INCIDENT INVESTIGATION AND ROOT CAUSE ANALYSIS

James L. Dolan, Martin, Ottaway, van Hemmen & Dolan, Inc.
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The title of this presentation is somewhat daunting even when I hear it and it may be that it could have been called “the search for a prime cause”.

At the beginning of any presentation and in fact when we first read the title of any presentation there are several questions we as professionals should ask ourselves.

1. What is the subject in ordinary terms?
2. Why are we talking about it or what good does it do for me?
3. Even if I get the drift of the subject, how is this speaker going to be able to give me any tools to use in my professional life?

In other words what, why and how.

All of us in this room represent some facet of the marine industry whether we are designers, engineers, builders, shipping company representatives, surveyors or consultants.

All of us also, although we prefer to create, build or maintain the ships used in our industry sometimes have to deal with the downside of our industry, the incidents, casualties and damages to the vessels we’re responsible for, the injuries to men and women that serve on them or the impact on the environment in which they operate. Not to mention the financial impact that such casualties or damages may have for our employer and our livelihood.

The topic today deals with that downside and hopefully we’ll be able to explore some tools that we can all use to address these issues with the same professionalism as we apply to the building of our industry and its assets.

At the start of this presentation, I put forth several questions on your behalf and I’d like to take the next 15 or so minutes to address these questions.

The first question concentrated on formulating the subject in ordinary terms and I would propose the following:

1. Incident investigation is self-defining and includes all review, research and forensic activities used by the investigator to determine cause.

(Figure 1)

2. Root or prime cause is defined as that cause occurring first in time or sequence; In other words, the earliest or original event or condition.

In order to gain a full perspective, we should define two other causes that we will refer to today. They are:

3. Proximate cause, which is defined as the cause (most) closely related in time or space to the incident.

   and:

4. Contributory causes, which are events or conditions which, although not prime or proximate, affect the outcome of the incident being investigated and/or amplify or aggravate the prime or proximate cause.

The second question was, "Why are we talking about this subject and what does it do for me?"

All of us, regardless of our current positions within the industry, may well be called upon to determine the cause of an incident or casualty and while we may be able to call upon expert help to carry out this task, we need to be cognizant of the players and the techniques used in a proper investigation.

I should emphasize that a proper investigation into cause is necessary to:

1. Avoid repetition of the incident;
2. Take future corrective or remedial action on the subject vessel or other vessels in the fleet;
3. Submit an acceptable claim to a marine insurance underwriter;
4. Serve in litigation or legal defense;

For the purpose of this presentation, I would like you to think of these as two elements:

- First the operational "why's" which include avoiding repetition and taking remedial action and second the legal imperative of claims under our insurance policies and future litigation defense.

- I am addressing these "why's" in reverse order because my own initial concern is usually to address the actual incident first and the legal consequences later, however, each case is different and may demand different priorities.

Let's just talk about these "why's" for a few minutes.

Relative to an incident or casualty and an insurance claim, remember, "you will not be alone". There will be a number of parties involved, all representing different interests and all with their own agendas, views and personalities.

Figure 2 will give you an idea of the players and represented parties or interests. Of course, not all will be present at every investigation, but you have to be prepared to deal with all at some time during your career. Let's just briefly go over the chart.

In order to deal with these diverse interests, it's helpful to know their respective positions and entitlements, and figure 3 will hopefully help you to navigate this legal minefield. I won't spend much time on this, but it's something you should keep handy when representing one of the parties so that you have a clear idea of responsibilities and what information each party can reasonably accept.

Normally, as marine professionals, it would be logical to investigate an incident or casualty thoroughly and to determine the root or prime cause and our training should lead us in this direction.

There are, however, cases in which it may not be possible or even reasonable to determine root cause and, in fact, a legitimate claim may be made based on proximate cause.

A recent casualty proceeding before the Supreme Court of New South Wales is a good example.

In this case a fishing vessel loaded with cargo arrived in Mombasa and the vessel shut down (dead ship) in order to fumigate for cockroaches. The starboard sea suction was, however, left open when the engine room was sealed. During the shutdown the outboard, starboard sea suction strainer box failed as a result of corrosion. Seawater entered the vessel and the vessel sunk.

