NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Vehicle Recorder Division
Washington, DC 20594

GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

DCA08FM002

By
Christopher Babcock

WARNING

The reader of this report is cautioned that the transcription of a voyage data recorder audio recording is not a precise science but is the best product possible from a Safety Board group investigative effort. The transcript or parts thereof, if taken out of context, could be misleading. The transcript should be viewed as an accident investigation tool to be used in conjunction with other evidence gathered during the investigation. Conclusions or interpretations should not be made using the transcript as the sole source of information.

NATIONAL TRANSPORTATION SAFETY BOARD
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May 6, 2008

Voyage Data Recorder (VDR)

Group Chairman's Factual Report
By Christopher Babcock

A. EVENT

Location:	Approach to Staten Island, New York
Date:	November 3, 2007, 0143 Eastern Daylight Time[1]
Vehicle:	*T/V Axel Spirit*
Operator:	Teekay Shipping
NTSB Number:	DCA08FM002

B. GROUP

A group was convened on November 13, 2007.

Chairman:	Christopher Babcock Vehicle Recorder Specialist National Transportation Safety Board
Member:	Neil Davis Director, Fleet Operational Services Teekay Shipping
Member:	Lieutenant Jake Hobson Marine Casualty Investigator United States Coast Guard
Member:	Bill Woody Marine Safety Investigator National Transportation Safety Board
Member:	Captain Dennis Wheeler President Sandy Hook Pilots Association

[1] All times are referenced to local EDT

C. SUMMARY

On November 3, 2007, at approximately 0143 EDT, the Bahamas flag vessel *T/V Axel Spirit*, operating as a bulk oil carrier with a complement of 22 crew, allided with the Ambrose light tower on approach to New York Harbor. After the allision the vessel proceeded to its destination at Perth Amboy, NJ The 800-foot vessel sustained substantial exterior and interior damage. No injuries were reported and no pollution occurred.

D. DETAILS OF INVESTIGATION

On November 5, 2007, the NTSB Vehicle Recorder Division's Audio Laboratory received information from the following VDR:

Recorder Manufacturer/Model: **Samsung S-VDR**
Recorder Serial Number: **0575/03**

Recorder Description

According to Chapter V of the International Convention for Safety of Life at Sea (SOLAS) Regulation 20 and federal regulations, VDRs are required aboard all vessels, other than passenger ships, of 3000 gross tonnage and upwards constructed on or after 1 July 2002, that engage in international voyages. The *Axel Spirit* was constructed in 2004 and was fitted with a VDR as a new build.

VDRs are required to store the last 12 hours of bridge audio, radar, and parametric data in crash protected memory units. Means must also "be provided whereby recorded data may be saved after an incident with minimal interruption to the recording process."[2]

Recorder Damage

The VDR suffered no damage during the allision and remained aboard the vessel. Safety Board investigators downloaded all stored data onto a portable hard drive which was returned to the Safety Board's Surface Recorder Laboratory.

VDR Contents Description

The VDR contained approximately 12 hours of bridge audio, radar displays, and parametric data from 0100 to 1330. The accident was not reported to the Coast Guard until after the vessel had docked. The Coast Guard initiated the emergency backup upon their arrival on scene at approximately 1330.

The VDR records two channels of mixed audio drawn from four microphones in the wheelhouse, one channel of mixed audio drawn from two microphones on the bridge wings, and audio from a single VHF frequency. Microphones are located at the port and starboard side of the front desk, the chart table, aft bridge area, and the port and starboard bridge wings. The bridge audio ranges from fair to good quality[3].

[2] IMO Assembly Resolution A.861(20) Performance Standards for Shipborne Voyage Data Recorders
[3] See attached audio quality scale

Post-display selection radar imagery[4] from the Furuno 10 cm radar is captured approximately every 15 seconds and stored to the VDR as a compressed bitmap image. The images stored to the VDR show the exact radar image displayed to the crew on the bridge including targets, ranges, and settings. The status and display of other radar systems that may have been in use is not recorded. The following valid NMEA fields were recorded:

- wind speed and angle
- water speed and heading
- water depth
- watertight and fire door status
- engine command and response
- rudder command and response
- datum reference
- speed over ground
- true heading

The VDR installed on vessels subject to the SOLAS carriage requirements must also record geographic position and UTC time. These parameters were not present of the *Axel Spirit's* VDR. The last IMO required inspection of the VDR aboard the *Axel Spirit* took place on January 28, 2007.

Transcription of relevant bridge audio, parametric, and radar data may be found in the "VDR Audio Transcript." The complete set of radar data may be found the public docket for this accident under separate cover. Plots of the relevant data can be found in Figures 1 and 2 in this report.

Timing and Correlation

In the absence of GPS position and time information, timing on the data files was referenced to the VDR internal clock. By looking at common radio transmissions as recorded by the VDR and the US Coast Guard Vessel Traffic Service it was determined the VDR internal clock was 3 minutes and 9 seconds ahead of UTC time. Timing on the audio transcript, parametric data, and radar imagery was shifted 3 minutes and 9 seconds and converted to local EDT.

