SENIOR CONSTABLE UPSTON

Q1 This is an electronic record of interview between Senior Constable David Upston of the New South Wales of the New South Wales Water Police and Barry Deakin. It is the 10th of the 2nd, the year 2000, on Thursday at the Launceston Novotel. The time on my watch is now 2.43pm, and also present, seated directly opposite me, is Detective Senior Constable Gray from Bega Detectives. Barry, for the purpose of the interview, could you please state your full name?

A Barry Deakin.

Q2 And your date of birth?

A 23rd of October, 1955.

Q3 Your address?

A Overtheway, Godshill, Fordingbridge, in England.

Q4 And your occupation?

A I'm a consultant engineer at the Woolson Unit at South Hampton University.

Q5 O.K. Barry, as I explained to you earlier, Detective Senior Constable Gray and I are making inquiries into the 1998 Sydney to Hobart Yacht Race, and we have been brought here as a result of the World Stability Conference and to speak to people in relation to their findings over a number of issues, and as you indicated to us earlier that being a member of the Woolson Unit you have made some, some dealings and some workings on the Fastnet Race. Is that correct?

A That's correct.

Q6 First of all, prior to moving on to those, could you give us your qualifications, please?

A I'm a, I studied at South Hampton University and did a B.S.C. in ship science, which is a naval architecture degree course, and became a member of the Royal Institution of Naval Architects at that time, and I've worked at the Woolson Unit for, oh, well, since 1978.

Q7 O.K. And the Woolson Unit produced a report on the Fastnet Race, there was a result of a number of deaths and, and vessels coming into difficulties in, in heavy weather. Could you explain a little bit about that, please?

A Well, the Woolson Unit's involvement was at the request of the Royal Yachting Association who were, who were taking part in the, in the study, and they asked us to calculate the stability of two of the yachts in the race. One of them was a yacht that had been reported to have faired very well in terms of stability and another one that capsized and stayed upside down for about 5 minutes. They were a Contessa 32 and a Nicholson half tonner, and so they arranged for us to have drawings of the two yachts and rating certificates which gave information on the displacement and centre of gravity, and so we were able to calculate the stability of the two yachts, the statical stability of the two yachts in, in the normal way you're using now, our standard computer programs which we use at the Woolson Unit, and so we, we produced stability curves

for the intact yachts and we also had a look at the effects of flooding on the yachts, because we were aware from, from what we'd been told about their investigations to date that a lot of the yachts had, had taken in quite a lot of water because the washboards aren't waterproof, washboards and hatches, so when the yachts are upside down they take on water and we thought it was important to take that into account in the stability calculations, and so these are calculations that appeared in the Fastnet Inquiry Report as an appendix and, and they've been referred to quite a lot ever since, you'll see the stability curves repeated in other people's books and references quite a lot, although the, the flooding aspect wasn't really picked up at the time, it was the intact stability that was, that was picked up and, and made much of in the press.

Q8 With the, the particular model of the vessel that you used as a model that stayed inverted for approximately 5 minutes, can you give a little bit more detail on that yacht, please?

A It was, it was a half tonne racing yacht built to exploit the I.O.R. rule which was in use at the time for rating the yachts, and the influence of the I.O.R. rule had, had meant that more and more yachts were being built with relatively wide beam to, to gain their stability from, from the width of the yacht as opposed to the ballast of the yacht, so in having the wide beam

it meant that they could carry the sail without carrying as much ballast so the, the ballast ratio was lower, and in comparison with, with some very traditional yachts where the ballast is carried at the bottom of a, of a long keel, the ballast on the, on the contemporary fin keel yachts is distributed relatively higher up because the, the whole fin is the ballast and it extends from the bottom of the canoe body down to the draft as opposed to all being in the, in the bottom of the keel. So there were two issues really, the hull shape was different and the, the ballast arrangement was different, there was less of it and it was higher up.

Q9 How does that differ in layman's terms between the I.M.S. and the I.O.R. rule, and the I.O.R. being the International Offshore Racing Council?

Q10 Yeah, the I.O.R. rule was a rule that was in use at that time and has, has been blamed quite a lot in recent years for the, the direction that yacht design went. The I.M.S. is, is a rule that's more in use now, come into favour more now, and it, it assesses the stability in a different way. I think that although the I.O.R. rule did influence yacht design, there's no doubt about that, it, it resulted in, in the types of shape that have become very popular because they're relatively fast, they've got attractive accommodation because the, the wide beam gives them attractive accommodation compared to the traditional deep narrow

yachts, so although it may have initiated the, the trends it can't be entirely blamed for the trends in yacht design. I think that marketing influences are just as effective in steering yacht design these days.

Q11 There was a number of recommendations brought out of the extensive work that was done by the Woolson Unit. Do you recall the, the basis of those recommendations?

A Well, I think there was considerable alarm when people saw these differences in the stability curves and quite a number of people who were closely involved in, in racing yacht design and the I.O.R. rule admitted that, that this was an undesirable trend and that they'd been partly at fault in, in steering the, the design in this direction and that it was not a seaworthy way to go. Although it produced successful fast yachts they weren't necessarily the sort of yachts that should be sailing in, in severe conditions, and that, you know, that, that there ought to be some attempt at, at revising the rule to try and reverse the trend.