The question arose in court as to whether the vessel sank due to negligence (leaving the sea suction valve open). This being the proximate cause and could represent a want of due diligence within the particular insurance clause.

The court ruled that failing to close the valves, which resulted in the sinking, was against "good practice", was negligent and that the sinking was "proximately caused by that negligence".

All this with a corroded strainer box.

So while I always encourage the professional to look for root or prime cause, the second encouragement would be to know your insurance policy coverage clauses and check whether or not whatever you may find matches the specific covered peril(s) in your policy.

The second "why" is distinct and separate from the insurance claim process.

(Figure 4)

This includes:

- Lessons that can be learned from a root cause study
- Correcting existing rules and instructions
- Expand the existing know-how
- Avoid repetition of unwanted incidents
- Be prepared for official investigations by regulatory bodies (Class, U.S.C.G., US Army Corps Engineers, Police, etc.)

Both of the reasons, the "why's", just discussed are important to you and your principals or clients and should be considered when conducting your investigations.

The third question addresses the "how" of our investigation and analysis.

The marine professional when given the responsibility for conducting an investigation has to be a little bit of Sherlock Holmes, father confessor, Solomon and most importantly, a logical thinker.

The first job after ensuring that the situation is stabilized, pollution prevented, personal safety has been secured and further damage mitigated is to start the collection of evidence.

(Figure 5)

Collecting Physical Evidence:

A. Maintain chain of custody
B. Types of evidence

- Vessel logs (deck and engine)
- Classification records
- Bell book
- Oil record book(s)
- Bunker records
- Soundings
- Equipment calibrations
- Radar log
- Radio log
- Compass error book
- Passage plan (trip card)
- Navigational charts (including corrections)
- Loading and stability information
- Company procedures
- Master's statements/Notes of Protest
- Company incident report
- Photographs/videos
- Layout of accident reports, facts versus opinions, hearsay and estimates
- Witness statements
- External evidence

Once evidence is collected, or rather during the course of evidence collection, the analysis phase starts and some basic thoughts on this are as follows:

(Figure 6)

Conducting an Analysis:

1. Keep company representative informed

2. Collect evidence contemporary with casualty:

   Photographs/video/sketches
   Statements from crew/witnesses
   Statement from injured person (if a personal injury case)
   Ship's logs and records
   Names of involved crew
   Ship's position, speed, draft, etc.
   Samples, if applicable
   External sources (USCG etc.)

3. Send out samples for forensic evaluation if applicable
4. Call in experts to provide technical reports (internal/external)
5. Review evidence collected, forensic results and experts' reports
   Work from events closest in time to casualty (Proximate) back to Root Cause

Hopefully at the conclusion of this exercise you will have arrived at a root cause for the incident or casualty or, at a minimum, a claimable proximate cause. If not, you will have to re-review the evidence collected or investigate further to uncover evidence originally overlooked. Apply logic at all times during the process.

Obviously, it remains to develop a report and there are acceptable samples available to us for this. For example, the U.S. Salvage Association manuals, The Salvage Association, (London) reports, both of which have been traditionally used in our industry. This includes the standard field survey format.

(Figure 7)

In any case, casualty reports should contain some basic information as:

- Vessel and persons involved
- Date, time and location of casualty
- Vessel position (geographic location)
- Course recorder time vs. bridge clock
- Any discrepancy between the bridge and engine room clock
- Names and addresses of officers on watch, helmsman, lookout and pilot, if onboard
- Names and addresses of witnesses
- Statements of individuals involved and witnesses
- Name of tugs and equipment, if being used at the time of casualty, and their location in respect to the vessel
- Sketches or photographs
- Detailed description of the casualty incident

- Details of damage sustained by other vessels or property involved in the incident
- Direction and strength of current and wind
- Vessel draft (fwd and aft), speed
- Speed of vessel at time of incident
- Signals and lights of all vessels involved
- Rough and smooth logs
- Bell books
- Night order book
- Charts used
- Course recorder graph
- Note of Protest

