Losses and Major Casualties 1984 - 92

Tankers and Bulkers 10,000 GT and above

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1 Introduction

Marine casualties are issues that are of concern, not only to the industry itself, but the issues are subject to an increasing public concern.

A series of accidents with serious environmental impact, e.g. pollution by oil spill [1, 2] have amplified the importance of these issues.

While most studies of marine accidents focus upon the analysis of individual accidents and the accident mechanisms, until now only very few studies on the statistical relationships between casualty rate and such factors as e.g. ship age and ship flag have been published [3, 4].

Therefore, the Institute of Mathematical Modelling at the Technical University of Denmark, and Burmeister & Wain Holding A/S initiated a preliminary statistical study with the aim of shedding light upon causes and circumstances related to accidents at sea.

The present report is a short summary of the findings of that study. A more detailed report including mathematical statistical models has been published by the Institute of Mathematical Modelling [5].

The study considered major marine casualties for ships (Tankers and Bulkers) of size larger than 10,000 GT in the years 1984 - 1992 as reported in the monthly Lloyd's List.

The casualty rate rose from 7.0 casualties/1,000 ships in 1984 to 12.3 casualties/1,000 ships in 1992 while in the same period the average age of the fleet increased from 9.5 year to 13.8 year.

In the study the increase in casualty rate has been directly related to the age of the fleet, and it is demonstrated that the older the ship, the larger the casualty rate. The estimated casualty risk risk for ships that are 20 years of age is more than twice the risk of ships that are only 10 years old.

2 The Data

The database that was used for the study was compiled by MSR consultants by combining data from two sources:

1. Data on losses and major casualties in the period 1984 to 1992. as they have been reported in the monthly Lloyd's List. The data was provided by the Institute of London Underwriters with Lloyd's Maritime Information as the original source. The data covers a total of 4,095 losses and major casualties.

2. Data supplied from Fairplay Publications Ltd with information on all cargo ships that have been in service in the period 1984 to 1994.

The database comprises approximately 22,000 ships.

3 Frame of analysis

A subset of the database that was considered to be extremely reliable was selected for this preliminary study.

The subset is defined as follows:

a. Category of ship: **Tankers and Bulk carriers**

b. Size of ship: **Ships of 10,000 GRT and above**

c. Year of construction: **Ships built in 1967 and later.**

d. Category of casualty: **All, except casualties caused by military action**

In total 8,766 ships with accounting for 64,250 vessel-years and 680 losses and major casualties entered the analysis.

4 Casualty trend 1984-92

Figure 1 shows the yearly casualty rate for the two groups, tankers and bulkers.

The yearly casualty statistics in the years 1984-92 for the fleet is shown in figure 1. The data underlying the graph is given in table 1.

The statistics for both groups, tankers and bulkers exhibit similar patterns.

It is seen that the yearly frequency of casualties increased from 46 casualties in 1984 to 95 casualties in 1992. corresponding to a yearly relative increase of 9.5 %.

The size of the fleet increased from 6,600 to 7,700 ships, viz. a relative increase of 2 % per year.

The casualty rate rose from 7 casualties/1,000 ships to 12.3 casualties/1,000 ships corresponding to a yearly increase of the casualty rate of 7.4 %.

