CORRESPONDENCE GROUP ON GUIDELINES FOR UNIFORM OPERATING LIMITATIONS OF HIGH-SPEED CRAFT

DISCUSSION DOCUMENT FOR ROUND 1

Background

This Correspondence Group was established by DE 49 with the following terms of reference:

.1 *to develop draft Guidelines for uniform operating limitations of high-speed craft, taking into account documents DE 50/18, DE 49/5/3 and DE 49/INF.5 and comments and proposals made in plenary, as well as contributions from the COMSAR, NAV and SLF Sub-Committees as they become available; and*

.2 *to submit a report to DE 51.*

This work is required to be carried out in the context of the new paragraph 1.9.7 inserted in the 2000 HSC Code by res. MSC.222(82) as follows:

1.9.7 In determining the worst intended conditions and the operational limitations on all craft for insertion in the Permit to Operate, the Administration shall give consideration to all the parameters listed in annex 12. The limitations assigned shall be those that enable compliance with all of these factors.

Annex 12 to the 2000 HSC Code, as also adopted by res. MSC.222(82) states in part:

As a minimum, the following factors shall be considered:

.1 *The maximum distance from refuge implied by 1.3.4.*

.2 *The availability of rescue resources to comply with 1.4.12.1 (category A craft only).*

.3 *Minimum air temperature (susceptibility to icing), visibility and depth of water for safe operation as addressed by 1.4.61.*

.4 *The significant wave height and maximum mean wind speed used when applying the requirements for stability and buoyancy in chapter 2 and associated annexes.*

.5 *The safe seakeeping limitations (especially significant wave height) considering the known stability hazards listed in 2.1.5, the operating conditions on the intended route (see 18.1.3.2) and the motions experienced during operation defined in 3.3 of annex 9.*

.6 *The structural safety of the craft in critical design conditions according to chapter 3.*

.7 *The safe deployment and operation of evacuation systems and survival craft as required by 8.6.5.*

.8 *The safe handling limitations determined in accordance with the sea trials required by chapter 17 and annexes 3 and 9, identifying any limitations on weight and centre-of-gravity position according to 17.3, and the effects of failures and malfunctions according to 17.4.*

Consideration of Issues

The group should note the outcome of the consideration of this item by DE 50, and in particular paragraphs 18.3 and 18.5 in relation to the submission DE 50/18 by China. Bearing this in mind, of the documents referred to this group the only one that attempts to cover all of the factors from Annex 12 is DE 49/INF.5 (RINA).

The contents of DE 49/INF.5 have therefore been edited into a “first draft” of the required guidelines for consideration by the group. This editing process has involved re-ordering the text from DE 49/INF.5 to reflect the above list of factors and to delete comments that relate to possible future amendments to the Code rather than implementation of the existing Code. It has been done in something of a hurry in order to get the document into circulation, so any damage done to the content of the source document is regretted.

Depending on the comments received in relation to this draft, further text may need to be inserted to take appropriate account of DE 50/18 in similar manner to the text developed by the group in relation to factors 1 to 5 and 7 and 8.

Comments requested

Comments are sought on this document as follows:

- General comments on the proposal to use DE 49/INF.5 as the source document
- Comments on the accuracy of translation of the Appendix from DE 49/INF.5
- Proposals for incorporating material from DE 50/18
- Detailed comments for improving the Appendix

APPENDIX

SUGGESTED DRAFT OF GUIDELINES

1 INTRODUCTION

An explicit element of the *Code of Safety for High-Speed Craft, 2000* (2000 HSC Code – "the Code") is that unrestricted operation is not suitable for high-speed craft and that operating limitations are necessary. In this regard, attention is drawn to clauses 1.2, 1.3.4 and 1.4.61 of the Code

These guidelines have been prepared to assist in the uniform implementation of paragraph 1.9.7 and Annex 12 of the Code and to provide information on the rationale underpinning such operating limitations.

Matters determining the operational limitations may be divided into three sectors:

- those affecting the safety of the craft as a whole;
- those specifically affecting the safety of the passengers and crew as individuals; and
- those affecting the safety of persons outside the craft.

The factors listed in each of the following sections can be related to one or more of these items.

