NTSB National Transportation Safety Board

General Aviation Safety Status & Activities

Twin Cessna Flyers
Branson, MO
June 12, 2014

Earl F. Weener, Ph.D.
Member, NTSB

N6529R - B36TC Bonanza

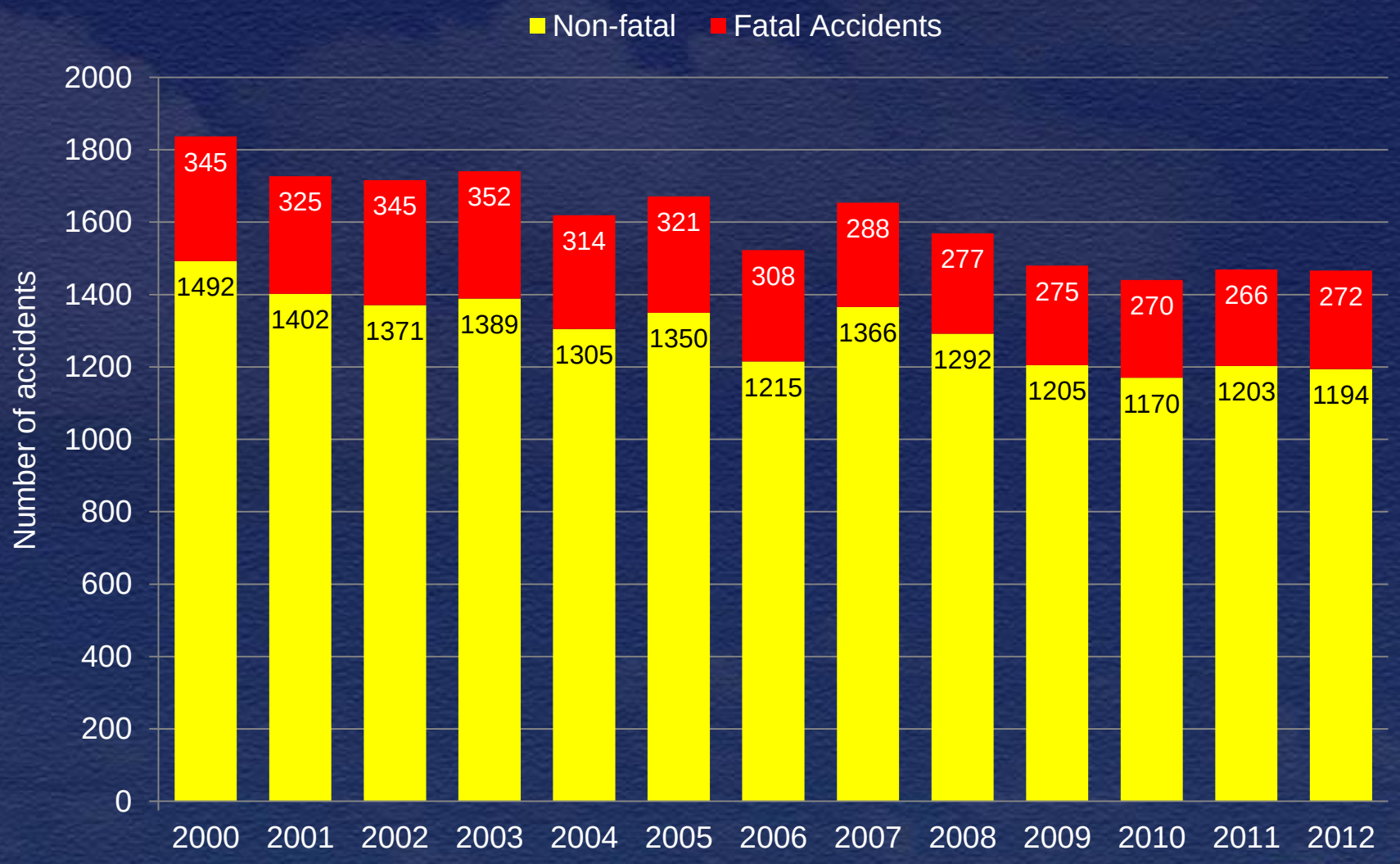
NTSB Mission

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.

Topics

- General Aviation Accident Trends
- Most Wanted List
- GA Community Activities - JSC
- NTSB Safety Alerts

All GA Accidents



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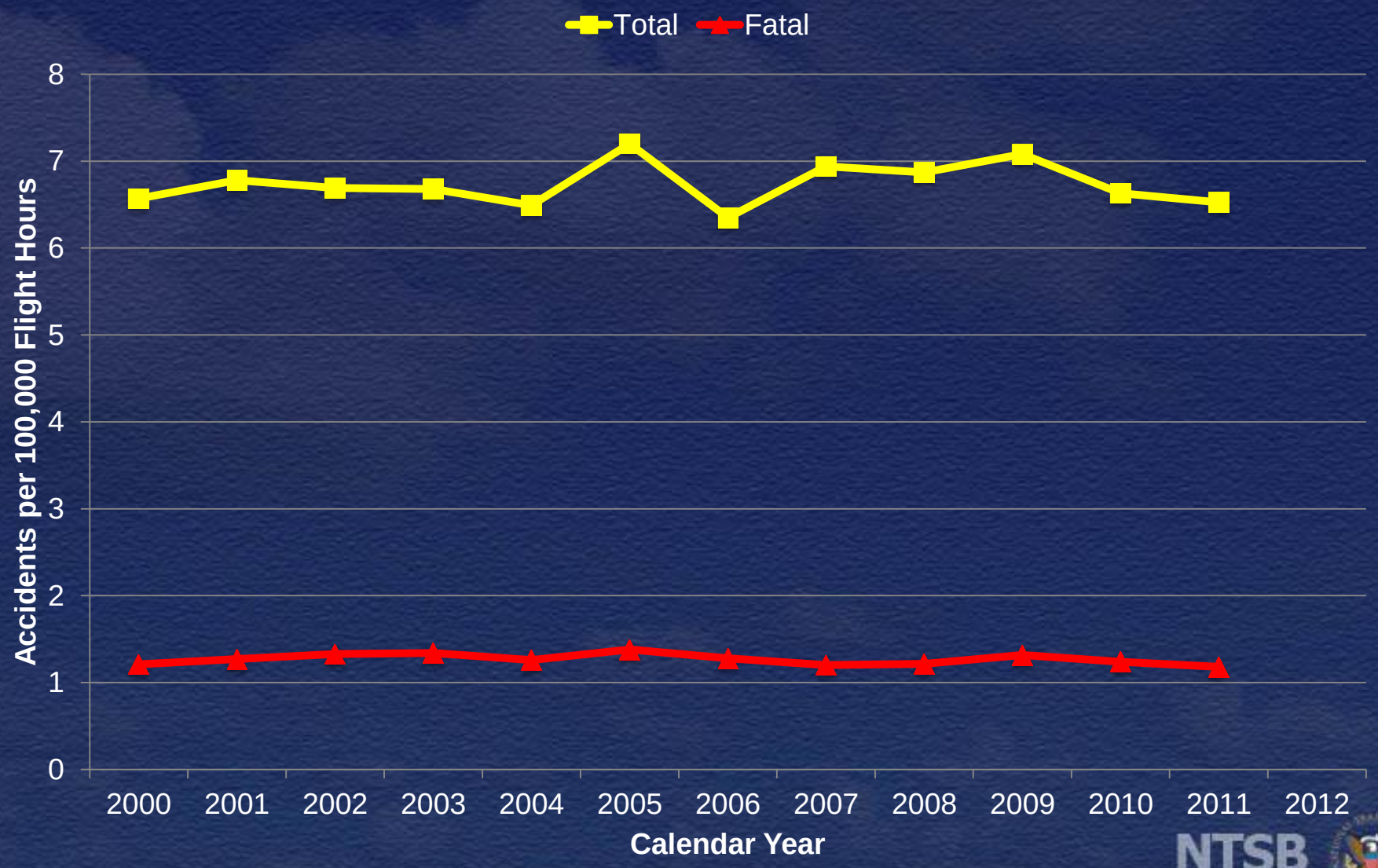
GA Accident-involved Fatalities

GA Accident Rates



Defining Fatal Accident Events All Part 91 GA 2008-2012

- Loss of Control in Flight
- System/Component Failure – Powerplant
- Controlled Flight into Terrain
- Collision with Terrain/Object (non-CFIT)
- VFR Encounter with IMC
- System/Component Failure – Non-Powerplant

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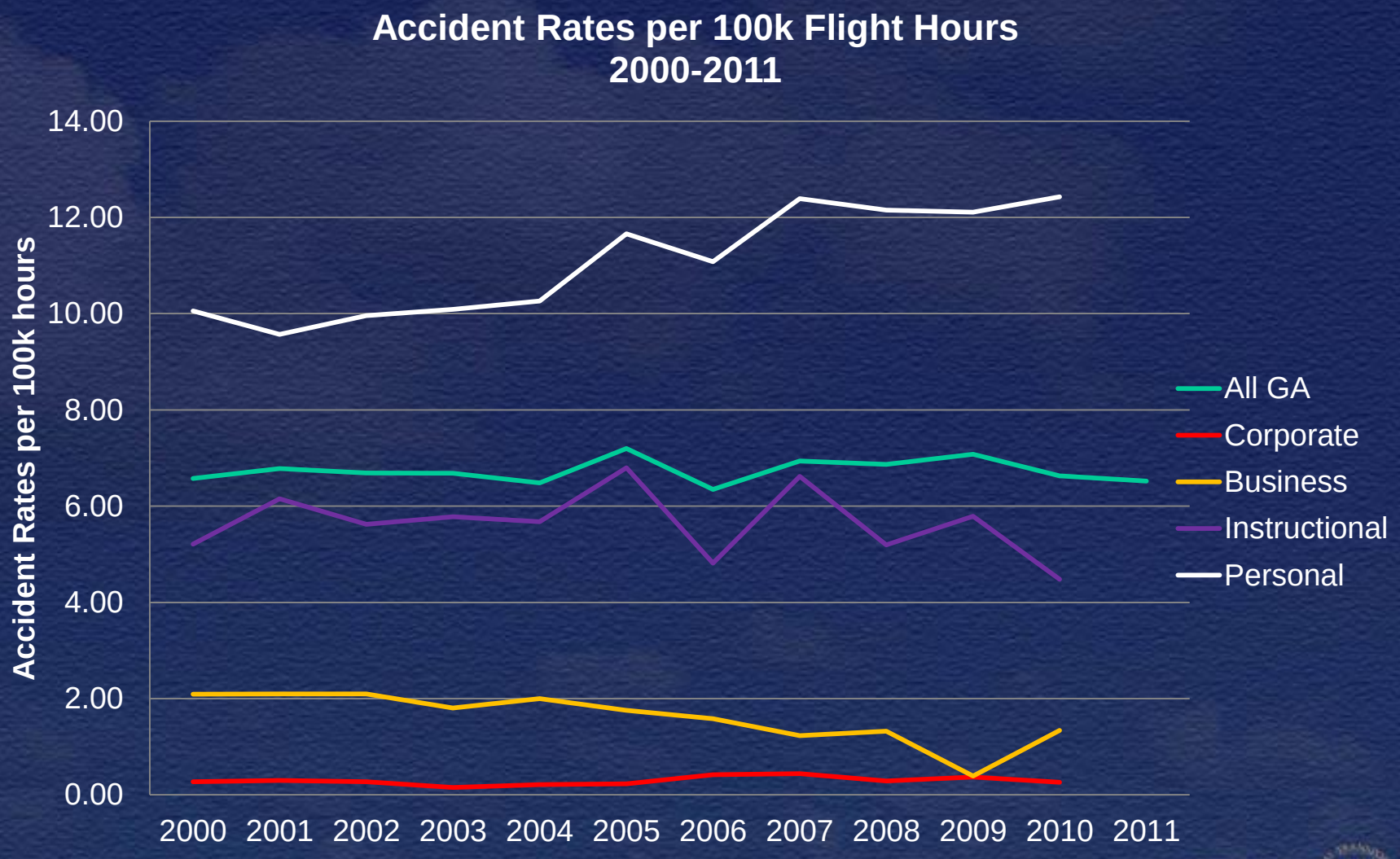
Accident Rates per 100k Flight Hours