Q12 With modern races today and current races, is it your understanding I.O.R. vessels can still enter these races?

A There are, there are now stability requirements for offshore races, depending on who is organising and regulating the race, but the offshore racing council have special regulations for offshore races which most, I think most race organisers take note of or adhere to, and the current special regulations for offshore races

do have quite explicit requirements for stability. I'm not really a yacht racing or yacht performance man so I'm not too well versed in, in the way the O.R.C. special regulations are applied in, in all cases to races, I'm not the right person to be asking about that, but I've looked at the special regulations and how they, how they address stability aspects and it's, it's been quite gratifying that in recent years they have been trying to tighten up on, on that, and I believe I'm right in saying that the latest issue of the special regulations have a requirement for the, for their highest category of offshore races, the unrestricted category where the boats are required to demonstrate that they're self righting.

Q13 In saying that, how do they go about demonstrating that? Is that either through line, line drawings or through - - -

A They can do a physical test, they can turn the boat over and take it to 180 degrees and demonstrate that by some means it can be self righted. It can be by, by moving water ballast if that's appropriate for that class of boat, or by inflating bags or by some means. I, I believe I'm right in saying that, that it can be an active system, that it should be demonstrated that it, that it will work in practice in calm water.

Q14 O.K. Now just, do you recall what the stability rating for the, for the Fastnet was, when the disaster occurred?

A There was a so called, I'm not sure what it was called now from memory, there was a, there was a stability, there was a stability factor or numeral index, and I can't remember what the name of it was, but it was basically an approximation at the, the stability at 90 degrees based on some principle dimensions of the hull, it took into account the beam of the hull and the, the depth of the canoe body and the displacement and, and it used as a basis the, I think the measured righting moment, at 1 degree, which is the, the result of the inclining experiment that they do for rating, and it, it put together those basic parameters and, and made some attempt at stability at 90 degrees. It was an approximate formula but it was some, some way of attempting to address the, the stability at 90 degrees. It wasn't a very successful attempt but it was an early attempt and, you know, they thought that they had made some attempt at addressing the problem. Of course, I mean, in hindsight it wasn't appropriate or accurate enough, but that was their, that was their intention.

Q15 O.K. Just getting back now to the, the Woolson report on the Fastnet Race, obviously there was, there was recommendations made. Do you recall, and without having the, the report with us today, do you recall, and your, especially with your work that you did on the report, any outstanding recommendations that, that, along that line?

A I don't recall exactly what the recommendations were but I, I believe that it was kept as a very simple factual technical report without going into the implications, the wider implications, they were really left for the, for the, for the inquiry team rather than us. So we conducted the calculations, presented the results and concluded, and sort of concise factual conclusions if you like, that these were the ranges of stability, that this was the effect of flooding, without going into, well, the broader implications.

Q16 Well, personally can you, from your conclusions, what, what do you believe was necessary, that perhaps should have been recommended?

A Well, we believed at that time that, that the range of stability was important. We could see that, that one of these yachts had a range of stability of, from memory, about 150 degrees, and the other yacht had a range of about 114 I think, something of that order, 117, but very different anyway, I can't remember the numbers exactly, but the, the ranges were very different and the character of the curves was very different, and the, the so called good yacht was by no means extreme in terms of its qualities. It was, there were lots of yachts around of, of traditional form which had much better stability characteristics than that, it's always heralded as, as a yacht with extremely good stability but in fact it's not, it's very average for that traditional type of yacht, but

the, the other example that we looked at was quite extreme. There weren't very many yachts around at that time that had a lower range of stability than that, it was one of the, not the most extreme yacht, there were some, but in general most boats weren't, weren't that extreme. So we felt that, that this was something that, that should certainly be taken account of and that wasn't, I don't think, the subject of our recommendations but it was implied by the recommendations and there was, there was some discussion between us and other people and we made some presentations to various groups of people on, on what the work really meant, and, you know, explained how the stability graph related to the, to the boats in practice by, you know, drawing pictures of boats on their side and upside down and, and trying to get the message over as to, to what this was all about. So we felt the message was fairly clear at that time, but it wasn't until later on when model tests were conducted that, that the message was really proven and hammered home, I think.

Q17 What was the message then that you were trying to get over?

A The message was that, that without a large range of stability it was quite possible for the boat to remain upside down after a capsize. The seas during the Fastnet Race were very severe, they had large breaking crests, and the breaking crest has got a tremendous

amount of energy in it, more than a lot of people realise even now I think, and it's sufficient energy to pick the boat up and throw it around and, and turn it over and drop it upside down, and the forces are enormous, very difficult to design anything to withstand being knocked down, and that was shown to be the case. There were a large number of yachts in the fleet, large percentage that were knocked down and turned upside down all through 360 degrees, and, and that percentage of yachts being rolled can't be coincidence, and there were all types of yachts that were rolled, but most of them of course came back up again and, and so it was our opinion that with a good range of stability that you would come back up again.

Q18 So in your, your expert opinion, what would you feel would be a good stability range for an ocean racing yacht?

