Recap of the NTSB PIREP Forum: Optimizing Safety Benefits for Pilots, ATC, and Meteorologists

Paul Suffern
NTSB Meteorologist
Wx Accident Trend
### TABLE 1
Pilots’ Usage of 15 Aviation Weather Products for Three Different Types of Flight

<table>
<thead>
<tr>
<th>Product</th>
<th>VFR Local</th>
<th></th>
<th>VFR Cross-Country</th>
<th></th>
<th>IFR</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Usually or Always</td>
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<td>Usually or Always</td>
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<td>Usually or Always</td>
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<tr>
<td></td>
<td>Self</td>
<td>All</td>
<td></td>
<td>Self</td>
<td>All</td>
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<tr>
<td>METAR</td>
<td>72%</td>
<td>78%</td>
<td></td>
<td>87%</td>
<td>82%</td>
<td></td>
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<tr>
<td>RADAR</td>
<td>72%</td>
<td>70%</td>
<td></td>
<td>81%</td>
<td>81%</td>
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<tr>
<td>TAF</td>
<td>70%</td>
<td>71%</td>
<td></td>
<td>72%</td>
<td>80%</td>
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<tr>
<td>Surf and chart</td>
<td>45%</td>
<td>41%</td>
<td></td>
<td>72%</td>
<td>77%</td>
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</tr>
<tr>
<td>Satellite</td>
<td>43%</td>
<td>45%</td>
<td></td>
<td>68%</td>
<td>61%</td>
<td></td>
</tr>
<tr>
<td>PIREP</td>
<td>43%</td>
<td>38%</td>
<td></td>
<td>55%</td>
<td>60%</td>
<td></td>
</tr>
<tr>
<td>Winds aloft</td>
<td>43%</td>
<td>45%</td>
<td></td>
<td>53%</td>
<td>46%</td>
<td></td>
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<tr>
<td>Area forecast</td>
<td>34%</td>
<td>36%</td>
<td></td>
<td>51%</td>
<td>58%</td>
<td></td>
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<tr>
<td>AIR/SIGMET</td>
<td>34%</td>
<td>43%</td>
<td></td>
<td>47%</td>
<td>57%</td>
<td></td>
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<tr>
<td>Conv. outlook</td>
<td>25%</td>
<td>20%</td>
<td></td>
<td>41%</td>
<td>41%</td>
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</tr>
<tr>
<td>Winds aloft-Gr.</td>
<td>22%</td>
<td>22%</td>
<td></td>
<td>38%</td>
<td>39%</td>
<td></td>
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<tr>
<td>Sig. weather chart</td>
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<td>26%</td>
<td></td>
<td>33%</td>
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<tr>
<td>NCWF</td>
<td>17%</td>
<td>17%</td>
<td></td>
<td>32%</td>
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<tr>
<td>Current icing</td>
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<td>11%</td>
<td></td>
<td>23%</td>
<td>30%</td>
<td></td>
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<tr>
<td>Frz level graphic</td>
<td>6%</td>
<td>7%</td>
<td></td>
<td>21%</td>
<td>18%</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* VFR = visual flight rules; IFR = instrument flight rules; PIREP = Pilot Weather Report; NCWF = National Convective Weather Forecast.
Inaccurate Pilot Reporting, ATC Coding

- Actual PIREP issued indicated severe turbulence at 1633 CDT at FL360 at this location. Error of 20 minutes, 1000’ altitude, and about 125 nm. Accident aircraft never reported severe turbulence to ATC.

- At about 1624 CDT: Location of accident aircraft thirty miles back along flight path from location of report to ATC

- At about 1628 CDT: Accident aircraft reports "a little turbulence" thirty miles back at FL370 to ATC

- At about 1613 CDT: Accident aircraft encounters turbulence at FL370
Learjet Severe Icing Encounter

- Severe icing right before touchdown
- Crew lost all forward visibility
- Veered, struck berm
- ATC did not tell crew of severe icing PIREP
Commander 690C Accident

Loss of control, fatal accident

- Difficulty maintaining heading, altitude in IMC
- Airframe icing
- Loss of engine power

NTSB case number ERA14FA112
NTSB PIREP Forum

• Since 2012 more than 20 accident/incident investigations revealed PIREP and/or weather dissemination issues
• Held PIREP Forum at end of June 2016
• Numerous stakeholders
  • FAA
  • NWS / FSS
  • Operators and pilot organizations
  • Labor unions
  • Department of Defense
  • Tech industry, equipment and service providers
NBSB PIREP Forum 4 Main Discussion Topics

- Use and Significance of PIREPs
- Submission, Solicitation, and Dissemination
- Training, Education, and Operations
- Future Improvements
PIREPs: Importance, Uses

Fairly universal awareness:

• Valuable source of in-situ info about actual weather conditions
• Strategic and tactical uses in NAS
  • Pilots, dispatchers: route planning
  • ATC: traffic routing, free up airspace
PIREPs: Importance, Uses

Less awareness among pilots, operators, ATC personnel:

• **Impact on weather products**
  • Essential for forecast verification
  • Critical for accuracy of global forecast models, add value to icing and turbulence product algorithms
  • Both adverse and fair weather PIREPs
PIREPs: Importance, Uses

• Forecasting skill past 10-20 years
  • Improved due to surface observations
  • No such dense observation network aloft (why more/better PIREPs needed)

