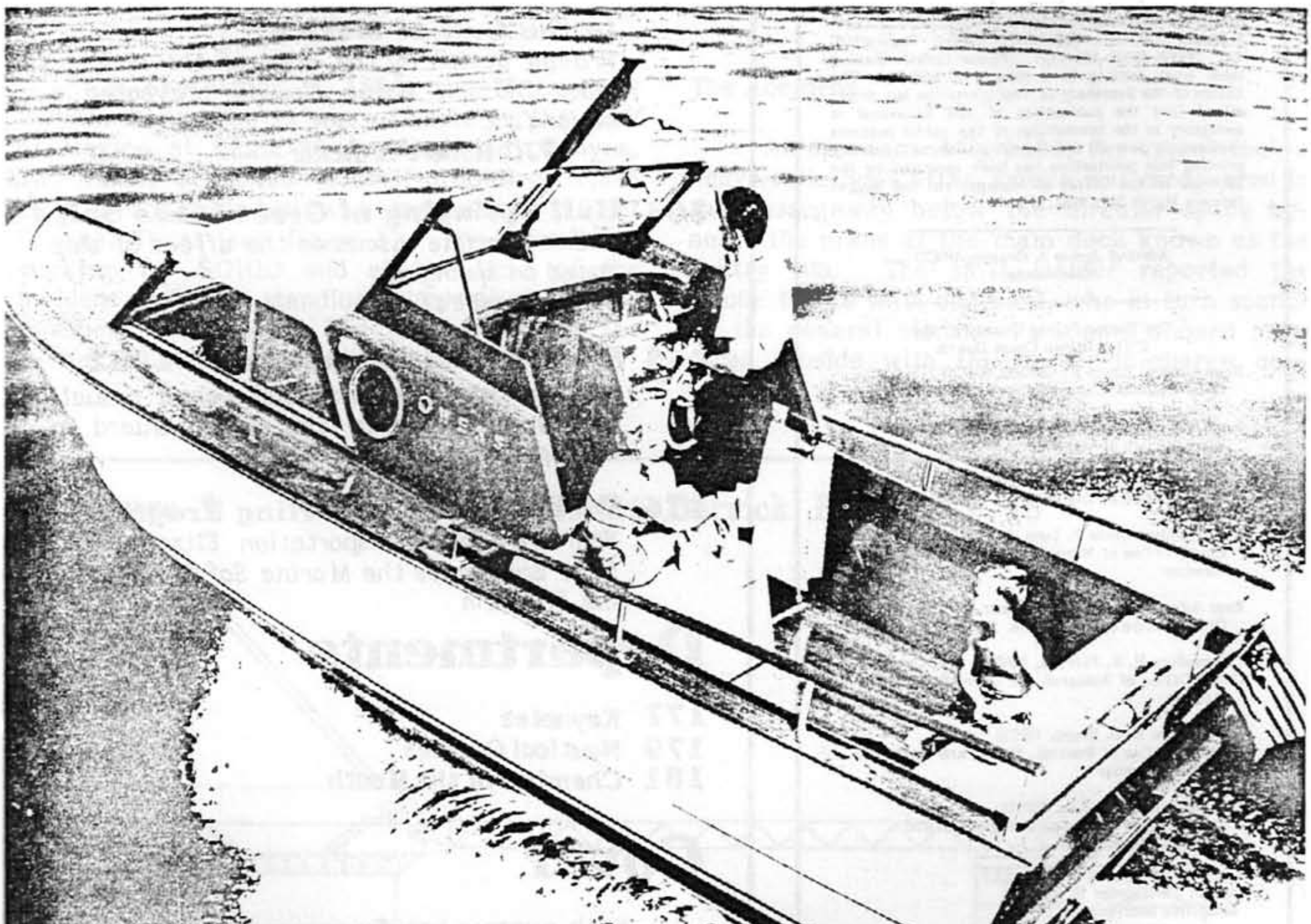
Proceedings

of the Marine Safety Council



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With summer rapidly approaching, many pleasure boaters will be launching their vessels after a cold, landlocked winter. The Coast Guard advises pleasure boaters to examine their vessels and perform needed maintenance before launching to prevent costly, and sometimes tragic, consequences. Official U.S. Coast Guard photo.

Major Disaster Averted in the Gulf of Mexico

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On September 7, 1984, the McDermott Derrick Barge No. 16 was offshore in the Gulf of Mexico at Block 20-A, Mississippi Canyon. The vessel is a 400' nonself-propelled, 7,846 gross ton, steel industrial vessel built in 1967 at Orange, Texas (see figure 1). The vessel was working for SOHIO and at the time of the incident and was standing by waiting for the weather to improve. The wind was from the east at about 18 knots with 6- to 8-foot seas.

The Accident

At approximately 1500, the vessel took a heavy roll. Soon after, smoke was discovered in the passageway below the circular space beneath the crane at the main deck known as the gantry tub. The shift welder reported the smoke to the shift engineer, who in turn sounded the general alarm. Personnel aboard mustered topside with the person-in-charge con-

Figure 1 **McDermott Derrick Barge No. 16**

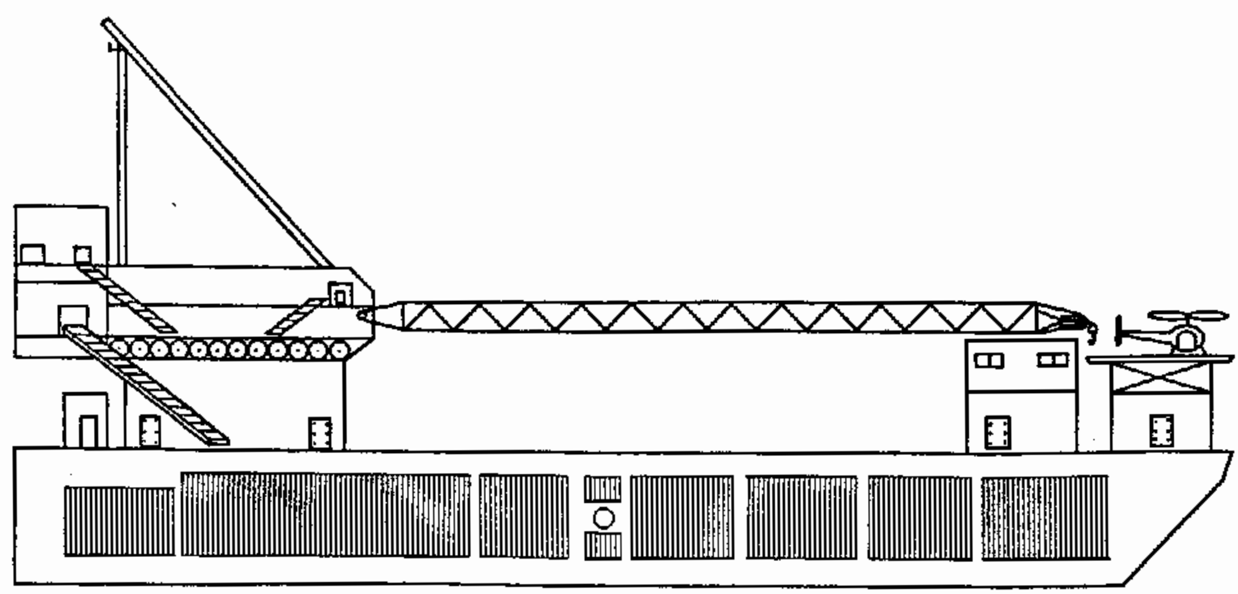
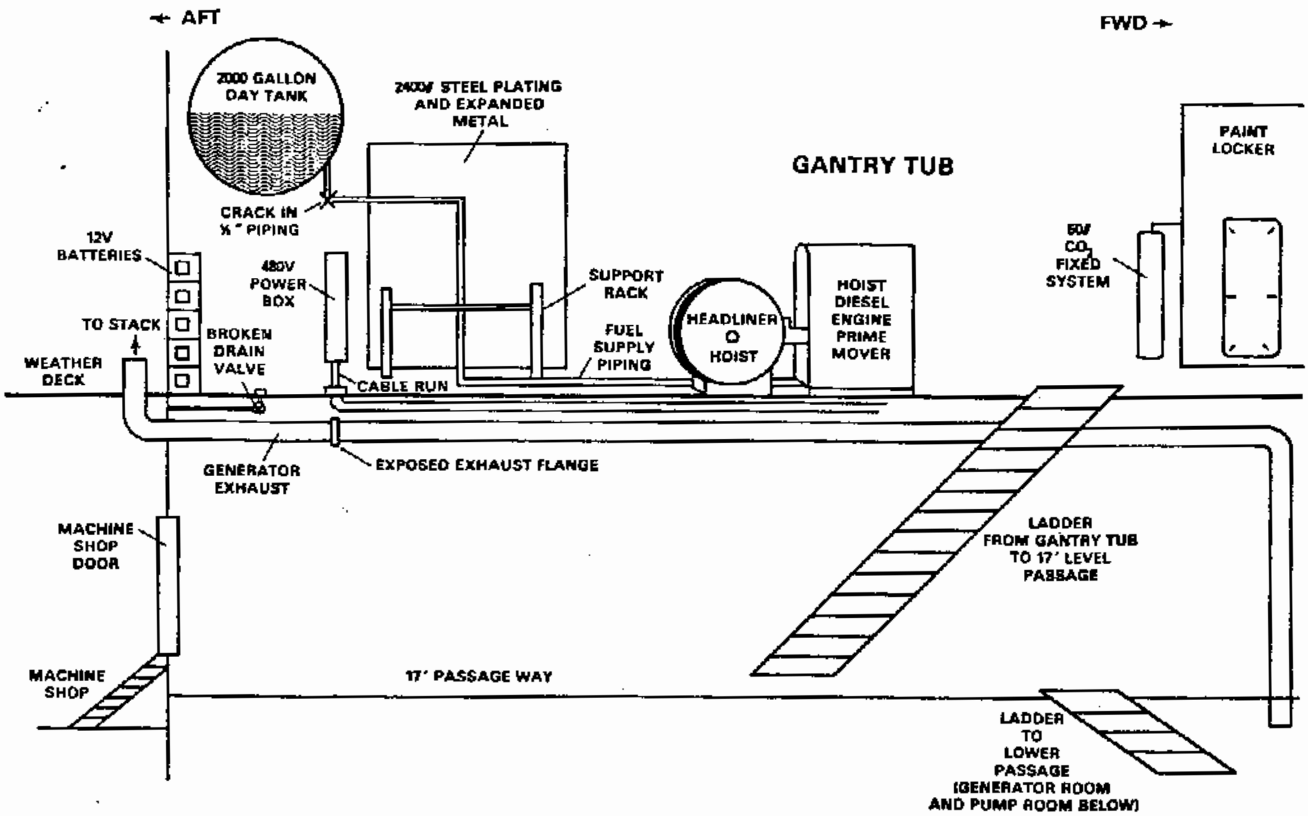