Any operational limitations resulting from consideration of those factors should be clearly communicated to the craft's operating personnel and referenced on the Permit to Operate.

2 MAXIMUM DISTANCE FROM REFUGE (1.2.5 & 1.3.4 OF CODE)

Clause 1.3.4 gives time limits for passenger craft (4 hours) and cargo craft (8 hours) for the passage to a place of refuge when proceeding at operational speed (90% of maximum speed when fully loaded). This is to allow the craft to operate solely in areas where the necessary shore-based support is available and to safely retire to shelter in the event of changes in the weather and hence sea state.

This limitation is generally set by the referenced provisions of the Code, but should be clearly stated in the craft's documentation and preferably shown on the permit to operate unless covered indirectly (eg. by coordinates of boundaries of the operational area).

3 AVAILABLE RESCUE AND OPERATIONAL SUPPORT RESOURCES (1.2.6, 1.2.7 & 1.4.12)

In some cases the operational limitations are functions of the resources available on the route, rather than the craft's limitations. Specifically, the Code is predicated on adequate

communications facilities, weather forecasts and maintenance facilities being available within the area of craft operation. Taken in conjunction with the requirement for proximity to place of refuge, the weather forecast requirement is intended to facilitate timely decision-making with regard to seeking refuge.

In setting the operational limitations, the flag Administration should consider whether the wave height corresponding to the Worst Intended Conditions should be such as to permit the craft to complete its passage without relying on a drastic reduction in speed, thus increasing the exposure of the passengers and crew to progressively more severe conditions. Such consideration relates to the craft being considered its own best survival craft in deteriorating conditions.

Clause 1.2.7 of the Code states: *"in the intended area of operation, suitable rescue facilities will be readily available."* Further, clause 1.4.12.1 states that a category A high-speed craft is one *"operating on a route where it has been demonstrated to the satisfaction of the flag and port States that there is a high probability that in the event of an evacuation at any point of the route all passengers and crew can be rescued safely within the least of:*

- *the time to prevent persons in survival craft from exposure causing hypothermia in the worst intended conditions,*

- *the time appropriate with respect to environmental conditions and geographical features of the route, or*

- *4 hours"*

Although the Code gives no guidance on what constitutes "suitable rescue facilities", the Permit to Operate should only be issued where the flag and relevant coastal State Administrations are satisfied that appropriate measures have been implemented and an appropriate assessment made that demonstrates to their satisfaction that the Code's requirements are met across the operational area.

4 MINIMUM AIR TEMPERATURE, VISIBILITY & DEPTH OF WATER (1.4.61)

Clause 1.4.61, in defining the Worst Intended Conditions, makes specific reference to the following parameters, which should therefore appear on the Permit to Operate, when appropriate:

- significant wave height
- wind force
- minimum air temperature
- visibility (eg. impaired vision and at night)
- minimum safe water depth.

5 SIGNIFICANT WAVE HEIGHT & MAXIMUM MEAN WIND SPEED FOR STABILITY AND BUOYANCY (CH. 2 & ANNEXES)

Several of the parameters used in evaluation of the stability and buoyancy relate to the environmental conditions. For example in:

- clause 2.6.11 the required minimum residual freeboard to downflooding is a function of the significant wave height corresponding to the Worst Intended Conditions; and

- Annex 7, 1.3 and 2.2, demonstration of sufficient residual stability uses the wind speed corresponding to the Worst Intended Conditions. Similarly in Annex 6, 1.1.4 and Annex 8, 1.1 and 2.1.4.3.

Therefore, the limiting significant wave height and the limiting mean wind speed used in compliance with the stability requirements should always be considered in setting the operational limits.

6 SAFE SEAKEEPING LIMITATIONS FOR DYNAMIC STABILITY (2.1.5, 18.1.3.2, 3.3 OF ANNEX 9)

Safe operation of most high-speed craft is significantly affected by the sea state. Safe seakeeping limitations may be as a result of some of the examples listed in clauses 2.1.5 and 17.5.4.1 of the Code, including most particularly: propensity to deck diving or broaching; incidence of hull or wet-deck slamming; plough-in, yawing and turning.

