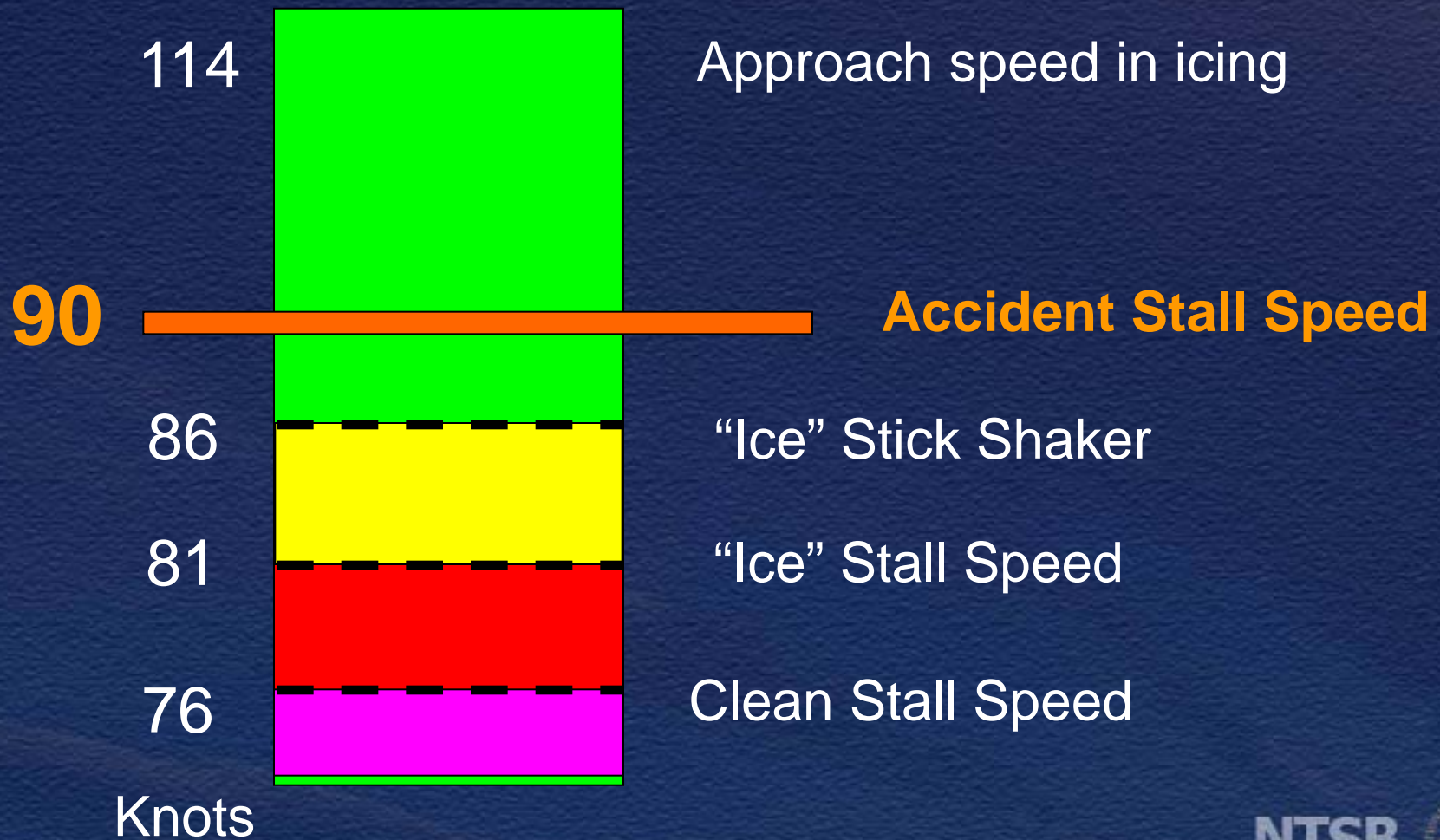
Airframe Icing

C560 Accident Sequence

- Airplane slowed below *V_{approach}*
- De-ice boots not operated in second icing layer
- Presence of an estimated 1/6 of an inch or less of ice accreted in SLD conditions caused the airplane to stall prior to stick shaker
- Airplane entered a rapid left roll prior to stall warning
- Airplane did not recover in the 1,500 feet agl available

