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Statistics on Collision Accidents Involving Offshore Structures

Statistiques d'accidents dus à des collisions avec les constructions maritimes

Statistiken über Kollisionsunfälle mit Offshore-Bauten

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SUMMARY
The Norwegian Petroleum Directorate requests that the probability of ship collisions should not by best available estimate exceed 10^{-4} per year. The question at once arises whether there exists today a sufficient amount of relevant, reliable and enough detailed collision data so as to support a probability calculation based on methods which by the way in themselves are questionable. The paper summarizes in a statistical way the data available on offshore collisions world-wide. A discussion of the data sources and the data is made, and suggestions to improve the present situation are given.

RÉSUMÉ
La Direction norvégienne des pétroles recommande que la probabilité de collision de navires avec une plate-forme en mer ne dépasse pas 10^{-4} par an. La méthode de calcul proposée est discutée d'autant plus que les données disponibles sont très limitées. L'article récapitule les statistiques mondiales établies en Norvège. Les sources d'information sont discutées et des propositions sont faites pour améliorer l'état actuel.

ZUSAMMENFASSUNG
Das norwegische Oel-Direktorat empfiehlt, dass der Wert der Schiffs-Kollisionswahrscheinlichkeit bei best verfügbarer Schätzung, 10^{-4} pro Jahr nicht überschreiten sollte. Die Berechnungsmethode sowie die dafür benötigen Daten werden diskutiert. Statistische Daten von Offshore-Kollisionen aus der ganzen Welt werden vorgelegt. Datenquellen werden diskutiert und Anregungen zur Verbesserungen der gegenwärtigen Situation gegeben.

1. INTRODUCTION

The exploration for and production of "black gold" from the world's continental shelves has naturally also introduced new hazards into the old traditional seafaring activities. An increased risk of collisions is due to offshore platforms being positioned and installed "at random" in the open sea with accompanying ship traffic, is one such hazard.

Until recently the risk of collisions was not considered, neither in the design nor the operation of offshore platforms, the reason being the lack of data both on ship traffic and collisions experienced as well as lack of reliable methods for calculating probabilities and consequences of collisions.

In Norway, the question of offshore collisions was accentuated through the issue of a governmental order in 1981 entitled: "Guideline for Safety Evaluation of Platform Conceptual Design" where ship collisions are listed as one type of accident which should be evaluated. According to the Guidelines, the probability of occurrence "should not, by the best available estimate, exceed 10^{-4} per year".

Det Norske Veritas has, for several years, been involved in research projects on ship-ship and ship-platform collisions both on the probability and consequence side. These activities include, amongst other things, an Offshore Accident Databank containing data on 515 offshore accidents which have occurred since 1970.

2. INFORMATION SOURCES

Collisions usually involve claims for compensations and the question of guilt often leads to long legal disputes. Therefore, the parties involved will naturally prefer to keep all information confidential; at least the details of the collision until legal questions have been settled.

However, there are normally two sources through which information concerning a collision is made public, namely, the Press and National authorities. In both cases, the consequences of the collisions have normally been very severe, also involving fatal accidents.

According to Norwegian Maritime Law, an inquiry must be held when a fatal accident occurs, when two ships collide or when an incident is assumed to have occurred which causes substantial damage to the ship or property outside the ship. If the accident is not considered covered by this law, the parties involved are under no obligation to report it to the Norwegian authorities.

A similar system, for instance, applies to the Dutch shelf, whilst in the United Kingdom it is mandatory for operators to report all accidents to the authorities.

In order to obtain information concerning collisions, the following sources exist:

- national authorities,
- the Offshore Press,
- international non-governmental organizations,
- insurance companies,
- classification societies,
- oil companies,
- ship owners,
- ship repair yards.

The statistics on offshore collision accidents, presented in this paper, are partly based on the data presented by national authorities and partly on data presented by the Offshore Press. The above is supplemented with data from a project presently carried out for the SPS (Safety Offshore Programme) managed by the Royal Norwegian Council for Scientific and Industrial Research (NTNF). Most of these data are, however, proprietary to the operator and shipowner and, therefore, have to be presented on a statistical form.

3. EXISTING MOBILE AND FIXED PLATFORMS

Fig. 1 shows the yearly distribution of the total number of mobile units in various geographic locations. Table 1 shows the estimated total number of fixed platforms in various geographic locations.

