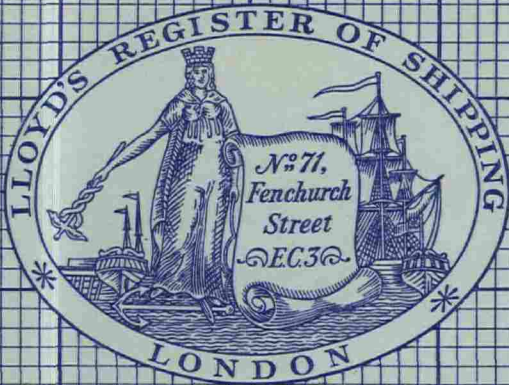


ARCHIEF



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Losses of Small Ships

*Paper read at the Institution
of Naval Architects in March,
1958*

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LOSSES OF SMALL SHIPS

By C. V. MANLEY (Associate)*

Read in London at the Spring Meeting of The Institution of Naval Architects on March 26, 1958, Professor E. V. Telfer, D.Sc., Ph.D. (Vice-President), in the Chair.

Particulars of world losses of merchant ships consequent upon casualty have been recorded by Lloyd's Register since the end of last century. The proportion of such losses, in relation to the total tonnage owned, has steadily decreased, as will be seen from the following figures:—

STEAMERS AND MOTORSHIPS TOTALLY LOST, CONSEQUENT UPON CASUALTY FROM ALL CAUSES (MAKING NO ALLOWANCE FOR SPECIAL TYPES)

Year	Number	Tons gross	Percentage of total tonnage owned
1903	237	298,376	1.14
1908	304	419,806	1.24
1913	295	445,265	1.09
1923	324	494,364	0.82
1928	288	481,528	0.77
1933	245	362,781	0.54
1938	217	361,195	0.56
1948	196	222,501	0.27
1953	226	322,222	0.35
1956	163	248,535	0.24

The casualties are recorded under the following headings:—

- Abandoned, Foundered, Missing.
- Burnt.
- Collision.
- Wrecked (stranding, striking rocks, sunken wrecks, etc.).
- Broken up, Condemned (consequent upon stress of weather, etc.).
- Lost, etc. (total losses which for want of sufficient information cannot be otherwise classified).

The losses of steamers and motorships recorded under the four main heads during various years since 1926 are given in Table I. (See pp. 5-12 for Tables I to XIII.)

It will be noted that the average size of ship is smallest in the category Abandoned, Foundered, Missing, and the next lowest size is represented by Collision Losses. The highest average size of ship is for Fire Losses. The approximate figures are:—

	Average size of ship (tons gross)
Abandoned, foundered, missing	890
Collision	1,120
Wrecked	1,630
Burnt	1,820

These figures include all merchant ships over 100 tons gross, of every type, service, and material of construction. In the survey which follows, wood and composite ships, sailing and auxiliary ships, fishing craft, tugs, dredgers, river ships, and other specialized types, have been eliminated, and a detailed study has been made of those casualties which apply to steel and iron ships engaged in normal peace-time sea-going merchant trading.

Strandings, etc., and Losses by Fire

An examination of the total losses reported under these heads during the five years 1951-55, special types being eliminated, gives the following result:—

	Wrecked		Burnt	
	Number	Percentage of total	Number	Percentage of total
Under 1,000 tons gross (200 ft. and below)	142	52½	15	43
1,000 to 2,500 tons gross (201 ft.-300 ft.)	42	15½	2	5½
2,501 to 5,500 tons gross (301 ft.-400 ft.)	48	18	10	28½
Over 5,500 tons gross ..	39	14	8	23
Total	271		35	

Losses by Collision

A similar analysis made by the author in 1954 of the total losses of steel sea-going merchant ships due to collision damage during a sample period of seven years, 1946 to 1952, shows that the majority occur to small ships.

The number of ships so lost during those seven years was 74, aggregating 98,500 tons gross; 81 per cent were under 300 ft. in length, and 57 per cent were below 200 ft. Only four ships were over 400 ft. long.

COLLISION LOSSES

1946-1952	Number	Percentage of total	Tons gross
200 ft. and below	42	57	17,900
201 ft.-300 ft.	18	24	28,700
301 ft.-400 ft.	10	13½	27,200
Over 400 ft.	4	5½	24,700
Total	74		98,500

* Clerk to the Technical Committee, Lloyd's Register of Shipping.

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Seventy-five per cent of the total were ships having one deck. Only 18 ships had two or more decks; 10 of these were shelter or awning deckers.

No figures are available of the total number of cases of damage through collision, but it is probably true to say that practically all ships suffer this common sea risk on various occasions in their lives. It would seem, however, that where exceptionally severe damage occurs it is, in general, only the small ships which fail to remain afloat.

It will be noted that during the sample periods investigated, more than one-half of the fire losses occurred to ships over 300 ft. long, but that in the case of ships wrecked, or lost by collision, the small ship predominates.

So far as strandings are concerned, it has to be remembered that the small ship is engaged mainly in coastwise trade, and may be regarded as more liable to this form of casualty.

In the event of collision it is reasonable to assume that the smaller of the two ships involved would be more likely to suffer severe damage. This result, therefore, is to be expected.

The same remarks do not necessarily apply to ships reported abandoned, foundered, or missing, and a special study has been made of these.

Ships Reported Abandoned, Foundered, or Missing

In 1949* and 1950† the author presented the results of a fifty years' survey of casualties to steel and iron sea-going ships reported abandoned, foundered, and missing since the end of last century. The examination showed, *inter alia*, that three-quarters of the casualties were to ships 300 ft. in length and below; that the majority at time of loss carried heavy bulk cargoes, coal carriers accounting for 27 per cent; that less than one-third of the losses took place during ocean voyages; and that an unusually high proportion of ships were lost during the first five years of age.

The further investigation now undertaken includes the ten post-war years 1946 to 1955, and a study has been made of the types of ships involved as indicated by the records of decks and superstructures. This survey, like the previous one, does not cover losses due to fire, stranding, explosion, or collision; it is confined to those ships which disappear at sea or become so unseaworthy that they founder, or have to be abandoned, and are totally lost. The results are tabulated in five-year periods from 1899 to 1955, war years being omitted.

The number of ships involved is 1,619, an annual average of 36, viz.:—

Period	Number of casualties	Annual average
1899-1903	194	38.8
1904-1908	211	42.2
1909-1913	219	43.8
1919-1923	283	56.6
1924-1928	183	36.6
1929-1933	141	28.2
1934-1938	151	30.2
1946-1950	102	20.4
1951-1955	135	27.0
Total ..	1,619	36.0

A striking feature is the contrast between the post-war periods following the two World Wars. In 1919-23 the number of such losses was the highest recorded; in 1946-50 it was the lowest.

* TRANS. I.N.A. 1950, p. 59. † TRANS. I.N.A. 1951, p. 95.

Size of Ship

Details of the casualties arranged under divisions of length are given in Table II. It will be noted that 79 per cent of the casualties occurred to ships below 300 ft. in length; that for ships below 200 ft. the annual average in 1899-1903 was 14, and in 1951-55 was 16.4; and that above 400 ft. the losses have remained consistently low, although the number of ships at risk has progressively increased.

The trend of these losses, expressed as a percentage of the total number of ships reported abandoned, foundered, and missing is shown in Fig. 1.

