(b) if the spaces are situated within the uppermost 'tween-deck; and

(i) if the tonnage mark is *not* submerged, the spaces should be *exempt* from inclusion in the gross tonnage;

(ii) if, on the other hand, the tonnage mark *is* submerged, the spaces should be *included* in the gross tonnage (paragraph 6).

ENTRY IN THE TONNAGE CERTIFICATE OF INFORMATION ON THE SPACES EXEMPTED

9. Pertinent information on the spaces which have been exempted from inclusion in the gross tonnage in accordance with paragraphs 8(a) and 8(b)(i) should be entered in the tonnage certificate, in a manner similar to the present practice in regard to the spaces not included in the gross tonnage.

CONTROL OF TONNAGE

10. *Tonnage certificate.* If a ship has a tonnage mark, the tonnage certificate of the ship should show two sets of gross and net tonnages determined in accordance with paragraph 8 above, except that when the statutory load-line is assigned on the assumption that the second deck is the freeboard deck and the tonnage mark is placed at the same level as the load-line mark, only one set of tonnages need be shown. (The term 'tonnage certificate' also covers the 'certificate of registry'.)

VALIDATION OF APPLICABLE TONNAGE

11. The applicable set of tonnages should be determined either (a) in accordance with the ship's loading condition, i.e. whether the tonnage mark is submerged or not, or (b) by the validation by the national authorities concerned of either of the two sets of tonnages for a certain period or for the voyage, as appropriate.

USES OF DUAL TONNAGES

12. When the tonnage certificate shows two sets of tonnages the higher set of tonnages will apply for the purposes of safety. Apart from this safety consideration, the choice between the two sets of tonnages for any particular purpose is left to the interests concerned.

APPLICATION

13. The above provisions should be applicable to all ships, whether existing or new.

RELATIONSHIP TO ANY UNIVERSAL SYSTEM OF TONNAGE MEASUREMENT

14. The above provisions should not necessarily form an integral part of any universal system of tonnage measurement.

EXCHANGE OF INFORMATION BETWEEN GOVERNMENTS

15. Governments should exchange, through the Organization, relevant information as to their practices in the matters covered by these Recommendations, the object being to ensure international uniformity as far as practicable in the interpretation and application of the Recommendations.

18 October 1963
Agenda item 12

Resolution A.49 (III)

APPROVAL OF THE RECOMMENDATIONS OF THE MARITIME SAFETY COMMITTEE ON STABILITY INFORMATION FOR SHIPS CARRYING GRAIN

The Assembly,

Taking note of Article 16(i) of the Convention concerning the functions of the Assembly,

Noting further Articles 22 and 30 of the Convention which set out the procedure for consideration and adoption of recommendations to members concerning maritime safety,

Noting in addition that the Recommendations of the Maritime Safety Committee were considered by the Council at its ninth session and transmitted to the Assembly,

Bearing in mind Regulation 12, Chapter VI – Carriage of Grain – of the International Convention for the Safety of Life at Sea, 1960, relating to the requirements for carriage of grain in specially constructed ships, and in particular paragraph (a) of that Regulation,

Noting that many countries already use the requirements of Chapter VI of the International Convention for the Safety of Life at Sea, 1960, as an equivalent to the corresponding requirements of the International Convention for the Safety of Life at Sea, 1948,

Having considered the Recommendations of the Maritime Safety Committee on stability information for ships carrying grain,

Decides

(1) to endorse the Recommendations as set out in the Annex on stability information for ships carrying grain in accordance with Regulation 12, Chapter VI, of the International Convention for the Safety of Life at Sea, 1960;

(2) to recommend that governments concerned give effect to these Recommendations;

(3) to recommend that governments, through the Secretariat, should exchange information on the action taken in this respect.