As can be seen, there are today (1981), a total of about 500 mobile units and 2100 fixed major platforms worldwide. For the North Sea, corresponding figures are about 60 mobile units and 90 fixed major platforms.

The total number of rig-years (1.1.1970 to 31.12.1981) for mobile units worldwide is 1051. A corresponding number for the North Sea is 516 (according to "Ocean Industry").

Geographic location	Total number of Platforms		Note
	All platforms	Major platforms only	
North Sea		90	U.K., Norwegian, Danish and Dutch Sectors
U.S.A.	2930	1270	
Middle East		260	
Total Worldwide		2100	

Table 1. Estimated number of fixed platforms in 1982 (Source: VERITAS).

4. SHIP COLLISIONS

Definitions

Ship collision data may be divided into the following categories:

a. Drifting buoys and other objects.
b. Drifting ships and barges.
c. Drifting fishing vessels.
d. Infringements of 500 m safety zone around offshore installations.
e. Impacts and collisions from supply vessels and other offshore-related traffic.
f. Collisions and near-misses from non-offshore related ship traffic (mainly trawlers and merchant ships).

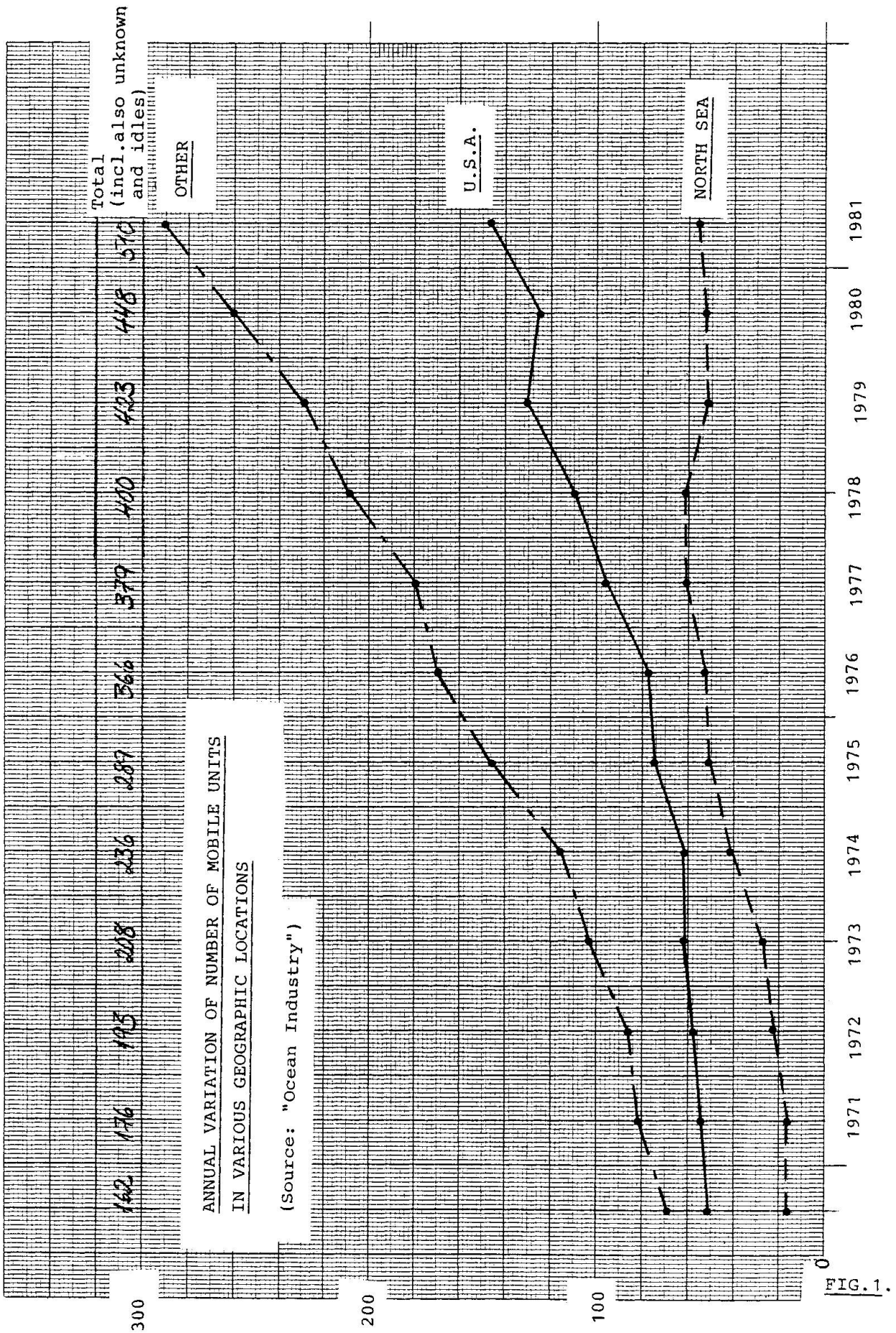
ANNUAL VARIATION OF NUMBER OF MOBILE UNITS
IN VARIOUS GEOGRAPHIC LOCATIONS
(Source: "Ocean Industry")
Total (incl.also unknown and idles)
OTHER
U.S.A.
NORTH SEA
142 176 195 208 236 287 366 379 400 423 446 470
300
200
100
0
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