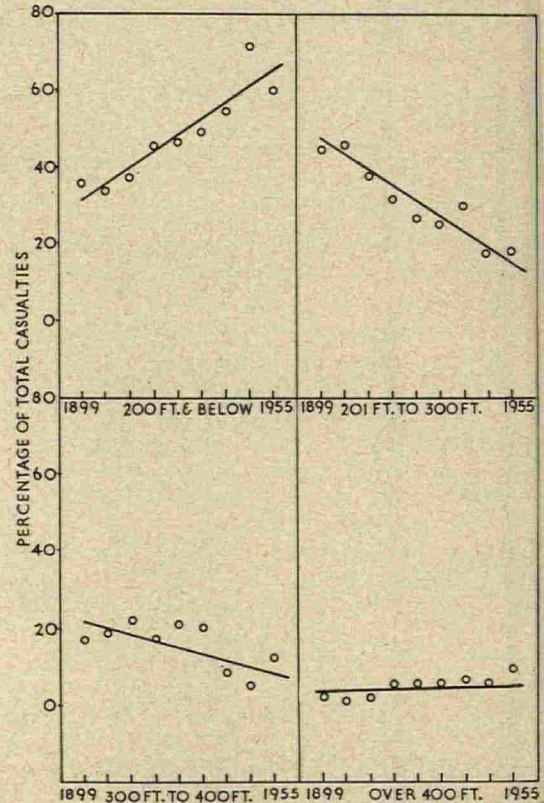


FIG. 1.—SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING. TREND OF CASUALTIES, 1899 TO 1955

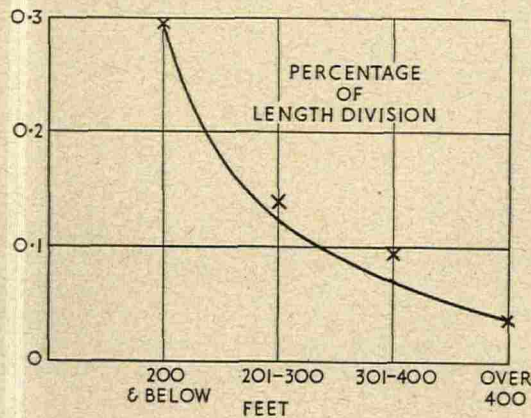
Relationship of Casualties to Total Tonnage at Risk

The desirability of ascertaining the relationship of the casualty figures to the total number of ships at risk is appreciated. To do so, an allowance in the totals owned has to be made for the specialized types which are ignored as casualties. For this purpose an estimated deduction has been made from the total owned below 200 ft. in length, and the U.S.A. reserve fleet (which is not at risk) is excluded. On this basis, taking the last casualty period (1951-55), and the year 1953 as representative of the total ships owned, we get the following result:—

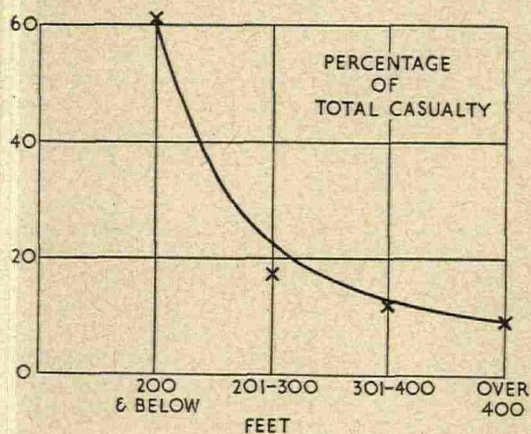
Ship Length Category	Casualty percentage of total number of ships at risk
200 ft. and below	0.30
201 ft.-300 ft.	0.14
301 ft.-400 ft.	0.09
Over 400 ft.	0.04

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This is shown graphically below:—



This compares closely with a similar graph drawn on the basis of percentage of total casualty, which shows the same comparative trend:—



It will be of interest to show the trend of the corresponding groups of tonnage owned, as a percentage of the total owned in the world since 1921. This is shown graphically in Fig. 2.

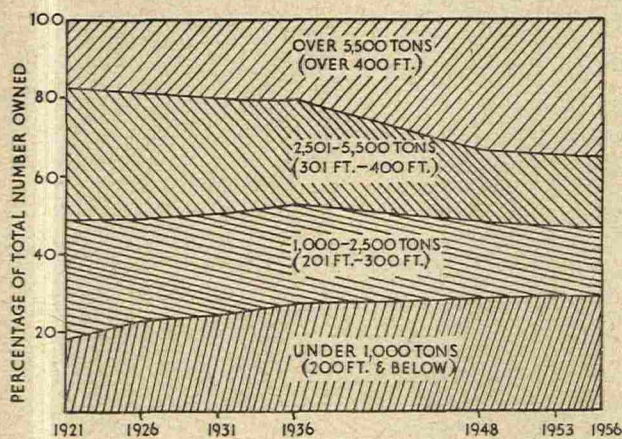


FIG. 2.—NUMBER OF IRON AND STEEL SEA-GOING MERCHANT SHIPS OWNED IN THE WORLD, 1921-1956 (AFTER ESTIMATED DEDUCTIONS FOR SPECIAL TYPES IGNORED AS CASUALTIES) SHOWING PERCENTAGE OF TOTAL IN DIFFERENT DIVISIONS OF SIZE

Ages of Ships

Table III gives details of the ages of the ships at time of casualty, and these are shown graphically in (Fig. 3). A

point of interest is that ships 1-5 years old show a higher percentage of loss than in any subsequent group until we come to the very old ships.

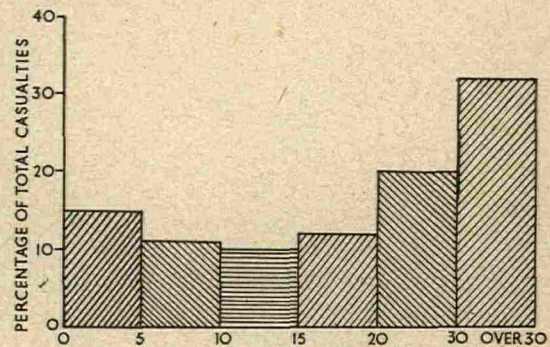


FIG. 3.—AGES OF SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING, 1899-1955

Cargoes

During the post-war years 1946-55 the percentage of loss of coal carriers and of ships carrying grain has decreased, and that for ships carrying ore and other bulk cargoes has increased. Of the total losses since 1919, coal carriers represent 22.7 per cent, ore carriers 8 per cent, other heavy bulk cargoes 15 per cent. Details are given in Table IV.

Voyages

It was previously demonstrated that from 1919-38, 70 per cent of the casualties occurred during winter voyages, and that the winter losses of ships reported missing averaged 84 per cent. During the two post-war periods 1946-50 and 1951-55, the winter losses were 73½ per cent and 71½ per cent respectively, and the winter voyages of ships reported missing averaged 90 per cent and 86 per cent.

Types of Ships

An analysis has been made of the types of ships reported abandoned, foundered, or missing, under the following heads:—

Ships having one deck.

- One deck, with erections extending over more than 50 per cent of length of ship.
- One deck, with erections less than 50 per cent of length of ship.
- One deck, with raised quarter deck.

Ships having two or more decks

- One deck and shelter or awning deck.
 - One deck and spar or shade deck.
 - Two or more complete decks.
- Details are given in Tables V, VI, VII, and VIII.

Of the ships 200 ft. in length and below, 95 per cent were one-deck ships; 62 per cent had erections less than 50 per cent of length; 4 per cent erections over 50 per cent; and 29 per cent were of the raised quarter deck type. (Table V and Fig. 4.)

Between 201 ft. and 300 ft., 68 per cent were ships with one deck, 32 per cent having erections under 50 per cent, and 6 per cent erections over 50 per cent; 30 per cent were of the raised quarter deck type; 5 per cent were shelter or awning deckers; 17 per cent had two or more complete decks. (Table VI and Figs. 5 and 6.)

