

WIVIS Weather Identifier and Visibility Sensor

Visibility Test Report

Based on Tests Conducted at
Sterling Test and Evaluation Branch
National Weather Service

October 1997

1. INTRODUCTION

This report describes the results of the testing of the visibility portion of the OSi Weather Identifier and Visibility Sensor (WIVIS). The first test was conducted from late December 1993 to early February 1994. The second test was conducted from December 1996 to May 1997. The purpose of the tests was to validate the WIVIS visibility measurement against recognized NWS standards in different weather conditions. Data was presented which compare the WIVIS visibility to the average of ASOS approved standard visibility sensors. This report only addresses the WIVIS performance when the visibility was 10 miles or less.

2. TEST APPROACH

The tests were conducted at the NWS Test and Evaluation Branch in Sterling Virginia. The sensors were installed in late December 1993. Tests were conducted in typical winter conditions of rain, snow, and fog events. The median values of visibility measurements from NWS standard visibility sensors were used to compare with the WIVIS results. The standard visibility sensors are a visible light (xenon) based forward scatter sensors. They have been tested extensively for more than 5 years at Sterling against 2 sets of transmissometer standards.

Sterling maintains several fully instrumented test beds for sensor test and comparison to recognized standards. For this test the sensors were not collocated. WIVIS sensors were located in the present weather test bed located west of building 16. The NWS standard visibility sensor used for comparison purposes was located in the visibility sensor test bed approximately 1000 feet (.2 mile) southwest of building 16. In addition to the horizontal separation, the sensors were also installed at different heights. The NWS standard visibility sensors were installed at ~4 meters high while the WIVIS was located ~2 meters high. These differences in siting are significant, especially because of the spatial and temporal nature of precipitation and fog. To help overcome these differences, data from both the WIVIS and NWS standard visibility sensors have been analyzed using a 10-minute running average.

3. TEST 1 RESULTS

A detailed analysis of four significant low visibility events was performed to better quantify WIVIS performance in poor weather conditions. During the test period there were four (4) significant low visibility events where the visibility was below 10 miles. Overall, the WIVIS performance was excellent with an average correlation coefficient **94.24%** as shown in the table below:

DATE / TIME	EVENT	VISIBILITY	TEMPERATURE	WIVIS vs NWS CORR. COEFF.
01/13/94 00:00 - 01/13/94 12:00	Ice Fog	0.04 – 4 mile 0.06 – 6 km	25 – 35 F -4 – 2 C	91.06%
01/13/94 12:00 - 01/14/94 12:00	Fog	0.07 - 8 mile 0.11 – 13 km	30 – 40 F -1 – 5 C	94.03%
01/25/94 17:00 - 01/26/94 05:00	Light Snow	0.15 – 7 mile 0.24 – 11 km	35 – 45 F 2 – 7 C	96.80%
01/28/94 14:00 - 01/29/94 02:00	Fog	0.1 – 10 mile 0.15 – 16 km	30 – 40 F -1 – 5 C	95.05%
TOTAL		0.04 – 10 mile 0.06 – 16 km	25 – 45 F -4 – 7 C	94.24%

4. TEST 2 RESULTS

A detailed analysis of the seventeen (17) visibility events were performed to better quantify WIVIS performance in different weather conditions. During the test period there were seventeen (17) visibility events where the visibility was below 10 miles. Overall, the WIVIS performance was excellent with an average correlation coefficient **93.01%** as shown in the table below.

5. CONCLUSIONS

The scattering graphs (not shown) indicated that the WIVIS and the NWS standard are highly correlated and exhibit an almost perfect 1:1 slope. The correlation of the WIVIS and the NWS standard would be further improved by collocation of the WIVIS and the NWS standard.

DATE / TIME	EVENT	VISIBILITY	TEMPERATURE	WIVIS vs NWS CORR. COEFF.
01/02/97 00:00 - 01/02/97 12:00	Haze	2.0 – 10 mile 3.0 – 16 km	30 – 50 F -1 – 10 C	93.73%
01/04/97 22:00 - 01/05/97 10:00	Fog	0.15 - 10 mile 0.24 – 16 km	45 – 60 F 8 – 15 C	90.13%
01/09/97 05:00 - 01/09/97 17:00	Light Snow	0.2 – 10 mile 0.3 – 16 km	25 – 35 F -4 – 2 C	86.96%
01/10/97 16:00 - 01/11/97 04:00	Snow	0.15 – 10 mile 0.24 – 16 km	25 – 40 F -4 – 5 C	98.91%
01/22/97 22:00 - 01/23/97 10:00	Fog	0.05 – 10 mile 0.08 – 16 km	15 – 55 F -9 – 13 C	88.00%
02/01/97 02:00 - 02/01/97 14:00	Fog	0.25 – 10 mile 0.4 – 16 km	30 – 60 F -1 – 15 C	94.48%
02/04/97 12:00 - 02/05/97 00:00	Ice Pellet & Rain	0.3 – 10 mile 0.5 – 16 km	35 – 40 F 2 – 5 C	96.28%
02/08/97 00:00 - 02/09/97 00:00	Snow	0.2 – 10 mile 0.3 – 16 mile	25 – 40 F -4 – 5 C	95.37%
02/14/97 20:00 - 02/15/97 08:00	Rain	0.2 – 10 mile 0.3 – 16 km	20 – 40 F -1 – 5 C	92.62%
03/01/97 04:00 - 03/01/97 16:00	Rain	0.4 – 10 mile 0.8 – 16 mile	40 – 55 F 5 – 13 C	91.37%
03/03/97 22:00 - 03/04/97 10:00	Haze	1.0 – 7 mile 1.6 – 11 km	35 – 40 F 2 – 5 C	95.73%
03/05/97 14:00 - 03/06/97 02:00	Freezing Rain & Fog	0.2 – 8 mile 0.3 – 13 km	20 – 40 F -7 – 5 C	95.79%
03/14/97 14:00 - 03/15/97 02:00	Mist	0.9 – 10 mile 1.4 – 16 km	40 – 50 F 5 – 10 C	91.91%
03/19/00 02:00 - 03/19/00 14:00	Rain & Snow	0.5 – 8 mile 0.8 – 13 km	30 – 45 F -1 – 8 C	95.30%
04/21/97 22:00 - 04/22/97 10:00	Fog	0.08 – 10 mile 0.13 – 16 km	50 – 55 F 10 – 13 C	91.90%
04/23/97 20:00 - 04/24/97 08:00	Drizzle	3.0 – 10 mile 4.8 – 16 km	40 – 50 F 5 – 10 C	91.79%
05/09/97 02:00 - 05/09/97 14:00	Fog & Rain	0.03 – 10 mile 0.05 – 16 km	30 – 65 F -1 – 18 C	91.00%
TOTAL		0.03 – 10 mile 0.05 – 16 km	15 – 65 F -9 – 18 C	93.01%