Airframe Icing

C560 Accident Airplane Relevant Speeds



Airframe Icing



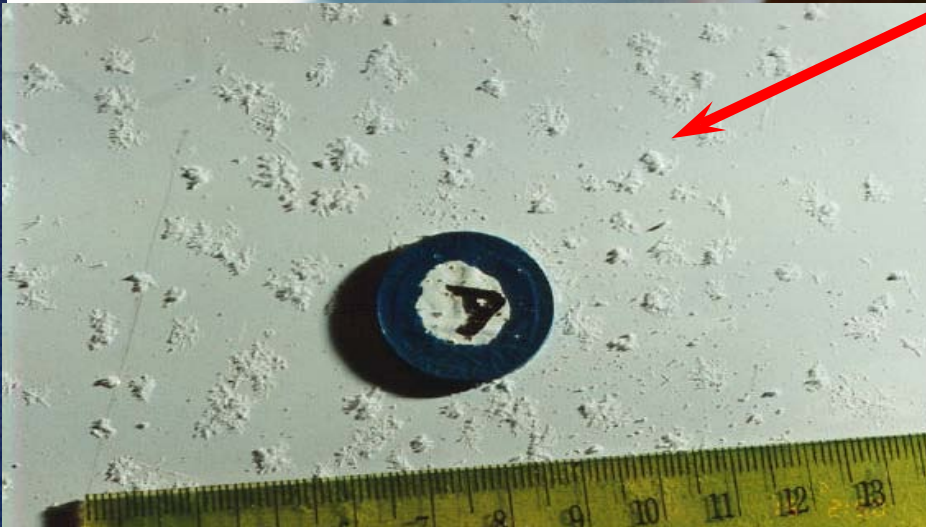
11/28/ 2004, Canadair, Ltd., CL-600-2A12, operated by Air Castle Corporation doing business as Global Aviation Glo-Air flight 73, collided with the ground during in snow conditions during takeoff at Montrose Regional Airport , Montrose, Colorado (Fatalities: 2 crew; 1 passenger).

Airframe Icing

Montrose, CO –
Flight CL 6002812



Small, almost
imperceptible
accumulations



Photos from Chaput, M., Hanna M., Ruggi E. and Mayhew, J.
Aircraft Full-Scale Test Program for the 1998/99 Winter,
APS Aviation Inc. Montreal, October 1999,
Transportation Development Centre TP 13485E

Recent Accidents and Incidents Demonstrate:

- Icing continues to be a threat to aviation safety
- Airplanes are operating in SLD environments for which they are not certified, particularly in lower layers of the atmosphere
- Rough ice shapes and intercycle ice shapes can cause large aerodynamic penalties, larger than some ice shapes currently used in certification

What can pilots remember?

- AIRSPEED, AIRSPEED, AIRSPEED
- Deice boots for all equipped airplanes need to be operated as soon as airplane enters icing conditions
- Autopilot can mask changes to handling qualities and trim changes due to ice. When possible, disconnect autopilot in icing conditions.

Runway Excursions

Commercial Transport Aircraft Accidents

1995 Through 2008

Aircraft Type	Turbojet		Turboprop	
	Major	Substantial	Major	Substantial
Damage	286	372	528	243
Total	658		771	
1,429 total accidents				
Western- and Eastern-built turbojet and turboprop aircraft				

