

## **EXPERT REPORT**

### **PART 2**

Maritime safety and the present system of  
Control, together with items for consideration

PREPARED BY

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

5 March 2013

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near Lamma Island on 01.10.2012

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Specialist Field	Ship Hydrodynamics, Aluminium Ship Construction and Ship Safety Regulation, as : further detailed in Expert Report dated 3 January 2013.
Appointed on behalf of	The Commission of Inquiry into the Collision of : Vessels near Lamma Island on 1 October 2012 (the " <b>Commission</b> ")
Prepared for	: The Commission
On instructions of	: Messrs. Lo & Lo, solicitors for the Commission ("Lo & Lo")
Subject matter / Scope of engagement:	: To assist the Commission in discharging its duties under the Terms of Reference and by acting as an expert witness in the inquiry hearings.
Documents reviewed	: See Appendix II
Documents referred to in this Report	: See Appendix III
Draft proposal on seat foundations and Voyage Data Recorder documentation	: See Appendix IV

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**The Terms of Reference of the Commission are as follows:**

Inquire into the facts and circumstances leading to and surrounding the collision of the two vessels that took place near Lamma Island, Hong Kong on 1 October 2012:

- (a) ascertain the causes of the incident and make appropriate findings thereof;
- (b) consider and evaluate the general conditions of maritime safety concerning passenger vessels in Hong Kong and the adequacy or otherwise of the present system of control; and
- (c) make recommendations on measures, if any, required for the prevention of the recurrence of similar incidents in the future.

**Instructions**

I have been instructed to give my opinion on the matters under the Terms of Reference and this Expert Report represents **Part 2** of my opinion which seeks to consider and evaluate the general conditions of maritime safety concerning passenger vessels in Hong Kong and the adequacy or otherwise of the present (March 2013) system of control, with the view to assisting the Commission in making appropriate findings under Item (b) of the Terms of Reference.

Considerations to address certain issues in the present system of control are also offered, although this could be subject to discussion of alternative approaches to maritime safety together with further clarification and understanding of the current system. This broadly covers item (c) of the Terms of Reference, although it also comments on observations on the regulations other than those areas directly involving the collision of two vessels that took place near Lamma Island on 1 October 2012.

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### Introduction

1. I, Dr Neville A. Armstrong, consultant naval architect of Fremantle, Western Australia, have been appointed as the Commission's expert to assist the Commission in determining the matters under the Terms of Reference. In this Report, I seek to consider and evaluate the general conditions of maritime safety concerning passenger vessels in Hong Kong and the adequacy or otherwise of the present (March 2013) system of control. These issues are, under its Terms of Reference, a matter for the Commission after hearing all of the evidence. The opinion and conclusions which are set out in this Report were formed on the basis of the evidence that I have seen, heard and read. I appear as an independent expert for the Commission unrelated to any other work.
2. A collision between a high speed passenger ferry Sea Smooth and a company passenger launch Lamma IV resulted in the death of 39 passengers travelling on the launch. The Commission was set up on 22 October 2012 and is currently inquiring into the facts leading up to the collision. My expert Report dated 3 January 2013 and subsequent Supplemental Reports provide my opinion on certain technical issues that were related to the cause of the accident.

### The system of Control of Maritime Safety for local vessels

3. The system of control of Maritime Safety for local craft in Hong Kong in 1995 at the time of construction and original certification of Lamma IV could best be described as informal. The Instructions<sup>1 2</sup> under which local vessels were surveyed and certificated were not supported by legislation, and consequently there were few mandatory requirements. The surveyors and inspectors, and those carrying out the plan approval on local craft, in many cases learned the requirements on the job from more senior people, and knowledge on maritime safety issues appears to have been mainly passed on verbally.
4. Different persons appear to have been carrying out the plan approval to those carrying out the survey, and there was a general 'disconnect' between these two phases of the safety checks, which led to errors in the case of *Lamma IV*.

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<sup>1</sup> Instructions for Survey of Launches and Ferry Vessels (1983) (The Blue Book)

<sup>2</sup> Instructions for Survey of Class I and Class II (1995)

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5. Ownership of fundamental safety issues such as Ship Stability was not taken by anyone, with documentation being noted as "seen" by the Marine Department, rather than being carefully assessed and approved.
6. The requirements of the Instructions in use in 1995 were basic, sometimes detailing quite trivial matters, and at other times missing some fundamental issues. The Instructions themselves were brief (The Blue book contained only 48 pages, the 1995 Instructions only 62 pages).
7. This situation changed in 2006 with the gazetting of **The Merchant Shipping (Local Vessels) Ordinance CAP 548**. This provided the necessary legislative backing for maritime safety to be properly addressed for local craft. CAP 548 was also supported by subsidiary legislation of the same year, specifically **The Merchant Shipping (Local Vessels) (Safety and Survey) Regulation CAP 548G**.
8. As specified under Part III of CAP 548, a Code of Practice<sup>3</sup> was also developed and issued in 2006, and under the provisions of CAP 548 Section 9, the Code of Practice [COP<sub>(2006)</sub>] was given some authority.
9. The comments that follow in this document are based upon my interpretation of CAP 548, CAP 548G and COP<sub>(2006)</sub>. I have no knowledge of alternative procedures that may have been developed within the Marine Department as acceptable Equivalents (as defined in COP<sub>(2006)</sub>)<sup>4</sup> or acceptable Exemptions (as defined in COP<sub>(2006)</sub>)<sup>5</sup>
10. At present I do not understand how the current system of plan approval and ship survey and inspection operates at a practical level. COP<sub>(2006)</sub><sup>6</sup> suggests that plan approval may be done by four different bodies, namely The Marine Department, an Authorized Surveyor, an Authorised Organization or a Recognized Authority. Surveys may also be carried out by these four bodies, subject to Mardep's agreement. How this works in practice would require more detailed investigation within Mardep and observation of the process, but there remains the potential problem of different persons doing the plan approval to those carrying out the survey. This is further discussed in the following paragraphs.

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<sup>3</sup> *CODE OF PRACTICE* – Safety Standards for Classes I, II and III Vessels

<sup>4</sup> COP<sub>(2006)</sub> Chapter I Section 8

<sup>5</sup> COP<sub>(2006)</sub> Chapter I Section 7

<sup>6</sup> COP<sub>(2006)</sub> Chapter II Sections 4 & 5

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11. Some of the issues that were discussed during the process of understanding the causes of the *Lamma IV* incident are raised in Part A of this Report, together with comment on the current (2013) maritime safety requirements, and suggestions are made to ensure on-going safety. These comments only apply to Class I ferries and launches.
12. Part B of this Report includes comment on issues not directly related to the Lamma IV incident but on other current (2013) requirements that have come to light during the reading of the regulations and which are offered as suggestions to clarify the understanding of maritime safety issues and to prevent similar incidents in the future.

#### **PART A: Current Safety Issues with reference to the loss of *Lamma IV***

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##### **(i) Potential for disconnect of design intent and actual construction.**

A-13. COP<sup>(2006)</sup> outlines a procedure<sup>7</sup> for survey and plan approval. There appears to be the potential for drawings to be approved by one authority (such as the Classification Society) and for the survey to be done by another (such as an

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<sup>7</sup> COP<sup>(2006)</sup> Chapter II Marine Bundle 11, Item 29, pp.3444-3447

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authorized surveyor). This is likely to lead to errors, such as the surveyor not understanding the reason behind certain design features and requiring detrimental changes. The drawing approval and the survey should ideally be done by the same persons to avoid situations such as happened with *Lamma IV* where the drawings showed a watertight bulkhead but the surveyor on site accepted it as non-watertight, and thereafter the as-built documentation (such as the damage stability book) continued to incorrectly show the bulkhead as watertight. There needs to be some continuity of knowledge between plan approval and survey and certification. Having stated this concern, such a system can be made to work, and a similar arrangement is in operation in the State of Queensland in Australia, although the certification process is not recognised by other Australian States.

- A-14. Using the case of changes to the plating thickness on *Lamma IV* as an example, if the approved drawing shows 5 mm plating and the surveyor accepts over-rolled plate at 4.83 mm, it is unclear as to how this should be recorded in the as-built plans, and whether the Classification Society responsible for the design approval would accept the change authorised by the surveyor on site.

