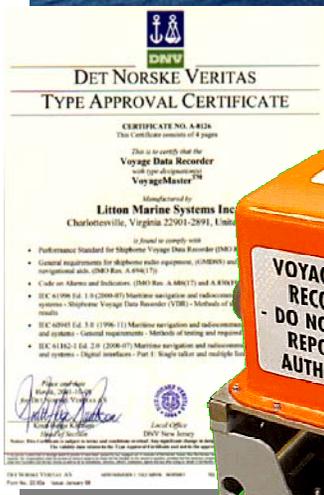
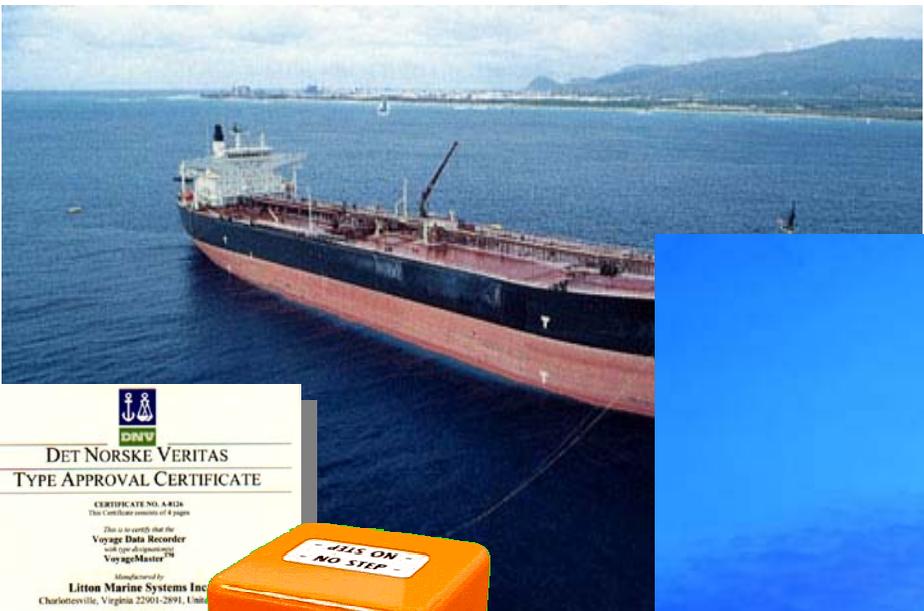


Maritime Voyage Date Recorders

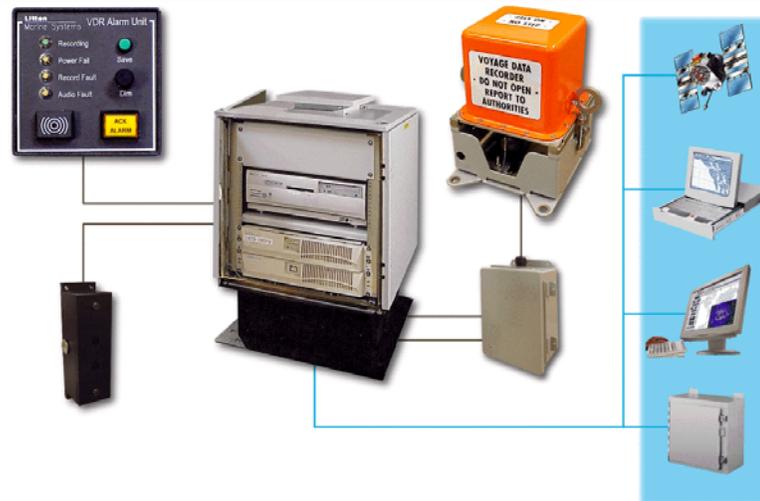
**National Transportation Safety Board
Vehicle Recorder Topical Technical Symposium
Alexandria, Virginia
June 4 and 5, 2003**

VoyageMaster VDR



VoyageMaster Voyage Data Recorder

What is it a VDR?