FIG.1.

An impact is defined as a type of collision causing only minor structural damage. No immediate repair is necessary. The accident is noted in the Captain's Journal with no further action taken. An impact is normally caused by the offshore-dedicated traffic (supply vessels, etc.).

A collision causes major structural damage usually necessitating immediate repair.

a. Drifting buoys and other objects - Norwegian sector

The main sources of information are the Main Rescue Centres in Stavanger and Bodø. Table 2 presents the monthly variation of reported drifting barges and other objects during 1979 and 1980. (Norwegian sector south of 65°N). As can be expected, there are concentrations in the Ekofisk, Frigg and Statfjord field areas. More complete information may be found in ref. [6].

MONTHLY VARIATION IN 1979

	Jan./ Feb.	March/ April	May/ June	July/ Aug.	Sept./ Oct.	Nov./ Dec.	Total 1979
BUOYS	31	22	9	0	14	18	94
OTHER OBJECTS	3	6	7	2	3	4	25
TOTAL	34	28	16	2	17	22	119
BUOYS AND OBJECTS IDENTIFIED BELONGING TO OFFSHORE INDUSTRY	11	8	3	1	4	7	34

(Included above)

MONTHLY VARIATION IN 1980

	Jan./ Feb.	March/ April	May/ June	July/ Aug.	Sept./ Oct.	Nov./ Dec.	Total 1980
BUOYS	21	25	4	1	13	15	79
OTHER OBJECTS	1	1	1	3	2	1	9
TOTAL	22	26	5	4	15	16	88
BUOYS AND OBJECTS IDENTIFIED BELONGING TO OFFSHORE INDUSTRY	10	4	0	0	5	4	23

(Included above)

Table 2. Ref. [5].

b. Drifting ships and barges - Norwegian section

Main sources of information are again the Main Rescue Centres. Reported incidents are presented in Table 3, ref. [7]

INCIDENT NO.	DATE	INCIDENT OCCURRED IN AREA	VESSEL/BARGE INVOLVED	INSTALLATION(S) THREATENED	
1.	Dec. 1971	Ekofisk	Barge with jacket platform	None on Norwegian side	
2.	18.12.74	Ekofisk	300 ft. barge	Ekofisk	Broke adrift while under tow German tug stood by in attendance. Weather: deteriorating force 10
3.	11.12.79	Outside Stavanger	Barge	None	
4.	12.12.79	Outside Lista	Barge	None	
5.	12.12.79	Frigg	10,000 ton barge H102	Frigg and later Statfjord, Brent	Tow parted 30 n.m. SE of Frigg. Tow re-established on 13.12. Weather: force 10-11, waves: 9 m.
6.	17.12.79	British sector	British ship "Manor Park" 480 on coaster	Ekofisk-Teeside pipeline booster platform 36/22A	Ship abandoned. Cargo of aluminium ingots shifted. Tow established on 18.12. Weather: force 10-12
7.	22.04.80	Outside Stadt	Barge	None	Reported drifting. Taken on tow.

Table 3. (contd.)

