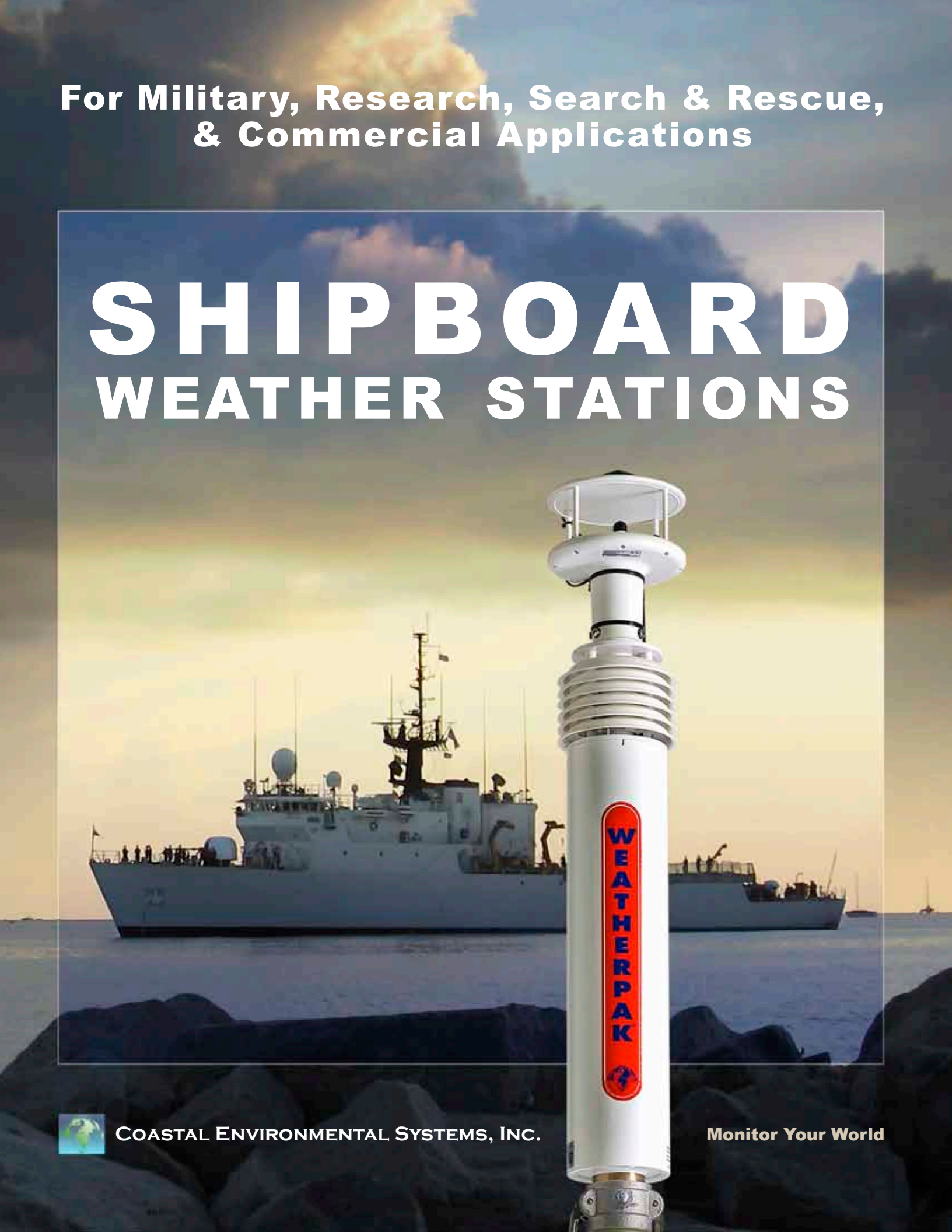
For Military, Research, Search & Rescue, & Commercial Applications

SHIPBOARD WEATHER STATIONS



Coastal Environmental Systems, Inc.