• One PIREP can result in drastic change to forecast, AIRMET, SIGMET, other advisories
PIREPs: Importance, Uses

- Bottom line: More, better PIREPs = more accurate weather forecasts
- "Life or death" for general aviation
- Relevant for transport category: Avoid turbulence injuries, damage
PIREPs: Importance, Uses

Data potential (wx perspective)

Source: AWC ADDS at https://www.aviationweather.gov/airep/gis
PIREPs: Submission, Solicitation, and Dissemination

- Need better quality, quantity, variety submitted from pilots, operators
- Need effective dissemination by ATC, FSS, dispatchers
- Specific time limit requirements prohibitive?
- What ways can technology aid ATC/pilots?
PIREPs: Training, Education, and Operations

- Lack of awareness of importance of PIREPs
- Lack of awareness of ways to submit PIREPs
- AOPA PIREP Survey
- Little emphasis in initial training on PIREPs (outside of wording)
- Rarely provided PIREPs from ATC/FSS w/o request
- Rarely/sometimes (75%) of pilots would provide unsolicited PIREP
- Never/Rarely (80%) has ATC requested PIREP
PIREPs: Training, Education, and Operations

• AOPA PIREP Survey
  • “Weather as forecast” would not likely submit a PIREP (10% would)
  • “Below 5,000 feet not much PIREP information…”
  • Most often receive PIREP information via FSS, NWS website, or ATC
  • Pilots more likely to provide PIREP to ATC (80%) than FSS (55%) if requested (excludes Alaska…)
  • Enforcement action only concern for ~15% of pilots
  • Only 38% (9% “always”) believed their PIREPs would make into NAS if provided…
NTSB Learned: Perspectives

Various PIREP user groups not fully aware of others’ needs, priorities, and constraints

- Weather forecasters/researchers
- Pilots/operators/educators
- ATC
- FSS
Considerations Moving Forward

- Short-term improvements within constraints of current system
- Foundation for supporting long-term solutions associated with emerging technologies
- NTSB drafting Special Investigation Report to analyze facts, make safety recommendations
Considerations Moving Forward

Places in which the PIREP is entered into a system as text for further dissemination.

*Beginning March 1, 2016 ATC discontinued forwarding PIREPs to LMFS (procedures for using FSS in Alaska remained unchanged).
AWC Experimental PIREP Submit Form

- Pilots, operators, dispatchers may submit PIREPs electronically

  - Users required to register and each account is validated (based on pilot’s license, e-mail address, and/or airline ID number)

  - Enables registered users to directly enter pertinent information to increase reports and assist other pilots, dispatchers, and flight planners
AWC PIREP Submit Form

- Pilots, operators, dispatchers may submit PIREPs electronically

  - Just like all PIREPs, these are integrated into the AWC forecast production process

  - Will be automatically formatted, distributed, and displayed graphically on www.AviationWeather.gov
Automated submission?

Diagram illustrating the flow of PIREP data, with emphasis on SWIM (Specialized Weather Information Message).

Places in which the PIREP is entered into a system as text for further dissemination:

- PIREP
- ACARS
- PED Application
- Company/Dispatch
- Private Weather Vendor
- Not Disseminated
- AIS-R
- Flight Data
- CWSU
- Flight Service
- Data Input Systems
- AWC Web Tool
- NAS/PublicDomain (via WMSCR)

*Beginning March 1, 2016 ATC discontinued forwarding PIREPs to LMFS (procedures for using FSS in Alaska remained unchanged).*
Technology aiding ATC?

Diagram:

- PIREP
- ACARS
- PED Application
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- Flight Service
- Private Weather Vendor
- Not Disseminated
- SWIM
- AWC Web Tool
- NAS/PublicDomain (via WMSCR)
- Data Input Systems
- AIS-R
- CWSU
- Flight Data
- Other ATC
- ATC Manager
- Air Traffic Controller

Legend:

- Places in which the PIREP is entered into a system as text for further dissemination.
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More PIREP Thoughts

- Submit more, better PIREPs
  - Time, location accuracy
  - Fair weather reports have value
- Become familiar with options
  - Situation dependent (ATC, FSS, app)
  - Even old PIREPs have value (change requirement?)
- Give braking action/bird/runway condition PIREP when no tower / closed tower
- Enforcement?
Any Questions?
Email: paul.suffern@ntsb.gov
AOPA PIREP Survey Available
30% of all part 121 accidents from 2000 to 2013 had weather as cause or factor
Part 91 – Weather As Cause/Factor period 2000-2011

19,441 Accidents

- Adverse Winds: 52%
- Accident: 29%
- Wx Related: 71%

- Precipitation: 4%
- Obscuration: 4%
- Clouds: 4%
- Whiteout: 0%
- Up/Downdrafts: 5%
- Windshear: 2%
- Turbulence: 3%
- Thunderstorms: 2%
- Structural Icing: 3%
- Carburetor Icing: 6%
- Density Altitude: 6%
- Low Ceiling: 7%
- Low Visibility: 4%
- Sand/Duststorm/Dust Devils: 1%
GTG 1hr Efst

GTG missed this storm

Reflectivity

Components & Output: 20100813 at 22z FL380

Insitu EDR tracks

NTDA/DCIT

Insitu EDR verification

In situ, Pireps (1 hr prior) & NTDA

GTGN & Next 15min In situ