A Well, we made recommendations to our regulatory authority, the Government authority, which at that time was the Department of Transport, when we developed regulations for sail training yachts, which are yachts where they're operating commercially with people paying for the privilege of going on board and expecting a high level of safety, a bit different to a racing situation, but when we did that we recommended a range of stability that was related to the length of the yacht and there's a, a simple formula which relates the, the required range to the length, which I could

give you a copy of, but basically it, it, it was 90 degrees for a 24 metre boat rising to about 150 degrees for a 7 metre boat, and those were, that was the range of sizes that we were asked to address, so it's, it's a variable thing but it was, it was made dependent on length because our feeling was that all these boats are out in the ocean in the same size waves, and so the larger the boat is the less likely it is to meet a wave big enough to capsize it, and if, if we, if we took our, as our basis the assumption that everyone who pays to go on any one of these boats deserves the same level of safety, then if they're going on a bigger boat, which is less likely to be capsized, then you needn't be so stringent on the requirements which are to re-right. So the smaller boats we, we set a higher range limit because they're much more likely to be capsized, it's going to happen much more frequently, and so it's more important that they, that they do come back. So it was a very simplistic relationship, didn't, didn't make any attempt at looking at the, the actual probabilities of occurrence, it was just a, a simple way of doing it, but it was also related to stability data that we'd gathered on a large number of yachts by this time, we had, because we operated a, a consultancy calculation service on stability, we'd gathered information on a lot of yachts of different sorts, and we could see quite a clear pattern between the, the traditional forms and the contemporary cruiser racer

types, and the traditional yacht forms generally had a very high range of stability when they were very small and it dropped off as the yachts got bigger, and this pattern of data were used as a, as a guide to, to judge the, the slope of this line with, of stability range against length.

Q19 Well, just on that though, Barry, and you may be able to correct me, but if, if a vessel of, of, vessels of various lengths entering into a, into a race, all travel through the same area of water, surely they experience the same forces, whether they are either a large or a small yacht. Now you were saying that the smaller the yacht the higher the stability rating should be to travel in that area of water, but would not the same forces be affected equally to the larger yacht if they were given a lesser degree of stability? Would they not then, hitting the same forces, being that the forces in fact, as you said earlier, from a breaking wave, are extremely powerful, have an affect on even, say a 70 foot boat compared to a 35 foot boat?

A Well, our feeling was that the energy that is required to, to capsize the boat is related to the size of the boat, so a certain amount of energy is required to pick up this, this object that's floating on the sea and physically throw it sideways, and as it's driven sideways across the sea something about the boat will, will cause some drag which will convert that motion into rotation, so initially the keel being dragged

through the water causes the boat to be tipped on its side, and then if the deckage becomes submerged that causes a lot of drag which, which causes the boat to rotate further and so on, and then if the mast goes in that causes the boat to rotate, so a certain amount of energy is required to pick the boat up and move it sideways, drive it across the sea, and the bigger the boat is the more energy's required, and since all the boats are operating in the same sea state, there will be a lot more waves with sufficient energy to, to push the small boats around than the big ones, so it was a simplistic argument but we felt that it, it sort of levelled up the, the odds, depending on whether you're going on a, a 7 metre boat or a 24 metre boat.

Q20 Are you aware of the Sydney to Hobart situation where, that a series of different sized boats entered the race, however the conditions were that, that it didn't matter that much the size of the boat, they all suffered the same consequences - - -

A I - - -

Q20 - - - even though they had a varying stability range?

A Well, I've had a quick read of the report on the race but I can't say that I've studied it carefully and I'm not familiar with it, so I'll take your word for that, that that's - - -

Q21 Yeah, O.K. Well - - -

A - - - that's what happened and your interpretation of it.

Q22 Yeah, no, no, I was just wondering could you comment on that, if that, if that is the case?

A I understand that, that the worst of the weather was very localised and didn't necessarily effect the whole fleet, from what I've been told, but no, I mean, I'd need to have another look at the - - -

Q23 O.K.

A - - - at the data really, to comment, I think.

Q24 Stuart?

DETECTIVE SENIOR CONSTABLE GRAY

Q25 Just on what Dave said then, Barry, if I was just to tell you that a 65 foot boat with quite a high stability, which was in the same sea state as a boat which was 40, 40 foot, which had a very low stability, both suffered the same sort of problems - - -

A Mmm.

Q25 - - - would that have any - - -

A They were both capsized?

Q26 Both, both inverted, 360 degrees.

A Right. Well - - -

Q27 So far as your theory's concerned - - -

A Yeah, that, no, that's, I can well believe it because whilst I say that, that there will be more waves around able to capsize the smaller boats - - -

Q28 Yeah.

A - - - there will be, in a very severe sea state, there will be waves around sufficient to capsize quite big boats. There is quite a lot of discussion amongst

people addressing this subject on how much energy's required to capsize the boat and relating it to the stability curve, and I don't know whether you're aware but the area under a stability curve as it's normally presented is, is a measure of the energy required to rotate a boat. I don't think that's a valid way of assessing the situation because it's not the way that yachts are generally capsized in breaking waves, they're picked up and thrown bodily by a huge amount of moving water which is actually travelling along the surface of the sea, the breaking crest is moving at, at the speed of the, of the wave travelling through the sea, and if you, if you look at the, the speed of movement and the volume of water that can be in, in a breaking crest and maybe a volume of water perhaps a couple of metres high, travelling across the surface of the sea, and if it's the length of the yacht, the energy involved in that, in that body of water moving at that speed is, is one or two orders of magnitude that's 10 or 100 times higher than the energy required to actually rotate the boat in calm water on the basis of the stability information. So there will be waves out there with more than enough energy to pick up and throw boats around, and whether they capsize is mainly dependent on whether that breaking crest of water hits the boat in the right place at the right time, or you could say the wrong time, but the boat has to present itself in, in just the right manner for the capsize to

