



Agenda Item 5: Exchange of OPMET Information

TAF VERIFICATION IN THE UNITED STATES

(Presented by the United States of America)

SUMMARY

This paper provides information on the US implementation of Aerodrome Forecast (TAF) verification through the Internet World Wide Web (Web) based program called Stats on Demand or SOD.

1. Introduction

1.1 In early 2000, the National Weather Service (NWS) introduced a TAF verification program to meet the needs of the individual forecaster, the Weather Forecast Offices. That effort gradually transitioned to a Web based system called Stats on Demand (SOD) around 2006 and serves the needs of over 1200 forecasters, 122 Weather Forecast Offices and National Weather Service Management. This Web-based utility could potentially be utilized by other States with a need for TAF verification.

1.2 TAF verification is an important part of the forecast process and is to be part of the NWS/FAA Quality Management System that is planned to be implemented in the 2010 timeframe. Being able to provide a forecaster with their individual biases helps forecasters recognize their strengths and weaknesses when preparing an aviation forecast. In addition, it also provides a means to evaluate how to improve the forecasting capability of the office to ensure training is focused on the area that requires the greatest attention.

2. Discussion

2.1 Reliable verification leads to focused training

2.1.1 Over the past six to eight years, the combination of training and verification has led to lower false alarm scores for Instrument Flight Rules (IFR) Ceiling/Visibility, while keeping probability of detection about the same for NWS TAFs. In addition, NWS forecasters and offices can determine TAF parameters being over or under forecasted. This information then drives the aviation training for the office and allows management to focus limited training resources on problem areas, rather than trying to

cover all parameters of the TAF. **Appendix A** provides some examples to give the reader a sense of the Stats on Demand program and Web interface.

2.2 **Expanding Stats on Demand to other States**


2.2.1 The TAF verification is not a simple and clear-cut process. By using SOD to provide TAF verification, States can focus limited resources on training rather than developing a verification program on their own.

2.2.2 SOD, or a similar type of program, can assist States in understanding how to improve their TAF. A brief overview of SOD is available in **Appendix B**.

3. **Conclusion**

3.1 The meeting is invited to take note of the information contained in this paper.

APPENDIX A



The screenshot shows the National Weather Service Performance Management Aviation Verification page. The header features the National Weather Service logo and the text "PERFORMANCE MANAGEMENT Aviation Verification". Below the header is a navigation bar with links for "Verification", "Evaluation", "Storm Data", "Training", "Data Archives", and "Resources". The main content area is titled "Aviation Verification Home" and includes a welcome message and a list of links for Terminal Aerodrome Forecast (TAF) Verification.

PERFORMANCE MANAGEMENT
Aviation Verification

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Aviation Verification Home

Welcome to the National Weather Service aviation verification section of the website. Below are the different performance.

Terminal Aerodrome Forecast (TAF) Verification

- [Stats on Demand Interface](#)
 - Data available: October 2005 - present
- [Stats on Demand Training](#) - coming soon
- [Stats on Demand FAQs](#)
 - [Interview with: Chuck Kluepfel on TAF Verification - Past and Future](#)
- [Verification Instructions \(pdf\)](#)
- [Verification Sites List](#)
- Quality Control Documents
 - [METAR](#)
- [Training: Interpreting TAF Verification Statistics: Impact of TEMPO Forecasts](#)

Main page

To End Date

Selection area set to WFOs.

Filter [\[?\]](#) None

Select [\[?\]](#) WFO Current Selections

DVN	<input type="button" value="Add"/> <input type="button" value="Remove"/> <input type="button" value="Clear"/>	<input type="text" value="FFC"/>
EAX		
EKA		
EPZ		
EWX		
FFC		

Element Type

Forecast Type

Guidance Type

TAF Type Scheduled Amended Scheduled and amended combined

TAF Begin Times 0000-0559 0600-1159 1200-1759 1800-2359 Select All

Forecast Projections >0 - 3 >3 - 6 >6 - 9 >9 - 12 >12 - 18 >18 - 24 >24 - 30 Select All

Email Option [\[?\]](#) Email me when the report is finished

Reports may take several minutes to create. Criteria should be small and limited.

Management interface

Report Page

Element	Significant Weather Type
TAF Type	Operational Impact (Scheduled Only)
Date Range	05/01/2009 TO 05/30/2009
WFOs	FFC
Cycle Times	0000Z, 0600Z
Projections	>0 - 3, >3 - 6
Report Format	Hours Minutes Percent Frequency

TAF (OPERATIONAL IMPACT) ELEMENTS

OBS\FORECASTS		FORECASTS		POD = 0.421 FAR = 0.792 CSI = 0.162
		YES	NO	
OBS	YES	58.08	79.75	
	NO	221.00	1,784.42	

OBS\FORECASTS		FORECASTS		POD = --- FAR = 1.000 CSI = 0.000
		YES	NO	
OBS	YES	0.00	0.00	
	NO	138.00	2,005.25	

OBS\FORECASTS		FORECASTS		POD = 0.000 FAR = --- CSI = 0.000
		YES	NO	
OBS	YES	0.00	1.00	
	NO	0.00	2,142.25	

OBS\FORECASTS		FORECASTS		POD = --- FAR = --- CSI = ---
		YES	NO	
OBS	YES	0.00	0.00	
	NO	0.00	2,143.25	

Weather types...dust is included as well.

