NEW SOUTH WALES STATE CORONER'S COURT

STATE CORONER: J B ABERNETHY

WEDNESDAY 29 MARCH 2000

5/98 - EVENT OF THE 1998 SYDNEY TO HOBART YACHT RACE

INQUEST INTO THE DEATHS OF JAMES MICHAEL LAWLER
MICHAEL BANNISTER
BRUCE RAYMOND GUY
PHILLIP RAYMOND CHARLES SKEGGS
JOHN WILLIAM DEAN
GLYN RODERICK CHARLES

Mr A Hill assisting the Coroner
Mr R Stanley QC for the Bureau of Meteorology
Mr R Weber for The Cruising Yacht Club of Australia
Mr A Shand QC for Mr Richard Purcell

PART HEARD

<ROBERT CLIVE MATTHEWS(9.35AM)
RESWORN

CORONER: For the record your name is Robert Clive Matthews, and you gave your address and occupation yesterday to this inquest.

HILL: Q. Mr Matthews, yesterday you were telling us about you were having difficulty with the harness buckle, is that it, or the clip, whatever you want to call it?
A. Yes, yes.

Q. Just behind you there's a series of clips on a board. Can you tell us which clip it was that you were using?
A. I had the carbine hook with the eyelet. It's marked here as C.

Q. What was the problem that you were having?
A. Can I take it off?

Q. Take it off, yes, take it off so that the Coroner can examine it.
A. The type of buckle that I had was the same as that one. The stainless steel--

CORONER: You can approach, Mr Hill.

A. It was the stainless steel buckle and the notch in the end of the clip with the strain on it, I had been right at the end of my line and the boat moving through the water, I just couldn't get it past that notch. It just wouldn't go.

HILL: Q. So that was stuck into the buckle itself?
A. Yeah, and it was only that little tiny notch in the end

that--

CORONER: I missed that. Could you explain that again, I'm sorry?

A. There's a small notch in the end of the hook there, and as I was trying to release it--

Q. It got caught in the notch?
A. It got caught in the notch.

HILL: Q. And that was because of the strain that was on the line was it?
A. Yes. I was right at the end of my line. That was the hook that I was using and this particular hook is actually made for this one and that's even - got an even bigger notch in it. That'd make it even worse.

Q. There's another type of release mechanism there. That's a sort of pull type. Have you had a look at that?
A. I have had a look at it, yes.

Q. What do you say about that one? Would that have enabled you to get free easier?
A. In conjunction with that--

Q. That harness?
A. That harness and that strap, it may have. Depending - I don't know whether that will actually work if it's twisted around several--

Q. The idea being is that you pull, pull that string which will release that theoretically on the - like that?
A. Yes.

Q. So that you don't have to - so that comes apart that way?
A. So instead of releasing it at your chest, you release it - you can pull it either from that one or from that one. But again that - the hook on the chest side still has that notch in it.

Q. Well you've seen that board of various clasps and retaining devices. Do you think any of those would have been better in the situation that you were in?
A. The way I had my harness actually fastened onto the yacht, the stormy seas strop probably still wouldn't have assisted me because I had it wrapped around - I had my harness wrapped around the helmsman's seat and back onto itself. It may have, I'm not sure.

Q. So have you got any thoughts on what sort of devices for quick release one can obtain?
A. Well if I was using the stormy seas type of harness arrangement, I'd make sure that I didn't wrap it around something. I'd make sure it went straight onto a strong point on the yacht rather than wrap through a strong point on the yacht and - but I'd still like to see something done

with the notch end on the other end in case that jammed for whatever reason.

Q. Because it's that little hook on the end is it that catches it?
A. That's the thing that got me, yes.

Q. Have you any idea why that little hook is there?
A. I assume it's to stop the - if they're under heavy load, to stop them from - the hook from opening by stretching.

Q. If I could take you back to the race itself. After the second rollover, you've told us what occurred. I think you got the life rafts on deck or one of them on deck, is that right?
A. Yes.

Q. I think one of them had to be put over the side at one stage?
A. We put one over the side and it just kept blowing over and over and over. We originally threw a lot of wet weather gear and cans of soft drink and anything else we could find that was loose and floating around the boat that might have been handy in the event of climbing into the raft, and it just flipped over and we lost all that. Shane and myself righted it probably four or five times in the space of about 15 or 20 minutes, and in the end we just said we'll leave it there and if we need to get in it we'll right it then.

CORONER: Q. Was it pulling a drogue when you put it in the water?
A. I don't know, I don't know.

Q. You know what I mean?
A. Yes.

HILL: Q. I think you wanted to say something about the radios. What was that?
A. Well there was a bit of stuff happening yesterday regarding the frequencies that we were using to talk to Telstra Control. In fact we weren't able to talk to Telstra Control, we were having to relay through other yachts. Now those other yachts from time to time would move out of our range. Because our - for whatever reason, the aerial being on the deck or whatever, we weren't able to transmit very far, and we established initial contact on 4483 I think. Once we'd established that contact through - I think the first boat was Yendys. It would have been pointless for us to go to 2182 unless Telstra Control, by taking control of the situation, had said please go to another channel, and the boat or boats in between would have also had to go to that intervening channel. As it was, if we'd switched to 2182, we wouldn't have been able to talk to anybody but the fish because Telstra Control was beyond our range and all the other boats were monitoring 4483. Once we established that initial contact, we were loathe to change to any other frequency.

CORONER: Q. And that will always be the position when you're working on a relay basis, because the other boats will have to relay - will have to change as well.
A. Yes. And the - I've forgotten what I was going to say.

Q. Sorry to interrupt you.
A. The - yeah, once we'd initialised that contact we just didn't want to change, and there was no need to change because nobody told us, nobody took control. Under normal radio operations where I've heard other situations, the base station usually takes control of the situation and clears the air waves, does whatever they have to so that they can tell you what's going on. Nobody at any stage got back to Business Post Naiad to say that your message has been transferred through to Canberra, this is what's happening. Nobody got back to us. They said yes, we've acknowledged your mayday, but that was all that happened and that was all that happened all night. There was no - we didn't know that our message had been passed on any further. We didn't know whether anything was being done to rescue us.

HILL: Q. And that of course would have a great effect on your morale?
A. Absolutely.

Q. There was one other aspect that my learned friend Mr Weber was cross-examining Mr Walker on, and that was that Mr Bush had been told that water was coming over the stern. Do you recall that?
A. Yeah. Water appeared to be coming from the stern of the yacht after the first roll.

Q. Did you tell this to Mr Bush?
A. Yeah. It was Peter Keats and myself were talking to Peter Bush at that stage. This briefing that we had or debriefing that we had was sort of a - if I dare use the word, it was sort of more of an informal chat.

CORONER: Q. Well it wasn't exactly like an inquest?
A. No, we weren't - we weren't sitting like school children looking up at the teacher in awe at Mr Bush. We were just sitting around a room and there were other conversations going on at times.

Q. And he didn't see you individually?
A. No. This water, Peter Keats after the first roll thought that the water was coming from aft because the area near the navigation station where he was situated kept filling up with water, but - and he had it down to about the level of the rest - the floor, under the floor, but it was still making water. Not a lot of water but it was still making water, and he was concerned that if there was a crack in the hull that might have been working and getting bigger, perhaps we might have been getting into a worse situation. But after probably 10 minutes of Peter baling out this very small area with - only making a small amount of water, we realised that it was coming from the two lockers under the settee berths in the centre of the yacht that were actually

both full of water and were draining into the bilge area of the yacht. Once that all levelled up, the water stopped going into the area that Peter was looking at all the time and we realised that we had - there was no situation to control.

Q. So it wasn't a case of water coming over the stern or through the stern or anything like that?
A. No.

Q. It was just the lockers were draining?
A. Yes.

Q. Did you explain that to Mr Bush?
A. Yes.

HILL: I've nothing further, thank you.

STANLEY: Q. Mr Matthews, how were you ascertaining the wind speeds when you were on the boat?
A. From the wind speed instruments or the instrument that was still working before the mast came down.

Q. Yes, I'm talking about before the mast came down. Whereabouts were you able to read it?
A. On the port side of the aft side of the cabin.

Q. Were you in court yesterday when the last witness gave evidence, Mr Walker?
A. I was, yes.

Q. He'd made reference to one of the pieces of instrument or instruments not working properly, recording a different--
A. The windward instrument was starting to do funny things, but the leeward one and the log and all the other instruments were still perfect.

Q. Where was the leeward one situated?
A. The leeward one would have been a distance of probably six feet from where I was sitting.

Q. Was that the one that you'd been looking at before the mast went?
A. Yes.

Q. And that's the one that you now know had been doing funny things?
A. No, no, that's - the windward one was doing funny things. That would have been probably five feet from where I was sitting. I mean the cabin's only a very narrow cabin.

Q. So you were able to see both of them were you?
A. Yes, yeah.

Q. And what, were they both intended to be reading the wind speeds?
A. The leeward one originally was set up to read something else, it might have been depth or something like that, and I

- when the windward one started - I think it was saying no set or something like that or error or something, and I just set the other one up on the other side to read the wind speed. Brooks and Gatehouse instruments are very to change that sort of thing on.

Q. In your record of interview at question 18 you'd been asked about and you were answering some questions about the weather forecast had changed from 45 to 55 and then they put out a storm warning. You then went on, "and from what I could gather it looked like it was only going to last about 10 to 12 hours this blow and we thought we could ride that out quite comfortably." How was it that you thought it was only going to last 10 to 12 hours?
A. That was the original information that I'd overheard. I didn't actually sit down and go through the weather forecast with a fine toothcomb like the navigator, the skipper and Steve. I knew that we were going to getting a lot of wind for an uncomfortable period of time.

Q. So did you regard 10 to 12 hours as a long period for this storm warning?
A. I didn't really regard it as anything. It was just something that I've been through before, it was going to be uncomfortable, but I didn't really - I wasn't overly concerned.

Q. Had you ever sailed in a race before where a storm warning had been issued?
A. I have sailed in a race before where a storm warning had been issued, but the storm warning was issued after that race began.

Q. That's the same circumstances as here.
A. Similar.

Q. Which race was that?
A. That was the around Australia race in 1988.

Q. For what waters was the storm warning issued?
A. We were in the Southern Ocean at probably 400 miles west, west-northwest of Tasmania.

Q. Have you ever been in a race or ever been on a yacht in Bass Strait when a storm warning as prevailing?
A. I have been on a yacht several times in Bass Strait when there's been a storm warning.

Q. What sort of conditions have you struck?
A. In one case much stronger wind, but the seas were nowhere near the seas that we encountered on this particular trip. I think - well I don't think, I know, the year I went across to Melbourne it was 1972, December 1972, and we were within about 20 miles of Point Lonsdale down near Cape Schanck, and it was reported in the paper the following day that the wind speed topped 98 knots at Point Lonsdale.

Q. So did you believe you had some idea as to what the

weather conditions would be with a storm warning?
A. I believe I did, and especially seeing as they were forecasting 45 to 55 with the storm warning. In Tasmania, quite frequently on any of the local Tascoast radio stations, if they give a strong wind warning or a gale warning or a storm warning, they will also add gusts to, and in the case of say a strong warning - or in the case of a gale warning they might say we've got a gale warning in such-and-such an area with gusts to 55 knots, which is into the storm warning area but they're only talking about gusts, and that is quite frequently heard on the radio.

CORONER: Q. And you say that's common in Tasmania with the Tasmanian Weather Bureau?
A. Yes. With the Tasmanian coastal what do you call them, volunteer coastal patrols and those sorts of people. I don't know whether they do that in New South Wales but--

Q. But you wouldn't expect to get gusts on a Weather Bureau forecast in Tasmania would you?
A. No.

STANLEY: Q. Did you hear any observations of the wind speed at Wilsons Promontory as being so much with gusts up to?
A. No.

Q. Did you hear any record of wind observations from Wilsons Promontory?
A. No, I didn't.

Q. Or any other land base?
A. Not until after the--

Q. After the race?
A. After the race.

Q. Do you know whether anyone on your boat made any attempt to find out wind speeds?
A. I'm not aware of anyone making an attempt.

Q. Were you aware that a storm warning was the most extreme warning that could be put out for these waters?
A. I was aware that the storm warning was the next one up from a gale warning. I certainly knew that and I knew that they were over - around about 50 knots, but I didn't - I wasn't aware that cyclone warnings were only referred to in tropical waters. The Weather Bureau in fact in the paper the following day were calling it a bomb, and I'm sure if they'd called it a bomb we wouldn't have known what the hell they were talking about.

Q. So it would be a rather unwise term for them to use in a forecast, wouldn't it?
A. I would think so, yes, yes.

STANLEY: Thanks.

WEBER: Q. Mr Matthews, I think you told the inquest yesterday that at the time of the race you were unaware of the removal of lead from the ballast of the vessel?
A. That's right.

Q. And that you became aware of that removal subsequent to being rescued?
A. Yes, I - yeah.

Q. Do you think it was in Eden?
A. I think it may have been in Eden. The first part of last year to me is a bit of a blur.

Q. I can understand that. Somebody told you didn't they that Bruce - that's Mr Guy - apparently removed lead from the bilge to optimise it to the IMS?
A. Yes.

Q. Who told you that?
A. I can't recall.

Q. The effect of what you were told was that by taking the lead out, Mr Guy hoped to obtain a handicap advantage. That correct?
A. I assume that that would have been why it was done, yes, but that's only an assumption.

Q. Well you were told weren't you that that was why it was done?
A. No, I was told there was lead removed.

Q. Do you recall being interviewed by the police on 16 March 1999 at Launceston?
A. Yes.

Q. At page 6 of the interview, question 39, you were asked "all right, since sailing on the Business Post Naiad in various races, are you aware of any alterations that have been made to the boat?" and you answered, "since the Sydney Hobart I was told that Bruce had apparently removed some lead from the bilge of the boat to optimise it to IMS." So that's what you were told, wasn't it?
A. That's what I was told later, yes. The time I was told back in Eden I was just told that lead was removed.

Q. But by the time you spoke--
A. By the time the police came to Tasmania, I was told that that's why the - that Bruce had done it.

Q. And you explain to the police on the next page in answer to question 48, explain that you're not a mathematician and you don't know exactly what stability index means. "All I know is there's a figure that designers and everybody works to get the boat down to an absolute minimum so it will go fastest for its size so you can win under IMS."
A. Yeah.

Q. And that was your understanding?

A. Yeah. I should have said mathematician or designer.

Q. And your reference to win under IMS is a reference to the fact that IMS is basically a handicapping system, isn't it?
A. Yes.

Q. And while Business Post Naiad was highly unlikely to get line honours, you were in the race for a possibility of a good result on a handicap basis, weren't you?
A. Well yes.

Q. You gave some evidence concerning the terrible situation that you were in after the second roll, and again I think you told the police that after your extraordinary effort to get yourself out of the water it was just a question of waiting for the next appropriately sized wave to come along to right the vessel?
A. Yes.

Q. And when it did come along it did right the vessel, correct?
A. Yes.

Q. You've given some evidence to this inquest concerning what you've described as a debriefing between certain of the crew and Mr Bush in Tasmania.
A. Yes.

Q. And you recall you gave some evidence about Mr Bush informing the crew that they needn't speak to the police if they didn't wish to?
A. Yes.

Q. And perhaps that they should consider legal advice?
A. Yes.

Q. What I want to suggest to you is at the same time that he said those things to you, he also said words to the effect of and you're similarly not required to speak to me?
A. I don't even recall him saying that.

Q. Not at all?
A. Not at all. As I said, it was a fairly casual sort of a setting.

WEBER: Thank you, Mr Matthews.

<WITNESS RETIRED AND EXCUSED

HILL: I have now Dr Renilsen. We have to set up this equipment here. Would you give us five minutes?

CORONER: Yes, I will. This is some technical evidence relating to the stability of the Business Post Naiad.

SHORT ADJOURNMENT

CORONER: I'm sorry for the delay. There are matters that come up which are unrelated to this inquest which from time to time I've got to deal with quickly. I'll just let you know, an inquest like this is very complex. The logistics of organising witnesses from all over the Commonwealth are not easy and my staff have done an amazing job in my opinion, Pam Lazzarini and Michelle in particular. But it's an ongoing problem which we're doing our best to cope with to the benefit of everyone, that is the interests of the families of the deceased, the interested parties who are represented at the bar table, and simply trying to get through the work. It's not going to finish at the end of next week and we're setting time aside in July I think now to hear the rest of it. I still hope to give a decision well before this year's race. So the time was taken up in chambers then in trying to organise witnesses to keep - and take into account the commitments of the lawyers, who have other commitments than this, and the witnesses themselves. Some can come on certain days, others can't, and we're trying as far as possible to accommodate everyone, so I hope you'll understand and bear with us when we have a break like that.