occur, so it has to hit the boat on the beam or turn it onto the beam. Generally if, if the breaking water hits the boat on the bow it will pass by the boat, if it hits it on the stern quarter it may rotate the boat to beam on situation and it, and that may not make any difference, but somewhere near beam on, and it has to be at the time of breaking when there is this huge volume of water moving across the surface. Once the wave is broken and the energy is starting to dissipate and the breaking crest has, has reduced and dissipated into the wave again, then, then there isn't enough energy probably to, to do any damage, and if the, if the wave breaks just after it meets the boat then there's no hazard, there's no hazard at all from non breaking waves, they don't capsize boats, and when we've done model experiments in the tank we've had to, to make comparisons between models we've had to be very precise about the position of the model on the breaking wave and at the time of the, of the breaking wave encounter. It's no good if you, if you just float the model and send a weight down the tank because the, the drift of the model around the tank will mean that it's never in quite the same place or the same angle each time, so we actually catapult the models into the wave using a mechanism which, which orientates the model and, and sends it forward at a, at a slow speed, and it's, it's triggered by the wave maker so that we can

control very carefully the exact orientation and timing of the event. So you can be lucky - - -

Q29 Mmm.

A - - - you can miss all those breakers that you can see all around you and you don't get one in quite the right spot, but, but you will encounter a lot of waves and, and you need to be very lucky not to encounter a breaking wave at some stage in a, in a very severe sea state.

Q30 O.K. Now when the Woolson unit became involved in this inquiry, is it the case that the Woolson Unit weren't necessarily concerned about capsize, or were they more concerned about inversion times relative to stability?

A Well, we were told that, that, that this boat had remained upside down for some time, and so we were conscious that that was the reason why we were assessing the stability, and at that time we weren't conducting model tests, it was for the, for the purpose of the inquiry it was purely doing the, the calculations to look at the range.

Q31 Right.

A That's all we were asked to do, range .....

Q32 So how did you calculate the, the inversion time and stability with one boat?

A We didn't, we didn't calculate the inversion time.

Q33 Right.

A Inversion time was what was reported.

Q34 Right.

A We just calculated the stability. It's a standard naval architectural process - - -

Q35 Right.

A - - - to calculate the stability and that's what we did.

Q36 O.K.

A So we, we didn't directly relate that to inversion time. There have been other, other researchers who have tried to relate that to inversion time. We, at a later date in the towing tank, we looked at a range of models and noted that some of them stayed upside down, some of them self righted very quickly, and that supported the, the other information that was around at the time.

Q37 Mmm.

A But, no, we didn't make any attempt at relating inversion time to the stability range, it wasn't, wasn't the subject of the exercise.

Q38 O.K. So after the initial calculations you then started using models to work out stability and inversion times. Is that right?

A That was at a later date - - -

Q39 Later date.

A - - - as a, as a result of another contract - - -

Q40 Right.

A - - - that we got. Yes, it wasn't part of the race inquiry. It was as a result of the race disaster that, that we, we put a proposal forward to do that research

and we got some money from one of the, one of the Government funded bodies which provided grants for research work, so we put a proposal forward for the work and the money was, was granted and then we, then we did those capsizing tests in the towing tank.

Q41 Right. So you were more interested in capsize as opposed to having the boat inverted and then testing its length of time inverted against a - - -

A Yes.

Q41 - - - wave height?

A That's correct. Yeah, we didn't ever put a model in the tank upside down - - -

Q42 Right.

A - - - and, and send waves down, we always put a model in the tank the right way up and looked at the, the vulnerability, vulnerability to capsize and whether it remained upside down after the passage of the transient waves - - -

Q43 Yeah.

A - - - we just had a few waves that went down and then it was calm water again. It either went through 180 degrees or 360 degrees or, or just got knocked down to some angle and, and came straight back up without capsizing, so those were the, the three possibilities really.

Q44 Now you mentioned flooding never took off during your studies.

A Well, it wasn't really picked up on by the, by the media or the, or the people that made much of the, of the dramatic difference between the two G.Z. curves, that was made much of - - -

Q45 Mmm.

A - - - but the flooding, it, it didn't, didn't seem to attract much attention.

Q46 Has there been much attention drawn to that in recent years .....

A There was a paper presented at this conference by Mr Nimoto who, who, his organisation put a full scale yacht in a tank and allowed it to flood and, and right itself, which, and they did calculations to, to back that up, but they're, they're the same calculations that were done at the time of the Fastnet Race inquiry, they're in the Fastnet Race report - - -

Q47 Mmm.

A - - - they're the same calculations, so that, all that was, although it's nothing new it was demonstrated with a full scale yacht so perhaps that will help to hammer the message home there.

Q48 Now so far as tank testing, what are your views in relation to the accuracy of tank testing with models?

A Well, it's the heart of our business, we've got every faith in it.

Q49 Yeah.