Figure 2

DIAGRAM OF VESSEL IN VICINITY OF FIRE

(VIEW FROM STARBOARD)



firming the roll call. All persons were accounted for. The Coast Guard was notified by nearby McDermott Derrick Barge No. 22, and as the firefighting efforts began, 31 persons were evacuated via company helicopters.

The chief engineer was in charge of the damage party fighting the fire. He and the first assistant engineer each donned a self-contained breathing apparatus, gear required in the complement of fully outfitted fireman's suits aboard large merchant vessels. They proceeded immediately to the third-level generator room and tripped the generators off the line by closing fuel valves. Working in thick smoke, they started the diesel-driven fire pump in the space opposite the generator room. After verifying that the pump was taking suction, they proceeded upward to the base of the ladder to the gantry tub (see figure 2) before being driven back by the heat. They managed to secure the watertight door to the machine shop, preventing the blaze from spreading any further aft. Retreating forward, they secured each watertight door as they passed through.

The paramount concern during the firefighting was to extinguish the blaze before the fuel tanks adjacent to the passageway below the gantry tub ruptured. On deck the rigger foreman had his men take out fire hoses and secure watertight doors and ventilation closures. They also secured all forced draft ventilation and air conditioners from remotely mounted electrical shutdowns on the main deck. They hooked up a three-cylinder lifter pump kept aboard for dewatering and, taking suction from a ballast tank, commenced cooling the port and starboard fuel tanktops. The towing vessel JARAMAC 62 assisted by providing additional cooling water to the base of the crane.

The firefighting was conducted in exemplary fashion. The crew gathered dry chemical portable extinguishers from throughout the vessel to the weatherdeck aft of the gantry tub. They discharged the agent into the gantry tub through a cable-run collar while injecting firefighting water through a vent to a particularly hot area near a series of welding machines within. Meanwhile, the chief engineer entered the gantry tub through a forward watertight door and released carbon dioxide from the 50-pound fixed system into the paint locker. Flames and smoke were pervasive in the passageway below the gantry tub, with the most intense heat radiating from the overhead corner opposite the watertight door to the machine shop. The combined effect of dry chemical and firefighting water reduced the heat sufficiently so that firefighters could enter the area where smoke was first sighted. The fire was extinguished at approximately 1715.

Inspections were made of the areas near the fire until about 1930, during which time water was continually applied for further cooling. With a reflash watch on station, the crew reopened fittings and watertight doors to eliminate smoke. Overhaul and dewatering in the gantry tub and passageway below followed as the vesel began transit to McDermott Pipeline Yard, Amelia, Louisiana, in tow of M/V GULF CAJUN.

The Investigation

Investigation of the incident began after the vessel was moored on September 9, 1984. The chief engineer, person-in-charge, first assistant, and shift welder were all questioned as reconstruction of the fire began. Examination confirmed that the two areas primarily affected by the blaze were the lower passageway aft below the gantry tub and the gantry tub itself. The first engineer indicated that most of the heat had been concentrated at the lower passageway above dual exhaust pipes from the Waukesha L-5790D diesel generators. At the time of the fire, the generators were working at full load, with the pyrometers reading 750°-900°F. Visual examination confirmed that much heat had been concentrated at this location. The heat and smoke patterns left color evidence of intense heat above the watertight door to the machine shop. The electrical cables overhead were charred in this vicinity, while further forward they were primarly melted. The cables entered the space through the overhead. It was noted that there was a cracked drain valve directly above the cable run. This drain appeared to be full of oily debris. Fuel tanks were located adjacent to the passageway. There was no apparent damage to the inboard side of the starboard tank, but the upper two feet of port inboard bulkhead was buckled in the corner above the generator exhaust where the fire appeared greatest.

Examination of the gantry tub followed. Damage was concentrated in the area aft of a GM 6-71 diesel-driven headliner hoist. This piece of gear took suction of its fuel supply from a 2000-gallon diesel fuel day tank mounted at the aft bulkhead approximately 10 feet above the hoist. Several welding machines were located nearby. Aft of the headlliner hoist, several 12-volt batteries were stored, though none were trickle-charging at the time of the incident. A rack of one-eighth steel plating and expanded metal weighing approximately 2,400 pounds was lying against the port side of the headliner hoist. Two 480-volt panelboards were also located aft of the hoist. The paint locker was located further forward. Examination revealed that the fixed carbon dioxide had been discharged into the locker with no-evidence of damage within. Securing the cover to the paint locker had prevented the extinguishing agent from escaping the space. Quick release of carbon dioxide probably prevented the paint locker bulkheads from reaching high termperatures. With paint ruled out as a source of combustion, attention was directed the the fuel day tank supply for the headliner hoist. The tank, which was built in 1966, showed no evidence of rupture. However, the half-inch mild steel supply piping to the hoist engine was cracked at a union joint directly above the one at the 480-volt panelboards. This panelboard showed little evidence of damage within, so it was doubtful that iginition of the fuel had orignated there.

When the lower passageway was reexamined, investigators discovered an exposed exhaust flange located directly beneath the cable run through the deck from the 480-volt panelboard. Close examination of the insulation blanket which appeared to be protecting the steel exhaust flange revealed a 2-inch gap of exposed metal between the wire lacings directly beneath the overhead panelboard. Since number two diesel fuel has an ignition temperature of about 500°F, the temperature of the hot exhaust piping with gases between 750-900°F was more than sufficient as an ignition source.

Conclusions

A heavy roll of the vessel at about 1500 on September 7, 1984 caused a rack supporting 2,400 pounds of steel plating and expanded metal to collapse. The plating fell against a half-inch fuel supply pipe, cracking it, and allowing as much as 1000 gallons of diesel fuel to spill on the deck. Some of the fuel passed through a cable run in the deck, falling directly atop hot exhaust piping. This fuel ignited.

