

AOPA

Mitigating Turbulence Impacts in Aviation Operations

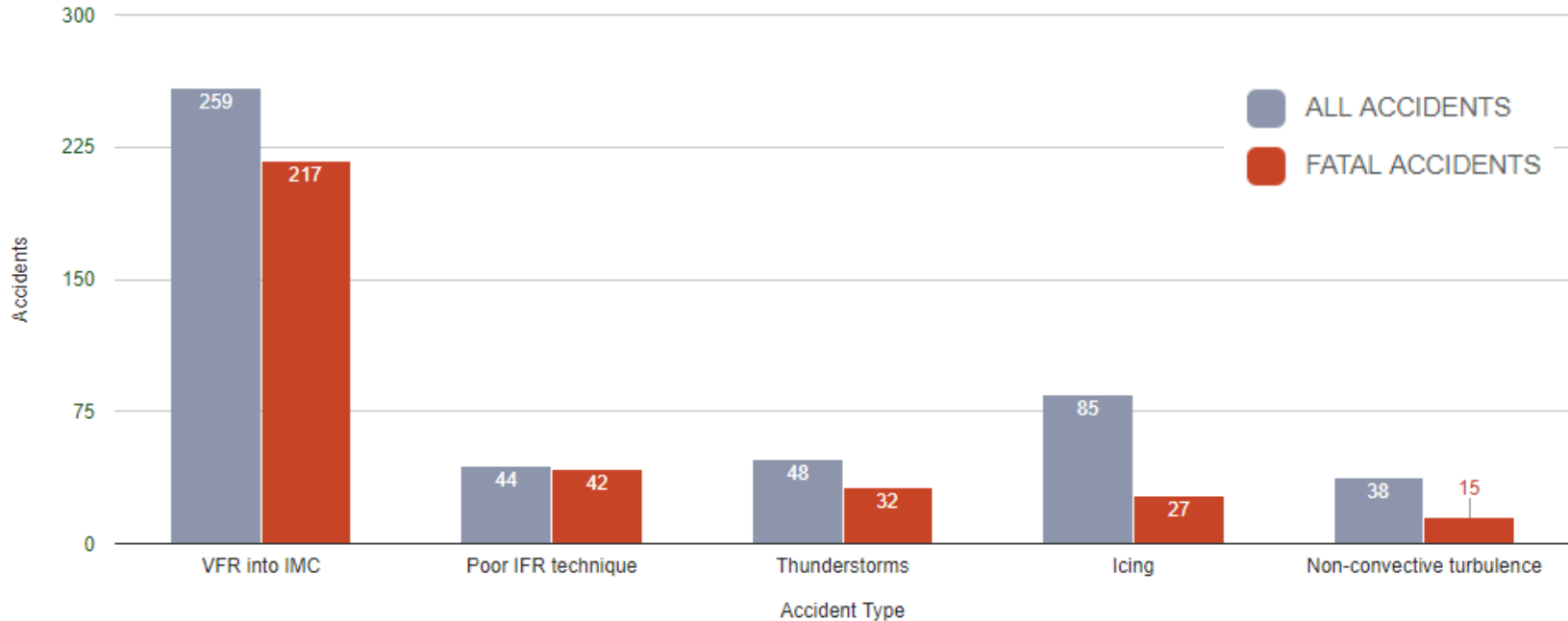
General Aviation Perspective

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Aircraft Owners & Pilots Association**

AOPA Air Safety Institute Nall Report

General Aviation Weather Accidents Last 10 Years



August 2018 NTSB Recommendations



- NWS forecasters may use inconsistent criteria to issue AIRMETs in concert with convective SIGMET
- Noted some forecasters issue AIRMET, some believe convective SIGMET is sufficient
- Convective SIGMET has limited scope and nonconvective turbulence may extend past this area



