International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)
Tenth Meeting of the GREPECAS Aeronautical Meteorology Subgroup (AERMETSG/10)
Buenos Aires, Argentina, 19 to 23 October 2009

Agenda Item 5: Exchange of OPMET Information

CLIMATOLOGY TO BUILD A BETTER TAF

(Presented by the United States of America)

SUMMARY

Climatology can be useful when preparing a Aerodrome Forecast (TAF) from the perspective of a new forecaster, an experienced forecaster, and for numeric forecasts. This paper briefly highlights the program used by the United States (US) and provides information on how to obtain the software for interested States

1. Introduction

1.1 Since 2003, the US has been working with Weather Forecast Offices (WFOs) to build an intuitive application that allows forecasters to use climatology to write a better TAF using statistics as a guide. The basis for this application goes back to the 1960's and 1970's when some States used paper tables prepared from their observational climatological databases. These tables gave the aeronautical meteorologist an idea of when the weather might trend up or stay the same over a period of hours. These tables where known as Conditional Climatological tables, or CC tables.

1.2 The Aviation Forecast Prep Software (AVNFPS) is the standard forecaster production platform used by the National Weather Service in preparing and monitoring TAFs. A portion of this software application uses conditional climatology to help the forecaster ascertain how good a TAF is. The following is a review of the application, with examples.

2. Discussion

2.1 The value inherent in Conditional Climatology

2.1.1 Conditional climatology is not a universal solution for forecasting, rather it provides value added information or insight to the forecasters on the probability of an event. Its greatest asset is that it helps to ensure that a new forecaster avoids common sense errors in their TAFs. For example, the

use of statistics can advise the forecaster that the probability that certain ranges of ceiling/visibility are unlikely with certain wind directions. Similarly, that same situation could be associated with low clouds and visibility overspreading a station. The use of a climatological database is a decision support aid that a forecaster can use to understand the probability at a given time of the year (i.e. sunrise or early in the morning) that an expected condition will linger for several more hours longer than the forecaster initially anticipated.

2.2 Adding value to the forecast production process

2.2.1 It is from this perspective that the AVNFPS climatology program adds value to the TAF production process. The aviation meteorologist can go through a, "what if scenario" for a given wind direction. For example, the forecaster anticipates a wind change from east to west in two hours and the aerodrome they are forecasting for is currently on Instrument Flight Rules (IFR). The question that is asked, "How quickly does the condition being observed clear with a wind shift?" Climatology is a powerful tool that the forecaster can use to improve the TAF of when events are expected to change both favorably and unfavorably.

2.2.2 Also, the use of climatology aids in Quality Control (QC). It can be used to advise the forecaster of the number of times the forecasted event has occurred over the past 30 years. In other words, how often has a particular combination of wind/weather/visibility and ceiling forecasted in a TAF occurred. For example, a forecaster has a TAF line that reads 33007KT 2SM BR OVC003. The forecast period is for a given month/location during the early afternoon. The QC function may advise the forecaster that in the past 30 years that particular combination occurred only twice. This advisory to the forecaster in essence makes the forecaster think twice about the forecast for these conditions to ensure that the event expected has a high likelihood of occurring given the understanding that statistically the event has occurred very infrequently with the known conditions.