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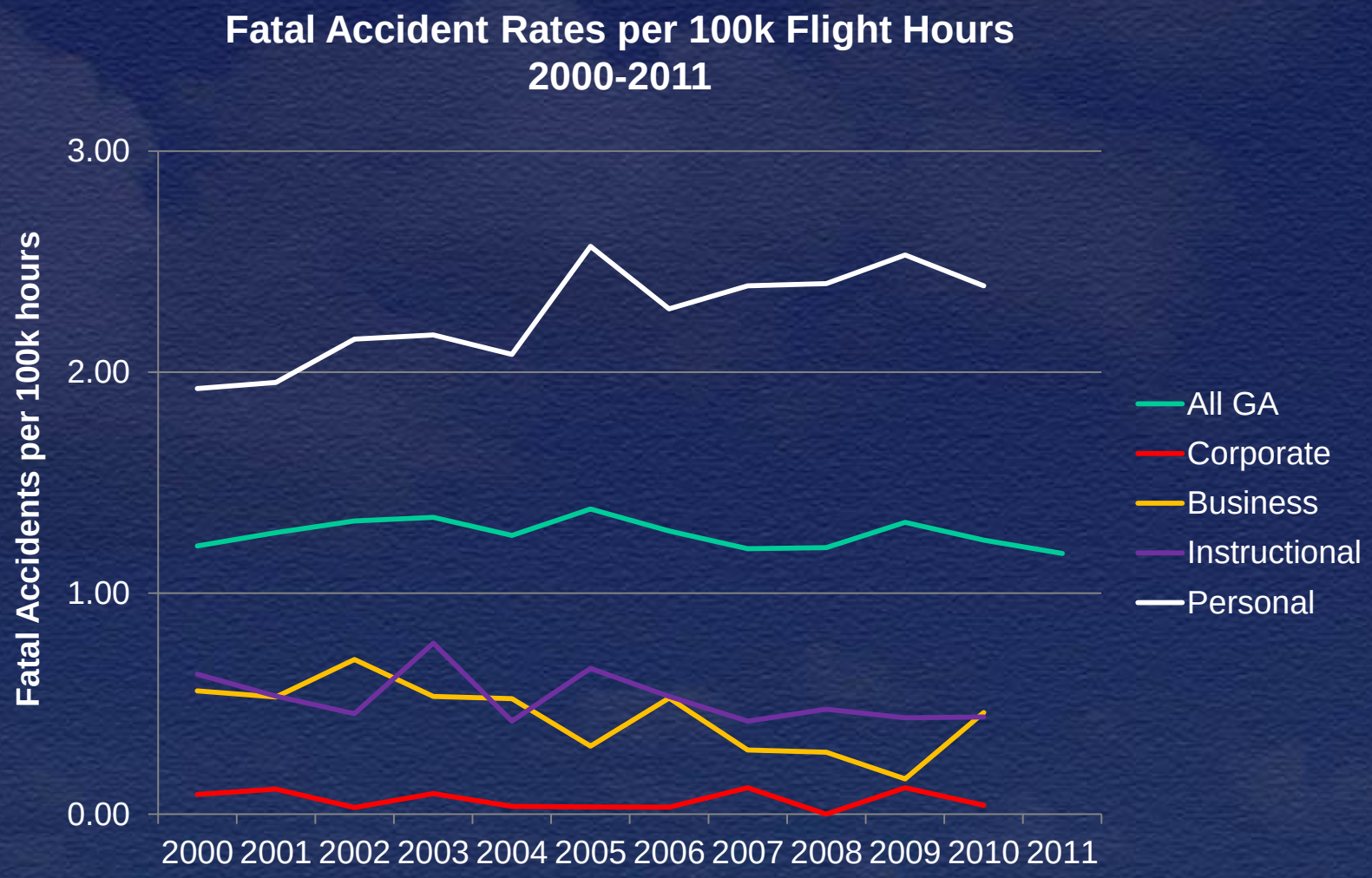
Fatal Accident Rates per 100k Flight Hours



Topics

- General Aviation Accident Trends
- Most Wanted List
- GA Community Activities - JSC
- NTSB Safety Alerts

NTSB Most Wanted List

- General Aviation: Identify and Communicate Hazardous Weather
- Address Unique Characteristics of Helicopter Operations
- Advance Passenger Vessel Safety
- Eliminate Distraction in Transportation
- Eliminate Substance-Impaired Driving
- Enhance Pipeline Safety
- Improve Fire Safety in Transportation
- Implement Positive Train Control Systems
- Promote Operational Safety in Rail Mass Transit
- Strengthen Occupant Protection in Transportation

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Why GA on the Most Wanted List?

- NTSB investigates approximately 1500 GA accidents per year
- Overall GA accident rate flat
  - Has not improved over the last decade
  - Airline accident rate decreased more than 80%
- Personal flying accident rate
  - Increased 20% over last 10 years
  - Fatal rate increased 25% over that period

- ***GA safety needs attention***

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GA – 2014 Most Wanted List Item

Identify and communicate hazardous weather

- Focus areas
  - Creation of weather information and advisories
  - Collection and dissemination of weather information
  - Pilot training and operations

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Why focus on weather?

- Weather continues to play a major role in accidents and incidents
- Most accidents and incidents in weather are preventable

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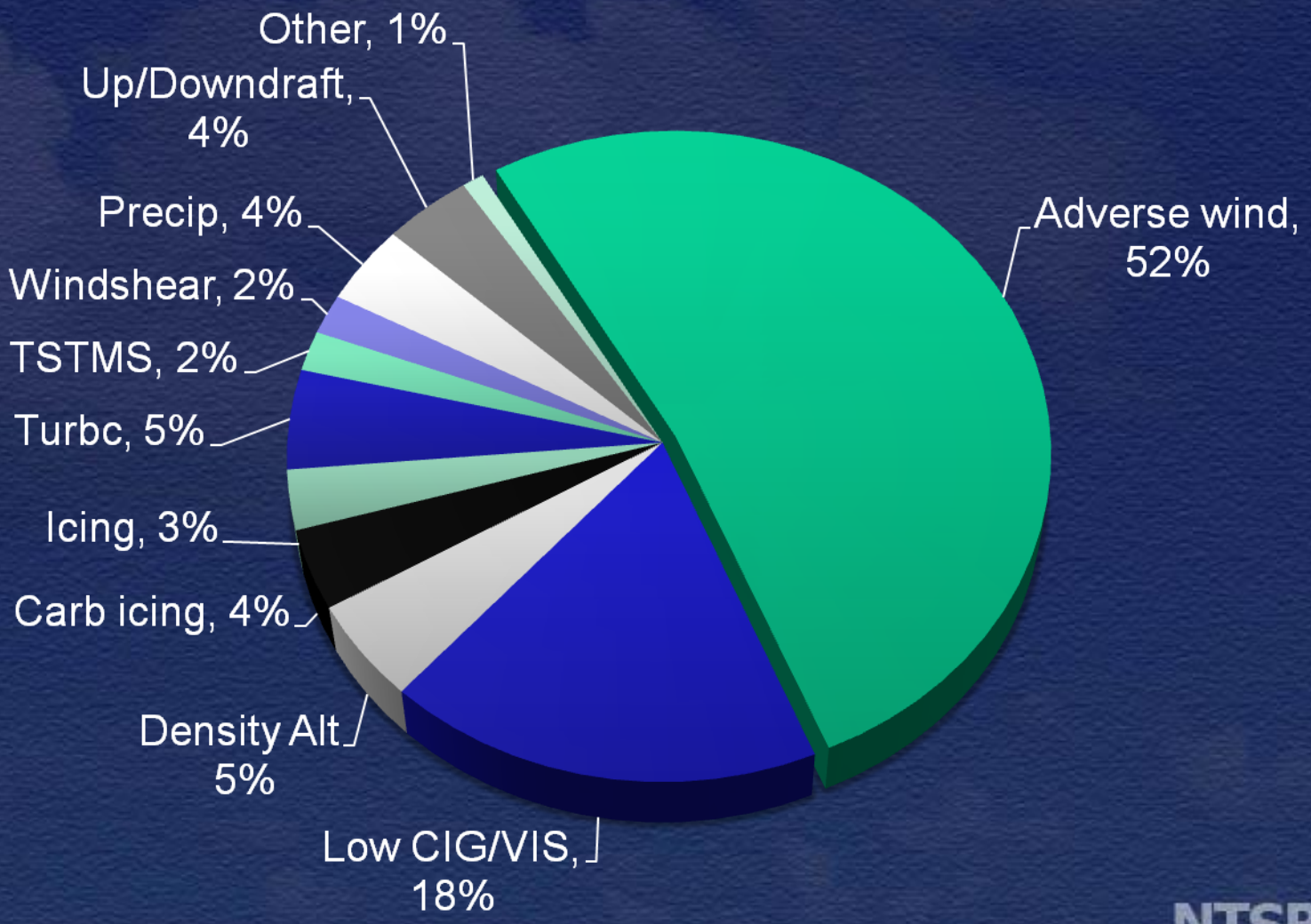
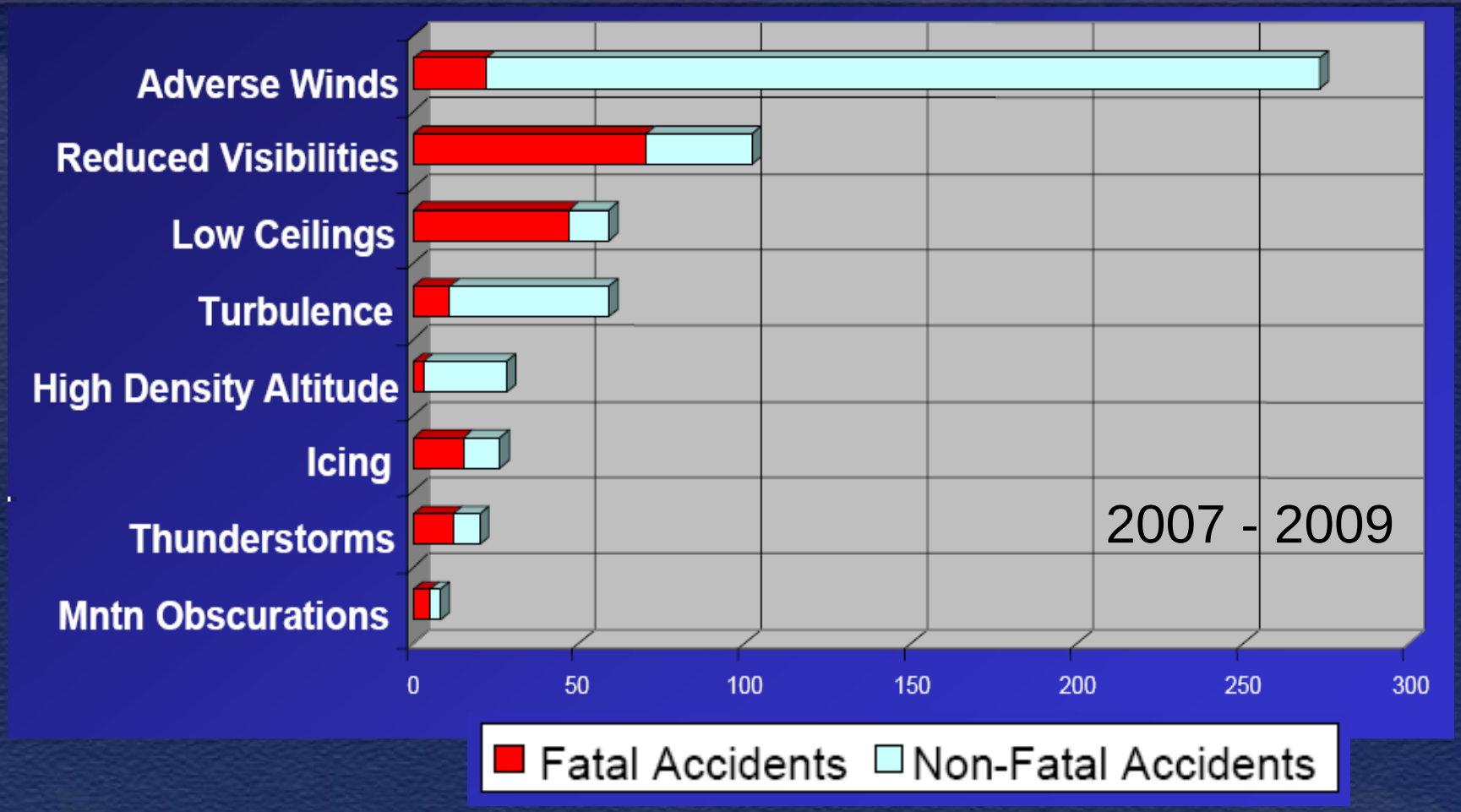
Part 91 Weather Related Accidents 2007-2009