**For Consideration 1:** The term “authorized organisation” is used throughout Chapter II Section 3<sup>8</sup> of COP<sub>(2006)</sub> as the persons who are able to conduct surveys, but there is no definition of what is an authorised organization. For example it is unclear whether this refers to a Classification Society “Authorised organisations” should be defined in Chapter 1 Section 3.

**For Consideration 2:** Further clarification is needed to avoid the potential for breaches of safety, particularly some feedback on how this has worked over the past six years.

**(ii) Drawing Approval process**

- A-15. **Issue:** Ownership of safety issues shown by drawings and documentation in 1995 were not taken by the Survey Authority (as drawings were stated to be “seen” rather than “approved”).

- A-15. **Current requirement:** CAP 548G<sup>9</sup> requires that drawings and documentation are marked as approved and identified by date and signature. Drawings are approved

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<sup>8</sup> COP<sub>(2006)</sub> Chapter II, , Marine Bundle 11, Item 29, pp.3445-3446

<sup>9</sup> CAP 548G Part 3

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by a “recognized authority” and copies of important documentation are provided to Mardep.

**For Consideration 3:** Current requirements appear to be satisfactory.

A-16. **Issue:** Technical requirements were not mandatory in 1995

A-17. **Current requirement:** CAP 548<sup>10</sup> authorises the issues of Codes of Practice and empowers such Codes as admissible in Court. Furthermore, in Part IV, it requires that all local vessels are certified and licensed.

**For Consideration 4:** Current requirements appear to be satisfactory.

**(iii) Alteration to local vessels**

A-18. **Issue:** One of the major contributing factors in the loss of *Lamma IV* was the increase in the weight of the vessel (lightship) by over 30% some years after the watertight subdivision had been calculated (by the addition of ballast and fendering and other items), resulting in a substantial decrease in freeboard to the margin line and which was not recognised.

A-19. **Current requirement:** CAP 548G<sup>11</sup> requires any modification to the vessel to be approved by Mardep, but only if the particulars stated on any certificate are to be modified. The certificate does NOT include any details of the weight of the ship, and therefore any alteration to the weight of the ship is not covered by Part 10. Chapter IV, Section 9 of COP<sub>(2006)</sub> refers to the impact of modifications to the vessel on the stability and the need for it to be approved and re-certified, but there is no requirement in the legislation for the watertight subdivision to be recalculated.

**For Consideration 5:** It is strongly suggested that the definition of “new vessel” be amended to include a new item under COP<sub>(2006)</sub> Chapter I “new vessel” (b) (i) (D)<sup>12</sup> “its lightship weight, or its maximum draught, or its freeboard, as appropriate, which would

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<sup>10</sup> CAP 548 Part III

<sup>11</sup> CAP 548G Part 10

<sup>12</sup> COP<sub>(2006)</sub> Chapter I, , Marine Bundle 11, Item 29, p.3438



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require re-calculation of the watertight subdivision and associated bulkhead locations and damage stability calculations”.

**For Consideration 6:** It is strongly suggested that the Certificate of Survey, Certificate of Inspection, records or Declaration, and the Licence, record the vessel lightship particulars as well as the other principal characteristics.

A-20. **Issue:** COP<sub>(2006)</sub> Chapter IV Section 9<sup>13</sup> concerns Modification onboard. There is no reference to the impact of modification on damage stability or watertight sub-division and floodable length.

**For Consideration 7:** Modify paragraphs 9.1 and 9.2 to read:

“9.1 Before a vessel is to undergo any modification, application should be submitted specifying the nature of the proposed alterations. Estimates of the effects of the modification on intact stability, damage stability and watertight sub-division should be submitted for approval.

9.2 If the stability estimates show that the alterations will adversely affect the intact or damage stability of the vessel, an inclining experiment, or a lightweight survey or a rolling period test, as appropriate, should be conducted. If the watertight-subdivision estimates show that the alterations will adversely affect the flooding capability of the vessel, additional buoyancy may be necessary.”

**(iv) Life-saving arrangements**

A-21. **Issue:** CAP 548 and its subsidiary legislation do not appear to have any definition of a lifejacket, or the expected performance characteristics of a lifejacket, other than to state that Lifesaving appliances conforming to the Life-Saving Appliances Code of SOLAS would be acceptable. See also comments on Page 32 of this Report.

**For Consideration 8:** Include in CAP 548 Part 1 Section 2 Interpretation; a definition - ‘“lifejacket” means a lifejacket certified in accordance with ISO 12402-3:2006 (Personal Flotation Devices – Part 3: Lifejackets, performance level 150 – Safety requirements), or equivalent, to the satisfaction of The Director.’

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<sup>13</sup> COP<sub>(2006)</sub> Chapter IV Section 9, Marine Bundle 11, Item 29, p.3487

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A-22. **Issue:** CAP548G Schedule 3 Table 7 does not specify the need for children's lifejackets for Class IV vessels licensed to carry not more than 60 passengers. It is not clear why this exemption is given, as it requires only 3 children's lifejackets under the regulation (5% of 60).

**For Consideration 9:** delete "100%<sup>(1)</sup>" from Table 7 and replace with "100% adult lifejackets + 5% children lifejacket <sup>(1)</sup>"

A-23. **Issue:** The origin of the requirements for 5% lifejackets for children is not understood. SOLAS requirements<sup>14</sup> state "a number of lifejackets suitable for children equal to at least 10% of the number of passengers on board shall be provided or such greater number as may be required to provide a lifejacket for each child".

**For Consideration 10:** delete "100%<sup>(1)</sup>" from Table 7 and replace with "100% adult lifejackets + 5% children lifejacket <sup>(1)</sup> or such greater number as may be required to provide a lifejacket for each child on board".

A-24. **Issue:** Many lifejackets remaining on board Lamma IV were stored in unmarked plastic bags held within the orange bag under the seat, which meant that they were not immediately identified as lifejackets. Furthermore it is understood that some of the lifejacket tapes were tied together and the knots were difficult to untie.

A-25. **Current requirement:** CAP548G Schedule 3 Part 1 Section 2(b) requires that every life-saving appliance carried on board shall be ready for immediate use.

**For Consideration 11:** Plastic bags were easily ripped open, but in a panic situation it is suggested that they were not immediately identifiable as containing lifejackets. The reason for the plastic bags is understood to be to prevent attack by insects, but the Commission will need to decide whether this is an acceptable solution.

**(v) Redundancy of emergency electrical power**

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<sup>14</sup> MSC.47(66) SOLAS Regulation 7 Paragraph 2.1.1

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A-26. **Issue:** The source of the emergency electrical power should be separate from the main power supply, to avoid loss of power in case of fire or flooding in the engine room.

A-27. **Current requirement:** COP<sub>(2006)</sub> Chapter II Section 7 Table 3<sup>15</sup> does not have a requirement for redundancy of emergency electrical power.

**For Consideration 12:** Add an additional item to COP<sub>(2006)</sub> Chapter II Section 7 Table 3, C&D: 9 *bis* "Location of emergency source of electrical power should be outside machinery space and above waterline—verification"

A-28. **Issue:** The source of the emergency electrical power should be located above the deepest load waterline, to minimise swamping in case of flooding of the engine room.

A-29. **Current requirement:** COP<sub>(2006)</sub><sup>16</sup> Chapter IIIA Part 4 Electrical Installation Section 21 Electrical Power Source does not have such a requirement

**For Consideration 13:** Add a new paragraph 21.5 *bis* "The emergency source of power shall not be located below the deepest load waterline."

**(vi) Damage stability**

A-30. **Issue:** COP<sub>(2006)</sub><sup>17</sup> Annex F Part 2 Paragraph (3) (d) refers to "margin line". There is no definition of margin line contained within either COP<sub>(2006)</sub> nor CAP 548 nor CAP 548G.

A-31. **Issue:** COP<sub>(2006)</sub><sup>18</sup> Annex F Part 3 Paragraph (9) (b) refers to "the margin line". There is no definition of margin line contained within either COP<sub>(2006)</sub> nor CAP 548 nor CAP 548G.