Several lessons in fire prevention are evident from this incident:

- Equipment and gear aboard vessels should be properly secured for sea. Had the stack of steel plating been secure and unable to move, the piping would probably not have been cracked.
- Fuel piping should be properly supported and located for maximum protection from its surroundings.
- Cable penetrations through bulkheads and decks should be made through stuffing tubes to provide maximum watertight protection and prevent the spread of flood and fire. Newer industrial vessels are constructed to meet this standard.
- Exhaust piping insulation should receive proper attention and maintenance.
- Everpresent high exhaust temperatures are a proven fire hazard. Foresight and attention to detail by crew members could have prevented this incident.

Damage was approximately $270,000. If not for the prompt detection of the fire and firefighting response by the crew of McDermott Derrick Barge No. 16, the port fuel tank adjacent to the lower passageway would have ruptured, and the contents of the temporarily inerted paint locker would have ignited. The result would have been a disaster of great magnitude with injury and loss of life.

Correction: Please note an error on page 139 of the June 1985 issue of **Proceedings.** Under the heading "Important Points for the Captain....", the incorrect statement reads, "Scuppers should not be left unplugged." The correct wording, of course, is "Scuppers should not be left plugged." We apologize to the author and to the readers for this error.

Hull Springing of Great Lakes Ships

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A series of Coast Guard reports has shown the importance of springing effects on Great Lakes ships. A. W. Troesch's paper[1] showed the effect of ship speed on springing and might be helpful to the operators of Great Lakes ships. A short article based on his paper follows.

Ship springing is the resonant response of the ship to a hydrodynamic excitation caused by incident waves. The effects of springing are twofold in that both the wave-induced bending moment and the number of cycles in long-term bending stress caluclations are considerably greater than the values calculated using traditional consideration of low-frequency wave excitation alone. Both effects are known to influence the behavior of ship structure through fatigue.

Since Great Lakes ships are usually slender and flexible and have a natural frequency which often matches incident wave frequencies, springing effects can be of great significance. There are two components of springing excitation: a linear one due to waves with a frequency close to the vessel's natural frequency and a non-linear one resulting from the harmonics of long waves or from the interaction of two different wave components.

For the bulk carrier M/V CORT, whose natural frequency is approximately 1.9 radians per second, both the high-frequency waves and the combinations of low-frequency waves can be in this range and result in springing. Although the short, steep, high-frequency waves generated from the short fetch characteristic of the Great Lakes are small in wave energy, they can still cause large-vessel vibration when resonance occurs.

TABLE 1 Variance of Midship Springing Induced Bending Moments at Ship Speed of 10.85 Knots

	Bending Moment (ft-ton)^2 x 10^8		
	Linear Component	Non-Linear Component	Total
Eagle Harbor Signif. Wave Height = 18 ft	85.35	40.70	126.05
North Superior Signif. Wave Height = 10 ft	13.05	2.90	15.95

TABLE 2 Variance of Midship Springing Induced Bending Moments at Ship Speed of 12.20 Knots

	Bending Moment (ft-ton)^2 x 10^8		
	Linear Component	Non-Linear Component	Total
Eagle Harbor Signif. Wave Height = 18 ft	45.65	20.45	66.10
North Superior Signif. Wave Height = 10 ft	7.45	1.85	9.30

A. W. Troesch, the author, has shown the variance of the midship bending moment induced by the linear and non-linear springing for the bulk carrier CORT in North Superior as well as in Eagle Harbor in table 1. The values in this table show that in some instances, the non-linear springing can contribute significantly to the total springing as well as to the overall bending stress. The author has also shown that the springing bending moment will drop substantially as the ship speed inceases just 1.35 knots as shown in table 2. Of course, increasing the speed beyond 12.2 knots or slightly changing the heading for this case may remove the springing response from an excitation minimum back to an excitation maximum.

On the basis of the numerical examples given, the author concludes that the total springing response is critically dependent upon the vessel's natural frequency and speed in addition to the shape of the sea spectrum that the vessel is operating in. Small changes in either may increase or decrease the springing bending moment. In some instances, the non-linearities can account for one-third of the total response. ‡

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[1] *A. W. Troesch, "Effects of Non-Linearities on Hull Springing,"* ***Marine Technology,*** *Vol. 21, No. 4, October 1984, pp. 356-363.*

Statistics of Casualties

Calendar Year 1982

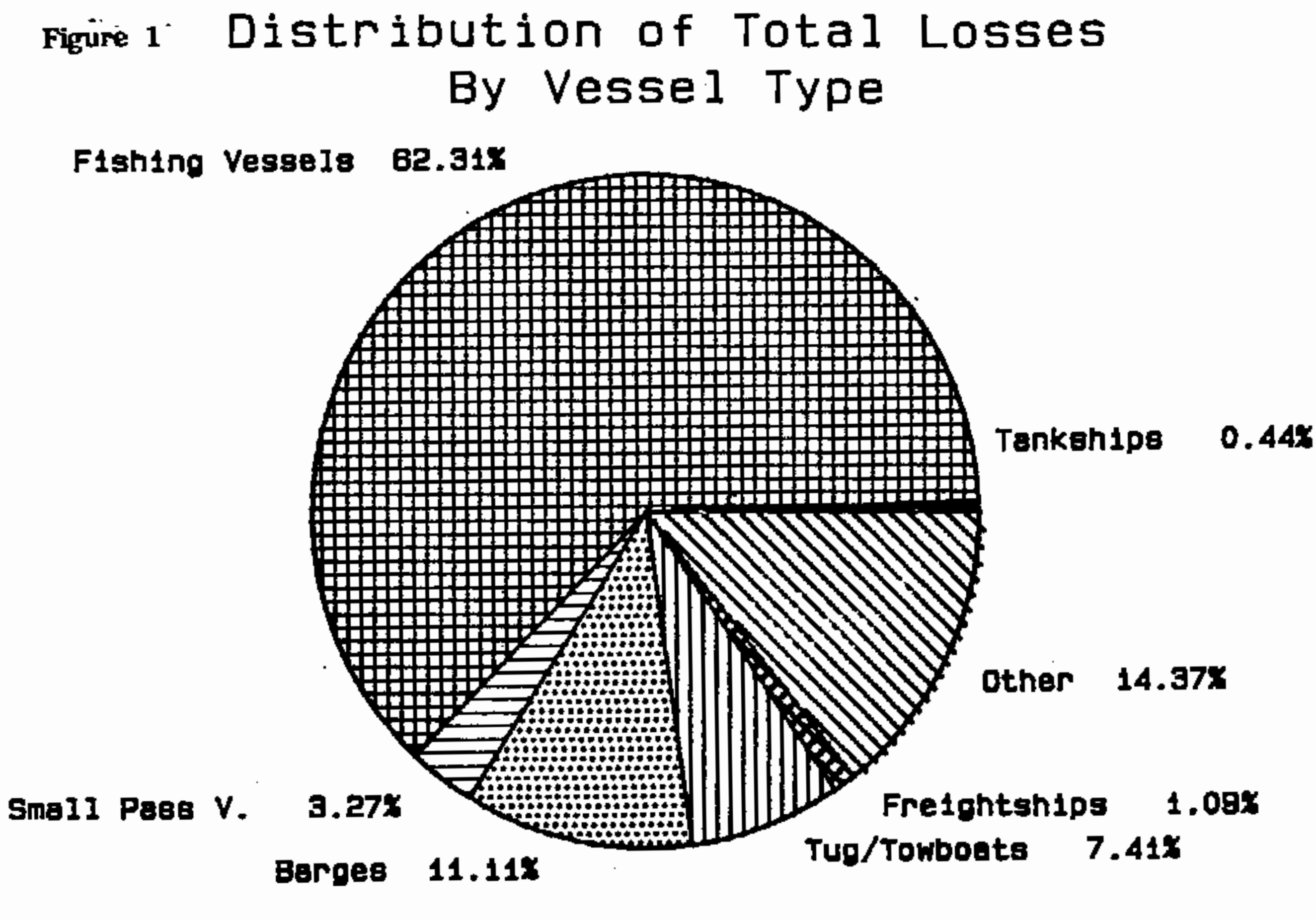
The format for reporting the statistics of casualties for calendar year 1982 has been changed from the format used in previous years. The new format separates the casualties into two subsets: those that resulted in total losses and those other than a total loss. The distribution of total losses by vessel type is shown in the pie chart (figure 1).

These statistics are a summary of the commercial vessel casualties that were investigated by Coast Guard marine investigators during calendar year 1982. The public, industry, and the Coast Guard have used the findings of the investigations to establish standards and determine the need for legislation to improve the protection of safety of life and property at sea.

