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Ship Investigations – An Engineer's perspective

Presentation prepared for the Marine Forum 2018

- Introduction and the role of the Marine Engineer Surveyor
- Types of surveys
- Investigations then and now
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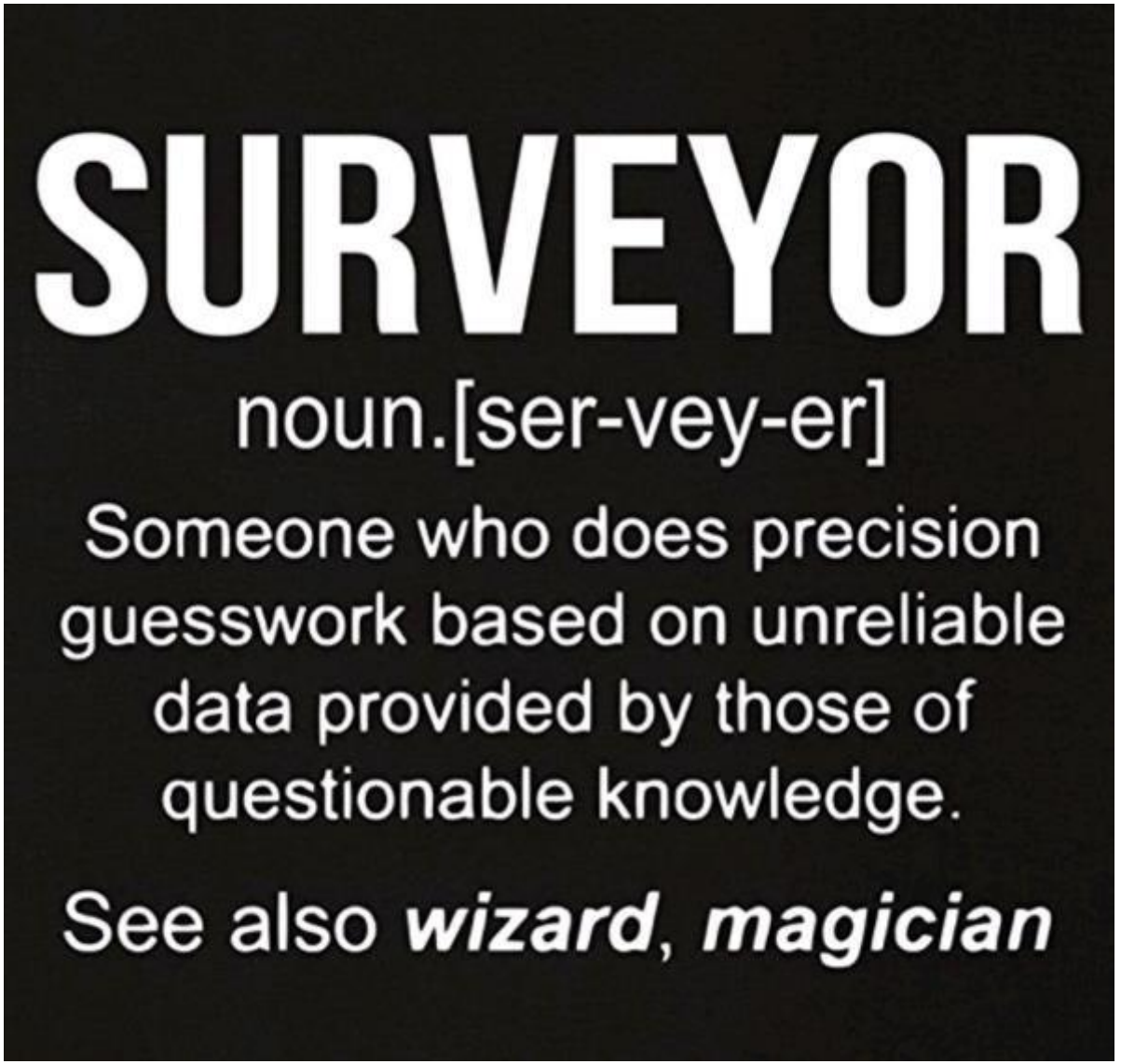
Introduction and role of the Marine Engineer Surveyor


SURVEYOR
noun.[ser-vey-er]
Someone who does precision guesswork based on unreliable data provided by those of questionable knowledge.
See also wizard, magician

"The marine surveyor is someone who measures, assesses, surveys, inspects, examines and reports on the subject of survey based on the client's instructions"

There are various types of marine surveyor and it follows that the instructing party in a marine venture must decide on the type of surveyor required, whether it be an engineer, master mariner or an expert in cargo or other field.