ANNEX

Recommendations on Stability Information for Ships carrying Grain

1. Regulation 12 of Chapter VI – Carriage of Grain – of the International Convention for the Safety of Life at Sea, 1960, relates to specially constructed ships with two or more vertical or sloping grain-tight longitudinal divisions suitably disposed to limit the effect of any transverse shift of grain.
2. In such ships, bulk grain may be carried without regard to special stowage conditions laid down for other ships (Regulations 4–11 of Chapter VI). Regulation 12 requires that the angle of heel caused by the shift of grain to a specified angle (8° if bulk grain is overstowed and 12° if not overstowed) after 2% sinkage by volume should not be greater than 5°. It further requires that masters of such ships should be provided with a grain loading plan and stability booklets approved by the Administration.
3. In order to assist masters of ships carrying grain in accordance with Regulation 12 to make the necessary calculations of the angle of heel to which the ship might list during the voyage and thus ensure that the ship will not exceed the prescribed angle of heel, the stability information supplied to masters, as required by Regulation 12(a)(iii), should contain information on heeling moments caused by shifting of grain cargo having different stowage factors.
4. These data should be given separately for each hold and information for the centre holds should cover both the following conditions: when the hold is overstowed and when not overstowed.
5. The heeling moments should be obtainable for various depths (or ullages) and stowage factors of grain loaded. Details should be given of the position of centre of gravity of cargo in relation to the depth of grain.
6. This information may be given in graphic, tabular, or any equivalent form. Appendices I and II show possible forms of presentation, but these are not intended to be exclusive.

APPENDIX I

Additional Data for Stability Booklets supplied to Masters of Ships carrying Grain, in accordance with Regulation 12, Chapter VI, of the International Convention for the Safety of Life at Sea, 1960

(Possible form of presentation)

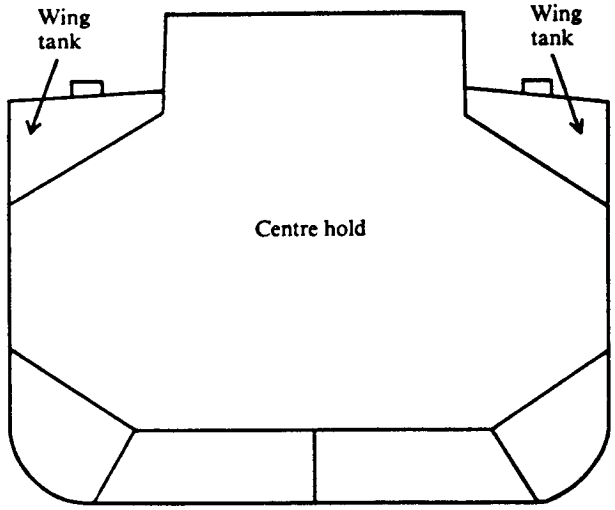
Additional data to be included for each cargo hold separately are shown in the two *pro forma* pages attached to this Appendix.

Explanatory notes on the preparation of these data

1. Each hold should be represented by a sketch outline of the transverse section.
2. Capacity and dimensions should be given for each hold.
3. A graph representing depth of grain, on loading and when levelled, in each hold against the heeling moment caused by the shift of a surface wedge of the grain from the horizontal of 12° after 2% sinkage by volume, should be shown for each compartment which may contain grain without overstow.
4. A further graph representing the depth of grain against the heeling moment should be shown for each centre hold when this hold is overstowed; in this case the heeling moments should be calculated after 2% sinkage by volume and a shift of the surface from horizontal of 8°.
5. Each graph should show the maximum heeling moment which will occur in the hold when the surface wedge assumed to shift is of grain stowing at 45, 55 and 65 cubic feet per ton, or of corresponding values in the metric system. It may be of some advantage to incorporate in the booklet another scale of cubic capacity against depth of grain for the compartments in each hold.
6. The graph should incorporate a scale of KG values (centre of gravity above keel) for both wing tank and centre hold against the depth of the grain on loading and when levelled.
7. For the purpose of these calculations it is proposed that any increase in the metacentric height due to a reduction in KG value when sinkage occurs in a partly filled hold or in a wing tank be disregarded.
8. The reduction in KG value due to a sinkage of 2% by volume in each centre hold when full should be stated.
9. The units used should be specified for all data.

