



# Weather to Fly



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## NWS Launches *Weather To Fly*, Quarterly Aviation Verification and Outreach Report

By Mike Graf, Editor  
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At the Aviation Services Branch (ASB), we see ideas generated from the field covering topics ranging from local outreach and verification to better techniques and more effective philosophies. Unfortunately, these ideas often get lost in the shuffle as staff move on or other events come to the forefront.

To collect and distribute these ideas and best practices, we are launching *Weather to Fly*, a quarterly aviation newsletter for NWS staff. *Weather to Fly* will focus on local aviation outreach and verification.

Why local outreach and verification? These two areas can be a challenge for a local office to get its arms around, in part, due to insufficient resources and training.

The goal of this newsletter goal is to alleviate some of those issues by sharing best-practices at WFOs and relevant guidance

from region and NWSH levels. Articles will be mostly by field staff, with a smattering of articles, coming from Regions and NWSH.

Send us your stories. Focus on local aviation verification and outreach. Email ideas or articles through your regional RAM, to Michael.Graf@noaa.gov. ➔

## New Stats on Demand; Review of Aviation GPRA Goals

By Mike Graf, Editor  
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Aviation Verify was recently updated and is now available online for use in the form of the "new" Stats on Demand.

In this article, I'll review three key areas:

- New Stats on Demand
- Aviation Service's Branch philosophy on Terminal Aerodrome Forecast (TAF) verification

- NOAA's Government Performance Results Act (GPRA) goals for TAF

At NWS headquarters, we run Aviation Verify for all 565 plus TAFs to obtain the Probability of Detection (POD) and False Alarm Rate (FAR). This measure is for the Instrument Flight Rules (IFR) flight category in the first six hours of the TAF. The updated aviation GPRA now measures the

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### Weather to Fly

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POD/FAR for the IFR category, in the first six hours. The previous value was 200/.5 or Very Low IFR (VLIFR), but is no longer used, since it didn't occur often enough to provide a good measurement.

So what does this all mean for the local office? From the verification standpoint, you have two viable options:

1. Use the advanced mode in the older Aviation Verify to derive the new GPRA goals and gradually move ahead by switching to the new Stats on Demand.

2. Begin to use the new Stats on Demand. The program is still being tested, so compare it's output to Aviation Verify in advanced mode. The calculations behind the two programs are about the same, so check for consistency. If you note a discrepancy, send an email to [Brent.Macaloney@noaa.gov](mailto:Brent.Macaloney@noaa.gov).

## Why Update Aviation Verify?

When Aviation Verify was deployed in 2001, this program was intended to run for each individual at the local office. Unfortunately, storage issues, lack of training and time constraints hindered this effort.

Instead many offices opted to run the program only for the office. The result was statistics with little meaning to individual forecasters. It's tough to help local offices improve when the forecasters are not sure where they are adding value.

To improve this situation, the verification branch at headquarters worked with Aviation Service Branch and the field to update Aviation Verify. The goal was to make it easier

for local offices and individuals to obtain statistics.

The updated Aviation Verify has become the new Stats on Demand program. The changes listed below should make it easier for the Aviation Focal Point (AFP) and others to run this new program.

- Data storage is now done centrally instead of being maintained on the WFO's LDAD. This relieves the ESA/IT from maintaining the collection feed and increases the reliability of data.
- Software is online.
- With the deployment of AVNFPS3.0, forecasters will be able to get individual stats.
- A graphical interface and a

Through the course of running Aviation Verify for more than 565 TAFs, details intrinsic to each local office are washed out. We do not recommend incorporating the national PODs/FARs into your baseline. Instead, consider the following ideas and suggestions on how an office could apply the new Stats on Demand.

Look at your weather regime/ climate and add offices that are similar. Use these surrounding WFOs to formulate a baseline for comparison to your WFO. Take advantage of surrounding offices and see what works for them.

Although I run the national numbers, I also run the regions as well, and they vary quite a bit based on regime and time of

**Table 1**

<b>FY</b>	<b><u>02</u></b>	<b><u>03</u></b>	<b><u>04</u></b>	<b><u>05</u></b>	<b><u>06</u></b>	<b><u>07</u></b>
<b>POD</b>	45	45	46	46	48	50
<b>FAR</b>	71	71	70	68	68	67

traditional interface allow AFPs to choose which offices they want to baseline against.