- The VDR is:
 - Analogous to a *flight data recorder* or **Black Box**, and is designed to aid in maritime casualty investigations aboard ships engaged on international voyages.
 - a commercial carriage requirement for all existing passenger vessels and new vessels over 3000GT built on or after July 1 2002.
 - A useful data source for crew training and warehousing operational “best practices” for the vessel owner / manager

What is recorded?

- **Date and time**
- **Ship's position, speed and depth**
- **Heading, wind speed and wind direction**
- **Bridge, VHF audio**
- **Radar images**
- **Main alarms (as required by class)**
- **Rudder and engine order and response**
- **Hull openings, watertight and fire door status (if fitted)**
- **Accelerations and hull stresses (if fitted)**
- **Other items that will aid in investigation**



IMO Fitting Requirements

Ship Type

New Construction

Existing



Passenger

July 1, 2002

Jan 1, 2004



Ro-Ro/Pax

July 1, 2002

July 1, 2002



All Others >3K GT

July 1, 2002

TBA

Challenges of Maritime Market

- **Highly competitive – about a dozen makers today**
- **Low volume**
- **Support/service difficult as ships often trade globally**
- **Few standards for interfacing**
- **Most ship systems are not VDR ready-back fits are especially difficult**
- **International equipment and service certifications**

State of Maritime Voyage Data Recorder Technology

- **Protective capsule is unique and purpose designed**
- **Excluding software and capsule most VDR subsystems are available through COTS channels**
- **Size and weight not of particular concern**
- **Maritime shipboard environment is a concern and challenge**



Bridge Alarm Unit

Data Capsule



System Options

Data Acquisition Unit



Satellite Communications



Real Time Voyage Display



Office Playback Station



Sensor Interface Unit

Ethernet Power

Mic Audio, Mic Test

Power

LAN

Inputs: Analog
Digital
Serial

Microphones
(up to 9 mics plus 3 VHF line feeds)

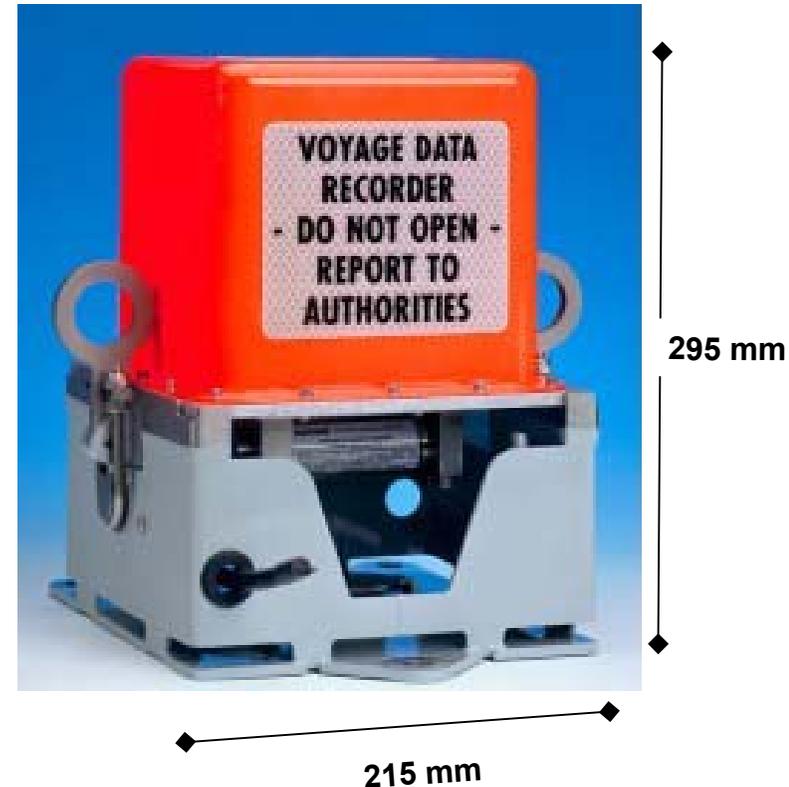
Note: Items Not To Scale

Junction Box

VDR Configuration Diagram

Protective Memory Capsule

- Meets all IMO, SOLAS and IEC 61996 regulations
- 12 or 24 hour storage capacity
- Small and lightweight (10.8 kilos)
- Unique single-handed quick release mechanism for easy recovery
- Survivability
 - *Impact Shock 50g for 11 milliseconds*
 - *Penetration – 250kg Mass dropped 3 meters impacting with a 100mm diameter pin*
 - *Fire Exposure – 1100 deg.C for 1 hour and 260 deg. C for 10 hours*
 - *Deep Sea Pressure – 30 days @ 60 Mpa (6000m depth)*



