Examples of what could happen when ship responses to sea and swells are not properly taken into account. These vessels were routed using "traditional" methods by a "leading" weather routing company.

## Technical Data

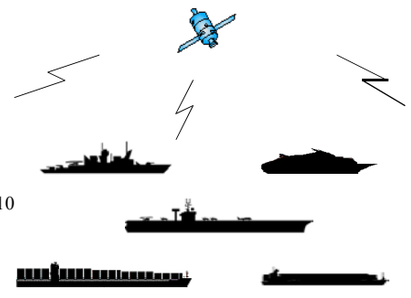
- Modern desk top or Notebook PC with P3/P4 processor running Windows 95/98/2K/XP Operating System
- Color graphics card with SVGA/XVGA support
- INMARSAT A/B/M, Fleet 77/55, C-Band, Wi-Fi, communication to OSI Weather Server via Internet or modem dial-up
- Mouse, Keyboard, Serial Port for the optional motion sensor
- 10 Mbytes of free local disk space
- Sound card (optional) to listen to the VOSS training tutorial

## Company Profiles

Both Ocean Systems and Oceanweather have been serving the maritime and offshore oil industries for over 20 years. Our clients include international shipping companies, major oil companies and government agencies. A shore-based version of VOSS has been designated as the OTSR tool at the US Navy ship routing centers.

Oceanweather's wind and wave forecast/hindcast models are the *de facto* standards in the offshore oil industry to provide design criteria and re-creation of environmental conditions in ship incident investigations.

Ocean Systems is also an OEM manufacturer/supplier of Voyage Data Recorder (**VDR**) hardware and soft-ware components, including the type-approved Protected Data Capsule, (i.e. "Black Box for ships").

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# *V*essel *O*ptimization and *S*afety *S*ystem — *VOSS*

## Onboard System for Optimum Ship Routing and Heavy Weather Damage Avoidance

An internal study by one major client found after using *VOSS* :

- √ Number of hours of weather delay reduced by 80%
- √ Ship structural damage claims reduced by 73% while costs reduced by 29%
- √ Number of cargo damage claims reduced by 87%

*"Some people are weather wise, but most are otherwise"*

*Benjamin Franklin*

# All Weather Routing Systems are **Not** Created Equal

# Ocean Systems VOSS - the Industry Benchmark

## √ VOSS User's Report In

Recent ship email to shore-side management:

"Just to put you at ease concerning our five hour early arrival at Port Angeles Pilot Station. This has been an unbelievable crossing ..... caught the Kuroshio current well, sailed great circle into the Bering Sea, and now that we're in a little weather, it's all astern of us. ***OSI once again was a tremendous asset giving me the confidence to route the vessel north in the dead of winter.*** We're still ahead of schedule....We've been at reduced rpm the entire crossing, and at minimum rpm for the last four days. Our daily fuel consumption for the crossing will average less than 150 tons a day. It's the best Eastbound crossing I've ever made in the winter."

Captain Chriss Carson, M.V. APL Thailand,
American Ship Management.

Dr. Vince Cardone of Oceanweather discussing weather patterns with forecasters

Dr. Henry Chen of Ocean Systems digitizing a hull form for customization of VOSS software

## √ Proven Over a Decade of Success

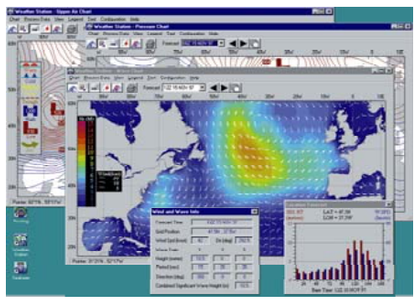
Each class of vessel is custom tailored to create a "virtual ship" model which reflects the response characteristics of motion, SHP/RMP, speed, fuel consumption in forecast wind and wave conditions. The following data are required if available:

- General arrangements drawing
- Ship's lines or body plan
- Bilge keel and other appendage details (if any)
- Hydrostatic curves
- Propeller curves
- Model test report
- Ship trial report, engine shop test report
- Past voyage log
- Stability booklet or loading manual