<MARTIN ROBERT RENILSEN(10.41AM)
SWORN AND EXAMINED

HILL: Q. Doctor, would you give the inquest your full name please?
A. Martin Robert Renilsen.

Q. And your address, sir?
A. 1267 East Tamar Highway, Dilston, Tasmania.

Q. I think you have a position at the Australian Maritime College?
A. Yeah, head of Naval Architecture and Ocean Engineering at the Australian Maritime College.

Q. Your qualifications are what?
A. I have a degree in Naval Architecture and Ocean Engineering and a PhD in the same subject.

Q. You did a report on the Business Post Naiad?
A. Yes.

Q. That took part in the 1998 Sydney to Hobart yacht race.
A. That's correct.

Q. Do you have a copy of that report with you?
A. I do.

HILL: Do you have a copy of that, Mr Weber?

WEBER: Yes, I do.

HILL: Q. I'm going to take you to portions of that report, but basically I believe you tested a model, you had a model made of the Business Post Naiad?

A. That's correct, it's behind you here.

Q. That's this model here, and that represents the Business Post Naiad after it was recovered and towed into Eden?
A. That's correct, yes, as best we could.

Q. You were told that that was the position of the mast, and you've looked at photographs to make up that model?
A. That's correct.

Q. You also consulted with the survivors of the crew of the Business Post Naiad in regards to the position of the mast and the model itself?
A. That's correct, and lines plans were provided to us, the shape of the hull was provided to us as well.

Q. As well, because it was a Farr(?) 40?
A. Farr 40, yeah.

Q. I think that some of the people from the Business Post Naiad actually watched the tests that you did?
A. That's correct, yes.

Q. These tests were a series of tests in a wave making tank, is that right?
A. Yes.

Q. And it was to test the stability of the vessel at varying degrees of limited positive stability, is that right?
A. That's right, yes. We tested a range of different centre of gravity positions for that purpose.

Q. So basically you started off with the hypothesis of the Business Post Naiad conforming to the IMS certificate that said it was 104.7 degrees, is that correct?
A. That's right, that was - we tested that condition, yes.

Q. And then you tested it at a LPS of 110
A. Hundred and ten, yes.

Q. And then 115?
A. Hundred and fifteen.

Q. And then 119?
A. Hundred and nineteen, yes.

Q. There were two sorts of tests as I understand it, one to see what sort of wave would be required beam-on to roll this vessel over 180 degrees. Is that right?
A. That's correct.

Q. And then there were further waves to see how high a wave would be and the time required to bring it back up to its upright position?
A. The time required in irregular waves you mean, yes?

Q. Yes, is that correct?

A. That's correct.

Q. In your report at page 5 you begin and you point out that the ORC race categories are stated in general terms and the special circumstances of any particular race may make deviations from these recommendations appropriate. What do you mean by that?
A. Well we just - we were basically just taking that information from the IMS regulations. We're not - we didn't specify what the stability index must be, we were just taking this information sort of pretty well, you know, just quoted straight out of their regulations.

Q. They're set by the ORC?
A. Correct.

Q. So for a category zero it's 120 and for a category 1 it's 115, and this was a category 1 race, though there was a grandfathering clause that we have heard about. Is that correct?
A. That's correct, although we didn't - we just took that as read. We didn't decide the grandfather clause or anything like that.

Q. I think that you wanted to show us first of all what it is that we should be looking at?
A. Yes. I just felt if it's appropriate it might be worth just going briefly through a couple of points of obstacles here, just to cover some areas. There's sometimes a little bit of confusion. Do you want me to proceed with that now?

Q. Yes, if you would show us.
A. I don't have the device do I? Thanks. What I want to do is just talk a little bit about statical stability which is the stability of a vessel in a stationary situation, which is basically the way the regulations both for yachts and for other vessels take into account. But I also want to talk a little bit about dynamic stability which is the - looking at the motions actually in waves, so we're looking at what actually happens in real life but the regulations don't take that into account.

Q. When you say the regulations, are you talking about the regulations that are set that say a category 1 race must have a stability of 115?
A. That's correct, that would be a statical stability requirement, and I'll maybe just explain what's meant by that in a moment or two. This is just a diagram of the - of an inverted yacht, and the two things that are of interest here is the centre of gravity which is here, so obviously the downward force acts through the centre of gravity, the centre of buoyancy here, and the upward force acts through the centre of buoyancy. When that vessel which is initially upside down at 180 degrees is heeled over to a small angle, what happens is the underwater force, the centre of buoyancy, moves across to some point - and in this diagram I've shown that here - so that the upward force acts up this vector and the downward force still acts through the centre

of gravity through this vector. In this particular diagram, the way I've shown it, this will create a frapple(?) which will bring this yacht back to its inverted position. Obviously it depends on how far across this centre of buoyancy moves. If it only went that far, then that frapple would be the other way and the yacht would in fact return to upright. The key thing to notice is this distance between centre of gravity and this point here, Z, which naval architects refer to as GZ and which is a righting lever. For small angles, we can also consider that this upward force acts through this point here which we call the metacentre, and for small angles this distance between the centre of gravity and the metacentre is quite important, and we refer to that as GM or the metacentric height, and as I say they're for small angles that's equal to GM sign theta. So what becomes really important when we're looking at the stability of anything at all is our GZ or righting lever curve. This is the heel angle along the bottom here and this is the GZ up the side here, and this is drawn from zero to 180 degrees. For most vessels of course we stop at around 90 degrees. We don't look at the stability of most vessels upside down. For a yacht of course that's very different. What this curve is telling us is that if we heel the vessel over to, for example, 40 degrees, we have a positive GZ so the vessel will come back to upright again. If we heel it over to this angle we still have a positive GZ, so the vessel will still come back upright again, but if we heel it over to this angle we have a negative GZ, and so what'll happen is the vessel will continue till it reaches 180 degrees. And this angle here is referred to as the limit of positive stability, and this is often known as LPS or limit of positive stability. The slope of this line here at this point gives us an indication of the size of GM, the metacentric height between the centre of gravity and M. This value here as the maximum value of GZ is obviously important, and this area under this curve is deemed to be important because if we want to get the vessel from this point to this point, we have to counteract the work that would be done because of this area, so these things are the things that are important. When we look at--

Q. If I just stop you there. Basically what you're saying is that vessel could be tipped right over to 120 degrees and it will still come back up. Is that 120?

A. Say 119.

Q. And it will come back upright?

A. A hundred and nineteen degrees and it will still come back upright.

Q. So if it's knocked down by a wave it'll go right over to 119 but come back up. If it goes further than 119 it then simply goes and continues on?

A. Exactly correct, yes. So that's an important angle, that limit of positive stability. On the other side looking at - once the boat is upside down and sitting at this point here 180 degrees, this is our inverted GM, so this is the upside down GM keeping us in this position, and this curve then, we're interested in the size of this maximum or

minimum, the lowest point of this curve and we're interested in this area here. The bigger this area, the larger this value and the larger this, the less likely the vessel is to come back upright again when it's upside down. So what I want to do is just look at the effect of changing the position of the centre of gravity, because this is essentially what we were doing in our experiments on that curve. This solid line is the original centre of gravity position and the dotted line would show just schematically what would happen if we raised the centre of gravity on this vessel. What happens is because the centre of gravity is closer to the metacentre it's raised up, that distance is smaller so this slope is less. The maximum value GZ becomes less, the angle of the limit of positive stability becomes less, the area under here becomes less. And all these things combined mean that the vessel with the higher centre of gravity from a statical point of view is much more likely to capsize. If we go to the other side and look at the inverted stability, the vessel sitting here with the higher centre of gravity, what we've got is a larger inverted GM, a larger value of GZ maximum down here and a larger area under this curve, and also a longer distance between here and the angle of positive finishing stability. So what that's saying is with the higher centre of gravity, the vessel is much more likely to stay upside down in this situation. So it's much more likely to capsize, much more likely to stay upside down from a statical point of view.

Q. If I could just stop you there. Do we raise the centre of gravity in a yacht such as the Business Post Naiad - if we took say 300 kilograms of lead from just above the keel area, would that have the effect of then raising the centre of gravity in that vessel?
A. Where are you putting the centre of gravity? You are moving it up the way?

Q. If I simply took 300 kilogram of lead from that area just here around the bilges, would that take the centre of gravity of that vessel up?
A. If you remove lead from below where the centre of gravity is then yes, it will move up. If you remove lead from above the centre of gravity then it will move down. And I think you are indicating a position below where the centre of gravity would be. Is that my answer to your question?

Q. Yes, yes.
A. So I just summarise there that these are the features that influence the self-righting, the limit of positive stability, the angle that I was talking about, the area under the gz curve, the inverted gm and the maximum negative gz. The other issue that I want to just mention from a statical point of view, we are still talking about statical stability, and from a statical point a view if the vessel has water on board then the water will move if it heels over. So in this diagram here the vessel is upright and this green centre of gravity here is the centre of gravity of the water that's trapped in the vessel at that point. If the vessel is heeled over the centre of gravity of course of that water will move across the way, we refer to that as a free surface, and that then will have an effect on the statical stability curve. The tests we did though were tests in waves and so we were actually looking at what happens in waves in real life. We had two separate types of tests. The first set of tests was in a single breaking wave and what we did there the water was completely calm in the tank and we generated a wave which we arranged for that wave, stick(?) wave, to break right next to where the model happened to be in the tank and what we did then was we changed the size of the wave, changed the position of the model till eventually we could find out the largest wave that didn't self-right the model. And that's a very deterministic thing that will not change, we could go and do that experiment tomorrow and the same thing will happen, exactly. We then did some test in irregular waves, which is like a real sea state. We didn't copy the exact real sea state at the time because we couldn't do that but we simulated something which would be representative of the real sea state of the parameters that would self-right the model. And what we did then was we tested the model, we put the model in the tank, we measured how long it would take before it would self-right. And we did that ten times for each centre of gravity position so that we could get an average and these are the results. And this clot here along the bottom here is a significant wave height that we tested in the tank. Up the side here is the time inverted in our

waves. This is not necessarily in real waves, this is the waves we were testing in the tank and you can see the various lines correspond to different limit of positive stability, so this line here corresponds to 119, 115, 110 and 104.7. So essentially what we are saying is that if you have got 104.7 and for a particular significant wave height you will take a lot longer - on average spend a lot longer upside down than if you had say 119.

Q. So for the Business Post Naiad at 104 it's going to take how long, can we work that out, under water?
A. I guess the problem is difficulty of relating what's going on at the time to full scale. This is a relativity, so in other words what we are saying is we can say relatively speaking between the three, but because these waves are not quite the same as the real waves I wouldn't want to put an absolute value on it.

Q. I understand. I think the next LPS done was 110, is it?
A. Yes. Sorry about the poor quality

Q. That's all right. And the third one done, the third curve, is 115?
A. Yes.

Q. Is it possible to look at it and say that at 115 you spend half the time or a quarter of the time--
A. Considerably less. I wouldn't want to necessarily put a number on it but considerably less as you can see from the graph, on average considerably less.

Q. But what I am trying to work out is when you say considerably less are you talking about around about a quarter, around about half, around--
A. Around about. That's right, yes. So as you can see here going from 104.7 to, for example, 120 it's less than half.

Q. It's less than half?
A. Around about that, yes.

Q. Is it therefore reasonable to say that if the vessel was 120, the LPS of 120 degrees, it will only take half the time to right, to bring it back up, than it would at 104 degrees?
A. On average within the limits of what we were able to sort of say. Roughly that, yes.

Q. And is that consistent all the way up to that?
A. That's correct, that's consistent through. As you can see the whole range is consistent and it doesn't matter what significant wave height we are talking about. So that whole - it was very definite. I should have said, I haven't presented the results here, they are in the report, that's also the case as we change the height of the wave, in the single wave tests showed exactly the same thing. You need a smaller wave to self-right it if it's got 119 than you need if it's got 104.7. So there is no doubt about that in our mind at all.

Q. The lesser the LPS, the larger the wave we need to right it?
A. For this vessel, yes that's correct. We then repeated the tests with water on board because it was quite clear that at the time the vessel did have water on board. We didn't know how much water and we put four tonnes of water on board. We only tested two conditions, the 104.2 and 118 degrees LPS and again it's quite clear that that same conclusion would arise if the water was on board. So that's not an anomaly that wouldn't occur if the water wasn't on board, the same thing occurs with water on board which was the purpose of doing these tests. So we were able to conclude increasing the limit of positive stability by lowering the centre of gravity makes the Business Post Naiad more likely to self-right and that same conclusion is the case if there is water on board. What I'd like to do, if I may now,--

Q. Certainly.
A. --is just take us beyond the Business Post Naiad, if I may, just very briefly because we have continued doing a lot of work in this area. I have to say I have stressed the fact that what naval architects have known about in the past has been statical stability and we are looking at what happens in the real waves, it's a dynamical situation and there is not much work been done on self-righting. So if we take not this vessel but another vessel, a more modern vessel, and imagine the vessel without the coach-house. We have this particular ..(not transcribable).. limit of positive stability 122.4, inverted gm, maximum negative gz. If the designer then decided--

Q. Coach-house is this portion on the top, the cabin?
A. The cabin part on the top. So this would be a flush deck type of vessel and if the designer decided that he wanted to make the vessel a little bit safer by giving it a large coach-house, a large cabin top which one would normally think would make it safer, it does, in fact from a statical point of view it increases the limit of positive stability, it decreases the inverted gm and it decreases the maximum negative gz. So all the things I was saying before would make out, without a shadow of a doubt, that this vessel would be safer than this vessel. The results - this is the same plot as before where we have got the significant wave height along the bottom here and the time inverted up here, this is with the coach roof and this is without. So in other words with the coach roof it takes a lot longer to self-right than without, which is completely the opposite of what we would have expected and completely the opposite of what statical stability would tell us.

Q. I think that basically the approach has always been to prevent a capsize and therefore you increased the LPS to do that, but in reality by increasing the centre of gravity or decreasing it you are in fact, when you are upside down, making yourself just as stable and unlikely to be knocked back up. Is that the conclusion--
A. Yes. Both these have got the same centre of gravity,

the difference between these two is the coach-house gives you a different underwater volume when you are upside down, it doesn't make any difference when you are the right way up. So from the point of view of capsizing it's no great big deal but from self-righting it makes a big difference, but that difference would appear to be a positive difference whereas in fact it's a negative difference so we were surprised by these results. If I can just show one more graph. We also tested two different hull shapes, and this is a key point, two different hull shapes with the same limit of positive stability. This is the same plot with significant wave height along the bottom and the time inverted up the side. This the Business Post Naiad, the model you can see over there, and this is a more modern type of hull form and you can see that even though they have the same limit of positive stability the length of time to self-right is quite different. So what we are saying from this is it seems to us that you cannot say that if you have a particular limit of positive stability for all vessels they will always self-right in the same length of time, which the current regulations basically are saying. So we believe there is an awful lot more understanding of the phenomenon of self-righting that needs to go on before one can say which boat was safe and which boat is not safe.

Q. So what you are saying is this, that although you have say an LPS of 115 that may mean that all of them can be pushed over to 115 and come back up--
A. That's correct.

Q. --but different vessels will spend different times underneath before they self-right because of their different configuration?
A. Because different configurations will take longer or a bigger wave or a smaller wave to get to that 115 degrees.

Q. So although you might set a rule that says the LPS is 115 because that's what vessels will be knocked over at, you cannot then say and they will all come back up within a particular time?
A. That's correct, yes.

Q. So it's really only the first part of what happens practically, and that is the knockdown, after that it will depend on each particular vessel?
A. Each particular vessel. The research that's gone in the past has been focusing on the knockdown, we have now learned that in fact any vessel can - knockdown I think is a reasonable sort of statement, we want to focus on what it will take to bring it back up again and we find that you keep the same LPS, different vessels behave in a very different way.

Q. So it's incorrect to think that if I set them all at 115 they will all come back up within 2 minutes?
A. That's correct. The only thing you could say is if you set them all at 180 they will all come up instantly. But that's ridiculous anyway, it's the only thing you could say.