Between 301 ft. and 400 ft., 30 per cent were ships with one deck, 22½ per cent having erections less than 50 per cent of length, 11 per cent were shelter or awning deckers, 26 per cent spar or shade deck type, and 33 per cent had two or more complete decks. (Table VII and Fig. 7.)

LOSSES OF SMALL SHIPS

Over 400 ft., 12 per cent had one deck only; 38 per cent were shelter or awning decks; 13 per cent spar or shade deck type; and 37 per cent had two or more complete decks. (Table VIII.)

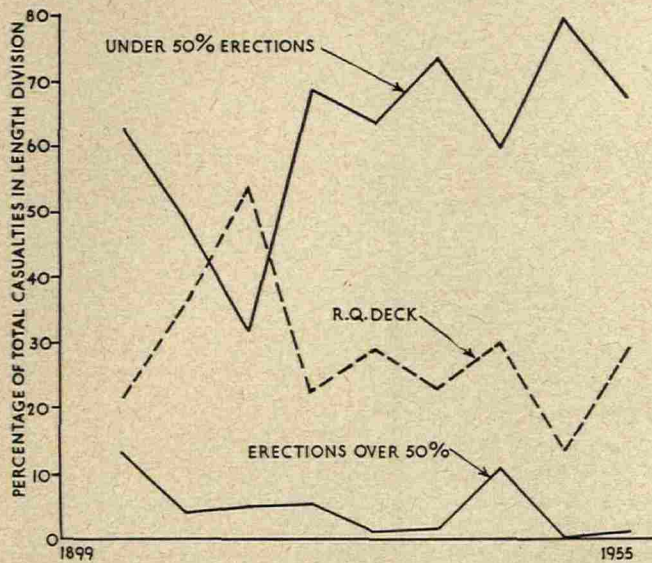


FIG. 4.—SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING, 1899-1955, 200 FT. AND BELOW. SHIPS HAVING ONE DECK

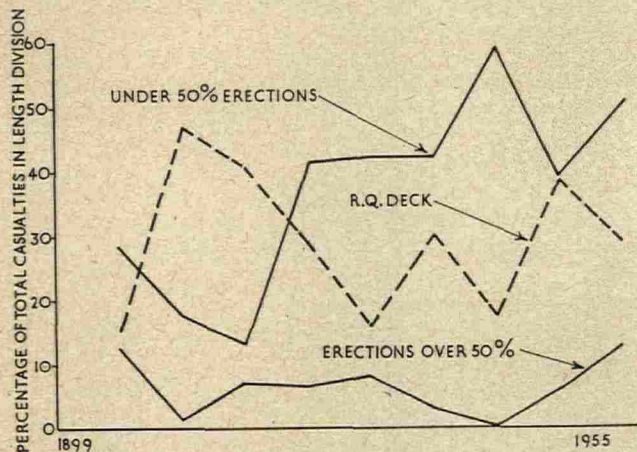


FIG. 5.—SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING, 1899-1955, 201 FT. TO 300 FT. SHIPS HAVING ONE DECK

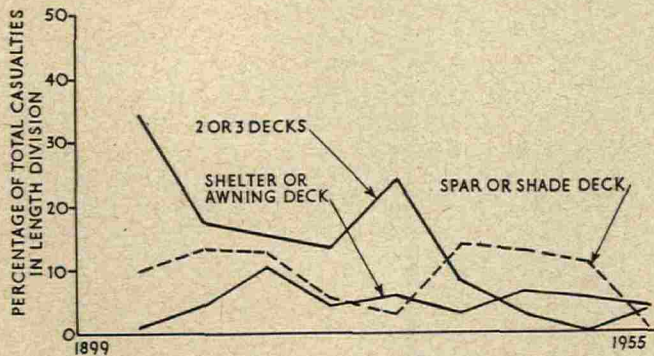


FIG. 6.—SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING, 1899-1955, 201 FT. TO 300 FT. SHIPS WITH TWO OR MORE DECKS

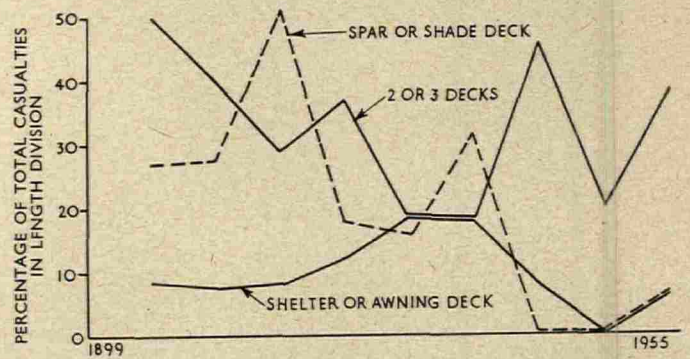


FIG. 7.—SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING, 1899-1955, 301 FT. TO 400 FT. SHIPS WITH TWO OR MORE DECKS

Ships 300 ft. in length and below reported Abandoned, Foundered, Missing, 1919-55

A special study has been made of the casualties since 1919 to ships 300 ft. long and under, which represent 79 per cent of the total. Details are given in Tables IX, X, XI, XII, and XIII. The number of ships involved, in relation to the total in all length divisions, is:—

1919-1955	Number	Percentage
200 ft. and below	524	52.7
201 ft. to 300 ft.	264	26.5
301 ft. to 400 ft.	149	15.0
Over 400 ft.	58	5.8
Total	995	100.0

The types of ships lost were:—

300 FT. AND BELOW

1919-1955	Number	Percentage
One deck, erections over 50 per cent	30	3.8
One deck, erections under 50 per cent	480	61.0
One deck and raised quarter deck ..	196	24.8
Shelter or awning deck	19	2.5
Spar or shade deck	24	3.0
Two or more complete decks	39	4.9
Total	788	100.0

The ages of ships 300 ft. and below at time of casualty, distinguishing the different types of ship, are given in Tables IX and X. It will be seen that they follow the same general pattern as the total casualties, 15½ per cent occurring to ships in the first five years of age—the highest percentage up to 30 years of age. For ships 200 ft. and below, the age pattern follows a descending curve up to 20 years, namely:—

	Per cent
1 to 5 years	15.5
6 to 10 years	11.1
11 to 15 years	8.6
16 to 20 years	7.8

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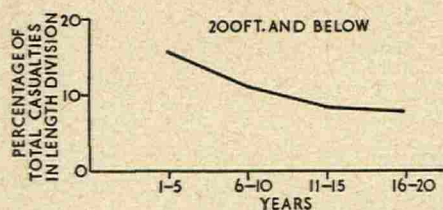


FIG. 8. AGES OF SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING, SHOWING THE TREND OF LOSSES OF SHIPS 200 FT. AND BELOW DURING THE FIRST 20 YEARS OF AGE

Of the ships having one deck, only 30 were recorded as having erections over 50 per cent of length; of these, 8 ships (27 per cent) were five years of age or under at time of loss.

Heavy bulk cargoes represented 51 per cent of the total, coal carriers accounting for 24 per cent, ore and other heavy dry cargoes for 27 per cent. Of the raised quarter deck type, 33 per cent carried coal, and 30 per cent grain, ore, or other heavy bulk dry cargoes. (Table XI.)

Only 18 per cent of the losses took place on ocean voyages. Of those in continental waters, 53 per cent occurred in the North Sea and North European waters, English Channel, and Bay of Biscay; 21 per cent occurred during Mediterranean and South European voyages. Fifty-six ships (8.7 per cent) were lost in the English Channel. (Tables XII and XIII.)