Implied but not explicit these limitations should also include excessively violent motions affecting the passengers and crew (see also 9 below).

Clause 18.1.3.2 of the 2000 HSC Code requires that the Administration be satisfied that the operating conditions on the intended route are within the capabilities of the craft. This should be verified during the trials conducted in accordance with Annex 9 and invoked by clause 17.2.1.

Administrations should note that clause 3.1.2 of Annex 9 of the Code explicitly states that "*worst intended conditions, referred to in 1.4.57 of this Code, are those in which it shall be possible to maintain safe cruise without exceptional piloting skill. However, operations at all headings relative to the wind and sea may not be possible."* This provision should be taken into account when setting operational limitations.

7 STRUCTURAL SAFETY OF CRAFT (CH. 3)

It is clearly vital to the structural integrity of a high-speed craft that the craft is not operated outside the limitations to which the structure has been designed.

Many classification society rules base their structural loadings on a nominal vertical acceleration (usually 1g) at the longitudinal centre of gravity. In order to avoid exceeding this structural limitation, the societies issue the craft with a diagram developed from this assumption, which relates the maximum permitted speed of the craft to the prevailing significant wave height. However such a diagram may only be applicable to head seas, which generally comprise the most onerous case.

Sometimes speed reduction in waves may be involuntary, due to increased resistance. But quite often, deliberate speed reduction may be required in order to stay within safe limits.

8 SAFE DEPLOYMENT OF EVACUATION SYSTEMS & SURVIVAL CRAFT (8.6.5)

The Code places great emphasis on the ability to evacuate a high-speed craft quickly and safely, the maximum evacuation time being linked (in 4.8.1) to the Structural Fire Protection time. To this end, 8.6.5 requires that: *"Survival craft shall be capable of being launched and then boarded ... in all operational conditions and also in all conditions of flooding ...."*

"All operational conditions" includes all conditions up to and including the Worst Intended Conditions (defined in 1.4.61). In implementing 8.6.5, flag Administrations should take account of whether the operating limitations of the craft are less restrictive than the conditions to which the craft's MESs and survival craft have been subjected during type-approval and as a result whether an evacuation in worst intended conditions is likely to be conducted in relative safety.

9 SAFE HANDLING LIMITATIONS (CH.17 & ANNEXES 3 AND 9)

The Code makes reference to three Safety Levels (see Table 1 in Annex 3) and prescribes the acceptable probability that each Safety Level may occur. Level 1 is expected to have a probability of occurrence of greater than 10^{-5}, i.e. Frequent or Reasonably Probable. Table 1 in Annex 3 reveals that for Safety Level 1 (Minor Effect) only prescribes that horizontal accelerations should not exceed 0.2g.

Whilst such a limitation is entirely appropriate, no limitation whatsoever is given in terms of vertical acceleration. In this context the question is whether people are liable to fall if standing or be thrown out of their seats due to excessively violent motion. Motion sickness is not the issue.

Similarly, Table 1 in Annex of the 2000 HSC Code stipulates acceptable maximum horizontal accelerations for severe and extreme operating conditions.

Table 2 in Annex 3 of the 2000 HSC Code makes it clear that Safety Level 2 relates to conditions when emergency procedures are required and passengers may be injured, and Level 3 to conditions when there is a large reduction in safety margins, and serious injury to a small number of occupants may occur.

The upper limit of Level 2 corresponds to the Worst Intended Conditions - see 3.3.2 of Annex 9 of the Code. The onset of Level 2 could be used to define the conditions in which passengers must be seated.

Many forms of high-speed craft may have safe handling limitations as suggested in 17.5.4.1 of the Code, for example:

- Amphibious hovercraft may have to avoid certain speed and drift angle combinations in order that plough-in or skirt tuck-under and possible capsizing do not occur.
- Many forms of high-speed craft may have to avoid excessive bow-down trim in order to preserve safe manoeuvring behaviour - see clause 17.2.1 of the 2000 HSC Code.

Chapter 17 of the 2000 HSC Code requires that safe handling limitations are determined by sea trials supplemented by model tests where appropriate, as described in Annex 9, and documented in the Craft Operating Manual. Sometimes such documentation may need to be reinforced by warning plaques.