The master of a vessel is required by law to report a marine casualty within 5 days after its occurrence to the nearest Coast Guard Marine Inspection Office or Marine Safety Office. The following summary represents casualties for which reports were received at Coast Guard Headquarters during calendar year 1982. These casualties, involving commercial vessels, were required to be reported to the Coast Guard whenever the casualty resulted in any of the following:

- an accidental grounding or an intentional grounding which also meets any of the other reporting criteria or creates a hazard to navigation, the environment, or the safety of the vessel;
- loss of main propulsion or primary steering, or any associated component or control system, the loss of which causes a reduction of the maneuvering capabilities of the vessel. Loss means that systems, component parts, subsystems, or control systems do not perform the specified or required function;
- an occurrence materially and adversely affecting the vessel's seaworthiness or fitness for service or route, including but not limited to fire, flooding, or failure of or damage to fixed fire-extinguishing systems, lifesaving equipment, auxiliary power-generating equipment, or bilge pumping systems;
- an occurrence not meeting any of the above criteria but resulting in damage to property in excess of $25,000. Damage includes the cost of restoring the property

Figure 1



to the service condition which existed prior to the casualty, but must exclude the cost of salvage, gas freeing, and dry-docking. It also does not include such items as demurrage.

Every event involving a vessel or its personnel which meets any of the conditions of a reportable casualty is of great concern to the Coast Guard. A number of reportable casualties are not investigated by the Coast Guard simply because they are not reported. Thus, it is of the utmost importance that the masters of all vessels ensure that all casualties are reported.

Three major casualties resulting in the total loss of inspected vessels over 100 gross tons occurred in 1982. These are described below:

Tankship SS GOLDEN DOLPHIN

At approximately 1554 (all times are zone description +3) on 6 March 1982, the SS GOLDEN DOLPHIN, while enroute from St. James, Louisiana to Dubai, United Arab Emirates, suffered multiple explosions in the cargo tank area and burned approximately 900 nautical miles due east of Bermuda. At the time of the explosions, four crew members were performing repairs to an on-deck steam line near number 3 center cargo tank. Five other crew members were in the number 4 center cargo tank removing sludge. After the explosions, the entire midships area was engulfed in flames and, at approximately 1630 on 6 March 1982, the Master ordered the vessel to be abandoned. The nine crew members who were working in the vicinity of the explosions and fire are missing and presumed dead. The 16 survivors were rescued by the M/V NORRLAND (Swedish). On 7 March 1982 at approximately 0820, the SS GOLDEN DOLPHIN sank in position 30° 08' North, 46° 39' West.

M/V POLING BROS. NO. 9

At 0932, 26 February 1982 (all times are approximate and are Eastern Standard Time), the tankship POLING BROS. NO. 9, O.N. 233333, while proceeding southbound in the East River, New York, in a light condition, caught fire and suffered a series of explosions in the vicinity of the Williamsburg Bridge. The vessel was soon engulfed in flames and lost propulsion. It then drifted toward the Brooklyn shore where it subsequently sank approximately 100 yards south of the Williamsburg Bridge. The resulting pollution was minor. Of the eight crew members aboard the POLING BROS. NO. 9, one was killed and three others suffered varying degrees of injuries. The ship was a total loss. Minor damage was also incurred to the Metropolitan Transit Authority equipment when a piece of metal from the POLING BROS. NO. 9 was hurled onto the Williamsburg Bridge and lodged itself between a subway train and the third rail.

Mobile Offshore Drilling Unit (MODU) OCEAN RANGER

At approximately 0052, 15 February 1982, the mobile offshore drilling unit (MODU) OCEAN RANGER, during a severe storm, commenced transmitting distress calls which indicated that the crew was abandoning ship. At or about 0307, 15 February 1982, the OCEAN RANGER capsized and sank in the Atlantic Ocean approximately 166 miles east of St. John's, Newfoundland in about 260 feet of water. In spite of the extensive rescue efforts of numerous vessels and aircraft, none of the 84 crew members survived. Twenty-two bodies were recovered between 15 February and 24 February 1982.

This statistical tabulation is intended to summarize the casualty experience for the entire commercial fleet. Because the summary is so all-encompassing, use of the statistics may lead to erroneous conclusions if the limitations of the data are not well understood. The Marine Safety Evaluation Branch of the Coast Guard's Marine Investigation Division will gladly assist in quantifying those limitations for each specific need.

Comments and recommendations for changes or improvements in the statistics should be addressed to Commandant (G-MMI-3), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593.

TABLES OF CASUALTY STATISTICS BEGIN ON THE NEXT PAGE.

TABLE 1

SUMMARY OF COMMERCIAL VESSEL TOTAL LOSSES
BY NATURE OF CASUALTY AND VESSEL SIZE FOR 1982

	FOUNDERED		FIRE/EXPLOSION		COLLISION		GROUNDING		HULL/MACHINERY DAMAGE		MISSING		OTHER	
	No.	GT	No.	GT	No.	GT	No.	GT	No.	GT	No.	GT	No.	GT
FREIGHTSHIP														
Less than 100 GT	3	69												
100-199	1	103												
200-299														
300-499														
500-1599														
1600-4999														
5000-9999														
10,000-19,999														
20,000 and Above														
TANKSHIP														
Less than 100 GT														
100-1599			1	1243										
1600-4999														
5000-9999														
10,000-19,999														
20,000-39,999														
40,000-99,999			1	44,881										
100,000 and Above														
PASSENGER VESSEL (inc. ferries)														
Less than 100 GT	10	236	2	130	2	25			1	19				
100-1599														
1600-4999														
5000 and Above														
TUG/TOWBOAT														
Less than 100 GT	17	776	3	206	1	75			2	109				
100-199	1	131	4	686	2	310								
200-299			1	247	1	296			1	244				
300-999			1	321										
1000 and Above														
OFFSHORE SUPPLY														
Less than 100 GT	3	278			1	94								
100-199	1	199												
200-499														
500 and Above														
MODU														
Less than 300 GT														
300 GT and over									1	14,913				
PLATFORM														
FISHING VESSEL														
Less than 100 GT	80	2,871	57	1,961	17	836	23	1,065	19	910	3	200	4	104
100-199	17	2,337	11	1,589	5	536	6	995	3	497				
200-499	4	1,697												
500-999	2	1,427	1	693					1	671				
1000 and Above			2	6,580										
State Numbered	12	60	4		5	16	2		2	14			6	106
TANK BARGE														
Less than 500 GT														
500-999					1	774								
1000 and Above							1	1,262						
FREIGHT BARGE														
Less than 100 GT							2							
100-999	13	8,814			8	5,228	1	721	3	2,705			15	12,168
1000 and Above	1	3,827			2	2,202			1	2,562				
Unknown	2								1					
MISCELLANEOUS														
Less than 100 GT	20	37	8		8	29	5	75	2				1	10
100 and Above (SP)	6	499							1	14				
100 and Above (NSP)									1	5,125			1	553
FOREIGN FLAG														
Freight	1	498												
Tank														
Other	3	3,924							2	2,786			1	

TABLE 2A

TOTAL LOSSES DURING 1982
TYPE OF VESSEL BY AGE OF VESSEL

Type vessel Age	0-4	5-9	10-14	15-19	20-24	25-29	30 & Above	UNKNOWN
FREIGHTSHIP	1				1		2	1
TANKSHIP		1					1	
PASSENGER VESSEL (inc. ferries)	1	1	4	4	2	1	1	1
TUG/TOWBOAT	2	2	3	5	2	5	14	1
OFFSHORE SUPPLY	1	2		1	1			
MODU		1						
PLATFORM								
FISHING VESSEL	45	45	25	27	15	16	81	1
STATE NUMBERED	3	6	5	1	3	1	7	5
TANK BARGE	1						1	
FREIGHT BARGE	14	6	11	8	3	2	3	2
MISCELLANEOUS	10	1	12	6	1	5	19	6

TABLE 2B

TOTAL LOSSES DURING 1982
NATURE OF CASUALTY BY AGE OF VESSEL

Casualty Age	0-4	5-9	10-14	15-19	20-24	25-29	30 & Above	UNKNOWN
FOUNDERED	33	21	24	12	15	16	65	11
FIRE/EXPLOSION	19	20	10	11	4	5	28	
COLLISION	9	6	10	12	3	2	9	2
GROUNDING	5	5	4	8	3	3	11	1
HULL/MACHINERY DAMAGE	4	10	3	5	3	1	9	2
MISSING	1	1					1	
OTHER	7	2	9	4	1	3	6	1