A The models have to be reasonably accurate and ballasted to the appropriate conditions so that, that needs to be

done with an understanding of, of, of the accuracy levels you're trying to achieve and the limitations of the testing. If you understand those basic principles then physical model testing is very, very good. It leaves, it leaves very little to chance because if you try to generate a numerical model of the problem then the numerical model is only as good as, as your understanding of the problem and we frequently conduct unusual model tests or tests on unusual boats where we're surprised by the results, and when you see the results, look at the behaviour, you can explain it, but if you try to, to come up with some theoretical model or numerical model then it would rely on you understanding every aspect of the problem when you start, so our, our faith is firmly in physical model testing.

Q50 And can you tell me, are there any governmental regulations so far as ocean racing is concerned in the U.K. so far as safety equipment, or is it all managed by the International Offshore Racing Council?

A It's, it's managed by the, by the yachting authorities rather than the Government authorities. The only Government regulations which apply in terms of stability are the, the Code of Practice for Small Commercial Sailing Vessels, so they apply to sailing school yachts, sail training yachts and charter yachts, anything that's operating in any way commercially, so if somebody charters a yacht to go in a race then that

yacht would have to comply with the M.C.A. Code of Practice.

Q51 Is it the case then if, if someone wants to charter a yacht to go into the, the Fastnet and there was a minimum stability set for the category of the race, would it be the case that the stability would have to be, would have to be higher in the yacht that I hired, as opposed to the minimum stability required for the yacht race?

A (NO AUDIBLE REPLY)

Q52 Do you know what I'm saying?

A You mean are the M.C.A. Code requirements higher than the - - -

Q53 Yes.

A - - - the O.R.C. requirement?

Q54 Yes.

A I think, I think that might depend on the size of the yacht, because the M.C.A. requirements are dependent on size because they're based on our original recommendations - - -

Q55 Mmm.

A - - - but I don't think the O.R.C. requirements have size as a basis. I could be wrong with details of that, but that's my belief.

Q56 I could tell you what the, the examples are with the different categories for yacht racing. You said before that you weren't a sailor. I can tell you that there's a number of categories so far as ocean racing is

concerned, there's a zero category and it goes down - - -

A Yes.

Q56 - - - to one, two, three - - -

A Yes.

Q56 - - - you may be familiar with that.

A Yeah.

Q57 Now I can tell you that the stability requirements for category zero, which is, is 120 degrees - - -

A Yes.

Q57 - - - and then it goes down at five to one, you know, like, category one - - -

A Yeah.

Q57 - - - is 115 ......

A Yeah, I understand, Sir, yeah.

Q58 Do you think, from, from your position do you think that it's, if the Government see fit to place regulations on commercial vehicle, vessels, and that includes hire yachts - - -

A Yes.

Q58 - - - and they require a higher, say stability rating - - -

A Yes.

Q58 - - - is there any need to regulate that across the board for yachting?

A For recreational boats, you mean?

Q59 Yeah, recreational ..... racing yachts.

A Should they be applying the regulation to recreational boats?

Q60 Yes, for racing yachts as opposed to the I.O.R. rule which is set by them for a number of various reasons, internal, external reasons or whatever, design reasons.

A I think that in general people should have freedom to, to put to sea in their boats - - -

Q61 Yes.

A - - - but I think that rather than this being a regulatory problem I think it's an education problem. I think that people are, are misled as to the abilities of their boats and they're putting to sea in every faith that their boat can do the job because, probably because the boat is being sold as an ocean cruising yacht - - -

Q62 Mmm.

A - - - and because someone has, has crossed the Atlantic in it or whatever, or in a similar boat, but I think that there's a big misconception in the public about how safe yachts are and, you know, there, there are a lot of yachts on sale that are lovely, spacious, fast, enjoyable cruising yachts which, which are excellent in some waters but shouldn't be regarded as, as a safe place to be in in a storm in the ocean.

Q63 Yes.

A So, I, I'm not really in favour of regulations for recreational boats, I think that it's more a job for the, for the people that manage the sport in the

country to educate the people who, who do that, but that's a personal opinion really.

Q64 Yeah, that's what I was asking. O.K. Dave?

SENIOR CONSTABLE UPSTON

Q65 Just, Barry, just keeping, going back to one thing - - -

A Mmm.

Q65 - - - in regards to the stabilities of, of different sizes of boats, and from what we've learnt today and what we've learnt over the last couple of weeks and, and in hindsight from previous studies, is it the case that, especially in vessels that go in ocean races or that, that sail in, in heavy seas, that the stability rating of those vessels, the vessel is safer with a high stability rate?

A The vessel is, is more likely to come back from a capsize if it's got a bigger range of stability, that's my understand of, of the physics, yes, so - - -

Q66 But we do understand that all vessels, regardless of their stability rate, hit by a particular breaking wave - - -

A Big enough one.

Q66 - - - will capsize.

A A big enough one will capsize.

Q67 There's not a problem with that.

A A container ship if it was hit by a big enough breaking wave would capsize.

Q68 Right.

A Yes. It would need to be a much bigger one of course.

Q69 So the higher the stability rate the quicker that vessel will self right?

A The more likely it is to self right, yeah, the less energy it needs - - -

Q70 And ..... and perhaps less endanger the crew.