FOG / MIST				
OBS\FORECASTS		FORECASTS		POD = 0.539
		YES	NO	
OBS	YES	157.75	135.17	FAR = 0.681
	NO	336.25	1,514.08	CSI = 0.251

HAZE / SMOKE				
OBS\FORECASTS		FORECASTS		POD = ---
		YES	NO	
OBS	YES	0.00	0.00	FAR = 1.000
	NO	14.33	2,128.92	CSI = 0.000

THUNDERSTORM				
OBS\FORECASTS		FORECASTS		POD = 0.416
		YES	NO	
OBS	YES	11.00	15.42	FAR = 0.810
	NO	46.75	1,674.58	CSI = 0.150

HAIL				
OBS\FORECASTS		FORECASTS		POD = ---
		YES	NO	
OBS	YES	0.00	0.00	FAR = ---
	NO	0.00	2,143.25	CSI = ---

SQUALLS				
OBS\FORECASTS		FORECASTS		POD = ---
		YES	NO	
OBS	YES	0.00	0.00	FAR = ---
	NO	0.00	2,143.25	CSI = ---

BLOWING SNOW				
OBS\FORECASTS		FORECASTS		POD = ---
		YES	NO	
OBS	YES	0.00	0.00	FAR = ---
	NO	0.00	2,143.25	CSI = ---

BLOWING SPRAY				
OBS\FORECASTS		FORECASTS		POD = ---
		YES	NO	
OBS	YES	0.00	0.00	FAR = ---
	NO	0.00	2,143.25	CSI = ---

VOLCANIC ASH				
OBS\FORECASTS		FORECASTS		POD = ---
		YES	NO	
OBS	YES	0.00	0.00	FAR = ---
	NO	0.00	2,143.25	CSI = ---

PERFORMANCE MANAGEMENT

Aviation Verification

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Home >> Performance Management >> Verification >> Aviation

Report Page

Element	Flight Category
TAF Type	Operational Impact (Scheduled Only)
Guidance Type	GFS MOS
Date Range	01/01/2009 TO 01/31/2009
WFOs	PBZ
Ceiling Threshold	1000 FEET
Visibility Threshold	3 MILE
Cycle Times	0000Z, 0600Z
Projections	>0 - 3, >3 - 6
Report Format	Hours Minutes Percent Frequency Toggle Legend

Hits (green)	Near Hits (olive)	Near Misses (yellow)	Misses (orange)	Total Misses (red)
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TAF (OPERATIONAL IMPACT) CONTINGENCY TABLE

OBS\FORECASTS	VLIFR	LIFR	IFR	MVFR	VFR	TOTAL
VLIFR	138	245	85	0	0	468
LIFR	13	704	677	23	11	1,428
IFR	114	430	2,173	1,303	349	4,369
MVFR	23	345	1,840	6,818	1,485	10,511
VFR	0	0	785	3,302	12,062	16,149
TOTAL	288	1,724	5,560	11,446	13,907	32,925
BIAS	0.615	1.207	1.273	1.089	0.861	----

GFS MOS CONTINGENCY TABLE

OBS\FORECASTS	VLIFR	LIFR	IFR	MVFR	VFR	TOTAL
VLIFR	196	187	85	0	0	468
LIFR	455	476	382	44	71	1,428
IFR	496	299	1,175	1,629	770	4,369
MVFR	316	290	1,647	6,040	2,218	10,511
VFR	76	150	650	3,756	11,517	16,149
TOTAL	1,539	1,402	3,939	11,469	14,576	32,925
BIAS	3.288	0.982	0.902	1.091	0.903	----

TAF (OPERATIONAL IMPACT) VS GFS MOS

TAF Better Than GFS MOS (TAF > GFS MOS)	7,986	(24.3)
TAF Worse Than GFS MOS (TAF < GFS MOS)	4,873	(14.8)
TAF = GFS MOS = OBS	15,236	(46.3)
TAF = GFS MOS <> OBS	4,830	(14.7)