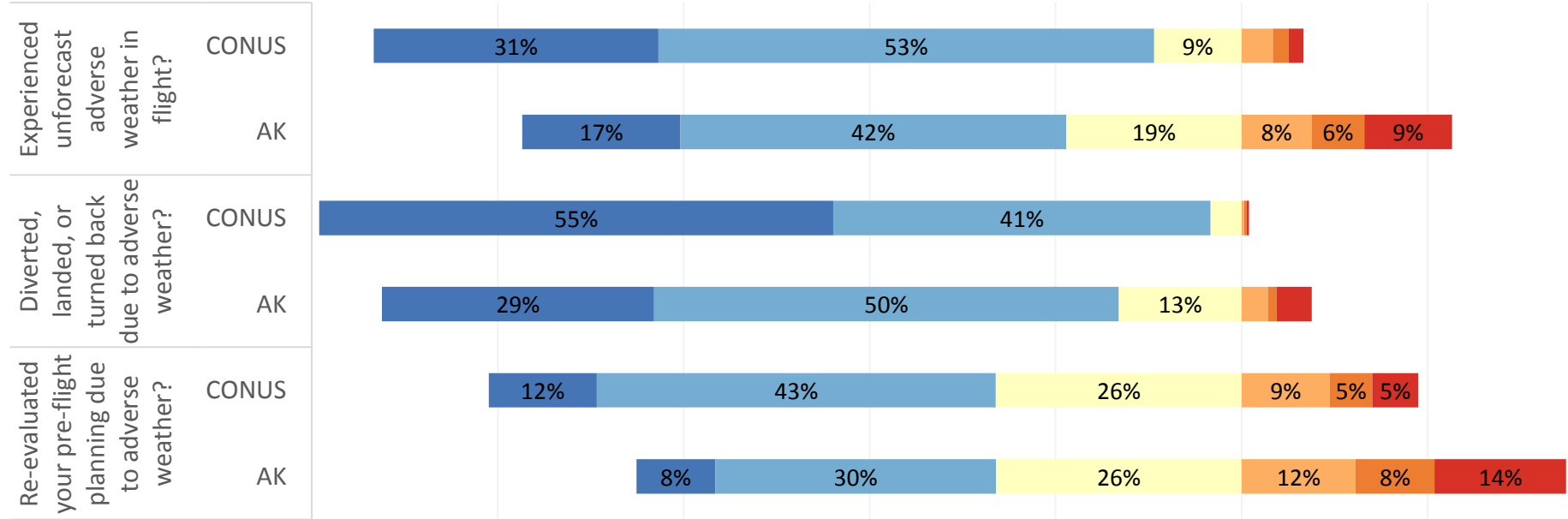
NTSB recommended clearer guidance on AIRMET issuance for nonconvective turbulence; formal training on low-level turbulence

Encounters with Unforecast Adverse Weather

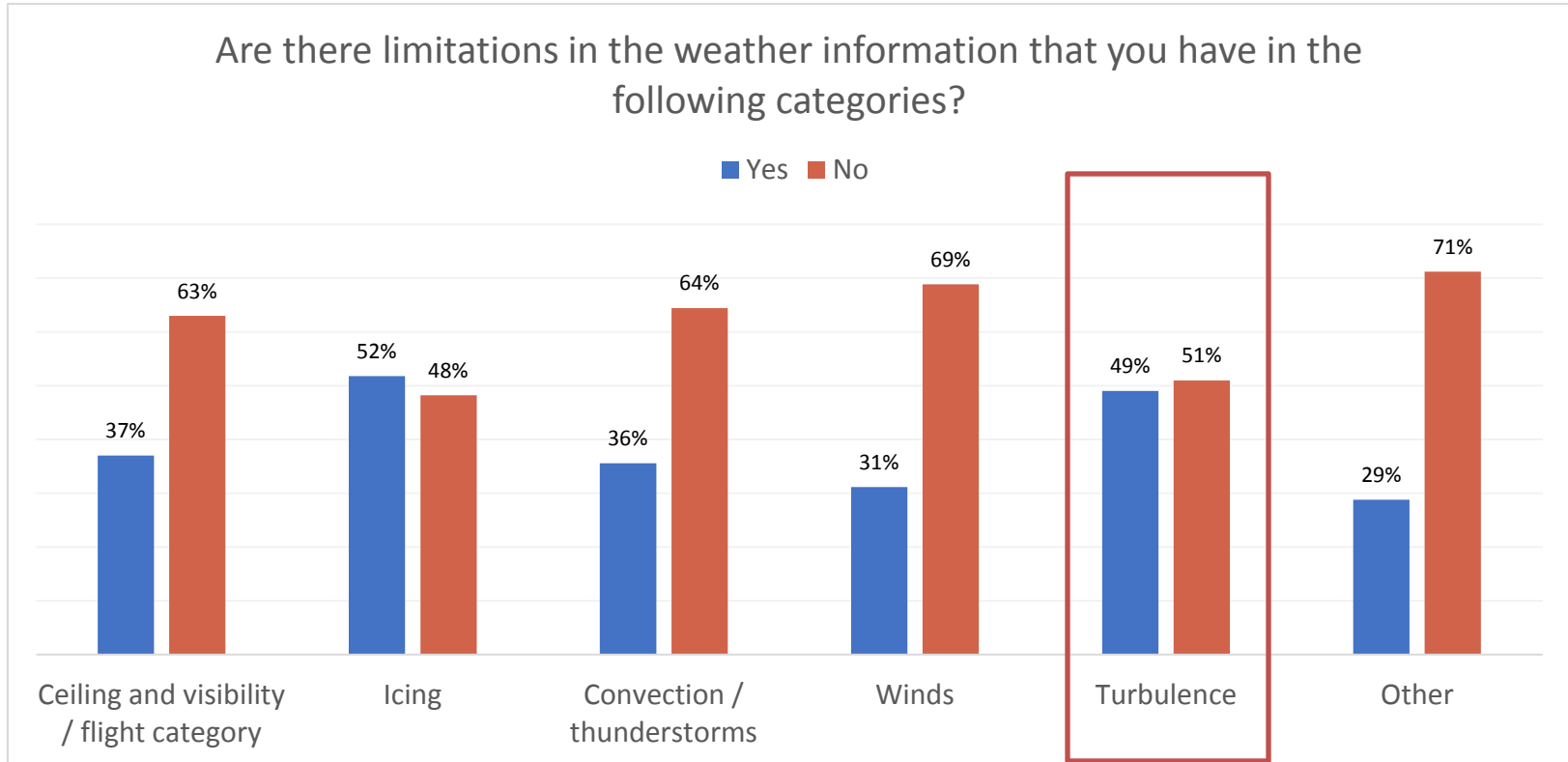


CONUS vs. Alaska: In the past 12 months, how many times have you...