But if you are going to pick some other angle each vessel will be different.

Q. In regards to its coming back up?
A. In regards to how long it will take to come back up again.

CORONER: Q. It's fair to say most of those sailing them wouldn't have any idea about the likely time their particular boat might remain inverted once it is overturned?
A. I think that's a very fair assumption and we think most people sailing would assume that it would come upright pretty quickly. And one of the things that surprise me, if you like, as a professional naval architect who is not normally interested in yachts but normally interested in the stability of vessels, it surprised me how long they stay upside down for in waves.

HILL: Q. I think there was another phenomenon that you came across and that was that when the vessel was actually inverted that by lifting the stern slightly out of the water it more or less wanted to right straight away and did in fact do so.
A. Yes, even in calm water.

Q. And there was I think the B52 where for some reason when they were upside down the crew moved to the bow area and then they moved back. Is there a correlation there that because they added weight into their bow area when they were upside down that lifted the stern which you found makes the vessel come back up?
A. Yes, when the vessel is upside down and if you trim it down by the bow it essentially is floating on the narrow bow part and lifting the broad stern part out of the water and as a consequence that makes it less stable and therefore it will come back upright again. Everybody that handles small dinghies knows that if you go up to the front you are very likely to capsize the thing, well it's just the same in reverse. So a trim down by the bow gives it less stability when it's upside down so it will come back upright again.

Q. I think that you or someone at the maritime college is working upon concepts so that when a vessel, particularly a yacht, is upside down there is some sort of system of raising the stern and thus flipping it back over?
A. It certainly makes you think that it wouldn't take much in the way of designing the vessel if designers had this in mind to be able to put something in there, either an inflatable bag or give it more buoyancy aft to lift the stern or whatever, if you could understand this phenomenon which, as you pointed out, we discovered when we were doing these tests. If we could understand it a little bit better surely we could use it to our advantage to make these vessels spend less time upside down. At the moment the rules don't cover that at all.

Q. Just to conclude. In regard to the Post Naiad the reality is this, that if its stability would have been

higher than 104 and up to 119 it would have righted quicker. Is that reasonable to say?
A. That's correct, lower centre of gravity, it would right it.

Q. And even though it had water in it, as has been described, that would not make a difference?
A. That's correct, it would still have righted quicker had the centre of gravity been lower.

Q. And if in fact it was found by this inquest that the stability of the Post Naiad was 109.5 or thereabouts it still would have taken less time had it been 115?
A. That's right, on average it would have been quicker to come up had it been 115.

Q. And the second thing that out of your conclusions that the inquest can draw is more or less a warning that although you can set the LPS at a certain angle, such as 115 degrees, that doesn't mean that each vessel once they are inverted will come up at the same time?
A. Correct, yes.

CORONER: Q. And a major factor in that seems to be the whole configuration of the vehicle?
A. The whole configuration when it's upside down, so you are thinking about the deck and the superstructure and so on.

Q. Another factor is of course whether it has a coach-house?
A. Correct, and the design of the cockpit and so on. Everything that is not normally under the water which is in the water when you are upside down now plays a bearing on what goes on.

HILL: Q. I think that Mr Andy Dovell, an architect and a designer, he actually came down, saw some of these tests and had a certain input into this?
A. That's correct. I mean I am not a yacht designed, he is a yacht designer so he understands the intricacies associated with the yachts and so he was able to make sure we weren't doing anything that was unlikely to be the case that you would do with yachts.

CORONER: Q. As a matter of fact he almost supervised as in so far as yachts are concerned?
A. That's right. I mean he understands the yacht regulations and the IMS certificates and everything else like that and he was able to tell us what we were doing right, what we were doing wrong. Just an oversight as to what we were doing.

HILL: Q. And I think that in fact this took some months to complete?
A. We actually - all these points on the graph here are quite a long ..(not transcribable)..

Q. I think that it takes about how many waves - how many times you have to set it up for--
A. Well, each of these points represents ten self-rights and that could take half a day sometimes, so it can take quite a long time.

Q. So when you add a point on there you in fact have to do ten tests and then you take the average, is that what you do?
A. That's right, yes. For the irregular waves it's a statistical thing and you have got to do an average.

CORONER: Q. I suppose it's your view that these tests are breaking new ground--
A. Well, absolutely.

Q. --so far as the ocean racing community are concerned?
A. Yes, yes, we are learning things that we didn't know a couple of years ago.

Q. And I assume there is not much known about these types of issue elsewhere on the planet.
A. That's correct.

Q. Is that fair to say?
A. Yes, that's correct, the work that was done after the Fastnet race was mainly on capsizing and not on self-righting and in fact one of the conclusions that came out of that work about size of vessel - the effect of the size of the vessel on whether it's likely to capsize or not is actually completely opposite when you look as self-righting. Maybe I can explain what I mean.

Q. Yes.
A. Obviously if you have got a larger vessel the waves are smaller with respect to the size of the vessel if you are in the same size of waves, so what that means is if you have got a larger vessel it can get away with being less stable from the point of view of how often it's going to capsize. And hence these leading people along the stability index and so on to say that larger vessels can have less stability that's fair enough, they are less likely to capsize, but when they capsize the waves are still smaller with respect to them than they would be in smaller vessels so they are less likely to come back upright again.

Q. I see. So if you are talking about something on a maxi yacht that might apply to a boat of that size?
A. Some people might suggest that a maxi yacht would be just as safe as a much smaller vessel if it had a smaller LPS. What I am saying is it's true it would be less likely to capsize even at a smaller LPS but it would be far far less likely to come back upright again.

HILL: Q. I am sorry, I--
A. Well, the only other overhead here I have got is this is a plot as best we can find of the real times that vessels have spent upside down, plotted as best we can find against

the LPS information and this is the time here. This is a prediction that was based on work that was done after the Fastnet race in the US and really the only purpose of this overhead is to show that I don't believe this to be a reliable prediction and we certainly wouldn't want to rely on it. And my only last overhead was just the point here about the Business Post Naiad and then the point about these statical measures to judge the likelihood of self-righting and it doesn't appear to be valid, it seems to be that we need to understand a lot more before we can religiously say it must be whatever criteria we use.

Q. Because in effect what you are saying is that the Business Post Naiad will come up if it is knocked over at 115 degrees LPS, if it's knocked over it will take X minutes to come back up, but another vessel which has a different shape et cetera even though it has the stability of 115 degrees may take Y minutes to come up, it's as simple as that?
A. Correct, yes.

Q. And therefore although you can set what the capsizing LPS is you can't really have a general rule for what it will require the time under the water. Is that basically it?
A. I wouldn't want to comment too much about the capsizing, I am not even sure that it applies to capsizing but it certainly doesn't apply to the self-righting. And I think our interest is focusing on self-righting because I think we all understand now that vessels can always capsize so we must look at self-righting.

CORONER: Q. The tests were done on the Naiad in what condition?
A. The model that you can see over there, in that condition with four separate centre of gravity positions to represent the four LPS values. So we have got a system inside there where we can move the centre of gravity up and down in here.

Q. How would things hold up if the mast hadn't been in a damaged condition?
A. Different from the way we have got it there you mean?

Q. Yes, have you any idea what your results would have been like?
A. We didn't do any tests on the Business Post Naiad with a different mast configuration. We have done some tests on other vessels with a different mast configuration but it's early days for us to really--

Q. I was thinking more of the mast intact.
A. Yes, it's difficult to say. If anything it looks like it might be slightly more likely to come back upright again with the mast intact--

Q. More quickly.
A. --but that actually contradicts research done on capsizing because in capsizing you are much more likely to capsize if you don't have your mast. But because the mast

is under water dragging along that might affect - but we haven't done enough tests yet to really conclude and we certainly didn't do any on the Business Post Naiad, they were all done in that configuration.

HILL: Q. What is current thinking with regards a vessel that has its mast intact and remains intact, is it likely to lift--
A. If the mast is intact that adds quite considerably to the raw moment of inertia which means that when you get hit by a wave you don't roll as rapidly, I am talking about when you are upright, and so you are much less likely to capsize in the first place. I mean 10 years ago we did tests like that and I think everybody understands that, there is no problems with that at all. And so masts should remain upright and that will stop you capsizing. Once you are upside down and the mast is in the water the story about the inertia is still the same, it's still got its inertia but it's got other hydrodynamic facts that it's dragging around in the water and we don't yet know the answer to that.

WEBER: Q. Dr Renilsen, I'll try and take you through your report as logically as I can and more or less the way that you have spelt it out. On page 4 you indicate, and I think it's been confirmed in your evidence this morning, that in the current state of knowledge there is not much known about the factors affecting the likelihood of self righting, correct?
A. That's right, yes.

Q. And you say that it's reasonable to assume that they be influenced by the invested gm, the limit of positive stability, the maximum negative gz value and the area between 180 degrees and the limit of positive stability. As to the latter that's the area below the zero horizontal in the figure 1.2 which--
A. Would it help if it was on the screen or not?

Q. Yes.
A. Can we go back?

Q. Yes. This area in here is the area you were referring to and I think you have expressed the view writing elsewhere that to look at that area below where the curve is below zero is a rather crude tool when it comes to determining self-righting of a vessel?
A. That's right, I guess that's the point I was trying to make.

Q. And you have articulated it, with respect, very nicely this morning. It's fair so say now that you can't say that there is a direct correlation between an LPS and the propensity of a vessel to re-right, can you?
A. For any vessel, that's correct.

Q. Yes, any vessel.
A. If you took one vessel and another vessel and they have the same LPS there is no certainty that they would both

self-right to the same level.

Q. And moreover the LPS is a creature of a static measurement in idealised circumstances, isn't it?
A. That's correct, yes.

Q. And in respect of any given vessel once it has been damaged it will no longer have the same LPS as measured, will it?
A. When it's got water on board.

Q. But for any number of reasons a racing vessel which is damaged will have a different LPS than it exhibited at the time that it was measured, correct?
A. You mean because the centre of gravity has moved or--

Q. Yes.
A. That's correct, yes.

Q. And that's inevitable?
A. Yes. If the centre of gravity moves the LPS will change.

Q. You are not actually expert in the measuring process for ocean racing yachts, are you?
A. That's correct, yes, I am not an expert.

Q. But you do know, don't you, that they strip a lot of the weight that would be actually carried on the vessel in a racing circumstance out of it and have a standard approach, you understand that?
A. Yes.

Q. And of course when the vessel is racing it's necessarily heavier?
A. Yes.

Q. And necessarily has a different LPS?
A. Yes. Maybe I should explain what we did to take that into account. Would that help?

Q. I'll come to that. So that's an are of uncertainty, if I can just come back to an area of certainty. What's certain is that the LPS is directly affected by the vertical centre of gravity?
A. Absolutely, yes.

Q. And that correlation is direct between those two factors?
A. For a particular vessel, yes.

Q. And if the vertical centre of gravity goes down the LPS goes up and correlatively if the vertical centre of gravity goes up the LPS goes down?
A. That's correct.

Q. If you could just go to page 6 for me, doctor. You say in the second paragraph after 'method' that "Capsize due to

wave induced knockdown is rare and it depends on the vessel encountering a severe breaking wave at exactly the wrong instant, the size of the breaking wave required to cause its capsize will depend on its relative position to the yacht and the yacht's initial condition prior to impact". What did you mean by the use of the expression 'initial condition prior to impact'?

CORONER: Where is that?

WEBER: It's the last line of the second paragraph under the subheading 'method', your Worship, on p 6.

WITNESS: If for example a wave had hit the vessel beforehand or if the wind was in the sail or whatever and it was at a heel angle, then what you would expect to happen would be different from if that wasn't the case. That's what I mean by initial, you know, initial heel angle followed by some other variable.

WEBER: Q. And it's fair to say that if racing yachts are experiencing the extreme conditions that they experienced in this race that any yacht is capable of capsizing?
A. That would be my impression. We haven't done any tests on every yacht and so on to verify that but that would be certainly my opinion.

Q. You mentioned that sorry, even at 180 LPS a yacht will capsize?
A. It would capsize but it would just come straight back up again.

Q. So is it correct to say, and leave extreme cases out, any conventionally configured racing yacht in those seas was capable of capsizing?
A. Yes, yes, I think it's a fair comment.

Q. And that's just a factor of really luck, isn't it?
A. There has got to be a lot of luck in it because it depends exactly where the breaking wave is when it hits you.

Q. That's right, because the direction of the wave for both capsizing and self-righting is an important variable, isn't it?
A. The direction of the wave with respect to the hull?

Q. Yes.
A. Yes, yes.

Q. And of course it power is also important, the power of the wave?
A. Yes.

Q. I don't mean to be critical in what I am about to say to you but your experiments were limited to beam-on waves, weren't they?
A. That's correct, yes.

Q. And so there is virtually an entire crucial area of variable, namely variable, direction, that your studies don't take into account?
A. Yes. We were only looking at the relativity so we selected that as a variable we wouldn't change.

Q. Certainly. So, and let's confine ourselves at the moment to self-righting, a much smaller wave than the one you have predicted may be required to self-right a given vessel if it hits the vessel on a more favourable angle than beam-on?
A. Yes, actually maybe you should say it the other way around. I actually think it's probably the most favourable angle we tested at, if we tested at a different angle it may need a bigger wave.

Q. But you thought beam-on was the most favourable?
A. That's what we thought, yes. We haven't tested any other angles so--

Q. So it's just a hypothesis?
A. Yes.

Q. But as I understood your evidence there seemed to be a suggestion that if you can get the vessel lifted at the stern it might assist its self-righting capabilities?
A. Yes, that lifting of the stern would be by providing more buoyancy at the stern but then it would still be the waves coming beam-on what could cause it so self-right.

Q. And it's not possible, is it, that waves coming slightly from the stern might also facilitate self-righting?
A. I'd hate to say it wasn't possible because there is a lot of things I am learning that I didn't know beforehand and it's quite possible, we have never tested that.

Q. Every yacht that inverts needs a suitable wave to come along to self-right, doesn't it?
A. Yes, obviously if the LPS say was 180 that suitable wave would only be a millimetre high, but in principle what you are saying is correct.

Q. And at the risk of putting even more fear into the yachting community, if you put a yacht other than a 180 degree LPS rated vessel in a tank in still conditions and you inverted it, it would stay over forever?
A. I am assuming we weren't letting water come ..(not transcribable)..--

Q. Yes, yes.
A. --or anything else like that. That's right, it would stay there forever, we'd come back the next day and it'd still be there.

Q. And indeed the lone French yachtswoman Isabelle Autissier virtually experienced this herself, didn't she? Do you know what I am talking bout?
A. I know what you are talking about. She was in waves

though of course, very small waves.

Q. Yes, but she got capsized in the southern ocean and no sufficiently large weave came along and she stayed over for days as I understand it.
A. I believe she wasn't alone though, the other Frenchman I think also stayed upside down for a long time too, didn't he.

Q. So that's first orthodox naval architecture principles and consistent with what been experienced in the real world, is that correct?
A. Yes, yes.

Q. Just staying on page 6, the penultimate paragraph. You have indicated the work that you did on irregular waves and I think that you repeated the experiment until you had 10 times when the vessel righted itself, correct?
A. That's correct, yes, to get an average.

Q. And you have then used those figures to derive an average. Do you have qualifications in statistics?
A. Oh all we did was add the times up and divide by 10.

Q. I am sorry, did--
A. No, I don't have, no.

Q. So you say there that you repeated the test a number of times to ensure statistical reliability but you aren't suggesting to his Worship by that that you can say that they are statistically valid, do you?
A. No, it's just a relative between the different hulls.

SHORT ADJOURNMENT

<MARTIN RENILSEN
ON FORMER OATH

WEBER: Q. Dr Renilsen, when his Worship rose for morning tea we were discussing the penultimate paragraph of p 6 of your report and you confirmed that you don't have statistical training yourself?
A. That's correct.

Q. What I wanted to suggest to you was, and I do so without any disrespect to you, you don't have a background which will allow you to say whether your experiments are sufficient to be statistically valid for the purposes of deriving averages.
A. Although I don't have a degree in statistics we do experiments a lot of the time and so we understand it. I think in my opinion we understand enough about statistics to make that statement for these experiments.

Q. But the area of discourse of how many times samples need to be taken or experiments need to be undertaken before they have statistical validity is the province of statisticians, is it not?