Engineer surveyors normally have a Chief Engineer's Certificate of Competency and will have many years of seagoing experience on various types of vessels.

He may also be a Naval Architect or a Degreed Marine Engineer with many years experience in the marine industry.

A surveyor must have good health, excellent observational skills, an attention to detail, honesty and plenty of common sense combined with an ability to remain independent and impartial at all times.

Independent surveyors have no statutory rights of access to any ship or port or marine facility without express permission.

It is important for a surveyor to properly understand his instruction and who he is acting for as access to the vessel and certain documentation can be denied if the surveyor is acting at variance to for example the ship owner.

The surveyor's ability to carry out their work will be completely dependent on the working relationships between the parties involved in a particular survey.

Types of surveys

- Structural Damage Surveys
- Machinery / Damage Surveys
- Electrical / Electronic Surveys
- Fire
- Collision/Allision and Grounding surveys
- Fuel / Bunker related surveys
- Performance disputes
- International Safety Management (ISM) Code audits/surveys

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Gathering and preservation of evidence

Gathering of evidence and the preservation thereof is crucial to any survey.

This normally entails compiling a document list based on the type of survey to be carried out and on observations made during the initial survey.

It is essential that the Surveyor has the knowledge and experience required for the type of survey.

Engineer surveyors need to have a good understanding of the type of vessel being surveyed, what information to request and sight and where to find it.

Engineer surveyors are often the first attendees and gather the necessary information.

The information gathered may not always be within their area of expertise.

This information can be assessed later by a relevant expert therefore it is crucial that it is obtained and preserved in a format that will be accessible at a later date.

There are today numerous recording instruments on the vessel and elsewhere which can be used to obtain empirical data which can be used as evidence.

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Investigations then and now

SAFMARINE AGULHAS grounding – investigation and findings

On the 26th June 2006, the vessel :SAFMARTINE AGULHAS" leaves the berth in East London at about 18h12 with a pilot on board and one tug fast.

The vessel departs using the main engine and everything appears to be normal.

The Pilot ordered full ahead on the engine to make the turn into the entrance and then slow ahead just after 18h16. The pilot ordered the vessel to steer 065 degrees then requested permission to leave the vessel. The weather was poor at the time so he wanted to leave the vessel inside the breakwater.

Just after 18h17 there is an alarm and the main engine automatically slowed down due to activation of the main engine safety system.

The Master requests the pilot to wait while he phoned the engine room. The second engineer told the Master that the engine was still running so the pilot left the bridge.

A few seconds later the main engine shuts down automatically due to activation of the safety shut down system.

Between 18h18 and 18h22 the Master attempts to start the engine from the bridge without success.

The pilot leaves the vessel at 18h22.

They continue to attempt to start the main engine and advise Port Control at 18h24 of a problem and that they require tug assistance.

By 18h28, the Chief Engineer managed to start the main engine on local control in the engine room.

By 18h30 the vessel was aground just outside the breakwater.

Numerous attempts were made over the next days to get the vessel off. By the 28th June it was decided that due to structural damage to the hull it would not be possible to get the vessel off safely.

Thereafter the investigations into the grounding commenced.

Several surveyors were involved for the various parties. Inspections were carried out on the vessel to determine the extent of damage to the hull.

The main engine and control systems were checked. Print outs were obtained from the movement recorder and engine alarm log.

Crew interviews were conducted over about 8 days.

Based on the information obtained a timeline was drafted.

Movement recorder	**18h16:28**	**SLAH (Slow ahead)**
		Pilot orders vessel to steer course of 065 degrees and then requests permission to leave the vessel.
Alarm printer	18h17:19	**Safety system operated alarm (Main engine slow down)**
Movement recorder	18h17:23	**Slow down with bypass**
		Master requests pilot to wait and then phones engine room. Master is advised by the second engineer that the engine is still running and releases the pilot.
Port Control	18h17:31	**Pilot leaves the bridge.**
Alarm printer	18h17:49	**Safety backup s/d alarm (Main engine shut down)**
Movement recorder	18h17:53	**Shutdown**
Movement recorder	18h17:58	**Main engine rpm "0"**
Movement recorder	**18h19:37**	**HAAH (Half ahead)**

It became apparent that the main engine was shut down automatically by the engine protection system without any indication as to what caused the shut down condition.