■ Never
 ■ 1 - 3 times
 ■ 4 - 6 times
 ■ 7 - 9 times
 ■ 10 - 12 times
 ■ 12 or more times



AOPA 2018 Weather Survey: Weather Limitations



Turbulence Limitations



- 49% of pilots perceived limitations in weather information related to turbulence
- No difference between Alaska and CONUS
- Many respondents believed that turbulence reports lacked detail and accuracy

We guess where the turbulence is, but really don't know unless we get a pirep

Severity categories affected by type of airplane, need more PIREPs, need better forecasting

Knowing the type of turbulence is important to understanding what to expect: shear, mountain wave, convective, terrain friction...

Efforts to Increase PIREP Submission



- Alaska PIREP Working Group of FAA and industry formed following 2015 Valdez, AK fly-in and STOL competition
- NTSB PIREP Forum in 2016
- NTSB PIREP recommendations in 2017
- FAA adds PIREPs as an ATO Top 5 issue in 2017

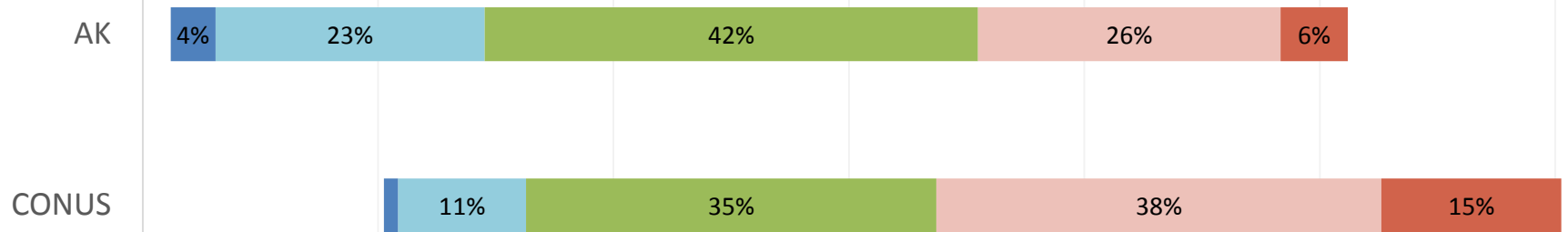
- Recognition of systemic issues
 - Pilot, ATC, FSS culture
 - Submission automation
 - Reporting format
 - Lack of tracking and quality assurance

Providing a PIREP



How often do you usually provide an unsolicited PIREP? By location

Always Frequently Sometimes Rarely Never



PIREP Fields are Important



- PIREP provided at FAI04545 but recorded as over FAI
- Entering PIREP information in wrong field impacts automation and plain language interpretation – Reduces utility of PIREP

The screenshot shows the FAA Aviation Weather Cameras interface. A map displays the location of FAI04545. A PIREP report is displayed in a pop-up window:

```
Raw Text
FAI UA /OV FAI /TM 2305 /FLO55 /TP C185
/TB LGT /RM SCT VRB BKN 060
Plain Text (Beta)
Location: FAI
Report Type: PIREP
Observation Time: 2017-04-30 23:05z
Aircraft Reference: C185
Altitude/Flight Level: 5500 Ft MSL
Sky Cover: missing
Flight Visibility &
Weather: missing
Temperature: missing
Winds: missing
Turbulence: missing
Intensity Light
Frequency: missing
```