- In addition to raw numbers, graphics will be available in the future.
- Stats on Demand provides data through December 2003. But the program will eventually have individual office data back through September 2001 for most WFOs.

Though the ASB currently runs the advance option of Aviation Verify, we only focus on a few of the many statistics provided, such as IFR POD/FAR of the first six hours of the TAF. These national numbers may have little in common with an individual WFO's statistics.

the year.

Individual offices vary even more. AFPs will notice big differences based on local WFO philosophy and other differences. Play up these differences with your counterparts from surrounding offices and begin to develop or add to a current list of best practices.

Begin to use the individual statistics for each forecaster. This capability comes online with AVNFPS3.0 and allows

**Table 2**

<b>FY</b>	<b><u>02</u></b>	<b><u>03</u></b>	<b><u>04</u></b>
<b>POD</b>	46	48	46
<b>FAR</b>	69	64	62

forecasters to understand where they add value. The AFPs can begin to access the strengths of individual forecasters. This, in turn, allows AFPs to train the office more effectively, based on individual needs.

The direct result will be a positive impact to GPRA performance numbers. This is the ASB's vision for verification.

### So What Numbers Are Given to NOAA?

Starting FY04, the POD/FAR for ceiling and visibility changed from 200/.5 to 1000/3. Current GPRA goals, based on the first six hours of the TAF, are shown in Table 1.

And how did we do? Table 2 shows the PODs/FARs for the nation derived from Aviation Verify starting in October 2001.

The numbers are cumulative for October-September FY02 and FY03. FY04 is from September 2003 to April 2004.

The biggest improvement has been the FAR; POD has stayed fairly steady. Decreasing FARs are usually a double-edged sword. Most of the time decreasing FARs implies lower PODs; however through improved software and better education and training, we've avoided the lower PODs.

To recap, keep in the mind the following two practices:

- Baseline against climatologically similar offices
- Use office and individual verification as a fine-tuning tool to help you train smarter.

These refinements will help improve NOAA's 1000/3 GPRA scores. →

## Forecasting Thunderstorms In Terminal Aerodrome Forecasts Some New Insights

*By Steven Thompson and Dan Baumgardt, NWS, La Crosse, WI  
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The Terminal Aerodrome Forecast (TAF) is the primary means of disseminating weather forecasts to the aviation community. In fact, TAFs serve a wide variety of aviation customers, ranging from general aviation to commercial and military operations.

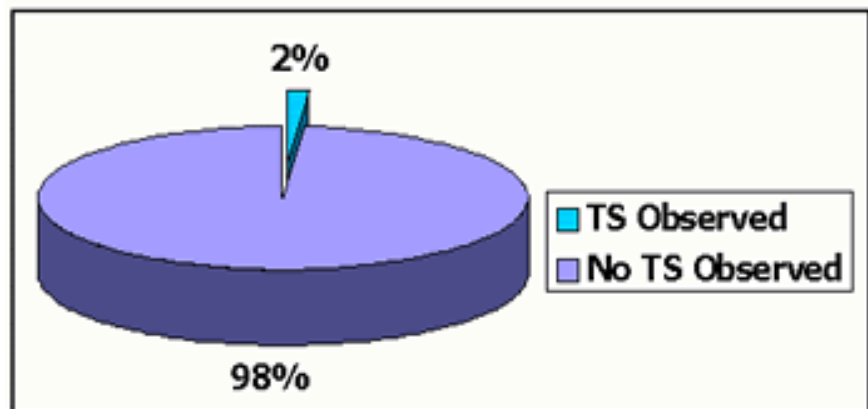
This article provides insights into improved thunderstorm forecasting in TAFs. By improving these forecasts, NWS reduces false alarm hours and increases airport operation efficiency, enhancing safety and promoting credibility of NWS aviation products.