INCIDENT NO.	DATE	INCIDENT OCCURRED IN AREA	VESSEL/BARGE INVOLVED	INSTALLATION(S) THREATENED	
8.	01.01.81	Ekofisk	Accommodation vessel "Berge worker"	None on Norwegian side	Weather: Hurricane waves: 12 m.
9.	15.01.81	Statfjord	Fishing vessel "Harøyfjord"	3 mobile drilling rigs	Ship abandoned weather: full gale
10.	19.03.81	German sector	Dutch trawler	Ekofisk-Emden Pipeline booster platform GNSC/H-7	Drifting with no crew on deck 50 m. past platform "Near-miss" collision
11.	24.11.81	Ekofisk	Service platform "Phillips SS"	Ekofisk-Tor platform	Weather: Hurricane. Anchor lost

Table 3.

There are a number of features common to many of the incidents reported. Most of the incidents (about 90%) occurred during the months of December and January, usually during very severe weather conditions.

Most of the incidents threatening a major offshore field involved vessels which service the offshore oil industry (all incidents except one).

At an offshore field during the construction phase, towed barges present a great danger (half the total number of incidents). During the operation phase, anchored installations (accommodation-service platforms/vessels) are dangerous.

Pipeline booster platforms, which are isolated from other offshore traffic are particularly exposed to small drifting vessels, i.e. fishing vessels, trawlers and coasters, which are all, of course, vulnerable to extreme weather conditions.

As can be seen, a total of 11 incidents of drifting vessels and barges were reported in the Norwegian sector during the period 1.1.1971 to 1.1.1982. None of these incidents resulted in the vessel concerned colliding with an installation. Only one incident was a "near-miss" collision (No. 10), which, however, was a special case involving, it seems, a "sleeping crew". One can, therefore, say that with the above "exception" in no case did the drifting vessel/barge approach closer than some nautical miles of an installation. Thus, statistically and historically, one would only expect a small minority of drifting vessel incidents to lead to collisions.

c. Drifting fishing vessels - Norwegian sector

Fishing vessels which are temporarily or permanently out of control may also represent a threat to installations in the area. With the assistance of local VERITAS surveyors, a survey is presently being carried out registering such occurrences for about 326 Norwegian ocean-going fishing vessels with VERITAS classification. Results will be presented at the end of 1982.

d. Infringements of safety zones - Norwegian and U.K. sectors

In Tables 4a and 4b, the reported infringements of the 500 m safety zones in the Norwegian and U.K. sectors are presented.

Table 4a. Infringements in the Norwegian sector.

Total number

YEAR	1975	1976	1977	1978	1979	1980	1981***	TOTAL
NUMBER	4	15	13	10	39	13	7	101

Total number split on Offshore Fields

FIELD	1975	1976	1977	1978	1979*	1980	1981***	TOTAL
EKOFISK	4	15	13	5	34	13	7	91
FRIGG	0	0	0	4	0	0	0	5**
STATFJ.	0	0	0	1	3	0	0	4

* Gives a total number of 37 incidents while other sources give 39 incidents.
** Elf assumes total incidents since 1974 to be 5.
Elf informs that no incidents have been reported in the last two years.
*** No incidents have been reported after 31.3.81

Total number split on Type of Vessel

SHIP TYPE	TOTAL NUMBER	IN %
FISHING VESSEL	66	73
NAVAL SHIPS	11	13
CARGO SHIPS	3	3
YACHTS	2	2
UNIDENTIFIED SHIPS	4	4
AIRPLANES	5	5
TOTAL	91	100

Table 4 b. Infringements in the U.K. sector

Total number

Infringements Type of Vessel	1976	1977	1978	1979	1980	%
TRAWLERS	15+	15+	15	33+	45	< 79.0
COASTERS	2	2	2	3	1)	
NAVAL TUGS	1	2	0	0	0)	
TANKERS	1	0	1	0	0)	> 21.0
CARGO	0	1	3	3	1)	
UNKNOWN OR OTHER	2	1	3	1	1)	
FREIGHTERS	0	0	1	0	0)	
TOTAL	21+	22+	26	40	48	100.00

More complete information may be found in ref [8].

e. &
f. Worldwide statistics on offshore collision accidents

In the following, worldwide statistics on collision accidents are presented according to Lloyds' List, extracted from the VERITAS Offshore Accidents Databank, ref [1].

Tables 5a to 5h are self-explanatory; however, some comments should be added.

As can be seen from Table 5a, the number of collision accidents ranks second to weather accidents. The total number of worldwide reported collisions during the 11 year period for all platforms (fixed and mobile) is 82.