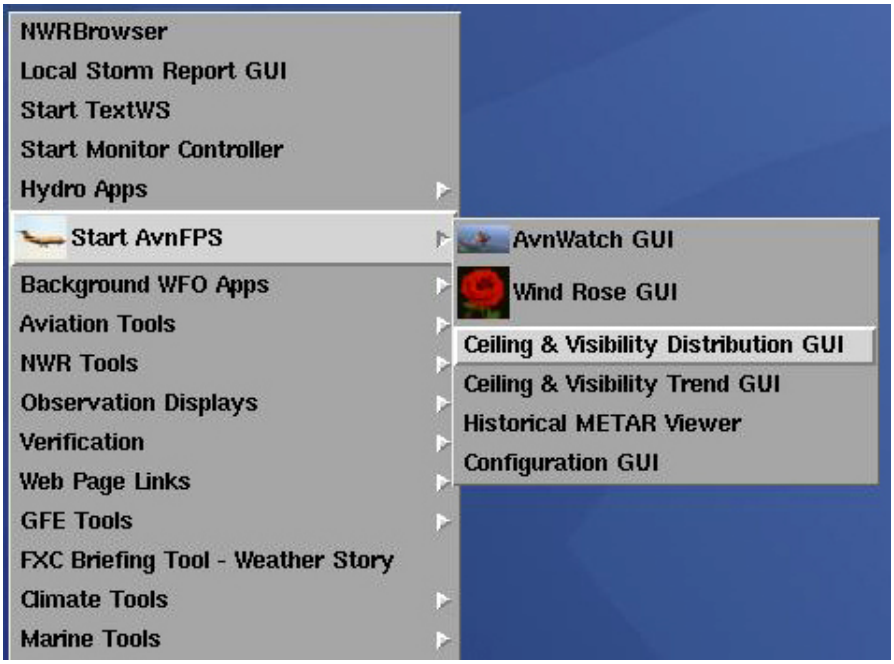
2.3 Some examples and comments

- Aviation Climatology is a database of observations for a given TAF site; the database contains Ceiling, Visibility, Wind Speed and Wind Direction and weather data for every day and hour for the past 30 years. At selected sites there is not a 30 year record.

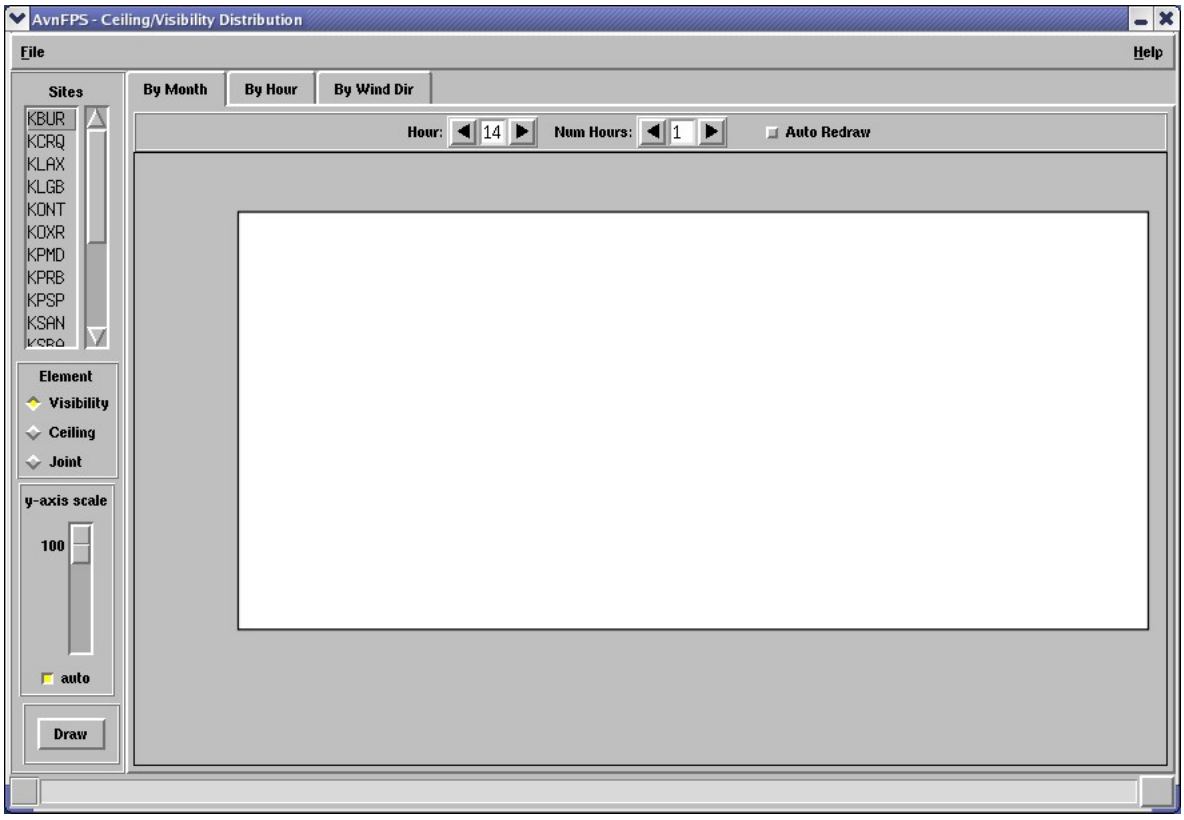
- Given a fairly normal climatological day, climatology is probably the best forecast tool for ceiling and visibility changes. For any given ceiling and visibility, AVNFPS climatology will produce a cig/vis forecast for the next one (1) to six (6) hours.