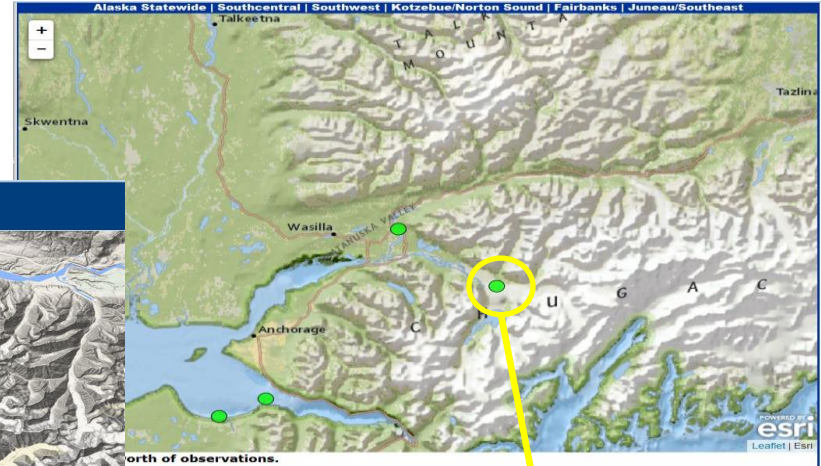
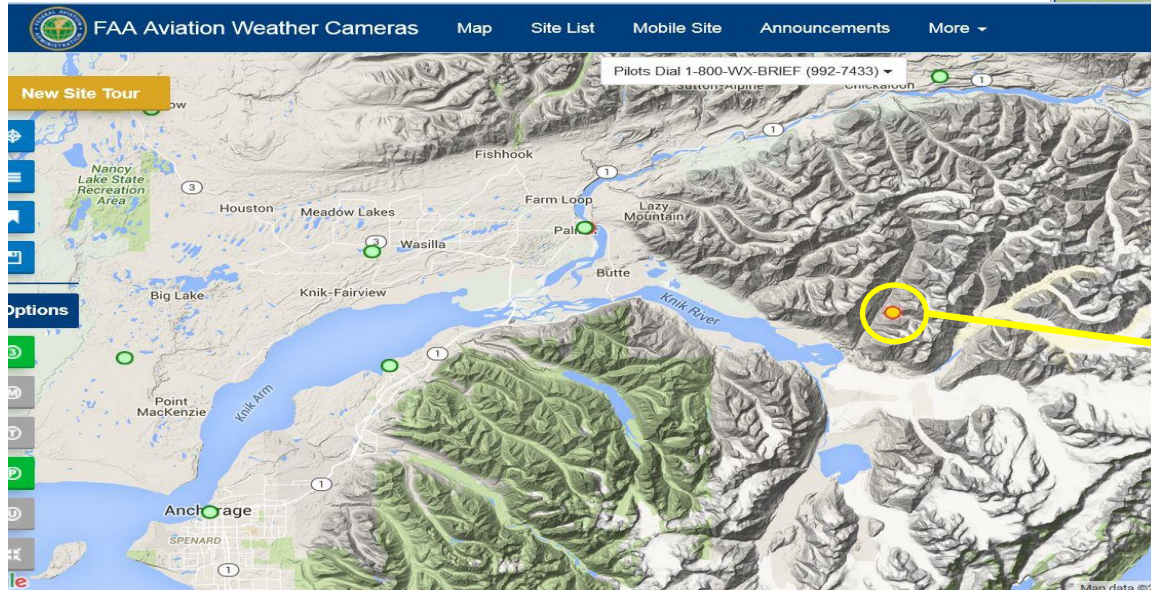
The screenshot shows the FAA Aviation Weather Cameras interface. A PIREP report is displayed in a pop-up window:

```
PIREP within the past 3 hours
Report Type: PIREP
Receipt Time: 2017-04-30T23:24:34Z
Observation Time: 2017-04-30T23:05:00Z
Aircraft Reference: C185
Latitude: 64.8001°
Longitude: -148.012°
Altitude: 5500 Ft MSL
Turbulence Conditions: Turbulence Intensity: LGT
Raw Text: FAI UA /OV FAI/TM 2305/FLO55/TP C185/TB LGT/RM SCT VRB BKN 060
```

Differences in Plotting



- Lat/long issues
- Placed PIREP over mountain instead of valley



Same PIREP, in Knik River Valley

Must Have: PIREP Submission Integration



- AOPA conducted PIREP survey in 2016 in support of NTSB's PIREP Special Investigation Report
- Better automation/technology would improve submittal rate
 - Integrate into apps/avionics
 - Include GPS provided position
- Simplify process/form for inflight transactions

PIREP Entry Form		SURVEY	INFO
This is an updated PIREP Entry page. Please refer to the Info page for more information.			
Items 1 through 5 are mandatory for all PIREPs			
1.	<input checked="" type="radio"/> UA (Routine Report) <input type="radio"/> UUA (Urgent Report)		
	Enter Lat/Lon - OR - Enter NAVAID		
2. /OV	Location: <input type="text"/> Weather reporting station:		
3. /TM	Time: <input type="text"/> Local (optional) <input type="text"/> UTC (required) 4 digits UTC e.g. 0915, 2330 <input type="button" value="Current UTC Time"/>		
4. /FL	Altitude/Flight Level: <input type="text"/> <input checked="" type="radio"/> climb 3 digits in hundreds of feet MSL. e.g. 095 = 9500 ft MSL; 210 = FL210 or 21,000 ft MSL <input type="checkbox"/> Unknown <input checked="" type="radio"/> level <input type="radio"/> descent Select climb, level or descent if applicable.		
5. /TP	Aircraft Type: <input type="text"/> 4 characters max. If unknown, use UNKN (e.g. C210, P3, UNKN)		

AWC PIREP submission form

Charting Changes



PIREP quick reference guide added to all Chart Supplements

Encoding Pilot Weather Reports (PIREP)