Bridge Alarm Unit

IEC 61996 4.4.3

(A.861/5.2.3) states that:

“The VDR shall automatically continuously monitor the following

- a) power supply;***
- b) record function;***
- c) bit error rate;***
- d) microphone functionality.***

Integral “Save” button automatically saves up to 6 hours of data via the DAU’s integral CD writer, and saves 12 hours of data on the DAU hardrive – a standard feature

96 mm

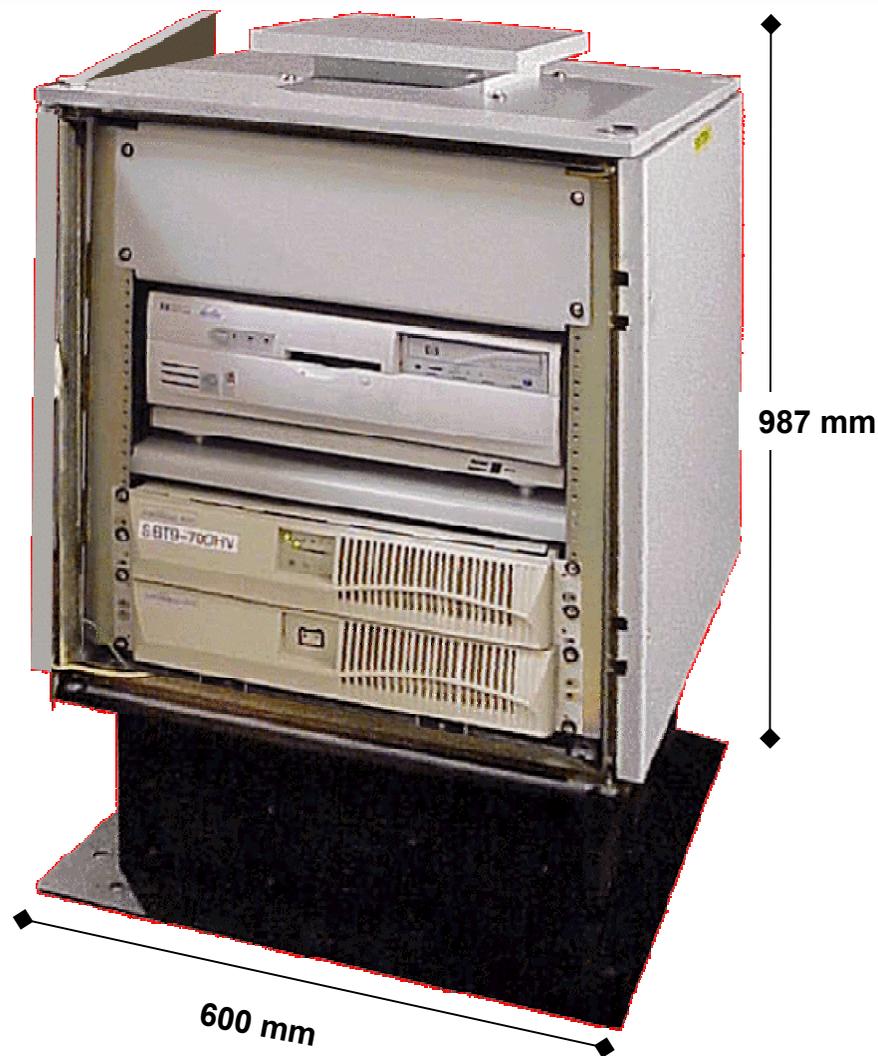


Front Panel

Data Acquisition Unit

Locking Cabinet includes:

- CPU for data processing and collection
- Audio module
- Radar/video module
- UPS with 2 hour capacity
- Integral Analog, Serial and Digital interfaces
- Network Hub (for interface to capsule, VDR workstation, ship LAN and/or optional remote SIU)
- CD Writer for data removal



Service & Annual System Certification

- **Per SOLAS V Regulation 18**

*“The voyage data recorder system, including all sensors, shall be subjected to an annual performance test. **The test shall be conducted by an approved testing or servicing facility** to verify the accuracy, duration and recoverability of the recorded data. In addition, tests and inspections shall be conducted to determine the serviceability of all protective enclosures and devices fitted to aid location. A copy of the certificate of compliance issued by the testing facility, stating the date of compliance and the applicable performance standards, shall be retained on board the ship.”*

Post Incident Data Recovery

- **File transfer ship to shore via communication channel**
- **File download from main unit to storage device, e.g., CD**
- **Removal or recovery of capsule**
 - **May prove difficult for ships sunk in deep water**

VDR Playback (multi-screen mode with map and radar)

Voyage Master: VDR Data Display and Playback System.

File from 10:00 Nov 11, 00 to 11:05 Nov 11, 00 Current: 10:35 Nov 11, 00

Run Stop [Progress Bar] Normal Fast 39:03 Help

IMO REQUIRED SHIP STATUS

Date Time
GMT: 10:38:47
LST: 00:00:00

Position:
LAT: 25-47.07N LON: 80-10.99W
Datum: Quality INVALID

Speed Knt	Deg.T	X	Y
Water 1.58	1.30	-0.30	
Grnd 1.58	291.00		

Heading True: 0.00 Deg. Magnetic: Deg.

Depth	Below Keel	From WL	Meters
FWD 5.90			
AFT			

Wind: Relative True
Speed: 11.00 Knots
Direction: 35.00 Deg

Rudder	Order	Response	Deg
Port: -76.11		77.14	
Center: -			
Stbd: -39.93		49.86	

Engine/Prop	Order	Response	RPM
Port: -0.37		0.7	
Center: -0.56		-4.69	
Stbd: -0.56		1.7	

Alarms: DN Doors: OPEN Hull Open:

Double click on data fields to change item.
● Normal ● No change ● Limit exceeded

Ship Tracking

Center Zoom In Zoom Out Current GPS: S7_GGA

Start GMT:	09:59:43
Current GMT:	10:38:47
Run Time:	0:39:05 h:mm:ss
Total Dist:	4.43 NM
Average Spd:	6.80 Knots

Radar: 10:39:01 Nov 11, 00

RMRI HDG 293.5°
STW 1.5 KT 100 M

NO ALARMS

OWN POSITION (NEV)
LAT 25°47.059 N
LON 080°10.967 W
UTC 10:38:42 1064

VDR Playback *(customized conning page showing azipod drives)*

Voyage Master: VDR Data Display and Playback System.

File form: 10:00 Nov 11, 00 to 11:05 Nov 11, 00 Current: 10:00 Nov 11, 00

Run Stop [Navigation icons] Normal Fast 3:58 Help

IMO REQUIRED SHIP STATUS

Date Time
GMT: 10:03:42
LST: 00:00:00

Position:
LAT: 25-45.51N LON: 80-07.15W
Datum: Quality INVALID

Speed Knt	Deg.T	X	Y
Water		11.80	1.00
Grnd	12.09	285.9	

Heading True: 0.00 Deg. Magnetic: Deg.

Depth Below Keel From WL
FWD: 6.50 Meters
AFT: Meters

Wind: Relative True
Speed: 23.00 Knots
Direction: 28.00 Deg

Rudder	Order	Response
Port:	5.33	5.40 Deg
Center:		
Stbd:	5.55	5.18 Deg

Engine/Prop	Order	Response
Port:	66.19	66.4 RPM
Center:	-0.56	34.87 RPM
Stbd:	61.69	62.4 RPM

Alarms: OFF Doors: CLOSED Hull Open: OFF

Double click on data fields to change item.
● Normal ● No change ● Limit exceeded