TABLE 3

SUMMARY OF COMMERCIAL VESSELS NOT INVOLVED IN A TOTAL LOSS
BY NATURE OF CASUALTY AND VESSEL SIZE FOR 1982

	FLOODED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACHINERY DAMAGE	WEATHER DAMAGE	OTHER
	No.	No.	No.	No.	No.	No.	No.
FREIGHTSHIP							
Less than 100 GT	1	1	12	4	6	1	6
100-199	2	3		1	3	1	1
200-299		2	3		2		
300-499			2	1	1		
500-1599	1	1	8	6	5		
1600-4999		1	7	6	5		1
5000-9999	1		10	10	13	1	7
10,000-19999	2	9	40	37	49	6	7
20,000 and Above		3	32	29	32	3	5
TANKSHIP							
Less than 100 GT							
100-1599			6	4	2		
1600-4999			2	2	3		2
5000-9999		1	4	1	1		
10,000-19,999		1	13	9	32		3
20,000-39,999	2	3	23	16	24	1	4
40,000-99,999		3	8	6	14		1
100,000 and Above				1			
PASSENGER VESSEL (inc. ferries)							
Less than 100 GT	14	12	22	31	49	1	21
100-1599			5	4	12		1
1600-4999		2	4	1	6		
5000 and Above	1	1	2	2	2	1	
TUG/TOWBOAT							
Less than 100 GT	5	10	118	74	32	2	34
100-199	9	12	186	132	37	1	22
200-299		3	56	46	15		6
300-999		2	122	231	25	1	12
1000 and Above			23	25	8		4
OFFSHORE SUPPLY							
Less than 100 GT	3	1	5				1
100-199	1		9	1	2		
200-499	1	2	17	2	4		
500 and Above		1					
MODU							
Less than 100 GT							3
100-200					1		
300 GT and Above		3	16	1	6	1	3
PLATFORM		7	9		3		1
FISHING VESSEL							
Less than 100 GT	50	22	70	65	225		79
100-199	17	11	23	40	76	4	16
200-499		1	3	2	4		1
500-999			3		3		
1000 and Above				1			
State Numbered	12	6	11	17	90	1	45
TANK BARGE							
Less than 100 GT	1		4	6			1
100-499	1		6	4	2		
500-999			45	58	6	1	9
1000 and Above	5	2	152	214	21	1	8
FREIGHT BARGE							
Less than 100 GT			45	55	2		17
100-999	4		308	469	31		155
1000 and Above		2	67	68	11	2	23
Unknown							
MISCELLANEOUS							
Less than 100 GT	3		19	21			
100 and Above (SP)	4	5	18	6			
100 and Above (NSP)	1	2	28	14		1	
FOREIGN FLAG							
Freight	1	5	67	41	48	1	14
Tank		3	16	13	8		3
Other		2	9	10	4		6

TABLE 4A:

VESSELS NOT INVOLVED IN A TOTAL LOSS DURING 1982
TYPE OF VESSEL BY AGE OF VESSEL

Type vessel Age	0-4	5-9	10-14	15-19	20-24	25-29	30 & Above	UNKNOWN
FREIGHTSHIP	74	83	71	44	41	18	47	12
TANKSHIP	25	40	23	25	24	23	32	
PASSENGER VESSEL (inc. ferries)	40	36	22	32	17	13	33	1
TUG/TOWBOAT	288	276	176	146	81	90	190	6
OFFSHORE SUPPLY	32	9	4	3		1	1	
MODU	20	8	2	4				
PLATFORM	5	1	1					13
FISHING VESSEL	188	130	85	64	30	38	178	3
STATE NUMBERED	31	19	35	27	29	12	22	7
TANK BARGE	107	127	119	102	37	9	32	14
FREIGHT BARGE	418	310	197	124	60	32	14	104
MISCELLANEOUS	94	27	67	43	12	12	20	98

TABLE 4B:

VESSELS NOT INVOLVED IN A TOTAL LOSS DURING 1982
NATURE OF CASUALTY BY AGE OF VESSEL

Casualty Age	0-4	5-9	10-14	15-19	20-24	25-29	30 & Above	UNKNOWN
FLOODED	31	18	22	11	12	14	30	4
FIRE/EXPLOSION	35	25	21	16	7	8	25	5
COLLISION	448	333	258	171	93	90	148	120
GROUNDING	460	423	291	219	102	60	137	95
HULL/MACHINERY DAMAGE	202	175	118	114	81	45	172	18
WEATHER DAMAGE	10	5	6	4	2	1	3	
OTHER	136	87	86	79	34	30	54	16

TABLE 5A

SUMMARY OF COMMERCIAL VESSEL LOSSES (LESS BARGES AND FISHING VESSELS) DURING 1982
BY CAUSE* AND NATURE OF CASUALTY

PERSONNEL	FOUNDERED No.	FIRE/EXPLOSION No.	COLLISION No.	GROUNDING No.	HULL/MACHINERY DAMAGE No.	MISSING No.	OTHER No.
Inatt. to duty	3		11	10	3		
Judgmental error	10		145	251	3		
Carelessness	5	7	7	3	3		
Lack of knowledge		1	2	13	1		
Relied on floating ATON				2			
Failed to							
Account wind/current	2		61	50			
Use nav. equip/charts			2	4			
Use radiotelephone			1				
Ascertain position			9	65			
Establish Pass Agreement			9				
Keep Proper Lookout			28	13			
Keep Right of Channel			6	1			
Comply w/Rule, Reg, Procedure			19	2	1		
Proceed at Safe Speed			9	3			
Yield Right of Way			8				
Stress							
Fatigue			3	1	1		
Physical impair.							
Intoxication			1				
Improper Loading	14				5		
Improper Maintenance	7	2	1		26		
Improper Mooring/Tow	4		2	1	2		11
Improper Securing/Rigging	10	1		1	3		
Improper safety Precaut	6	5	2	3			
Operator Error	16	3	108	149	7		
Other	9	9	17	24	14		4

* Cause is first one listed in each record

TABLE 5B

SUMMARY OF COMMERCIAL VESSEL LOSSES (LESS BARGES AND FISHING VESSELS) DURING 1982
BY CAUSE* AND NATURE OF CASUALTY

ENVIRONMENT	FOUNDERED No.	FIRE/EXPLOSION No.	COLLISION No.	GROUNDING No.	HULL/MACHINERY DAMAGE No.	MISSING No.	OTHER No.
Adverse weather	22	1	19	18	22		26
Adverse current	15		9	15	9		10
Debris			8		19		
Ice	4	1	6	4	12		3
Lightning		1					
Shoaling			2	65			
Submerged object	6		55	2	4		
Channel hazard			6	30			
Inadequate AtoN							
Other	1		12	7	1		1

* Cause is first one listed in each record

TABLE 5C

SUMMARY OF COMMERCIAL VESSEL LOSSES (LESS BARGES AND FISHING VESSELS) DURING 1982
BY CAUSE* AND NATURE OF CASUALTY

MATERIAL RELATED	FOUNDERED No.	FIRE/EXPLOSION No.	COLLISION No.	GROUNDING No.	HULL/MACHINERY DAMAGE No.	MISSING No.	OTHER No.
Failed Materials:							
Structural	128	13	9	15	81		10
Mechanical	41	22	8	10	305		1
Electrical	2	29	2	1	77		
Corrosion	3				15		
Normal wear	1				23		
Improper welding							
Improper riveting					3		
Steering failure			9	5	6		
Fouled propeller	4		1	2	9		
Inadequate:							
Lighting							
Stability	10						
Lifesaving equip							
Firefighting equip							
Controls							
Lubrication					4		
Maintenance							
Insufficient fuel					7		
Propulsion Failure			9	8	2		
Fatigue Failure					14		
Other	8	6	13	13	18		2
NEC	29	31	47	67	54		3
CAUSE UNKNOWN	107	101	33	13	106	3	6