Monitor Your World

Shipboard Systems for Harsh Environments

Relative and True Winds, Single Point and Multiple Points

A shipboard weather station has very special requirements. It must operate in both a harsh and a dirty environment—where salt spray, stack exhaust, high winds, fog and heavy rain are frequent.

Many are also required to calculate ***True*** winds (the wind relative to the Earth's True North) and ***Relative*** winds (winds relative to the ship)

U.S. Navy SEALs' ships use a single point WEATHERPAK®.

when the ship is moving, stationary, drifting or performing some experiment or maneuver.

To defeat these conditions it is necessary to have a completely sealed unit, minimize cables and connectors, and utilize double O-ring seals and metallic components built from 6061-T6 Mil-spec anti-corrosive aluminum. This enclosure should be protected with a baked on thermoplastic resin.

To calculate True North under ***all*** conditions it is necessary to have both GPS and a built-in, no-moving-parts compass (the GPS for while the ship is moving, and the compass for when it is drifting, stationary or in other conditions where the bow is not pointed directly in the direction the ship is moving).

U.S. Coast Guard Buoy Tenders use dual WEATHERPAK®s.

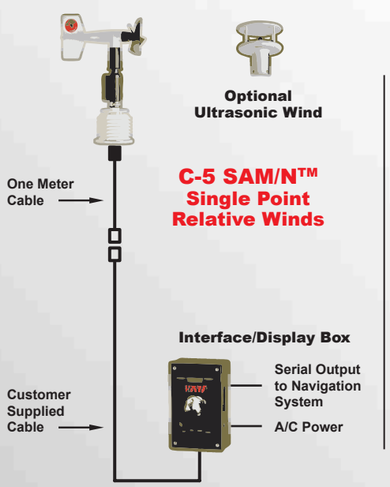
Combine all of these special requirements with 30 years of experience selecting the right sensors to measure and survive under extreme conditions, and the knowledge to feed data to your ship's interfaces, and you have two industry workhorses—Coastal's WEATHERPAK® and C-5 SAM/N™ shipboard weather stations.

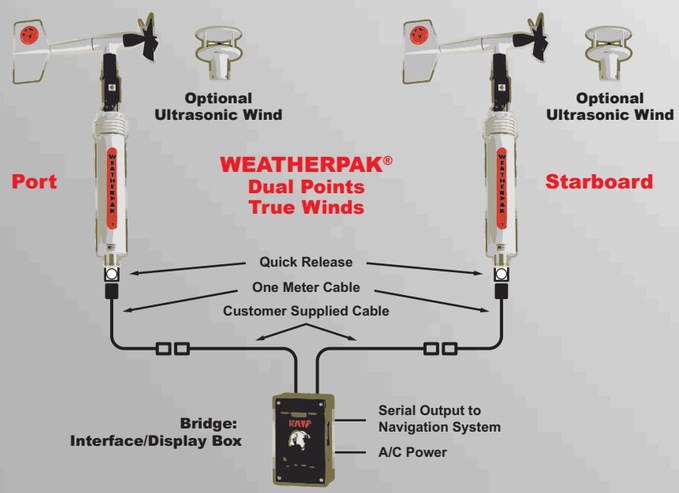
Single-Point

- Coastal single-point systems can be WEATHERPAK® or C-5 SAM/N™
- WEATHERPAK® computes True winds
- No exposed cables
- Multiple displays

Single-Point Components

- Ultrasonic or regular wind monitor
- Relative humidity
- Pressure
- Temperature
- Solar radiation
- Rainfall
- Visibility
- Other sensors
- Display/Repeater
- NMEA 0183





Dual Points

- Two WEATHERPAK®s with two wind monitors
- True winds
- Automatic upwind detection and reporting
- Partial or full duplication of sensors
- Multiple displays

Dual Point Components

- Ultrasonic or regular wind monitors
- GPS/Compass
- Pressure
- Temperature
- Relative humidity
- Solar radiation
- Rainfall
- Visibility
- Other sensors
- Manual override
- Repeaters/NMEA