During the convective season, April-September, thunderstorms occur only a small percentage of the time (Figure 1) at NWS La Crosse TAF sites: La Crosse, WI (KLSE) and Rochester, MN (KRST). As a whole, NWS Central Region TAFs

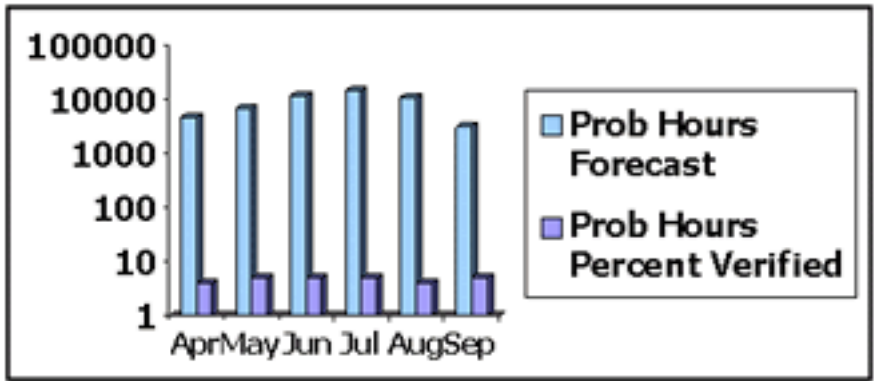
consistently forecast too many hours of small thunderstorm probabilities (PROB), with resultant poor verification scores (Figure 2).

In May 2001, NWS La Crosse began an initiative to improve thunderstorm forecasts in the TAFs. Based on forecast staff input and thunderstorm verification scores, the following strategies were developed and implemented:

- Limit PROB and TEMPO groups beyond 8 to 12 hours of TAF issuance
- Limit time length of PROB and TEMPO, i.e., # less than or equal to 2 hours
- Eliminate forecast of TS beyond 12 hours of TAF issuance
- Use vicinity thunderstorm (VCTS) or cumulonimbus (CB) in lieu of TEMPO and PROB groups



**Figure 1.** Percentage of hourly observations with and without thunderstorms (TS) at KLSE and KRST (April-September 1961-1990).



**Figure 2.** Probability of thunder (PROB TS) hours forecast in the TAFs issued by the NWS Central Region Forecast Offices in 2003 versus the percent verified. Note: logarithmic scale.

- Factor in climatology, i.e., time of day, month
- Only use TEMPO for categorical events
- Key on **organized** versus unorganized convection.

The last item in this list is especially important. Organized convection is considered to have a greater than or equal to 50 percent probability of occurring.

A couple examples of organized convection would be

a squall line along ahead of a cold front and a Mesoscale Convective System (MCS) associated with return southerly flow in a warm air advection regime.

In addition to focusing on organized convection, forecasters are encouraged to use a consistent approach to forecasting thunderstorms in TAFs. The “funnel effect” philosophy (Figure 3) uses certainty versus uncertainty,

allowing the most probable outcome to be conveyed to the aviation customer.