Weather Related Accidents



Weather related accident categories can have high fatality rates!

Areas of Concern

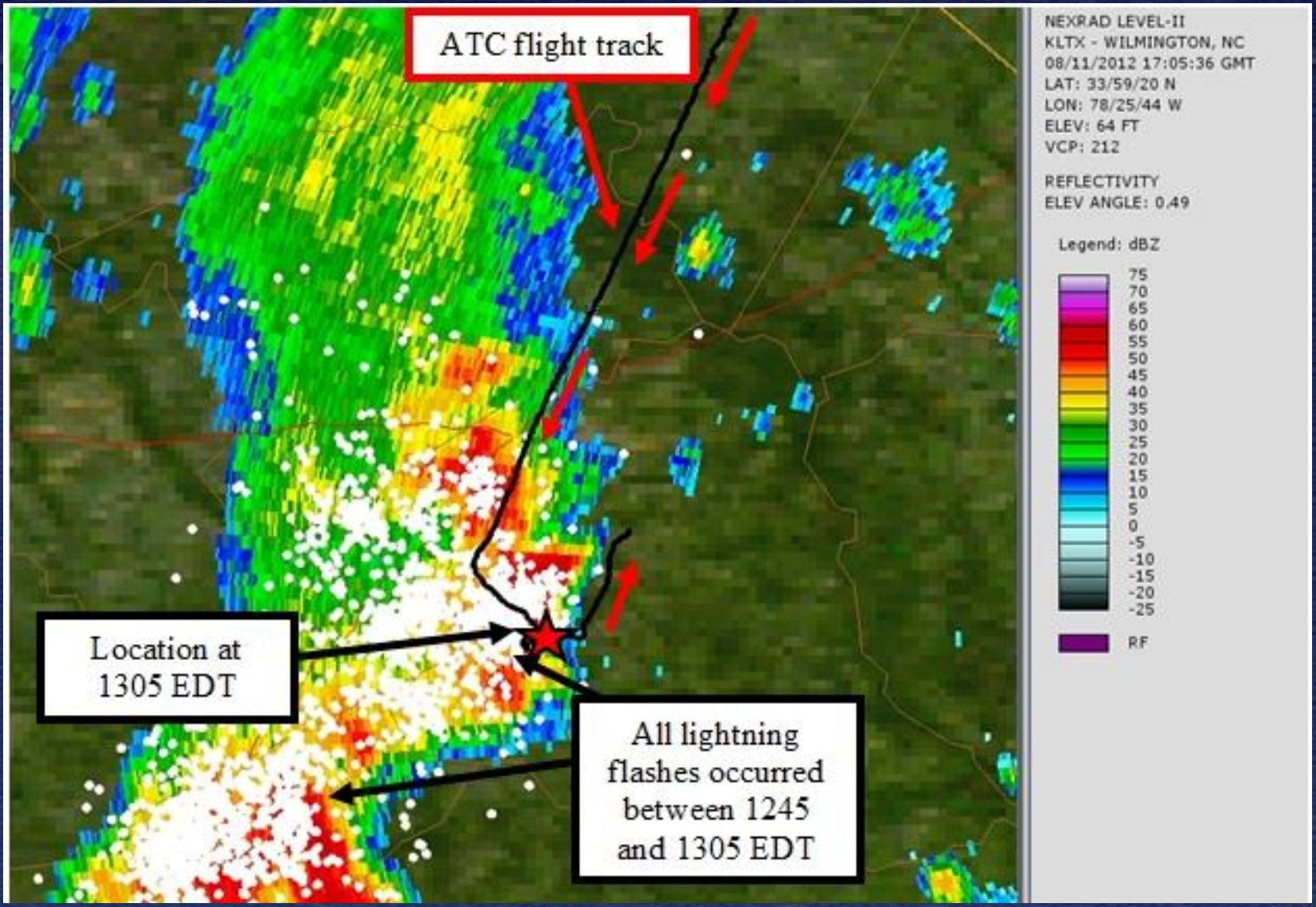
- The overall ATC/pilot/met culture
- Wx training for ATC and pilots
- NWS consistency in aviation information/products
- PIREPs

ERA12LA500

Beech V35B, N11JK
Effingham, SC
August 11, 2012

- IFR flight
- Weather briefing obtained/ flight plan filed
- Non-fatal

KFLO 111730Z 22008G25KT 1 3/4SM +RA BR FEW033 BKN049 22/20 A2997 RMK AO2 PK WND 26033/1714 RAB14 P0008=


ATC flight track
Location at 1305 EDT
All lightning flashes occurred between 1245 and 1305 EDT
NEXRAD LEVEL-II
KLTX - WILMINGTON, NC
08/11/2012 17:05:36 GMT
LAT: 33/59/20 N
LON: 78/25/44 W
ELEV: 64 FT
VCP: 212
REFLECTIVITY
ELEV ANGLE: 0.49
Legend: dBZ
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
RF

Effingham
Timmonsville
Florence
Darlington
Witherspoon Island
Byrds Island
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Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google earth

Elliott
Lee
Timmonsville
Effingham
Florence
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Image Landsat
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Timmonsville
Darlington
Florence
Effingham
Coward
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CEN12FA108
Piper PA-32-260, N3590T
Near Bryan, TX
December 19, 2011

- IFR flight
- Weather briefing – unknown
- Five fatalities

Main Wreckage, Forward View

CEN12FA108

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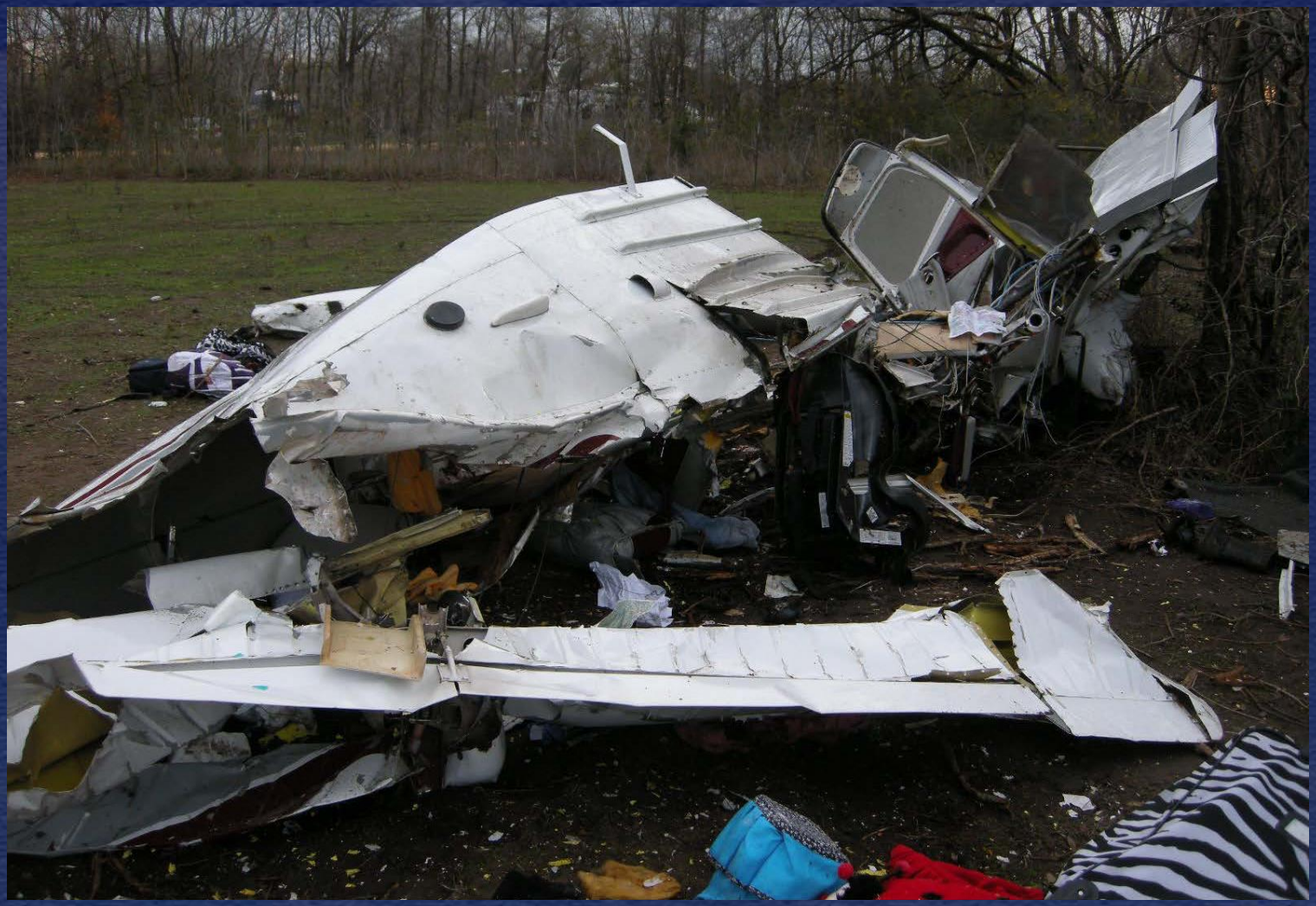
Main Wreckage, Left Side View

CEN12FA108

Main Wreckage, Right Side View



CEN12FA108

Left Wing

CEN12FA108

Bryan Texas Accident (CEN12FA108)