5x5 CONTINGENCY TABLE SCORES TAF (OPERATIONAL IMPACT) / GFS MOS

Percent Hits	66.5 / 58.9
Percent >1 Category Errors	5.3 / 9.0

Ceiling and
Visibility
tables

Peirce Skill Score (PSS)	0.505 / 0.380
% Improvement TAF PSS over GFS MDS	32.7

4x4 CONTINGENCY TABLE SCORES (Combine VLIFR & LIFR) TAF (OPERATIONAL IMPACT) / GFS MOS

Percent Hits	67.3 / 60.9
Percent >1 Category Errors	4.7 / 7.2
Peirce Skill Score (PSS)	0.516 / 0.408
% Improvement TAF PSS over GFS MDS	26.7

POD/FAR/CSI SCORES TAF (OPERATIONAL IMPACT) / GFS MOS

Scores/flight Category	LIFR	IFR	M/FR	VFR	VLIFR	LIFR & Below	IFR & Below
Probability of Detection	0.493 / 0.333	0.497 / 0.269	0.649 / 0.575	0.747 / 0.713	0.295 / 0.419	0.580 / 0.693	0.731 / 0.599
False Alarm Ratio	0.592 / 0.660	0.609 / 0.702	0.404 / 0.473	0.133 / 0.210	0.521 / 0.873	0.453 / 0.553	0.395 / 0.455
Critical Success Index	0.288 / 0.202	0.280 / 0.165	0.450 / 0.379	0.670 / 0.600	0.223 / 0.108	0.392 / 0.373	0.495 / 0.399
% Improvement TAF CSI over GFS MDS	42.2	70.1	18.9	11.8	106.3	5.0	23.9

CRITICAL THRESHOLD DATA 2x2 CONTINGENCY TABLES

TAF (OPERATIONAL IMPACT)

OBS\FORECASTS	CIG <1000 or VIS <3	CIG >=1000 and VIS >=3	Total
CIG <1000 or VIS <3	4,579	1,686	6,265
CIG >=1000 and VIS >=3	2,993	23,667	26,660
Total	7,572	25,353	32,925

POD (CIG < 1000 or VIS < 3)	0.731
FAR (CIG < 1000 or VIS < 3)	0.395
CSI (CIG < 1000 or VIS < 3)	0.495

GFS MOS

OBS\FORECASTS	CIG <1000 or VIS <3	CIG >=1000 and VIS >=3	Total
CIG <1000 or VIS <3	3,751	2,514	6,265
CIG >=1000 and VIS >=3	3,129	23,531	26,660
Total	6,880	26,045	32,925

POD (CIG < 1000 or VIS < 3)	0.599
FAR (CIG < 1000 or VIS < 3)	0.455
CSI (CIG < 1000 or VIS < 3)	0.399

Profile Of Data Used For This Report

Scheduled Forecasts Analyzed	558
Total 5-Minute Intervals	32,925 / 40,176 (82.0 %)
Discarded 5-Minute Intervals	0
Missing 5-Minute Intervals	4,194
5-Minute Intervals Missing Forecasts	0
5-Minute Intervals Missing Observations	4,194
5-Minute Intervals Missing Guidance	0

- [View Problematic Metars](#)
- [View Forecasts](#)

NOTE: All data is subject to modification
[Problems, Questions, or Comments?](#)

APPENDIX B

A brief overview of Stats on Demand (SOD)

TAF Verification: This *Stats on Demand* program is the official NWS TAF verification tool. TAFs are evaluated every five minutes, twelve times per hour or 288 times for an entire 24-hour TAF. The 5-minute interval times end in either a "0" or "5". Forecast conditions at the end of each 5-minute interval are matched with the most recently reported METAR/SPECI, and each element (e.g., ceiling) is verified separately. Routine hourly METARs that do not report just before the hour are assumed to be missing, and all 5-minute verification intervals following that scheduled METAR are discarded as missing until a new METAR or SPECI is reported.

The user of Stats on Demand also specifies one of the following options concerning scheduled and amended TAFs: (a) verify scheduled TAFs only, (b) verify amended TAFs only, or (c) verify scheduled and amended TAFs.

Most verification statistics are computed from categorical contingency tables of forecasts versus observations for TAFs and the user-selected guidance product. Since forecasts are evaluated every 5 minutes, the contingency tables usually contain twelve entries per hour per verification site. However, the user of *Stats on Demand* can request that contingency table entries be given as the number of 5-minute intervals (frequency), number of hours, number of minutes, or percent of the contingency table total. Forecast categories for each element are defined in section.

Projections: Scheduled TAFs are issued and verified for projections of 24 hours beyond the initial valid time of the most recent scheduled TAF. For verification purposes, projections are defined from the initial valid time of the TAF, which is 0000, 0600, 1200, or 1800 UTC for scheduled TAFs and the issuance time for amendments.

- Greater than zero to 3 hours.
- Greater than 3 to 6 hours.
- Greater than 3 to 6 hours.
- Greater than 6 to 9 hours.
- Greater than 9 to 12 hours.
- Greater than 12 to 18 hours.

- END -