

3RD SUPPLEMENTAL EXPERT REPORT

PREPARED BY

DR. NEVILLE ANTHONY ARMSTRONG

Expert Witness appointed by the Commission of Inquiry
into the Collision of Vessels
near Lamma Island on 1 October 2012

3 March 2013

Dr. Neville Anthony Armstrong

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Introduction

1. I make this supplemental report in response to the observations made in the 4th Supplemental Witness Statement of Wong Wing Chuen (“**Mr WC Wong**”)¹.

Watertight bulkhead at Frame ½

2. In Paragraphs 4 and 5 of Mr WC Wong’s 4th Supplemental Witness Statement (“**4th Supplemental Statement**”), I believe that he has misunderstood the line of questioning when referring to the transcript of Day 28, page 97. According to my recollection, supported by the transcript at page 96 lines 10-15, Mr Mok SC (Counsel for Mardep) was asking about my 2nd Supplemental Report dated 25 January 2013 (“**My 2nd Supplemental Report**”), specifically the Table at the lower part of page 6 thereof². This was a Table of the results of various calculations that I did to determine where the final waterline would be if the Tank Room was flooded in a hypothetical accident, for *Lamma IV* with a lightship weight as it was in 1996, 1998 and 2005, and also if it had a watertight door or not. There is no reference to 0.1L anywhere in this part of my 2nd Supplemental Report, because it was a straightforward calculation of flooding a space which was longer than 0.1L. It was not intended to represent any regulatory requirement, just to illustrate the practical and vital importance of the watertight door if *Lamma IV* had been in an accident in which the Tank Room alone was flooded.
3. The same calculation was repeated for both the Tank Room and Engine Room flooded, with the results shown at the bottom of page 7 of my 2nd Supplemental Report³, under the same conditions. Again this was not presented in a way that demonstrated anything to do with 0.1L nor implying any interpretations of the regulations; it was merely a set of calculations intended to illustrate the capability of the vessel to survive or not with or without a watertight door at various times during the life of *Lamma IV*. In fact the final line on page 7 of my 2nd Supplemental Report reflects

¹ Marine Bundle 13, Item 81a, pp.4927-4931

² Expert Bundle II, Item 10, p.928

³ Expert Bundle II, Item 10, p.929

closely the situation in which *Lamma IV* sank, and the previous line indicates that the vessel would not have sunk immediately if a watertight door had been fitted. These are not regulatory issues.

4. Paragraph 4 of Mr WC Wong's 4th Supplemental Statement comments "that Mardep does not agree with Dr. Armstrong's interpretation". I would respond that I merely did an illustrative calculation, and there was no interpretation. I have checked the calculation and it is correct, so I do not understand what Mardep could disagree with, other than perhaps disliking the result of the calculation.

Aft peak bulkhead

5. Mr WC Wong comments, in paragraph 6 of his 4th Supplemental Statement, on my observations that the aft peak bulkhead was normally located at the after end of the vessel and in my experience at about 10% or slightly less from the after end. I would like to further clarify my observations. Firstly, it should have been taken in the context that we were discussing only passenger ships (Class 1) as is implied by many if not all of the other regulations and calculations involved in this case. Secondly, when quoting "10% of the length", I should perhaps have made it clear what the term "length" referred to.
6. Most persons skilled in the art of naval architecture and specifically in the regulatory aspects would know that length is usually the distance from the forward perpendicular to the aft perpendicular on a theoretical waterline representing 85% of the Depth to the main deck of the vessel. The forward perpendicular is at the intersection of this theoretical waterline and the stem of the vessel, and the after perpendicular is at the centreline of the rudder stock. Alternatively, if 96% of the distance between the forward perpendicular and the extreme after end of the vessel on the same theoretical waterline is greater than the distance to the rudder stock, then this alternate distance. This is the definition used in SOLAS⁴ for the purposes of stability and watertight sub-division. The definition of "length" in Part 1, Section 2 of the Merchant Shipping (Local Vessels) (Safety and Survey) Regulation, Cap.548G⁵ is essentially the same. Therefore my distance of 10%L for the aft peak

⁴ SOLAS Chapter II-1 Construction Part A General; referring to The Protocol of 1988 relating to the International Convention on Load Lines, 1966 Annex 1 to Annex B, Regulation 3 [See extracts of Resolutions MSC.194(80) and MSC.143(77) of the International Maritime Organization, at Appendix IV to this Report]

⁵ Legislation Bundle, Item 15

bulkhead was not intended to represent 10% of the overall length of the vessel or some other length. With reference to the approximate location of the aft peak bulkhead in my experience, it was a distance intended to be measured forward of the centre of the rudder stock.

Aft peak bulkhead on catamarans and multi-hull craft

7. Another clarification of my observation of the aft peak being at approximately 10%L in my experience, concerns multihull craft particularly catamarans. Catamarans generally have excellent stability characteristics and have demonstrated an ability to survive severe damage from collisions and grounding. For example the catamaran *St Malo* in 1997 opened up the entire length of one hull after striking rocks at 35 knots off the Channel Islands and yet remained afloat on the remaining undamaged hull and was eventually towed to harbour and repaired. (The survivability of catamarans when open to the sea was also demonstrated by *Sea Smooth* to some extent). On catamarans, there are two aft peak spaces, each one being of considerably smaller size than the equivalent monohull craft. Because of the considerably smaller volume of the aft peak space on catamarans, I have observed that the aft peak bulkhead is often considerably further forward than on the equivalent monohull. In an accident, for example when the rudders go aground, it is most unlikely that both aft peak spaces will be flooded. *Lamma IV* of course was not a catamaran, and my observations about 10%L were not meant to include catamarans, just as they did not include sailing craft or other non-standard vessels that are fundamentally different to *Lamma IV*.