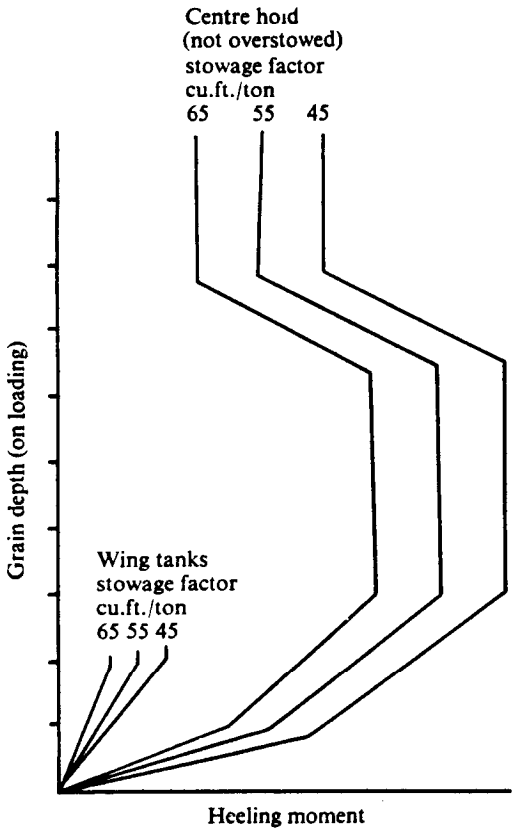
Instructions for the Master

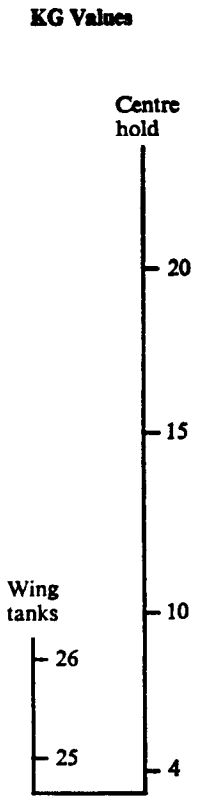
1. Before commencing to load grain the master should prepare a calculation of metacentric height for the projected voyage.
2. Deductions from the metacentric height should be made for the assumed loss of metacentric height due to the free surface effects of liquids in tanks.
3. The reduction in KG value for centre holds, when filled, due to a 2% sinkage by volume should be applied in calculating the metacentric height.

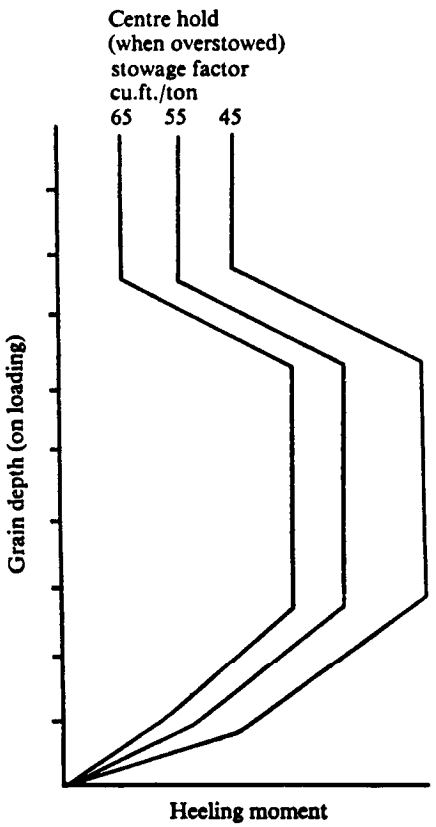


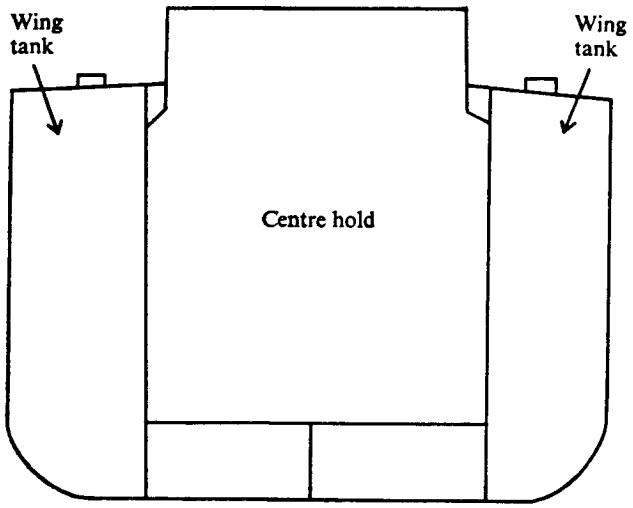
S.S. 'Nonesuch'
Hold No. 2

Hold capacity ..... cu.ft. or m³
Hatch capacity..... cu.ft. or m³
Maximum hold length.... ft. or m
Maximum hold width .... ft. or m
Maximum hold depth .... ft. or m
Reduction in KG value
due to 2% sinkage of
grain in full hold ..... ft. or m