A. That's true.

Q. And it's a quite complex field of discourse in itself?
A. That's true, yes.

Q. What I want to suggest to you is, and I'll come to some examples of it later, that your 10 experiments to achieve a wave size at which the vessel self-rights was insufficient for statistical validity for averaging. What do you say to that?
A. You are saying you want to suggest that to me or--

Q. I'm just putting that to you as a proposition. What do you say to that?
A. Yeah. I would agree with you that we couldn't say an absolute value, but we can say a relativity value across the whole tests that we did.

Q. Well perhaps we're about to be in furious agreement. What I wanted to suggest to you is that the best that your tests can do at present is show a trend.
A. I think - I think I'm saying the same thing, yes, yes.

Q. It would be a mistake for someone to look at your work and say LPS figure X, average wave height Y, then on average it will take four minutes to right itself?
A. If you mean the significant wave height, yes, I would agree with you. That's right, exactly.

Q. Perhaps I should make that more sensible for his Worship. If you'd be kind enough to go to page 21 and figure 6.2, that as I understand it is a summary of the average wave height which you derived necessary to self-right a vessel at given LPS figures.
A. Are you referring to table 6.2?

Q. Table 6.2, yes doctor.
A. No, these are from the single wave tests, so for these tests they were done in the first type of test where the water was calm and we just made one wave come by.

Q. Where do we go to find the correlative table for--
A. It would be figure 6.5 on page 23.

Q. I'm indebted to you. I see, it's not set out in a tabular form.
A. It's not, because of the way it is, it's easier to present it in a diagram.

Q. Let's just stop there if you'll bear with me. What I want to suggest to you there, if you join the dots or the triangles or the squares as the case may be, what you see is a rather scattered picture don't you?
A. That's correct, yes.

Q. Doesn't that in itself suggest a doubt about the range of the results from an averaging point of view?
A. No. You can see if you look for example at the crosses that would be the 104.7, you can see that all the crosses are above the triangles, which is the next one down.

Q. Just either with a pen or in your own mind do the job that I did last night. Join the dots on the triangles.
A. Yes.

Q. They go straight down, straight across, down again and horizontal.
A. But there's no triangles for example that are lower than the equivalent square at the significant wave height or higher than the equivalent cross in the other situation, the

significant wave height.

Q. All I'm asking you these questions for is to suggest to you that the work that you've done to date, and obviously you could do more and more tests and no doubt you will, is helpful in showing trends but will not toss up statistically valid average wave heights that will cause a vessel to right first?
A. If I can paraphrase what I think you've said, if that's permissible, I would not want to go to a significant wave of 2.5, go up to that line, across to the side and say that's exactly the wave - exactly the length of time that on average the vessel will stay upside down. I'm agreeing with you there, yes. I wouldn't want to say that.

Q. Thank you. Before morning tea you indicated that the evidence of your tests was suggestive of the fact that if the stern of the vessel in capsize is higher than the bow, that will assist in the righting process.
A. Yes. Maybe I should clarify if I may. All we did there was we had the model in calm water, no waves, and basically you can imagine the scale of the model. We can put our finger underneath the model and lift the stern ever so slightly with a very small force and the model will self-right.

Q. As I recall your evidence, you raised that in the context of some peripheral discussion about the capsize of B52.
A. I think Mr Hill was talking about B-52. My understanding is that the people moved forward in B-52 to change the trim, but we didn't test B-52 and we didn't test that.

Q. Do you know that B-52, according to the LMS material which is annexed to Mr Dovell's report, had a LPS of 119?
A. I can't remember off the top of my head what it was.

Q. Would you like a copy of--
A. I've read his thing a while ago. I can't remember.

WEBER: Your Worship, it's in volume 7A, tab 7, and it's at table B.

Q. It had an LPS of 119 and the evidence was, and this is on page 3 of the report, that the vessel stayed inverted for four minutes, and which I suppose is just suggestive of the evidence that you've given, that one can't crudely look at LPS and say it's going to tell you when this vessel's going to come up or not.
A. I would agree with you entirely. Different vessels, even with the same LPS as we showed in our experiments, could have different self-righting times.

Q. There was a seminar wasn't there in March 1999 at the University of New South Wales where people in naval architecture and other related disciplines met to discuss what's fallen from this tragedy, correct?

A. Mm.

Q. And you delivered a paper, correct?
A. Mm hmm.

Q. And so did Mr Dovell?
A. Dovell, yes.

Q. His thesis is that there was no correlation between LPS and the stability for a yacht to be rolled or severely knocked down in extreme conditions. Do you agree with that?
A. Yes.

Q. He says it's noteworthy, on page 4, "the time spent inverted by each of the yachts rolled was in line with the correlation established by USYRU." What's that?
A. United States Yacht Racing Union I think.

Q. In 1989. Do you know that work?
A. Yes.

Q. And none of the boats report being upside down for more than four minutes, which is the expected value for a yacht with a limit of positive stability of 115.
A. I don't agree with that statement that he made.

Q. Because you're moving away from the usefulness of LPS as a measure of self-righting.
A. Yes.

Q. I understand that. I've side-tracked myself. I'm sorry, do you want to say something more?
A. I was just going to say, that is over a year ago now and I think we've all, including Andy Dovell, learned a lot more about the problem than we all knew then, and I think you might find Andy not agreeing with that now as well.

Q. So it's hopeful that from good from a naval architecture point of view will come from this tragedy.
A. I'm hopeful of that.

Q. I side-tracked myself, as is my wont. I was asking you about your view that's emerging that for the stern to be raised assists somehow in the self-righting process.
A. That's correct.

Q. The evidence in this case is that Business Post Naiad had its sails stowed in the aft section of the vessel. Now when the vessel rolled twice, I think it would be fair to assume that they would be severely waterlogged?
A. I wouldn't want to comment in that.

CORONER: Well make that assumption.

WEBER: Q. Accept from me for the purposes of the questions I'm asking you that the sailmaker suggested that the weight of the wet sails might be at least 400 kilos and that whilst some of them moved in the roll, most of them stayed to the

aft. So can you assume that for me?
A. Yeah.

Q. Is it true to say that on your present understanding of self-righting, that would have been a factor in itself which would have militated against the vessel self-righting?
A. Yes. Again without having done the tests, that would be my gut feeling that that would be the case.

Q. It's right to say isn't it that when the vessels rolled, and we know this vessel rolled twice, it would be almost impossible to work out with any degree of assuredness what the actual vertical centre of gravity of the vessel was in its second rolled state?
A. What we did to try and do that for our tests, and I'm not sure if that's a help, is we took the position of the mast in its damaged situation and allowed the - you know, and said the centre of gravity will move down as a consequence and made our best estimate.

Q. His Worship's heard evidence yesterday that certain of the sails ended up in the bilge, that the anchor chain ended up in the bilge, that the stove broke clear of its retainer and that there were - all of the food from out of both the freezer and the dry food storage areas was in the bilge, that there was certain of the crew's gear, although it was in fairness uncertain of precisely what it was in the bilge, but one can readily imagine a chaotic situation. All of those facts, and if that's unfairly rolled up tell me, all of those facts would have a significant bearing wouldn't they on where the true centre of gravity of Business Post Naiad was after roll two?
A. Yes. The effect it would have would be the weight multiplied by the distance it's moved. So in actual fact when you do the sums, the mast is quite a large amount of weight, moved a long way. We took that into account. People are no longer on the rail as they would be in the IMS condition, they've moved inside. We've taken that into account. If you've got a smallish weight as you're talking about moved a smallish distance, it does make a difference but a much smaller difference than the other differences, and so--

Q. What I'm driving at is simply this. Because no one can any longer recreate the circumstances below decks on Business Post Naiad when she rolled the second time, no one can ever calculate first its vertical centre of gravity at that point, correct?
A. Yes.

Q. Or its LPS?
A. Correct. All you can do is make an estimate as best you can do.

Q. I'm not in the slightest way critical of you for this, but you didn't factor into account any of the evidence that I've just summed up to you in your calculations, did you?
A. No. The only things we took into account was the mast

and the people and equipment.

Q. And those--

HILL: I missed what he said because you talk over the end of his answer.

WEBER: I apologise if I did that.

HILL: Q. What did you take into account?
A. The mast and the people that moved is what we took into account. We just - and again we didn't go on wage(?) of the individuals, we just made a guess as to what their weight would be.

WEBER: Q. But all those extra facts that I've just given you would only have a tendency to inhibit the capacity of the vessel to self-right after the second roll, wouldn't it?
A. They'd all have moved down the way, but then when the vessel's upside down they're moving up the way. Assuming that's the case, yes, it would have a small--

Q. Go to page 7 if you'd be so kind, doctor. I just want to ask you a question more for my own education than anything. The Jonswap spectrum to which you refer in the fourth paragraph, that spectrum is an attempt to replicate in a tank ocean conditions is it not?
A. Particular type of ocean conditions, steep irregular waves.

Q. Short steep irregular waves rather than your previous experiment which was a single wave.
A. That's right.

Q. And then the measurement in the Jonswap spectrum is the average of the highest one-third of those waves, is that correct?
A. That would be referred to as the significant wave height.

Q. That means that - and I think you deal with this on page 13, that the technology is such that you couldn't test long high waves?
A. That's correct.

Q. You'd agree with me wouldn't you that it was long high waves that the vessel Business Post Naiad was actually encountering?
A. Yes, a whole mixture of long high and short steep.

Q. To that extent, the experiment that you've done doesn't equate to - at least to that extent, your experimentation doesn't equate to the actual conditions that were being experienced in the open seas?
A. That's right. We're not trying to pretend we're simulating exactly the same waves. It's just simulating the components of the waves that would have self-righted the vessel.

Q. Long high waves as a matter of physics are experienced less frequently than short waves, aren't they?
A. Yes.

Q. And so it's more likely that the long high wave is going to capsize a vessel, correct?
A. No. A long wave - and for example, the longest wave you can think of is probably the tide, so you could have a very very high tide but it doesn't have any effect on the motions of the vessel other than going up and down, and I use that as an analogy. So if you've got very long swell, the vessel will go up and down in the swell but it won't actually roll in it.

Q. I'm indebted to you. I need to be more specific. There's been a lot of evidence before his Worship that what was horrifically being experienced was high 15-metre shallow-backed breaking waves. Were you aware of that?
A. Mm hmm.

Q. And obviously you can't recreate those in a tank?
A. We're trying to recreate the component of these waves is what would cause the dynamics on the vessel, which is the sort of breaking apart of them if you like, the steep part of them. That's what we're trying to simulate.

Q. But those waves, those sorts of waves which are causing the capsize, are also the sorts of waves that you're looking for another one to come along and start the self-righting process?
A. Yes.

Q. That's fair to say isn't it?
A. That's right, yes.

Q. Those waves as a matter of physics tend to be more widely spaced than the other waves in the wave sets, correct?
A. The breaking waves?

Q. Yes, those large waving (as said) waves.
A. Yes, yes, the breaking waves.

Q. So in the real world, and I don't say that with any disrespect--
A. No, no.

Q. --but if you're out in the open sea and you've been capsized by a big breaking wave, what you're really waiting for and praying for is the next big breaking wave to come along?
A. A big breaking wave, and the big question that we have is how big does it have to be to self-right you, and that's what we're trying to get a feel for.

Q. There was evidence that with Business Post Naiad that after they got rolled the second time they experienced a relative lull in wave activity. Would that be consistent

with what you've just been telling me?
A. Absolutely. I mean it's a random process. You'll get some big waves, some small waves, it's a field in itself in fact.

Q. But is it statistically - is it either a matter of statistics or a matter of physics the case that usually after a large breaking wave there is a lull?
A. It's - I mean I guess it's like tossing a dice. You know, just because you've got a six doesn't mean the next time you're less likely to get a six.

Q. I understand. Could you go if you would to page 9 of your report, the first paragraph. "The model was fitted with a mast and a boom which were arranged to simulate the configuration at the time of the incident." I was somewhat uncertain as to whether you were referring to the first incident, the first roll, or the second roll.
A. No, the whole project was about the second roll.

Q. So it was always tested in the manner in which it sits to his Worship's left?
A. That's correct.

Q. Go to the next page if you wouldn't mind. You told me earlier that one respite from the uncertainties about some of the things we're discussing is the certainty that vertical centre of gravity and LPS were directly and inversely correlated.
A. Correct.

Q. Then you refer in appendix B, as I understand it, to the effect on vertical centre of gravity of being de-masted.
A. That's right.

Q. Have I understood you correctly? And you've calculated in appendix B that the overall downward shift in the vertical centre of gravity was .305 metres, correct?
A. That's correct, that was our estimate.

Q. And so it follows does it not that there was a correlative increase in Business Post Naiad's LPS as a consequence of being de-masted?
A. Yes.

Q. Are you able to give his Worship an indication of the extent of increase of LPS consequent on that de-masting?
A. Not without my computer and doing the calculations, but perhaps I should make it clear, when we're referring to the LPS we're referring to the LPS in the intact condition. When we tested the model we tested it in what we call the incident condition, so that the model tested doesn't have the LPS that we're referring to. It would have had, had it been in the intact condition. Have I explained myself very well? Maybe not.
A. You probably have perfectly well, but I'm not too good at this so perhaps you could try it again.

Q. If you imagine the vessel is in its measured condition and measured condition is where the IMS certificate calculates its LPS at, but it wasn't in the measured condition that it was in in the waves. So what we've done is we've taken the vessel, ballasted it in our minds if you like as to how it would be to give us the LPS in the measured condition, then made these changes that go between the measured and the incident condition, and that's what we tested.

Q. I understand that, but you didn't make any attempt to recalculate its LPS in its damaged condition, did you?
A. That's correct. We were referring to the LPS as what would have been on the IMS certificate.

Q. Which is a base from which to work?
A. That's right, you just have to have some base.

Q. Don't speculate if you don't want to, and given that you don't have your computer, doing the best you can, what do you think would be the impact of de-masting causing as it did a .3 metre drop in the vertical centre of gravity on Business Post Naiad's LPS?
A. Probably the best way to think about that is if you look at the .305 and you look at the KG in that table, table B1 - I'm not sure. Appendix B. What we actually tested was the KG in the sailing condition going from .502 to .777 metres from our base line. That would have been the sailing condition, but the incident condition is in the next column .195 to .472. So the range of change if you like is actually less than the range .305 so, you know, the highest condition of KG in the incident conditions .472 wasn't quite the same as .502 which was the lowest condition in the sailing condition, so there's not quite an overlap. Does that make sense?

Q. I think it does. If you feel like you can't do it, simply say, but can you give us an impression of the effect on Business Post Naiad's LPS of it being dismasted?
A. If it was dismasted the LPS would be large, yes.

Q. But can you give us impression?
A. I couldn't. Actually it might be here, just a second. Yes, if you look on - no, no, my apologies, it isn't here.

Q. Let's move on. Could you go please doctor to page 18, and I want to draw your attention to the penultimate paragraph on that page. Just to put these questions in context for you and for his Worship, you're there discussing the experimentation for irregular wave sets, correct?
A. That's correct.

Q. The problem was that the model kept drifting under the action of the waves and you had to secure it by a boat hook to keep it beam to the waves, is that correct?
A. That's correct, yes.

Q. Is that because the model didn't wish to be beam to the

waves, it wished to adopt its natural attitude to the prevailing waves?
A. A combination of things. Also the fact that we've got - the tank's only three and a half metres wide and we wanted to keep the model in the middle of the tank as I dropped it down, so it's a whole combination of things. How it would have responded in a real sea - the other point I should make is that our waves all come from one direction and referred to as long-crested waves or uni-directional waves. In a real sea you've got multi-directional waves so they come from a range of directions all around about a heading, so we had to force this to be on beam seas if you like onto our - in our long-crested waves in our narrow tank.

Q. That object, the model, has a natural attitude that it wishes to take to the waves doesn't it?
A. Yes, and that--

Q. As would the full size version?
A. And that would vary depending on the wave. You know, each wave would exhibit a different - slightly different angle.

Q. So again here this is another example of where the experimentation differed significantly from what would have been happening in the open sea, correct?
A. That's correct, yes.

Q. You were forcing the vessel into a position where it was most vulnerable to capsize being beam-on?
A. Self-righting.

Q. And least vulnerable to self-righting?
A. No, most vulnerable to self-righting, if you can use the word vulnerable to self-righting, but you know what I mean.