Conclusions

General

The proportion of losses consequent upon all types of casualty, in relation to the total tonnage owned, has progressively decreased from 1.14 per cent in 1903 to 0.24 per cent in 1956.

Strandings, etc., and Losses by Fire

During the sample period of five years investigated, 68 per cent of the ships wrecked, and 48½ per cent of those lost by fire, were below 300 ft. long; 23 per cent of the fire losses related to ships over 400 ft. in length.

Collision Losses

The annual loss due to collision damage is low, averaging ten ships during the period of seven years investigated; 81 per cent were under 300 ft. in length.

Ships reported Abandoned, Foundered, or Missing

Since 1899, 79 per cent of the total number of ships reported abandoned, foundered, or missing were below 300 ft. in length.

The percentage of such casualties to ships of 200 ft. and below has progressively increased. During 1899-1913 the average was 36 per cent of the total; in 1919-1938 they averaged 48 per cent; in 1946-55 the average was 66 per cent.

Up to 1938, 70 per cent of the total losses occurred during winter voyages, and the winter losses of ships reported missing averaged 84 per cent. During 1946-55, the corresponding percentages were 72½ per cent and 88 per cent.

New ships in the first five years of age represented 15 per cent of the total casualties.

Below 300 ft. the great majority of ships lost were ships having one deck with erections less than 50 per cent of the length; 29 per cent were of the raised quarter deck type.

Above 300 ft., 73½ per cent of the ships had more than one deck; of these, 16½ per cent were shelter or awning deckers, 23 per cent were of the spar or shade deck type, and 34 per cent had two or more complete decks.

From 1919 to 1955, 53 per cent of the total casualties were to ships carrying heavy or bulk dry cargoes (coal, ore, and similar heavy cargoes, grain). The lowest percentages were: oil or molasses, 2.9 per cent; ballast, 3.0 per cent.

Below 300 ft., 51 per cent carried heavy bulk cargoes, but in ships of raised quarter deck type the proportion of losses whilst carrying heavy bulk cargoes was 63 per cent.

The author desires to thank the Committee of Lloyd's Register for permission to publish the paper, and to make use of information compiled by the Society, but wishes to emphasize that the Committee are in no way responsible for the manner in which this information has been presented. He also expresses his appreciation of the helpful co-operation of Mr. W. J. Beer, F.S.S., of the statistical department of Lloyd's Register, in certain aspects of the investigation.

TABLE I

TOTAL LOSSES OF STEAMERS AND MOTORSHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING; BURNT; LOST BY COLLISION; WRECKED (MAKING NO ALLOWANCE FOR SPECIAL TYPES)

Year	Abandoned, foundered, or missing		Burnt		Collision		Wrecked	
	Number	Tons gross	Number	Tons gross	Number	Tons gross	Number	Tons gross
1926	76	64,937	37	72,725	36	55,495	146	234,650
1931	49	36,879	20	50,642	24	23,662	140	206,157
1936	57	60,977	26	59,696	28	36,892	147	196,602
1946	28	32,563	16	45,833	19	23,671	86	196,766
1947	43	22,310	26	75,374	17	17,245	91	226,525
1948	48	41,654	24	33,313	11	8,138	94	125,462
1949	57	26,281	28	34,567	29	17,739	91	143,043
1950	52	28,772	25	46,295	14	14,969	111	148,787
1951	50	69,751	16	32,671	20	17,431	98	115,419
1952	51	42,731	22	17,598	19	28,391	79	127,777
1953	60	61,374	33	60,005	32	47,678	87	117,300
1954	54	70,344	18	35,140	13	10,093	84	140,802
1955	43	34,910	13	10,249	34	51,379	75	145,662

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TABLE II

SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING, 1899-1955

Size of Ships (Length)

Period	200 ft. and below No.	Annual average	201 ft. to 300 ft. No.	Annual average	301 ft. to 400 ft. No.	Annual average	Over 400 ft No.	Annual average	Total No.	Annual average
1899-1903	70	14.0	86	17.2	34	6.8	4	0.8	194	38.8
1904-1908	72	14.4	97	19.4	40	8.0	2	0.4	211	42.2
1909-1913	82	16.4	84	16.8	49	9.8	4	0.8	219	43.8
1919-1923	129	25.8	90	18.0	49	9.8	15	3.0	283	56.6
1924-1928	86	17.2	50	10.0	38	7.6	9	1.8	183	36.6
1929-1933	70	14.0	36	7.2	28	5.6	7	1.4	141	28.2
1934-1938	83	16.6	46	9.2	13	2.6	9	1.8	151	30.2
1946-1950	74	14.8	18	3.6	5	1.0	5	1.0	102	20.4
1951-1955	82	16.4	24	4.8	16	3.2	13	2.6	135	27.0
Total	748	16.6	531	11.8	272	6.0	68	1.5	1,619	36.0
Percentage of total casualties ..	46		33		17		4			

TABLE III

SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING, 1899-1955

Ages of Ships at time of Casualty

Period	Under 1 year No.	1-2 years No.	3-5 years No.	6-10 years No.	11-15 years No.	16-20 years No.	21-30 years No.	Over 30 years No.
1899-1903	6	2	9	23	24	19	44	67
1904-1908	10	12	11	24	26	36	50	42
1909-1913	12	8	14	23	21	45	55	41
1919-1923	9	35	27	25	16	22	42	107
1924-1928	8	4	19	38	18	19	34	43
1929-1933	2	5	5	13	18	15	32	51
1934-1938	4	5	1	7	22	25	35	52
1946-1950	2	3	9	7	6	5	18	52
1951-1955	4	5	10	21	11	8	12	64
Total	57	79	105	181	162	194	322	519
Percentage of total casualties ..	3½	5	6½	11	10	12	20	32

LOSSES OF SMALL SHIPS

TABLE V

SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING, 1899-1955. TYPES OF SHIPS LOST
200 ft. and below

	One deck			Two decks			Total No.
	Erections over 50 per cent No.	Erections under 50 per cent No.	R.Q. No.	One deck and shelter or awning deck No.	One deck and spar or shade deck No.	Two decks No.	
1899-1903	9	44	15	—	2	—	70
1904-1908	3	35	26	5	—	3	72
1909-1913	4	26	44	3	3	2	82
1919-1923	7	89	29	2	1	1	129
1924-1928	1	55	25	1	2	2	86
1929-1933	1	52	16	—	—	1	70
1934-1938	5	50	25	1	—	2	83
1946-1950	—	59	10	2	1	2	74
1951-1955	1	56	24	—	—	1	82
Total	31	466	214	14	9	14	748
Percentage	4	62	29	2	1	2	

TABLE VI

SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING, 1899-1955. TYPES OF SHIPS LOST
201 ft. to 300 ft.

	One deck			Two or more decks			Total No.
	Erections over 50 per cent No.	Erections under 50 per cent No.	R.Q. No.	One deck and shelter or awning deck No.	One deck and spar or shade deck No.	Two decks or three decks No.	
1899-1903	11	24	13	1	9	28	86
1904-1908	1	17	45	4	13	17	97
1909-1913	6	11	34	9	11	13	84
1919-1923	6	37	26	4	5	12	90
1924-1928	4	21	8	3	2	12	50
1929-1933	1	15	11	1	5	3	36
1934-1938	—	27	8	3	6	2	46
1946-1950	1	7	7	1	2	—	18
1951-1955	3	12	7	1	—	1	24
Total	33	171	159	27	53	88	531
Percentage	6	32	30	5	10	17	

LOSSES OF SMALL SHIPS

TABLE VII

SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING, 1899-1955. TYPES OF SHIPS LOST
301 ft. to 400 ft.