Conclusion

At the end of the day, in our business and most others, incidents will take place and casualties will occur due to:

(Figure 8)

- Human Factors
- Mechanical failures
- Fortuitous events

These incidents or casualties involve:

- People
- Ships
- Cargo
- Environment

and we, as professionals should understand that over the years the priorities of our world has changed. An example is:

(Figure 9)

It is important that we, the industry professionals, recognize the need for proper investigations, understand the relationships of the separate interests involved and develop the ability to conduct thorough, logic-based investigations of incidents and casualties. In addition, we must be able to organize the evidence for proper claims presentation and implement reasonable remedial or corrective actions to prevent reoccurrence of these incidents or causalities.

In closing, I hope this brief presentation will assist us all in our professional careers, and I will be pleased to receive any inquiries on this subject.

- **ROOT CAUSE**

  ACTUAL INITIAL CAUSE OF INCIDENT/CASUALTY (PRIME CAUSE)

- **PROXIMATE CAUSE**

  APPARENT CAUSE CLOSEST IN TIME/EVENT TO INCIDENT/CASUALTY

- **CONTRIBUTORY CAUSES**

  ANY NUMBER OF INFLUENCES LEADING TO OR CONTRIBUTING TO INCIDENT/CASUALTY

Figure 1

Figure 2

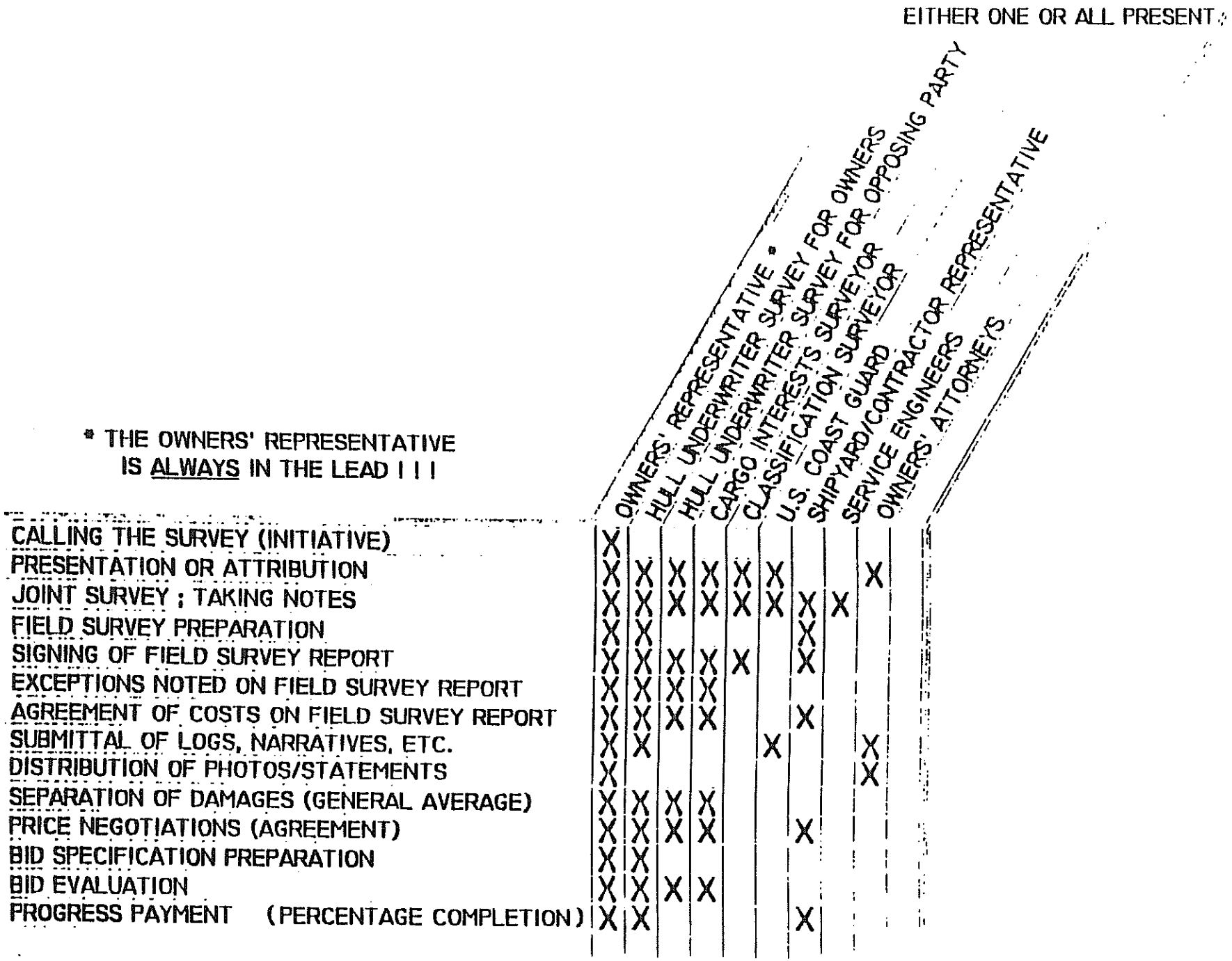

Figure 3

Reasons for Making a Root Cause Analysis

- Lessons that can be learned from a root cause study
- Correcting existing rules and instructions
- Expand the existing know-how
- Avoid repetition of unwanted incidents
- Be prepared for official investigations by regulatory bodies (Class, U.S.C.G., U.S. Army Corps Engineers, Police, etc.)

Figure 4

Collecting Physical Evidence

A. Maintain chain of custody

B. Types of evidence

- **Vessel logs (deck and engine)**
- **Classification records**
- **Bell book**
- **Oil record book(s)**
- **Bunker records**
- **Soundings**
- **Equipment calibrations**

Figure 5

- **Radar log**
- **Radio log**
- **Compass error book**
- **Passage plan (trip card)**
- **Navigational charts (including corrections)**
- **Loading and stability information**
- **Company procedures**
- **Master's statements/Notes of Protest**