Q. Yes, I do know what you mean.
A. I should say these tests weren't done for capsizing, only for self-righting, these particular tests you're talking about.

Q. Could you go to page 20 of your report. I just want to ask you some questions about table 6.1. In your left hand column you describe the conditions, and we can find out what they are from the appendices, correct?
A. Table sorry, I was looking at the--

Q. Yes, table 6.1.
A. Yes.

Q. And then we've got LPS in degrees, which we can all understand, and then we've got what you've calculated as average wave heights. Correct?
A. No. This is the tests with the single wave.

Q. I see, I'm sorry.
A. So that's the absolute wave height.

Q. Is the figure for condition B being 115 LPS and the wave height figure is 5.38. Is that correct that figure?
A. Yes, and you can see on the graph below the figure 6.1, you can see the outcome of that, and we've drawn a trend line through that.

Q. But isn't that aberrant? Would you not expect when you are dealing with capsizing that it would take a larger wave to capsize the 119 LPS vessel compared to the 115?
A. That's true. I mean we would and we don't know why that is. We'd just report it as the outcome of our tests.

Q. What I've done is take that out as aberrant for better or worse, and I've just done a simple analysis and I'd like your comments upon it. If you round the 119 up to 120, okay, and then you round your 104.7 up to 105 you get maths that I can more readily deal with, you've got 15 degrees.
A. Mm hmm.

Q. And you've got a difference in wave height between 5.06 and 4.19 which is .87 of a metre. I rounded that up to .9. Does that mean on your analysis - is it valid to say that your analysis for capsizing with single waves is showing a 5 per cent change in LPS has an effect of .3 of a metre in propensity to capsize? I haven't expressed that very well but you understand what I mean?
A. I haven't done the percentage sums that you've done, but if that - I mean your logic up until the percentage signs I agree with you entirely. The only point I'd point out is that it's not linear. I mean it shouldn't be considered to be linear, and the relationship between LPS and the wave height wouldn't be linear. I mean if--

Q. But you've represented--
A. We've just drawn a trend line through that.

Q. I'm sorry, I didn't mean to interrupt you.
A. No, I mean we've just drawn a straight trend line through that, but I don't believe you can continue that on either end as--

Q. No, but within the confines of the experimentation, is that logic that I've indicated valid?
A. Yes, yeah.

Q. So for each five degrees going up, your analysis suggests that the vessel will withstand another .3 of a metre of wave?
A. Yes. I haven't done the sums but I'm following your logic I think.

Q. What I want to suggest to you is that that really doesn't say anything of value when one is considering a ship, a vessel, which is confronting a 15-foot wave - a 15-metre wave, I'm sorry.
A. It's the - what we're looking at is an artificial situation as you've said, where we're trying to simulate the part of the wave that causes the capsize. So if you have a

large wave which is very steep, my point is that most of that is actually quite long as well. Physically you can't make that wave short and it's that short part, the part that's breaking, and the power in the breaking wave that's what actually causes the capsize. Not the fact that the wave is so high, it's the fact it's that last little bit that's actually breaking that's what's causing it.

Q. Accepting my maths, which is always dangerous, for the purpose of these questions, you're talking about a relatively small amount of wave height difference for five degrees, aren't you?
A. Wave height difference--

Q. To capsize.
A. I mean I'm not sure whether you think it's small or not, but it's significant.

Q. Well it's .3 of a metre.
A. Mm.

Q. If we're considering in this inquest what happens when vessels are confronting 15-metre waves, what I want to suggest to you is that this analysis about .3 of a metre correlates to five degrees becomes irrelevant. Do you agree with that?
A. No, I don't believe it's irrelevant. Your analysis that says that this is equal to such an angle, such an angle is equal to such a wave height, is I think stretching it a little bit when you're talking about that sort of situation. What I think we can say here quite categorically is that if you change the vertical position of the centre of gravity, you lower the vertical position of the centre of gravity, you will make the vessel more likely to - less likely to capsize, which is the point we were trying to get at. But I wouldn't want to predict what size of wave that meant full scale.

Q. I don't wish this to sound facetious. Are you really saying in relation to capsize that a more stable boat capsizes less readily than a less stable one?
A. That's right.

Q. In table 6.2 you do a corresponding analysis for self-righting tests do you not?
A. That's correct.

Q. My mathematical approach would be equally valid to that, do you agree?
A. Yes, yes.

Q. Could we go then to page 25. You're there dealing with self-righting on the assumption that the vessel is carrying 4,000 kilos of water.
A. That's correct.

Q. The first thing you found was that carrying the extra water in the bilge did not seem to affect the vessel's

propensity to capsize in the first place?
A. Correct. Only points that we - we couldn't say categorically one way or the other, that's right.

Q. That diagrammatically is represented in 6.7 by that very flat line?
A. Exactly.

Q. Your conclusion in relation to re-righting, self-righting, was that - sorry, could you tell me that again, what your conclusion was in self-righting?
A. In self-righting, you can see looking at figure 6.8, that at 118 degrees of LPS it requires a smaller wave height than at 104.7 degrees of LPS.

Q. That's a slightly more pronounced line than the 6.7 line but it's still not a particularly pronounced shift, is it?
A. That's correct. It is a shift, we can say there is a shift, but how big it is, you know. It's a shift that we can notice and we know is there but we wouldn't get too excited about it.

Q. You wouldn't ascribe to it much materiality?
A. On its own, no.

Q. Just on that, would I be right in thinking that that result surprised you?
A. Which result?

Q. The result that there seems to be a marginal assistance in re-righting through having water on board?
A. Sorry, maybe I misunderstood your question. The diagram on page 6.8, both points have got water on board, so what we're doing is not looking at the effect of water on board, we're looking at what effect having water on board would have on the effect of LPS.

Q. And your conclusion is in respect of re-righting?
A. In respect of re-righting, that the same as we were saying without water on board, that the larger the LPS the smaller the wave that is required to self-right it. The same conclusion comes out as for without the water on board. And perhaps I could take you to the following figure 6.9 is essentially the same figure but done in irregular waves, and that shows the same conclusions, so the two together, I think it's a reasonable conclusion to make.

Q. Just so that I'm not misunderstanding you, when you've got a hypothetical 4,000 kilos of water aboard, what effect do you say that has on re-righting, self-righting?
A. What I'm saying is with 4,000 kilograms of water on board, if you increase the LPS then you would be - you'd require a smaller wave to self-right it and you would have less time to self-right it.

Q. In that regard, the water is obviously a form of weight isn't it?
A. Yes.

Q. And it's affecting the vertical centre of gravity like any other weight?
A. Correct.

Q. But it will react differently in a self-righting incident than solid weight would it not?
A. Exactly, yes.

Q. Is that what you referred to as the free surface effect?
A. Exactly, yes.

Q. Is that, just so that I understand it, a more homely way, an old-fashioned refrigerator where you defrost it and you get the long flat - big flat tray, you walk into the sink, once you start to tip it a little bit, all the water rushes and you spill it on the floor?
A. That's right.

Q. Is that the free surface effect?
A. That's the free surface effect, yes.

Q. And does that partially explain what you're referring to in this discussion?
A. Well both have the same free surface effect, so we're not looking at the effect of the free surface effect if you like, we're just looking at does the free surface effect change our conclusion that LPS, the effect of LPS on the self-righting ability.

Q. But there would be nothing corresponding to free surface effect in relation to any heavy items that had been dislodged in the rollover and were in the bilge?
A. All the - all the rigid masses on the model were fixed.

Q. But in the real world example of what happened, if there are heavy items in the bilge, they are absolutely positively working against self-righting?
A. Yes. They may or may not move them in - you know, they don't necessarily--

Q. Just for the purposes of my question, if you'd assume that there are heavy items that have moved into the bilge. They are unequivocally inhibiting self-righting, is that correct?
A. Because of the change in centre of gravity position you mean?

Q. Yes.
A. Yes.

Q. Can I take you to appendix E, E for Eric.
A. Yes.

Q. And could you go to the second table of appendix E. That's headed condition B, B for Bertie, LPS115.
A. Yes.

Q. Do I understand that table to be setting out the time

for self-righting for each of the 10 experiments within each wave height?
A. That's correct. That's the raw data.

Q. Go then if you'd be so kind to 2.13.
A. Yes.

Q. The sixth experiment, and these are re-righting times aren't they, self-righting times?
A. Self-righting times.

Q. Go to the sixth experiment. That showed that the vessel in the model state re-righted in the face of an average 2.13 wave in 35 seconds?
A. Correct, full scale. Sorry, we have used the scaling factors to determine what it would have been full scale time, time scales with experiment as well.

Q. It's an attempt to give us real time?
A. If we were in a unidirectional wave of this type and so on this would be what it would be full scale, but we are not so we are not trying to predict what's happening in real life.

Q. But it is some indication of real time?
A. That's correct.

Q. And then go down to the 9th time the experiment was run.
A. Yes.

Q. The same model in the face of an average 2.13 metre variable waves took 3,549 seconds to right?
A. That's correct.

Q. I am sorry, I didn't bring my calculator with me, but I calculate that to be 59 and quarter minutes.
A. Yes.

Q. So that's saying, is it, that even in test conditions, experimental conditions, the model yacht in the face of the same wave patterns, substantially the same wave patterns,--
A. It's not the same wave pattern, it's the same significant wave height.

Q. Sorry, I withdraw that and I appreciate you qualifying that. The model in the face of the same average significant wave height can vary in re-righting from one half of a minute to virtually one hour?
A. That's correct, it just depends how long it takes for the wave that will self-right it to come.

Q. And that must be something that would be experienced in reality in the open sea?
A. Oh absolutely, I mean the whole point about this exercise is that you are waiting for the wave that's going to self-right you to come, how long does that take, and without all the things like this that it just depends how long it's going to be.

Q. And of course I think you'd agree now that LPS in fact tells you virtually nothing about when the vessel once it's capsized is actually going to come up?
A. Between different vessels, that's correct, that's what we found.

Q. Well, even in considering any given vessel, in the real world it's LPS is virtually irrelevant to how long it's going to actually be inverted?
A. You are more likely to be, and we are talking in likely

terms here, you are more likely if the LPS is larger to come up quicker, more likely to, but that doesn't guarantee that you--

Q. No. And even with that greater likelihood with 1.15 and facing hypothetical average wave heights of 2.13 if you are lucky you might be over for 35 seconds and if you are unlucky you might be over for an hour?
A. That's correct.

Q. I want to go to an area where it may well be that you don't feel comfortable in answering so please tell me if you don't. It's common ground that Business Post Naiad had loose ballast removed from it in two tranches over the time in which it was of the owner, the ultimate owner, and so we have been concerned with lead removal.

CORONER: There was also effectively ballast replaced by putting in lockers and things like that, wasn't there?

WEBER: Yes, that's right.

CORONER: So if we are going to get it right let's get it right. It wasn't just the fact that ballast was removed because there was compensating ballast put in, wasn't there?

WEBER: Yes, well I haven't to the numbers yet, your Worship, but I am indebted to your Worship.
Q. The better view of the evidence seems to be, and I will no doubt be corrected by those to my right if I am wrong, that 680 kilos of lead in two tranches were removed and 250 to 300 kilos worth of extra fitout were put in and so assuming the upper of those limits you might have a nett weight loss of 360 kilos, that's been the gravamen of the evidence. What amount of lead would you need to remove from a vessel like the Business Post Naiad, in your view, to cause its LPS to fall from 113 degrees to 104.7?
A. Obviously I can't answer that, apart from anything else it depends where you are removing the lead from. If you remove the lead from the centre of gravity it won't change other than marginally because you are changing the displacement. I mean nobody could answer that question as posed and I certainly couldn't.

Q. What would you need to--
A. You need to know where you were removing it from and I couldn't answer that here and now, but it's the sort of thing if you knew where you were removing it from it's quite a straightforward calculation to do.

CORONER: Q. Is the fact of where you are replacing some of it too relevant as well?
A. Exactly. If you are putting some of it back same thing, yes.

WEBER: Q. The evidence as I understand it was that the removed ballast was in the bilge above the keel.
A. So that would be quite close to the centre of the

gravity position.

Q. Yes.
A. So it wouldn't make very much different I wouldn't have thought, but again I wouldn't want to--

CORONER: Don't answer it.

WEBER: It just helps us if - perhaps it helps his Worship.
Q. So doing the best you can if you had a nett loss of ballast from the bilge above the keel of say 380 kilos it's your impression that that would not have a significant effect on the LPS?
A. If it's close to the centre of gravity it won't have very much - it will have an effect, it won't have very much effect.

Q. If the vessel was calculated as having an LPS of 109.5, and that was a true measure, and you wanted to quickly get it over 110, so in other words you had a choice of where you could put it in the most efficient place, doing the best you can how much lead do you think you'd need to put in to push you over that line?
A. I couldn't answer that, how much. The best thing to do actually would be to take weight away from the top rather than adding weight in low because it'd give you more freeboard as well if you take weight away from up high.

Q. So you could do two things--
A. You could do two things, you could take weight away from up high or add it down low. Or a third thing would be move it from up high to down low.

Q. That would have a win win effect, wouldn't it?
A. But to say how much it had to be to move its LPS - it's quite easy to answer that question but I just can't do it--

Q. No, I understand that and I am indebted to you for making the effort. Can I just then come to your conclusions which are on page 29. We have discussed conclusion 1, and you recall I apologised if I sounded facetious, but 1 is saying no more and no less than more stable boats capsize less frequently than less stable boats?
A. Yes. If I may say so conclusion 2 is the same too.

Q. Yes, except that's to do with self-righting.
A. But it's the same thing.

Q. Yes. That's a conclusion that you draw in relation to hypothetical vessels with LPS of 119 on the one hand and 104.7 on the other, that's a fairly significant spread of LPS you'd agree?
A. Mm.

Q. And you'd agree with me, would you not, that you could not draw that same conclusion if the LPS at the lower end of the spectrum was 109.5?
A. Going from 109.5 to?

Q. 119.
A. Look, it'd be the same, just not as much.

Q. But you have used the expression much less likely. I am not criticising you, please understand me for that, but it would be correlatively less likely--
A. Less, much less likely.

Q. The first time Business Post Naiad rolled she self-right within less than a minute in her initially undamaged state. What does that say to you about Business Post Naiad's propensity to self-right in its as measured form?
A. Well, I am not sure I can answer that because I don't know anything about when the mast broke and so on, how violent the whole thing was. You have got to appreciate there is a difference between being upside down and coming back upright again or actually the momentum of taking you right the way through. I am not sure I can really answer that.

Q. Would it help if you factored in the fact that the vessel was de-masted on that first roll?
A. You mean it had been de-masted in the roll?

Q. It de-masted in the roll which was self-righted in less than a minute.
A. Was it self-righted straight away or was it upside down for a while and then--

Q. It was upside down for less than a minute.
A. I don't know, I am not sure that I know much about that. I mean one of the things as have discussed is that it varies, it depends on how soon you get the wave. If it stopped upside down and then got another wave sort of quickly then it would come back upright again.

Q. I think the evidence that may help this is that it was just a continuous roll right around and about 10 seconds.

CORONER: Q. Does that help?
A. Well, the only thing I comment that's quite different from being stuck upside down and then having to go from being upside down. We have observed rolls in the tank where the wave will hit the model and the model will go right over and come straight back up again and the dynamics are quite different from it being upside down to then coming right around.

HILL: One point that I do want to clarify.
Q. As far as self-righting is concerned there is that difficulty, as has been pointed out by my learned friend in the tables, that it can take between I think 30 seconds and almost an hour and that just appears to be the luck of being at the place where that wave breaks at the right time and there is two points I want out of that. You can say though that as far as stability is concerned the greater the stability of the vessel, the LPS, the degrees there, the less likely you are to get into the position of being upside

down in the first place?
A. In the first place, that's correct. Yes, that's another--

Q. So that's why it's essential that in these races you have the higher stability of vessels because we all know that it will go so far and will come back up?
A. Yes.

Q. The other thing is this, that you were pointing out to my friend that it's not the actual height of the wave that causes the problem. It can be 40 feet high, if it has got no breaking wave you will in fact go over it, it's that last portion that's breaking that's the danger area, if I can use that--
A. Yes, you put that a lot better than me. We were trying to simulate that last little bit and that's what we were doing, so we wouldn't want to relate exactly the wave height to exactly the full size because it's only that component of the wave.