- History of Flight
  - December 11, 2011
  - Cross country flight with four passengers
    - Jackson, MS to Waco, TX
  - Level cruise at 8,000 ft.
  - Pilot informed ATC he was diverting around an area of thunderstorms
  - Last reported he was in “bad” weather and was going to try to get out of it.
  - Radio and radar contact lost
  - Pilot and four passenger fatalities

Bryan Texas Accident (cont)

- Wreckage
  - Main wreckage consisted of airplane except for
    - Left wing, vertical stabilizer, rudder, and right wing tip fuel tank
    - Wreckage spread over path a half mile long and 200 ft. wide
  - Left wing spar showed wing failed in positive overload

Bryan Texas Accident (Cont)

- Aircraft
  - Piper PA-32-260 (Cherokee Six)
    - 6,125 hrs. on airframe
  - Postcrash examination
    - no preimpact anomalies of engine or systems
- Pilot
  - Private, SEL, Instrument rating
  - Total time 392 hrs.
  - 14 hrs. actual instruments

Bryan Texas Accident (Cont)

- Weather conditions SIGMET
  - Potential for
    - heavy rain showers,
    - thunderstorms,
    - wind in excess of 45 knots,
    - clear air turbulence,
    - low-level wind shear
  - Pilot relying on Garmin 696 with XM weather – NEXRAD mosaic

Bryan Texas Accident (Cont)

- NEXRAD data likely showed pilot clear of precipitation
- Near end of flight, flew into rapidly developing rain shower
- Last three updates were at least 6, 7, and 8 minutes old when displayed

Pilot's On-Board Weather Image

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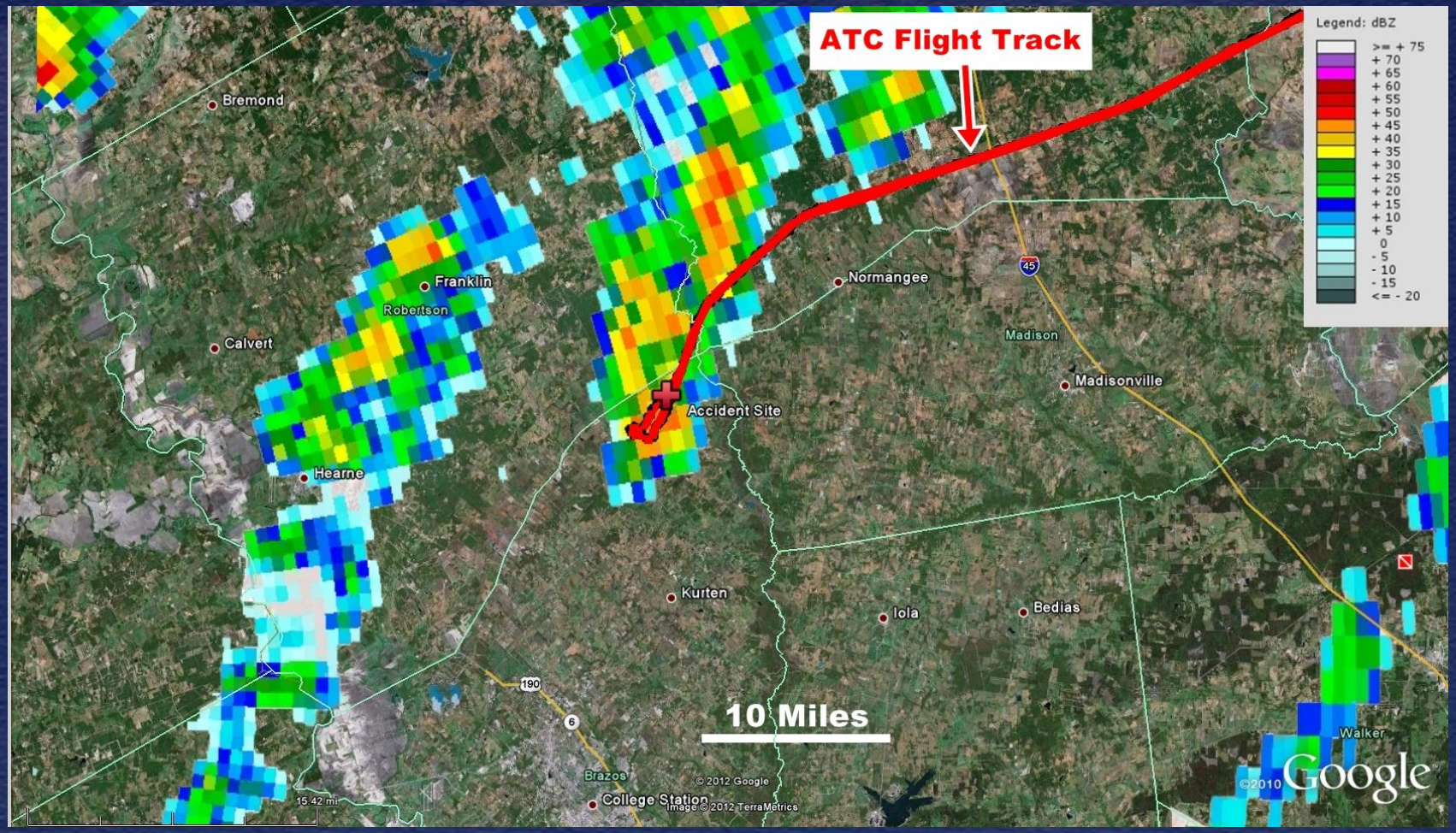
Actual Flight Path



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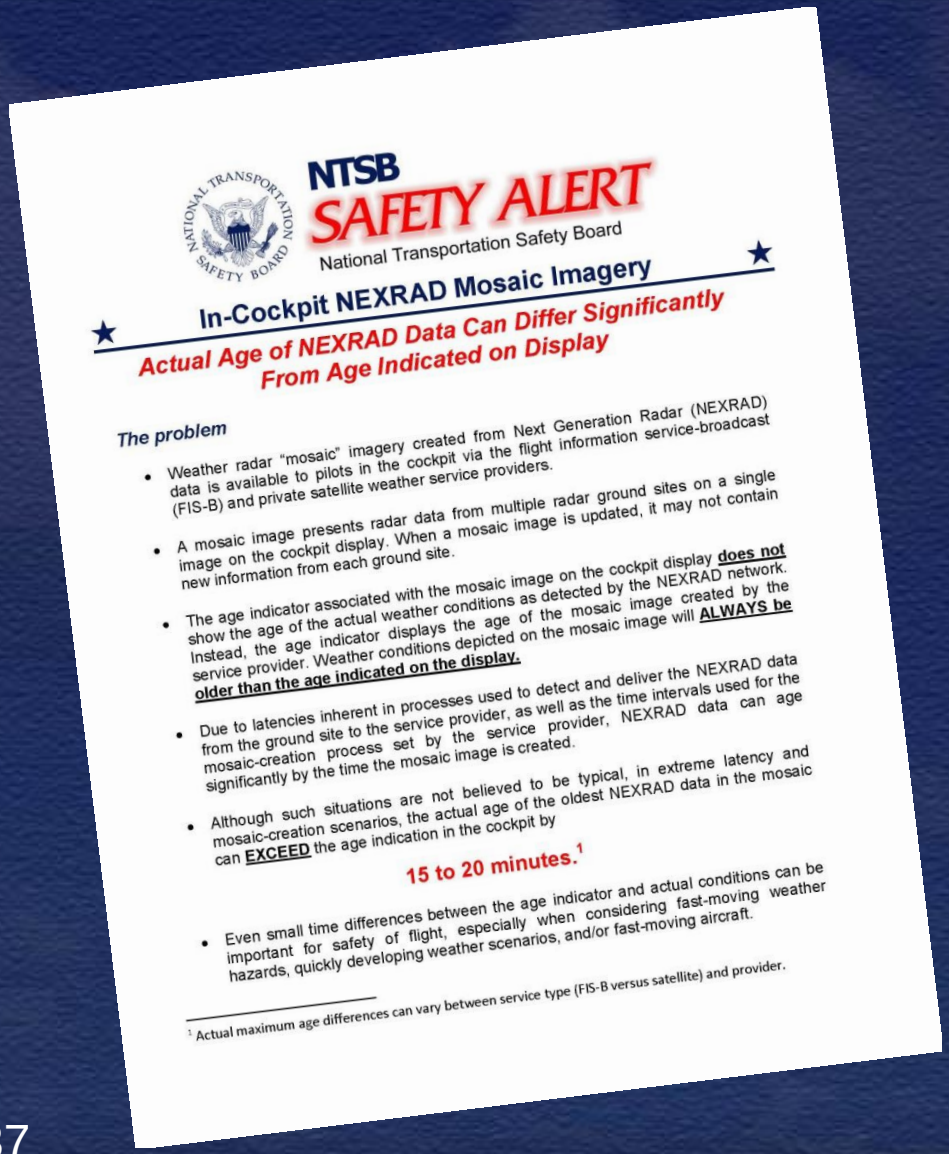
Bryan Texas Accident (Cont)

- NEXRAD displayed age indicator - time of mosaic image compilation/creation
- Not all components of mosaic are updated
- Oldest data can exceed age indication by 15 to 20 minutes in extreme cases

NEXRAD mosaic shows where weather <u>WAS</u>, not where it <u>IS</u>

SA - In-Cockpit NEXRAD Imagery



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In-Cockpit NEXRAD Mosaic Imagery

Actual Age of NEXRAD Data Can Differ Significantly From Age Indicated on Display

The problem

- Weather radar "mosaic" imagery created from Next Generation Radar (NEXRAD) data is available to pilots in the cockpit via the flight information service-broadcast (FIS-B) and private satellite weather service providers.
- A mosaic image presents radar data from multiple radar ground sites on a single image on the cockpit display. When a mosaic image is updated, it may not contain new information from each ground site.
- The age indicator associated with the mosaic image on the cockpit display **does not** show the age of the actual weather conditions as detected by the NEXRAD network. Instead, the age indicator displays the age of the mosaic image created by the service provider. Weather conditions depicted on the mosaic image will **ALWAYS be older than the age indicated on the display.**
- Due to latencies inherent in processes used to detect and deliver the NEXRAD data from the ground site to the service provider, as well as the time intervals used for the mosaic-creation process set by the service provider, NEXRAD data can age significantly by the time the mosaic image is created.
- Although such situations are not believed to be typical, in extreme latency and mosaic-creation scenarios, the actual age of the oldest NEXRAD data in the mosaic can **EXCEED** the age indication in the cockpit by

15 to 20 minutes.[1]

- Even small time differences between the age indicator and actual conditions can be important for safety of flight, especially when considering fast-moving weather hazards, quickly developing weather scenarios, and/or fast-moving aircraft.

[1] Actual maximum age differences can vary between service type (FIS-B versus satellite) and provider.

"…the actual age of the oldest NEXRAD data in the mosaic can EXCEED the age indication in the cockpit by 15 to 20 minutes."