TABLE 6

DEATHS/INJURIES RESULTING FROM TOTAL LOSS OF
COMMERCIAL VESSELS DURING 1982

	FOUNDERED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACHINERY	MISSING	OTHER	TOTAL
FREIGHTSHIP	2/0							2/0
TANKSHIP		10/3						10/3
PASSENGER VESSEL	32/3		1/0					33/3
TUG/TOWBOAT	3/0	0/1	1/0					4/1
OFFSHORE SUPPLY	2/1							2/1
FISHING VESSEL	22/3	1/3			0/1	7/0		30/7
STATE NUMBERED	2/0							2/0
MODU					84/0			84/0
PLATFORM								
FREIGHT BARGE								
TANK BARGE								
MISCELLANEOUS	4/0	0/1	3/0				0/1	7/2
LICENSED OFFICER	3/1	2/1			0/1			5/3
CREW	34/3	9/7	2/0		84/0	5/0	0/1	134/11
PASSENGER	25/3		1/0					26/3
OTHER	5/0		2/0			2/0		9/0

TABLE 7

DEATHS/INJURIES RESULTING FROM A COMMERCIAL VESSEL
NOT INVOLVED IN A TOTAL LOSS DURING 1982

	FLOODED	FIRE/EXPLOSION	COLLISION	GROUNDING	HULL/MACHINERY	WEATHER DAMAGE	OTHER	TOTAL
FREIGHTSHIP		0/2	0/10		0/4	0/2		0/18
TANKSHIP	0/1	4/4						4/5
PASSENGER VESSEL		0/3	1/18	1/1	3/9			5/31
TUG/TOWBOAT		0/2	5/21	0/1			1/0	6/24
OFFSHORE SUPPLY		2/2						2/2
FISHING VESSEL	0/4	2/1	0/4	0/1				2/10
STATE NUMBERED		0/2	0/1					0/3
MODU		1/0			0/1			1/1
PLATFORM		1/4			0/1			1/5
FREIGHT BARGE			1/0				0/1	1/1
TANK BARGE		1/3	2/2					3/5
MISCELLANEOUS	1/0	5/6	14/30	5/3	3/0			28/39
LICENSED OFFICER		2/0	0/2					2/2
CREW	0/4	4/18	13/56	4/2	3/3	0/2		24/85
PASSENGER	1/0	0/1	7/28	2/1	1/9			11/39
OTHER	0/1	10/10	3/0	0/3	2/3		1/1	16/18

TABLE 8

OTHER DEATHS/INJURIES ONBOARD COMMERCIAL VESSELS DURING 1982
(NOT RELATED TO A VESSEL CASUALTY)

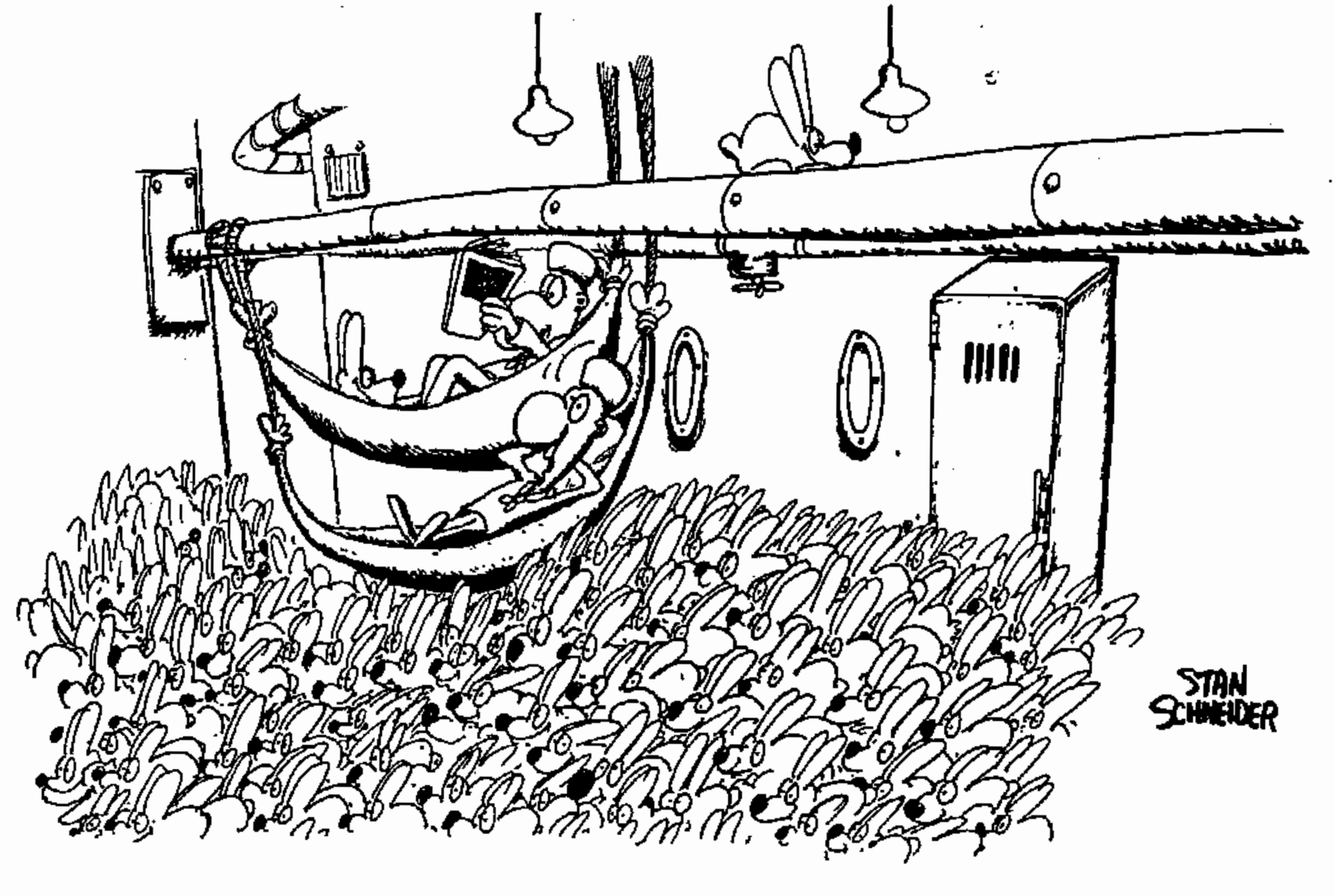
	SLIP/ FALL ONBOARD	FALL OVER BOARD	DISAPPEAR	STRUCK BY OBJECT	PINCH OR CRUSH	BURN SCALD	ELECTRIC BURN/ SHOCK	CUT	CAUGHT IN LINES	ASPHYXIA	SPRAIN OR STRAIN	DROWN	DIVING	UNKOWN OR NOC	TOTAL
FREIGHTSHIP	1/118	6/0	1/0	1/45	0/23	0/10	0/2	0/7	0/8		1/30	8/0		4/13	22/2[illegible]
TANKSHIP	4/38	1/0		0/17	0/13	0/7	0/1	0/5	0/2	0/1	0/10	1/0		0/9	6/[illegible]
PASS. VSL.	0/15	1/0		0/6	0/4	0/1	0/2	0/1			0/1	4/0	5/1	0/5	10/[illegible]
TUG/TOWBOAT	0/17	14/1		1/8	4/5	0/1	0/1	0/3	0/4		0/6	13/0	0/1	1/1	33/[illegible]
OFFSHORE SPLY	0/12	2/0	1/0	3/7	0/7		0/1	0/2	0/1		0/4	3/0	0/2	1/3	10/[illegible]
FISHING VSL.	1/20	12/2	2/0	3/14	1/15	0/2	1/0	0/2	0/8	2/0	0/2	17/1		2/8	41/[illegible]
STATE NUMBERED		7/0										8/0	1/0	1/0	17/[illegible]
MODU	1/41	2/1		3/54	0/37	0/7		0/3	0/4	1/0	0/42	1/0		0/9	8/[illegible]
PLATFORM	2/92	1/1		4/96	0/48	0/9	0/3	0/17	0/4		0/51	1/1	0/1	4/16	12/[illegible]
FREIGHT BARGE	1/3	3/0		0/1	1/0		0/1					2/0			7/[illegible]
TANK BARGE	1/4	2/0		0/1					0/1	1/0		2/0			6/[illegible]
MISCELLANEOUS	1/16	8/3	1/0	3/21	3/18	0/2		0/1	1/1		0/13	10/0	2/2	4/10	33/[illegible]
LICENSED OFFICER	3/30	6/0		0/15	2/4	0/6	0/1			0/1	0/5	6/0		0/2	17/[illegible]
CREW	6/318	41/8	5/0	15/241	4/162	0/31	1/9	0/40	0/33	2/0	1/132	49/2	0/2	13/64	137/[illegible]
PASSENGER	1/14	3/0		0/1	0/1							4/0	4/0	2/3	16/[illegible]
OTHER	2/16	9/0		4/13	3/3	0/2	0/1	0/1	1/0	2/0	0/22	11/0	4/5	2/5	38/[illegible]

