Friends and Partners in Aviation Weather
July 21, 2014

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Member, NTSB
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

Number of accidents

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<tr>
<th>Year</th>
<th>Non-Fatal</th>
<th>Fatal Accidents</th>
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<tr>
<td>2013</td>
<td>1492</td>
<td>221</td>
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</table>
GA Accident-involved Fatalities

The graph shows the total number of fatalities from GA accidents from 2000 to 2013. The fatalities peaked in 2006 and have been decreasing since then.
GA Accident Rates

*The 2011 GA Survey is currently not available. FAA is actively engaged in re-calibration efforts and expect to have validated 2011 data published at a later date.
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Fatal Accident Rates per 100k Flight Hours

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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
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
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**
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
Why focus on weather?

• Weather continues to play a major role in accidents and incidents

• Most accidents and incidents in weather are preventable

- Adverse wind, 52%
- Low CIG/VIS, 18%
- Density Alt, 5%
- Carb icing, 4%
- Icing, 3%
- TSTMS, 2%
- Windshear, 2%
- Precip, 4%
- Up/Downdraft, 4%
- Other, 1%
Weather related accident categories can have high fatality rates!

2007 - 2009
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=
Location at 1305 EDT

All lightning flashes occurred between 1245 and 1305 EDT
CEN12FA108
Piper PA-32-260, N3590T
Near Bryan, TX
December 19, 2011

- IFR flight
- Weather briefing – unknown
- Five fatalities
Main Wreckage, Forward View
Main Wreckage, Left Side View
Main Wreckage, Right Side View
Left Wing

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 (CEN12FA108)
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
• 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
Actual Flight Path

ATC Flight Track

Legend: dBZ
- 20 - 10 - 5 0 + 5 + 10 + 15 + 20 + 25 + 30 + 35 + 40 + 45 + 50 + 55 + 60 + 65 + 70 + 75

10 Miles

Google

NTSB
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 WAS, not where it IS**
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 the lengths 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.

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

Available on www.ntsb.gov

“...the actual age of the oldest NEXRAD data in the mosaic can EXCEED the age indication in the cockpit by 15 to 20 minutes.”
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
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 **does** vary greatly from what is forecast.
- Report weather that **does not** 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
Topics

- General Aviation Accident Trends
- Most Wanted List
- GA Community Activities - JSC
- NTSB Safety Alerts
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*
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…
# Business Flying, 2008-2013

## Number of Fatal Accidents

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Accidents</th>
</tr>
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<tbody>
<tr>
<td>Loss of Control In-Flight</td>
<td>18</td>
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<tr>
<td>Controlled Flight Into Terrain</td>
<td>9</td>
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<tr>
<td>Fuel Related</td>
<td>3</td>
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<tr>
<td>System/Component Failure - Non-powerplant</td>
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<tr>
<td>System/Component Failure - Powerplant</td>
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<td>Unknown</td>
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<td>Other</td>
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<td>Turbulence Encounter</td>
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<td>Windshear/Thunderstorm</td>
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# Instructional Flying, 2008-2013

## Number of Fatal Accidents

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<th>Category</th>
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<td>System/Component Failure - Powerplant</td>
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<td>Abnormal Runway Contact</td>
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<tr>
<td>Low Altitude Operation</td>
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<td>Abrupt Maneuver</td>
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<tr>
<td>Collision on Takeoff or Landing</td>
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<tr>
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<tr>
<td>Loss of Control on Ground</td>
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<tr>
<td>Unintended Flight Into IMC</td>
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<tr>
<td>Unknown</td>
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Personal Flying, 2008-2013

Number of Fatal Accidents

- Loss of Control In-Flight: 521
- System/Component Failure - Powerplant: 120
- Controlled Flight Into Terrain: 102
- Other: 58
- System/Component Failure - Non-Powerplant: 55
- Unintended Flight Into IMC: 49
- Unknown: 47
- Fuel Related: 31
- Low Altitude Operation: 30
- Midair: 22
- Collision on Takeoff or Landing: 16
- Abrupt Maneuver: 15
- Abnormal Runway Contact: 14
- Loss of Control on Ground: 10
Loss of Control In-Flight, 2008-2013

Number of Fatal Accidents

- Personal Flying: 521
- Instructional Flying: 59
- Business Flying: 18
### Fatalities by CAST/ICAO Common Taxonomy Team (CICTT) Aviation Occurrence Categories


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<thead>
<tr>
<th>Category</th>
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<tr>
<td>External fatalities</td>
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<tr>
<td>Onboard fatalities</td>
<td>971</td>
<td>4269</td>
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#### Note:
Principal categories as assigned by CAST.

For a complete description of CICTT Aviation Occurrence Categories, go to: [http://www.intlaviationstandards.org/](http://www.intlaviationstandards.org/)
Primary category of accidents

- Personal flying
- Instructional flying
- Business flying
- Airline flying
Safety Enhancements Identified

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

28 Safety Enhancements
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”
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

Available on www.NTSB.gov
Accident Investigations

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

“Learn all you can from the mistakes of others. You won’t have time to make them all yourself”
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.”