**For Consideration 14:** Add a definition to COP<sub>(2006)</sub> Chapter I Section 3.1 consistent with SOLAS (or as CAP 369AM) -

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<sup>15</sup> COP<sub>(2006)</sub> Chapter II Section 7 Table 3, Marine Bundle 11, Item 29, p. 3459

<sup>16</sup> COP<sub>(2006)</sub> Chapter IIIA Part 4, Marine Bundle 11, Item 29, p. 3473

<sup>17</sup> COP<sub>(2006)</sub> Annex F Part 2 Paragraph (3) (d) , Marine Bundle 11, Item 29, p. 3544

<sup>18</sup> COP<sub>(2006)</sub> Annex F Part 3 Paragraph (9) (b) , Marine Bundle 11, Item 29, p. 3546

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*“margin line” means a line drawn at least 75 millimetres below the upper surface of the uppermost deck up to which transverse watertight bulkheads are carried, at the side and stern of the ship’*

A-32. **Issue:** COP<sub>(2006)</sub><sup>19</sup> Annex F Part 3 Paragraph (9) (a) refers to a calculation by “the constant displacement method”. This is a reference to a methodology that was used for calculation before computers were generally available, and this sentence, which was taken from SOLAS, has now been deleted from SOLAS, because computerised calculation methods have made it obsolete,

**For Consideration 15:** Delete “as calculated by the constant displacement method”

#### **(vii) Watertight sub-division**

##### **Background**

A-33. At the time of construction of Lamma IV, (1995) watertight sub-division was a requirement included in the Instructions in force at the time, with detailed legislation provided by Schedule 1 of CAP 369AM.

A-34. Damage stability requirements were given in Schedule 3 of CAP 369AM, but these were not mandated under the Instructions in force at the time. Nevertheless, the builder of *Lamma IV* did investigate the damage stability and stated the damaged GM<sub>T</sub> value as well as the watertight sub-division calculation.

A-35. It is necessary to explain the terms “watertight sub-division” and “damage stability”.

a). Watertight sub-division is the process by which a vessel may be prevented from foundering (sinking) owing to a breach of watertight integrity (such as the admission of water following a collision), and subject to limitation on the size of the hole in the ship. By limiting the size of any internal compartment of the ship and surrounding it by watertight bulkheads, sufficient buoyancy can be provided by all of the remaining compartments that are not damaged so that the vessel continues to float. The size of each compartment is usually determined by the volume necessary for the waterline of the damaged craft to remain below the main

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<sup>19</sup> COP<sub>(2006)</sub> Annex F Part 3 Paragraph (9) (a) , Marine Bundle 11, Item 29, p. 3546

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deck, by a nominal distance of 75mm. The location of 75mm below the deck is usually called the margin line.

b). Stability of a ship is a measure of the ability of the craft to return to the upright position if displaced to one side by some external force, such as the wind or weather or other forces such as passengers crowding on one side or cargo shifting to one side. Stability is only referenced to the transverse direction, and usually associated with a roll or heel angle.

c). Damage stability refers to the ability of the vessel to return to an upright position if displaced to one side by an external force, when the watertight integrity of the craft is breached and water has entered the vessel.

A-36. If sufficient water enters a vessel, then it will either capsize by rolling over owing to insufficient damage stability (but not necessarily sink) or it will founder (sink) in the upright condition or with excessive trim, owing to insufficient watertight subdivision. A good example of a vessel foundering owing to inadequate subdivision, but having adequate damage stability is the *Titanic*, about which many learned papers have been written on its stability and watertight integrity. The *Titanic* sank by the stern, and indeed broke in half whilst remaining "upright" and did not capsize to one side. In my opinion, the sinking of *Lamma IV* was also a case where the craft sank but had adequate damage stability, as the craft foundered by the stern without rolling over and capsizing to one side.

A-37. Watertight sub-division is a quite separate item from damage stability and the characteristics of one cannot be easily determined from the characteristics of the other.

A-38. Lamma IV had excellent sub-division when constructed in 1995 and had adequate damage stability. In fact the sub-division was so good that subsequent calculations showed that it could remain afloat without submerging the margin line with any two compartments flooded, (although the regulations only required one compartment standard).

A-39. Unfortunately when the weight of the vessel was increased in 1998 by the addition of solid ballast and fendering and possibly some other items, amounting

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to a weight increase of over 30%, the sub-division standard was substantially reduced, allowing the margin line to become submerged when the two aft compartments were flooded. It was not recognised at the time that the watertight sub-division had been compromised by the addition of weight.

A-40. However at the same time, by adding a substantial amount of weight low down in the vessel, the damage stability capability increased.

A-41. This example may be theoretical, because *Lamma IV* was not required to meet a standard to survive with two compartments damaged, but it does demonstrate that sub-division and damage stability are not the same and are not connected. Improving one does not imply improving the other, and can reduce it.

A-42. In the condition in which *Lamma IV* sank, with three compartments flooded (Engine Room, Tank Room and Steering Gear Compartment), according to my calculations the vessel had adequate damage stability and the proof of that lies with the fact that it sank by the stern without rolling over to one side.

**The current situation**

A-43. The question arises whether the issues of watertight sub-division and damage stability are adequately covered in the current regulations and could a situation happen again to a new vessel similar to that of *Lamma IV*, where the weight increased and the watertight subdivision requirements were not met, or a watertight bulkhead was certified even though it was not watertight.

A-44. Watertight-subdivision is a fundamental characteristic of ship design. It is calculated at a very early stage and before the hull shape and layout of the vessel is finalised, and sometimes it determines the principal characteristics of the craft, such as length or beam or depth. There is no specific requirement on CAP 548G concerning the requirements of watertight subdivision, nor of damage stability, except for a broad requirement in Section 9 that plans relating to “(e) arrangements relating to watertightness...bulkheads” and “(f) stability” should be approved.

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- A-45. The 2006 Code of Practice – Safety Standards for Classes I, II and III Vessels [COP<sub>(2006)</sub>] is issued under Section 8 of CAP 548. Chapter II Section 5<sup>20</sup> of COP<sub>(2006)</sub> requires that estimated damage stability information is submitted at an early stage, and a final damage stability calculation is provided after the vessel is complete. There is no reference to the location of bulkheads or to watertight sub-division in this Section.
- A-46. COP<sub>(2006)</sub> Chapter IV<sup>21</sup> is titled Freeboard and Stability. Section 2 refers to an Annex F<sup>22</sup> of the Code for damage stability matters for a launch or ferry designed to carry more than 100 passengers. The remainder of the Chapter mainly covers intact (undamaged) stability and other unrelated matters. There is no reference in this Chapter to watertight sub-division.
- A-47. Annex F is titled “**Damaged Stability Requirements for Launches, Ferry Vessels**”. In *Part 1 (1) Damaged Stability Requirements* there is reference to the vessel being “sub-divided by bulkheads which should be watertight up to the bulkhead deck into compartments the maximum length of which should not exceed the length permitted by the required **freeboard** and **intact stability** as calculated in accordance with Parts 2 and 3 of this Annex.”
- A-48. This might appear to refer to watertight sub-division, but it makes little technical sense to me. The length of a compartment cannot have any relationship with a vessel **freeboard**, and in any case there is no reference to freeboard in Parts 2 or 3 of the Annex. Furthermore there can be no relationship between **intact stability** and the length of a damaged compartment, as intact stability by definition refers to a vessel without damage. This whole section appears to have been written by someone who did not understand the concept of watertight sub-division.
- A-49. It might reasonably be assumed that the first sentence of Part 2<sup>23</sup> should read “The damaged stability of every vessel...” rather than “The stability of every vessel...”