By this time the engine room was breached and had started to flood.

It was then decided to remove the entire engine monitoring and alarm system cards as well as the relevant pressure switches that would have activated the engine shut down and to preserve them for analysis.

This was done and the components were landed ashore.

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The vessel aground.

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Access to the vessel.

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Alarm cards.

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Alarm cards boxed up.

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Pressure switch.

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Pressure switch labelled and sealed.

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By 05th August 2006 the cargo had been discharged and the vessel had broken into two.

The cards and pressure switches were sent to the OEM in Rotterdam where they were placed into a rack similar to that on the vessel.

Simulations were run using the data obtained during our investigations to closely match the sequence of events.

It was determined that the lube oil pressure switch may have been faulty.

The pressure switch however tested normal under standard test scenario.

The pressure switches were then sent to a laboratory in Switzerland where they were subjected to various tests and it was found that the lube oil pressure switch was failing under certain vibration conditions. This resulted in spurious alarm condition which caused the engine to shut down subsequently run aground.

As part of the investigation and in putting together the time line, we had to obtain navigational data to determine the track and position of the vessel from leaving the berth until running aground.

The vessel did not have AIS but a GPS track plotter from which screenshots were obtained on a playback mode.

The VTS system at Port Control was not operational.

There was no VDR on the vessel.

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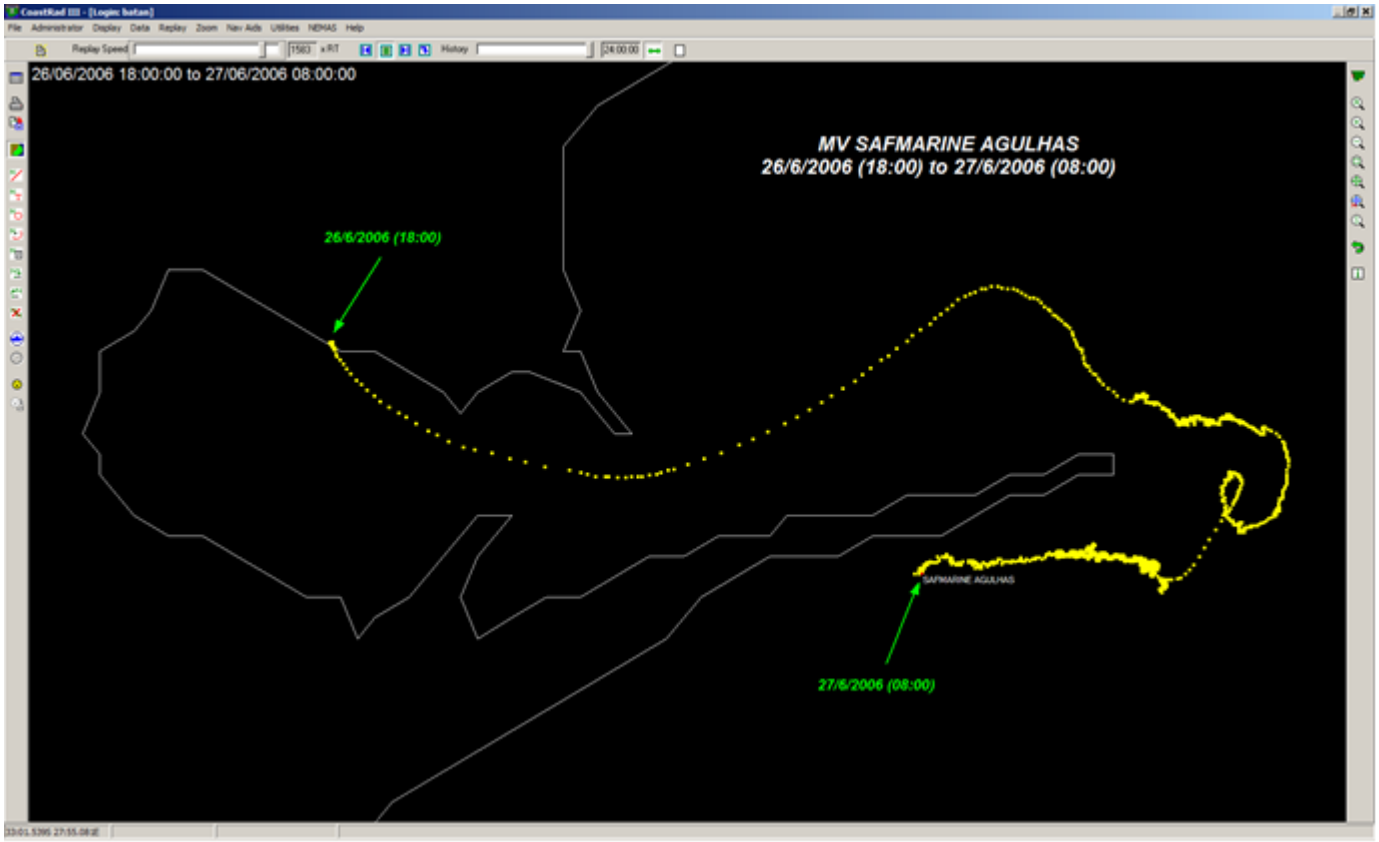
We were aware that the Silvermine (SA NAVY) were tracking vessels on the coasts so were made representation to them and they (IMT) provided us with data which was then plotted in order to get the vessel track and position.