Available on www.ntsb.gov

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Pilot Reports - PIREPS

- PIREPs are a critical source of aviation weather information
- PIREPs allow ATC and meteorologists to keep all pilots aware of weather hazards
- **ALL** PIREPs (including *"null"* and *"light"* reports) are operationally significant to an aviation meteorologist !
- PIREPs can communicate better flying conditions, help reduce AIRMET size, and prevent weather advisories from "crying wolf"
- PIREPs can help warn pilots of conditions that may be worse than forecasted

PIREPs assist with…

- AIRMETs
- SIGMETs
- CWAs
- TAFs
- Area Forecasts
- Computer models (turbulence forecasts, icing forecasts, etc…)
- Products developed by meteorologists and provided to ATC
- EVERYONE's situation awareness of weather

NTSB interests

- *Hazardous Weather Identification and Communication in General Aviation* – NTSB Most Wanted List item
- NTSB recognizes importance of improving the PIREP "system" in NAS

  Pilots – increase volume of PIREPs and ensure reporting is accurate and detailed

  FAA – major changes to the way PIREPs are handled, ensuring more timely and accurate weather related information is received by the pilot

  NWS – consistent weighting of reports by meteorologists, so the best products are delivered to the flying community
- NTSB formally working with AOPA, FAA and NWS

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What should pilots do?

- Understand that YOUR reports provide the BEST situational information on aviation weather for other pilots, ATC, and meteorologists
- Give detailed PIREP's, especially when reporting hazardous weather conditions, to ATC or Flight Watch
- Report weather that <u>does</u> vary greatly from what is forecast
- Report weather that <u>does not</u> vary greatly from what is forecast
- Provide routine reports even if it's severe clear and no turbulence

What should pilots do?

- To ensure your report gets to those who need it, begin communication with “I want to make a PIREP”
- Report icing and turbulence encounters in accordance with FAA criteria:
  - Icing (sections 7-1-21 and 7-1-22 in AIM)
  - Turbulence (section 7-1-23 in AIM)

AOPA PIREP resource:

http://flash.aopa.org/asf/skyspotter/swf/flash.cfm

Summary

- Identifying and Communicating Hazardous Weather - Most Wanted List
- Multi-year/on going effort
- Most weather related accidents and incidents are preventable

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Topics

- General Aviation Accident Trends
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- GA Community Activities - JSC
- NTSB Safety Alerts

GA Joint Steering Committee

Adapt the successful CAST model

- Cooperative Government and Industry
- Data driven risk management
- Consensus decision-making
- Voluntary commitment
- Implementation focused

The GAJSC is a means to…

- *Focus limited Government/Industry resources to data-driven risks and solutions*

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GA JSC Organization

- Steering Committee
  - Co-chaired by FAA and AOPA
- Safety Analysis Team
  - Co-chaired by FAA and GAMA
- Working Group(s)
  - Composed of subject matter experts as appropriate and relevant to topic

GA JSC Participants

- Government
  - FAA, NASA, NTSB, NWS
- Industry/Operational Community
  - GAMA, EAA, NBAA, NATA, AOPA, SAFE, NAFI, FSF, UAA, Pegasus, SAMA, Insurance, Academia…

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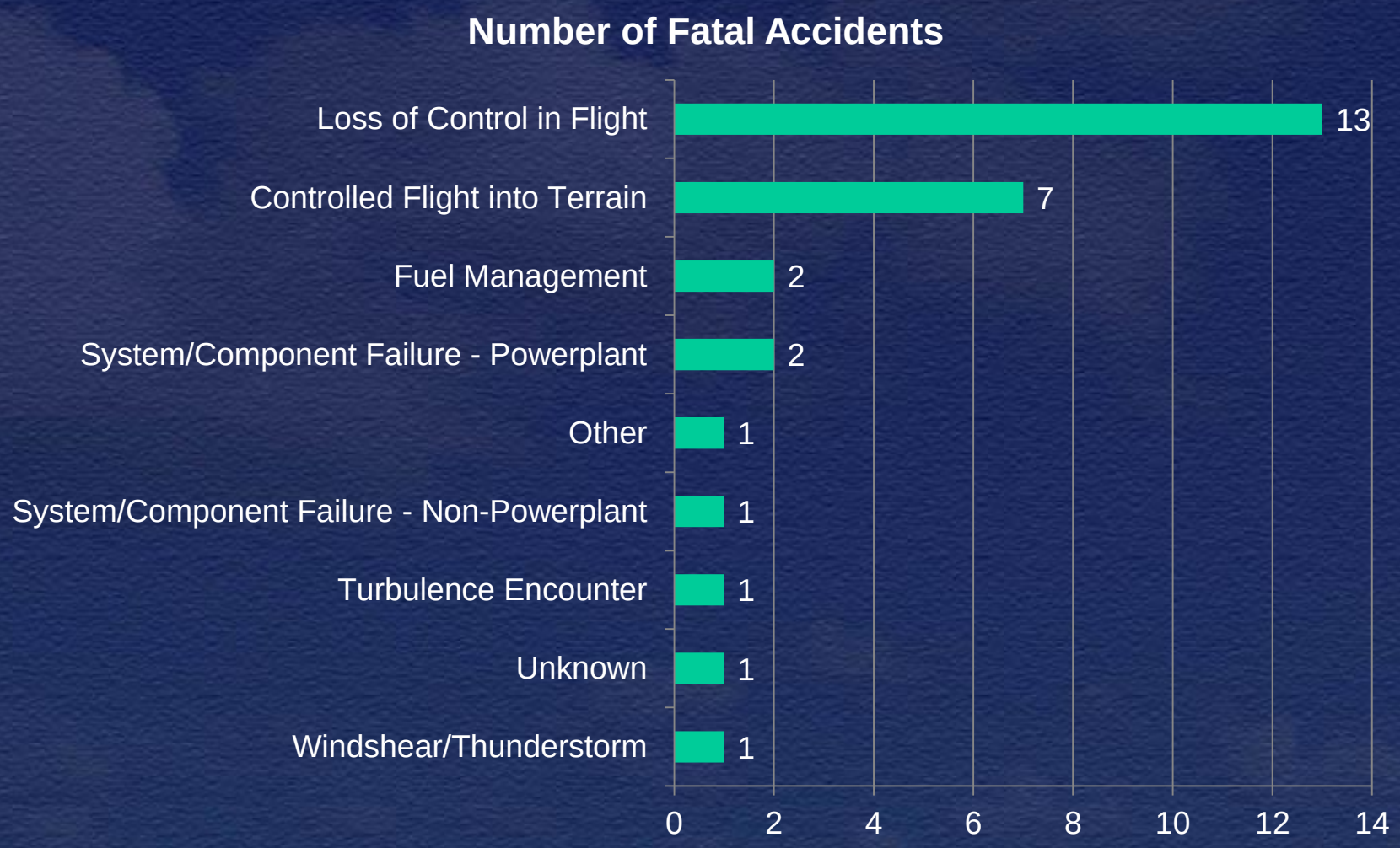
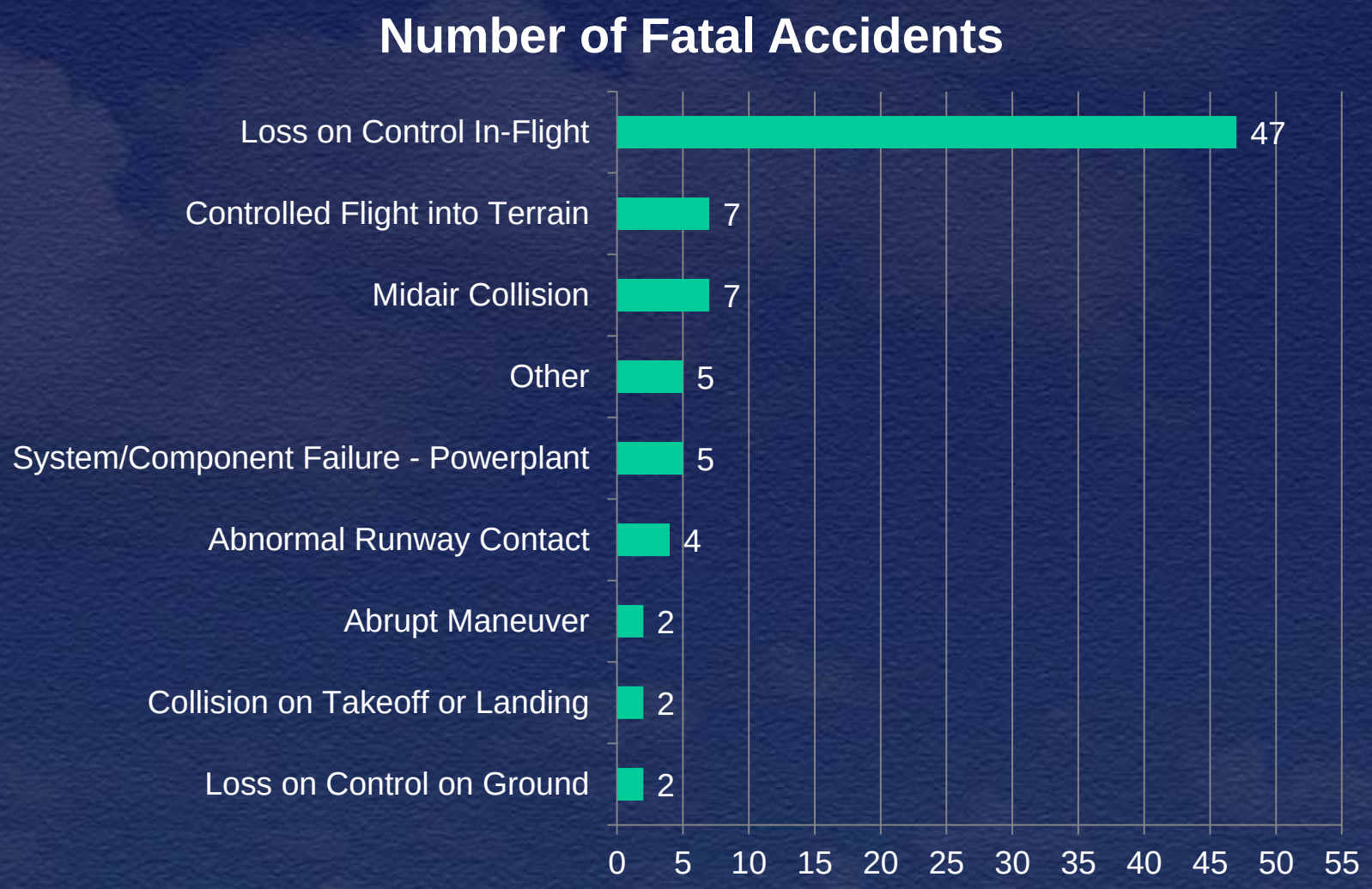
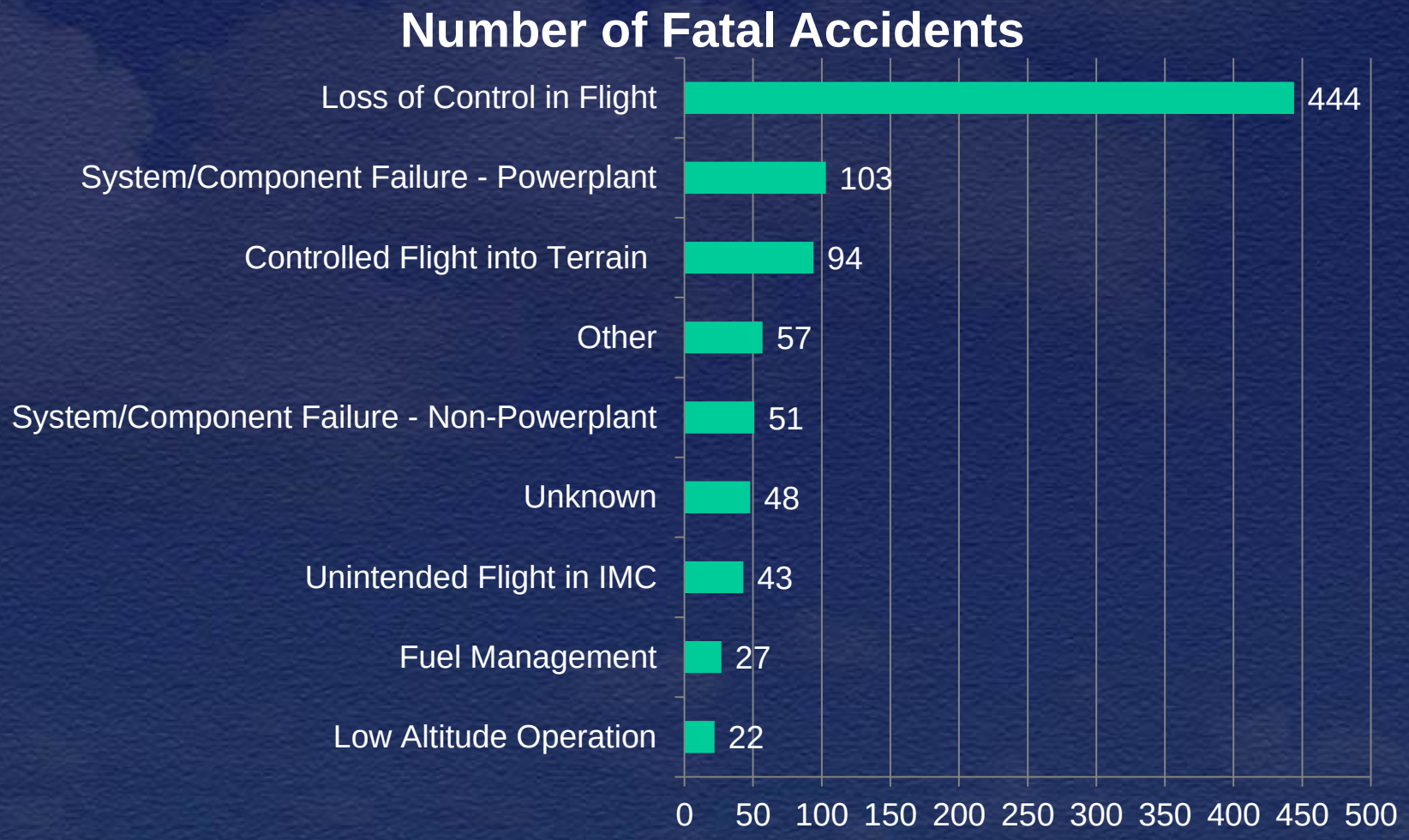
Business Flying, 2008-2012