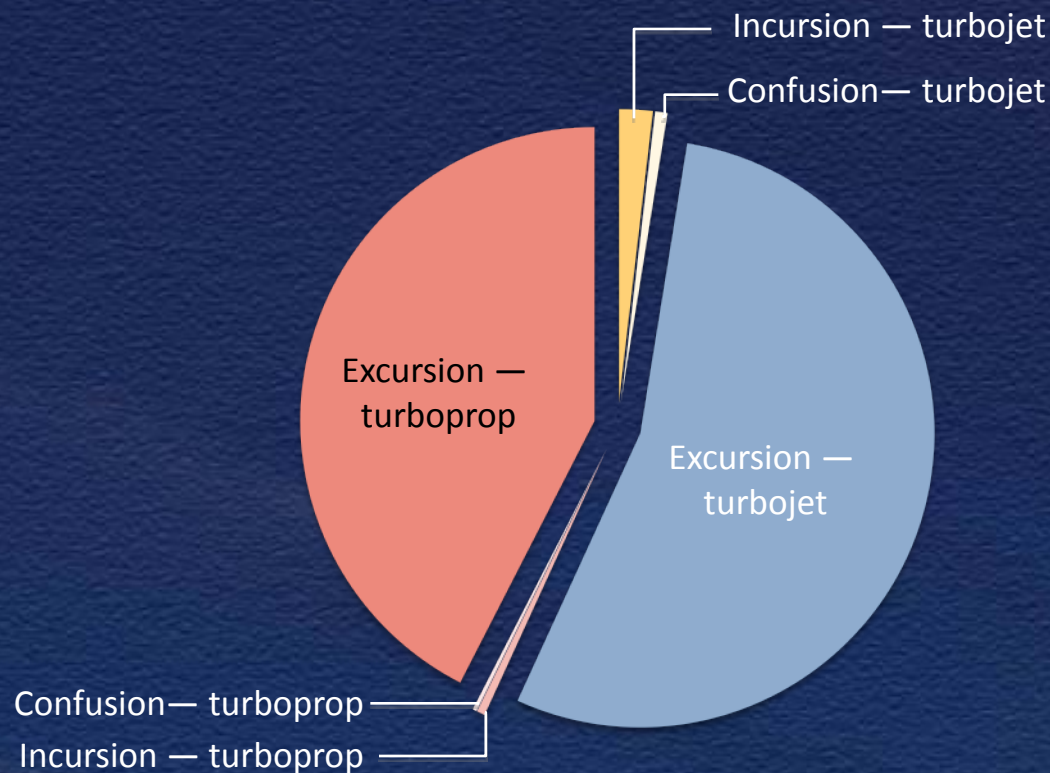
Commercial Transport Runway Accidents 1995 Through 2008

Accident Type	Number of Accidents	Average Annual Rate	Percent of Total Accidents*
Incursion	10	0.7	0.6%
Confusion	4	0.3	0.3%
Excursion	417	29.8	29.0%

* A total of 1,429 accidents occurred during the period.