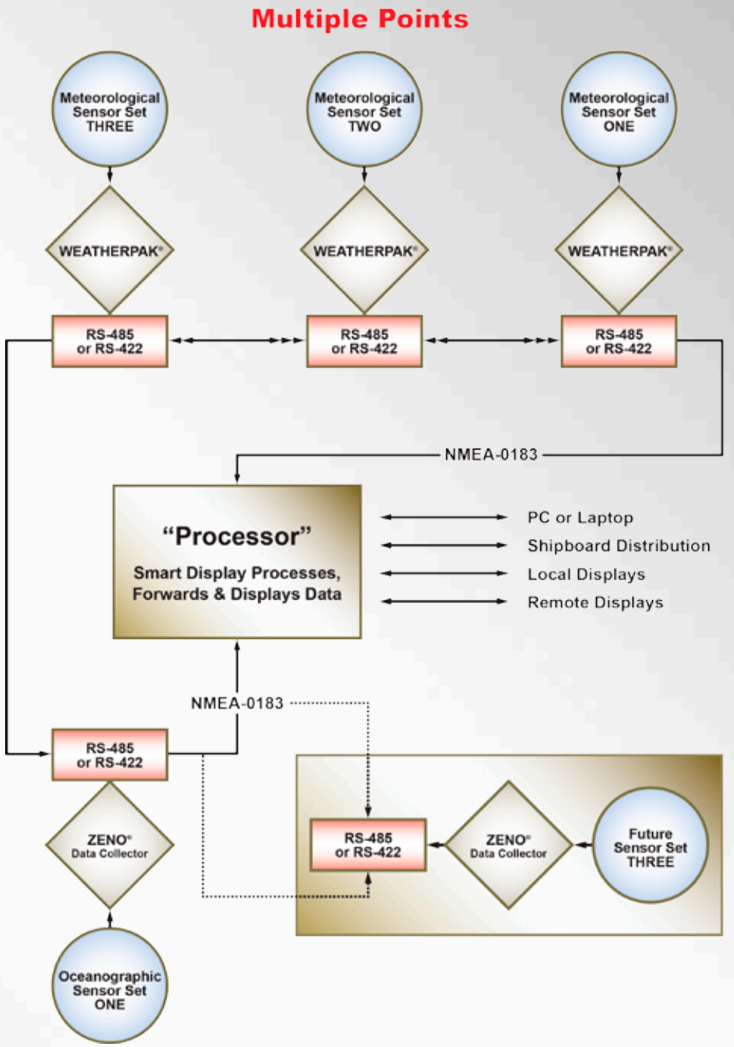
Multiple Points

- Port, starboard and aft WEATHERPAK®s
- True winds
- Automatic upwind detection and reporting
- Sub-surface (below deck) sensors
- Database
- Multiple displays

The U.S. Navy (SMOOS) uses multiple point systems.

Multiple Point Components

- Ultrasonic or regular wind monitors
- GPS/Compass
- Pressure
- Temperature
- Relative humidity
- Solar radiation
- Rainfall
- Visibility
- Other sensors
- Sensors below deck:
  - Water temperature
  - Conductivity
  - Water quality
  - Salinity
  - Other
- Manual override
- Repeaters/NMEA



Which Coastal Shipboard Weather Station is Best for Your Vessel?

WEATHERPAK®

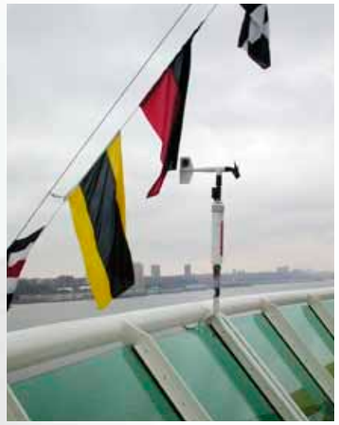
WEATHERPAK® is used on ships that require True wind calculations, both port and starboard wind data, on larger military vessels, and on research vessels.

The WEATHERPAK® shipboard weather station employs a powerful 32-bit microcontroller (ZENO® 3200 datalogger) – affording it sophisticated processing abilities. The WEATHERPAK® is capable of computing True winds from its own independent GPS receiver.