Figure 5 (Cont.)

- **Company Incident Report**
- **Photographs/videos**
- **Layout of accident reports, facts versus opinions, hearsay and estimates**
- **Witness statements**
- **External evidence**

Figure 5 (Cont.)

Conducting an Analysis

1. **Keep company representative informed**

2. **Collect evidence contemporary with casualty:**

   Photographs/video/sketches

   Statements from crew/witnesses

   Statement from injured person (if P.I. case)

   Ship's Logs and Records

   Names of involved crew

   Ship's position, speed, draft, etc.

Figure 6

Samples if applicable

External sources (U.S.C.G. etc.)

3. **Send out samples for forensic evaluation if applicable**

4. **Call in experts to provide technical reports (internal/external)**

5. **Review evidence collected, forensic results and experts' reports**

   Work from events closest in time to casualty (Proximate) back to Root Cause

Figure 6 (Cont.)

HULL AND MACHINERY CASUALTIES

REPORT TO INCLUDE:

- Date, time and location of casualty
- Vessel position
- Course recorder time vs. bridge clock
- Any discrepancy between the bridge and engine room clocks
- Names and addresses of officers on watch, helmsman, lookout and pilot, if onboard
- Names and addresses of witnesses
- Statements of individuals involved and witnesses
- Name of tugs if being used at the time of casualty and their location in respect to the vessel

Figure 7

- **Sketches or photographs**
- **Detailed description of the casualty incident**
- **Details of damage sustained by other vessels or property involved in the incident**
- **Direction and strength of current and wind**
- **Vessel draft (fwd and aft), speed**
- **Speed of vessel at time of incident**
- **Signals and lights of all vessels involved**
- **Rough and smooth logs**
- **Bell books**
- **Night order book**
- **Charts used**
- **Course recorder graph**
- **Note of Protest**

Figure 7 (Cont.)

Causes Leading to Damages

- **Human factors**
- **Mechanical failures**
- **Fortuitous events**

Figure 8

CASUALTIES INVOLVE:

1. **People**
2. **Ship**
3. **Cargo**
4. **Environment**

PRIORITIES:

Past	**Present**	**Financially**
1	1	1
3	4	4
2	2-3	3
4		2

Figure 9