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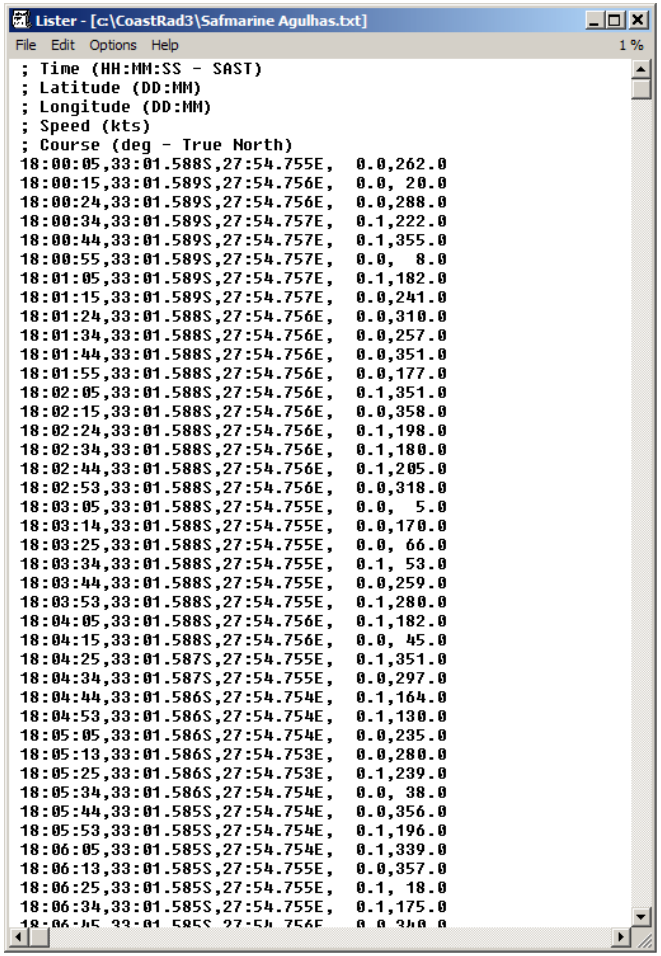

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Another vessel grounding – investigation and survey

A container vessel grounded recently while entering Port and made contact with the breakwater with the bow.

The vessel refloated itself after few hours on the high tide and after transferring of ballast internally.

This was done after the companies emergency response team had been alerted and they had convened in the head office where they were able to assess the situation based on the information provided by the vessel.

Detailed damage stability calculations were carried out and the Mate was advised on the ballasting procedure required such that the maximum bending moments and shear stress parameters were not exceeded.

This was all occurring in real time.

Was appointed on behalf of Owners Hull Underwriters and also to assist the Owners P&I Surveyor with the investigation if it was required.

The Owners P&I Surveyor was an experienced Master Mariner with experience in gathering the required navigational and other empirical data required for the investigation.