- There are some limitations to this program. It is assumed that the day has to be normal. There has to be low ceiling (040 AGL or less) or a low visibility (5SM or less). It does not predict good flying weather turning to bad flying weather. It does, however, predict, bad weather getting worse…or trending better.

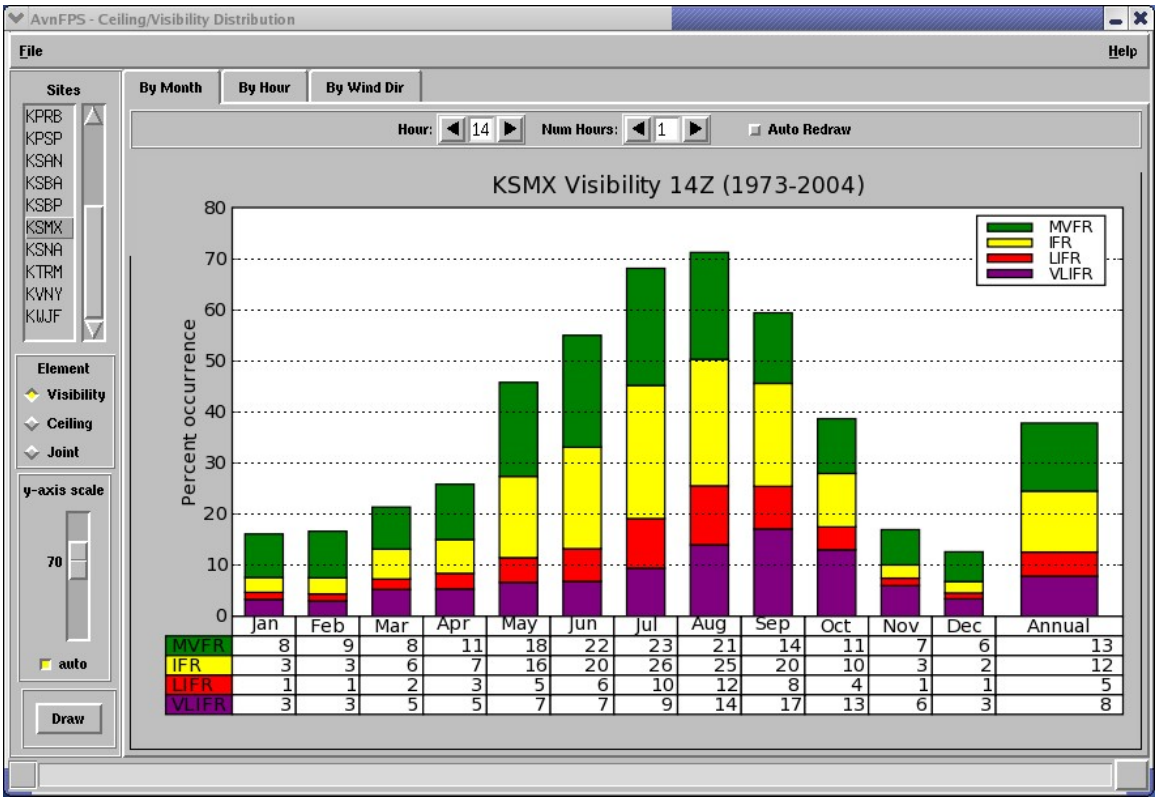
- AVNFPS consists of two programs: Ceiling and Visibility Distribution, which determines how normal the day is and Ceiling and Visibility Trend to forecasts changes in Cig and Vis based on current conditions and climatology.