WEATHERPAK® employs its own compass to compute true wind direction. Advanced computing power also allows it to consider both port and starboard systems, to determine which is upwind, correct to true wind, then report that data. It is also powerful enough to communicate with other ships' sensors via RS-232, RS-422 or RS-485.

Unique Features – Physical

- WEATHERPAK® contains ***all*** the standard sensors and eliminates ***all*** cables and ***all*** connectors; (cables and connectors are the weakest point on any marine system)
- WEATHERPAK® is double O-ring sealed; all electronics are protected with this seal; there is ***no*** desiccant to change out or any maintenance!
- WEATHERPAK® external housing is constructed of ***Military-Standard*** 6061-T6 anti-corrosive aluminum
- External housing is coated with a baked-on thermoplastic resin
- A WEATHERPAK® can be removed or replaced in service in less than 60 seconds
- Most sensors can be replaced or removed in less than 60 minutes
- ***Every*** wire in or out is protected from radar, radios and electrical interference



This cruise ship's three-point system features WEATHERPAK®s port, starboard and aft.

Unique Features – Functional

- WEATHERPAK® can measure and calculate ***both*** True and Relative winds in any situation (using the built-in GPS and Compass combined)
- Dual WEATHERPAK® systems can perform Auto-Upwind switching – so that the best data is always reported to the ship's systems (manual override is also provided)
- Other sensors can be added in addition to the standard; common add-on sensors are: water temperature, visibility, solar radiation (global, long, short wave)

Boeing built radar platform uses dual WEATHERPAK®s.

- Compass is at top of WEATHERPAK® and not much affected by ship's metal – but if necessary compass can be "swung" for calibration

Unique Features – Software/ Firmware

- WEATHERPAK® can be set to average data at any rate – typically it is set for a 5 second average
- WEATHERPAK® has an auto-reboot if it encounters any problem during operation
- Any sensor can be added at any time (follow manual instructions, specify this option when ordering)
- Firmware is optimized for weather and environmental measurements and calculations
- Alarms can be set on any measurement or calculation
- Can send out NMEA-0183, ASCII or other formats or several different formats to different ships systems
- Supports repeaters

C-5 SAM/N™

The economical C-5 SAM/N™ maintains the ruggedness and ease of use found in all Coastal Environmental Systems weather stations. With a sensor head that digitizes the data right at the sensor, the signals become impervious to electronic static and radio noise.

A single cable leads from the sensor head to the display electronics where a built in 4 x 20 character LCD continually displays all the data. For data storage and graphing with our INTERCEPT® software, a cable (up to 1000 feet in length) can be connected from the display directly to a computer.

- Electronics sealed in aluminum enclosure protected by baked on thermoplastic resin
- Sensors integrated into a single sensor head
- Performs a 5 second average of data
- Comes with display, and can forward data in NMEA 0183
- Supports repeaters
- Does not compute True winds

The forward sensors on the NATO "Alliance." The ship features a Coastal weather station that measures wind speed/direction/gust/sigma theta at three different points (port, starboard and aft).

INTERCEPT® Software

INTERCEPT® Software is built on an open source platform that will automatically gather, organize, archive and display data from all weather stations in the network. It is web based so any number of users on the ship's LAN can view the data by using a simple web browser like Microsoft® Internet Explorer or Mozilla Firefox.

INTERCEPT® sends XML data feeds making the information available to anyone with Internet access. Access to data is protected and regulated by employing password protected or restricted accounts with different levels of access, such as Administrator, Maintenance, Observer, etc.

Users have access to (depending on User type):

- A view to browse log data
- A view to customize their own user account
- Tabular summary of weather data from all stations
- Graphical display of wind data from all stations
- Station view: display all data for one station
- An overview of the status of all stations
- A view to configure the layout of the station view (which shows data for one station) and to add or configure all the stations
- Views to configure the application, set up alerts, and customize diagnostic messages

Who Depends on Coastal?

Greece, Mexico, Chile, Israel, France, Ecuador and Taiwan

Many International Navies also rely on Coastal shipboard systems, some for specialized ships, others outfit their entire fleet with Coastal systems.