Description of Audio Events

The accident occurs approximately 45 minutes into the recording. The transcription includes events from the beginning of the recording until the Sandy Hook pilot boards the vessel at approximately 0200 EDT. The recording continues until 1337 EDT.

Christopher Babcock
Vehicle Recorder Specialist
Vehicle Recorder Division

[4] Post-display selection radar imagery includes "electronic signal information…which was actually being presented on the master display of the radar at the time of recording. This shall include any range rings or markers, bearing markers, electronic plotting symbols, radar maps, whatever parts of the of the SENC (system electronic navigation chart) or other electronic chart or map that was selected, the voyage plan, navigational data, navigational alarms and the radar status data that were visible on the display." (IEC 61996-1, Voyage Data Recorder Performance Requirements)

Audio Quality Rating Scale

The levels of recording quality are characterized by the following traits of the voyage recorder information:

Excellent Quality — Virtually all of the crew conversations could be accurately and easily understood. The transcript that was developed may indicate only one or two words that were not intelligible. Any loss in the transcript is usually attributed to simultaneous bridge/radio transmissions that obscure each other.

Good Quality — Most of the crew conversations could be accurately and easily understood. The transcript that was developed may indicate several words or phrases that were not intelligible. Any loss in the transcript can be attributed to minor technical deficiencies or momentary dropouts in the recording system or to a large number of simultaneous bridge/radio transmissions that obscure each other.

Fair Quality — The majority of the crew conversations were intelligible. The transcript that was developed may indicate passages where conversations were unintelligible or fragmented. This type of recording is usually caused by bridge noise that obscures portions of the voice signals or by a minor electrical or mechanical failure of the VDR system that distorts or obscures the audio information.

Poor Quality — Extraordinary means had to be used to make some of the crew conversations intelligible. The transcript that was developed may indicate fragmented phrases and conversations and may indicate extensive passages where conversations were missing or unintelligible. This type of recording is usually caused by a combination of a high bridge noise level with a low voice signal (poor signal-to-noise ratio) or by a mechanical or electrical failure of the VDR system that severely distorts or obscures the audio information.

Unusable — Crew conversations may be discerned, but neither ordinary nor extraordinary means made it possible to develop a meaningful transcript of the conversations. This type of recording is usually caused by an almost total mechanical or electrical failure of the VDR system.