Q. And it's that little component, if I can use that term, that does the damage, that is the breaking part is the one that knocks you over?
A. That's correct. Maybe I can just make a point. If the waves are very very small of course then you have a larger scatter because it's less likely that you'll get the large wave getting along. The waves are large, the scatter is a lot less. I mean we have focused on the one which was the largest scatter. If you look at the larger waves there is a lot less scatter between the information.

Q. When you say scatter I am not quite--
A. Sorry, scatter between the ten different runs, that ..(not transcribable).. in the ten different runs. That was a very very small wave we were looking at there and for example if you had no wave at all it would be very very long runs. But if you see no wave at all, very very small wave, but you are always going to get something that happens to self-right. So the difference is bound to be a lot larger.

Q. That was in E conditions (b) and the wave height was 2.3, was it?
A. Yes, that's very very small wave height.

Q. I don't suppose you are likely to be knocked over, unless you were extremely unlucky like the French sailors seem to be, and spend a long time upside down?
A. I won't comment about the French sailors.

HILL: You find that amusing, I understand. I have nothing further actually.

CORONER: You picked the most extreme example, Mr Weber, of all the tests to cross-examine on with the hour.

<WITNESS RETIRED AND EXCUSED

HILL: The next witness is Mr James from AMSA and there are three components of his evidence. One is he will be able to give evidence on the personal EIPRBs and their use. The second point is that he will be able to give evidence as to the search pattern in regards to the Margaret Rintoul when it happened upon the vessel Sword of Orion.

CORONER: What, the actuality of what the Margaret Rintoul would go into had she turned?

HILL: That's right. And the third point is that he gives evidence to show that he has looked at the files and Business Post Naiad's mayday was in fact received very quickly from Mr Carter and was acted upon in accordance with the available resources that they had at that particular point. So they are the three areas that will be covered by Mr James. At the moment he is having a conference outside with Mr Hunt and I wonder therefore if we could take the luncheon adjournment.

LUNCHEON ADJOURNMENT

HILL: The next witness is Mr Young but before we get to him, Mr Coroner, I want to make this statement, it's about the two witnesses Mr Anderson and Mr Fisher. Mr Fisher was the original measurer of the Business Post Naiad in Tasmania and I think that everybody appears to be of the opinion that the measurement he gave was incorrect. He got together with Mr Anderson, who is a measurer from New South Wales, and Mr Dovell. Mr Dovell's conclusions were that Mr Fisher was initially wrong in his measurements. What I propose is to send Mr Dovell's report to Mr Fisher and if Mr Fisher is in agreement with what Mr Dovell says I was not going to call either Mr Fisher or Mr Anderson unless there is anyone who wants to actually ask them pertinent questions.

CORONER: I'd agree with that.

HILL: So can I leave that with the Bar table.

CORONER: Yes, I hope it's positive.

WEBER: Could I please reserve my position. I'd like it obviously to be put to know what the upshot of ..(not transcribable)..--

CORONER: Of course.

<JOHN YOUNG(2.20PM)
SWORN AND EXAMINED

HILL: Q. Would you give the inquest your full name please.
A. John Young.

Q. Your address, sir?
A. 66 William Wilkins Crescent, Isaacs, ACT.

Q. Your occupation?

A. I am currently the manager of operations at the Australian Search and Rescue Centre.

Q. Could you tell us what qualifications you have and experience?
A. My experience is mainly navy, I spent 31 years in the navy as a warfare officer and that means spending a lot of time in operations rooms in maritime operations. Subsequently I joined AUSSAR in May 1998 and spent 10 months as the analysis officer there looking at SAR operations in detail before moving into the operations management position.

Q. SAR operations, search and rescue?
A. Yes.

Q. You have in fact had an interview that took place on 20 July 1999, a record of interview?
A. That's correct.

Q. You have also made available a document dated 25 February 2000 which deals with personal EIPRBs and I think you have also done a search pattern on what could have been done in regards to the deceased Glyn Charles, is that right?
A. The first two points are correct, the third one is not. I have not actually done a search pattern. I was requested to provide some search and rescue advice on the usefulness of Margaret Rintoul II as a search platform and I did some work on that basis.

Q. Perhaps if we deal with that first. What were you told, first of all, about the Margaret Rintoul II?
A. I was told that it had been stated in the Court that if Margaret Rintoul II at the time she found Sword or Orion, which I believe to be around 18.45 on 27 December, had made herself available as a search platform that the search for Glyn Charles could have begun immediately. I have subsequently been given some information that wasn't available to me directly from the representing solicitors indicating where they believe Sword of Orion to have rolled and where they believe Margaret Rintoul to have found her and that has supplemented the question--

Q. What information was that that they gave you?
A. They indicated the position of Sword of Orion at 16.44 on 27 December and said at this time Sword of Orion's position was 38.18 south, 150.17 east. They then indicated that the Sword of Orion was moving at approximately 7 to 8 knots towards Eden, that she was rolled at about 16.50 at which time Glyn Charles was washed overboard. The precise position at which that happened wasn't know. They indicated at 18.45 on 27 December Margaret Rintoul reported the vessel's position, which we assume to be Margaret Rintoul, as being 38.15 south, 150.22 east and Sword of Orion must have been in the immediate vicinity. The questions I was asked were how would AUSSAR have planned the search at that point and how useful would Margaret Rintoul have been in carrying out that search. I have not felt in a position to

answer the first question of how would the search have been planned because I don't know what the environmental conditions were with sufficient accuracy at the time, we didn't go through that process at the time so I'd be really hypothesising. I have prepared an answer to the second part of that question, how useful would Margaret Rintoul have been, and the answer is not very much use at all.

Q. Why not?
A. The conditions at the time were quite unhelpful for searching. We go through a process of calculating how a search platform can perform and knowing the weather conditions at the time, the height of eye of the observer in the boat and what the cloud cover was, there are a number of factors we take into account, we then can determine what width this vessel could sweep as it passes through an area. Typically for an aircraft it can be quite wide, for a vessel that is down at height of eye at about 6 feet or so it's quite narrow. Looking for a person in the water in the condition at the time with lots of whitecaps around to distract the eye searching would be very difficult from a yacht and I concluded, based on a pure calculation, that the swept width of Margaret Rintoul II would in fact be in the order of 7 yards, unless the yacht passed within 7 yards of the man overboard you would not have a significant probability of detecting the man overboard. On that basis I would have to say that the yacht would not be a very useful search platform.

Q. As you can imagine as lawyers we are somewhat word voyeurs, not very useful. Are you saying it would be of no use whatsoever or are you saying that there would be some use but not a great deal or would you not have bothered?
A. I have calculated that the swept width that Margaret Rintoul could cover, that is as she passed through an area what area would we say was cleared and the man wasn't there, was 14 yards wide, 7 yards either side of the yacht. To conduct a search that would say to me as an operations manager that area is cleared, you don't have to revisit it again, the yacht would actually need to sail up a line, move 14 yards over, sail back down the line, move 14 yards over, sail up the line again in order to clear an area to a suitable probability of detection so that we could say yes that area has been searched. It's actually not a practical thing to ask of the yacht to do to remain within 7 yards of a straight line under the conditions prevailing at the time.

Q. I suppose as well with the drifting of someone the 14 yards that you have just swept and you are going up to turn around he may well have floated from the area that you intend searching now into the area that you have just searched?
A. Indeed, that's quite possible too. They would have to be short legs for it to be a meaningful search. But the conclusion I reach is that if the Australian Search and Rescue Centre had been aware at the time, and we weren't, that Margaret Rintoul II was on the spot and the yacht had been offered as a search platform we would have said no, the

yacht was of no practical value for us.

Q. That's as far as the person Glyn Charles is concerned?
A. Yes.

Q. There was of course the incident with the crewman aboard the vessel Kingara.
A. Yes.

Q. And he went overboard without any means of flotation or anything like that, in black clothing, and he was spotted by the helicopter and I dare say you have read the interviews about that?
A. I am generally aware of the circumstances although I don't have formal records on that basis, no.

Q. When we compare that with the position of the deceased Mr Charles and the rescue of Mr Cameron from the vessel Kingara is that simply a matter of luck that occurred in such a way?
A. My understanding is it's not a matter of luck. My understanding of the Kingara case is that in fact the man was in sight all of the time. Kingara was still sailing, still under way, and the feedback that I have received is that because the man was still in sight when the helicopter turned up on the scene the helicopter could be directed to the man so there was no need to search at all.

Q. Basically once a crew member goes overboard in that sort of weather and you lose sight of them the possibility of finding them with a yacht would appear to be quite remote?
A. Very small.

Q. And when you deal with a crewman that's gone overboard some two hours or an hours and a half before that I suppose then the odds lengthen again, is that basically it?
A. Indeed, I would have said that the prospects for any yacht to find the man at that stage other than by sheer blind luck stumbling across him would be very very small. The way to deal with that particular problem is with an air search, not with a surface search. An aircraft would have a better prospect.

Q. You said that you were given a position of the Sword of Orion at 16.44, is that correct?
A. Yes.

Q. Where did that position come from, do you know?
A. I don't, I have only been supplied it by the solicitors representing Margaret Rintoul II. It's certainly not part of my records.

Q. I want to then move on to the Business Post Naiad. You have examined the file for that, have you not?
A. Yes, I have.

Q. There was a mayday from that vessel, was that received by the search and rescue?

A. Yes, it was. I should rephrase that not to give the wrong impression, the mayday was not received directly from search and rescue. The record I have on the file is that - the search and rescue centre we have for many years placed a search and rescue officer with the CYCA race headquarters to act as a liaison officer.

Q. Is this Mr Hughes?
A. Mr Hughes.

Q. Sam Hughes?
A. Sam Hughes. He rang through to the search and rescue centre at a time that's been stamped as 0711 on 27 December, and that translated to 18.11 in local time, saying from Young Endeavour Business Post Naiad was rolled, suffered hull damage, actuated EIPRB, gave a position of 38.05 south, 150.32 east, said he was trying to steer 174, there were nine people on board and it was taking water. So that's the first indication within the search and rescue centre that Business Post Naiad had a problem. I understand from other information I have, although it's not part of AUSSAR's records, that that's an elapse time of around about 20 minutes, 15 to 20 minutes from the time that Business Post Naiad actually sent its mayday.

Q. That lapse time of about 20 minutes is that good, bad or is that an average timing?
A. I think that's reasonably good actually given that it would have needed to go from Business Post Naiad to the race relay vessel to Hobart to AUSSAR and come through two other pairs of hands each time being read out as a voice message. I'd say that's pretty good performance.

Q. Would it have been quicker, and I presume it would, if there would have been say a search and rescue person aboard the Young Endeavour and thus cut out Hobart by linking straight to Canberra?
A. Not necessarily. The issue is what communications are available, not what kind of person is handling the information. Young Endeavour had regular contact with race headquarters in Hobart, for whatever reason Young Endeavour decided to pass the information that way and it came to us as quickly as it was reasonably possible.

Q. We have to differentiate between Young Endeavour and Telstra control, which is the race group on board that.
A. I understand.

Q. Have you differentiated between those?
A. I have not. I know that Young Endeavour has a communication suite, the ship Young Endeavour has a communication suite that would allow them to pass the message more directly to the search and rescue centre. They have ..(not transcribable).. satellite communications. Having said that the former communication is typing it up to create a message and then sending it via the satellite system. Whether that would have been faster than two-voice transitions I would only be guessing, it's not necessarily

quicker at all.

Q. What happened after search and rescue got the Business Post Naiad mayday? What occurred then, can you tell us?
A. Yes, the search and rescue centre transmitted a distress broadcast to all shipping in the area, that went out at 18.16 local time.

Q. What would that frequency have been on?
A. It would go out on multiple channels through the coast radio stations which would transmit it on high frequency and it would also have gone out in INMAR set(?) channels as a satellite broadcast. So merchant shipping in the area would have a very good chance of receiving that message and it comes with warning alarms to warn them there is a high priority message coming in.

Q. The merchant shipping of course, they have to keep a watch on HF and VHF at all times and these are the emergency channels. So that would have been the channels it would have been broadcast on?
A. Forgive me while I have a look at the records.

Q. Yes, certainly.
A. The HF frequencies to be transmitted on were defined as 2524, 4535 and 4620 kilohertz, they would be the frequencies at which shipping would have the best chance of receiving the message as opposed to necessarily distress frequencies per se. It's not where you would expect to hear a mayday but they are the channels in which you could get out to merchant shipping.

Q. So the position is this, that although you keep a listening watch on those channels that are designated, that's HF and VHF, when you in the search and rescue centre actually obtain a mayday you then broadcast on the frequencies that are more probable to be heard?
A. Yes. To be precise we do it through the coast radio stations, which are a Telstra contracted operation contracted to the Maritime Safety Authority. So we would pass a message out to the coast radio stations to be broadcast on HF frequencies as well as transmitting directly ourselves on INMAR set(?) because we have the terminals in the search and rescue centre.

Q. Apart from the broadcasts that were sent out what was the next thing that occurred with regards to that vessel?
A. My recollection is that the search and rescue officers on duty attempted to get hold of aircraft that could go to the position. I know that within a few minutes, I can't give you an exact time, but within a few minutes the ABC helicopter, Gary Tyshurst's(?) aircraft, was asked to go to Business Post Naiad's reported position and the fixed wing aircraft Sierra-Alpha-Romeo was asked to go out there. And then subsequently at longer time intervals as aircraft became available another helicopter, which I don't recall the identity of, and one of the navy helicopters were all directed to the Business Post Naiad's situation.

Q. Is it correct to use the phrase that you actually commandeer aircraft or anything else that's in the vicinity to go to this rescue. Is that how it works?
A. Commandeer is not the right expression.

Q. Well what's the right expression?
A. With most aircraft we actually lease them on a commercial basis. We hire them for the task.

Q. All right.
A. What we will do is to put together a brief for the aircraft pilot, fax it through to where he's taking off from, in the normal course of events. If the aircraft is already airborne we will pass the information on whatever channel we can use to get to the aircraft.

Q. Well what power did you have over the ABC helicopter that was presumably gathering news, could you actually say to it, "You will go and do this."?
A. No.

Q. You don't have that power?
A. No we don't, we can ask him to do that.

Q. Can I take it that in the vast majority of cases they comply with that request?
A. Yes that's right.

Q. I want to then move on into the area of personal EIPRB's and as part of that I want to find out a little bit more about the EIPRB's that the boats themselves had. Now I understand that there are two types, is that correct?
A. There are two technologies, the technologies are described in terms of the frequencies that they work on. There is a technology associated with 121.5 megahertz transmissions and there is also a harmonic of that.243 megahertz. Those two go together.

Q. All right.
A. 243 is for military purposes, 121.5 is for civil purposes. Most of - I shouldn't say most of - there are a very large number of 121.5 megahertz beacons in use around the country. They serve a homing function, or, they were introduced as a homing function, where a suitably equipped aircraft can detect a signal and it's just a woop woop woop kind of sound, they detect the signal and can home on it to find out what's at the far end, find out what the nature of this distress is. The 121.5 megahertz beacons can also be detected by the Coast Bass Satellite Beacon Detection System. So we have two means of determining whether a beacon is active or not, it may be detected by satellite, it may be detected by a passing aircraft that is listening on the right frequency or both.

Q. I see, right.
A. 406 megahertz distress beacons have an additional component. The 406 megahertz component has an embedded digital message which can be passed through a satellite and back to ground station, and that the digitally encoded message provides some information about the source of the beacon. When a beacon is purchased the details of the owner, the ship it belongs to, can be registered into a date base, the Search and Rescue Centre operates a data base of

Australian beacons, and when we detect that beacon being transmitted we can go to the date base and find out who it belongs to, what their contact telephone numbers are, et cetera, and it allows us to do some, what I'd call intelligence work, to find out more about the incident that's going on at the far end of the chain. It doesn't tell us what's going on there but it does tell us something about who it's happening to.

Q. Well I understand at one stage that quite a few beacons went off in the Sydney to Hobart Race?
A. Yes that's right.

Q. And some of those were the 1.25?
A. Most were.

Q. And some were the 406?
A. The Search and Rescue Centre detected one 406 megahertz beacon, from the yacht B-52.

Q. So straight away you knew that that beacon belonged to B-52?
A. Correct.

Q. But the other ones, the 1.25's, you couldn't tell which yachts or anything about the vessel they'd come from?
A. No, all we knew was that there was a distress beacon activated, a distress beacon that had been detected by aircraft, we only knew the very broadest vicinity in which it was being detected. If it was detected by satellite we would know within around about 20 kilometres or so where it was. We could then put an aircraft into the area that could home on it and find out what the emergency actually was.