At Sea Display : C:\Program Files\LMS VDR DEMO\default.con

File Add Alarm Door

GPS

LAT : 25-45.51N
LONG: 80-07.15W
DTM :
CMG : 285.90
SMG : 12.09

Heading

GYRD: 287.7° CMG: 287.73
CTS: 287.7°

Wind

Speed: 25.00 Kts
True Wind Direction: 17.00 Deg
Speed: 24.00 Kts
Relative Wind Direction: 30.00 Deg

Water Depth

6.6 Meter

Port Azipod

Angle: 5.43° 5.52°
RPM: 66.19 66.4

Stbd Azipod

Angle: 5.60° 5.25°
RPM: 61.69 62.4

Fix Azipod

Angle: 0.00° 0.00°
RPM: -0.56 34.87

Ship Speed

LOG 11.80 Kts

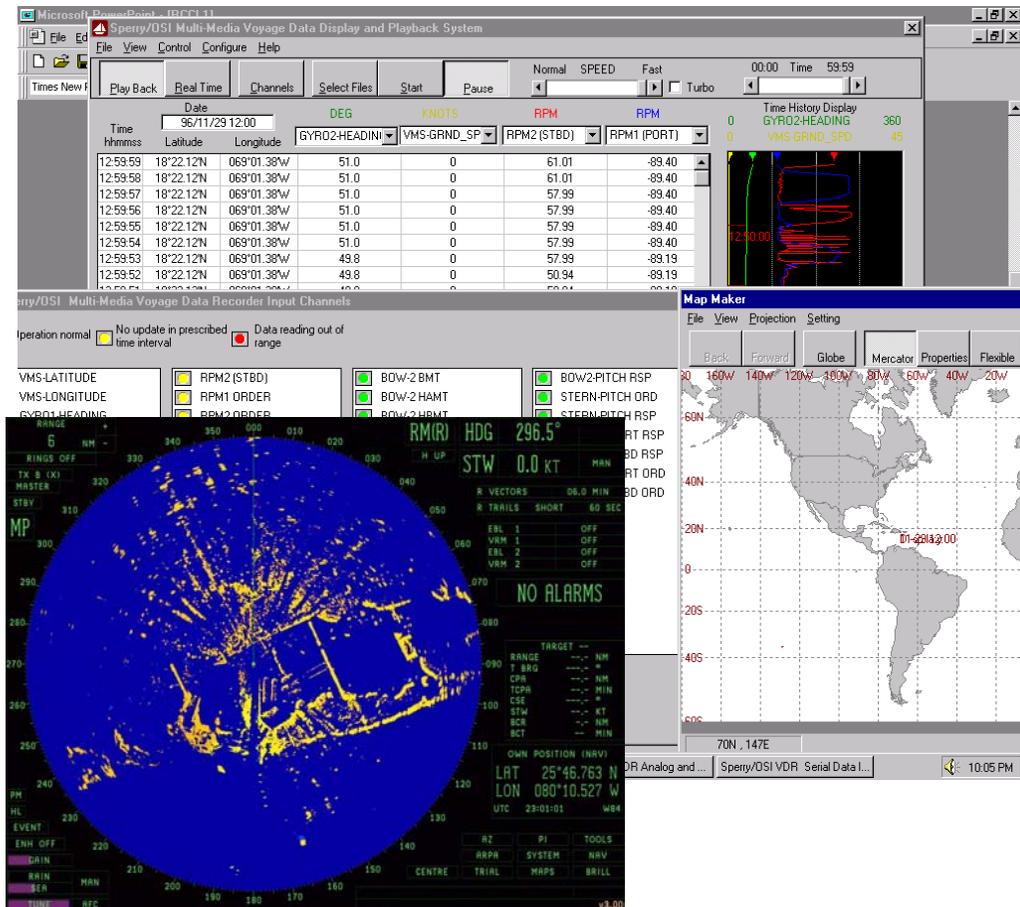
LOG -0.90 Kts

Thrusters

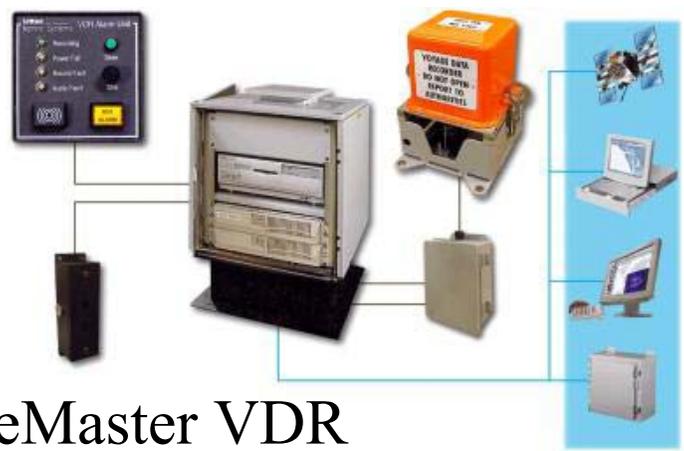