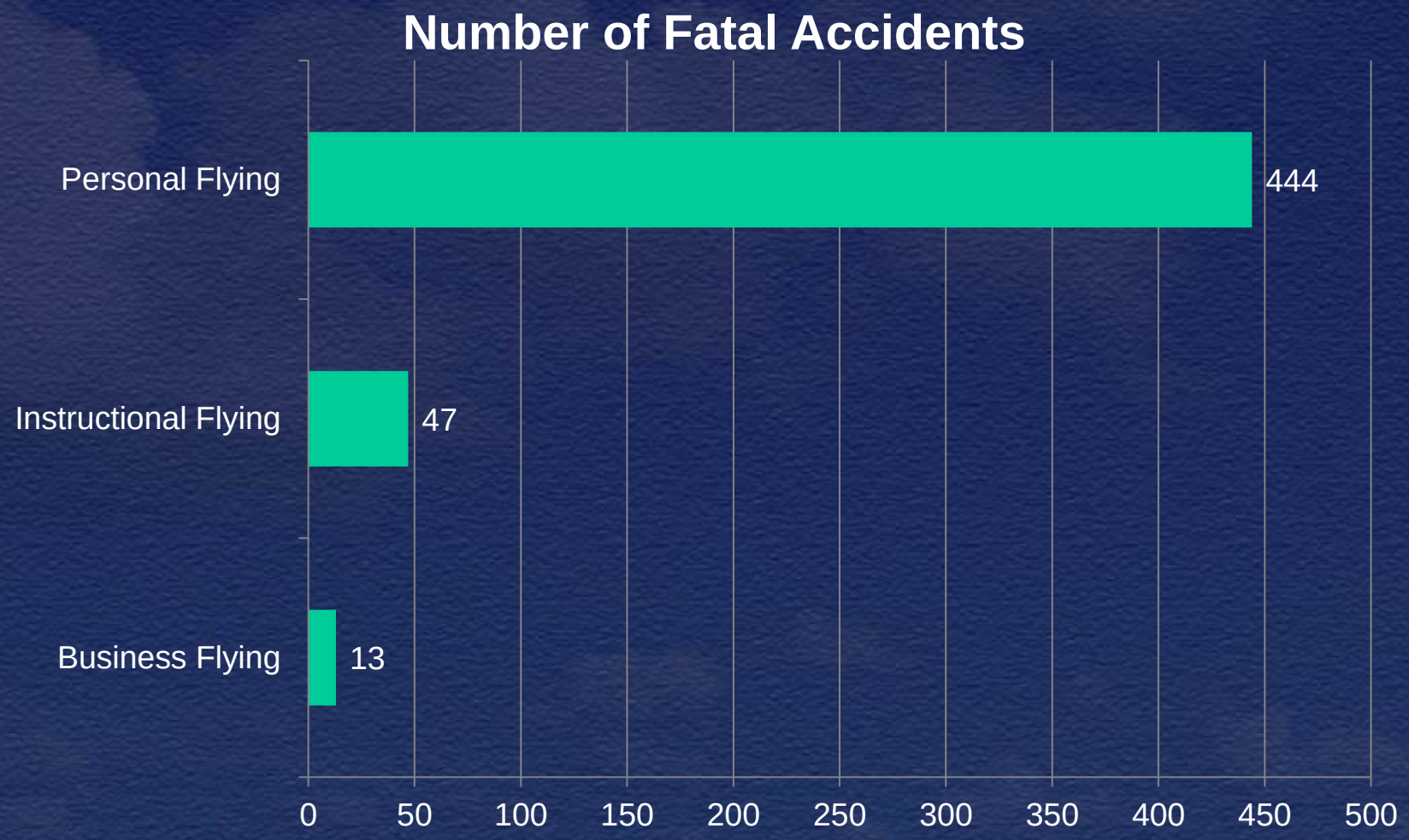
Instructional Flying, 2008-2012



Personal Flying, 2008-2012



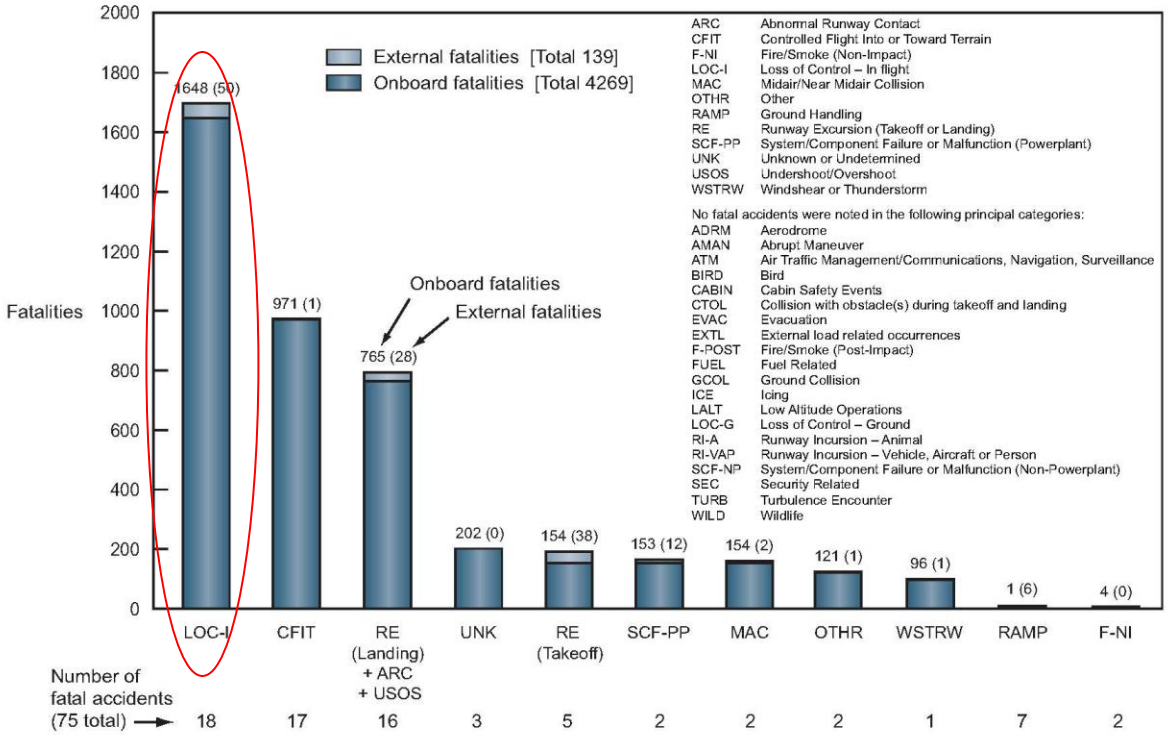
Loss-of-Control 2008-2012



Boeing Annual Statistical Summery

Fatalities by CAST/ICAO Common Taxonomy Team (CICTT) Aviation Occurrence Categories

Fatal Accidents – Worldwide Commercial Jet Fleet – 2003 Through 2012



ARC	Abnormal Runway Contact
CFIT	Controlled Flight Into or Toward Terrain
F-NI	Fire/Smoke (Non-Impact)
LOC-I	Loss of Control – In flight
MAC	Midair/Near Midair Collision
OTHR	Other
RAMP	Ground Handling
RE	Runway Excursion (Takeoff or Landing)
SCF-PP	System/Component Failure or Malfunction (Powerplant)
UNK	Unknown or Undetermined
USOS	Undershoot/Overshoot
WSTRW	Windshear or Thunderstorm

No fatal accidents were noted in the following principal categories:

ADRM	Aerodrome
AMAN	Abrupt Maneuver
ATM	Air Traffic Management/Communications, Navigation, Surveillance
BIRD	Bird
CABIN	Cabin Safety Events
CTOL	Collision with obstacle(s) during takeoff and landing
EVAC	Evacuation
EXTL	External load related occurrences
F-POST	Fire/Smoke (Post-Impact)
FUEL	Fuel Related
GCOL	Ground Collision
ICE	Icing
LALT	Low Altitude Operations
LOC-G	Loss of Control – Ground
RI-A	Runway Incursion – Animal
RI-VAP	Runway Incursion – Vehicle, Aircraft or Person
SCF-NP	System/Component Failure or Malfunction (Non-Powerplant)
SEC	Security Related
TURB	Turbulence Encounter
WILD	Wildlife

Note: Principal categories as assigned by CAST.