	One deck			Two or more decks			Total No.
	Erections over 50 per cent No.	Erections under 50 per cent No.	R.Q. No.	One deck and shelter or awning deck No.	One deck and spar or shade deck No.	Two decks or three decks No.	
1899-1903	—	3	2	3	9	17	34
1904-1908	2	5	3	3	11	16	40
1909-1913	1	4	1	4	25	14	49
1919-1923	1	14	1	6	9	18	49
1924-1928	3	14	1	7	6	7	38
1929-1933	2	7	—	5	9	5	28
1934-1938	—	6	—	1	—	6	13
1946-1950	1	3	—	—	—	1	5
1951-1955	2	5	1	1	1	6	16
Total	12	61	9	30	70	90	272
Percentage	4½	22½	3	11	26	33	

TABLE VIII

SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING, 1899-1955. TYPES OF SHIPS LOST
Over 400 ft.

	One deck			Two or more decks			Total No.
	Erections over 50 per cent No.	Erections under 50 per cent No.	R.Q. No.	One deck and shelter or awning deck No.	One deck and spar or shade deck No.	Two decks or three decks No.	
1899-1903	—	1	—	1	—	2	4
1904-1908	—	—	—	—	—	2	2
1909-1913	—	—	—	1	3	—	4
1919-1923	—	—	—	5	5	5	15
1924-1928	—	2	—	4	—	3	9
1929-1933	—	—	—	5	1	1	7
1934-1938	—	—	—	5	—	4	9
1946-1950	—	2	—	1	—	2	5
1951-1955	—	3	—	4	—	6	13
Total	—	8	—	26	9	25	68
Percentage	—	12	—	38	13	37	

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TABLE IX

SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING

Ages at Time of Casualty, distinguishing different Types, 1919-1955

200 ft. and below

	Under one year No.	1-2 years No.	3-5 years No.	6-10 years No.	11-15 years No.	16-20 years No.	21-30 years No.	Over 30 years No.	Total No.
One deck. Erections over 50 per cent ..	1	—	3	4	—	—	—	7	15
One deck. Erections under 50 per cent	11	28	22	45	29	27	52	147	361
R.Q. deck	4	4	9	8	13	14	17	60	129
One deck and shelter deck	—	—	—	—	1	—	—	5	6
One deck and spar or shade deck ..	—	—	—	1	1	—	2	—	4
Two decks	—	—	—	—	1	—	2	6	9
Total	16	32	34	58	45	41	73	225	524
Percentage	3.0	6.1	6.5	11.1	8.6	7.8	13.9	43.0	

TABLE X

SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING

Ages at time of Casualty, distinguishing different Types, 1919-1955

201 ft. to 300 ft.

	Under one year No.	1-2 years No.	3-5 years No.	6-10 years No.	11-15 years No.	16-20 years No.	21-30 years No.	Over 30 years No.	Total No.
One deck. Erections over 50 per cent ..	—	3	1	—	4	4	—	3	15
One deck. Erections under 50 per cent	8	6	10	17	14	14	19	30	118
R.Q. deck	1	3	3	5	5	5	5	41	68
One deck and shelter deck	—	1	1	—	2	1	3	5	13
One deck and spar or shade deck ..	—	—	—	—	—	1	8	11	20
Two or more decks	—	1	3	—	—	—	7	19	30
Total	9	14	18	22	25	25	42	109	264
Percentage	3.4	5.3	6.8	8.3	9.5	9.5	15.9	41.3	

LOSSES OF SMALL SHIPS

TABLE XI

SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING. 300 FT. AND BELOW
Cargoes carried at time of Casualty, 1919-1955, distinguishing different Types of Ship

	Coal No.	Ore No.	Other heavy bulk cargoes No.	Grain, etc. No.	Oil or molasses No.	Light or medium cargoes No.	Timber No.	General cargoes No.	Ballast No.	Not known No.	Total No.
One deck. Erections over 50 per cent	7	1	4	1	1	5	3	6	—	2	30
One deck. Erections under 50 per cent	105	27	91	20	10	53	27	46	13	88	480
R.Q. deck	64	9	38	11	1	20	9	19	6	19	196
One deck and shelter or awning deck	2	2	—	1	—	4	1	5	2	2	19
One deck and spar or shade deck	4	—	—	1	—	4	—	8	—	7	24
Two decks	8	1	2	3	—	3	2	10	3	7	39
Total	190	40	135	37	12	89	42	94	24	125	788

TABLE XII

SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING, 1919-1955. 300 FT. AND BELOW
Voyages during which Lost

	1919-1923 No.	1924-1928 No.	1929-1933 No.	1934-1938 No.	1946-1950 No.	1951-1955 No.	Total No.	Percentage No.
OCEAN VOYAGES:								
North Atlantic	13	18	5	17	5	2	60	7.6
South Atlantic	2	—	5	2	1	5	15	1.9
North Pacific	18	8	6	10	3	1	46	5.9
South Pacific	4	2	2	3	—	1	12	1.5
Indian Ocean	—	3	3	1	3	—	10	1.3
Total	37	31	21	33	12	9	143	18.2
Percentage	17	23	20	25	13	8	18	
CONTINENTAL WATERS:								
Coastal	34	22	13	16	26	11	122	15.5
North Sea and North European ..	66	36	39	42	35	52	270	34.2
English Channel	22	18	7	5	1	3	56	7.1
Bay of Biscay	8	1	2	1	2	2	16	2.0
Mediterranean and South European ..	41	19	19	17	12	25	133	16.9
Total	171	96	80	81	76	93	597	75.7
Percentage	78	70	75	63	83	88	76	
Japanese Islands	9	8	4	14	3	3	41	5.2
Australasian Waters	2	1	1	1	1	1	7	0.9
Total	11	9	5	15	4	4	48	6.1
Percentage	5	7	5	12	4	4	6	
GRAND TOTAL	219	136	106	129	92	106	788	

LOSSES OF SMALL SHIPS

TABLE XIII

SHIPS REPORTED ABANDONED, FOUNDERED, OR MISSING. 300 FT. AND BELOW

Voyages during which Casualty occurred, and Cargoes carried, 1919-1955

	Ore No.	Coal No.	Other heavy bulk cargoes No.	Grain, etc. No.	Oil or molasses No.	Light or medium cargoes No.	Timber No.	General cargoes No.	Ballast No.	Not known No.	Total No.
OCEAN VOYAGES:											
North Atlantic	2	21	6	4	—	6	2	9	5	5	60
South Atlantic	1	—	2	—	—	4	—	3	1	4	15
North Pacific	—	6	1	1	1	10	1	11	—	15	46
South Pacific	1	4	—	—	1	—	—	4	—	2	12
Indian Ocean	—	2	—	1	1	3	—	2	—	1	10
CONTINENTAL WATERS:											
Coastal	—	26	27	3	1	9	5	10	7	34	122
North Sea and North European	19	75	52	17	4	36	24	22	5	16	270
English Channel	3	23	18	—	—	4	2	4	—	2	56
Bay of Biscay	4	3	4	1	—	—	1	1	—	2	16
Mediterranean and South Euro- pean	7	20	20	9	4	14	6	25	4	24	133
Japanese Islands	2	8	4	1	—	3	1	2	2	18	41
Australasian Waters	1	2	1	—	—	—	—	1	—	2	7
TOTAL	40	190	135	37	12	89	42	94	24	125	788

DISCUSSION

The Chairman: The first Table in this interesting paper shows that in the years from 1903 to 1956, ships presumably classed with Lloyd's Register have been allowed by fate to increase their useful lives. This not only applies to the ships of Lloyd's Register. It also seems to apply to their retired Chief Ship Surveyors, of whom four are fortunately still with us. We have a communication from their senior, Sir Westcott Abell, which I shall now ask the Secretary to read.

