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Finding the missing piece

Seeing the whole picture in marine investigation p6

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Hard data vs soft data

Seeing the whole picture

Captain Paul Drouin
FNI

In 1998, the year I started my marine accident investigation career, data collection in many ways had not changed for decades. We collected the hard data available; course recorder (if the pen and ink had been maintained and the recording paper scroll was still working), rudimentary engine data, photos of the bridge or accident scene and the log book. And that was about it. Of course, in cases of broken equipment or fire scenes there was hard data to find and keep, as there is today. For navigation accidents, the hard data was more scarce. But things were changing rapidly.

Electronic charts were coming on stream even before ECDIS carriage became mandatory and we were learning how to ferret out the data from these. It was interesting, rewarding but sometimes frustrating work. Yet, when we succeeded, we gained some valuable added insight into what happened. As electronic charts became more sophisticated, and with the advent of mandatory ECDIS and voyage data recording (VDR) equipment as well as AIS carriage and recording, the hard data flow increased exponentially.

As with any new technology there were teething problems. In those early days VDR data was overwritten within 12 hours if the backup button was not pressed, which happened more often than we wished. On the other hand, sometimes the bridge team pressed the backup button twice (just to make sure it was saved!) which had the unfortunate effect of deleting the backup file altogether. And bridge audio recordings were notoriously bad to the point of often being useless. Many subsequent investigations pointed to this fact until better standards evolved to make bridge audio recordings more reliable.

With the passage of time, new VDR standards and improved technology made good quality hard data a boon for investigations. We were on the cusp of truly understanding what happened and when it happened. But there was, and is, still a need to collect soft data so we could understand why the event happened – why the persons involved took the actions or decisions they did. They acted almost universally in good faith and with the best of intentions. Yet, contrary to their wishes, bad outcomes occurred.

Conducting an interview

Even with greatly improved hard data recordings, interviewing the witnesses is still just as important as ever. First and foremost, developing a relaxed and trusting rapport with the witness is critical. Proper interview technique and a conducive environment are both foundational to a good interview outcome. If at all possible, choose a quiet and comfortable location to interview each witness – in complete confidentiality. Use the Golden Rule of interviewing: never interrupt a witness! This is very difficult as your mind will be racing with extra questions as the witness speaks. Jot these questions down in your notebook and only ask them once the witness has completely finished their train of thought.

Invite the witness to start their recollection of events much earlier than just before the accident events. Often, investigators will ask the witness to describe their day from the moment they got up from bed. This 'free-recall' method is surprisingly powerful if done correctly as the witness will begin to see their day play in their head like a film, and this will lead to much better recollection of events. Witnesses may tend to accelerate the time during this process and skip to the accident time. The investigator may need to ask the witness to go back and start their recollections again from the point where they jumped forward.

Fatigue data

Even once the witness has exhausted their recollection of events, there is still data to collect. One practice we often used while I was with the Transportation Safety Board of Canada was to end the interview by collecting fatigue data. Rest-work logs are not a reliable indicator of whether fatigue played a role in the accident. This is because they are not really 'rest' indicators at all, but instead indicators of time 'worked' and time 'not worked'. 'Not working' does not mean the person received recuperative sleep. And only good recuperative sleep can combat fatigue.

In my article 'Investigating for fatigue' (*Seaways*, July 2013 – see box) I wrote that;

'As a rule, an individual cannot accurately assess his/her own fatigue. It is up to the investigator, by asking the right questions, to determine if the person was in a fatigued state or not. You should not ask: 'Were you tired during your watch?' During your data collection you should more correctly ask: 'Please describe to me the periods of rest, work and sleep you experienced, starting from the time of the occurrence and working backwards at least three days.' (Studies have shown that at least 72 but preferably 96 hours of rest, work and sleep data is necessary to assess for fatigue.)

The same article also describes the quantitative and qualitative data analysis that is necessary in order to evaluate whether fatigue played a role in the accident. In short, for a quantitative analysis, each hour of sleep is worth +2 credits and each hour awake is -1 credit. A negative result indicates probable 'sleep debt'. Then, a qualitative analysis of the sleep period should be performed by asking such questions as:

- Was your sleep interrupted?
  Interruptions mean the sleep will probably be less restorative.
- Where did you sleep?
  If sleep was elsewhere than the regular place of sleep – this could make the sleep less restorative.
- Do you have any sleep pathologies?
  Obviously, sleep pathologies will also reduce the restorative effects of sleep.

But even with a confirmed sleep debt (quantitative) and qualitative confirmations of bad sleep, this still does not mean fatigue actually played a role in the accident. Fatigue as a contributing factor in the accident can only be posited if it can be shown that both:

- The person was in a fatigued state using both quantitative and qualitative methods of evaluation; and
- The unsafe act or decision that was instrumental in the accident is consistent with the type of behaviour expected of a fatigued person.

Some behavioural indicators that a person is suffering from fatigue are:

- Impaired judgement (distance, speed, and time);
- Reduced problem solving ability;
- Forgetting or ignoring normal checks/procedures (provided that not ignoring them is the norm);
- Preoccupation with single tasks;
- Slower reaction time;
- Reduced situational awareness.

Such behaviour indicators may be difficult to collect but could be discerned through interviews with other witnesses or even on the VDR replay, such as bridge audio recordings.

The sum of the parts

To sum up, the hard data now available to investigators via VDRs, ECDIS and other onboard data recorders makes establishing what happened and when much easier than in the past. Yet, we must not let this tsunami of data overwhelm other aspects of a good investigation. Getting inside the witness's head using advanced interview techniques is essential. We must learn why the persons involved took the actions and made the decisions they did. This should lead to the discovery of the unsafe conditions and underlying conditions that contributed to the accident.

And don't neglect the fatigue data during the interview process. As described, looking at work-rest logs is not sufficient to establish whether fatigue played a role in the accident, even if the logs appear to show compliance with MLC and STCW. Unfortunately, even national investigative agencies sometimes overlook this fact. For example, in a recently reviewed report we can read the following; 'Analysis of the bosun's records of hours of rest submitted ... showed that he had 98 hours of rest in the previous seven days and 14 hours before [...the accident]. The records of the other crew members were also compliant with the MLC and STCW Convention requirements. Thus, fatigue was not considered to be a contributing factor to this accident.'

In essence, it is not a question of hard data versus soft data after all. These data are complementary. Neither one should overshadow the other in the discovery of the contributory factors in an accident or incident – on the contrary; they should support each other.

Editor's note: All editions of *Seaways* back to 2006 are now available on the website. To access an issue:

- Log in to the Members' Area and go to 'My NI'
- Open the current issue of *Seaways*.
- Click on the 'Archive' icon (looks like a file box) on the top right.
- This will open a list of all the back issues of *Seaways* currently available; just click on the one you want!