Thrust 1: Ord: 1 % Res: -2
Thrust 2: Ord: 0 % Res: -1
Thrust 3: Ord: 0 % Res: -2
Thrust 4: Ord: -1 % Res: -1

VoyageMaster Workstation (On Board)

- A networked VDR workstation designed to provide **real time** situational display of all data recorded by the VDR
- Available sat-com interface
- A useful tool for automating certain navigation and engineering logs
 - Noon reports
 - Bell books
 - Fuel logging
 - Vessel performance monitoring



Selling Value



VoyageMaster VDR

iFleet



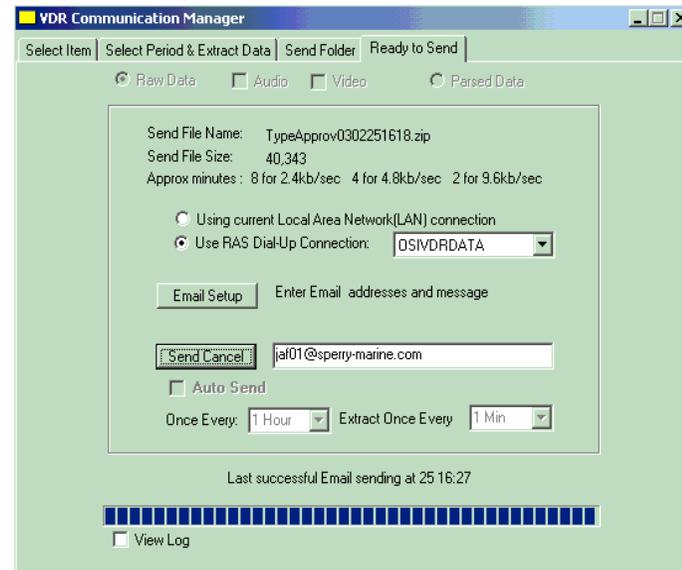
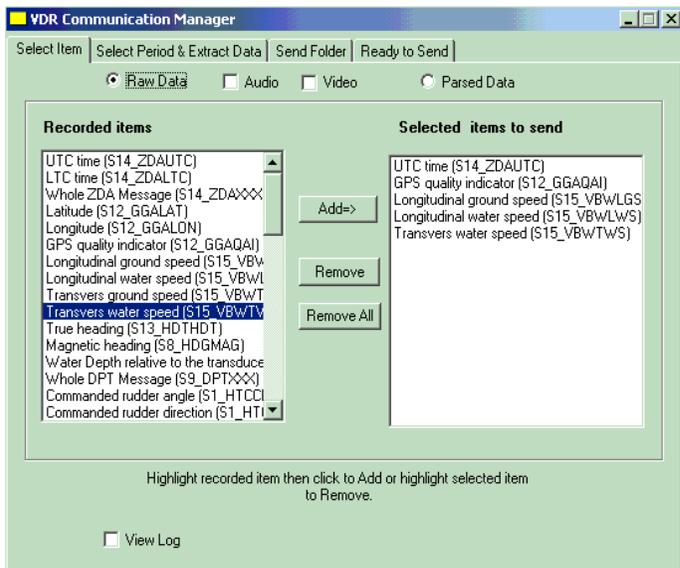
Data Transfer