TABLE 9

SUMMARY OF COMMERCIAL VESSEL CASUALTIES AND INVOLVEMENTS
BY NATURE OF CASUALTY FOR 1982

Involvements With Total Losses	FOUNDERED No.	FIRE/EXPLOSION No.	COLLISION No.	GROUNDING No.	HULL/MACHINERY DAMAGE No.	MISSING No.	OTHER No.	TOTAL
Casualties	181	95	32	38	33	3	12	394
Involvements	197	97	53	40	37	3	33	460

Involvements Without Total Loss	FOUNDERED No.	FIRE/EXPLOSION No.	COLLISION No.	GROUNDING No.	HULL/MACHINERY DAMAGE No.	MISSING No.	OTHER No.	TOTAL
Casualties	135	136	665	829	822	27	190	2804
Involvements	142	142	1661	1797	925	31	522	5210



"If we ever get back to port, I promise never to take another rabbit on board!"

DOT's Safety Reporting Program

Secretary of Transportation Elizabeth Hanford Dole recently announced that the Department of Transportation (DOT) will ask seamen on commercial vessels to report near-mishaps on a confidential basis in an effort to develop new ways to reduce marine accidents.

Secretary Dole said this would be done under a 1-year demonstration program starting June 1, 1985. The program is designed to pinpoint hazards that may not be fully understood and to identify potential causes of marine accidents.

"Knowing the circumstances of near-accidents can help us prevent future accidents," Dole said. "I am asking pilots, officers, other seamen, and fishermen to report on potentially unsafe situations and near-accidents, and what caused them," Secretary Dole said. "The purpose is to glean information, identify trends, and take corrective actions." Dole emphasized that those who make reports will be guaranteed anonymity.

In developing the Marine Safety Reporting Program, DOT consulted with officials of port authorities, shipping companies, and maritime labor unions. DOT will work with these groups in making seamen aware of the program.

(continued on page 180)

Elizabeth Hanford Dole
Secretary of Transportation

Final Rules

CGD 84-058	Unmanned River Service Dry Cargo Barges; Load Line Regulations	(May 9)

This rule exempts unmanned river service dry cargo barges operating on short voyages in Lake Michigan from Calumet Harbor, Chicago, Illinois to Burns Harbor, Indiana from the requirements to obtain a load line certificate. Effective date: June 10, 1985.

CGD 81-078	Safety Rules for Self-Propelled Vessels Carrying Hazardous Liquids	(May 22)

This rule adds to and revises the lists of cargoes regulated under Parts 30, 151, and 153 of Title 46 CFR. In Part 153, it clarifies confusing provisions, deletes impractical provisions, and reduces some requirements while adding several others. Generally, these changes agree with standards adopted by the IMO. Effective date: July 22, 1985.

CGD 85-001 CGD 85-001A	Marine Safety Reporting Program (MSRP)	(June 5)

These rules amend the provisions of 46 CFR Part 5 and 33 CFR Subpart 1.07 to conform with a Coast Guard law enforcement policy concerning persons who participate in the voluntary Marine Safety Reporting Program. 46 CFR Part 5 is amended such that the Coast Guard will not impose suspension and revocation proceedings against voluntary participants if certain conditions are met. 33 CFR Subpart 1.07 is amended such that the Coast Guard will not assess a civil penalty against a voluntary participant of the MSRP for a violation involving navigation and control of a vessel if certain conditions are met. Effective date: June 1, 1985.

Final Rule Correction

CGD 84-058	Ports and Waterways Safety, Shipping Safety Fairways, Gulf of Mexico	(May 23)

This document corrects errors contained in the 33 CFR Part 166 coordinate description of shipping safety fairways and anchorages in the Gulf of Mexico. These corrections are for the Port Mansfield Fairway, the Matagorda Entrance Anchorage Area, the Aransas Pass to Calcasieu Pass Fairway, and the Panama City Fairways. These corrections become effective on June 24, 1985.

Proposed Rules

CGD 78-174 CGD 78-174A	Inflatable Life Jackets and Hybrid PFDs Recreational Hybrid PFDs	(May 29)

CGD 78-174 proposes approval and operating requirements for inflatable life jackets and hybrid personal flotation devices. If this proposal is adopted, use of these products would be optional, but, if carried, limitations would be applied. CGD 78-174A proposes requirements in addition to those in CGD 78-174 for carriage of hybrid PFDs on recreational boats and on Outer Continental Shelf activities. The comment periods close on July 15, 1985.

Extension of Comment Period

CGD 83-071a	Mobile Offshore Drilling Unit Requirements	(May 16)

This notice extends the comment period for the advance notice of proposed rulemaking published on March 25, 1985 (50 FR 11741). This is being done in response to requests by commenters. The comment period closes September 23, 1985.

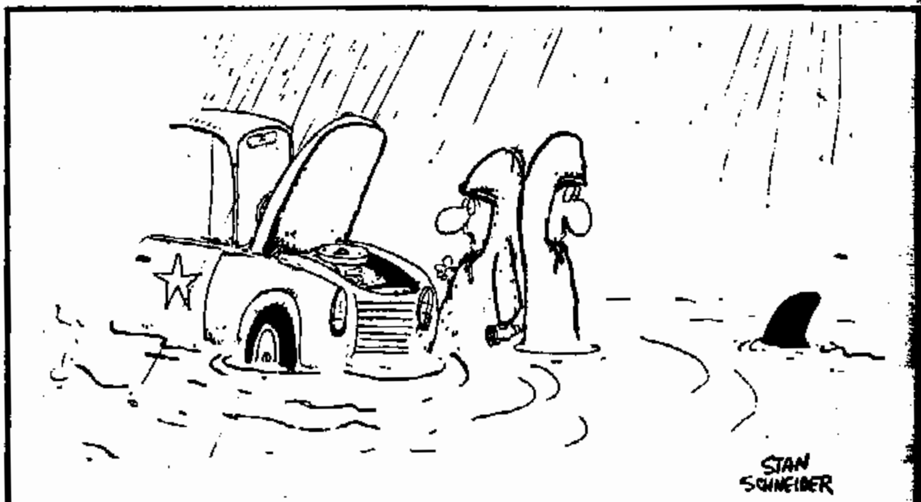
CGD 84-098	Revision to the Regulations on Outer Continental Shelf Activities	(May 16)

This notice extends the comment period for the advance notice of proposed rulemaking published on March 7, 1985 (50 FR 9290). This is being done in response to requests by commenters. The comment period closes September 3, 1985.

CGD 84-088	Certification of Seamen	(June 3)

The February 4, 1985 advance notice of proposed rulemaking called for comment on the total revision of 46 CFR Part 12, Certification of Seamen, to be submitted by June 1, 1985. The comment period has been extended 60 days to August 1, 1985.

Requests for copies of NPRMs should be directed to the Marine Safety Council. The address is Commandant (G-CMC), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; telephone (202) 426-1477. The office, Room 2110, is open between the hours of 9:00 a.m. and 4:00 p.m. Monday through Friday. Comments are available for inspection or copying during those hours.



"What else could possibly go wrong?"

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations:

ENGINEER

1. If the centrifugal switch or relay for cutting out the starting winding of a split-phase induction motor failed to open while the motor was in operation, the

A. motor would overspeed.
B. starting winding would burn out.
C. motor would immediately stall under load.
D. motor torque would be above normal at rated speed.

Reference: Hubert, Preventive Maintenance of Electrical Equipment

2. Because of the close tolerances used in fuel injectors, a worn plunger would require

A. grinding the spare plunger to the barrel.
B. replacing the plunger and the barrel.
C. highly polishing both the plunger and barrel.
D. any of the above.

Reference: Maleev, Diesel Engine Operation and Maintenance

3. Which automatic boiler control should you test prior to lighting off an auxiliary boiler?

A. Automatic bottom blow valve
B. Low water level cutoff switch
C. Voltage output of the ignition transformer
D. Insulation resistance reading in the ignition system high tension leads

Reference: Nav Ship Tech Manual 9510

4. To avoid corrosion and/or oxidation of the element, a filled-system thermometer bulb is often protected by a "well" or casing. In addition to protecting the element, the "well" will also

A. cause consistently higher-than-actual readings.
B. cause consistently lower-than-actual readings.
C. slow the response of the element.
D. increase the element's sensitivity.