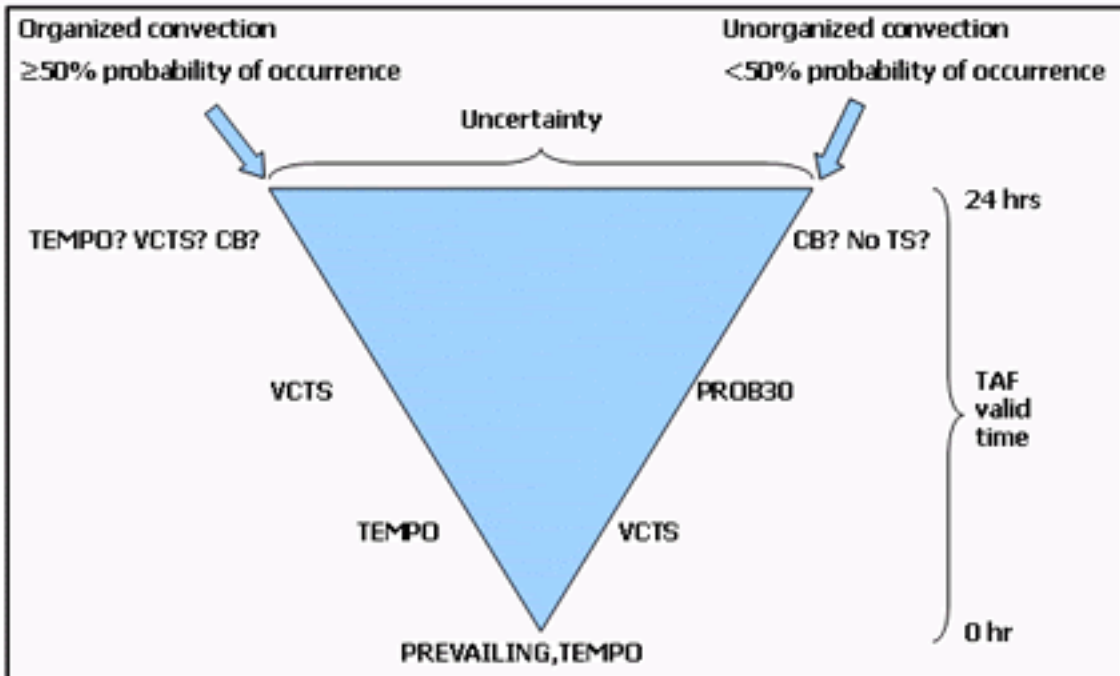
For example, consider the following scenario where thunderstorms are possible but will probably be scattered. There is a 30 percent chance of thunderstorms in the forecast grid database. At 18 to 24 hours from TAF issuance, with model guidance indicating unorganized convection, the recommended TAF would read:

```
FM2100 18012KT P6SM
BKN040CB
FM0000 18012KT P6SM
SCT250=
```

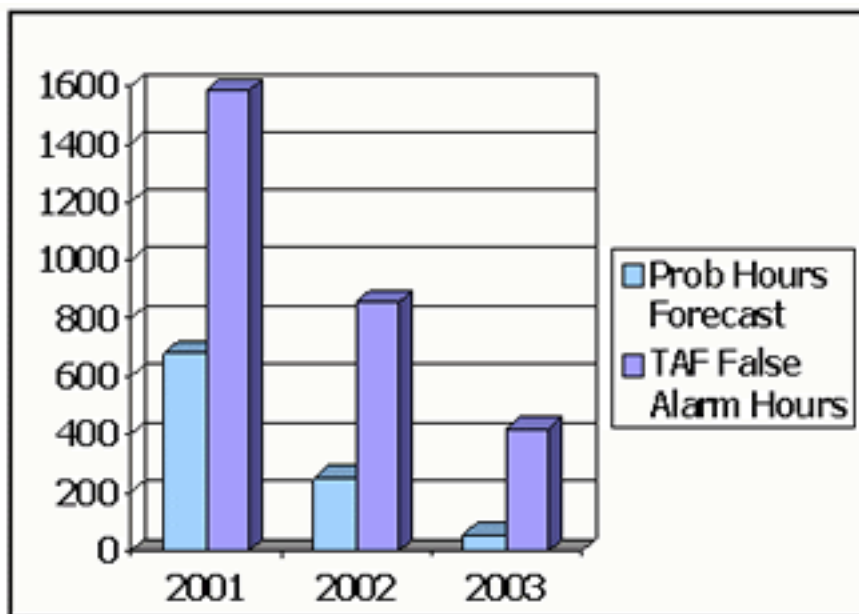
While at 3 to 6 hours from TAF issuance, with scattered thunderstorms currently on radar, the TAF would evolve to:

```
FM2100 18012KT P6SM VCTS
BKN040CB
FM0000 18012KT P6SM
SCT250=
```

The key point is that CB and VCTS should be used in the above



**Figure 3.** Funnel effect philosophy of forecasting thunderstorms in TAFs.



**Figure 4.** Probability of thunder (PROB TS) hours forecast in the TAFs at KLSE and KRST, combined, from 2001-2003 (April-September). Also, the number of TS false alarm hours for the two TAF sites during the same time period.

scenario rather than TEMPO and PROB groups, thus reducing the potential for false alarm hours.