From Table 5c, it can be seen that the average frequency of collisions per 100 mobile rig-years, as can be expected, is highest for the North Sea compared to the U.S.A. and worldwide.

From Table 5d, it can be seen that the great majority of collisions occur during the operating phase.

According to Table 5e, 15 out of 82 collisions have occurred in the North Sea since 1970.

Looking at Table 5f, we shall notice, however, that only 4 of these collisions have caused damage, the other 11 only caused minor or no damage at all. Corresponding figures for the USA (Tables 5e and 5g) are 22 and 8, respectively.

Though the number of collisions are high, the consequences are normally small and also the number of lives lost by collisions are relatively small, see Table 5h.

Type of Accident	Struc. Loss							RELATIVE FREQUENCY OF ACCIDENT TYPE (%)
	Tot. Loss	Sev. Dam.	Damage	Min. Dam.	No Dam.	Unknown	Sum	
WEATHER	5	10	23	17	9	-	(82)64	20(16)
CAPSIZING	11	4	1	1	-	1	18	
COLLISION	2	2	15	20	13	-	(82)52	16(16)
GROUNDING	1	6	2	3	1	-	13	
BLOWOUT	8	6	12	7	6	-	(80)39	12(16)
LEAKAGE	1	2	3	-	2	-	8	
MACHINE	-	1	5	6	-	-	12	
FIRE	1	3	12	8	-	1	25	8
EXPLOSION	-	2	5	6	-	1	14	
OUT OF P.	-	-	2	-	4	1	7	
FOUNDER.	3	-	-	-	-	1	4	
STR. DAM.	1	3	16	20	2	-	42	13
OTHER	-	1	3	8	15	1	28	9
UNKNOWN	-	-	-	-	-	-	-	
SUM	33	40	99	96	52	6	326	100

Table 5a. Collisions Worldwide.

Number of accidents distributed on "Type of Accident" and "Degree of Structural Loss", for mobile units only.

Period of occurrence: 01.01.70 - 31.12.81
Source: "Lloyd's List"

( ) Corresponding figure including also fixed platforms.

1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	SUM
4(5)	3(4)	3(4)	4(6)	1(3)	7(13)	4(9)	2(4)	8(11)	6(6)	7(13)	3(4)	52(82)

Table 5b. Yearly distribution of total number of collisions worldwide. (Source: "Lloyds List").

1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
2.5	1.7	1.6	1.9	0.42	2.4	1.1	0.53	2.0	1.43	1.58	0.59

Average
Worldwide: 1.39
North Sea: 1.55
U.S.A.: 1.05

Table 5c. Yearly distribution of total number of collisions worldwide per 100 rig-years for each year. (Source: "Lloyds List" and "Ocean Industry").

Type of Accident	OPERATION MODE					
	CONSTRUCTION	TRANSFER	MOBILIZE	OPERATING	UNKNOWN	SUM
WEATHER	2	24	1	37(50)	-	64(82)
CAPSIZING	-	6	3	7	2	18
COLLISION	5	7	-	31(57)	9	52(82)
GROUNDING	2	8	2	1	-	13
BLOWOUT	-	-	-	38	1	39
LEAKAGE	-	2	-	6	-	8
MACHINE	-	7	-	4	1	12
FIRE	2	2	1	16	4	25
EXPLOSION	6	1	-	6	1	14
OUT OF P.	-	5	-	1	1	7
FOUNDER.	-	4	-	-	-	4
STR. DAM.	4	6	9	20	3	42
OTHER	3	7	1	15	2	28
UNKNOWN	-	-	-	-	-	-
SUM	24	79	17	182	24	326

Table 5d. Collisions Worldwide.

Number of accidents distributed on "Type of Accident" and "Operation Mode", for mobile units only.

Period of occurrence: 01.01.70 - 31.12.81
Source: "Lloyd's List"

Type of Accident	SHELF		
	U.S.A	NORTH SEA	WORLDWIDE
WEATHER	10(16)	18(23)	64(82)
CAPSIZING	10	-	18
COLLISION	11(22)	8(15)	52(82)
GROUNDING	1	3	13
BLOWOUT	18	3	39
LEAKAGE	-	2	8
MACHINE	2	4	12
FIRE	8	5	25
EXPLOSION	2	5	14
OUT OF P.	-	1	7
FOUNDER.	1	-	4
STR. DAM.	10	7	42
OTHER	3	16	28
UNKNOWN	-	-	-
SUM	76	72	326

Table 5e . Collisions U.S.A. and North Sea

Number of accidents distributed on "Type of Accident" and "Geographic Location", for mobile units only.