Al C. Patrick Kelly
Vicepresidente de ventas de
Coastal Environmental Systems.
Oficio Núm. 007

SEMAR

México D.F., a 10 de febrero de 2010.

Estimado Señor Patrick Kelly:

Esta Dirección de Meteorología Marítima a mi cargo con relación
meteorológicas para barco Weatherpak que hemos adquirido desde1993, q
usted que sus equipos han demostrado ser de la mejor calidad debido a s
han soportado sin problemas las vibraciones producidas en nuestros barco
su funcionamiento y fácil operación. Por otro lado, hemos recibido por parte
su representante en México un respaldo técnico eficiente y oportuno al cu
forma con los requerimientos de equipos y refacciones, nos han dado resp
necesidades de emergencia, hemos enviado a oficiales electrónicos a sus
recibir capacitación y existe a la fecha linea abierta para resolver cualquie
español.

Por último quiero comentar que los Comandantes de los barcos que
estaciones Weatherpak se encuentran muy satisfechos con estos equ
opinión se ha diseminado entre los demás Comandantes por lo que cada v
solicitudes de ministración de Weatherpak.

Sin otro particular, aprovecho la ocasión para enviarlo un cordial saludo

Atentamente
Capitán de Fragata CG. DEM. EMO.
Director de Meteorología Marítima
Juan M. Aguilar Morales

Dirección General Adjunta de Oceanografía, Hidrografía y Meteorología - Dirección de Meteorolog
Tramo HIDMM #861, Col. Los Cipreses, Del. Coyoacán, C.P. 04830, Edificio "B" 1er. Nivel, Tel. 56-24

Translation

To Mr. Patrick Kelly
Vice President of Sales of
Coastal Environmental Systems
Document Number 007

Mexico City, February 10, 2010

Dear Mr. Patrick Kelly:

As the person in charge of this Maritime Meteorology Office, with reference to the weather stations (Weatherpak) for our ships that we have acquired since 1993, I would like to reiterate that your equipment has proven to be of utmost quality due to its robustness to withstand the vibrations on our ships without any difficulties, its performance is reliable and easy to operate. Incidentally, your firm and your representative in Mexico have provided us with efficient and timely technical support when filling our equipment and spare-part requirements in time and form. They have provided immediate responses to our emergency needs, we have sent our electronic specialists to your facilities for training and, as of this date, there is open communication for solving any technical doubts we may have in Spanish.

Finally, I would like to mention that the Captains of the ships that have Weatherpak stations installed are extremely satisfied with the equipment and they have shared this opinion among the other Captains and, as a result, we constantly receive additional requests for Weatherpak financing.

Without anything further at this time, I send warm regards.

Cordially,

Commander of the Frigate CG. DEM. EMO
Director of Maritime Meteorology
Juan M. Aguilar Morales
[Signature]

Research Institutes Around the World:

NOAA; NATO-OTAN; INCOIS (India); Bulgarian Academy of Sciences Institute of Oceanology; Maritime State University (Russia); CICESE (Mexico); Nanhai Rescue Bureau, Ministry of Communications, PRC; and U.S. Navy T-AGS 60 Class Research Ships

These and many more research institutes use Coastal shipboard systems because of their ability to integrate a multi-point system, monitor oceanographic as well as meteorological parameters, and because of the high quality and flexibility of the WEATHERPAK®. Additionally, they share the data with on- and off-ship scientists in real-time using Coastal's web-based INTERCEPT® software.

U.S. Navy (SMOOS), Navy SEALs and PT Boats

Coastal was awarded the SMOOS (Shipboard Meteorological and Oceanographic Observing System) contract for 150 ships for the U.S. Navy, both combatants and non-combatants. Additionally, the Navy uses these weather stations for the ultra "quiet" Navy SEALs ships and their coastal patrol boats.