Sir Westcott Abell, K.B.E., M.Eng. (Honorary Vice-President): The Institution is the proper place to put on record this statistical study of the losses of small ships and seems to bring out factors of the ship itself that may perhaps be a cause of loss; but statistics are not easy to give direct evidence; often we find what we look for and in so doing lose sight of a vital factor.

For instance, ever since my early studies in freeboard in about 1912 I have held the view that small ships, say under 300 ft. long, could well do with more freeboard, and this paper says two things on page 237, second column: The share of casualties for lengths below 200 ft. continues to increase, being 36 per cent at the start of the century, rising to 48 per cent between the wars and to 66 per cent in the 10 years after 1945.

The type factor must matter, for 29 per cent of losses below 300 ft. length were of the raised quarter deck pattern, while for single deck ships with less than half covered erections losses were 50 per cent, or half the total, and within these two types were nearly 80 per cent of losses of small ships.

I would like to comment on the weather factor, for most of these smaller ships trade coastwise with greater risks and meet with shorter waves of greater height since many of these losses take place within, say, 200 miles of the coast. Here I note from page 237 that up to 1938 winter voyages accounted for 70 per cent of all losses, and in the post-1945 decade the percentage was higher, nearly 73. It is well to comment that about 1912, with the Weather Office help, we found that for the winter North Atlantic some 80 per cent of severe gales took place between

October 15th and April 15th, which seems to accord with the losses given in the paper.

Since the question of freeboards of small vessels is in doubt, it is well to mention that the paper excludes trawlers, which by virtue of their forward sheer seem to be more seaworthy than other ships of their size.

Mr. Manley deserves our thanks for the trouble he must have taken to prepare this study of losses, and if he has any other point to make, even if the statistics are not complete, he might add it to his conclusions without prejudice.

Mr. J. M. Murray, M.B.E., B.Sc. (Vice-President): I am very pleased indeed to take part in the discussion on this paper which, of course, must be read in conjunction with two previous papers on the subject by the same author.

This and the preceding papers are unique of their kind. There is no other source from which statistics of this kind can be gathered, and the work entailed in an analysis such as Mr. Manley has undertaken is very great indeed. I have the greatest regard for the value of this work, and I hope the knowledge that he has made an important contribution to the statistics of losses may in some way compensate Mr. Manley for his efforts.

There are many aspects of this paper which might usefully be discussed, but it seems to me that there are three outstanding pieces of information to be derived from the tables. They are:—

- (1) The percentage of steamers and motorships totally lost from all causes in the last 50 years has decreased continuously.
- (2) The ships abandoned, foundered, or missing have decreased in numbers in approximately the same degree, but I do not think the percentage reduction is quite so great.
- (3) In the last casualty period the percentage of loss diminishes as the size of ship increases.

The very small number of ships more than 400 ft. long which are lost represent a very encouraging feature from some points of view; and when these numbers are considered in conjunction

with the number of ships at risk I think it will be agreed that the numbers are very small indeed.

Here I feel that Mr. Manley would add still further to the value of his paper if he gave us the actual numbers of ships at risk. I appreciate that we are always asking for something more and I know that there is some difficulty in obtaining the figures, but I am quite sure they would be very welcome.

There are many other interesting conclusions which can be drawn from the tables, and it is interesting to note that Table I throws some light on the interaction between radar and collision. For the first five years of the post-war period the average loss per year was 18, and for the next five years 24 ships, due to collision. It would be interesting to know the proportion of ships so lost to the number at risk; it would appear that, as the numbers at risk have increased, the percentage of ships lost in this way has declined.

Ships have obviously become safer during the last 50 years, but I feel that we naval architects cannot take full credit for this improvement. I think it is about 100 years since the Admiralty meteorological service was instituted, and the information on weather which is given by broadcast and otherwise must have had a very important effect on the rate of casualties.

Mr. H. E. Skinner, O.B.E., B.Sc., R.C.N.C. (Member): As one who is outside the orbit of Lloyd's Register I would like to say how much we appreciate and sympathize with the tremendous amount of patient work which Mr. Manley has put into the preparation of this and his two earlier papers. The upshot, of course, is to show how safe the world merchant marine is. But, as he has pointed out, there are a few dark spots.

I want to confine my remarks to the ships which are reported as abandoned, foundered, or missing, and to ships less than 200 ft. long, because I think it is in this area that Mr. Manley's report is most revealing.

He has wisely abstained from drawing all the conclusions he might have done from his paper and has left it to naval architects to try to push these conclusions a bit further. But we must first ask him whether sufficient figures have been given to be susceptible of this analysis; Sir Westcott Abell has referred to the danger of drawing too much information from statistics. I think Mr. Manley is in a position to tell us whether we can in fact use these figures, and in particular the figures given for ships reported abandoned, foundered, or missing.

If his answer is "yes," then I would suggest that the hypothesis which fits the losses is lack of sufficient stability in the small vessels. If that is assumed, none of the facts are inconsistent with it, except possibly ships carrying liquid bulk cargoes which have very small losses. We must explain that. All these ships are well sub-divided and might form a category which is quite different from the types of ships that we are considering in general.

But one factor which appears is that the fully loaded liquid cargo does not move in relation to the ship. It is possible that bulk cargoes of a more solid kind do move in relation to the ship. But that does not absolve the naval architect of the necessity of making provision for such, because these small ships are not in a position to have their cargoes attended to in the same way as other ships, and therefore the naval architect must design the ships with sufficient stability to cope with such conditions.

The easiest way to increase stability is by increase of freeboard. We see the virtual effect of increased freeboard illustrated in Fig. 4, where ships of under 50 per cent erections, i.e. ships with low freeboard, have a higher casualty loss than those with raised quarter decks, and in turn the casualties are apparently less again for ships with full erections. It will be noticed that these trends are independent of the cargo carried. One would suppose that a shelter deck ship would have the least losses, but there are fewer of them. That is why it is important that Mr. Manley

might, and I hope he will, enhance the value of his paper by giving us, at any rate for Fig. 4, the number of ships at risk, because surely these conclusions must be related to that.

In Lloyd's Register a Rule, which affects small ships, has been recently introduced to the effect that where ships are deficient in freeboard and have no fore-castle, they must be given extra sheer. I think that is a very heartening move in the right direction.

Mr. J. Lenaghan (Member of Council): This paper does not give technical information, nor does the author intend that it should. However, it is one that stimulates technical curiosity and in that respect this and Mr. Manley's two previous papers are of considerable interest to naval architects.

A previous speaker referred to the lack of freeboard in certain small ships, and it may be that this shortcoming has been a contributory cause for the loss of so many of the small ships under the heading abandoned, foundered, or missing. Figs. 4 and 5 emphasize the importance of erections and these are not unconnected with freeboard. Ships of the R.Q.D. type are relatively high in the casualty figures and it would be interesting to hear what is the proportion of casualties in this class, as compared with the total number of those ships at risk.

There appears to have been a downward trend in casualties, from all causes, over the past fifty years, but in the post-war period 1947 Table I shows that casualties under columns "burnt" and "wrecked" are exceptionally high as compared with any other year in this particular period.