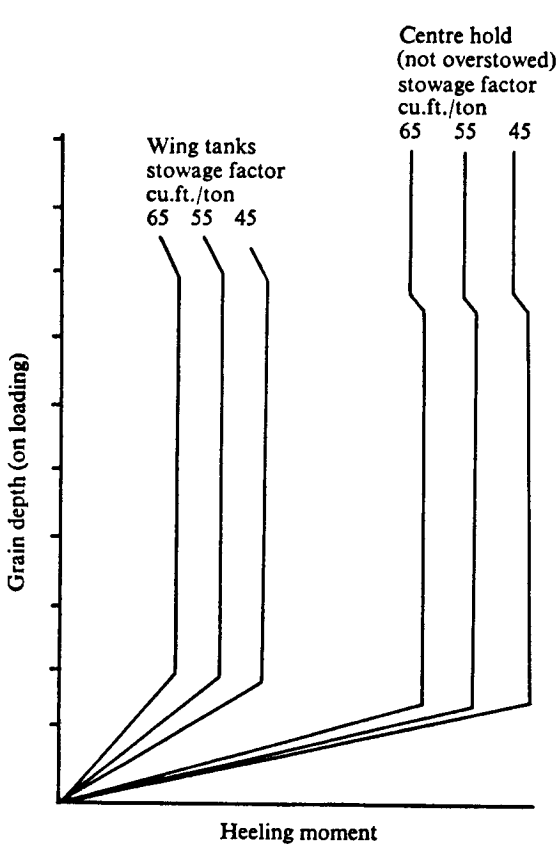


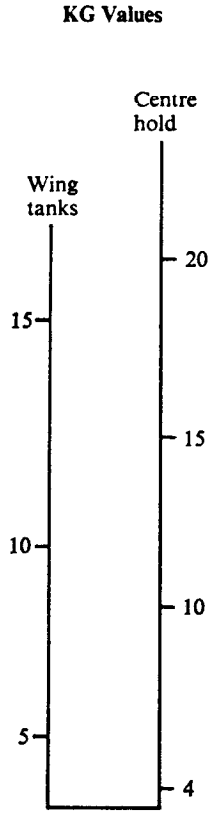


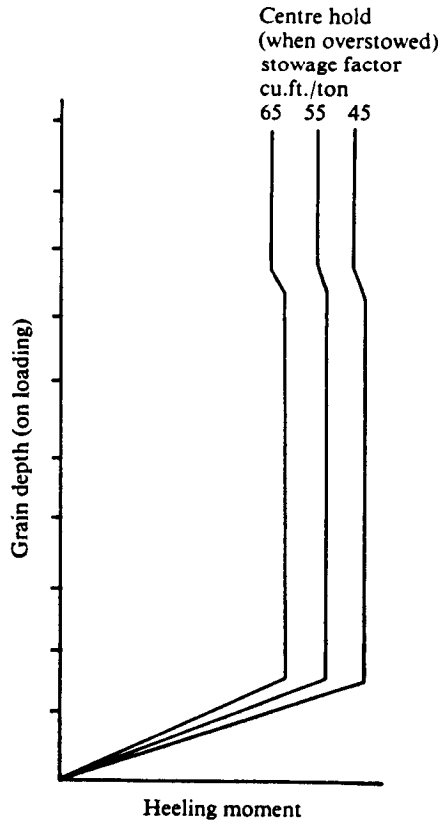


S.S. 'Nonesuch'
Hold No. 3

Hold capacity ..... cu.ft. or m³
Hatch capacity..... cu.ft. or m³
Maximum hold length.... ft. or m
Maximum hold width .... ft. or m
Maximum hold depth .... ft. or m
Reduction in KG value
due to 2% sinkage of
grain in full hold ..... ft. or m







4. The sum of heeling moments should be combined from the individual moments of holds and wing tanks containing grain.

5. The displacement on departure and on arrival at the discharge port should be taken from the displacement and deadweight scale which must be included in the stability booklet.