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<sup>20</sup> COP<sub>(2006)</sub> Chapter II Section 5, Marine Bundle 11, Item 29, p.3447

<sup>21</sup> COP<sub>(2006)</sub> Chapter IV, Marine Bundle 11, Item 29, pp.3480 - 3487

<sup>22</sup> COP<sub>(2006)</sub> Annex F, Marine Bundle 11, Item 29, pp.3544 - 3546

<sup>23</sup> COP<sub>(2006)</sub> Annex F, Marine Bundle 11, Item 29, p. 3544

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- A-50. Annex F Part 2 paragraph (3) (d) refers to a margin line, but there is no definition as to what this is or to what it refers.
- A-51. Part 2 Section (6)<sup>24</sup> refers to the extent of damage. However, there is no reference to whether this is limited to one-compartment damage, and without such a reference it can only be assumed that the extent of damage quoted can be applied anywhere in the ship. This means that if the damage occurs on a bulkhead, then there will be a two-compartment standard. This may well be the intention of the writer, and I have no difficulty with this, except to note that it is a higher standard than would be applied in most other countries. In Australia for example, passenger vessels have to meet a one-compartment standard for passenger numbers up to 399, and only above 400 is there a two-compartment standard.
- A-52. *Annex F Part 3 Sufficiency of Stability in the Damaged Condition* commences with the words “the intact stability of the vessel should be deemed to be sufficient if... after the assumed damage..”, which is difficult to understand because after damage there is no relevance of intact stability. I suggest that the word “intact” should be replaced by “damaged”.
- A-53. The whole of Annex F gives the impression that individual phrases have been borrowed from various IMO publications and previous Hong Kong Regulations without proper consideration of the whole meaning.
- A-54. In summary, in Annex F there is no clearly defined requirement for **watertight sub-division**, no defined criteria against which to judge the adequacy of watertight sub-division, and no guidance on the procedures to be adopted to calculate it.
- A-55. There is damage **stability** criteria but no clear definition of the standard of the assumed damage.
- A-56. I am unable to judge whether the Chinese version is correctly written and that the English version might have been poorly translated.

**For Consideration 16:** That the whole of Annex F is carefully re-written. It should not contain the complicated formulations contained in Schedule 1 of CAP 369AM, originally

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<sup>24</sup> COP<sub>(2006)</sub> Annex F, Marine Bundle 11, Item 29, p. 3545



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copied from 1974 SOLAS (and SOLAS has since been re-written and does not contain these same calculations any more). Modern computer software has made the calculation of watertight sub-division a simple process. What is needed in Annex F is a concise summary of the outcomes to be achieved by watertight sub-division.

**(viii) Seats and seat attachment**

A-57. *Issues:* Seats were poorly attached to the deck of composite sandwich construction on Lamma IV, and became loose over time.

A-58. *Current Requirements:* According to COP<sub>(2006)</sub><sup>25</sup>, passenger seats are required to be attached to the deck in a manner “adequate for the intended service”.

A-59. This is reflected in the Operating Licence and the certification on Installation suitable for “combined coxswain” operation of a Class I vessel<sup>26</sup>, which both state “The form, design and attachments to the deck of passenger seats should be adequate for the intended service”. It is not clear what is an adequate attachment.

**For Consideration 17:** It is suggested to include some realistic value against which the attachment of seats might be judged. This value will need to allow for the constant changes in loads owing to operation of the vessel in waves and causing the attachments to work loose over time.

A methodology is suggested in Appendix IV to this Report, based on the assumption that an adequate attachment is one that remains intact during operation of the vessel during its normal operation in its intended service for the entire period of time between annual surveys.

**(ix) Structural issues**

**(a) Plating thickness**

A-60. *Issue:* Lamma IV was manufactured with hull plating of less than the thicknesses shown on the approved drawings.

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<sup>25</sup> COP<sub>(2006)</sub> Chapter V Paragraph 3.5, Marine Bundle 11, Item 29, p.3490

<sup>26</sup> COP<sub>(2006)</sub> Annex P, Marine Bundle 11, Item 29, p.3627

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A-61. **Current Requirements:** COP<sub>(2006)</sub><sup>27</sup> requires that the structure is designed in accordance with the requirements of a Classification Society. It further states that the Classification Society Rules and Regulations are to be complied with in their entirety. However it is not clear to me from reading COP<sub>(2006)</sub> whether the minimum scantlings shown on the drawings might be liberally interpreted by the person surveying the ship, as detailed in Paragraph A-14 of this Report.

**For Consideration:** See For Consideration 2.

**(b) Corrosion**

A-62. **Issue:** Disagreement on the corrosion properties of different materials.

A-63. **Current requirements:** Corrosion is extensively covered for steel items in COP<sub>(2006)</sub> Annex M<sup>28</sup>. Corrosion is also covered by the Rules and Regulations of the Classification Society and is generally embedded within their formulations for scantlings.

**For Consideration 18:** That reference is made in Annex M that the information relates only to steel material.

**(x) Watertight bulkheads and access openings**

A-64. **Issue:** Access openings fitted in watertight bulkheads.

A-65. **Current Requirements:** The Hull Construction<sup>29</sup> requirements state that every launch or ferry should be fitted with a collision bulkhead; a fore and aft bulkhead to the main engine space; an additional bulkhead where any compartment exceeds 40% of the length; and for a vessel longer than 24 metres, an aft peak bulkhead unless the engine room is situated at the aft end of the vessel.

A-66. Section 2.5<sup>30</sup> also requires that bulkheads should be of watertight construction, and Section 2.6 requires that access openings fitted in watertight bulkheads shall be equipped with effective watertight closing appliances.

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<sup>27</sup> COP<sub>(2006)</sub><sup>27</sup> Chapter III Part 1, Marine Bundle 11, Item 29, p.3461

<sup>28</sup> COP<sub>(2006)</sub> Annex M, Marine Bundle 11, Item 29, pp. 3596-3599

<sup>29</sup> COP<sub>(2006)</sub> Chapter IIIA Part 2 Section 2, Marine Bundle 11, Item 29, p.3461

<sup>30</sup> COP<sub>(2006)</sub> Chapter IIIA Part 2 Section 2.5, Marine Bundle 11, Item 29, p.3462

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A-67. **Comment:** Paragraph 2.1 (d) "...an aft peak bulkhead unless the engine room is situated at the aft end of the vessel" clearly indicates that the aft peak bulkhead is expected to be located in the after part of the vessel.

**For Consideration 19:** Current requirements appear to cover the need for watertight doors, both at the design approval stage, and at the survey stage<sup>31</sup>.

(a) It is suggested that hinged watertight doors have a maximum permitted width of 800 millimetres with a sill no more than 2.5 m below the freeboard deck and marked on each side of the boundary in bold and permanent lettering 'THIS DOOR TO BE KEPT CLOSED AND SECURED'. Only one hinged watertight door should be permitted within any hull (i.e. maximum of one in each hull of a catamaran). Hinged watertight doors should be arranged to generally open forward (or outboard) except doors to the aft peak and other high flooding risk spaces should open into the space.

(b) It is suggested that a hinged watertight door should be fitted with catches and other quick-action closing devices capable of being operated from each side of the bulkhead in which the door is fitted. The speed of complete closure of the door (including securing) should not exceed 90 seconds with the vessel in the upright position. All hinged watertight doors should be provided with a means of indication at the operating compartment (e.g. the wheelhouse) to show whether the door is open or closed. An audible alarm should be provided at each side of the opening.

**(xi) Built in accordance with the approved plans**

A-68. **Issue:** there may be a lack of communication between the drawing approval process and the survey process.

A-69. **Current Requirements:** Unclear

**For Consideration 20:** That the Certificate of Survey or Certificate of Inspection contains a statement signed by the surveyor that the vessel has been built in accordance with the approved plans.

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<sup>31</sup> COP(2006) Chapter II Section 7 Table 3 Item A&B 4, Marine Bundle 11, Item 29, p.3458

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**(xii) On-going professional development of Marine Department Ship Surveyors and Inspectors**

A-70. **Issue:** As outlined in Paragraph 3 of this Report, during the time of construction of *Lamma IV* (1995) there was reliance on passing on knowledge from more experienced persons (on-the-job training) without necessarily backing this up with more formal professional development.

**For Consideration 20:** That opportunity be provided for the on-going formal professional development of Ship Surveyors and Ship Inspectors within the Marine Department, in addition to their on-the-job training.

**(xiii) Voyage Data Recorders**

A-71. **Issue:** There has been some difficulty with understanding the exact situation between the two craft involved in the collision in the period immediately before the collision.

**For Consideration 22:** It is suggested that consideration be given to the fitting of Voyage Data Recorders to all Class 1 Ferries and Launches carrying in excess of 100 passengers, similar to those devices (VDRs) required for SOLAS passenger craft. IMO has published two relevant documents, Resolution MSC.163(78) dated 17 May 2004 covering *simplified Voyage Data Recorders* (S-VDRs) and Assembly Resolution A.861(20) adopted 27 November 1997 titled *Performance Standards for Shipborne Voyage Data Recorders* (VDRs). Copies of these documents are contained in Appendix IV of this Report.