Q. Now with the 406, which was the B-52, in fact you could tell in a shorter compass than 20 kilometres, is that right?
A. Yes, the area - it's a very complex issue, but the area around a 406 beacon could be characterised as being about five kilometres, within about a five kilometre circle of the beacon itself.

Q. So as soon as that came up you knew it was the B-52?
A. Yes.

Q. It was their beacon and it was within an area of five kilometres?
A. Yes.

Q. The other ones, it was 20 kilometres and you didn't know who they were?
A. That is correct.

Q. Now of course if you were searching for vessels would it make the task easier if you went across the B-52, for arguments sake, and its beacon was activated, you would know it was the B-52 down there, and thus identify the yacht itself?
A. That's true, if there's single yacht in the vicinity of

the beacon transmission we could make that presumption.

Q. So if you were looking for the Winston Churchill and you came across a yacht and it was emitting the beacon signal for the B-52, you would know then that that was not the Winston Churchill and you'd have to go elsewhere to search for that beacon?
A. It's not as easy as that.

Q. Okay, you tell us?
A. The 406 megahertz component of this beacon transmitting with the digital message in it is received at the Search and Rescue Centre. We at the Search and Rescue Centre know what we're looking for. The aircraft that goes out there is not in a position to receive the 406 megahertz component, the aircraft can only receive the 121.5 component of that beacon, which is what it homes on. So from the aircraft's viewpoint, unless he can talk to AUSAIR and carefully compare the positions that these things have been found at, we couldn't be 100 percent sure that the beacon, the 121.5 beacon the aircraft had homed to was actually the 406, same source as the 406 digital message.

Q. What I'm driving at is this, the survivors aboard the Winston Churchill, they took their EIPRB, though it wasn't a 406. If it had been a 406 and they had it in their - or next to their raft, you would have been able to trace that beacon to within a five mile area?
A. That's correct, five kilometres.

Q. Sorry, five kilometres. And therefore you would have been able to put an aircraft in that area and you would have been able to say reasonably - so that if the EIPRB was still attached to that life raft, that somewhere in that five mile area is going to be a life raft with the EIPRB of the Winston Churchill attached?
A. What we would do is to give the aircraft a position to go to based on that circle, with a very high prospect that the aircraft would detect the homing signal and home to it and find out what was actually going on at the far end.

Q. Right?
A. Now from the Search and Rescue Centre's viewpoint, if the only information that we have is that this beacon identified as the Winston Churchill's was active, and this is hypothetical, that it was active, we wouldn't know if the helicopter was actually looking for the Winston Churchill or looking for a life raft or looking for a person in the water, because we don't know what's actually happened at the far end.

Q. Certainly, but if the message had been one simply that "We are abandoning the vessel, taking to the life rafts, we've take our EIPRB with us." And that's all you've got. At least then you'd be able to track them down with some certainty?
A. Yes.

Q. What about, and I take it that the smaller the object, it may display a keen grasp of the obvious, but the smaller the object you're looking for the more difficult it is, so if it's an area of 20 kilometres it's four times as bad than if it's an area of five kilometres?
A. I can't do the calculation in my head but I think it's actually markedly worse than that.

Q. Is it? All right, so the reality is, is it better from your point of view, in your opinion, to have a 406 EIPRB than a 125?
A. Sorry can I take us back. Yes I think I get the sense of the question. The 20 kilometre circle is - it's not normally a dramatic problem for the aircraft that's homing on the beacon. If it gets within about 20 kilometres of the beacon it's likely to hear it and therefore be able to home on it. What it does create is a problem for the Search and Rescue Centre in trying to co-ordinate activities. You have these larger circles overlapping on each other, it's more difficult to determine which incident is which and to create a clear picture of the events that are actually going on out there.

Q. Right.
A. The 406 megahertz beacon tends to remove that confusion, so hypothetically if we sent an aircraft to B-52 and the aircraft could identify the yacht, then we know categorically that beacon, that yacht, that event, are all tied up together, we can deal with that issue and having dealt with it give it a tick and move onto something else, quite unambiguously. It's much more difficult to do that with the 121.5 beacons because when they're densely clustered you're never quite sure that the one that was detected by the satellite system is actually the one that the helicopters turned up to. These larger areas of uncertainty. So co-ordination of the event becomes, multiple events, becomes more difficult.

CORONER: Q. So for an event like this are you saying it would be better the boats, vessels, were equipped with 406 EIPRBs in conditions like this?
A. I would go further your Worship. It's actually better if the vessels, the life rafts, and people in the water, are equipped with the 406 megahertz beacons.

Q. And practical terms, is there a cost factor?
A. Yes there is. I don't know the current costs, but I believe 406 beacons, personal beacons, are in the order of six times as expensive as 121.5's.

HILL: Q. Now when you said personal beacons, what about ones for yachts?
A. The beacons come in a staggering variety. You can buy them so that - to equip a yacht, and you can buy them to be a personal one attached to your life jacket.

CORONER: Q. So in general terms they're much more expensive than 121.5?

A. Yes.

HILL: Q. We'll get costs on these things later, but from your point of view, from the rescue point of view, the 406 is preferable?
A. Yes. There's another dimension to that which - predicting into the future a bit here, but because 406 is the newer technology, the COSBAS SARSET Council, I can't remember their proper name, but the international council that deals with COSBAS SARSET is looking towards the time when it will phase out the processing of 121.5 megahertz beacons by satellites. That's predicted to happen in 2008/2009, in that sort of time period.

CORONER: Q. So people will be expected to get the better technology?
A. Yes.

Q. And I suppose it's reasonable - it's expected the cost will go down the more demand and supply?
A. That's right your Worship.

Q. Are there any significant drawbacks that you can identify in the 406 EIPRB's as opposed to the 121.5's?
A. No, apart from the cost, the 406 has no disadvantage compared to 121.5.

HILL: Q. I take it that the 406, there can be a large one for a vessel and presumably a small one, that you can actually have a personal EIPRB one?
A. Correct.

Q. And that would give you the same benefit such as if it was Mr Shand purchased it it would be Alec Shand and they would know who it was?
A. Yes.

Q. And is there any problem with all of those going off in an area?
A. The answer is the more of them that are going off the more difficult it is to, (a) make priority judgments between them, and (b) understand what is going on just because of the mess of information.

Q. Well if you had information such as, "Four men have taken to the life raft, they've all got personal EIPRB's, is it likely that it would show up as they were all activated and they were all - appeared to be coming from the one place? Is that how it would work?
A. We're talking about the 406 megahertz beacon?

Q. Yes, the 406. Suppose we have four people in a life raft with their personal EIPRB's on, they're all 406 and they're all activating?
A. I can't speak with authority on exactly what the satellite system would make of that situation. I don't have the technical knowledge to do so, to be truthful. It's a question I could take on notice and try to bring an answer

back to the court it that's what you wish.

CORONER: Q. If you could give us that in writing that would be a help. And in particular whether it would be better in those sort of situations, when you've got four persons in a life raft in the open sea, it would be better for one of them to activate the EIPRB. You know, that's what we're looking at. We're looking at the practical ways of improving finding these people in conditions like this. So if you keep that in mind.
A. Your Worship I'm happy to make a statement on that. It is my view that when a group of people are in distress together they should be using one beacon.

Q. Right.
A. Not multiple beacons. I have not doubt about that at all. But that's a protocol and a self discipline issue, not a technical issue.

Q. Right. Not necessarily a technical - I see.

HILL: Q. That's a system where in fact you would conserve the battery powers et cetera of the other ones is it?
A. Yes. Well that's one element of the thinking, but the other one is to have one single beacon is to avoid (a) confusing the satellite system, and (b) confusing the Search and Rescue Centre.

CORONER: Q. I think you've answered the question.
A. Yes.

HILL: Q. Now--
A. Sorry, while we're on that subject can I also point out that there's a significant difference between the capability of the satellite system to be able to process large numbers of beacons. The COSBAS SARSET earth stations are specified to be able to process at least 10 121.5 megahertz beacons, provided they are either separated by sufficient geography to be able to determine to be separate, or they're separated in frequency, so that the system can tell them apart. It's a much larger number for 406 megahertz beacons. I took some notes on that.

Q. Go on?
A. For 406 megahertz beacons I believe it's in the order of 90 can be processed by the satellite detection--

CORONER: Q. See that's another big benefit of the improved technology.
A. Yes.

HILL: Q. Were personal EIPRB's available in December of 1998 do you know?
A. I can't answer the question to be truthful. I believe so. Again it's--

Q. 406, I'm told that 406 personal EIPRB's were not available in December of 1998. Do you know of that or not?

A. I can't comment I'm sorry.

Q. Well supposing they weren't and there were 125's available - 121.5 - do they operate in the same way or is it that we just have the problem that they've got a wider buffer zone?
A. Sorry, I've got lost, could you ask me the question again?

Q. If there were personal EIPRB's available but they were not 406, they were the 121.5, and if they were available what's the problems with them if any?
A. The problem that arises if you have a very large number of beacons available is that people are inclined to use them, to set them off, and it gives us a number of problems. One is that, as I have already described, the satellite detection system is specified to be able to detect at least 10, I don't think anyone knows exactly how well it would perform. I don't know that anyone knows exactly what would happen if there were more beacons available at present. But the probability is that accurate detections would suffer, there would be a degradation of the system performance such that not only would you not detect all the beacons present, but even the ones you did detect the detection might be spoiled as a consequence. So if there were a large number present I would have to say that the satellite system would be degraded very heavily and the prospects are that we would not be able to use it to the advantage that we currently do. A second problem is that when you task aircraft out into the area to home on beacons, they also then find multiple signals. As a general rule their equipment is not designed to deal with that, it's designed to home on a single 121.5 signal, so again. the helicopters and aircraft would find life much more difficult trying to work out there. And the third problem from out viewpoint is, if the only information we have is a 121.5 signal and we don't know what it is - what's the real emergency that's caused it, then we have no way of making a priory job run. It would be like everyone in the room shouting at the same time and the net result of that would tend to wipe out the benefit of having all the beacons in the first place. If their use could be heavily disciplined and based on a real understanding, an educated understanding of them.

Q. And the technology of them?
A. You might be in a different picture. But even 10 percent of the sailors on the Sydney Hobart set them off, 121.5 effectively becomes not very helpful.

Q. Now what you say in your document of 25 February, you lay out the problems, the difficulties that you have, and what you say is this, that "In conclusion, first of all, beacons have a vital role in the larger SAR system. For a single Sydney Hobart person overboard and separated from his yacht, a personal beacon would likely represent the difference between recovery alive and disappearance without trace. Particularly if night intervenes. On that basis alone Ausair could not do other than support the personal

carriage of distress beacons?
A. Correct.

Q. And that is still your opinion?
A. Yes.

Q. Now if Mr Charles had had a personal EIPRB on when he disappeared, what could have been done for him?
A. It's hypothesising to an extent.

Q. Oh yes I realise that.
A. Can I say for the real situation I don't know the answer, because I haven't analysed what aircraft were available and where they are. It's quite probable that in the time that it took us to detect the beacon and to send an aircraft out to it, that Mr Charles would have died anyway. There are some significant time intervals involved here.

Q. All right.
A. There's the time for a satellite pass that can detect the beacon, or if you don't have a satellite pass for an aircraft to refine the understanding of what's going on well enough and the time taken to get hold of an aircraft that's suitable to do a rescue and then for it to get out there. We're talking sometimes hours involved here.

Q. Yes.
A. Can I make the point also that in that context distress beacons by their very nature are not the best way of getting the message through. The very best way of getting the message through is by a voice communication with a suitable authority. Because then you get better information about what's going on and you get it immediately.

Q. So--
A. So it's a weapon of last resource.

CORONER: Q. You come back for the Mayday?
A. Yes.

HILL: Q. So your best method is that someone should in fact radio in the position of the distressed vessel, the state it's in, and what's happening around it. Is that basically?
A. Very much so. That's a much preferable position for the Search and Rescue Centre than simply detecting a distress beacon.

Q. Well what was the message, if any, that you got with regards the Margaret Rintoul's radio message and the vessel, Sword of Orion. Was there anything at all?
A. The summary of that incident indicates that at 0829 UTC, and that would be 1929 on 27 December local time, the Rescue Co-ordination Centre was advised of a man overboard from Sword of Orion in a position approximately 40 miles south east of Gabo Island. My file record doesn't indicate where that information came from. I hypothesise now that I know where Margaret Rintoul II was at the time that it came from

her through the radio relay vessel and into AUSAIR, but my records don't actually indicate where that information came from.

Q. So it's silent on that?
A. It is.

Q. Nothing about the state of the vessel?
A. Oh sorry. Then the message said there were also several persons seriously injured.

Q. And the vessel itself, does it say it's dismasted or--
A. The distress broadcast, and it's the same kind of broadcast that we discussed earlier, pushed out by the Rescue Co-ordination Centre at 0828, so 1928 on 27 December, simply says, "A man reported overboard from the yacht Sword of Orion vicinity 3814 south, 15024 east, at 270815." So it's reporting the time at which we believed that to have happened, 1915 local. Clearly the message that Mr Charles had been washed overboard two hours earlier in a different position was not one that percolated into the Rescue Co-ordination Centre.

Q. What was done with that information?
A. I'm talking from memory here rather than from the records.

Q. Yes, of course.
A. As I recall it the aircraft, Sierra Alpha Romeo, one of the fixed wing aircraft, was in the vicinity, went to Sword of Orion, found Sword of Orion, and then provided better information. He attempted to conduct a search for Mr Charles but couldn't do so because of the weather and in fact the weather conditions drove him off scene, so the aircraft actually had to leave the scene because of the weather conditions.

Q. And this was a fixed wing?
A. Yes a fixed wing aircraft. Sometime later than that, about an hour later, darkness would have intervened. So the first really major search that the Search and Rescue Centre was in a position to commence was at first light the following morning.

Q. And I take it a search was conducted after that?
A. Yes, the Search and Rescue Centre co-ordinated two searches that day, on 28 December. So that was - the morning search had eight aircraft involved, eight fixed wing aircraft, and we - I'm just estimating off the chart here, searched in an area of around about 1000 square miles for Mr Charles, and then seven aircraft searched basically the same area in the afternoon of the 28th and at the end of that time the search was suspended.

Q. Now they would have been the aircraft that dropped the life rafts, is that correct?
A. I don't believe any aircraft actually dropped life rafts.

Q. No but there would have been ones that were capable of doing so?
A. Oh yes.

Q. And that's the life raft at either end and a string in between and it comes down?
A. Yes, they also come in various forms.

Q. Various forms, all right, we'll hear from Mr Boag I think about that.
A. Sorry, they would be aircraft in the main from trained civil search and rescue units.

Q. I may not have asked you this question. The Margaret Rintoul did not tell you that there was a man overboard. Is that correct or, if my memory serves me correctly, what you said is, you've got a notification of a man overboard, you're not sure where it came from?
A. Correct, we received the information according to the broadcast we put out--

Q. 2019 wasn't it, or 2029 or something?
A. We've sent out a broadcast at 1928 on 27 December and it referred to positional information relevant to the time 1915. That appears to be the first time that we knew of the Sword of Orion either as a dismasted vessel or as a man overboard. The information that we sent in the distress message said there was a man overboard, so that's the information that's come through to us. I could hypothesise that it came from Margaret Rintoul, because the times work well.

Q. But if the Margaret Rintoul was not in communication, voice communication either by the radio or by hailing, one can assume that that has come from somewhere else. That they wouldn't know that anyone had fallen overboard?
A. Yes, I don't know what the circumstances were.

Q. No I understand that. Nothing further thank you.

WEBER: I don't wish to cross-examine your Worship.

SHAND: Q. Mr Young I draw your attention to the communication which I think is part of the records of AUSSAR, which deals with the advice to your service of a man overboard from Sword of Orion, 40 miles south east of Gabo Island. I think you referred to that a few minutes ago. Do you see that?
A. Yes.

Q. It's given an incident number if that helps, 1998/4384.
A. Yes.

Q. And as we've said, or has been discussed just a moment ago, the certainty is perhaps that the information about the man overboard didn't come from Margaret Rintoul?
A. Yes.