Start Menu

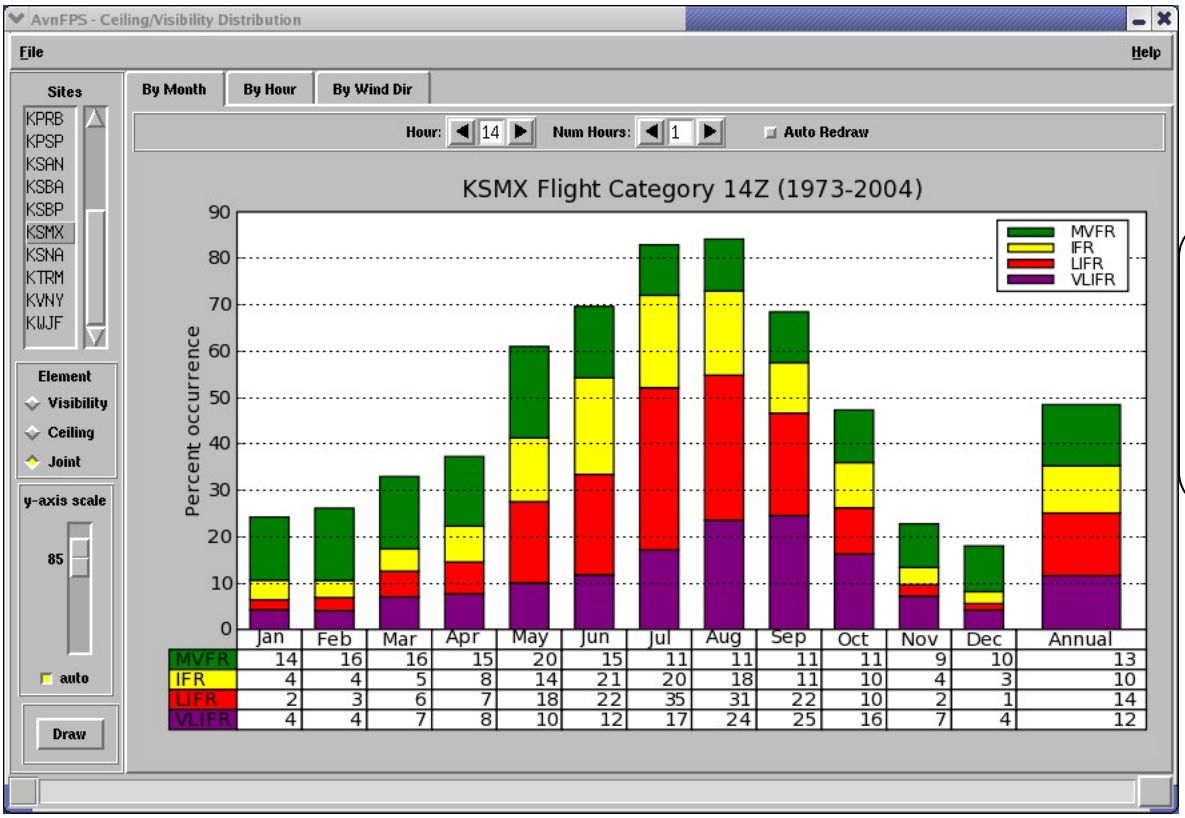


Option Menu



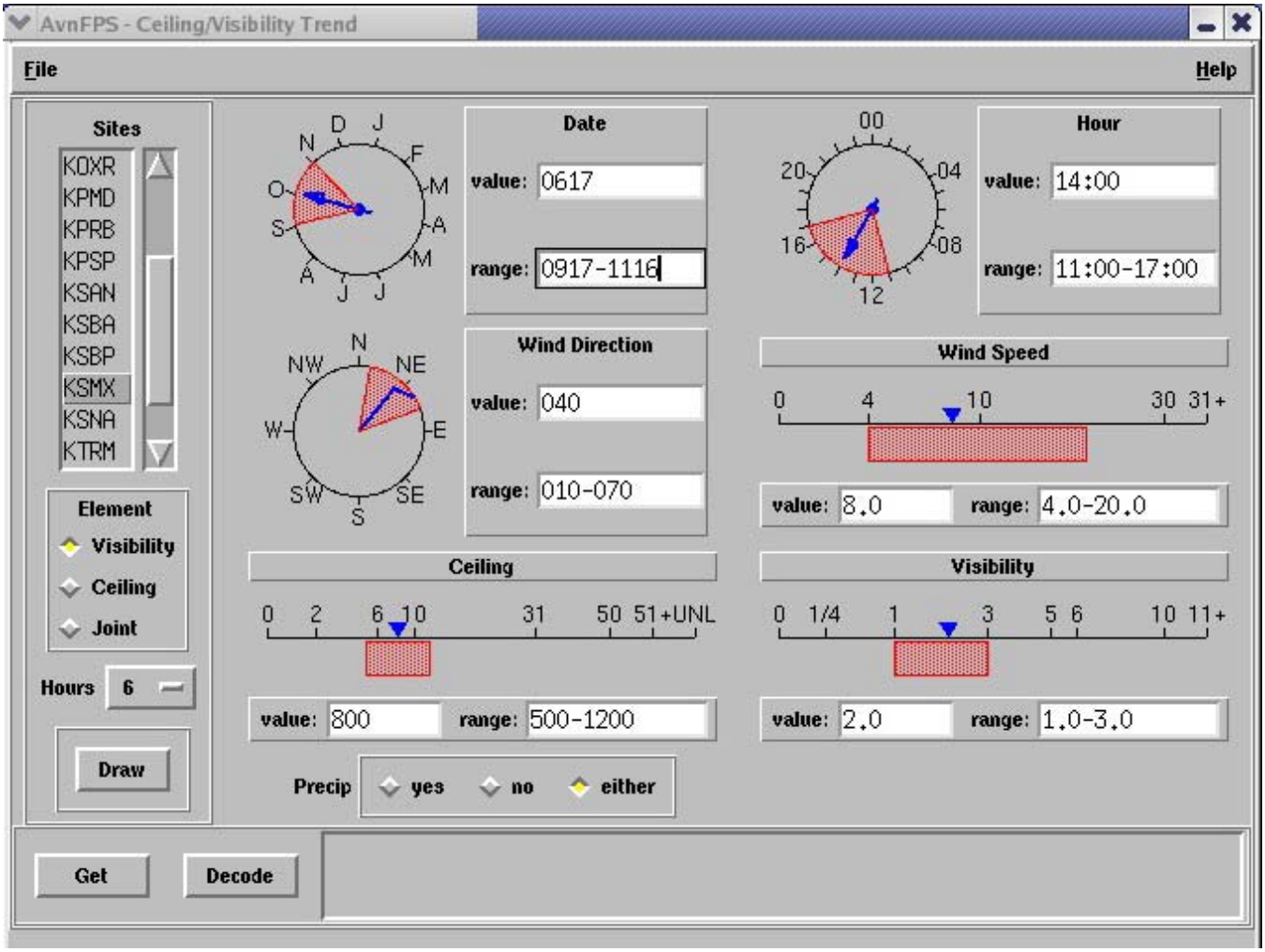
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
MVFR	8	9	8	11	18	22	23	21	14	11	7	6	13
IFR	3	3	6	7	16	20	26	25	20	10	3	2	12
LIFR	1	1	2	3	5	6	10	12	8	4	1	1	5
VLIFR	3	3	5	5	7	7	9	14	17	13	6	3	8