**PART B: Current Safety Issues not related to the loss of *Lamma IV***

The intention of this Part is to suggest improvements to aspects of the current legislation. These items are not directly related to the loss of *Lamma IV*.

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**(xiv) Plan approval.**

B-1. **Issue:** CAP 548G Part 3 Section 7 defines the term “plan”. This term “plan” is also used in several other places without definition, for example Part 4 Section 22, Part 10 Section 76 and in Schedule 3, and appears to have the same meaning.

**For Consideration 23:** remove the paragraph at Part 3 Section 7 (4) and re-locate at Part 1 Section 2 Interpretation as ‘ “Plan”, unless the context otherwise requires, includes drawings, details, diagrams, calculations and other documentation’.

B-2. **Issue:** CAP 548G Part 3 *Approval of plans:* Section 9 (1) (i) requires the approval of Stability, but the meaning of this term “stability” is not defined; specifically in this context it is unclear whether it means intact stability or damage stability or both.

**For Consideration 24:** That the term “stability” is clarified. I believe that it should include a reference to both intact and damage stability.

B-3. **Issue:** CAP 548G Part 3 *Approval of plans:* Section 9 (1) (i) contains too many disparate systems in the phrase “fuel, machinery, shafting and electrical systems”.

**For Consideration 25:** That sub-paragraph (i) be replaced by five separate sub-sections-

- (i) Fuel system including pipework and tank details
- (i) *bis* Pipework schematics other than fuel.
- (i) *bis bis* Rudder, steering gear and emergency steering.
- (i) *bis bis bis* Shafting arrangements and details
- (i) *bis bis bis bis* Electrical schematic, including emergency power arrangements

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- B-4. **Issue:** CAP 548G Part 3 *Approval of plans*: Section 9 (1) (l) should specifically refer to radio-communications (including VHF) as specified in Schedule 3 (Provision of Life-Saving Appliances) Part 2, Table 1, Table 4 and Table 6.

**For Consideration 26:** That Part 3 Section 9 (l) and Section (13) (4) (i) be modified to read “navigational and communication equipment, including radio communications, lights, shapes and sound signals;”.

- B-5. **Issue:** CAP 548G Part 3 *Approval of plans*: Section 9 (1) does not contain any information that describes the vessel shape.

**For Consideration 27:** Add sub-paragraph (p) Lines plan

- B-6. **Issue:** CAP 548G Schedule 2 (a) permits exemption from plan approval for some Class III vessels. It is not obvious whether the sub-sections (i), (ii), (iii) etc are alternatives or whether they are individual requirements. In other words, whether exemptions apply to (i) Category B vessel; AND (ii) an outboard open sampan; AND (iii) less than 10 m in length overall; AND etc or do the exemptions apply to (i) Category B vessel; OR (ii) an outboard open sampan; OR (iii) less than 10 m in length overall; OR etc..

**For Consideration 28:** clarify the meaning by adding either “and” or “or” at the end of each line to subsections (a) and (b).

- B-7. **Issue:** CAP 548G Schedule 2 (b) permits exemptions for a Class III vessel that meets a number of requirements numbered (i) through (iv). It is not clear whether these are individual requirements or alternatives. In other words, should they have the word “and” between the requirements or the word “or”.

**For Consideration 29:** clarify the meaning by adding “and” at the end of each line numbered (i) to (iii) (or the alternative “or”).

- B-8. **Issue:** COP<sup>(2006)</sup> Chapter II Section 4.2 on Submission of Plans and Data<sup>32</sup>. The term “not classed vessel” is confusing when under the regulations local vessels are divided into Class I, II, III and IV and form the title of this COP. “Not classed”

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<sup>32</sup> COP<sup>(2006)</sup> Chapter II Section 4.2, Marine Bundle 11, Item 29, p.3447

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presumably in this context refers to the approval process not being done through a Classification Society.

**For Consideration 30:** Delete the words “not classed vessel” in 4.2 and replace with “vessel not classed with a Classification Society”.

B-9. **Issue:** COP<sup>(2006)</sup> Chapter II Section 4<sup>33</sup> permits plan approval to be carried out by a recognised Classification Society as listed in Chapter I Section 3. There are various references in Section 4 to the vessel being “classed”. If the intention is for this to apply to vessels which are properly classed and issued with a Classification Society Certificate, then it should be stated in this section that Classed vessels must remain in survey with the Classification Society. If a vessel is not maintained within class to the Classification Society requirements on an annual basis, there may be difficulty in the on-going survey process, and it raises the question whether a vessel can be easily transferred to mardep for survey.

B-10. Perhaps the intention was only for the Classification Society to conduct plan approval, and if so then the vessel should not be referred to as being “classed”.

B-11. Plan approval by a Classification Society (attracting a once-off fee) is not the same thing as the vessel being constructed to Class Society requirements and receiving a Classification certificate, which attracts annual fees.

**For Consideration 31:** Clarify what is meant by “classed” and “not classed” on an on-going basis.

B-12. **Issue:** COP<sup>(2006)</sup> Chapter II Sections 4.2 and 4.3 on Submission of Plans and Data<sup>34</sup>. The term “marked with @” should be clarified.

**For Consideration 32:** Replace “marked with @” by “marked with @ in the Table in Section 5”.

**(xv) Lifesaving.**

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<sup>33</sup> COP<sup>(2006)</sup> Chapter II Section 4, Marine Bundle 11, Item 29, p.3447

<sup>34</sup> COP<sup>(2006)</sup> Chapter II Section 4.2 and 4.3, Marine Bundle 11, Item 29, p. 3447

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B-13. **Issue:** CAP 548G Schedule 3 *Provision of Life-saving appliances* in Part 1 Section 3 contains requirements for plans to be kept on board, but this paragraph includes several aspects other than life-saving, namely fire-fighting apparatus, navigational equipment and stability. These items should be moved to the appropriate sections rather than listed under life-saving appliances; otherwise there is the risk of them being missed.

**For Consideration 33:** Add new Schedule (2) bis. *Documentation to be kept or displayed* on board. See also COP<sup>(2006)</sup> Chapter II Section 6.

B-14. **Issue:** CAP548G Schedule 3 Part 2 in Table 4 and Table 6 requires that cargo vessels and fishing vessels carry rocket parachute flares on board. However there is no requirement for Class 1 (passenger-carrying) craft to carry rocket parachute flares.

**For Consideration 34:** Given the very low cost of flares and their ability to attract attention at night-time I would suggest that they be required for Class 1 craft as well. Reliance on mobile telephones is not recommended, as the nearest rescuers would not be aware of the need for assistance.

**(xvi) Noise on-board.**

B-15. **Issue:** CAP 548G Part 9 Section 74 refers to a maximum noise level of 85 dB(A) in passenger spaces. This is an extremely high value and represents the upper limit of damage to hearing without protection. (Also the reference given has now been superseded).

**For Consideration 35:** replace the value of 85 dB(A) by 70dB(A) in accordance with the various levels given for various public spaces in IMO Code on Noise levels on Board Ships, Resolution A. which also defines the term "noise level".

**(xvii) Category of vessels.**

B-16. **Issue:** CAP 548G Schedule 1 giving Categories of local vessel does not contain any reference to a Class IV vessel in the Table, which is quite confusing, and unclear as to whether it is Category A or Category B, which for example is required by Table 3



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in Schedule 4 Part 2. It is noted that under Schedule 3 Part 2 Class IV vessels may carry more than 60 passengers.

**For Consideration 36:** Add to CAP 548G Schedule 1 reference to Class IV, being “auxiliary powered yacht”, “cruiser”, “open cruiser”.

**(xviii) Firefighting**

B-17. **Issue:** CAP548G Schedule 4 Section 2 (1) (a) (i) states that fire pumps are required to be driven by means other than the vessel’s main engine. However footnote (5) to Part 2 Table 1 states that the fire pump may be propulsion engine driven, as does footnote (6) to Table 3 and footnote (3) to Table 6.