Data Analysis & Fleet Management

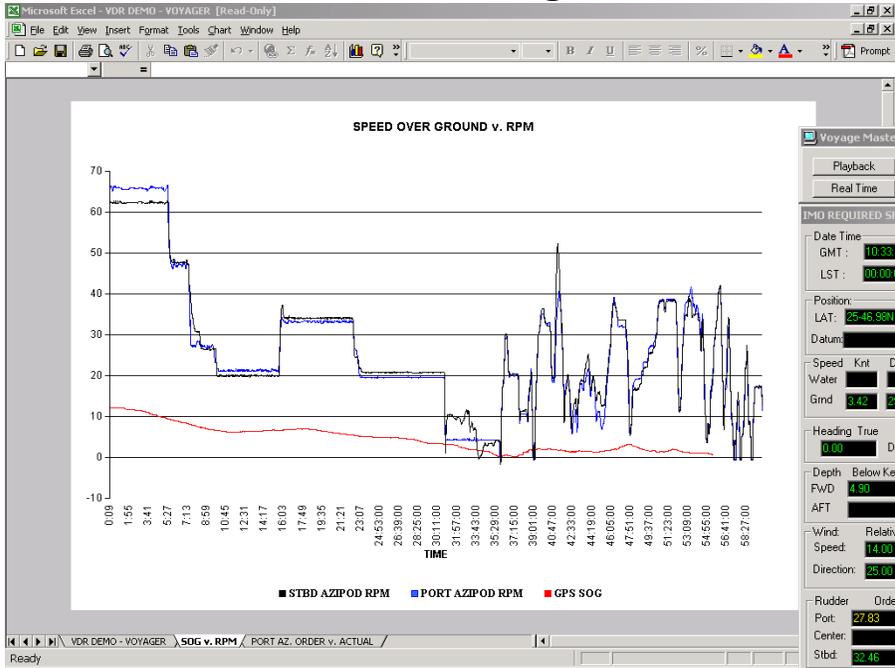
VDR Communications Manager “The Link”

- Select data elements to transfer
- Select the period of interest



- Specify the place to save data before sending it
- Specify email address to send the data to

VDR Playback (Historical Trends and Analysis)



Exported Data used to generate customized performance curves in Excel®

Voyage Master: VDR Data Display and Playback System
Current: 10:30 Nov 11, 00 | File from: 10:20 Nov 11, 00 to 11:05 Nov 11, 00
Playback | Real Time | Data Chart | Ship Track | Radar | Audio 1 | Audio 2 | Audio 3 | Audio 4
Export | Run | Stop | Normal | Fast

VDR REQUIRED SHIP STATUS
Date Time: 10:39:37 GMT, 00:00:00 LST
Position: LAT: 25-46.90N, LON: 80-10.77W
Datum: Quality DIFFERENTIAL
Speed: Knt 14.00, Deg T 2.90, X 10.30, Y 3.42, 296.71
Heading True: 0.00, Magnetic: 0.00
Depth: FWD 4.90, AFT
Wind: Speed: 14.00, Direction: 25.00
Rudder: Port: 27.83, Center: 0.56, Stribd: 32.46
Engine/Prop: Port: 1.50, Center: 0.56, Stribd: 2.06

Data Chart
-150 Thruster 1 Actual 150
-150 Port Azipod RPM Order 150
-90 SIN(Port Azipod) Actual 90
-90 SIN(Stribd Azipod) Actual 90
0 WSPD-1 RELATIVE 120
-30 DGPS1-SOG 30
-30 DGPS2-SOG 30
-150 Thruster 2 Order 150
-150 Thruster 2 Actual 150
0 DGPS2-COG 360
-150 Thruster 1 Order 150
-150 Thruster 2 Order 150
DGPS1-SOG
HEADING-TRUE FOG
WSPD-1 RELATIVE
WDIR-1 RELATIVE
WSPD-2 RELATIVE
WDIR-2 RELATIVE
Water Depth below keel

Above, the playback data in strip chart form is easily customized by the user.

VoyageMaster VDR

Thank You!