We attended on board the vessel immediately after berthing along with the Class Surveyor.

Briefly interviewed the Master and decided on the scope of survey.

We analysed the data that had been stored by the crew at the time of the grounding and the period thereafter and it was immediately clear that there was no machinery or equipment failure that led to the grounding.

The focus was therefore twofold;

- Preservation of documents and electronic data.
- Determination of the extent of damage.

Documentation had mostly already been prepared and stored by the crew electronically apart from log books which were scanned.

Once tanks and compartments had been opened, ventilated and gas freed safe for entry an inspection of the structure was carried out.

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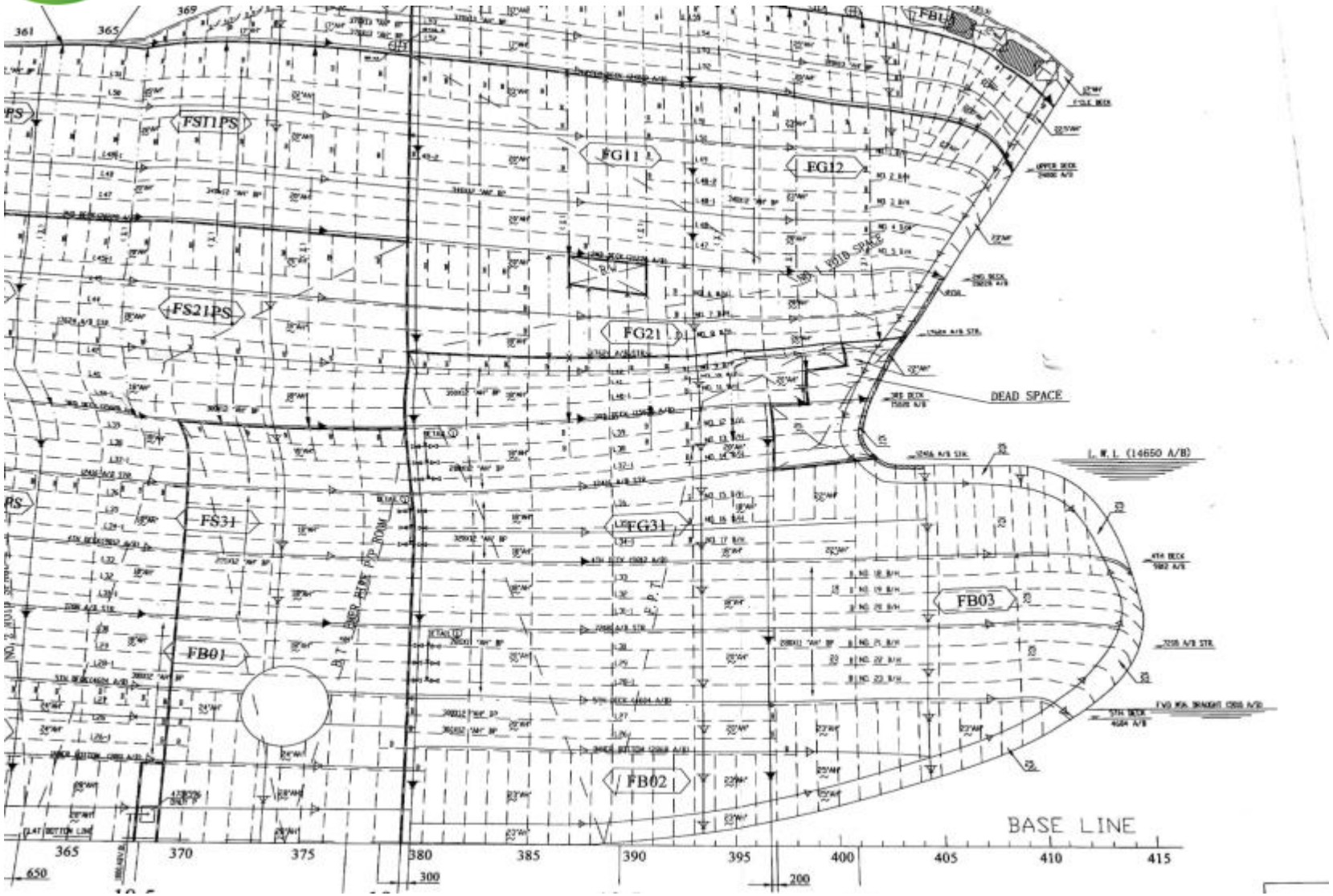

