



Preparedness Directorate
Office of Grants and Training

Summary



The U.S. Department of Homeland Security, Preparedness Directorate, Office of Grants and Training (G&T) established the System Assessment and Validation for Emergency Responders (SAVER) Program to assist emergency responders in performing their duties. The mission of the SAVER Program is to

- Provide impartial, practitioner relevant, and operationally oriented assessments and validations of emergency responder equipment.
- Provide information that enables decision-makers and responders to better select, procure, use, and maintain emergency responder equipment.
- Assess and validate the performance of products within a system, as well as systems within systems.
- Provide information and feedback to the user community through a well-maintained, Web-based database.

The SAVER Program established and is supported by a network of technical agents who perform the actual assessment and validation activities. Further, SAVER focuses primarily on two main questions for the emergency responder community, “What equipment is available?” and “How does it perform?”

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The Portable Weather Stations Analysis Report

The objective of the portable weather stations (PWS) assessment project was to evaluate and assess the comparative parameters of six wireless PWS systems used by emergency responders in the warm or cold zones of a hazardous materials (hazmat) release. Subject matter experts (SMEs) from the emergency-response community, who have hazmat operations or higher level of training and previous PWS training and experience, were used to evaluate and assess the selected PWS. The assessment included a scenario driven field assessment of PWS systems to provide emergency responders with reference information on currently available technologies, capabilities, limitations, and usability.

The PWS assessment project provides the emergency response community with comparative information on six wireless PWS used by emergency responders to conduct more accurate hazard analyses, which aid in determining safe response actions and enhancing public safety. A PWS system supplies precise weather information to plume modeling software, enabling the computer programs to graphically display a chemical plume prediction for the hazmat incident. This capability provides important information for establishing exclusion zones,



Columbia Display Console

determining personnel deployment, and deciding whether to evacuate or shelter-in-place.

The Center for Domestic Preparedness (CDP) conducted the comparative assessment on PWS systems from February 13 through February 15, 2006, at the CDP in Aniston, Alabama. The assessment scenarios were developed using a scenario selected from the Homeland Security Council National Planning Scenarios and tasks recommended by the PWS focus group. The assessment scenarios consisted of four activities: sensor and display setup (figure 1), data collection (figure 2), disassembly (figure 3), and repackaging (figure 4).

This is a summary of the contents of the PWS analysis report. The report should be viewed for the full discussion and recommendations. The complete report can be found on the SAVER Web site (<https://saver.fema.gov>).

The PWS Systems

The PWS systems that were included in the assessment were selected based on the primary criterion that the downselect process should eliminate stations requiring a setup time of more than 75 minutes and those PWS whose

advertised line-of-sight communication range was less than 1,000 feet. Stations with no moving parts were considered as well as those with vehicle-mount capabilities. Six PWS systems were assessed representing five manufacturers.

- Coastal Environmental WEATHERPAK 400 MTR
- RainWise HM 1 HazMat
- Climatronics TACMET II HazMat Station
- Columbia Pegasus-EX FlyAway Kit
- Columbia Orion Nomad
- WeatherHawk 916

Assessment Results

The rating system used by the CDP in the PWS assessment is based on a 100 point scale. Higher scores indicate better PWS performance. In the tests that were conducted, the WEATHERPAK system rated highest. Overall, all of the PWS systems but one rated fairly close to each other with scores ranging between 79.3 and 74.6 out of 100 overall. The WeatherHawk scored the least with 58.9. These results are shown in table 1. Figure 5, the SAVER QuickLook chart, provides a graphical representation of the results. The QuickLook chart for the PWS assessment is available on the SAVER Web site.

PWS System/Category	Overall	Affordability	Capability	Deployability	Maintainability	Usability
WEATHERPAK	79.3	7.1	24.1	16.3	6.6	25.2
HM-1 HazMat	76.8	6.9	23.8	16.7	6.2	23.2
TACMET II	76.6	6.8	23.9	16.8	6.6	22.4
Pegasus-EX	75.3	7.0	23.6	15.1	6.7	22.9
Orion	74.6	7.0	23.5	15.0	5.9	23.2
WeatherHawk	58.9	6.5	17.4	11.8	5.0	18.2

Table 1: Overall weighted category scores.

Evaluators' comments

Evaluators compared the features of the individual PWS and evaluated both common and unique components of each system. During the assessment, each evaluator scored all six PWS and provided positive and negative observations and opinions based on the five SAVER categories: capability, usability, affordability, deployability, and maintainability. Examples of the evaluators' comments are included below.

The evaluators were able to assemble the **WEATHERPAK** sensor platform within three minutes. There were no wires or pinch points with this station, and its wide tripod seemed to make the system stable. Wind speed and barometric pressure were detected quickly after setup, the data was easily received and interpreted, the console was easy to read, and it included a global positioning system.

However, the system took as long as ten minutes for the temperature readings to stabilize.

Evaluators commented that the **HM-1 HazMat** data transmission was uninterrupted from the sensor platform to the transceiver, even with minor obstructions in the transmission path. Evaluators also noted that the light emitting diode readout was well-designed for easy reading. Still, although a tie down kit and hammer were included, evaluators commented that the tie down kit and tripod connection appeared to be poorly designed. This system did not appear to be stable and the tie down system was not secure.