1. **UA - Routine PIREP, UUA - Urgent PIREP**
2. **/OV - Location:** Use 3-letter NAVAID identifiers only.
 - a. Fix: /OV ABC, /OV ABC 090025.
 - b. Fix to fix: /OV ABC DEF, /OV ABC DEF 120020, /OV ABC 045020-DEF 120005, /OV ABC-DEF-GHI.
3. **/TM - Time:** 4 digits in GMT: /TM 0915.
4. **/FL - Altitude/Flight Level:** 3 digits for hundreds of feet. If not known, use UNKN: /FL095, /FL310, /FLUNKN.
5. **/TP - Type aircraft:** 4 digits maximum, if not known use UNKN: /TP L329, /TP B727, /TP UNKN.
6. **/SK - Cloud layers:** Describe as follows:
 - a. Height of cloud base in hundreds of feet, if unknown, use UNKN.
 - b. Cloud cover symbol.
 - c. Height of cloud tops in hundreds of feet.
 - d. Use solidus (/) to separate layers.
 - e. Use a space to separate each sub element.
 - f. Examples: /SK 038 BKN, /SK 038 OVC 045, /SK 055 SCT 073/085 BKN 105, /SK UNKN OVC
7. **/WX - Weather:** Flight visibility reported first. Use standard weather symbols, intensity is not reported: /WX FV02 R H, /WX FV01 TRW.
8. **/TA - Air temperature in Celsius:** If below zero, prefix with a hyphen: /TA 15, /TA -05.
9. **/WV - Wind:** Direction and speed in six digits. /WV 270045, /WV 280110.
10. **/TB - Turbulence:** Use standard contractions for intensity and type (use CAT or CHOP when appropriate). Include altitude only if different from /FL. /TB 5XTM, /TB LGT-MOD BLO-090.
11. **/IC - Icing:** Describe using standard intensity and type contractions. Include altitude only if different than /FL: /IC LGT-MDT RIME, /IC SVR CLR 028-045.
12. **/RM - Remarks:** Use free form to clarify the report. Most hazardous element first: /RM LLWS -15KT SFC-003 DURIG RNVY 22 JPL. Refer to FAAH 7110.10 for expanded explanation of TEI coding.

Examples of Completed PIREPS

UA /OV RED 170030/TM 1315/FL160/TP PA60/SK 025 OVC 095/180 OVC /TA -21/WV 270048

UA /OV DHT 360015-AMA-CDS/TM 2116/FL050/TP PA32 /SK UNKN OVC/WX FV03 R /TB LGT/TA 04/RM HVY RAIN

PIREP FORM

Pilot Weather Report → = Space Symbol

3-Letter SA Identifier

1. **UA** → **UUA** →

Routine Report Urgent Report

2. **/OV** → Location: _____

3. **/TM** → Time: _____

4. **/FL** → Altitude/Flight Level: _____

5. **/TP** → Aircraft Type: _____

Items 1 through 5 are mandatory for all PIREPS

6. **/SK** → Sky Cover: _____

7. **/WX** → Flight Visibility and Weather: _____

8. **/TA** → Temperature (Celsius): _____

9. **/WV** → Wind: _____

10. **/TB** → Turbulence: _____

11. **/IC** → Icing: _____

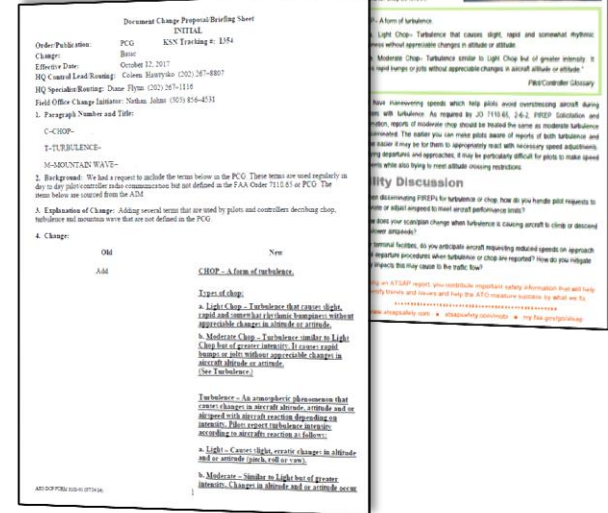
12. **/RM** → Remarks: _____

FAA FORM 7110-2 (1-8) Supersedes Previous Edition Electronic Version (Adobe)

Pilot/Controller Communication Improvements



- “Chop” is considered a type of turbulence
- Inconsistency in pilot/controller guidance
- Not all moderate chop being submitted as PIREP
- Pilot/Controller Glossary updated to harmonize terminology – and expectations – between pilots and ATC
- Mountain wave also defined



Further Effort Needed on PIREPs



Controllers and Flight Service

- Emphasis on null reports
- Best practices for solicitation
- Confirmation PIREP is accepted into the system to benefit forecasters and pilots not on the frequency
- Efficiency of transaction

Pilots

- Emphasis on null reports, counter PIREP myths
- Integration of PIREP submission with EFB
- Training on PIREP format
- FIRCs, BFR's, safety seminars, other outreach