**For Consideration 37:** Resolve the inconsistency.

B-18. **Issue:** CAP548G Schedule 4 Section 2 (2) (c) permits the use of bilge pumps as fire pumps. It is possible that if bilge pumps are used in this role and the suction is inadvertently or purposefully taken from the bilge of a compartment then there is the possibility of pumping spilt oil or fuel onto the fire.

**For Consideration 38:** Deletion of the use of the bilge pump as a fire pump.

**(xix) General.**

B-19. **Issue:** COP<sub>(2006)</sub> Chapter 1 Section 7.2 on Exemptions<sup>35</sup>. Reasons for exemptions should be documented by the surveying authority, traceable and available for any future analysis into their effectiveness, or in case of failure.

**For Consideration 39:** Add to the end of the final sentence “...and which shall be documented to the extent necessary to understand the rationale behind the exemption.”

B-20. **Issue:** COP<sub>(2006)</sub> Chapter I Section 8.2 on Equivalences<sup>36</sup>. Reasons for exemptions should be documented by the survey authority, traceable and available for any future analysis into their effectiveness, or in case of failure.

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<sup>35</sup> COP<sub>(2006)</sub> Chapter 1 Section 7.2, Marine Bundle 11, Item 29, p.3442

<sup>36</sup> COP<sub>(2006)</sub> Chapter I Section 8.2, Marine Bundle 11, Item 29, p.3443

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**For Consideration 40:** Add to the end of the final sentence "...and shall be fully documented to the extent necessary to understand the rationale behind the exemption."

**(xx) Plans to be displayed on-board.**

B-21. *Issue:* COP<sub>(2006)</sub> requires plans to be displayed on-board<sup>37</sup> of light, shape and sound signals and radio-communications equipment (if fitted). The reason for this is not at all clear to me, as there are no plans of any of these items and it is obvious that lights and signals are positioned where required by the international regulations, and sound signals and radio-communications are fixed items in the wheelhouse. This requirement appears to be specific to Hong Kong regulations, with no international equivalent, and I cannot see the value in it. The safety plan contains too much information on it to be useful in an emergency and deleting some items would be beneficial.

**For Consideration 41:** Delete light, shape, sound signals and radio-communications from section 6.1 (b) and also the equivalent in Section 6.2.

B-22. *Issue:* COP<sub>(2006)</sub><sup>38</sup> refers to plans to be displayed on-board in conspicuous places throughout the vessel. There is too much information to be displayed on one plan for it to be easily understood in an emergency.

**For Consideration 42:** That safety information be presented in two plans, in line with international convention, and the paragraph be amended accordingly to read "For every Class I vessel carrying more than 100 passengers, the following plans should be exhibited in conspicuous places throughout the vessel as follows:

- (a) A fire plan showing the location of all fire-fight appliances, the structural fire protection boundaries and the location of fire detection and fire alarms.
- (b) An escape plan showing the location and arrangement of all life-saving appliances, and all means of escape and all escape arrangements.

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<sup>37</sup> COP<sub>(2006)</sub> Chapter II Section 6.1 (b) , Marine Bundle 11, Item 29, p.3451

<sup>38</sup> COP<sub>(2006)</sub> Chapter II Section 6.2, Marine Bundle 11, Item 29, p.3451

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B-23. **Issue:** COP<sub>(2006)</sub><sup>39</sup> requires certain plans to be retained on-board. These should be the latest available plans, particularly if the vessel has been modified, such as the seating arrangement and the locations of firefighting or lifesaving equipment.

**For Consideration 43:** Add a new paragraph 6.2 bis: For every Class I, II and III vessel (excluding wooden fishing vessel and sampan) which has been modified or altered in a way that would change the seating arrangement or disposition of lifesaving or firefighting appliances, then all plans and documentation carried or displayed on-board should be modified to reflect those changes.

B-24. **Issue:** COP<sub>(2006)</sub> on Submission of Plans<sup>40</sup>. As-built plans may be required by a ship owner for their own record purposes under the terms of the Building Contract with the shipbuilder, but otherwise there is no mandatory requirement for the ship owner or the shipbuilder to draw as-built plans. It might be useful for Mardep to maintain a record of as-built plans as well as the approved plans, but this will take up space and may cause confusion in the future unless the as-built plans are also to be approved. Doubling up on the approval process is not considered to be desirable, although it would capture issues such as the shell plating being approved at one thickness but the boat being built at another under agreement with the surveying authority. This issue and the value of as-built plans needs some further discussion.

**For Consideration 44:** As-built plans should be provided by the Ship owner to Mardep.

**(xxi) Survey.**

B-25. **Issue:** COP<sub>(2006)</sub><sup>41</sup> Chapter II Section 7 Table 1 Item A1 uses a slash mark “/” which is unclear as to whether this is an alternative option.

**For Consideration 45:** Item A1 to be modified to read “Draught Marks and Load Line (if this is applicable) – verification”.

B-26. **Issue:** COP<sub>(2006)</sub><sup>42</sup> Chapter II Section 7 Table 1 Item A12 is unclear as to the meaning of “Seating”.

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<sup>39</sup> COP<sub>(2006)</sub> Chapter II Section 6, Marine Bundle 11, Item 29, p.3451

<sup>40</sup> COP<sub>(2006)</sub> Chapter II Section 4, Marine Bundle 11, Item 29, p.3447

<sup>41</sup> COP<sub>(2006)</sub> Chapter II Section 7 Table 1 Item A1, Marine Bundle 11, Item 29, p.3452

<sup>42</sup> COP<sub>(2006)</sub> Chapter II Section 7 Table 1 Item A12, Marine Bundle 11, Item 29, p. 3452

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**For Consideration 46:** Item A12 to be modified to read “Position of navigation light location and foundation – verification”.

B-27. **Issue:** COP<sub>(2006)</sub><sup>43</sup> Chapter II Section 7 Table 3 Item A&B 6; mixes up essential safety items and general accommodation items, and these should be separated.

**For Consideration 47:** Item A&B 6 to be modified to read “Passenger Spaces, Crew Spaces, cabin escape arrangements, bulwarks and rails - general inspection”.

**For Consideration 48:** A new item A&B 2 *bis* “Signage within passenger spaces including exits, no smoking, lifejacket donning instructions, escape plan and fire-fighting plan”.

B-28. **Issue:** COP<sub>(2006)</sub><sup>44</sup> Chapter IIIA Part 2 Hull Construction Paragraph 3.5 contains a typographical error (missing word).

**For Consideration 49:** modify the middle of the sentence to read “...in accordance with the rules of the Classification Society, based on the.....”.

**(xxii) Hull Construction.**

B-29. **Issue:** COP<sub>(2006)</sub><sup>45</sup> Chapter IIIA Part 3 Machinery Installation Paragraph 10.2 is inconsistent with regards to the final two sentences on fire dampers.

**For Consideration 50:** Delete from Paragraph 10.2 the words in the final sentence “..if fitted,” as the previous sentence states that it is a requirement to be fitted.

**(xxiii) Machinery Installation.**

B-30. **Issue:** COP<sub>(2006)</sub> Chapter IIIA Part 3 Machinery Installation Paragraph 10.4<sup>46</sup> concerns Escape from the engine room. The engine room is the space with the highest risk of fire on board a vessel, and there have been many unfortunate occasions when fire blocked the only means of escape from the space. International

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<sup>43</sup> COP<sub>(2006)</sub> Chapter II Section 7 Table 3 Item A&B 6, Marine Bundle 11, Item 29, p.3458

<sup>44</sup> COP<sub>(2006)</sub> Chapter IIIA Part 2 Paragraph 3.5, Marine Bundle 11, Item 29, p. 3462

<sup>45</sup> COP<sub>(2006)</sub> Chapter IIIA Part 3 Paragraph 10.2, Marine Bundle 11, Item 29, p. 3466

<sup>46</sup> COP<sub>(2006)</sub> Chapter IIIA Part 3 Paragraph 10.4, Marine Bundle 11, Item 29, p.3466

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regulations require that there be two escapes from an engine room, and that they be as widely separated as possible. This is also stated elsewhere in COP<sub>(2006)</sub><sup>47</sup>.

**For Consideration 51:** Modify the first sentence to read "Two means of escape including suitable permanent ladders and exits should be provided for the engine room, as widely separated as possible, as required by Chapter VI Paragraph 13.4.3".