6. The angles of heel for departure from the loading port and arrival at the discharge port should be determined from the following formula:

$$\text{Tangent of angle of heel} = \frac{\text{Sum of heeling moments}}{\text{Displacement} \times \text{GM (corrected)}}$$

APPENDIX II

ADDITIONAL DATA FOR STABILITY BOOKLETS SUPPLIED TO MASTERS OF SHIPS CARRYING GRAIN, IN ACCORDANCE WITH REGULATION 12, CHAPTER VI, OF THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1960

(Possible form of presentation)

EXPLANATORY NOTES

The following curves should be given for each hold, as shown on the *pro forma* page given below:

- curve of grain capacity (in cubic feet or cubic metres);
- curve of position of centre of gravity above base line (in feet or metres);
- curve of heeling moments (in feet^4 or metres^4) due to shift of grain which, after application of a stowage factor gives the heeling moment in tons–feet or tons–metres.

These curves should be shown against the ullage below the top of the hatch at the mid-length on the centre line (in feet or metres) on loading and when levelled.

The curve of heeling moments should be estimated assuming a 2% sinkage by volume followed by a shift of grain surface to an angle of 12° with the horizontal for cases where there is no overstowing. In cases where overstowing is used (assumed shift is 8°) the heeling moment can be taken as 70% of that given for the 12° shift.

To ensure that the possible angle of heel due to shift of grain for a particular loading does not exceed that prescribed (5°), the usual trim calculation is made and the longitudinal position of the vessel's centre of gravity is obtained, together with the transverse metacentric height corrected for effect of liquid free surface (GM_c).

The angle of heel (θ) will be determined from the following formula:

$$\text{Tan } \theta = \frac{M}{\Delta \times GM_c \times \rho}$$

(Tan θ must be less than 0·0875 to satisfy the requirements of the Convention)

or alternatively:

$$\theta^\circ = \frac{57{\cdot}3 \times M}{\Delta \times GM_c \times \rho}$$

(θ must be less than 5° to satisfy the requirements of the Convention)

Where:

M = total grain heeling moment in feet^4

Δ = vessel's displacement in tons

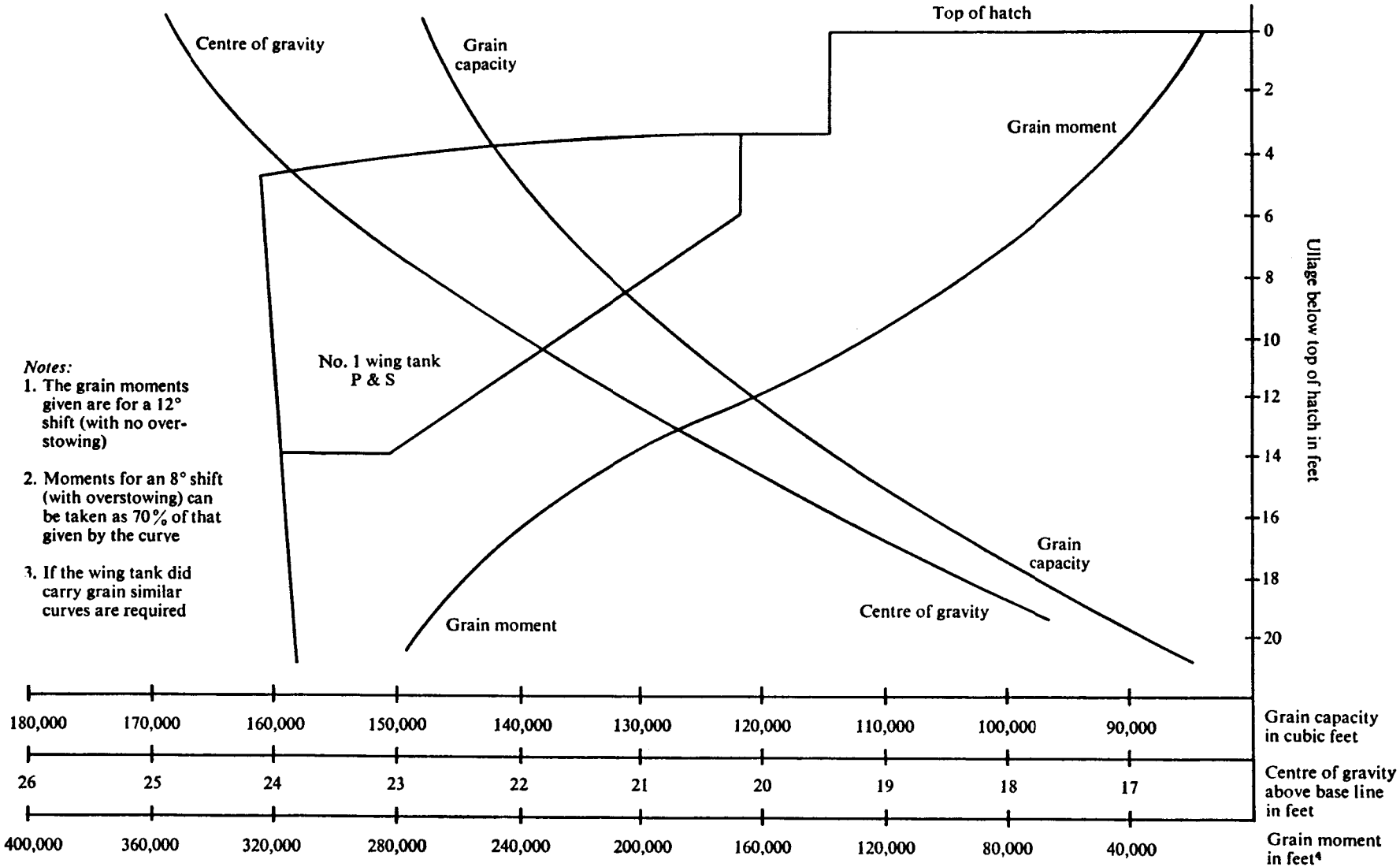
GM_c = transverse metacentric height in feet corrected for liquid free surface