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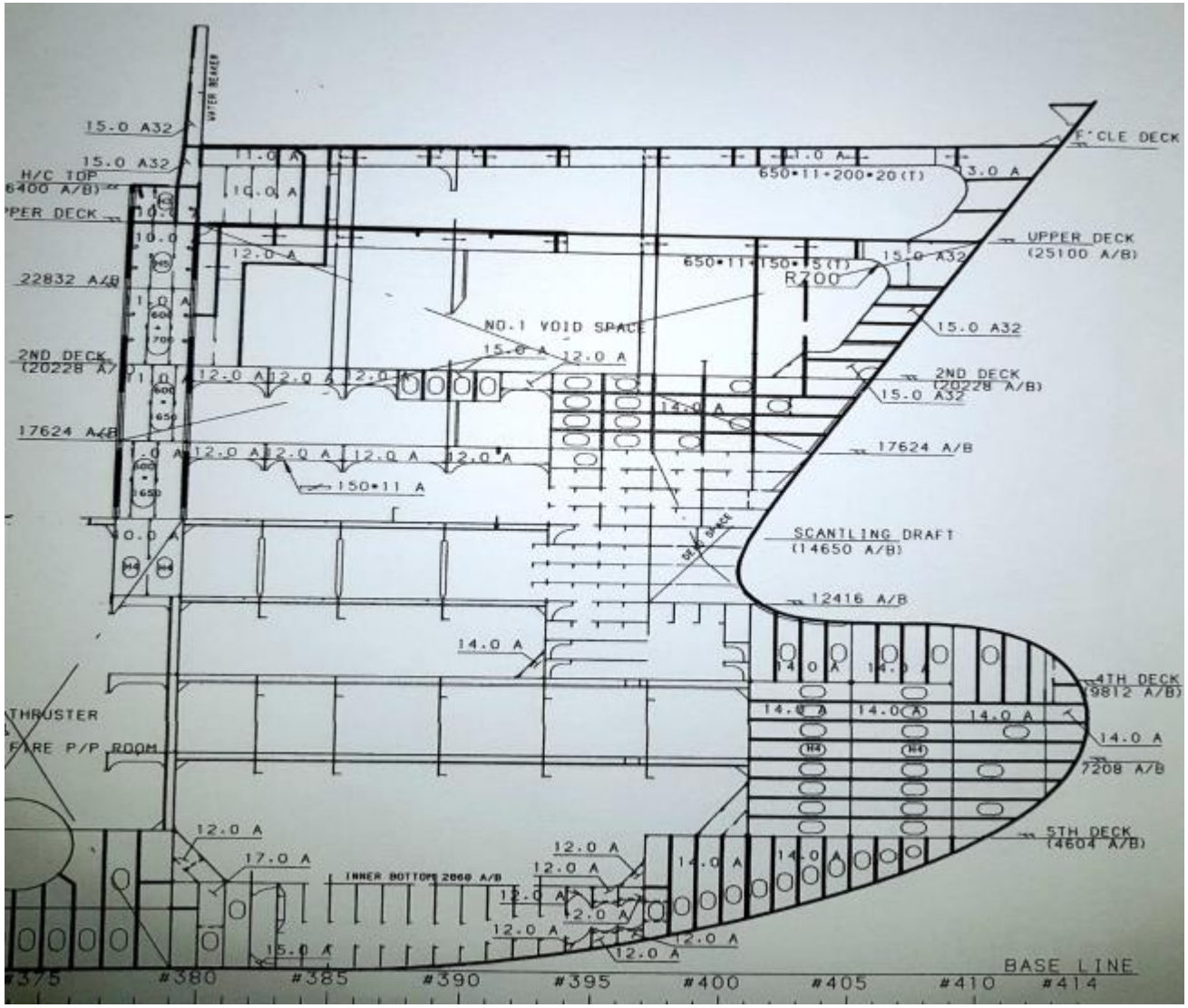

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Inspecting damage inside a forepeak tank following a grounding of a container ship.