B-31. **Issue:** COP<sub>(2006)</sub> Chapter IIIA Part 3 Machinery Installation Paragraph 11<sup>48</sup> contains a requirement that fuel oil with a flash point above 61°C should be used. SOLAS require the minimum flash point to be 60°C, and the ISO standard for Marine Diesel Oil is also 60°C.

**For Consideration 52:** Change the minimum fuel oil flash point to read "...above 60°C".

B-32. **Issue:** COP<sub>(2006)</sub> Chapter IIIA Part 3 Machinery Installation Paragraph 17 Steering Gear Item 17.1<sup>49</sup>. The capability of the steering gear as stated is an important requirement, but it is frequently found that a more difficult requirement is for the steering gear to be capable of operating the rudder when going astern, particularly for unbalanced rudders. Going astern with no steering is potentially dangerous.

**For Consideration 53:** Modify the final paragraph to read "The main steering gear should also be capable of returning the rudder from hard-over to the midships position when the vessel is operating astern at maximum permitted speed. An emergency means of steering should also be provided, which may be either powered or manually operated.

**(xxiv) Electrical installation.**

B-33. **Issue:** COP<sub>(2006)</sub> Chapter IIIA Part 4 Electrical Installation Section 21 Paragraph 21.6<sup>50</sup> requires ventilation fans and fuel oil pumps to be capable of being stopped from a location outside of the space in which they are fitted. This requirement is reproduced almost exactly in another part of COP<sub>(2006)</sub><sup>51</sup>.

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<sup>47</sup> COP<sub>(2006)</sub> Chapter VI Paragraph 13.4.3, Marine Bundle 11, Item 29, p.3503

<sup>48</sup> COP<sub>(2006)</sub> Chapter IIIA Part 3 Paragraph 11, Marine Bundle 11, Item 29, p.3466

<sup>49</sup> COP<sub>(2006)</sub> Chapter IIIA Part 3 Paragraph 17 Item 17.1, Marine Bundle 11, Item 29, p.3469

<sup>50</sup> COP<sub>(2006)</sub> Chapter IIIA Part 4 Section 21 Paragraph 21.6, Marine Bundle 11, Item 29, p.3473

<sup>51</sup> COP<sub>(2006)</sub> Chapter VI Paragraph 10.1, Marine Bundle 11, Item 29, p.3500

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**For Consideration 54:** Delete Paragraph 21.6; (alternatively, given that it is an important topic, add to the end of the sentence "...as required by Chapter IIIA Part 4 Paragraph 21.6."<sup>52</sup> and also add "accommodation space" to the list of compartments)

**(xxv) Stability.**

B-34. *Issue:* Chapter IV Freeboard and Stability, Paragraph 3.2 (b)<sup>53</sup> provides exemption from inclining experiments for vessels for which an accurate result cannot be obtained. This is particularly the case for catamarans, which are exempted from an inclining experiment in the HSC Code of IMO owing to the inaccuracies involved in extreme changes in the underwater form when a multihull craft such as a catamaran is heeled, leading to erroneous results. (The inclining experiment accuracy is based on an assumption that the hull is "wall-sided" and the waterplane area does not change by a large amount). This can be important because of the inherent danger involved in erroneous stability values, although catamarans generally have extremely high stability values.

**For Consideration 55:** Change paragraph 3.2 (b) at the part within brackets to read "(e.g. a dumb lighter with extreme beam, and multihull craft)".

B-35. *Issue:* COP<sub>(2006)</sub><sup>54</sup> requires a stability booklet to be submitted for approval. It would be helpful to indicate who should approve the stability booklet.

**For Consideration 56:** Modify Paragraph 6.1 to finish with "should be submitted for approval to the appropriate authority as required by Chapter II Section 3 and Section 4.

**(xxvi) Structural Fire Protection.**

B-36. *Issue:* COP<sub>(2006)</sub><sup>55</sup> Chapter VI Section 13 Structural Fire Protection Paragraph 13.5.2 the requirement for exterior boundaries of superstructures and deckhouses which are required to be insulated to A-60 standard shall be constructed of steel is not understood, as there are no requirements in the following Tables 1 & 2 in subparagraph 13.5.3. for A-60 standard to be applied to an open space (which would be the exterior boundary). The only practical application of this on a SOLAS vessel is

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<sup>52</sup> COP<sub>(2006)</sub> Chapter IIIA Part 4 Paragraph 21.6, Marine Bundle 11, Item 29, p.3473

<sup>53</sup> COP<sub>(2006)</sub> Chapter IV Paragraph 3.2 (b) , Marine Bundle 11, Item 29, p.3486

<sup>54</sup> COP<sub>(2006)</sub> Chapter IV Section 6 Paragraph 6.1, Marine Bundle 11, Item 29, p.3486

<sup>55</sup> COP<sub>(2006)</sub> Chapter VI Section 13 Paragraph 13.5.2, Marine Bundle 11, Item 29, p.3505

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where the exterior space is an escape or a muster station for liferaft boarding, which would have its own entry in the Tables, but as there is no such entry in the Tables in 13.5.3, then paragraph at 13.5.2 has no meaning.

**For Consideration 57:** Delete paragraph 13.5.2, or alternatively add a new item "Open deck escape path or muster station" to Table 1 and Table 2 in 13.5.3.

**(xxvii) High-speed and DSC Craft.**

B-37. *Issue:* COP<sub>(2006)</sub><sup>56</sup> Chapter XI Section 3 Paragraph 3.1 concerns Damage Stability of HSC Code craft. There would appear to be an incorrect reference to intact stability in Annex 7 of the HSC (1994) Code.

**For Consideration 58:** COP<sub>(2006)</sub> Chapter XI Section 3 Paragraph 3.1, replace "annex 7 (except paragraph 1.5) of the HSC Code" with "annex 7, Section 2 of the HSC Code".

**(xxviii) Mandatory aspects of the Regulations.**

B-38. *Issue:* It is not always clear what aspects of the regulations are mandatory and what information is provided for guidance. IMO regulations use the convention that the verb "shall" is a mandatory requirement, and the verb "should" provides recommended guidance. The verb "may" suggests an alternative provision.

**For Consideration 59:** If COP<sub>(2006)</sub> is to be modified at some future stage, then the IMO convention identifying mandatory requirements should be adopted.

**PART C: Potential Safety Issues for Vessels certified before 1 January 2007**

C.1. The intention of this Part is to identify potential safety issues for passenger vessels which were certified under the previous Instructions<sup>57,58</sup>, that is, prior to the issue of CAP 548 and CAP 548G, and which are still in service. The aim is to suggest improved safety measures, learning from the loss of Lamma IV and the consequent investigations.

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<sup>56</sup> COP<sub>(2006)</sub> Chapter XI Section 3 Paragraph 3.1, Marine Bundle 11, Item 29, p.3527

<sup>57</sup> Instructions for Survey of Launches and Ferry Vessels (1983) (The Blue Book)

<sup>58</sup> Instructions for Survey of Class I and Class II (1995)

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- C.2. Currently there appears to be no documented "Statement of Safety Objectives" which would help to identify the intentions and outcomes of the Merchant Shipping (Local Vessels) Ordinance and subordinate regulations. Without understanding how passenger safety is intended to be ensured over a range of topics, some of which are inter-dependent, it is difficult to offer comprehensive advice on what standard is required of ships built to previous regulations. A starting point in addressing this issue would therefore be to discuss with Mardep whether they have existing high-level "Safety Aims", and if not, then to provide assistance to them to retrospectively develop such aims.
- C.3. The Local Vessels Advisory Committee (LVAC), established under Part II of CAP 548, is authorised to assist with the general regulation or control of local vessels in Hong Kong<sup>59</sup>. Without a Statement of Safety Objectives providing a high-level scope of work, it must be difficult for this committee to operate cohesively and rapidly.
- C.4. Changes to requirements will necessarily involve additional cost for vessel Owners. A Regulatory Impact Assessment (RIS) should be commissioned by Mardep to assess the cost and risk implications and benefits to safety of any proposed changes, and to submit such information to the LVAC. Changes deemed to be necessary should be processed by the LVAC as quickly as possible.
- C.5. Notwithstanding the apparent lack of required safety outcomes for passenger craft, the following items are deemed to be worthy of immediate consideration:

**Life-saving appliances:**

- C.6. Although Chapter VII of the COP(2006) refers to life-saving appliances being of approved type and preferably ones which comply with the LSA Code, there have been many changes to the LSA Code made since MSC.48(66) referred to in Paragraph 1.2. It is proposed that this should be changed to read Resolution MSC.48(66) and subsequent amendments, including MSC.207(81), MSC.281(82), MSC.272(85) and MSC.320(89).