ρ = stowage factor in cubic feet per ton.

A sample calculation is given on page 11.

PRO FORMA PAGE

HOLD No. 2 (67′ 3″ long)



Notes:

1. The grain moments given are for a 12° shift (with no over-stowing)
2. Moments for an 8° shift (with overstowing) can be taken as 70% of that given by the curve
3. If the wing tank did carry grain similar curves are required

Example

LOADED DEPARTURE CONDITION WITH GRAIN CARGO HOMOGENEOUSLY STOWED AT 46 CUBIC FEET PER TON IN NOS. 2, 3, 4, 5 AND 6 HOLDS, ALL HOLDS BEING SLACK. THE ULLAGES FOR EACH HOLD ARE LISTED BELOW.
VESSEL'S DISPLACEMENT: 21,059 TONS

Metacentre above the base line KM=28·42 feet

(1) CARGO WEIGHT, POSITION OF CENTRE OF GRAVITY ABOVE BASE LINE AND HEELING MOMENT

Hold No.	Ullage in feet and inches	Capacity in cubic feet (from curves)	Position of centre of gravity above base	Vertical moments in feet⁴	Heeling moments in feet⁴ (from curves)	Remarks
1	—	—	—	—	—	Empty
2	0′ 6″	146,900	24·77	3,638,713	21,000	No overstowing
3	6′ 0″	141,800	22·36	3,170,648	57,000	,, ,,
4	9′ 0″	133,200	20·97	2,793,204	101,000	,, ,,
5	10′ 6″	129,600	20·54	2,661,984	128,000	,, ,,
6	10′ 6″	144,000	24·23	3,489,120	19,000	,, ,,
		695,500	22·65	15,753,669	M=326,000	

Cargo weight $= \frac{695{,}500}{46} = 15{,}120$ tons

(2) TRANSVERSE METACENTRIC HEIGHT

Item	Tons	Position of centre of gravity above base	Vertical moments in tons–feet
Light ship	5,259	26·00	136,734
Fuel, fresh water, stores, etc.	680	22·80	15,504
Grain cargo-see (1)	15,120	22·65	342,468
DISPLACEMENT	21,059	23·49	494,706
Transverse metacentre above base		28·42	
Transverse metacentric height (uncorrected)		+4·93	
Liquid free surface correction		−0·14	
Transverse GM (corrected for liquid free surface)		+4·79	

Estimated angle of heel $\theta° = \frac{57{\cdot}3 \times 326{,}000}{21{,}059 \times 4{\cdot}79 \times 46} = 4{\cdot}1°$ (less than 5°, therefore satisfies the requirements of the Convention)

18 October 1963
Agenda item 12