Stand Alone Displays for Every Application

The display box/bridge interface is at the center of the WEATHERPAK® Shipboard Weather Station. It distributes power to the system, collects data from the WEATHERPAK®, displays selected data on the screen, and passes the NMEA message out to the navigation system. In the dual WEATHERPAK® system, a switch allows the user to select which WEATHERPAK® will report data to the display and output the NMEA message.

About Coastal

- Founded in 1981
- Began by building shipboard and buoy mounted weather stations
- WEATHERPAK® was co-developed with the U.S. Navy for buoy and shipboard use
- Systems use GPS & Compass to compute True Winds
- NMEA 0183 and other formats

A Sample of Coastal Ship & Platform Customers (Last 8 Years)

- Israeli Navy – 12 stations/ships
- Sperry Marine – 35 ships (freighters/tankers)
- Greek Navy – 7 ships
- Ecuador Navy – 2 ships
- U.S. Navy – Coastal Patrol Vessels – 12 ships
- Mexican Navy – 19 ships
- Finnish Coast Guard – 2 ships
- U.S. Navy (SEALS) – 7 boats
- National Oceanic & Atmospheric Administration – 5 ships
- U.S. Navy (TAG-60 Research) – 3 ships
- U.S. Coast Guard – 15 ships
- NATO – 5 stations
- U.S. Coast Guard (PT Boats) – 4 boats

U.S. Navy Ships

- **SMOOS**
  150 Aviation systems: (Wind speed/direction, cloud height, visibility, precipitation, precipitation identification) Multiple points on the ship for measurements
- **Special Boat Squadron**
  WEATHERPAK® (Ultrasonic wind sensors, air temperature, relative humidity, pressure – tie into ships' systems)
- **PT Boats**
  C-5 SAM/N™ (Stand alone systems with local display)
- **USS Abraham Lincoln**
  WEATHERPAK®
- **T-AGS 60s**
  WEATHERPAK® – Dual System

Chilean Navy Ships

- Have purchased 20 systems over 5 years
- Single point wind speed and direction, relative humidity, air temperature, pressure
- Use different configurations and Repeaters throughout ship

Specifications

Sensors

Wind Monitor (Ultrasonic – S1510)

Wind Speed	
Range:	0 - 60 m/s (117 Kts)
Accuracy:	+/- 2%
Resolution:	0.01 m/s (0.02 Kts)
Wind Direction	
Range:	0 - 360° (no dead band)
Accuracy:	+/- 3°
Resolution:	1°

Wind Monitor (Mechanical – S1104)

Wind Speed	
Range:	0 to 60 m/s (117 Kts)
Accuracy:	+/- 0.3 m/s (0.6 Kts)
Resolution:	0.1 m/s (0.2 Kts)
Wind Direction	
Range:	360° mechanical, 355° electrical
Accuracy:	+/- 3° (2° optional)
Resolution:	1°

Air Temperature/Relative Humidity (S9276)

Operational Range:	-40°C to +60°C; 0-100%
Accuracy:	0.2C; 1%

Barometric Pressure (S1081)

Operational Range:	-40°C to +85°C
Accuracy:	+/- 1 mBar at 22°C +/- 2 mBar from 0°C to +65°C +/- 3 mBar from -30°C to +65°C
Resolution:	1 hPa reported

Barometric Pressure (S80079)

Operational Range:	-50°C to +60°C
Accuracy:	0.2 hPa at 25°C 0.3 hPa from -50°C to 60°C
Resolution:	0.1 hPa reported

GPS (S1516)

Operational Range:	-40°C to +85°C
Channels:	12 simultaneously

Compass (S1085)

Operational Range:	-40°C to +70°C
Accuracy:	±1.0° (at 25°, 0° heel)

Visibility (S90032-V)

Operational Range:	10 meters - 20 km
Accuracy:	10%

Electronics

32 bit Microcontroller, 18 bit resolution, 5 serial ports, 16 analog, 15 digital

Ask or email for more detailed or special specifications needed.

Coastal Environmental Systems, Inc.

820 First Avenue South, Seattle, WA 98134

Telephone: (800) 488-8291 / (206) 682-6048 • Fax: (206) 682-5658

www.CoastalEnvironmental.com