Tables III and XII invite requests for further information. Table III shows that the number of casualties within the 10-year age group have increased and especially is this the case between 5 and 10 years in the period 1951-55. Is this in any way connected with wartime built tonnage? Table XII indicates high casualty percentages for ships trading in Continental waters. Could it be said that these are largely due to weather and, if so, does it suggest a disregard for the weather reports which all shipping in these waters must receive over the radio?

Coal cargoes, always regarded as a hazardous cargo in certain weather conditions, now appear to have been superseded since 1946 by "Other heavy bulk cargoes." Could the author be a little more precise and state what type of cargoes are placed under this classification? Also, it is difficult to understand why in Table XIII so many casualties have occurred in ships having "Not known cargoes." If the casualty is officially recorded, does it not automatically follow that the nature of the cargo carried at the time of casualty is also recorded?

It is perhaps unfair to ask the author direct technical questions; nevertheless, it would be of interest if he could state that as a result of his researches, he can confirm that the fitting of steel hatch covers has contributed to greater safety. Many small ships now have such covers and yet the casualties to ships 200 ft. and below appear to have increased. It may be that the casualties are concerned with ships fitted with wooden hatches rather than steel covers.

Mr. G. M. Boyd (Member): With regard to the first table in the paper, showing losses from all causes over the years, although it shows that the percentages have dropped considerably, the figures for the total number of ships lost are surprisingly uniform; there are irregularities here and there, but no strong trend is apparent. I am wondering whether it is an inherent feature that the number of ships lost in a year is more or less constant. I think it would add to the value of the paper if the author could give in this table the percentages of ships as well as of gross tonnage. That applies also to the table at the bottom of the second column on the first page, showing collision losses. In these cases we are given the tonnages and numbers, but we are given only one of the percentages. It is quite easy to calculate

percentages on a number basis—18·2, 29·2, 27·6, and 25·2—again surprisingly constant.

I hope I shall not be regarded as carping, but one always wants to get more of the background of data so as to analyse it in different ways. I would think that in an analysis of this kind it would be possible, even if very laborious, to set up an "accident rate" which would be related, not only to numbers, but to time. That was done some years ago by Dr. Vajda* in a paper to the Royal Statistical Society for one particular type of ships. He does not mention the name of that type, but I think it related to Liberty ships. Of course, he used rather elaborate statistical methods, and in particular he used Hollerith machines, so that it was rather a big undertaking. The question is whether something of the kind would be justified in this case.

Finally, I think the two curves on page 235 might be amended slightly to fit the points rather better; but that would not alter the conclusions that have been drawn from them.

Mr. L. J. Brinton (Member): Considering for a moment the losses due mainly to stress of weather and which come under the heading "Abandoned, Foundered, or Missing," Mr. Manley has shown that the possibility of becoming such a casualty is greatest in the small ship. As naval architects we have not control over the elements, but design and safety of ships is our job, and it should be our concern to ascertain the cause of these casualties and, if possible, to find a solution. For this purpose it would be helpful, if Mr. Manley has the necessary information, to further sub-divide those casualties, listed under this heading, into cause of casualty, such as loss of stability, broaching to, breakdown of steering gear, shift of cargo, etc. Also, where loss is caused by flooding, then which of the openings in a ship are most vulnerable. Such information may point the way to the solution.

Much has been said in the past about the freeboard of small ships, and the usual remedy suggested to improve their safety is to increase the freeboard. But, bearing in mind that we shall gain only a few inches in this way, is it necessarily the answer or even the right way to tackle this problem? After all, a submarine operates safely with a negative freeboard because its openings are as nearly 100 per cent invulnerable as human endeavour can make them. I would like to suggest that it would be preferable to concentrate upon improving the safety of any openings in the small ship. To this end it may be necessary to consider the amending of the Load Line Rules, which at present stipulate that the ship with 2 in. freeboard and the ship with 10 ft. freeboard have the same standard of closing openings, even though, with a small freeboard, the openings are in a far more vulnerable position.

Finally, I should like to make a point about the danger of using statistics. It is suggested that we should have larger freeboards to make safer ships, because, as indicated by Fig. 4, ships with erections of more than 50 per cent are less likely to become casualties than those having erections under 50 per cent. I would point out that a ship with over 50 per cent erections has less freeboard than ships with under 50 per cent, other things being equal.

Mr. R. DuCane: I would like to ask the author two questions. First, Mr. Lenaghan has commented on the fact, as shown by Fig. 3, that more new ships were lost than ships, 5, 10, and 15 years old. Is that because the author's figures are fairly recent? Has there been a great increase in the building of new tonnage, so that automatically we have more new ships actually at risk than older ships?

Secondly, I have been wondering what Lloyd's Register of Shipping would think of the suggestion that we should limit the lives of ships to (say) 20 years. I am sure that the shipbuilder

* *Supp. Journ. Roy. Stat. Soc.*, Vol. IX, Nos. 1-2, 1947.

at least, if not the shipowner, would welcome the idea. But it does seem from Fig. 3 that there is a tremendous rise in the percentage of total casualties represented by ships more than 20 years old. I suppose that may be due to the gradual deterioration of the ships' structures and water-tight fittings.

May I ask whether the standard of survey is, in fact, the same for 30-year-old vessels as for new ships? Presumably 30 years ago the Rules governing the building of ships were not so advanced as they are now, and, unless the owner of a ship 30 years old is told to bring her up to date, I suppose one has to accept a somewhat lower standard of safety. I should like to know what is the Rule about that, and whether the owner has to try to bring his ship up to date or whether that is considered impracticable.

Professor E. V. Telfer, D.Sc., Ph.D. (Vice-President): I would like to draw attention to Figs. 4 to 7 which very strikingly show the value of increased effective freeboard. Fig. 4 is particularly clear and suggests the advisability of more specific research. It is, for example, very interesting that the raised quarter deck losses should lie between the below and above 50 per cent erection figures. This suggests that it might be able to demonstrate in greater detail the increasing value of progressively greater effective freeboard. Alternatively, the evidence might clearly demonstrate the intrinsic safety of the single-deck, long-bridge type, and if this were the criterion an even smaller extent than 50 per cent may prove to have been conducive to safety. Could Mr. Manley examine this point and advise us accordingly? His statistics undoubtedly appear to suggest that increased effective freeboard, because of its increasing stability at angles beyond which the upper deck edge becomes immersed, is a safety quality which has really to be called upon under sea-going conditions. Because of this likelihood the efficiency of erection closing appliances is an equally vital factor, and these incidentally are likely to be kept in best condition for the long bridge erection. The recent inquiry into the loss of the German school ship *Pamir* brought out the unquestionable importance of effective closing of erections. Could Mr. Manley also distinguish type of closing appliances in his analysis?

The Chairman: I should like officially to endorse the thanks to Mr. Manley already spontaneously expressed by the meeting. I think Mr. Manley may rightly be described as an ideal Associate of this Institution. Many of our Associates have very intimate although non-professional contacts with naval architecture, and it is right that they should give us of their experience. I trust that more Associates will emulate Mr. Manley's excellent example.

Written Contributions to the Discussion

Mr. William Bennett, O.B.E., B.Sc. (Member): Had the author included the year 1956 in the losses given in Table I, the collision losses would, no doubt, have shown a relatively greater increase due to the unfortunate losses that year. While, as he states in his conclusions, the annual losses due to collisions is low, it is still high; as also are the fire losses which seem to happen mostly in the larger ships.

The paper is timely, since another Safety of Life at Sea Conference is in prospect, and the information here given will be of value in the forthcoming deliberations, which we hope will have a marked effect in reducing the losses still further.