Period of occurrence: 01.01.70 - 31.12.81
Source: "Lloyd´s List"

Type of Accident	Struc. Loss							RELATIVE FREQUENCY OF ACCIDENT TYPE (%)
	Tot. Loss	Sev. Dam.	Damage	Min. Dam.	No Dam.	Unknown	Sum	
WEATHER	1	1	8	5	3	-	18(23)	25(19
CAPSIZING	-	-	-	-	-	-	-	
COLLISION	-	-	2(4)	3(6)	3(5)	-	8(15)	11(12)
GROUNDING	-	2	-	1	-	-	3	
BLOWOUT	-	-	1	1	1	-	3	7(8)
LEAKAGE	-	-	-	-	2	-	2	
MACHINE	-	-	1	3	-	-	4	
FIRE	-	-	2	3	-	-	5	7(10)
EXPLOSION	-	1	1	2	-	1	5	
OUT OF P.	-	-	-	-	1	-	1	
FOUNDER.	-	-	-	-	-	-	-	
STR. DAM.	1	1	1	3	1	-	7	
OTHER	-	-	1	4	11	-	16	
UNKNOWN	-	-	-	-	-	-	-	
SUM	2	5	17	25	22	1	72	100

Table 5f. Collisions North Sea

North Sea accidents distributed on "Type of Accident" and "Degree of Structural Loss", for mobile units only.

Period of occurrence: 01.01.70 - 31.12.81
Source: "Lloyd's List"

Type of Accident	Struc. Loss							RELATIVE FREQUENCY OF ACCIDENT TYPE (%)
	Tot. Loss	Sev. Dam.	Damage	Min. Dam.	No Dam.	Unknown	Sum	
WEATHER	1	4	1	3	1	-	10	13(11)
CAPSIZING	6	3	-	-	-	1	10	
COLLISION	-(1)	1(3)	2(4)	6(6)	2(8)	-	11(22)	14(15)
GROUNDING	-	-	-	-	1	-	1	
BLOWOUT	5	2	5	2	4	-	18(49)	24(33)
LEAKAGE	-	-	-	-	-	-	-	
MACHINE	-	-	1	1	-	-	2	
FIRE	1	2	3	2	-	-	8	10
EXPLOSION	-	-	2	-	-	-	2	
OUT OF P.	-	-	-	-	-	-	-	
FOUNDER.	-	-	-	-	-	1	1	
STR. DAM.	-	1	5	4	-	-	10	13
OTHER	-	1	-	2	-	-	3	
UNKNOWN	-	-	-	-	-	-	-	
SUM	13	14	19	20	8	2	76	100

Table 5g. Collisions U.S.A.

USA accidents distributed on "Type of Accident" and "Degree of Structural Loss", for mobile units only.

Period of occurrence: 01.01.70 - 31.12.81
Source: "Lloyd's List"

Type of Accident	Struc. Loss							NUMBER OF LIVES LOST (%)
	Tot. Loss	Sev. Dam.	Damage	Min. Dam.	No Dam.	Unknown	Sum	
WEATHER	13	0	0	0	0	0	13(13)	3
CAPSIZING	21	6	0	0	0	1	28	
COLLISION	1	8	0	4	0	0	13(30)	3(5)
GROUNDING	0	6	0	0	0	0	6	
BLOWOUT	185 s	26	21	0	0	0	232 s(251)	45(42)
LEAKAGE	0	1	0	0	0	0	1	
MACHINE	0	0	1	0	0	0	1	
FIRE	0	0	0	0	0	0	0	
EXPLOSION	0	2	2	8	0	0	12	
OUT OF P.	0	0	0	0	0	0	0	
FOUNDER.	72 p	0	0	0	0	0	72 p(73)	
STR. DAM.	123 a	0	0	7	1	0	131 a(137)	26(23)
OTHER	0	0	0	2	0	0	2	
UNKNOWN	0	0	0	0	0	0	0	
SUM	415aps	49	24	21	1	1	511 aps (595)	100

Table 5h.

Number of lives lost distributed on "Type of Accident" and "Degree of Structural Loss", for mobile units only.