Q. No suggestion that there was any communication, meaningful in that regard between Sword of Orion and Margaret Rintoul on first sighting or after?
A. Right.

Q. Does it appear from the first paragraph in this incident report, that an urgency broadcast to shipping having been immediately issued, do you see that remark?
A. Yes.

Q. An aircraft on scene, which was described in the report I have as a helicopter but turns out to have been a fixed wing aircraft?
A. Correct.

Q. Was forced to leave the area due to bad weather. Does that have a time attached to it when that happened, where the fixed wing aircraft was forced to leave the area?
A. I don't believe that that's timed accurately in our records here.

Q. Does that seem to have been the first aircraft on the scene?
A. Yes.

Q. Well then the next remark is, in this report, or incident report, "The search area for the missing man for first light was calculated for the first aircraft on the scene expected at about..", and then there's a time given as there for Greenwich meantime?
A. Yes that's right.

Q. Which translates does it not in an eastern Australian summertime to about 6 am?
A. That's correct.

Q. That was a calculation made by your people was it, AUSAIR people?
A. Yes.

Q. Helicopter tried to evacuate the vessel of remaining crew. Was that an arrangement that was made to your knowledge?
A. I know that the remaining crew were evacuated from the Sword of Orion, so yes.

Q. Not necessarily by your air services I take it? Could have been by someone else?
A. Well the search and - I actually can't answer the question without doing some more detailed analysis of our records.

Q. Well I won't worry you, I don't think it's necessarily consequential enough. Speaks of the helo, meaning helicopter I suppose, arriving at about 1847 and lifting off the six crew, et cetera. That of course is 1847 eastern Australian summer time?
A. Yes.

Q. And it's on the - therefore on the evening of the 27th of December?
A. Yes.

Q. The last paragraph deals with this, "Search for a man overboard was not successful and was suspended at about" and then the time then given translates to about 6.14 pm on the evening of 29 December, eastern Australian summertime?
A. The search was suspended at 28, so that's the - 1958 on 28 December 1999.

Q. Thank you, you've properly corrected me of course. Suspended at about, and the time given is 281058 Greenwich meantime?
A. Yes.

Q. Translating to 9.58 pm eastern Australian time?
A. Yes.

Q. Now I just wonder whether that search referred to there, being a search by air I suppose?
A. Yes.

Q. Has any connection with remark in the first main paragraph, of the fixed wing aircraft having been forced to leave the area due to bad whether. Is that the same aircraft?
A. No, the fixed wing aircraft, Zero Alpha Romeo, was on the scene at around about the time, or, within a couple of hours of the Sword of Orion suggesting her problems. So that was the evening of the 27th that Sierra Alpha Romeo was on scene and was forced to leave the area for bad weather.

Q. All right?
A. The search, the formal search, was conducted on the 28th. Well that was clearly enough was it after the six crew members had been lifted off Sword of Orion.

Q. Now the question I want to ask you is whether in fact AUSAIR ever received from the Sword of Orion, the position of Glyn Charles, Charles at the time he went overboard, as signified by the man overboard button. Did it every receive that position from Sword of Orion?
A. We didn't ever receive any direct communications from the Sword of Orion.

Q. No,and in fact when one comes to the information that you got from Sword of Orion, does it come to this, that - I'll refer you to a further communication that appears from your file, which is in terms - it says, printed by Root at 72225, 29 December 1988, Is the way it's headed. Do you have that one?
A. Can you give me the time again please.

Q. If I'm giving you the time, which I suppose it is, it's 7.22.25, 29 December. That's the time it is printed by Root, so it says?
A. Yes I have that.

Q. Well the main paragraph down that page a bit, is in these terms, FM RCC Australia - what does that mean?
A. It's from the Rescue Co-ordination Centre Australia.

Q. Then what follows along that line?
A. What the message is saying is that from the Rescue Co-ordination Centre Australia to - and it's to all shipping in the area, this is a distress broadcast. At time - the reference time for this message is 27.08.28 Zulu. And that in fact is referring back to the original distress broadcast so that mariners can correlate them and it gives them also a number 984384, which is actually this file number and it's the number we ascribed to that incident. It then refers to a particular chart, pulse 359--

Q. That's Point Hicks to Montague Island chart?
A. Correct. And that's so that mariners know which chart to be looking at. It then passes information about the incident and the only relevant information here is that which originally applied. So this is a repeat distress broadcast.

Q. Right, well I come to that information which reads in this way doesn't it, man reported overboard from yacht Sword of Orion vicinity. And then a bearing is given, is it not?
A. A position.

Q. A position, and then on the next line after the position it says, at 27.08.15?
A. That's correct.

Q. That's a time is it?
A. That's the time that correlates with the position. So the man overboard was in position 38.14 south, 150.24 east and the time of the man overboard was at 27.015.

Q. Yes but the problem about this position given there, is it not, that it's the position of the Sword of Orion, is it not? It doesn't purport to be a position relating to Glyn Charles. Am I right?
A. We subsequently believe that to be the case based on the information that we'd been gathering while attempting to assist with your inquiries into this. Yes.

Q. Well we would know I suppose, would we not, whether it was the position of one or the other from the time indicated as being that at which the position was supplied, wouldn't one? And that time is at 7.15pm isn't it eastern Australian time?
A. That's correct. That's when the message came through to us of a man overboard from Sword of Orion. The message obviously didn't include the information that the man had gone overboard two hours previously, or two-and-a-half hours

previous.

Q. Yes. As we know the man went overboard at about 16.50 Australian time. Is that right?
A. That's information you have supplied to me sir.

Q. I think it is - oh indeed it is. Let me assure you that this is information coming from the tape, is it not - sorry, this is information coming from the report of the Review Committee of the Cruising Yacht Club of Australia which provides information as to the various events, the chronology. And it tells us that on 27 December 1998 at 16.50 Sword of Orion rollover 360 degrees, dismasted, MOB, mayday, EPIRB activated on deck, lost sight of MOB - man overboard, five to seven minutes later. So 16.50 and referring back to this message that we have been looking at which went to the mariners as you've said, that seems to indicate a position at 7.15pm?
A. That's correct.

Q. Thus doesn't have any particular relationship to the time at which the man overboard incident occurred. Is that right?
A. Yes, based on the information collected by the CYCA, it appears that the message that we received and acted on was not completely accurate.

Q. The plain fact is, is it not, bearing in mind these positions and the time at which Margaret Rintoul reported her position at the time of the sighting of Sword of Orion that the man overboard incident occurred at 16.50 or thereabouts and the Margaret Rintoul report of the sighting at 19.20 - I withdraw that, reports at 19.20 that Sword of Orion had been sighted at 18.45 at the position again mentioned in the chronology supplied by the report of the Cruising Yacht Club.

CORONER: Before you answer that question - I'm loath to interrupt you, but I don't think they say they saw the Sword of Orion, it's a red flare.

A: Red flare. That's what was put in the end I think. That Rintoul reported at 19.20 a red flare had been sighted at 18.45.

SHAND: Q. For this purpose, both these two details I have been referring to are to be found in the radio log, exhibit 24. All right, we'll take then the position being that 16.50 is the time at which the rollover and the MOB is reported?
A. Are you saying that's in the log? The 16.50?

Q. Oh, it's not?
A. No it's not.

Q. I see. Right. Well I'm told that's apparently various people's estimate or guess. It just appears in the chronology as if it's established time, but if we can assume

for the moment that 16.50 is somewhere about the time of the rollover and the man overboard, and the sighting by Margaret Rintoul of the red flare is at 18.45, very close to two hours is it not?
A. Yes.

Q. Perhaps an hour fifty-five, if we assume that's the gap between those two things, man overboard and the sighting of one boat by the other. Well now if in fact there was a contemplation that Margaret Rintoul may have instituted some sort of a search for Glyn Charles bearing in mind that substantial lapse of time since the unfortunate man went overboard, one has to take - and they would have to have been taken into account I suppose wouldn't they, factors including the fact that in regard to the drift of, on the one hand, the body or the man, and on the other hand the dismasted yacht, that the indications are that they'd have been travelling first of all in different directions?
A. That's likely.

Q. You've mentioned today that the yacht would be under the influence of winds?
A. Yes.

Q. The body would not, would it?
A. That's broadly correct. The yacht would tend to make more - what we describe as leeway, as a result of the wind. The body - the man being in the water with only a head exposed is much less likely to be pushed around by the wind. Both of them will tend to move downwind due to wave action.

Q. Due to wave action?
A. Yes.

Q. Does - the current, of course, then has to be taken into account, does it not?
A. The current will tend to affect both bodies in the same way.

Q. So have you got the situation where there would be a differential between current and wind effect?
A. The factors at work here would have been the current affecting both objects, the man and the boat, unless the boat happened to drift into an area of different current, the two of them would tend to be affected the same way and that wouldn't tend to draw them apart. Both wave action due to the wind, and the wind itself, would tend to push them apart.

Q. We've had a description in fact, how in the very early stages after the man went overboard those who were seeking in some desperation to consider how to rescue him, saw him disappearing further and further to the rear of the boat?
A. That's right.

Q. And apparently not slowly, at quite some rapidity. Would that give you some early indication of the separation that thereafter occurred between the two objects?

A. Not knowing - I don't know from my records actually how far they drifted apart or how quickly. It's been put to me from other evidence that I don't hold, that it was in the order of 100 yards in six minutes or something of that kind of nature.

Q. All right, well any search which Margaret Rintoul it might be contemplated may have attempted to carry out - we know it didn't happen, would have first of all require at least to come to an approximation as to where that search might start and that of course would require a calculation as to in what direction and how far the body had drifted from the point, if they could identify it, where the man went overboard?
A. Yes.

Q. Which you wouldn't have had so far as you were concerned? The point where he'd gone overboard?
A. At that stage, certainly. Clearly the Search and Rescue Centre believed it knew - believed that in a position approximately as described at 19.15 the man went overboard. Equally clearly that information was incorrect.

Q. But during a period of two hours, what were the prospects in any event of some useful calculation being made which might have had the result of Margaret Rintoul starting to search approximately in the area where the body was at that time? Or at a time when the Margaret Rintoul could have got to the point where it might have been?
A. For the Search and Rescue Centre, with the communications that were available at the time, the prospects of putting together a sensible search for Margaret Rintoul to execute would be very small. Clearly we actually didn't hold the relevant information. For Margaret Rintoul itself, or for the skipper of Margaret Rintoul, to make an estimate of where to look in my opinion would have been very difficult. We know for instance that the probability is that Sword of Orion in drifting away from the man due to wind did not go directly downwind from the man. Being a sailing vessel, it's actually designed to go cross wind or even upwind under certain circumstances, and so the prospects of it sailing directly downwind from a man were quite small. So in fact Margaret Rintoul, even if the yacht knew how far away the man was, would have a large arc in which to search.

Q. And in any event, if in fact some decision had been made as to where Margaret Rintoul with the slightest degree of utility, could have started using its mobility to look for the body, based upon a radii of seven yards from either side of the boat, would have had to take into account the fact, wouldn't it, in those conditions and those seas, that it had no motor?
A. Indeed.

Q. And what chance - I mean, we've talked about the shape of the seven yard type model which it would have had to try to follow in order to be at all effective, without a motor,

how difficult would that have been in those conditions?
A. I would hypothesise from my own yachting experience, very difficult. In fact, maybe impossible. What would have been required to make any sense of this at all would be direct communications between the Search and Rescue Centre and Margaret Rintoul II. Without those kind of direct communications, the idea of putting together a methodical search is just not practical.

Q. It gets back to the fact that if there were to be any sort of effective search it had to be from the air?
A. Correct.

Q. And the history of this matter shows that the air search which was attempted had to be abandoned at a fairly early time because of the conditions of the weather?
A. That's correct also.

Q. Have you done a calculation as to how far you believe there would have been separating Glyn Charles' person or body, and the Sword of Orion at the end of that two hours following the man going overboard?
A. Not precisely that. I have - based on information provided to me about the position of Sword of Orion at 16.44 and the position it was reported at 18.45, if those two positions are accurate and there is always some uncertainty about positions anyway, but if those two positions are accurate, Sword of Orion had actually moved in a direction approximately 053 degrees, at 4.9 miles in that time. Now for most of that time, all but six minutes of it, Sword of Orion was drifting. She did spend about six minutes actually under way, under sail, before she was rolled at 16.50. So I can say that from the position that the man was lost overboard to where Sword of Orion was found, if the positions are accurate, was approximately five miles away to the north east. What I don't know is two hours later where the man actually was, because he also would have moved from the position where he was lost overboard. So I can't give you a complete and final answer. All I can say is it could be a number of miles away.

Q. And in directions which can't really be with any reliability determined?
A. That's correct. The consequence of that is that the Search and Rescue Centre deals with all that uncertainty by creating a large area and putting a lot of aircraft in to look.

Q. You've also come to a calculation have you not, of a percentage chance of Margaret Rintoul finding this person in the water? You've done that, haven't you, just in terms of the inefficacy of the seven yards of cover to either side of the boat which the search would involve?
A. Yes that's right.

Q. What sort of percentage did you calculate, taking into account only those factors, not the effluxion of time or the delay or anything like that, what percentage chance did you

think Margaret Rintoul would have of finding that person in the water?
A. I used two factors, one was the calculation of a sweep width of seven yards and the other one was, as we described this creeping line search, how far apart the lines would be. We wouldn't regard it as practical that the lines be fourteen yards apart, so I took a nominal track spacing of a quarter of a mile on the basis that a vessel could actually navigate to a quarter of a mile, and on that basis the probability of detecting the man in the water in one passage through the area was 1.4 per cent.

Q. And that fails to take into account where the body was, how far away it was, what direction it was, and all the difficulties involved there?
A. Yes. It also fails to take into account whether in fact the yacht could steer the sorts of courses. Whether in fact it could be managed in a sensible way in that sea state to conduct that search at all. I don't believe it could be.

Q. Adding to that, the absence of a motor?
A. Correct.

Q. Let me ask you this question, hypothetical though it is, if AUSAIR through yourself had known that Margaret Rintoul was in the vicinity of Sword of Orion at about 18.45 hours on 27 December, would AUSAIR or you have asked Margaret Rintoul to assist in the search for Mr Charles?
A. May I caveat my remarks by saying that I was not the operations manager of AUSAIR at the time and I was not the search and rescue mission co-ordinator making such a decision. If the similar situation would have come up with similar information today when I am the operations manager, I would not be asking Margaret Rintoul II to help.

CORONER: I think you said that in response to Mr Hill's examination, didn't you?

HILL: Q. Well I understand from the questions that you've just answered that there was very little hope whatsoever of the Margaret Rintoul finding Mr Charles in the positions that have been given to you under those circumstances?
A. That's correct.

Q. So the only hope, if there was a hope, would have been from an aircraft search, is that what you're saying?
A. That's what I'm saying.

Q. Now you also said that the best method of that would have been for the Margaret Rintoul to be in direct communications with Search and Rescue Centre, is that correct?
A. I think I was making that comment in a different context. As a general rule, if anyone on scene has direct communications with the Search and Rescue Centre, the prospects of success improve.

Q. So if the Margaret Rintoul had passed a radio message

from the Sword of Orion via Telstra control, and then back would that then have aided in a search by air for the deceased, Mr Charles?
A. Clearly the information that I have in my files here is at variance with other evidence that I don't hold but which is doing the rounds. If Margaret Rintoul by communicating with AUSAIR was able to clarify the position for AUSAIR, the understanding of what was going on out there, then that would have been of benefit to our search and rescue operations. Whether in the particular circumstances it would have made any difference to the search I am not able to say because as I indicated before I haven't done a detailed analysis of what aircraft were available, where they were and whether they could have actually been directed to the scene.

Q. But what you would need, the fundamentals you would need, is the communication from the person who is nearest to hand to tell you what the circumstances were?
A. Yes.

Q. So that you then would be able to co-ordinate whatever it was that was possible to co-ordinate?
A. Yes.

<WITNESS RETIRED AND EXCUSED

HILL: That finishes my witnesses for today. I think that I will communicate with Mr Kothe's legal representative to see what is happening tomorrow morning. But it is hoped Mr Kothe will be here tomorrow morning and we've reserved the whole day for him but I do have other standby witnesses.

ADJOURNED UNTIL 30 MARCH 2000

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