For a complete description of CICTT Aviation Occurrence Categories, go to: http://www.intlaviationstandards.org/

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Primary category of accidents

- Personal flying – LOC
- Instructional flying – LOC
- Business flying – LOC
- Airline flying – LOC

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DFW08FA237

- **Cessna 320D, N4165T**
- **Airmans Acres, OK93**
- **Collinsville, OK**
- **Sunday, Sept 28th, 2008**

- VFR
- Part 91
- Maintenance test flight
- Two fatalities

DFW08FA237 – FWD Right Side

Photo

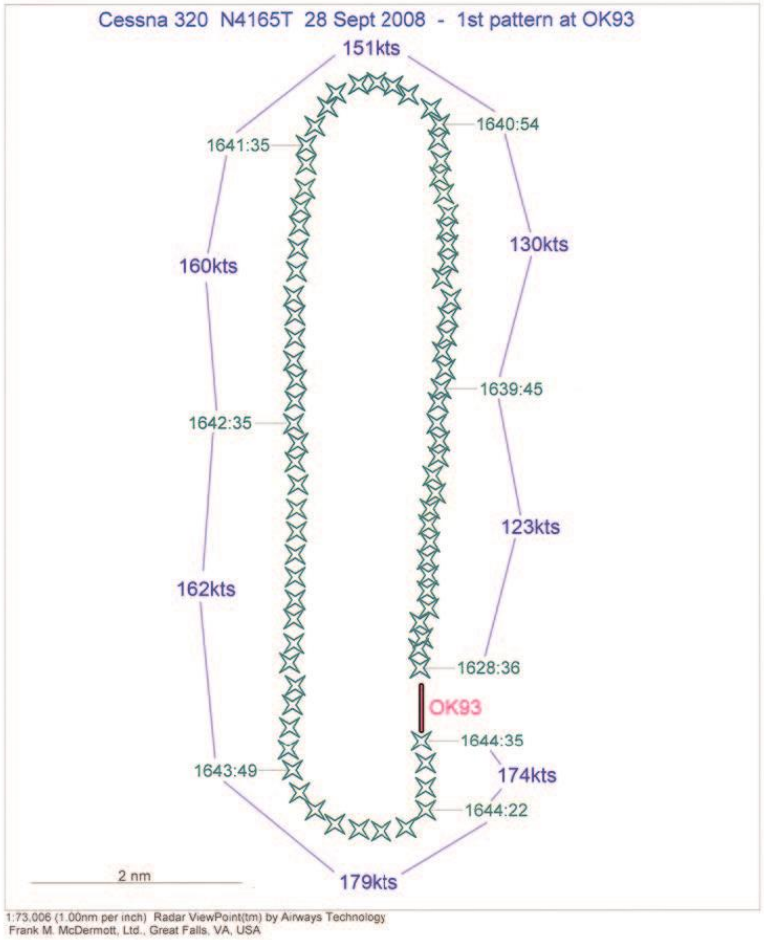
DFW08FA237 – Left Side

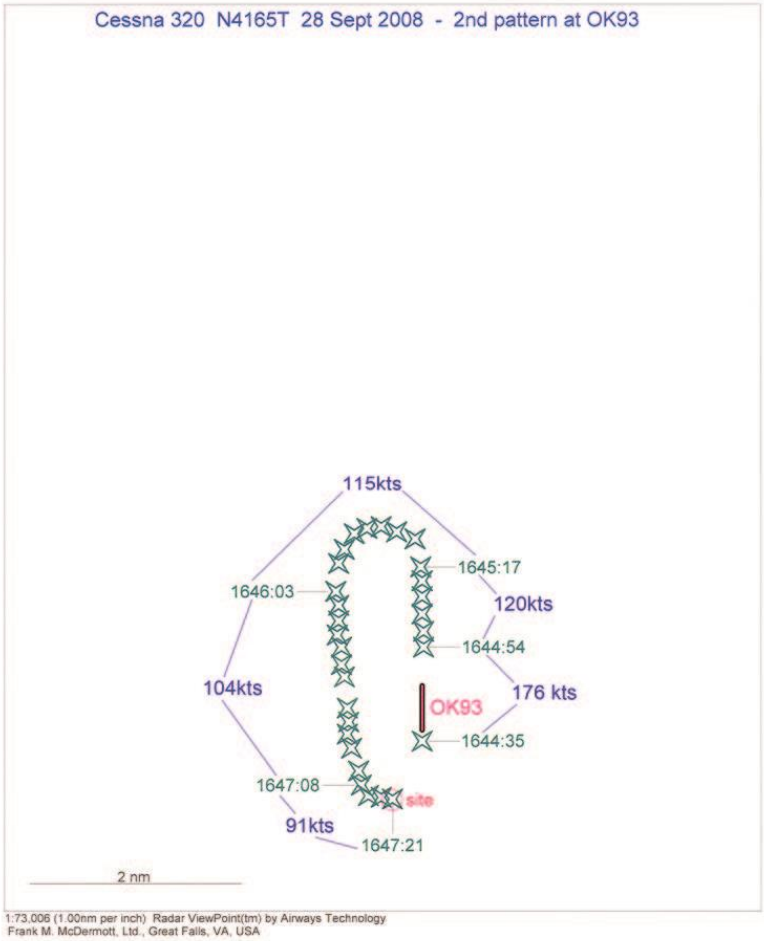
DFW08FA237 – FWD Left Side

DFW08FA237

- Aircraft
  - Cessna 320D
  - First flight after a four year restoration
  - No pre-impact anomalies detected
- Pilot/Owner
  - Private pilot license
  - SEL, MEL, A&P, current medical
  - 215 hours total time
- Pilot/CFI
  - Commercial pilot license
  - SEL, MEL, Instruments, CFI, current medical
  - 2000 hours total time

DFW08FA237 – Radar Tracks





DFW08FA237

Witness – A&P credentials

- High speed taxi test
- Mag check & prop cycle
- Normal takeoff
- Elongated pattern & normal approach
- Go around
- Second approach with gear extended
- Turn to base leg
- Witness looked away momentarily
- Saw airplane “heading almost straight down”

DFW08FA237

- CFI/Commercial Pilot
  - History of hip pain & PTSD
    - Toxicology findings
      - Nortriptyline – prescription antidepressant & pain control
      - Trazodone – prescription antidepressant & insomnia treatment
      - Fluoxetin – prescription antidpressant treatment for PTSD symptoms
    - Possible distraction by hip pain
    - Possible impairment by nortriptyline

NTSB

DFW08FA237

- Private pilot – owner
  - Allergy symptoms
    - Toxicology findings
      - Diphenhydramine – OTC antihistamine
        - Commonly results in drowsiness
        - Measurable effects on performance of complex cognitive and motor tasks
    - Likely impairment by diphenhydramine

Neither pilot indicated conditions or use of detected medication on last Airman Medical application

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DFW08FA237

- Probable Cause
  - The crews' failure to maintain adequate airspeed, which resulted in an aerodynamic stall close to the ground

ERA11FA233

- Cessna 402B, N402RC
- Biddeford Municipal, B19
- Biddeford, ME
- April 10, 2011

- VFR
- Part 91
- Repositioning flight
- One fatality

ERA11FA233

ERA11FA233

ERA11FA233

- Aircraft
  - Cessna 402B, N402RC
  - Manufactured 1977
  - August 2010 Annual
    - 6624 hrs TT,
    - Engines 359 hrs since overhaul
- Pilot
  - ATP, MEL, CFII
  - 4700+ hrs civilian flight time

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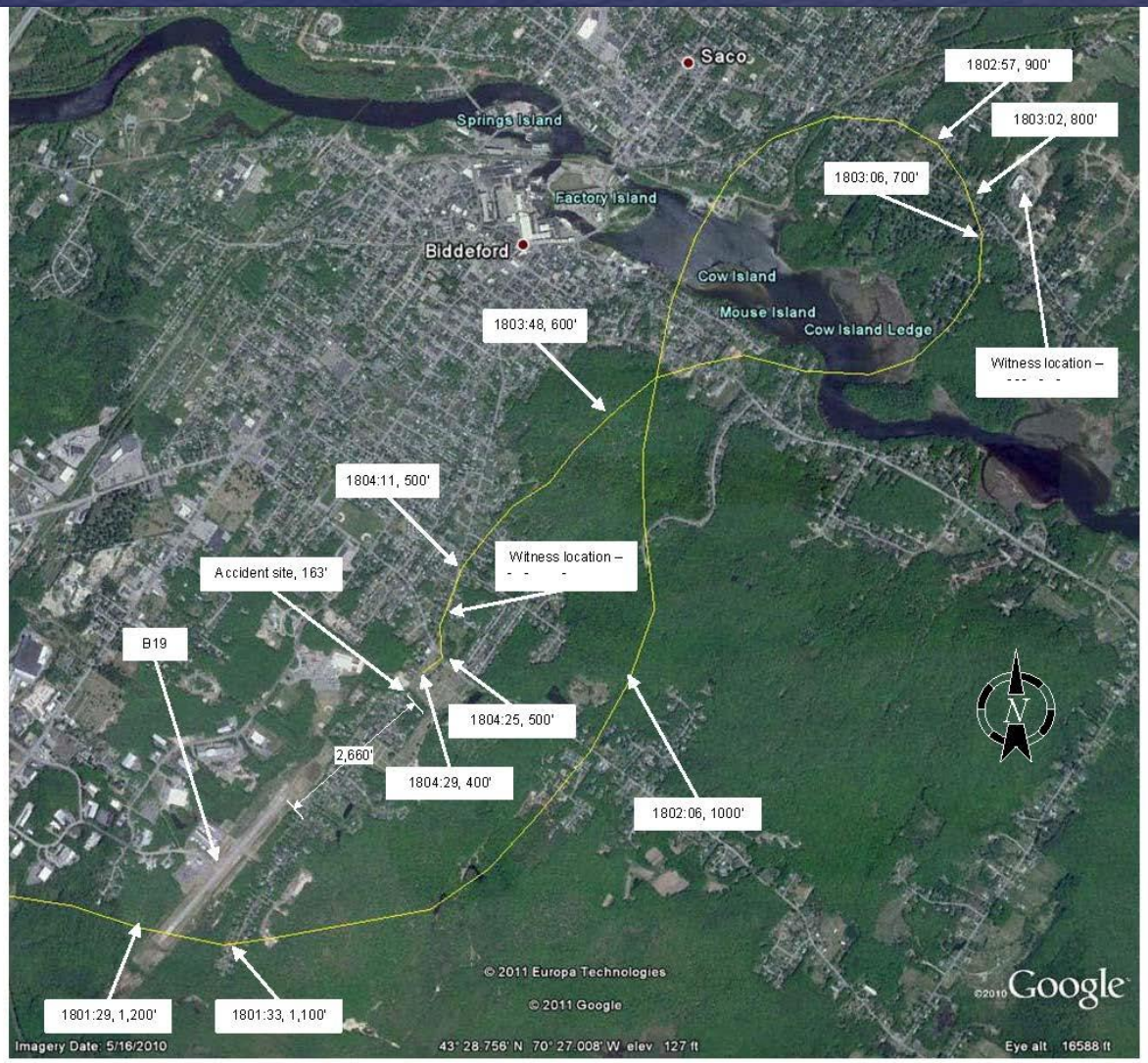
ERA11FA233

- History of flight
  - Repositioning flight West Chester Co., KHPN to Portland, KPWM
  - Changed destination to Biddeford, B19
  - Flew left downwind RW24 two miles past approach end
  - Made approximately 250 degree right turn followed by shallow left turn toward final
  - Last radar data: 400 ft alt, 69 kts