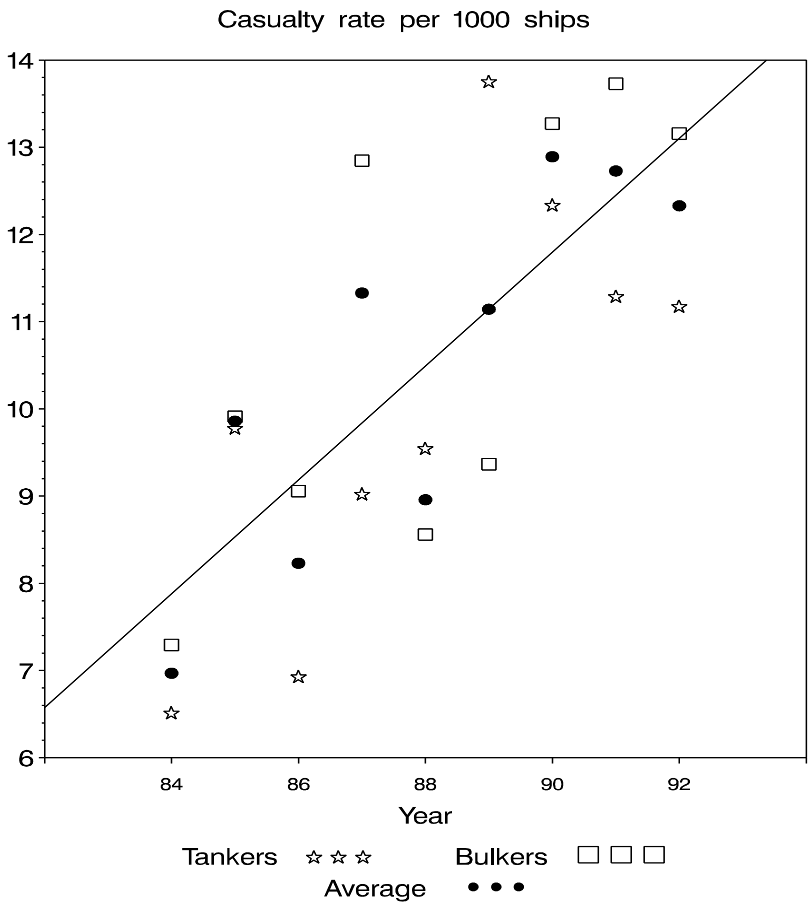

Figure 1. **Yearly casualty rate in casualties/1,000 ships versus calendar year**
Bulk carriers and Tankers 10,000 GT and above

It is well known in the industry that the average age of the fleet has been increasing in the recent years. Therefore, the average age of the fleet under consideration has also been given in table 1. It is seen that the average age increased from 9.5 years in 1984 to 13.8 years in 1992, corresponding to a yearly relative increase of 4.7 %.

The statistics have been summarized in Table 2.

		Year								
		84	85	86	87	88	89	90	91	92
Tan-	casualties	18	27	19	25	27	40	37	35	36
kers	ships	2761	2760	2741	2769	2827	2908	2998	3099	3221
	cas.rate	6.52	9.78	6.93	9.03	9.55	13.76	12.34	11.29	11.18
	Av.age	9.52	10.08	10.54	11.05	11.64	12.22	12.81	13.36	13.72
Bulk	casualties	28	41	39	54	36	40	58	61	59
	ships	3838	4136	4305	4203	4205	4271	4370	4443	4484
	cas.rate	7.29	9.91	9.06	12.85	8.56	9.37	13.27	13.73	13.16
	Av.age	9.52	9.74	10.03	10.20	10.85	11.65	12.38	13.09	13.82
All	casualties	46	68	58	79	63	80	95	96	95
	ships	6600	6897	7046	6973	7032	7179	7369	7542	7706
	cas.rate	6.97	9.86	8.23	11.33	8.96	11.14	12.89	12.73	12.33
	Av.age	9.52	9.88	10.23	10.54	11.17	11.88	12.56	13.20	13.78

Table 1. **Yearly casualty rate in casualties/1,000 ships**
Bulk carriers and Tankers 10,000 GT and above

Table 2. **Summary statistics**

	Tankers	Bulkers	All vessels
Number of vessels	3,706	5,060	8,766
Number of vessel- years 1984-92	26,000	38,250	64,250
Yearly relative increase of casualty rate	7.0 %	7.7 %	7.4 %
Yearly relative increase of average age of fleet	4.7 %	4.8 %	4.7 %

5 Casualty rate in age groups

The correlation between the ageing of the fleet and the casualty rate becomes even more apparent when the casualty statistics are broken down into age groups.

In figure 2 the casualty rate is related to the age of the ship. The data underlying the graph is given in table 3.

The casualty rate tends to increase with the advancement of age. This tendency was found to be statistically significant.