Ceiling and Visibility Distribution for Visibility



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
MVFR	14	16	16	15	20	15	11	11	11	11	9	10	13
IFR	4	4	5	8	14	21	20	18	11	10	4	3	10
LIFR	2	3	6	7	18	22	35	31	22	10	2	1	14
VLIFR	4	4	7	8	10	12	17	24	25	16	7	4	12

Ceiling and Visibility Distribution for Joint Ceiling and Visibility



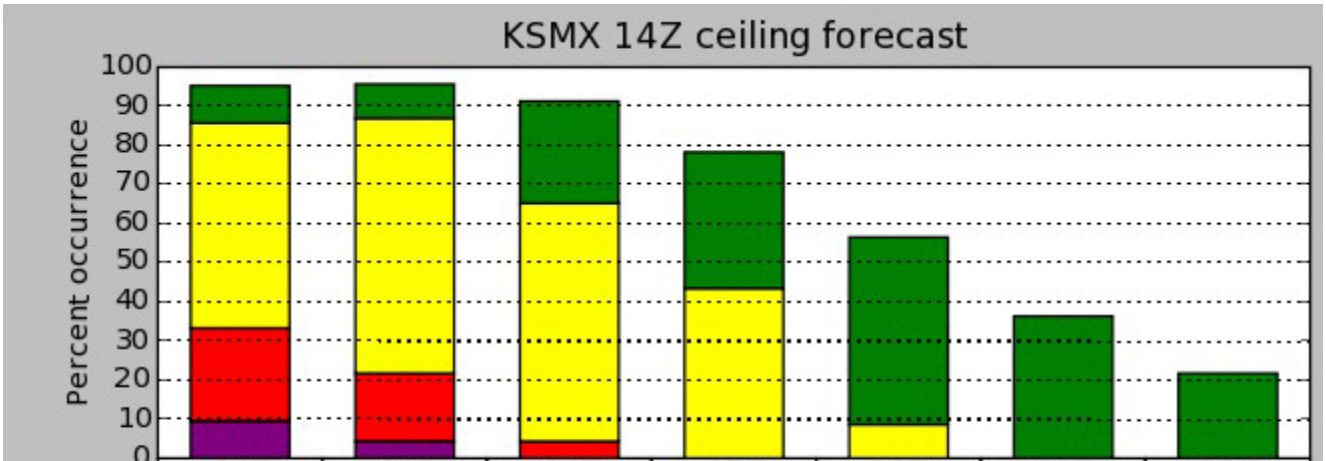
This view allows the forecaster to take the current observation or add some fudge factors to add more data. For example instead of one wind direction and speed, the Aviation Meteorologist could open the window to allow a wind directions from the east and plus or minus 15 degrees on either side. Or rather than just one wind speed, the forecaster may have a range from 5 to 10.

Ceiling and Visibility Trend Results…Cig Only – VFR is inferred

- A great forecast tool when properly used.
- Best for predicting burn off or changes to a pre-existing ceiling or fog obscuration
- Works best during normal conditions
  – Count refers to total data points

Some words of caution…Aviation Climatology gives very little information on arrival times of lower flying conditions

- Aviation Climatology does not make wind predictions



	14Z	15Z	16Z	17Z	18Z	19Z	20Z
MVFR	10	9	26	35	48	36	22
IFR	52	65	61	43	9	0	0
LIFR	24	17	4	0	0	0	0
VLIFR	10	4	0	0	0	0	0
COUNT	21	23	23	23	23	22	23

3. **Conclusion**

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

3.2 The software application is known as AVNFPS and more information can be found at http://www.nws.noaa.gov/mdl/pgb/AvnFPS/OB9/html/index.html

3.3 States can obtain the software at no cost, and modify for their own operations.

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