A Yes. There are other factors and there have been, there was a paper presented at this conference where some tests were done which indicated that perhaps the addition of a coach roof, which does increase the range of stability, was detrimental to, to righting. Unfortunately the researchers that did that work didn't, didn't find the reason why and it was a very, it's a very early stage of that work so I don't know how much faith we can put in that result, and then there have been cases of racing yachts that have capsized and stayed upside down when they've had apparently quite good ranges of stability, over 120 degrees, but they're very, very stable upside down, they've got a very high G.M. which means they're very stiff, it takes a lot of force to rotate the boat again, and if the mast is intact then there's a tremendous resistance to rotating the boat with a big mast on a racing yacht, lot of resistance to rotating that up through the surface of the water. So range of stability is important, it's something we can measure easily, it's something we can regulate easily, it is fundamental to the problem. It may not be everything

but two boats with the same range of stability may have different behaviour when they're upside down, but it's, I'm a firm believer in keeping regulations simple and it is a very simple thing to regulate, and I think that the things that, that make a difference are things like the shape of the deckages and probably coach roofs, from what we've seen here this week, things like that are much more difficult to measure and quantify and regulate, but range of stability is a simple thing to measure, simple thing to calculate these days - - -

Q71 Mmm.

A - - - and I see no reason why it shouldn't form a basis of regulations. Now I'm not, there are opposing view I must say, I'm not, I don't speak for the whole, whole of the world who's discussed this subject, there is - - -

Q72 It's a personal view.

A It's a personal view but it's a, it's a very common one. There are people who disagree with it, but it is a very common view amongst the researchers. Yeah. (Tape Beeping)

Q73 Just one, just one more thing.

DETECTIVE SENIOR CONSTABLE GRAY

I've got to ask something too .....

SENIOR CONSTABLE UPSTON

Q74 In regards to the measuring of a vessel, do you believe that the deck and coach roof should be taken into account when a vessel is measured under certain circumstances?

A I think if you're looking for the right answer for the range of stability, then it's essential that you do because the coach roof and, and cockpit combings and deck camber do make a big difference to that, but if you are looking at a regulatory situation you could allow for that because you could allow a margin of safety on your minimum requirement, and then say, Well, O.K. you could do it without adding those components in but you have to meet some, some higher standard, or the standard could be set at a higher level for everything - - -

Q75 Mmm.

A - - - and then you wouldn't bother ever to measure those things, but it's not difficult to do that but it's, it's not straightforward for the, for the I.M.S. rating system as it's set up at the moment to do that, so they measure the hulls only and then they do their only stability calculations rather than rely on the designers - - -

Q76 Mmm.

A - - - values so they can confirm the stability of the hull, and they do that for, for performance purposes as well of course, they - - -

Q77 Mmm.

A - - - it's not purely done from the safety point of view, they're - - -

Q78 Mmm.

A - - - measuring the hull for performance and the safety aspect is a by product - - -

Q79 Mmm.

A - - - but it means they don't have to rely on the designer's calculations.

Q80 O.K. Evidence seems to suggest that the higher, the greater the stability and in fact the previous person we interviewed indicated that, you know, from his experience and his studies that, you know, he wouldn't take to sea in anything less than 150 degrees.

A Right.

Q81 O.K?

A Yeah.

Q82 Obviously the higher the stability there's going to be some reduction in performance so far as speed, to a certain degree. Would you agree with that, or - - -

A I don't know that that is necessarily the case. No, I think - - -

Q83 A lot of people do abdicate that though.

A - - - that, that the modern trend is for light, light wide hulls and they are fast because they plane well. The traditional way of achieving stability with narrow deep hulls and long keels was a slow solution, yeah, so to force people to go back to traditional shapes would mean that the boats would be slower in general, yeah. But there are other ways of gaining the range, you can fit more ballast low down.

Q84 Yeah. So what I'm saying here though is, is it the, the regulations as they stand set at the minimum requirements for a category O, for example, is 120 - - -

A Yes.

Q84 - - - degrees, so if we know, if we know that 150 is, and higher is the most safest way to go - - -

A Yes.

Q84 - - - and certain bodies aren't prepared to change the minimum requirements - - -

A Yes.

Q84 - - - is that a situation where it needs to be regulated internationally or governmentally?

A It depends on what you regard as an acceptable level of risk, I think. Do you want to make the boats absolutely fail safe like a, like a self righting lifeboat, or are you prepared to accept some level of risk.

Q85 We'll just stop for a second. The, the time on my watch is now 3.25pm. This interview is suspended for a tape change.

INTERVIEW SUSPENDED

INTERVIEW RESUMED

SENIOR CONSTABLE UPSTON

Q86 The time on my watch is now 11 minutes past 4.00. This interview between Upston and Deakin is resumed. Barry, do you agree that we, we stopped the interview to change tapes and we've had a further discussion on

different issues as a result of conversations earlier had, and we now want to discuss, or do you agree on - - -

A Yes, that's - - -

Q86 - - - on that happening?

A - - - that's correct, that's fine, yeah.

Q87 And we, we've discussed in the break a number of issues relating to British and, and U.K. requirements that are, that are in place now - - -

A Yes.

Q87 - - - legal requirements and also stability ratings that are regulated. Could you expand on that, please?