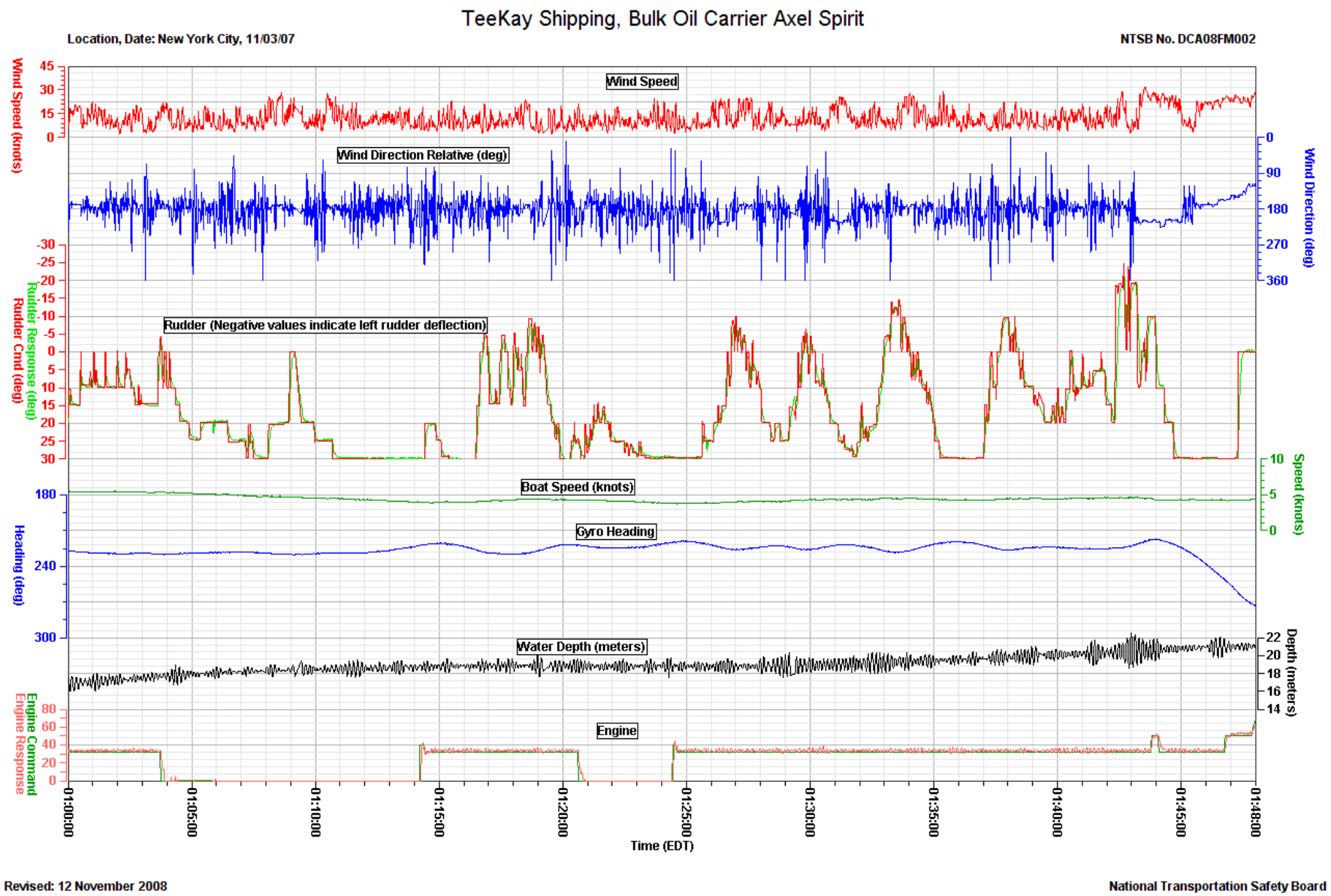

Figure 1 Data from 45 minutes prior to allision

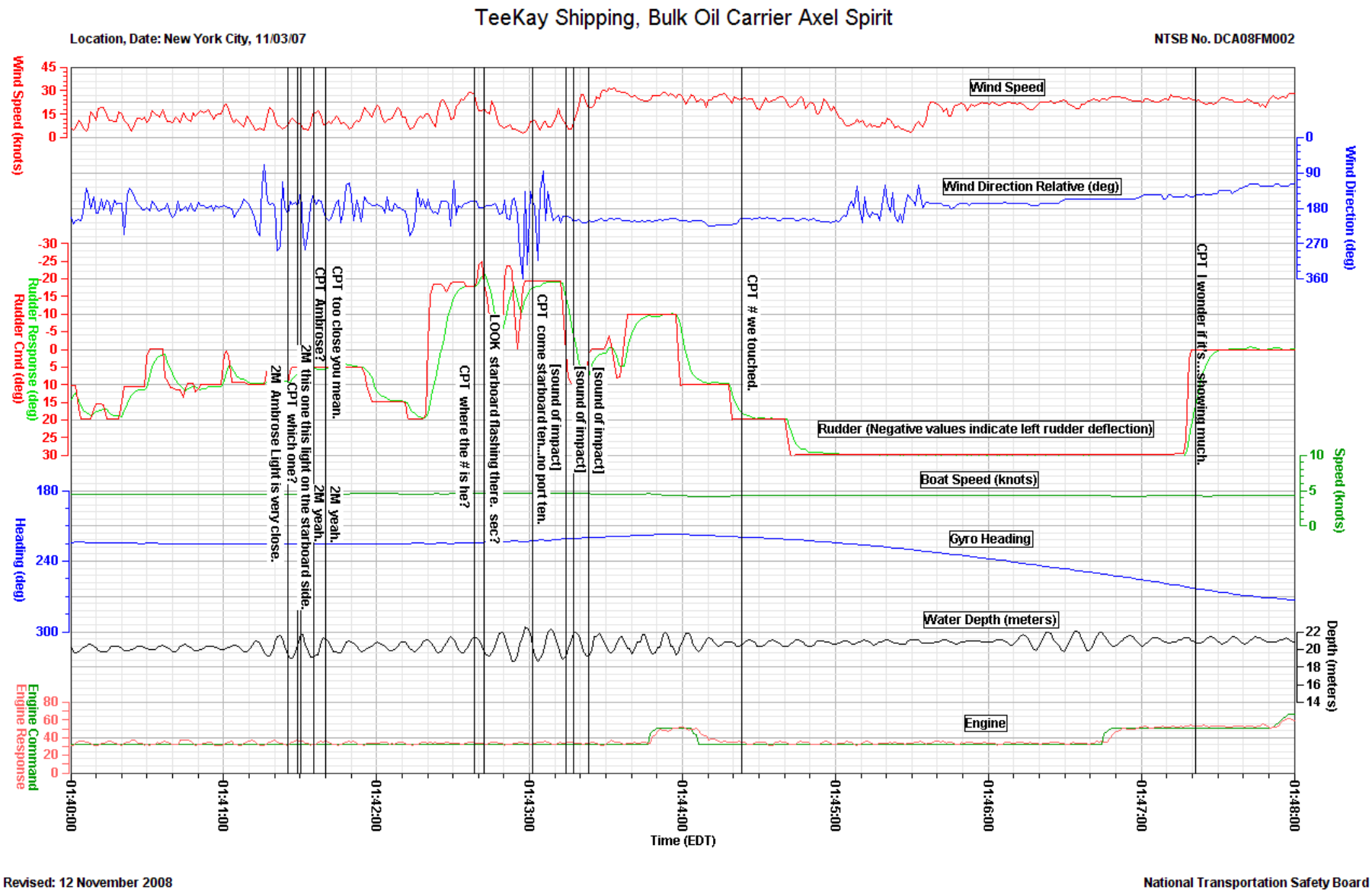

Figure 2 Accident data with selected VDR audio