Examples of the location of the aft peak bulkhead

8. Mr WC Wong in documentation WWC-25⁶ to his 4th Supplemental Statement, provides fifteen examples of designs which purport to show the location of the aft peak bulkhead at distances in excess of 10%L, and I would like to comment on these numerous examples.
9. According to the Code of Practice – Safety Standards for Classes I, II and III vessels, dated 2006, Chapter IIIA Part 2, paragraph 2.1(d)⁷, the aft peak bulkhead is not

⁶ Marine Bundle 13, Item 81b, pp.4932-4958

⁷ Marine Bundle 11, Item 29, p.3461

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required when the vessel length is less than 24 metres or where the engine room is fitted at the after end of the vessel, nor for double-ended ferries (paragraph 2.2)⁸.

10. None of the examples put forward by Mr WC Wong are required to have an aft peak bulkhead under the current 2006 Code of Practice, for the reasons as illustrated in the following Table in which the discriminating factors are shaded in grey. The exception is Number 12 *Sakorn Wisai*, which has a distance from the centre of the rudder stock to the aft peak bulkhead of about 7.8 metres, which on a stated length between perpendiculars of 82 metres gives a distance of 9½%L, which is within my arbitrary 10%L figure.

MB13	Title	Class	Hull type	Size	Other
4932	Austral 34 Dinner cruise	Passenger	Catamaran	31.9m	Smooth water only
4934	Auto Express 65	Passenger	Catamaran	61.1 m	
4936	Damen shoalbuster 1907	Workboat	Monohull	< 20m	
4938	Damen shoalbuster 3209	Workboat	Monohull	c. 30m	
4940	Jaeggevarre	Passenger	Monohull	80 m	Double-ended
4941	Seawind	Passenger	Catamaran	47.2 m	
4942	Betty H	Workboat	Monohull	<24 m	
4943	Southcat WFSV	Workboat	Catamaran	18.2 m	Eng Room aft
4945	5 de Novembre	Passenger	Monohull	42.0m	Double-ended
4947	Bremen 1	Workboat	Monohull	< 24m	Eng Room aft
4949	Runo	Passenger	Catamaran	< 24m	Eng Room aft
4951	Sakorn Wisai	Passenger	Monohull	82m	*
4953	LSM Servewell	Passenger	Monohull	19.0m	Eng Room aft
4955	Roaz Corvineiro	Passenger	Catamaran	38.65m	Eng Room aft
4957	Al Khattab	Workboat	Monohull	28.27m	

* Note: The distance of the bulkhead on this vessel is less than 10%L from the rudder stock axis

11. Mr WC Wong's comments on which instructions were being applied at the time of construction of *Lamma IV* are noted.

⁸ Marine Bundle 11, Item 29, p.3461

Expert's Declaration

I, DR NEVILLE ANTHONY ARMSTRONG, DECLARE THAT:

1. I declare and confirm that I have read the Code of Conduct for Expert Witnesses as set out in Appendix D to the Rules of High Court, Cap. 4A and agree to be bound by it. I understand that my duty in providing this written report and giving evidence is to assist the Commission. I confirm that I have complied and will continue to comply with my duty.
2. I know of no conflict of interests of any kind, other than any which I have disclosed in my report.
3. I do not consider that any interest which I have disclosed affects my suitability as an expert witness on any issues on which I have given evidence.
4. I will advise the Commission if, between the date of my report and the hearing of the Commission, there is any change in circumstances which affect my opinion above.
5. I have exercised reasonable care and skill in order to be accurate and complete in preparing this report.
6. I have endeavoured to include in my report those matters, of which I have knowledge or of which I have been made aware, that might adversely affect the validity of my opinion. I have clearly stated any qualifications to my opinion.
7. I have not, without forming an independent view, included or excluded anything which has been suggested to me by others, including my instructing solicitors.
8. I will notify those instructing me immediately and confirm in writing if, for any reason, my existing report requires any correction or qualification.

9. I understand that:

- (a) my report will form the evidence to be given under oath or affirmation;
- (b) questions may be put to me in writing for the purposes of clarifying my report and that my answers shall be treated as part of my report and covered by my statement of truth;
- (c) the Commission may at any stage direct a discussion to take place between the experts for the purpose of identifying and discussing the issues to be investigated under the Terms of Reference, where possible reaching an agreed opinion on those issues and identifying what action, if any, may be taken to resolve any of the outstanding issues between the parties;
- (d) the Commission may direct that following a discussion between the experts that a statement should be prepared showing those issues which are agreed, and those issues which are not agreed, together with a summary of the reasons for disagreeing;
- (e) I may be required to attend the hearing of the Commission to be cross-examined on my report by Counsel of other party/parties;
- (f) I am likely to be the subject of public adverse criticism by the Chairman and Commissioners of the Commission if the Commission concludes that I have not taken reasonable care in trying to meet the standards set out above.

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Statement of Truth

I confirm that I have made clear which facts and matters referred to in this report are within my own knowledge and which are not. Those that are within my own knowledge I confirm to be true. I believe that the opinions expressed in this report are honestly held.



Dr Neville A Armstrong

3 March 2013