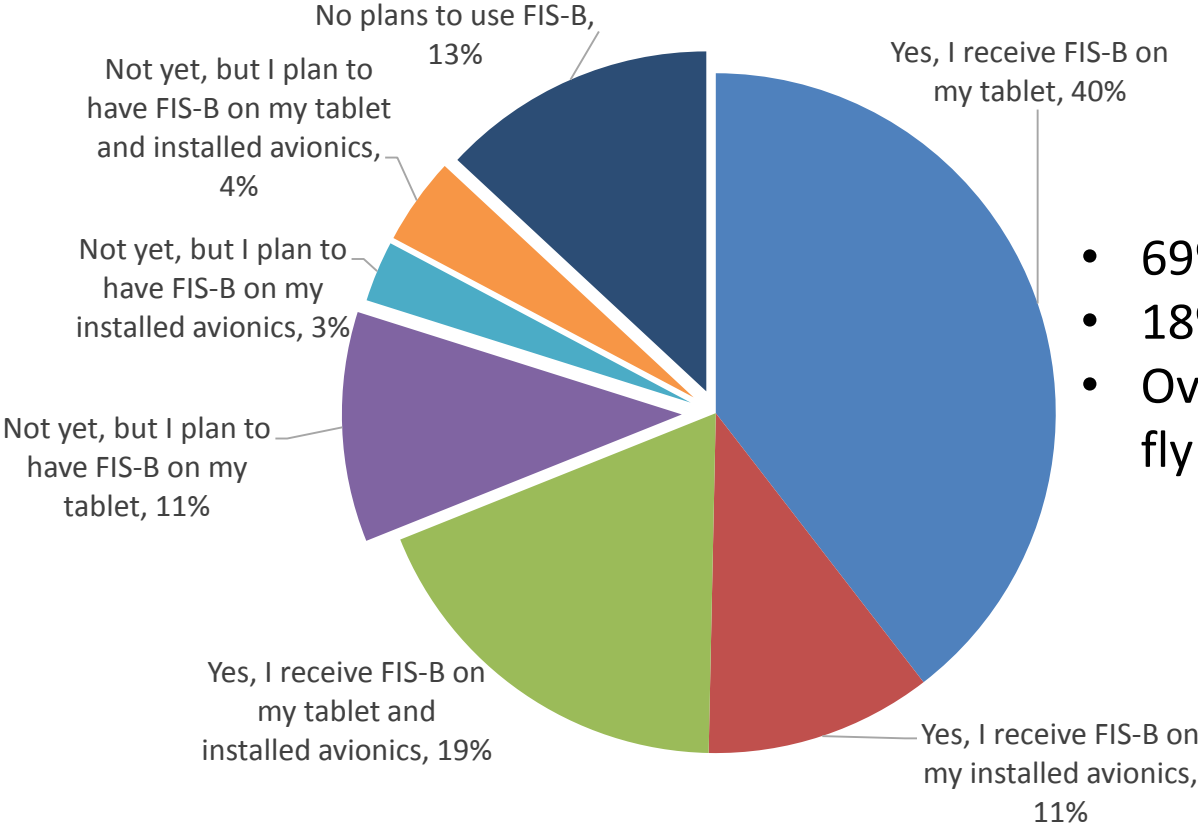
WTIC Capabilities for General Aviation



- Flight Information Service-Broadcast (FIS-B) is one of the key GA elements of ADS-B
- For aircraft that are ADS-B In equipped, FIS-B delivers NEXRAD radar images, AIRMETs, SIGMETs, PIREPs, and other weather reports directly to an EFB or cockpit multifunction display
- Other solutions are available like SiriusXM Aviation



FIS-B Utilization

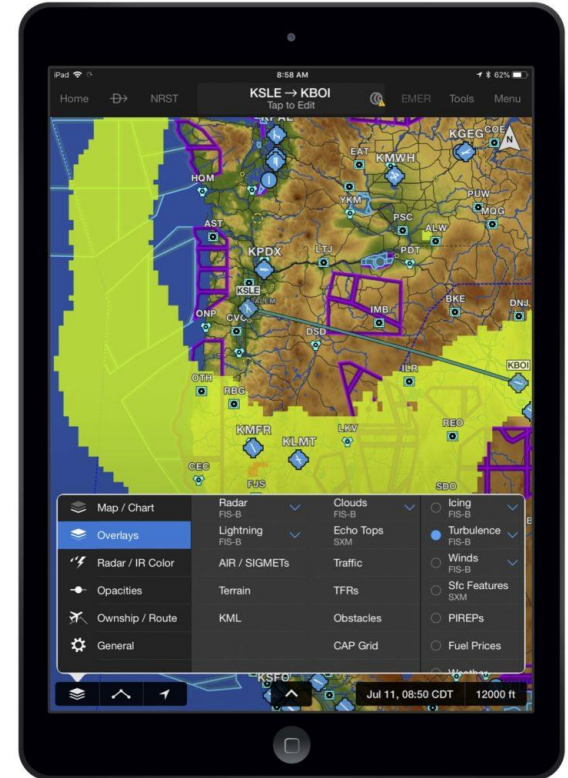


- 69% of respondents use FIS-B
- 18% plan to use FIS-B
- Over 80% of pilots routinely fly with an EFB

