

IMO DE50 CORRESPONDENCE GROUP ON GUIDELINES FOR OPERATING LIMITATIONS FOR HIGH-SPEED CRAFT

VERTICAL ACCELERATIONS

Introduction

Clause 3.3.2 of Annex 9 of the 2000 HSC Code states that in the Worst Intended Conditions *“nor shall any other craft characteristic motion ... exceed levels that could impede the safety of passengers.”*

The HSC Code does not elaborate on how this should be interpreted.

RINA has submitted that in view of this text, Administrations may at their discretion require that passengers should remain seated in conditions in which the maximum superimposed vertical acceleration in any part of the public spaces may exceed [0.5]g, and that in the Worst Intended Conditions such accelerations will not exceed [1.0]g, unless they are satisfied that the hazard to passengers has been adequately considered and addressed, for example by requiring that seat belts are worn.

The values of acceleration given above are tentative.

The purpose of this note is to consider what values may be appropriate for insertion.

Presentation

In Table 1 of Annex 3 of the 2000 HSC Code, values of acceleration are quoted as maxima.

Clause 3.2 of Annex 9 of the 2000 HSC Code suggests that peak accelerations can be extrapolated by multiplying RMS values by a factor of three.

For convenience, in this note, all subsequent accelerations are quoted as maximum values. Where necessary these are derived from RMS values by using this factor.

Discussion

Ref 1 provides various sources of criteria:

- Figure 9 presents peak acceleration against rise time for two levels of Dynamic Response Index (see Refs 2 to 5). This indicates that the spinal injury rate is not expected to exceed 0.1% if the peak acceleration is always below 3g.
- Table 6 presents NATO personnel criteria limits from Ref 6.
- Table 8 of Ref 1 summarises criteria for vertical and transverse accelerations from Refs 7 to 9.

Ref 10 summarises US Navy small craft criteria.

Refs 11 to 14 and 16 to 18 also suggest vertical acceleration criteria.

Comparison

The following table compares these various criteria, including for convenience the limits given in Table 1 of Annex 3 of the 20000 HSC Code, which it is understood derive from Ref 15.

Vertical acceleration	Transverse acceleration	Description	Source
3.0g		Spinal injury rate always less than 0.1%	Ref 1, Fig 9
1.5g		USN Endurance limit for crew for 1-2 hours (mean of 1/10th highest)	Ref 10
1.5g		Military functioning, max at LCG	Ref 16
1.0g		USN Endurance limit for crew for 4-8 hours (mean of 1/10th highest)	Ref 10
1.0g		Unpleasant but tolerable (does not state whether with seat belts or not)	Ref 17
1.0g	0.50g	Survivability	Ref 18
0.825g		Most of the attention devoted to keeping balance	Ref 11
0.825g		Simple light work, short periods on HSC	Ref 1, Table 8
	0.35g	HSC Code Safety Level 2 limit	Ref 15
0.60g	0.30g	Light manual work – fatigue sets in quickly	Ref 1, Table 8
0.60g	0.20g	NATO bridge limit default criteria	Ref 6
0.60g		Light manual work possible, causes fatigue quickly	Ref 12
0.60g		Fare paying passengers, max at LCG	Ref 16
0.45g	0.21g	Heavy manual work – fishing vessels	Ref 1, Table 8
0.40g	0.20g	Personnel carrying out operational duties	Ref 18
	0.20g	HSC Code Safety Level 1 limit	Ref 15
0.30g	0.15g	Intellectual work	Ref 1, Table 8
0.30g		Work of a more demanding type, long term tolerable for crew	Ref 13
0.15g	0.12g	Transit passengers	Ref 1, Table 8
0.15g		Passenger on ferry, limit for persons unused to ship motions	Ref 14

Proposal

From the above comparison it is suggested that the following guidance on maximum vertical acceleration may be appropriate:

Safety Level 1:	0.40g to 0.60g
Safety Level 2:	0.60g to 0.825g

References

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