A We assisted the U.K. Regulatory Authority, which was then called the Department of Transport, in developing their, their requirements for sail training yachts, and they've since been adopted in Codes of Practice for all small commercial sailing vessels, and at the time we recommended a minimum range of stability related to the length of the yacht and the, that was one of the, one of a number of recommendations. When the recommendations were put to a working group comprising the Authority and ourselves and representatives of the industry, they were reluctant to accept the recommendations as they stood because a lot of the types of yachts that were being used at that time for charter and sailing school purposes would not have been able to continue to operate, they were outside the regulations as proposed, and so pressure was brought to

bear on the Government Authority to, to relax the requirements for certain categories of operation and two, two additional categories of boat were, were decided on where if they operated within I think 60 miles of a safe haven they relaxed the stability requirements and required a lesser range of stability, and then there was a further category which I think is within 20 miles of a safe haven and the, the requirements were relaxed again, so for someone operating far offshore in the unrestricted category then they had to comply with our original recommendations and closer inshore they were relaxed, which we were reluctant to see because we felt that even close to a safe haven there was still potential for encountering big enough breaking waves to capsize some of the small yachts, but the argument was that they were within, within reach of a safe haven in the time of a forecast and within reach of rescue services, and so that the, the level of hazard was much reduced, and the, the Government Authority were willing to accept those arguments and so the relaxed standards became, became part of the new Codes.

Q88 So just to rehash on what you've just said there in, in my understanding is that through your expertise and through scientific studies you came up with a formula to regulate size of vessel to a stability rating - - -

A That's right.

Q88 - - - which was across the board no matter where you operated in, whether it was close to the shore or off, off - - -

A Yes.

Q88 - - - offshore, and this - - -

A Yes, we hadn't considered that as a, as a, as a way of doing it, we just thought that we would make it the same wherever they were operating.

Q89 And, and this was as a result of making a regulatory situation - - -

A Yes.

Q89 - - - for commercial vessels?

A Yeah, vessels, vessels carrying people that were paying to go to sea for, for pleasure or training or - - -

Q90 And then industry came along and lobbied Government, who disagreed with your findings and the - - -

A To some extent, yes, yes, felt they were too stringent.

Q90 - - - and then the Government reduced the stability ratings as a result of that lobbying?

A For some categories operating closer to the, to the, to the shore or to a, to a safe have, so they could seek shelter if they had a bad forecast, yeah.

Q91 Right. And can we now just briefly discuss how you came about and the, the results of your studies for, and we mentioned off tape, the length of the vessel compared to its stability rating. Can you just give us a brief outline on that?

A We gathered information on a large number of yachts for which there was reliable stability data and we plotted their range of stability against their length and got a, a scatter diagram if you like, and we knew which, which, which yachts were which on this picture obviously, and we were able to, to see which yachts were traditional cruising yachts, and they, they lay generally in a, in a, within an envelope of data, and the contemporary yachts which had derived from racing designs influenced by the I.O.R. and, and market forces, as I said earlier, so the cruiser racers, if you like, not contemporary cruiser racers, fell generally below that envelope in another region of the graph, and we proposed a line on the graph as a minimum range of stability, which was aligned with the envelope data for the traditional yachts, so they formed a diagonal envelope and we drew a line underneath that envelope and the line extended from, I think I'm right in saying about 150 degrees, that's 7 metres, which was the minimum range, minimum length of boat that we were asked to consider, and it, it dropped to 90 degree range of stability for a 24 metre vessel, which was the, 24 metres is a natural break in the regulations because boats of more than 24 metres come under different types of regulations in the U.K, and we felt that, that that, whilst that line was a very simplified relationship we felt that it, it did, in some way levelled up the, the probability for safety for people

operating the large sailing ships and the small yachts. If the two vessels were at sea in the same ocean, severe ocean conditions, then the small yacht would be very likely to suffer some capsize or knock down, and it would therefore, it would be more likely to be knocked down, it would need to be, it would need a higher probability of righting itself to give the same level of safety, which was our, our philosophy behind that, that line, and that's, that differs from the recommendations put forward by other people where they've recommended a single value for the range of stability for all sizes. By doing that you ensure that all boats have the same likelihood of returning from a capsize but not all sizes of boat are as likely to be capsized in the first place because the bigger the boat is, the few waves are in the ocean big enough to capsize it, so that was the philosophy behind the recommendation, and it was, it was aimed at trying to give a, a roughly even level of safety for all types of boats.

Q92 Was that study, did that study also take into an account any studies of wave motion in, in, on oceans and frequency of waves?

A We didn't, we didn't address the probability of capsize in that study. A paper was presented this week which, which related wave spectre and probability theory to this problem and I think it was only a matter of time before somebody did that because this, this straight

line recommendation that we'd made was a very simplistic way of doing that, simply by aligning it to the, to the data that we had and using that as a guide, so some work has now been done and a paper was presented and I think that, that that might provide a better way of coming up with some regulatory relationship between range and size if people feel that that's the right thing to do.

Q93 Do you feel that if that study and that paper has been presented in this forum, will you take that back and perhaps if it has merit and credit, that you will then readjust your thinking to how you come up with your stability diagonal line?

A Well, our work is all commercial consultancy and so unless somebody pays us to do further studies we won't be doing further studies, but obviously I have an interest in the subject so I'll be reading the paper quite closely from my own point of view, but, but whenever we are asked to recommend some standards for Government use like this, we always try and keep things as simple as possible and I think that there's a great danger in making things over-complicated and, and without more casualty data on our chart we have no reason at the moment to change the recommendation. It may be that some Sydney/Hobart casualties or some future casualties will force us to move the line upwards and I, we would never move the line downwards but it may be that the line needs to be adjusted

upwards as more casualties occur and, and it's proven that, you know, that this perhaps isn't a sufficient level of safety.