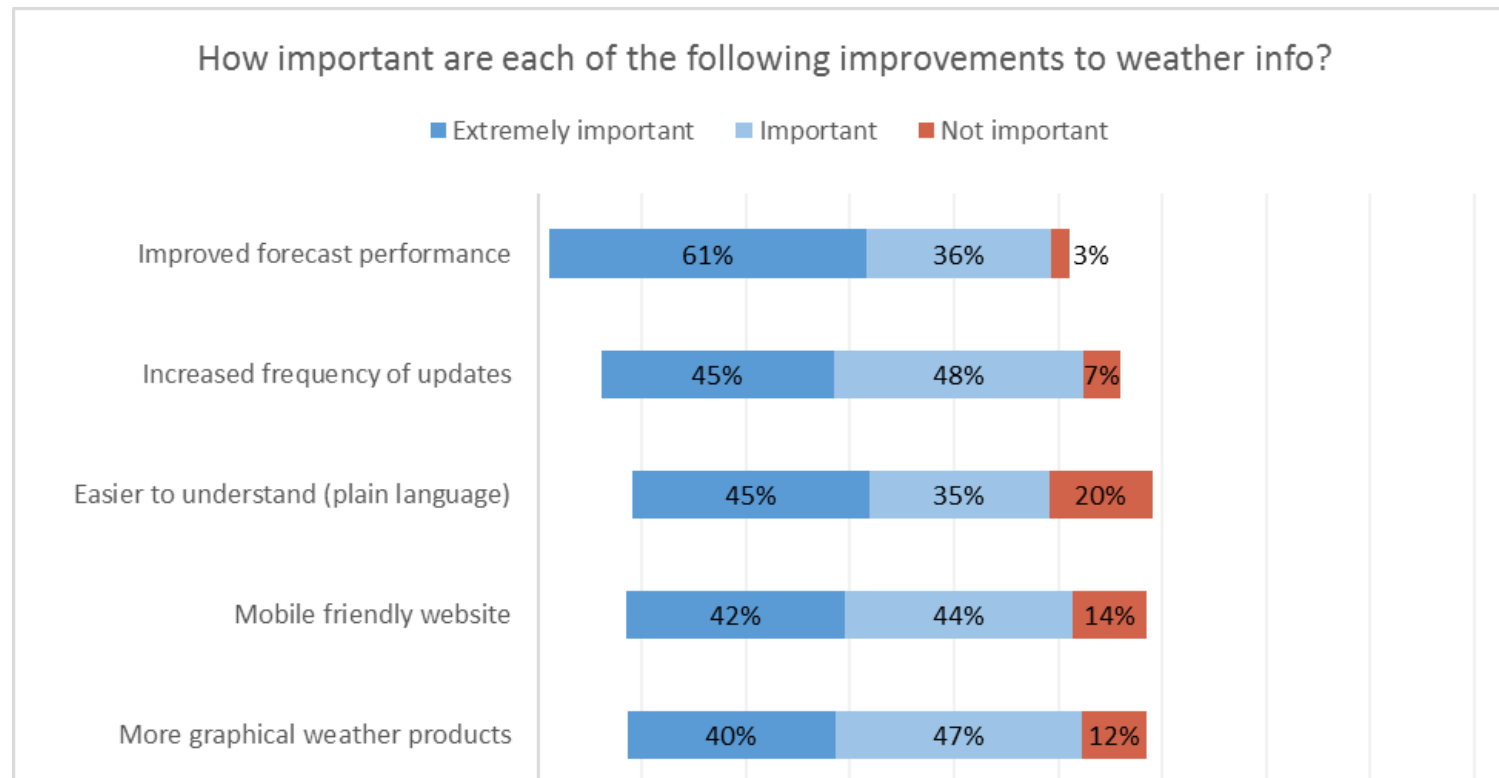
FIS-B Improvements: Turbulence Forecast



- FIS-B Turbulence Forecast product provides turbulence data representing a 1-hour forecast of turbulence energy throughout CONUS
 - 12 altitude levels—every 2,000 feet, from 2,000 feet msl to 24,000 feet msl
- Graphical Turbulence Guidance (GTG) forecast product from NWS
 - This model is run on an hourly basis.
Transmission interval: 15 minutes
- Maximum turbulence severity in either the Mountain Wave or Clear Air Turbulence source