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<sup>59</sup> CAP 548 Part II Section 5 Paragraph 1(b)



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- C.7. The required standard for lifejackets for all passenger vessels should be up-graded to an agreed standard in accordance with Consideration 8 in Part A item (iv) of this Report, following an RIS.
- C.8. A requirement for children's lifejackets on all passenger craft should be 5% children's lifejackets or such greater number as may be required to provide a lifejacket for each child on board, in line with SOLAS requirements as given under Consideration 10 in Part A item (iv) of this Report.
- C.9. Dependency on lifejackets alone and a very limited number of lifebuoys, in order to provide buoyancy for all passengers and crew is not considered satisfactory, especially in rough weather or strong winds. Consideration should be given to requiring liferafts to a greater capacity, dependent on the area of operation. Liferafts will need to be capable of being launched on either side of the vessel, which may require some major structural changes.
- C.10. Vessels should be required to carry parachute rocket flares in order to attract attention at night time. As stated in Part B of this Report, mobile telephones do not alert potential nearby rescuers. It is noted that two rocker flares were carried on board *Lamma IV*, but these were contained within the sealed liferaft container<sup>60</sup>. It would be more practical to have some available within the wheelhouse.

**Redundancy of Electrical Power:**

- C.11. Consideration should be given to requiring the emergency source of power, if provided by batteries on craft licensed to carry more than 100 passengers, to be located outside of the engine room, subject to a RIS.

**Watertight Doors:**

- C.12. All watertight doors should be fitted with alarms in the wheelhouse to indicate whether they are open or closed, and marked on each side of the boundary in bold and permanent lettering 'THIS DOOR TO BE KEPT CLOSED AND SECURED'.

**Annual Survey, Certification and Licence:**

- C.13. The form of the annual survey documentation and associated Certificate and the Licence were updated in 2008. They contain some trivial items (such as how many

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<sup>60</sup> Certificate of Survey May 2012, Marine Bundle 4, p 829

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buckets were on board *Lamma IV*<sup>61</sup>) and yet give little detail on some of the important items. Suggested changes to the form of the current documents are proposed to give additional detail as follows:

- i. Life Saving Appliances: Actual numbers should be given of each appliance, including children's lifejackets (noting that they may vary depending on the current voyage) and should be clearly stated without a need to consult other documents.

- ii. A new paragraph to be added stating : "Watertight doors are fitted at the following locations and are capable of being securely closed:

.....

....."

*(Noting here that for **new** craft proposals, only one watertight door should be permitted per vessel).*

- iii. Lightship weight, from inclining experiment on  
(date).....tonnes

C.14. During the annual survey of all passenger-carrying craft, catalogue the following features:

- i. All watertight doors and access openings on board in apparent watertight bulkheads;
- ii. The location of the emergency battery supply to the navigation lights and other navigational equipment;
- iii. Whether the vessel has decks manufactured from GRP or other composite foam sandwich construction, and having seats fastened to them;
- iv. Note all layout changes that have been made since the original General Arrangement, such as the position and orientation of seats.
- v. In addition, during the annual survey on each vessel certified to carry more than 100 passengers, conduct a lightship check to determine any changes to the vessel weight since the original certification, and thus identify potential watertight-subdivision issues. This light ship check need only be done during one survey.

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<sup>61</sup> 2\_Vessel License of LAMMA IV, Police Bundle H, p.1316+

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**Seat Foundations:**

C.15. Conduct a RIS of craft having GRP foam sandwich construction with seats fixed to them, with the intention of identifying the work and cost required to attach seats more robustly.

C.16. As a condition of survey, require all vessel owners to seek approval from Mardep to move seats or make changes to the seating arrangements except where the seating design is such as to permit simple changes without affecting the attachment to the deck, such as seats fitted to tracks connected to the deck. Any changes approved by Mardep should include changes to the escape plan displayed on-board.

**Voyage Data Recorders:**

C.17. Carry out a RIS to identify the feasibility and cost of fitting Voyage Data Recorders to all passenger craft.

**Further Investigations:**

C.18. Organise and conduct a workshop or seminar to identify the standard of watertight subdivision for vessels certified to carry more than 100 passengers, and identify how many vessels this would affect.

C.19. After a suitable period during which data is gathered from the annual surveys, and from Mardep records, identify the numbers of craft:

- carrying more than 100 passengers in which ballast has been added
- carrying more than 100 passengers and in which the lightship check indicates a change in the lightship of more than [5%]
- in which modifications have been made or in which the absence of a watertight door may have caused changes to the watertight subdivision

C.20. Commence an independent assessment of the watertight sub-division and damage stability of each craft certified to carry more than 100 passengers, focusing on those vessels identified from the annual surveys listed above.

**A note on Structural Fire Protection.**

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C.21. A major difference between the regulatory requirements prior to 2006 and those subsequent to 2006 concern the fitting of structural fire protection (SFP), specifically around the engine room. The intention of SFP is to minimise the spread of a fire and to give adequate time for passengers and crew to escape. A suitable fire protection strategy requires not only the fitting of SFP material around the periphery of the engine room, but also a suitable layout of the vessel, and therefore a good fire protection strategy is usually incorporated into the overall ship design. It is also very difficult to fit SFP material around bulkhead and deckhead penetration such as pipes, electric cables and ventilation trunks. Therefore I consider that it is not feasible and would almost certainly be prohibitively expensive to require Structural Fire Protection to be fitted to existing craft.

## **PART D: Future Safety Issues**

### **A note on lifejackets for infants<sup>62</sup>.**

D.1. In addition to a number of children's lifejackets, SOLAS requires additional infant's lifejackets, as stated in Regulation 7, in accordance with MSC Resolution MSC.201(81)<sup>63</sup>: *"For passenger ships on voyages of less than 24 h, a number of infant lifejackets equal to at least 2.5% of the number of passengers on board shall be provided"*.

D.2. Consideration should be given to the need for infant lifejackets. In this regard it is noted that there could be children's lifejackets that are certified to also fit infants; and that ships certified to SOLAS are generally quite large ships that give sufficient time for the fitting of lifejackets to small infants, indeed the premise of SOLAS is that lifejackets are donned prior to gathering at muster stations for boarding of lifeboats or liferafts. On the other hand, local vessels in Hong Kong waters are generally small craft which can sink very quickly, and realistically there may be insufficient time for infant lifejackets to be fitted.

## **Safety Obligations**

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<sup>62</sup> This topic is relevant not only to vessels certified before 1 January 2007 but to all local passenger vessels

<sup>63</sup> IMO Resolution MSC.207(81) on Amendments to the International Convention for the safety of Life at Sea 1974, as amended, Chapter III Regulation 7 – Personal Life-saving appliances

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**D.3.** Questions about the high-level “Safety Aims” of Mardep were introduced at paragraph C.2 of this Report. There was also an exchange concerning high-level passenger safety objectives during the Hearing on Day 43 (1 March 2013) (see pages 81-83 of the transcript). Australia has recently tackled this issue and has published documentation which may be of assistance to Mardep in identifying Safety Obligations at various levels. Part of this documentation is attached as Document C<sup>64</sup>. Further detail can be provided if it is deemed to be useful.

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<sup>64</sup> Extracts from National Standard for Commercial Vessels, Australia (Part B)

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**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 dated 3 January 2013.
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 been shown the sources of all information I have used in Appendix II.
6. I have exercised reasonable care and skill in order to be accurate and complete in preparing this report.
7. 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.
8. I have not, without forming an independent view, included or excluded anything which has been suggested to me by others, including my instructing solicitors.

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9. I will notify those instructing me immediately and confirm in writing if, for any reason, my existing report requires any correction or qualification.
10. 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**

5 March 2013