ERA11FA233


Saco
Springs Island
Factory Island
Biddeford
Cow Island
Mouse Island
Cow Island Ledge
1802:57, 900'
1803:02, 800'
1803:06, 700'
1803:48, 600'
Witness location –
1804:11, 500'
Witness location –
Accident site, 163'
B19
1804:25, 500'
2,660'
1804:29, 400'
1802:06, 1000'
1801:29, 1,200'
1801:33, 1,100'
© 2011 Europa Technologies
© 2011 Google
©2010 Google
Imagery Date: 5/16/2010
43° 28.756' N 70° 27.008' W elev 127 ft
Eye alt 16588 ft

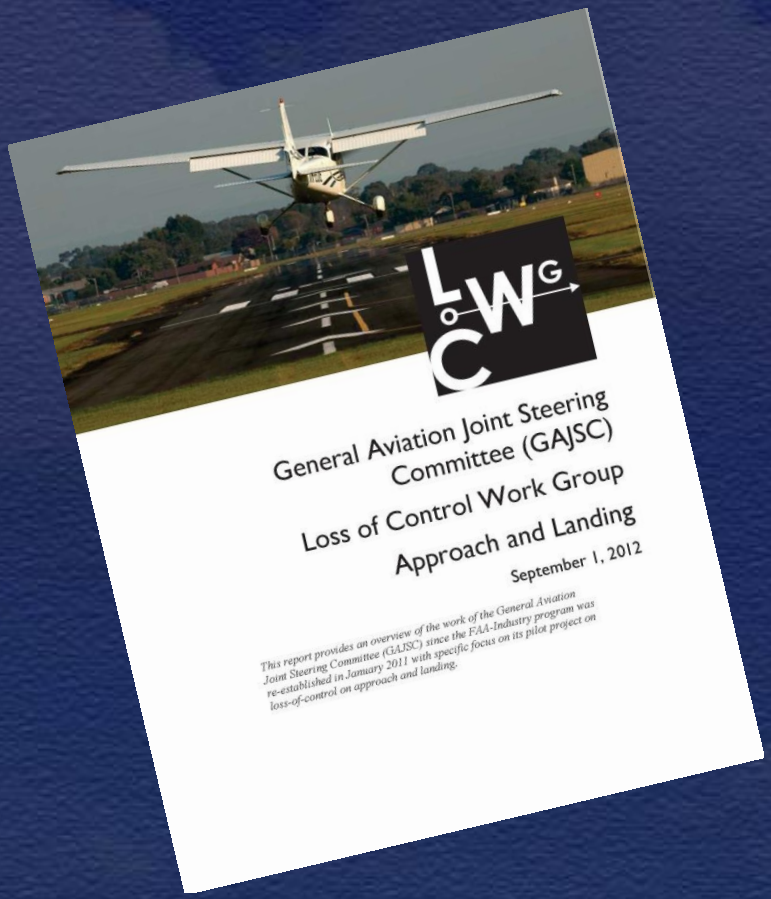
ERA11FA233

- Wreckage
  - Aircraft consumed by post impact fire
  - All components found in immediate area
  - Right engine examination showed partial loss of power after 20 minutes run
  - Examination of throttle and control assembly showed damaged o-rings
  - New o-rings installed, unit reassembled, reinstalled resulting in successful test run

ERA11FA233

- Probable Cause
  - The pilot did not maintain minimum controllable airspeed while on final approach with a partial loss of power in the right engine, which resulted in a loss of control.
  - Contributing to the accident was the partial loss of engine power in the right engine due to the improperly installed o-rings in the engine's throttle and control assembly.

Loss-of-control Working Group



Safety Enhancements Identified

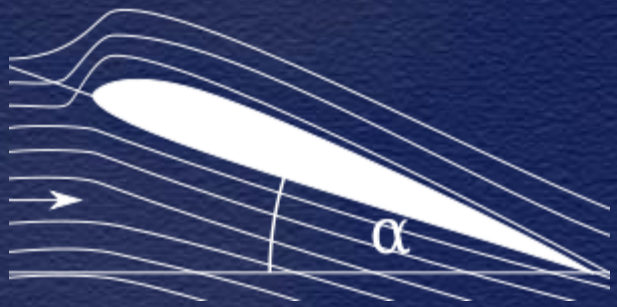
- AOA – New, Current, Retrofit
- Aeronautical Decision Making
- Stabilized Approach
- Single Pilot CRM
- Medication effects
- Weather Technologies
- Etc…

28 Safety Enhancements

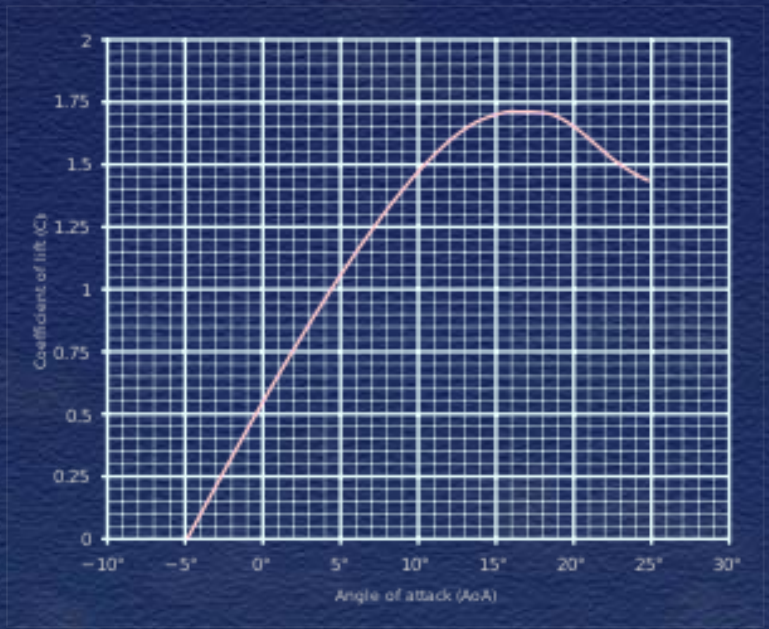
NTSB

Lower Cost AOA Displays

- Stall occurs at a specific Angle-of-Attack
  - But not always at the same airspeed



First of AOA indicators built to ASTM stds and installed as a minor mod



FAA installation policy changed

Stall Recovery

- Reduce the angle-of-attack below maximum lift coefficient
  - Push over to eliminate stall warning
- Level wings
- Adjust throttle
  - Avoid overspeed and high G levels
- Pitch back to level
- Don’t try to “Power out of a stall”

FDM Benefits to the GA Community

- **Flight replay capability** of flights brought into the program
- **Comparison of self with the greater GA community**
- **Identification of potential risks** discovered in their own flight data
- ***Systemic Improvements in GA safety***

NTSB

Topics

- General Aviation Accident Trends
- Most Wanted List
- GA Community Activities - JSC
- NTSB Safety Alerts

NTSB Safety Alerts

- Preventing Aerodynamic Stalls
- Reduced Visual References
- Is Your Aircraft Talking to You
- Risk Management for Pilots
- Risk Management for Mechanics

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SAFETY ALERT
National Transportation Safety Board

Preventing Rote Callouts

Confirm Cockpit Indications Before Making Callouts

The problem

- Recent National Transportation Safety Board investigations have identified several instances in which pilots made callouts without first verifying the cockpit indication that corresponded with the callout.
- In these cases, the pilots acted out of habit and made callouts based on what they expected to see regarding the cockpit indication but did not take the time to verify it.
- Examples of accident investigations include the following:
  - A Boeing 757 overran the end of the runway while landing in Jackson Hole, Wyoming. The captain called out "deployed" even though the speedbrakes were not deployed and "two in reverse" even though neither reverser was fully deployed. Both the speedbrakes and the thrust reversers had mechanical defects, and the captain did not manually deploy the speedbrakes when they failed to deploy automatically because, based on his rote callout, he did not recognize that they did not deploy.[1]
  - A Hawker 800 crashed after a late go-around attempt in Owatonna, Minnesota. After touchdown, the copilot called out "we're dumped," but the flaps were not all the way in the lift dump position and the airplane did not slow down as expected, leading the pilot to attempt to go around.[2]

[1] Runway Overrun, American Airlines Flight 2253, Boeing 757-200, N668AA, Jackson Hole, Wyoming, December 29, 2010, Aircraft Accident Report NTSB/AAR-12/01 (Washington, DC: National Transportation Safety Board, 2012).
[2] Crash During Attempted Go-Around After Landing, East Coast Jets Flight 81, Hawker Beechcraft Corporation 125-800A, N818MV, Owatonna, Minnesota, July 31, 2008, Aircraft Accident Report NTSB/AAR-11/01 (Washington, DC: National Transportation Safety Board, 2011).

Available on www.NTSB.gov

Safety Alert Video Preview

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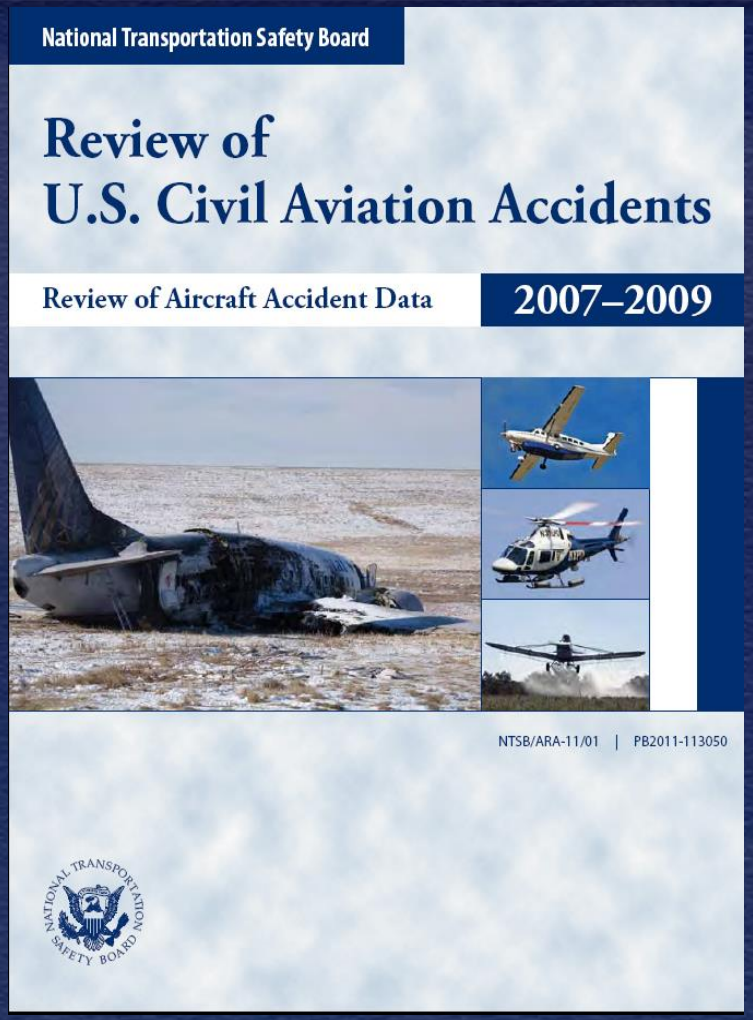
Accident Investigations



- NTSB accident files are on-line
- Many recent accident Dockets are on-line
  - Factual reports,
  - Interviews
  - Photographs
- www.ntsb.gov

http://www.ntsb.gov/doclib/reports/2011/ARA1101.pdf

Alfred Sheinwold

"Learn all you can from the mistakes of others. You won't have time to make them all yourself"

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Douglas Adams

"Human beings, who are almost unique in having ability to learn from the experience of others, are also remarkable for their apparent disinclination to do so."

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