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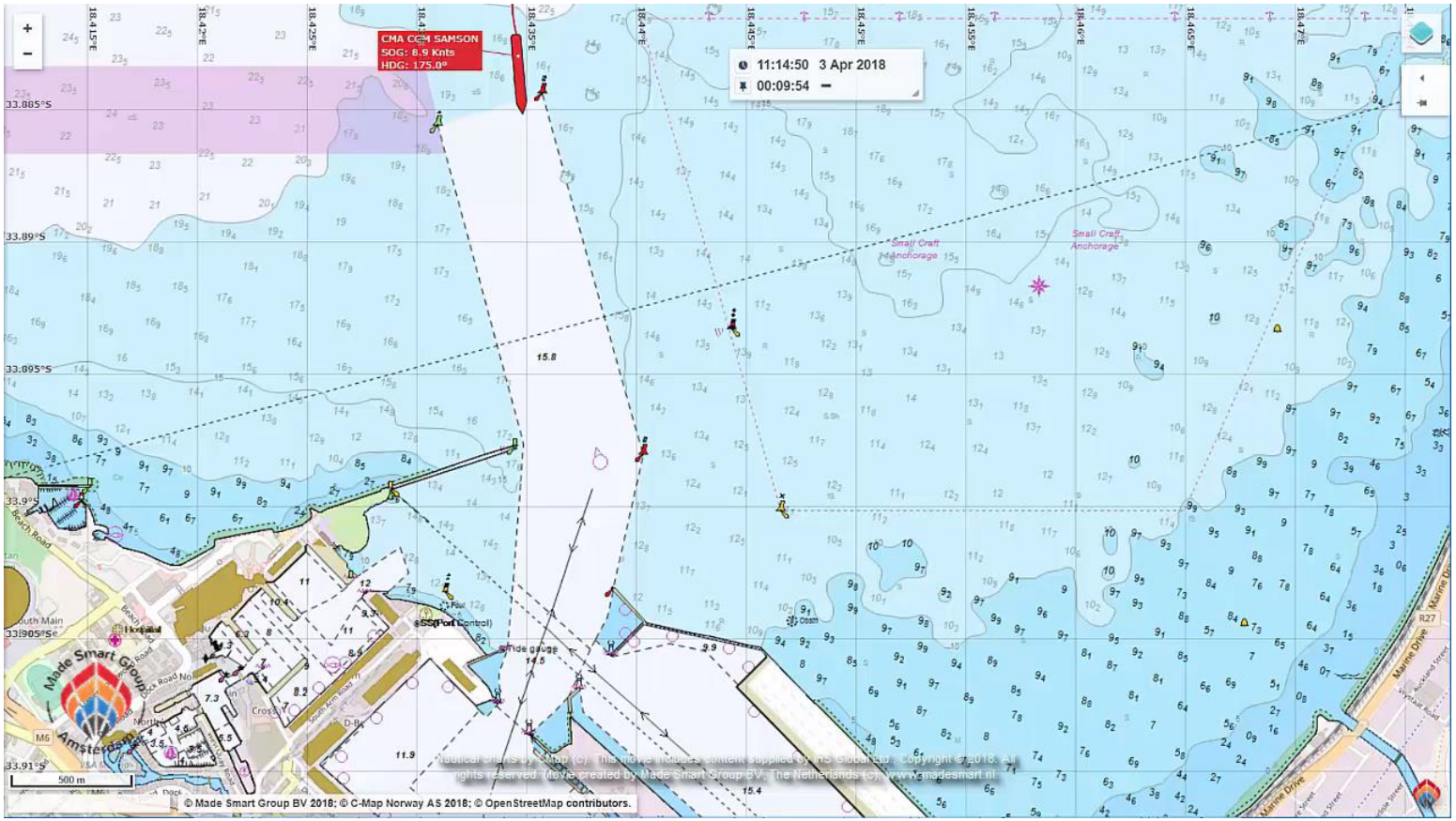
Marine Forum 2018



Conclusions:

- Technology has changed the way we do surveys.
- Experience and knowledge is still required to understand and interpret the data.
- It is imperative to obtain and preserve as much real time data as possible and as quickly as possible.
- Vessels (over 500 GT) are required to have VDR systems installed but they are not always reliable so other source data should be obtained as well.
- Finally, I always believe that should all else fail, the Cook will be able to provide you with the real story.

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