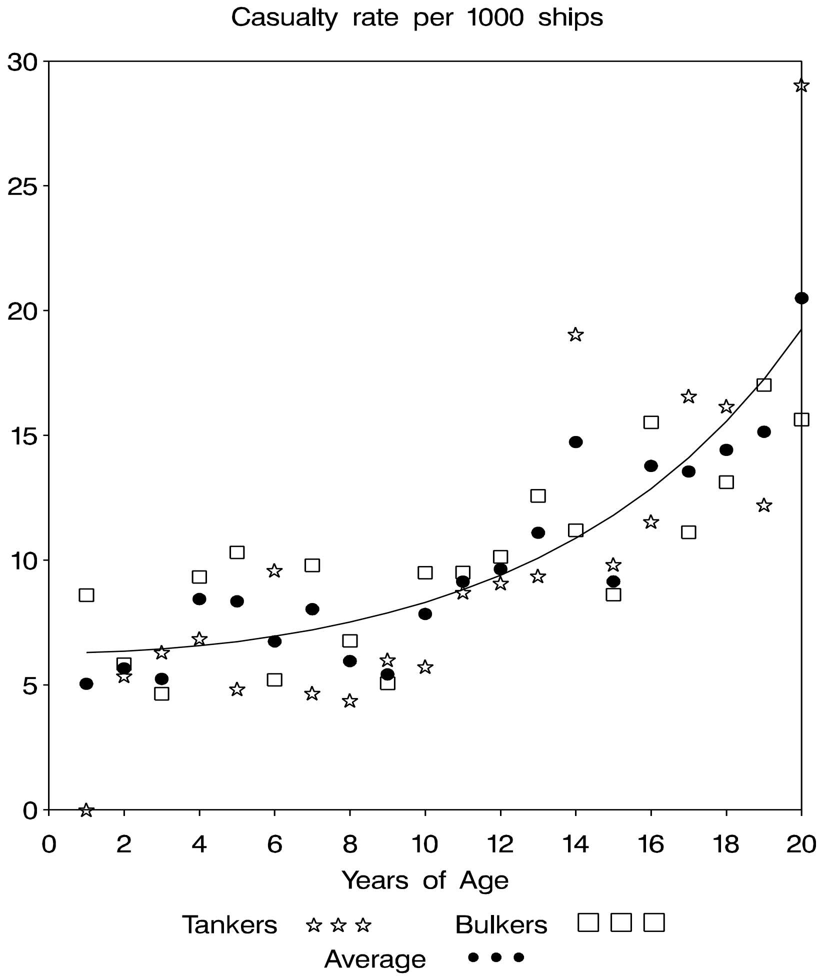

Figure 2. Yearly casualty rate in casualties/1,000 ships versus age
Bulk carriers and Tankers 10,000 GT and above

Age	Bulk carriers Casual-ties	Bulk carriers Vessel years	Bulk carriers Cas rate	Tankers Casual-ties	Tankers Vessel years	Tankers Cas rate	Total Casual-ties	Total Cas rate
1	6	697	8.60	0	491	0.00	6	5.05
2	9	1542	5.84	5	930	5.37	14	5.66
3	8	1721	4.65	6	950	6.32	14	5.24
4	17	1822	9.33	7	1021	6.86	24	8.44
5	19	1843	10.31	5	1031	4.85	24	8.35
6	10	1922	5.20	10	1042	9.59	20	6.75
7	20	2042	9.79	5	1069	4.68	25	8.04
8	15	2217	6.77	5	1139	4.39	20	5.96
9	11	2171	5.07	8	1332	6.01	19	5.42
10	19	2000	9.50	9	1567	5.74	28	7.85
11	19	1998	9.51	15	1721	8.72	34	9.14
12	20	1973	10.14	16	1760	9.09	36	9.64
13	25	1988	12.58	16	1706	9.38	41	11.10
14	23	2054	11.20	32	1678	19.06	55	14.74
15	18	2089	8.62	16	1627	9.83	34	9.15
16	31	1997	15.52	18	1558	11.55	49	13.78
17	20	1798	11.12	24	1448	16.57	44	13.55
18	22	1675	13.13	20	1237	16.17	42	14.42
19	24	1410	17.02	11	900	12.22	35	15.15
20	17	1088	15.63	18	619	29.06	35	20.50

Table 3. Yearly casualty rate in casualties/1,000 ships versus age
Bulk carriers and Tankers 10,000 GT and above

The base-level of the casualty rate was estimated to be 6.3 casualties/1,000 ships. The estimated (smoothed) values of the casualty rate for selected age groups are shown in table 4.

Age of ship in years	1	5	10	15	20
Estimated casualty rate casualties/1,000 ships	6.3	6.7	8.3	11.8	19.25

Table 4. **Estimated risk of casualty for selected age groups**
Bulk carriers and Tankers 10,000 GT and above

It is seen that the relative increase of the casualty rate is faster, the older the ship. The risk for ships that are 20 years of age is more than twice the risk of ships that are only 10 years old.

6 Flag, Classification society

In the study it was moreover investigated whether a further breakdown of the casualty statistics into groups of flag states or groups of classification societies could reveal significant differences between such groups.

Only a few, rather course groupings were investigated. The difference in casualty rate for these groups was not found to be statistically significant.

Only very few studies on statistical accident data have been published.

7 Acknowledgement

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References

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