The **TACMET II**'s tie down kit was easy to use, even though instructions were not included. However, evaluators commented that this system might be blown over in high winds because of the narrow tripod base, even with the



Figure 1: Sensor and Display Setup



Figure 2: Data Collection



Figure 3: Disassembly



Figure 4: Repackaging

use of the tie down kit. Also, the tripod case was cumbersome and awkward for one responder to carry, thus requiring two for easier transport and assembly of the system. However, evaluators noted that two rechargeable batteries and a charging system were included with the TACMET II system.

With the **Pegasus-EX** system, two transceivers were required in order to use the display console and the PC creating some confusion with the power source connections. The power supplies for the display console and transceivers needed different connections to prevent confusion. But Columbia Weather Systems WeatherMaster 2000 software was included, which allowed multiple stations to be monitored through a wireless link. This system can interface with ALOHA and other plume modeling software. Columbia also included a two-year warranty with this system. Due to the system containing some moving parts, it should be returned to the manufacturer for all maintenance and repairs.

With the **Orion**, evaluators were able to obtain readings of temperature, humidity, and barometric pressure in approximately 10 minutes, although wind data was received immediately upon setup. The tripod components including guy wires, mast extension, tie down kit, and hardware assembly caused a more difficult set up of this system than the other Columbia system, Pegasus-EX. The sensor platform took approximately 14 minutes to assemble, but the display console took only about three minutes to set up.

The **WeatherHawk** system was not compatible with plume modeling software, but it was the only system assessed that could be hardwired through an RS232 serial port located on the sensor platform. Evaluators commented that this system seems to be best suited for permanent fixtures or masts even though the mast was made of thin-walled aluminum tubing which could easily bend in high winds. Also, several parts were made of plastic, yet the tripod folding mechanism appeared to be durable. Evaluators noted inclement weather could cause some parts to rust.

Overall Assessment Results

Table 1 lists PWS systems' ratings, on a 100 point scale. These ratings are for the assessments conducted by the CDP, using category weightings that were based on information reported by Subject Matter Experts in a focus group. Ratings for all PWS indicate the WEATHERPAK and HM-1 HazMat had the highest overall ratings followed by the TACMET II, the Pegasus-EX, the Orion, and lastly the WeatherHawk, respectively.

Overall comments indicated that all six of the evaluated PWS would allow emergency responders to successfully collect meteorological information during an emergency response. The "best" system for the job will be dependent upon the responder discipline, jurisdictional budgets, and tasks to be performed.

For Further Information

For complete PWS assessment recommendations, visit the SAVER Web site. All of the CDP's reports pertaining to the PWS assessment can be found on the Web site, along with reports on other technology assessed as part of the SAVER Program.

SAVER is sponsored by the U.S. Department of Homeland Security, Preparedness Directorate, Office of Grants and Training.

For more information on the portable weather stations project please see the SAVER Web site or contact the SAVER Program Support Office.

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Product	SAVER CATEGORIES					Features	Comments
	COMPOSITE	AFFORDABILITY	CAPABILITY	DEPLOYABILITY	MAINTAINABILITY		
  Coastal Environmental WEATHERPAK 400 MTR	★	★	★	★	★	<ul style="list-style-type: none"> • Wind speed • Wind direction • Temperature • Barometric pressure • Relative humidity • Less than 1 minute setup • Internal automatic compass • 30-second data transmission 	\$18,614
  RainWise HM-1 HazMat	★	★	★	★	★	<ul style="list-style-type: none"> • Wind speed • Wind direction • Temperature • Barometric pressure • Relative humidity • 2-minute setup • Nuclear radiation • Dew point 	\$5,680
  Climatronics Corporation TACMET II HazMat Station	★	★	★	★	★	<ul style="list-style-type: none"> • Wind speed • Wind direction • Temperature • Barometric pressure (optional sensor) • Relative humidity • Solar radiation • Spread spectrum radios • Solid-state sensors (no moving parts) 	\$8,575
  Columbia Weather Systems Pegasus EX FlyAway Kit	★	★	★	★	★	<ul style="list-style-type: none"> • Wind speed • Wind direction • Temperature • Barometric pressure • Relative humidity • LCD touch screen display • Wheeled transportation case • Nylon tripod case 	\$6,700
  Columbia Weather Systems Orion Nomad	★	★	★	★	★	<ul style="list-style-type: none"> • Wind speed • Wind direction • Temperature • Barometric pressure • Relative humidity • Precipitation • Dew point • Heat index 	\$7,194
  WeatherHawk 916	★	★	★	★	★	<ul style="list-style-type: none"> • Wind speed • Wind direction • Temperature • Barometric pressure • Relative humidity • Solar radiation • Rainfall • Pre-calibrated sensor set 	\$1,895

Figure 5: SAVER QuickLook chart. The QuickLook chart offers responders a mechanism to select equipment items based on characteristics that are of most importance to their department. Using the QuickLook chart, responders can emphasize and de-emphasize the five SAVER categories to fully refine their search for equipment items.