Q94 Stuart?

DETECTIVE SENIOR CONSTABLE GRAY

Q95 Do you have difficulty, if I can just refer to your chart here, just as a, as an interest, you say that, for example, the commercial stability requirements for say a 7 metre boat was 150 degrees - - -

A Yes.

Q95 - - - and that could be a yacht or a power craft?

A Only a yacht.

Q96 Only a yacht, O.K. Do you have difficulties coming to grips with the fact that the Government has regulated that a 7 metre yacht has to be, has to have a stability ..... of 150 degrees, but yet the same size vessel is able to enter blue ribbon ocean races, the same size yacht is able to enter blue ribbon offshore races, with a stability at 120?

A Yes, I do have difficulty with that, yes - - -

Q97 Why?

A - - - yes, because I don't think it's a sufficient level of safety for that size of yacht.

Q98 Right.

SENIOR CONSTABLE UPSTON

Q99 Anything else you want to say?

A Well, I, I'd like to add that I've been working on this subject for a long time now - - -

Q100 Mmm.

A - - - about 20 years, and I've always thought that, I've always been surprised at how little notice has been taken of the research. The research has been done a long time ago, people have repeated the research, people seem to have, it's, it's a fact of life that people always need to prove things for themselves I suppose, but the research has been done by more than one organisation and, and still very little account seems to be taken of it in some circles, and there are certain, certain members of the industry who are striving very hard to raise public awareness and there are people who, who are obviously driven by market forces and, and are being driven in the opposite direction by those market forces, so I think it's disappointing that the public are being misled still about the level of safety of the boats that they're buying.

Q101 Can I just ask you, if you're Government set those regulations, through your experience and, and the tests that you conducted and the calculations you did, can you tell me how is it that an organisation, an ocean racing organisation aren't required to have that same stability index for example .....

A Well, they're not legally required to comply with those Government regulations. Why they - - -

Q102 Why would they not?

A - - - why they choose to use a different standard is, is up to them I suppose, but they obviously regard that as sufficient, or they're being driven by similar market forces perhaps, but, but whatever, I mean, they must, I presume that they must, they must believe that they're operating ..... sufficient level of safety until it goes wrong and they're proved wrong.

Q103 O.K. In, in the knowledge that we have as a result of the Sydney to Hobart Yacht Race, would it change your thinking if I was to tell you that a number of yachts, and we'll put them in the casualty, in the casualty sector of what you were talking about earlier - - -

A Mmm.

Q103 - - - that they were a large vessel that suffered casualties with a high stability index?

A Well - - -

Q104 Higher than was required - - -

A Yes.

Q104 - - - to enter the race anyway.

A Well, that would, that would prove that, that large yachts can be capsized by the conditions that prevailed at the time, that there was sufficient energy in the waves around to capsize those yachts, and it, and it also proves the fact that a yacht can remain upside down when it's got a substantial range of stability. I don't know what the, what the range was that you're talking about but it is, there have been several cases of yachts that have remained upside down with, with

what some people would consider a substantial range, so it proves it can happen and whether or not you accept it depends, as I said before, on whether you accept that level of risk. You know, maybe, maybe these boats are the only ones that have ever encountered that kind of incident and maybe that's an acceptable level of risk, but if it, if it happens or has happened and not been reported more often, then, you know, you have to decide what level of risk you'll, you'll, you'll adopt for a particular race or national regulation or whatever it might be.

Q105 Do you think studies should be undertaken to look into wave heights, with breaking waves especially, to look more closely at that so that proper studies can be carried out as a result of the stability or the ..... or stability indexes of vessels of all sizes?

A No, I, I think we know enough, enough research has been done for us to understand the capsize mechanisms, we understand why yachts capsize. More work will be done, it's clear from this conference that more work will be done on what makes yachts right themselves after a capsize or what prevents yachts from righting themselves easily after a capsize, and there may be, there may be some merit in that for designing in systems to help yachts right, but if a yacht has a large range of stability it doesn't need any other system, it will right itself, and I think that we know what range of stability is required and, and several

researchers have said independently that if a yacht has a range of stability of around about 150 degrees it, it stands very little chance of staying upside down, it will right itself quite readily. It might be possible to design a yacht that won't but in general, the shape of yachts as they are now, if they've got that range of stability they, they do come back and they will come back, tests have shown, independent tests have show that. So I don't think we need to do any more research to understand the problem, we need to decide on what's the acceptable level of risk, and that's, that's what will govern where you place your, your minimum requirements for any, for any case.

Q106 O.K. Look, I've got no further questions, Barry. Stuart?

DETECTIVE SENIOR CONSTABLE GRAY

No.

SENIOR CONSTABLE UPSTON

Q107 O.K. Is there anything else you'd like to add at this stage?

A No, I can't think of anything at this stage. I'll provide you with some papers and articles I've written which will give you more background.

Q108 All right, thank you for those. All right. The time on my watch is now 4.28pm. This interview is now concluded.

INTERVIEW CONCLUDED