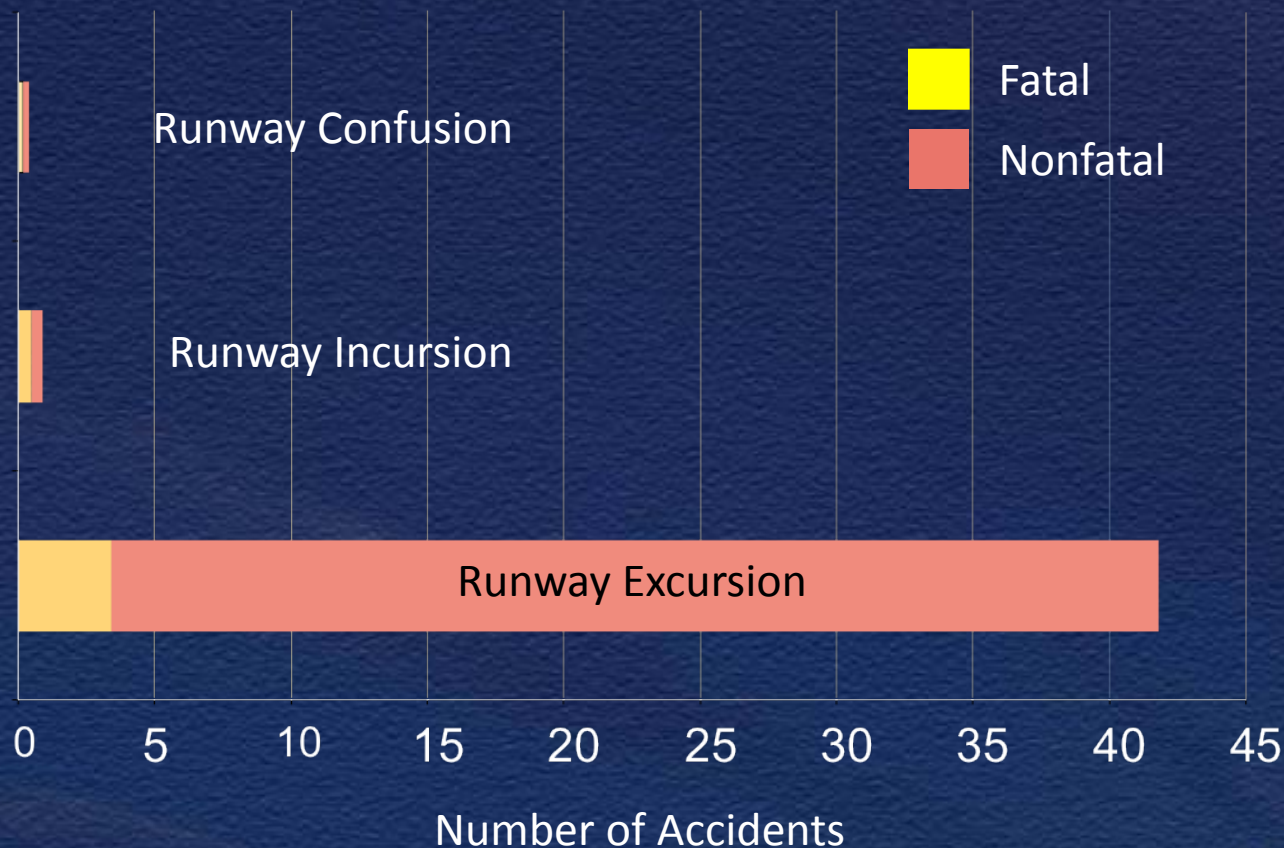
Runway Excursions

Commercial Transport – Runway Related Accidents 1995–2008



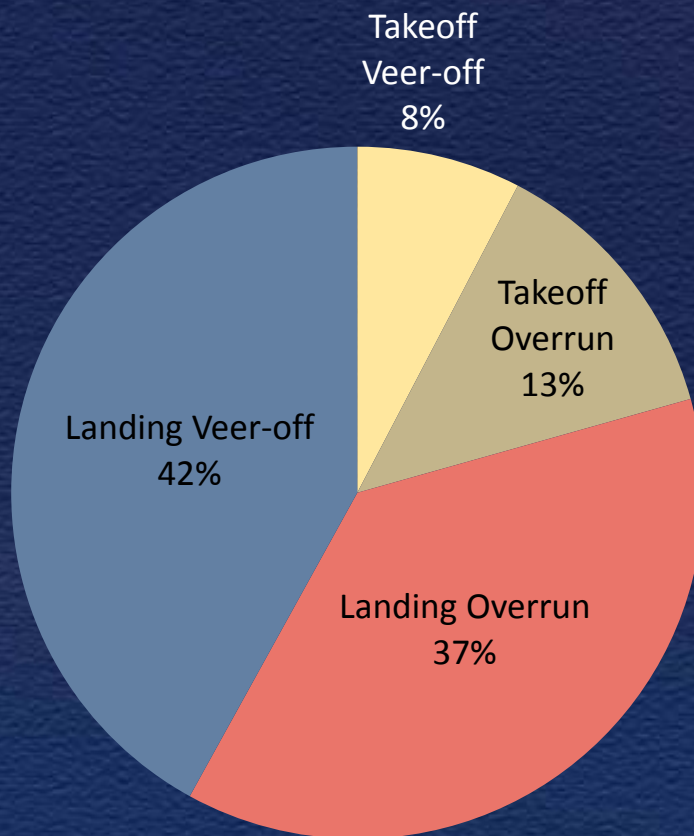
Runway Excursions

Fatal/Nonfatal Runway Accidents, Commercial Transports — 1995–2008



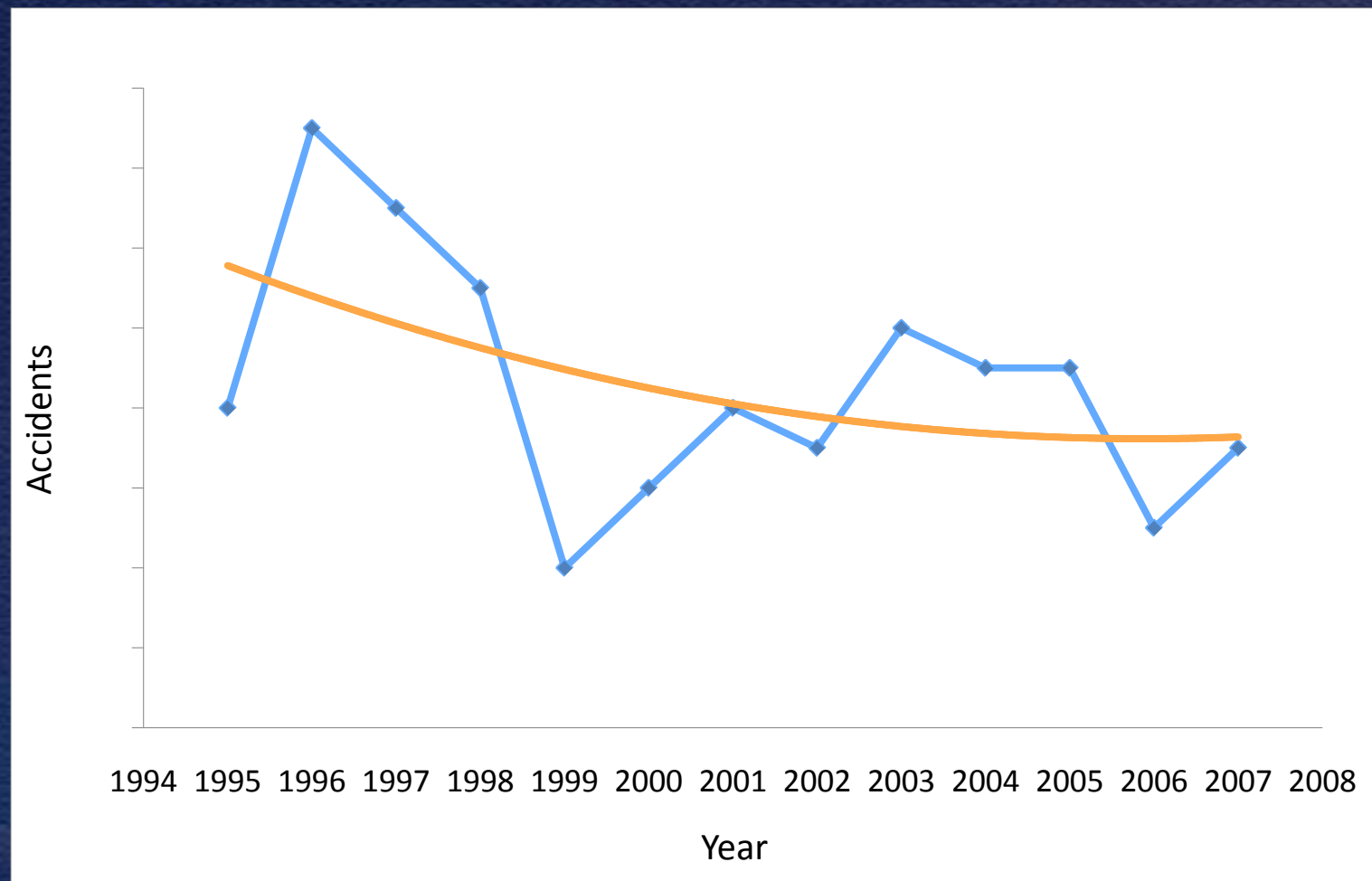
Runway Excursions