Another example to consider is a scenario where a number of forecast diagnostics indicate an organized convection (MCS) is likely in your forecast area. At 20 to 24 hours from issuance, the recommended TAF would read:

```
FM0600 18015G23KT P6SM
BKN250
FM0800 16015G23KT 4SM -
SHRA BR VCTS OVC040CB
TEMPO 0812 2SM SHRA BR
BKN020CB=
```

While closer to the event, 2 to 6 hours from TAF issuance, with an actual MCS approaching, the TAF would evolve to:

```
FM0600 18015G23KT P6SM
BKN250
FM0800 16015G23KT 4SM -
TSRA BR OVC040CB
TEMPO 0911 2SM TSRA BR
BKN020CB...
```

VCTS is used in the outer TAF periods to reduce false alarm hours. As the event becomes more certain, TEMPO groups are used to provide detail, with prevailing TS reserved for imminent conditions.

By incorporating the ideas listed above, NWS La Crosse TAFs realized a 92 percent drop in the use of PROB hours during the convective season from 2001 to 2003 (**Figure 4**). More importantly, thunderstorm false alarm hours were reduced 74 percent for the same time frame.

Caution is advised when using the insights presented in this article. There is no silver bullet when forecasting thunderstorms in TAFs. A higher level of TAF preparation and monitoring is needed to use the strategies suggested here.

In addition, probability of detection may suffer at the expense of reducing false alarm hours.

Accurately forecasting thunderstorms in TAFs is a

difficult task; however, if the NWS can improve its accuracy, the aviation community benefits tremendously.

Some of these benefits include more efficient airport operations and enhanced aviation safety.

The insights presented here may prove useful on a local, regional and national scale for improving thunderstorm forecasts in TAFs. →

## Acknowledgments

The International Station Meteorological Climate Summary CD ROM (V3.0 March 1995) was used for 1961-1990 observational data at KLSE and KRST. This CD was jointly produced by the Fleet Numerical Meteorology and Oceanography Detachment, National Climatic Data Center (NCDC), and USAFETAC OL-A.

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# Aviation Forecasting is Changing the NWS Local Forecasting Frontier

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NWS forecast offices are continuously fostering and improving working relationships with their users. At NWS Columbia, we are trying to be more proactive in building and maintaining relationships with the aviation community.

Below are some ideas we've implemented at Columbia as well as information to consider when forecasting thunderstorms in TAFs.

First, it's essential to meet with the airport operations manager. This person can be a great ally and source of information at your local airports. The manager usually can tell you which local customers are being served by your TAFs and can give you feedback on your Airport Weather Warnings (AWW) when you issue them.

I have an annual meeting with our airport manager. The manager in turn has asked us for input on purchasing a lightning detection system to improve safety for airport operations. We work closely with the airport operations staff to inform them of any weather impacts for the Columbia Metropolitan Airport.

Second, we work closely with the Flight Safety Duty Officer, an FAA employee who is active in the aviation community, especially the General Aviation community.

Every first Thursday of the month, we hold a program called "Thursday Night Movies" held at the Civil Air Patrol building. A speaker gives a presentation and then shows an aviation related

show or short movie complete with popcorn and sodas.

Third, using the NWS survey has been a great source of information on how pilots get needed flight information. I had a wonderful opportunity to teach the pilots about the TAF terminology and what exactly a TEMPO meant. I was surprised to see how many did not know about TEMPO.

Finally, as the verification of TAFs continues to be an NWS concern, the task of doing the

Stats on Demand program. Many forecasters are not in this mindset when crafting the TAF, instead they think on an hourly or longer basis.

Forecasters who have switched from the public forecast mindset of a period being 12 hours to the TAF mindset of one hour, need to think again--it is really 5 minutes when it comes to verification.

The new Stats on Demand is coming down the pike as well.

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verification on your own as the Focal Point has been quite challenging.

Columbia WFO recently held a southeastern regional verification meeting to determine what we need to look at when doing our verification reports. There were several findings from the meeting, but the biggest discussion point was whether TAFs should be verified every 5 minutes.

Few forecasters realize TAFs are evaluated every 5 minutes in Aviation Verify and the new

One goal is to reduce a lot of the number crunching currently going on by the AFP.

The idea is that the AFPs will be able to be more proactive in training and input for each individual forecaster's development in aviation forecasting.

If you have questions concerning aviation outreach or verification at WFO Columbia SC, please contact me at the address above. ➔