Professor A. M. Robb, D.Sc. (Vice-President): It may be permissible to evoke a memory of more than 50 years ago. The circumstance was a passage down the Irish sea in a coaster about 180-190 ft. long, with the usual three masts and the machinery aft. The sea was perfectly calm, but on each side, at the forward

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end of the short bridge immediately forward of the raised quarter-deck, there was a pool of water, formed by waves created by the ship curling over the belting and passing inboard through the scupper holes in the bulwarks. The question raised then, and repeated ever since then in general terms, was: "Can such a freeboard be considered adequate?" In the discussion on the paper submitted by Mr. Manley to The Institution in 1950 several contributors raised the same question, and the present paper justifies a repetition—with emphasis. Table II shows that 46 per cent of all the casualties from 1899 to 1955 were in the group of ships of least size. Table IV shows that almost all the casualties occurred when the ships were loaded, and accordingly the freeboards were minimal. And Table V shows that ships with more than one deck, and therefore relatively generous topsides, do not figure significantly in the total. It therefore seems clear that the freeboards of small ships are not adequate, and the question now rising is: "When, and how, can a re-examination of freeboard regulations be undertaken?"

Author's Reply

It should be emphasized that the casualties dealt with in the paper relate to total world figures and not only to classed ships. Lloyd's Register, since the end of last century, has compiled complete records of all merchant ships in the world above 100 tons gross. This information is not available from any other source.

Sir Westcott Abell is a life-long authority on sea casualties, and any view expressed by him must command respect. Particular note is taken of his remark that smaller ships in the coasting trade run greater risks because they meet with shorter waves and greater height. His suggestion that small ships require more freeboard, which is supported by Mr. Skinner, Mr. Lenaghan, and Professor Robb, is one which will undoubtedly lead to a good deal of controversy. Professor Robb's remarks on this point are noted with interest.

Sir Westcott Abell quotes meteorological evidence that most of the severe gales in the North Atlantic occur between October 15th and April 15th. This coincides closely with the period used by the author for "Winter Voyages," namely October–March in the northern hemisphere and September–April in the southern hemisphere.

Mr. Murray observes that the number of casualties to the larger ships is small, and this is true; one of the features of the investigations has been that throughout the whole period of 56 years, the incidence of casualties to ships over 400 ft. in length has remained consistently low.

The thoughtful contributions of Mr. Skinner, Mr. Lenaghan, Mr. Boyd, and Mr. Brinton are appreciated, though they seem to have one thing in common—an insatiable thirst for further information.

The losses of R.Q.D. ships are being studied, and it is hoped to make the result available later. The data at present available indicates that below 300 ft. in length, ships of this type represent nearly one-quarter of the total number at risk.

The high incidence of casualties to comparatively new ships is mentioned by Mr. Lenaghan and Mr. DuCane. The actual

figures for ships up to 10 years of age reported abandoned, foundered, or missing are:—

Period	Number	Per Cent of Total Abandoned, Foundered, Missing Casualties
1899–1903	40	21
1904–1908	57	27
1909–1913	57	26
1919–1923	96	34
1924–1928	69	38
1929–1933	25	18
1934–1938	17	11
1946–1950	21	21
1951–1955	40	30

It is interesting to note that the same number of such ships was lost during 1899–1903 as in 1951–1955. Expressed as a percentage of the total casualties, the trend of these losses is as shown in Fig. 9. This shows that the maximum upward trend has been during the years immediately following the two World Wars, though to a lesser degree after the Second World War.

Mr. DuCane suggests that in modern times there are presumably a greater number of new ships at risk than formerly. This is agreed; 701 merchant ships were launched in the world in 1923, and in 1956 the number launched was 1,837. On the other hand, in 1919–1923 ships reported abandoned, foundered, or missing in the first five years of age represented 25 per cent of the total, as against 14 per cent in 1946–1955.

Mr. DuCane wonders whether the lives of ships might be limited to, say, 20 years, and also asks if the standard of survey is the same for 30-year-old ships as for new ships. The suggestion to limit the lives of ships seems hardly practicable in view of the many and disparate trades and services in which ships are employed, some much more onerous than others. The oldest classed ship in Lloyd's Register Book, built in 1877, still maintains her class, and there are other ships still in service which are 70 or 80 years old. A glance at the survey regulations of Classification Societies will show that the nature of the survey becomes more rigorous with increasing age.

Mr. Lenaghan comments on the high casualty percentages for ships trading in continental waters, and asks if it can be said that these are largely due to weather. Heavy weather conditions are undoubtedly closely associated with the losses of ships reported abandoned, foundered, or missing; 70 per cent of the losses occurred during winter voyages, and there is always a crop of these casualties following upon a severe winter gale.

Mr. Lenaghan asks for the types of cargo listed as "Other heavy bulk cargoes." Examples are: pig iron, granite, sand and gravel, paving stones, sulphur, clay, slag. He mentions the "Cargo not known" column in Table XIII. It will be realized that certain of these losses occur in remote and inaccessible places, and in some cases, while the bare facts of the casualty are available, no other information is forthcoming.

Mr. Lenaghan asks also if the researches indicate that the modern tendency towards fitting of steel hatch covers has contributed to greater safety. It is not known how many modern small ships have steel hatch covers and details of the hatches fitted are not available in all the casualties examined. No direct reply can therefore be given to this question, but it may be noted that in the ten years 1899–1908 losses of new ships in the first five years of age represented 12 per cent of the abandoned, foundered, or missing casualties as compared with 14 per cent in 1946–1955.

An interesting suggestion is made by Mr. Boyd about the possibility of arriving at an "Accident rate" for ships, as had been attempted by Dr. Vajda in a paper presented some years

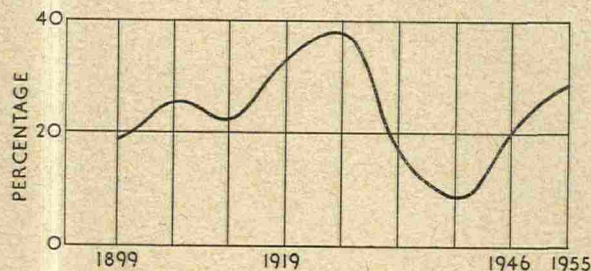


FIG. 9

LOSSES OF SMALL SHIPS

ago to the Royal Statistical Society. Dr. Vajda's study contained a very detailed analysis of accidents to new ships, 2,447 in number, completed during a period of three war-time years. It embraced ship days of exposure, intervals between accidents, and frequency distribution treated by various statistical methods. It involved a colossal amount of work even with this limited amount of material, and the results, though statistically interesting, are in my view only of academic interest.

Mr. Brinton asks for further particulars of causes of casualties to ships reported abandoned, foundered, or missing. The author is examining this question, but it will be realized that no information is available for the ships reported missing, which represent about 20 per cent of the whole.

Professor Telfer asks for more information about erection percentages, etc. The amount of labour involved in this type of analysis is enormous, but the author will consider whether it would be practicable to give more details.

Mr. Bennett is right in surmising that the years 1953-1956 showed increased collision losses. This period represented a considerably higher tonnage for this type of casualty, owing to the loss of the *Andrea Doria* in 1956. The majority of these casualties, however, related to small ships.

One of the lighter sides of investigations such as these lies in the unusual cargoes encountered. One ship carried "cork and cereals"—which seemed to indicate a light breakfast. Another carried a cargo of "nuts and wine," which seemed very apposite. One cargo was recorded as "Coffins, etc.," and one could not help wondering what the "etc." represented. Another unusual cargo was described as "Sun flower expellers." One ship, which stranded, ironically carried a cargo of "wrecking equipment."

The author thanks all the contributors to the discussion for their appreciative remarks which have encouraged him to continue his researches.