Period of occurrence: 01.01.70 - 31.12.81
Source: "Lloyd's List"

a - "Alexander Kielland" included, 123 lives lost
p - "POHAI 2" included, 72 lives lost
s - "SEDCO 135-C" included, 180 lives lost

e. Impacts and Collisions from Offshore Dedicated Traffic - North Sea

In the U.K. sector, all impacts and collisions are required to be reported to the Department of Energy, Petroleum Engineering Division. In the Dutch and Norwegian sectors, however, no reporting system exists.

To our knowledge, no collisions causing serious damage have occurred as of today with offshore related traffic in the North Sea. Impacts, however, occur frequently. Table 6 presents some figures for the U.K. sector.

Table 6. Reported impacts and collisions in the U.K. sector. (Source: Department of Energy.)

(All impacts and collisions are between supply/standby vessels manoeuvring in the neighbourhood of fixed/mobile platforms).

1980		1981	
1.01 - 31.03.1980:	0	1.01 - 31.03.1981:	7
1.04 - 30.06.1980:	3	1.04 - 30.06.1981:	3
1.07 - 30.09.1980:	0	1.07 - 30.09.1981:	1
1.10 - 31.12.1980:	6	1.10 - 31.12.1981:	5
TOTAL 1980:	9	TOTAL 1981:	16

Most of the above occurrences can be characterized as impacts which caused very minor or no damage to ships and/or platforms.

For Norwegian waters, similar reports are not available for public use. A confidential investigation is presently being carried out by VERITAS in order to assess incidents of collisions and impacts which have occurred with supply ships and other offshore related traffic. 32 ship-owners have been contacted, who, together own 168 VERITAS classified ships. Also, 13 mobile rig-owners have been contacted. A few overall figures may be given; 17 ship-owners and 9 rig-owners have responded so far. During the period 1975-81, a total of 30 impacts have been reported by the ship masters.

f. Collisions and Near-misses from External Passing Traffic

North Sea

To our knowledge, only two collisions have been reported in the North Sea area between external passing traffic and an offshore platform. Both collisions involved trawlers en route; one occurred in the Dutch sector and one in the U.K. sector.

The fisherman in the Dutch sector collided with a platform in 1973. No further details are known.

The incident in the U.K. occurred in the autumn of 1981 when a trawler struck a fixed platform and stuck. It bent a 5´ section of deck upright.

As regards near-misses, we know only of one reported incident when a Dutch trawler with no crew on deck passed full speed 50 m away from the NORPIPE pipeline booster platform, GNSC/H-7. The incident was reported to the authorities as violation of the 500 m safety zone. Certainly, other near-misses must have occurred but it is often difficult to collect any kind of information since no written reports normally exist.

Other parts of the world

In other parts of the world, collisions certainly have occurred. We know, however, of only one incident which has been publicly reported. This occurred in August 1981, outside Louisiana in the Gulf of Mexico, involving a tanker running into a steel jacket platform at 18 knots. Contributing causes to the collision were that the existence of the platform was unknown to the ship's master, that a blind sector existed on the ship's radar due to the ship's foremast, and the decision of the master not to follow the recommended shipping lane through the area (ref. [8]).

5. CONCLUSIONS

We have, in this paper, presented some relevant statistics on collision accidents involving offshore structures. It remains to be seen, however, what use we can make of the available statistics in order to achieve our objective in gaining a better understanding of the problems and reducing the collision risk in the future.

Obviously, the probability for major offshore collisions in the North Sea is very small, making probability calculations rather uncertain. Based on the two collisions known today, an estimated collision frequency for passing trawlers may be established and applied to areas with varying passing trawler traffic. Similarly, this may be applied to impacts from offshore dedicated traffic. For other types of potential collision threats, however, where no collision has occurred in the North Sea, such as for instance, passing merchant ship traffic and drifting ships, etc. we are obliged to rely on other methods.

For collision consequence calculations, details of actual collisions would certainly be of great value. However, even in those few cases when such data are revealed, the initial ship data (course, speed, mass, etc.) are uncertain, and would only be known in cases of controlled test conditions.

Therefore, our main conclusion is that the available collision statistics today for the North Sea can only provide part of the input to a collision probability estimate. For collision consequence calculations, available collision data are of limited value.

Let us hope that our present situation of lack of offshore collision data from the North Sea will continue.

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