Accidents - 1995 through 2008

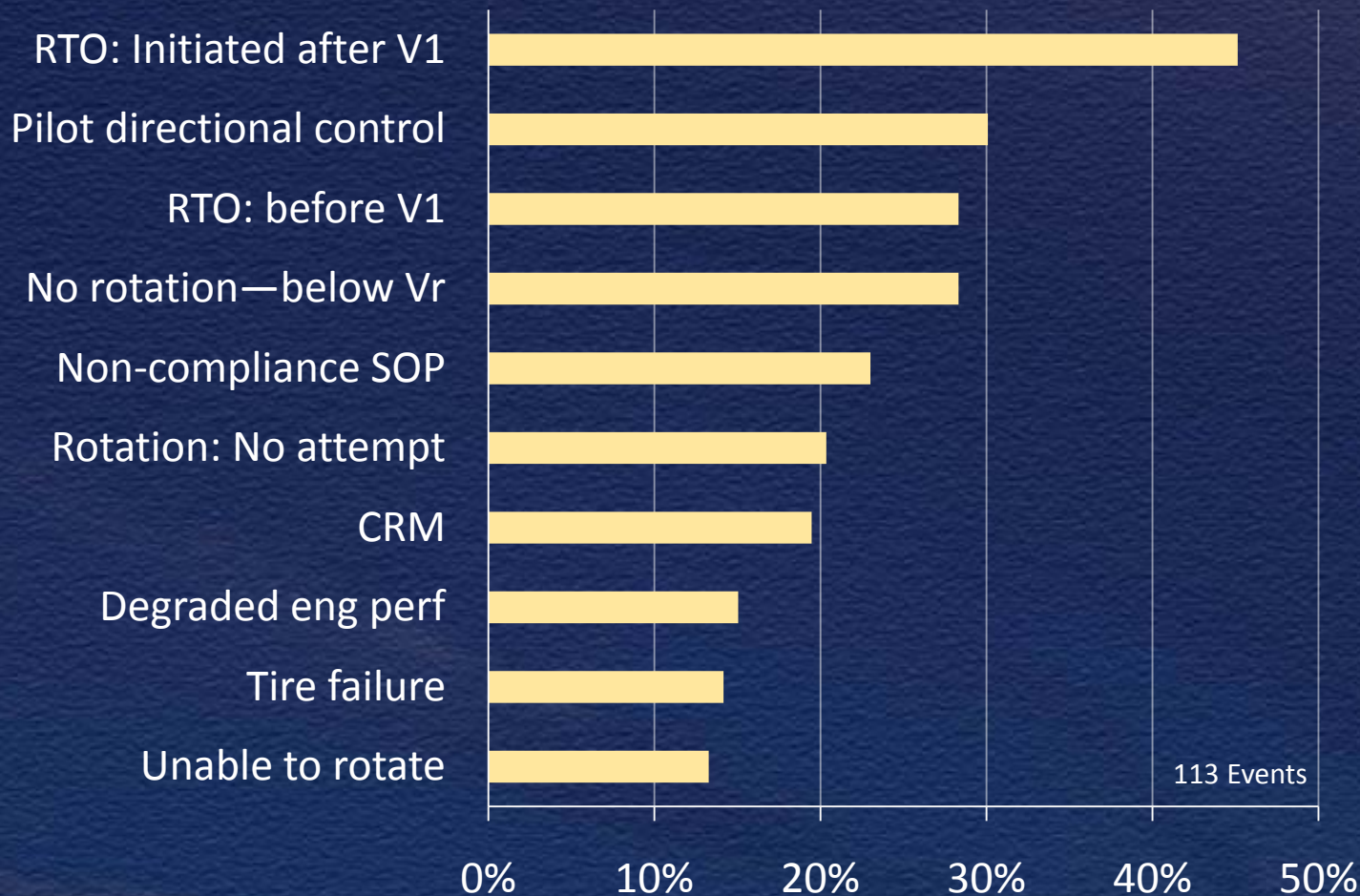


Runway Excursions

Takeoff Excursions – 1995 through 2007

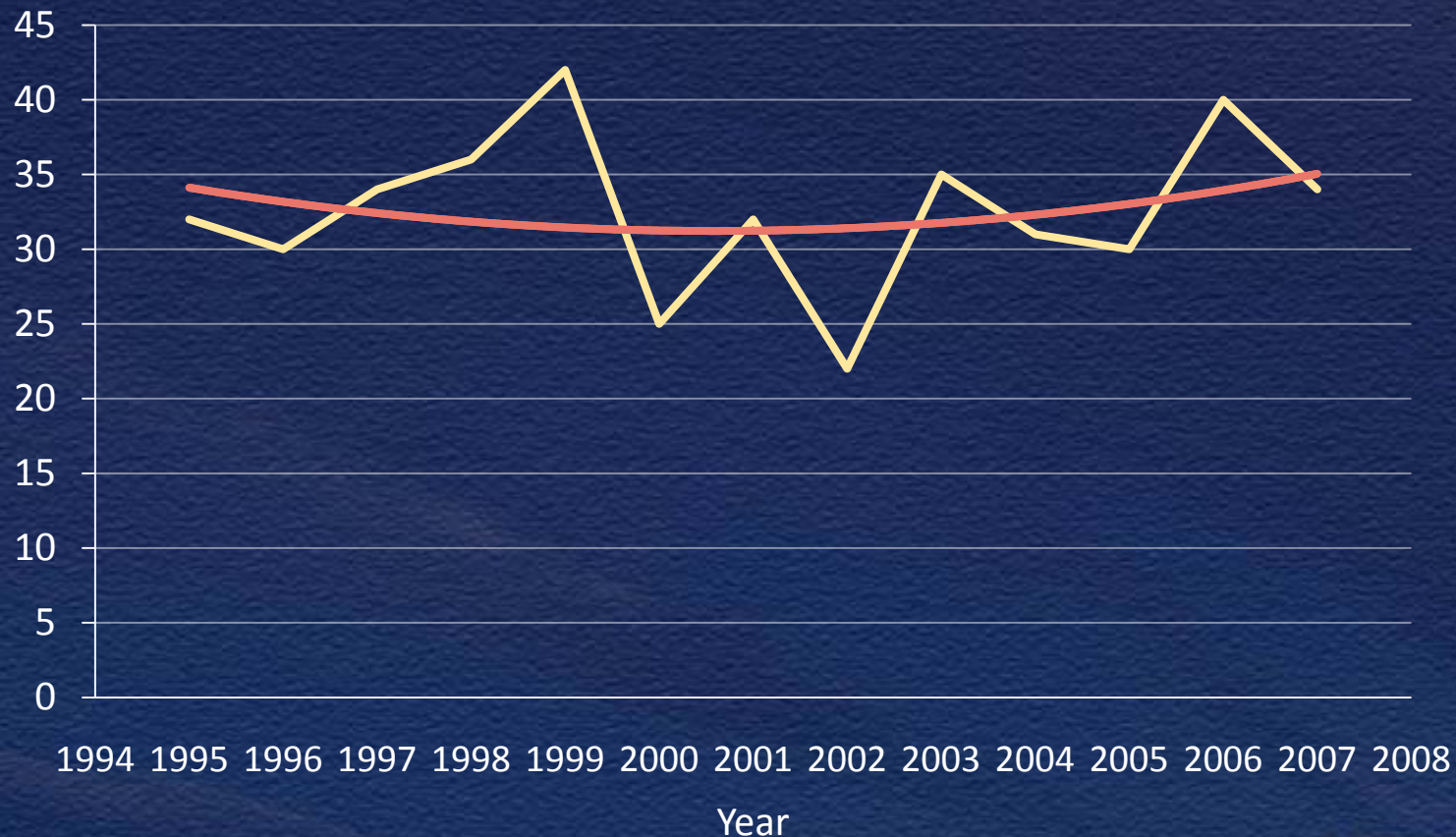


Takeoff Excursions, Top 10 Factors



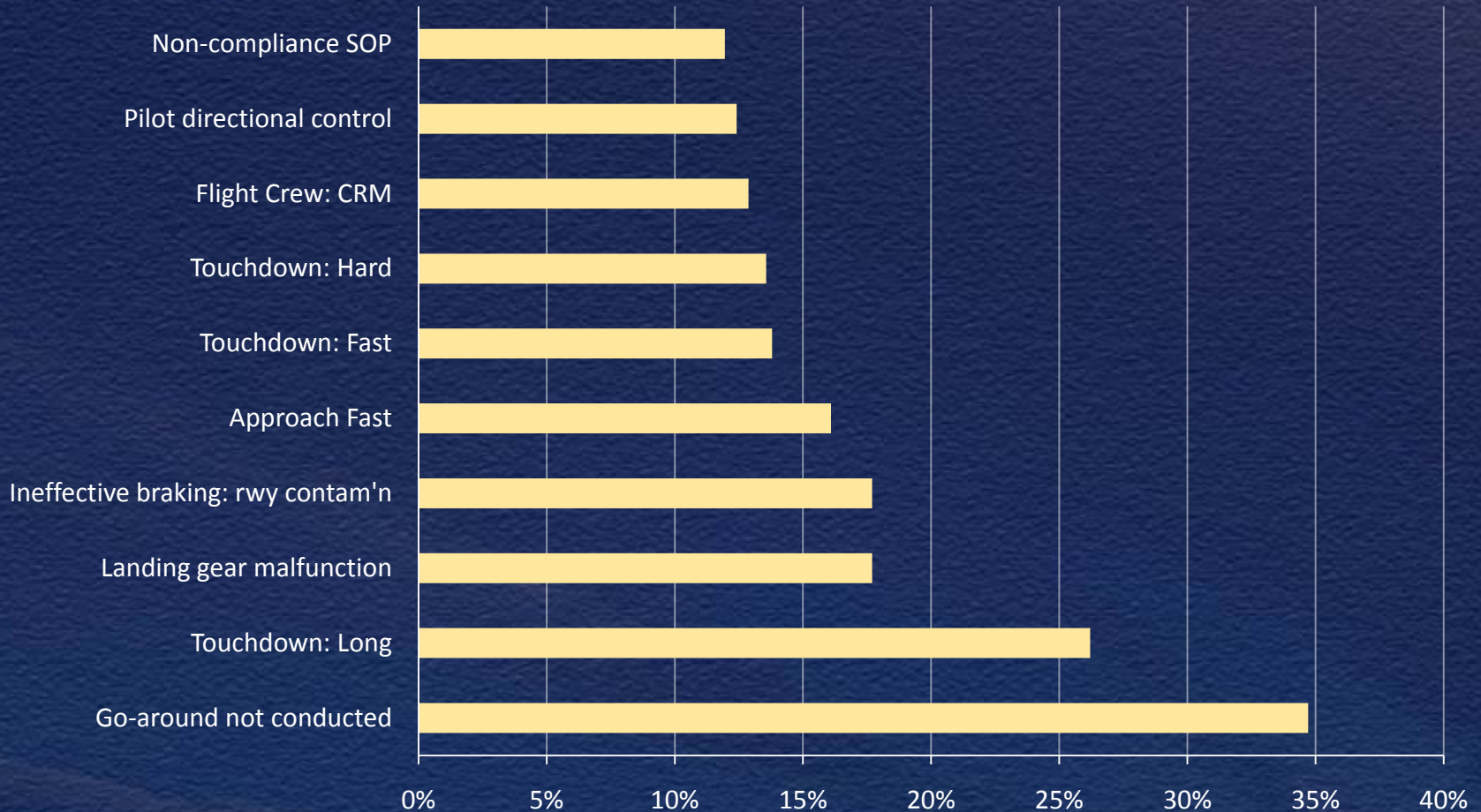
Landing Excursions

1995–2007



Runway Excursions

Landing Excursions, Top 10 Factors



Runway Excursions

Corp/Biz Aircraft vs. Full Fleet — Landing Excursions



Runway Excursion

Risk Reduction Summary

- Takeoff Excursions
 - RTO decision and execution
 - Weight and balance and performance calculations
- Landing Excursions
 - Unstable approaches
 - Failure to conduct a go-around
 - ATC influences
 - Runway contamination information

Runway Excursion

Risk Reduction Summary (continued)

- Common Issues
 - Mechanical malfunction
 - SOP adherence, development and review
 - Airport runway environment and safety areas
 - Global standards for runway condition measurement and reporting
 - Aircraft performance data

Why?



NTSB Board Meeting – March 15, 2011

July 31, 2008 – East Coast Jets flight 81, Beechcraft, crashed while attempting to go around after landing on runway 30 at Owatonna Degner Regional Airport, Owatonna, Minnesota (Fatalities: 2 pilots; 6 passengers).



NTSB