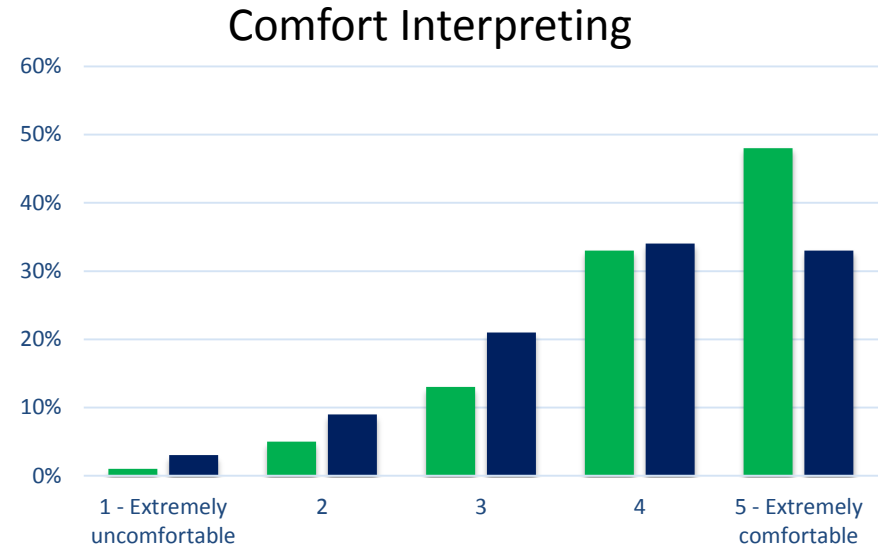
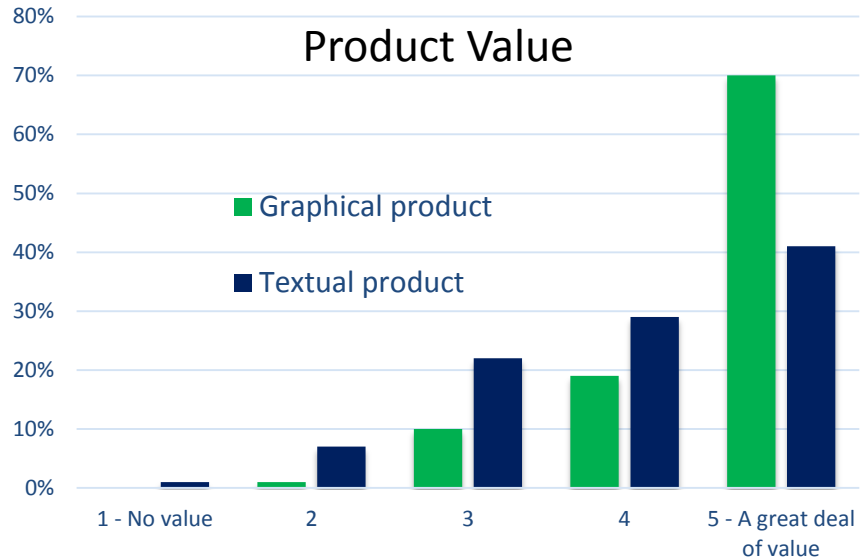
General Aviation Top 5 Requested Improvements



Comparing Graphical and Textual Products



- Pilots highly desire graphical products
- Similar comfort level with interpreting graphical product

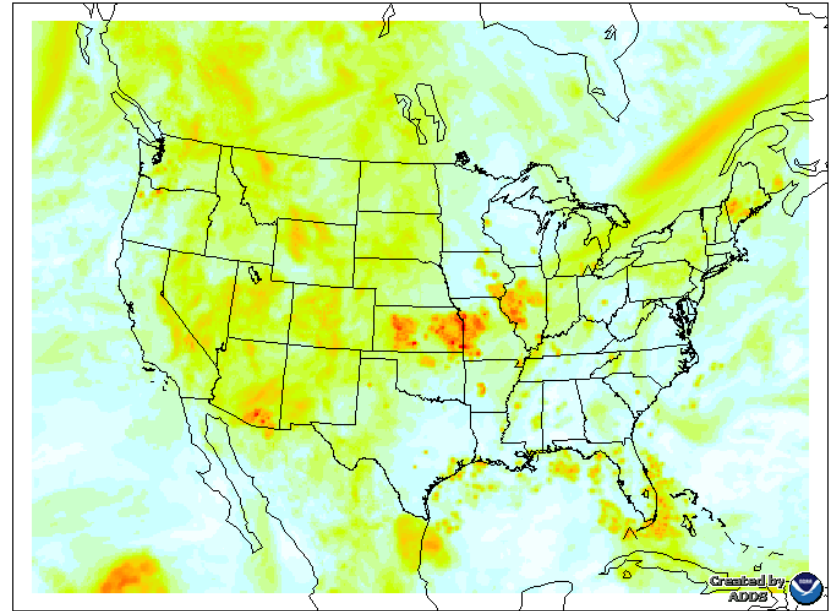


Graphical Turbulence Guidance Pilot Feedback



-
- Like the altitude cross sections
 - Graphical depiction
 - Want regional views

 - GTG Nowcast – GTGN
 - Better decision making



Pilot Education

- Informed consumers – Aware of best practices
- Training requirements – Knowledge exam changes
- Utilizing technology to make smart decisions
- Know before you go mentality
- Understanding limitations, lag time, and constraints of your specific equipment and plan accordingly
- Never become distracted by technology – Flying always comes first



AOPA

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[AOPA 2016 Pilot Report Survey](#)
[AOPA 2017 Weather Survey](#)
[AOPA 2018 Weather Survey](#)

Thank you!