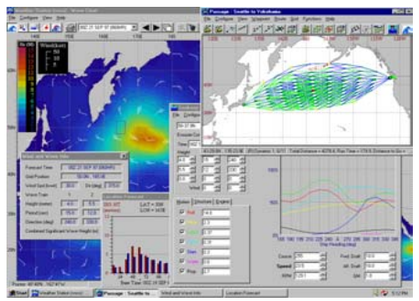
## √ Best Global Wind and Wave Forecast in the World

Oceanweather utilizes atmospheric forecasts from major national weather centers as input to in-house state-of-the-art global wind and wave models generating 10 days of forecast twice a day 365 days a year. Accuracy of the forecast is enhanced by real-time ingestion of satellite altimeter/scatterometer wind and wave measurements, ocean buoys and ship observations, as well as by experienced meteorologists.

- A unique process to forecast Hurricane/Typhoon generated sea and swells as soon as track and intensities have been updated
- Twice daily forecast available on 1.25 x 2.5 degree Lon/Lat global grid with update of global circulation currents
- Data includes tropical cyclone tracks, 500 millibar heights, surface pressure, wind speed, wind direction and three (3) wave trains
- Detailed synopsis of current weather patterns and forecast accuracy provided by experienced meteorologists
- User defined size and days of forecast for download by ships at sea from our weather servers via modem or Internet 24/7



Multi –Window display of surface pressure, wind and wave charts with sea and swells



Optimization of possible routes between departure and arrival ports. Seakeeping plot confirms SOE

## √ True optimization for minimum time and minimum cost routes over a range of arrival times

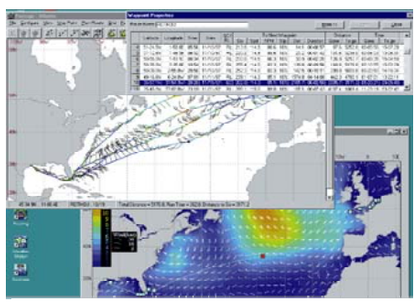
In addition to user simulated routes for comparison of fuel consumptions and arrival times, VOSS offers a sophisticated optimization algorithm for minimum time and minimum cost routes over a range of arrival times without exceeding the Safe Operating Envelope (SOE).

- User defined SOE limits in terms of ship motion or wind speed, wave heights and distance from tropical cyclones
- Red-circle along the simulated route indicates exceedance. Optimization algorithm ensures non-exceedance or else no solution
- Probabilistic monthly wind and wave climatology for voyages longer than 10 days
- User-friendly intuitive interface to try many "what if" scenarios to improve seamanship skills
- Proven to minimize heavy weather damage and life-cycle cost of hull and machinery

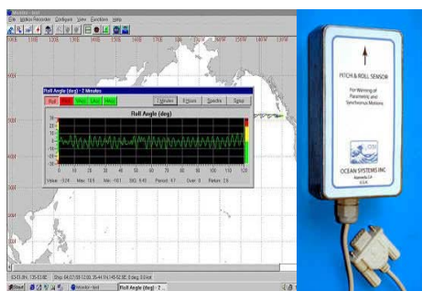
## √ Customized Ship Response Predictions with user specified loading conditions (Drafts and GM)

A sophisticated ship motion program computes Response Amplitude Operators (RAOs) with user specified drafts and meta-centric height. Takes into account voluntary speed reduction based on vessel motions propeller/engine limitations.

- Allows user to simulate multiple routes for comparison
- Predicts roll and pitch motion, accelerations, slamming, bending moment, shear force, speed, power and RPM using forecast or user input sea and swell conditions
- Custom tailored speed keeping and sea-keeping response calculations take both voluntary and involuntary speed reductions into account, thereby realistically predict future ship positions in relation to storms movements



Simulation of multiple routes displaying en route conditions, pitch and roll as well as fuel consumed



Picture of the motion sensor and display of roll angle 5-minute time history plot

## √ Early Warning of Synchronous and Parametric Rolling using inexpensive motion sensor (optional)

A low-cost motion sensor is available to provide continuous monitoring of roll, pitch and accelerations.

- Continuous plot of motion time histories as well as frequency spectra
- Identifies motion periods and threshold crossing probabilities
- Provides early warning of Synchronous and Parametric Rolling based on latest research findings
- Simple installation via a serial port interface. Solid state device with no moving parts. External power is not required
- Compact size (115 x 66 x 31mm, 4.5x2.5x1.2 inches)