Reference: Principles of Naval Engineering, NAVPERS

5. Some Pollution Prevention Regulations only apply to "new ships." Under these regulations, a "new ship" is a ship

A. that has undergone a major conversion that is completed before December 31, 1979.
B. for which the building contract is placed after December 31, 1975.
C. that has undergone a major conversion for which the contract is placed between June 30, 1974 and December 31, 1975.
D. the delivery of which is on June 30, 1976.

Reference: 33 CFR 151.05(i)

DECK

1. Flame screens are used to

A. contain flammable fumes.
B. protect firefighters from flames.
C. prevent flames from entering tanks.
D. keep flames and sparks from getting out of an engine's exhaust system.

Reference: CG 174

2. What is the displacement of a barge which measures 85' x 46' x 13' and is floating in saltwater with a draft of 10 feet?

A. 1452 tons
B. 1117 tons
C. 500 tons
D. 17.5 tons

Reference: Baker, Introduction to Steel Shipbuilding, 2nd ed.

3. Metacentric height is a measure of

A. initial stability only.
B. stability through all angles.
C. maximum righting arm.
D. all of the above.

Reference: Ladage, Stability and Trim for the Ship's Officer

4. Camber, in a ship, is usually measured in

A. inches per feet of breadth.
B. feet per feet of breadth.
C. inches per feet of length.
D. feet per feet of length.

Reference: Baker, Introduction to Steel Shipbuilding, 2nd ed.

5. Seeing that all hands are familiar with their duties, as specified in the station bill, is the responsibility of the

A. master.
B. chief mate.
C. safety officer.
D. department heads.

Reference: 46 CFR 97.13-20

ANSWERS

ENGINEER
1-B;2-B;3-B;4-C;5-B
DECK
1-C;2-B;3-A;4-A;5-A

If you have any questions about "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone (405) 686-4417.

***PROGRAM**, cont. from p. 176*

The program will seek information on safety-related incidents, problems, or conditions involving the handling of ships, aids to navigation, weather reporting, equipment performance, ship-to-ship communications, chart accuracy, and other factors affecting vessel navigation and control.

The marine program, which will focus mainly on U.S. commercial vessels in coastal and inland waters, will be conducted by DOT's Transportation Systems Center in Cambridge, Massachusetts. The reports and data received will be analyzed, and the information will be disseminated to the maritime industry.

In 1983, 4,698 marine accidents involving 7,069 U.S. commercial vessels resulted in 274 fatalities and 209 injuries. These accidents caused hundreds of millions of dollars in property damage. About two-thirds of the accidents involved vessels that collided with another vessel, rammed into a pier or other structure, or went aground. The 274 fatalities occurred on fishing vessels, oil exploration and drilling ships, freight and tank ships, and towing and other vessels.

According to the Maritime Transportation Research Board, National Research Council, a large majority of these accidents result from human error. Most are not the result of flagrant errors but of lack of understanding or failure to account properly for local conditions. These conditions include such things as geography, water currents, weather, navigation aids, charts, channel characteristics and markings, and local traffic.

Copies of reporting forms can be obtained by calling this toll-free number: 1-800-225-1612. More information about the program can be obtained from A. L. Lavery, Transportation Systems Center, Kendall Square, Cambridge, Massachusetts 02142; telphone (617) 494-2577.

Robert M. Camillucci

Acetic Acid

Acetic acid is a colorless, waterlike liquid which has a characteristic vinegary odor. It is used extensively in producing a variety of materials: synthetic fibers, cellulose acetate, acetate rayon, antibiotics, hormones, vitamins, and insecticides. It is also used in the dyeing, printing, and food preserving industries.

Acetic acid was first discovered and studied in its dilute form, vinegar (3%-6% acetic acid), well before the birth of Christ. Theophrastos (327-287 B.C.) studied vinegar's reaction with copper metal, which produces verdigris, a greenish-blue poisonous pigment. Acetic acid was first produced from its chemical elements in 1847. This acid at one time was prepared through the dry distillation of metal acetates such as copper and silver acetates. Today it is commercially prepared by oxidation of acetaldehyde, carbonylation of methanol, or liquid-phase oxidation of hydrocarbons. In its most concentrated form, the chemical is known as glacial acid.

Highly concentrated acetic acid can be dangerous and may present many possible hazards. Although it is a very stable material, acetic acid reacts violently with other elements, including chromic acid, sodium peroxide, nitric acid, and other oxidizing materials. When diluted, acetic acid becomes corrosive, and contact with metals should be avoided.

With a flashpoint of 110°F (open cup), acetic acid is a combustible liquid and presents a fire hazard. These fires can be extinguished with dry chemicals, alcohol foam, carbon dioxide, or a water spray. Acetic acid also reacts with metals to form acetate salts and hydrogen gas. The presence of hydrogen gas is an explosion hazard.

Personal safety and protection, although simple, is important. When handling acetic acid, rubber gloves and protective clothing should be worn to protect the body, skin, and hands. Safety goggles or a face shield should be used to protect the eyes and face. If respiratory protection is required, then a full face respirator should be used when dealing with low concentrations of the chemical. A self-contained breathing apparatus may be used when dealing with high concentrations. Items contaminated by acetic acid should be removed immediately and washed as soon as possible. Persons handling the acid should wash thoroughly and be examined for any accidental contact.

Acetic acid also presents a serious health hazard. Any solution containing 50 percent or more acetic acid should be considered a corrosive acid. Hands and skin may become blackened and severely blistered after contact with the chemical. Conjunctivitis (the inflammation of the mucous membrane that lines the inner surface of the eyelids) and corneal erosion may appear if acetic acid vapors come in contact with the eyes. Acetic acid vapors are quite harmful if inhaled, and digesting the chemical can sometimes be fatal. If swallowed, acetic acid causes severe pain in the mouth, esophagus, and stomach. Vomiting and diarrhea may occur, as may laryngitis, bronchitis, and cardiovascular collapse.

Robert M. Camillucci was a Third-Class Cadet at the Coast Guard Academy at the time this article was written. It was written under the direction of LCDR Thomas J. Haas for a class on hazardous materials transportation.

Common first aid should be used if any of these symptoms occur. Large amounts of water should be used to wash acetic acid from the body. All clothing should be removed and thoroughly laundered before being reworn. In the case of a severe burn, do not apply any ointments or oils to the injured areas without knowledgeable supervision. The eyes should be flushed with water immediately, and this irrigation should continue for at least 15 minutes. After this irrigation, two or three drops of at 0.05% pontocaine solution may be applied to the eyes. A second 15-minute irrigation should follow, and an eye specialist should be consulted as soon as possible. Contact lenses should not be worn when working with the acid. If acetic acid is digested, do not try to induce vomiting. Milk, mixed with egg whites, will be helpful if available. If not, the victim should drink as much water as possible to dilute the acetic acid. Seek medical treatment immediately. This situation can be fatal.

The Coast Guard regulates acetic acid as a Subchapter O commodity for tankship and tank barge shipment. These regulations are found in Title 46 of the Code of Federal Regulations, Parts 151 and 153. The U.S. Department of Transportation considers acetic acid a corrosive material. The U.S. Environmental Protection Agency lists acetic acid as a Category D pollutant, whereas the International Maritime Organization (IMO) lists it as a Category C pollutant. The IMO includes it in Chapter 6 (BCH)/Chapter 17 (IBC) of its Chemical Codes. Acetic acid is found on pages 8017-1 and 8017-2 of the International Maritime Dangerous Goods (IMDG) Code and is assigned a Hazard Class of 8. (Formerly it was assigned to Hazard Class 3.3 on page 3116.) ‡

Chemical name:	Acetic acid
Formula:	CH_3COOH
Synonyms:	ethanioc acid glacial acetic acid vinegar acid methane carbolic acid
Physical Properties:	
boiling point:	118°C (244°F)
freezing point:	17°C (62°F)
vapor pressure:	
20°C (68°F)	11 mm Hg
30°C (86°F)	20 mm Hg
Threshold Limit Values (TLV)	
time weighted average:	10 ppm; 25 mg/m^3
short term exposure limit:	15 ppm; 37 mg/m^3
Flammability Limits in Air (at 100°C, 212°F)	
lower flammability limit:	5.4% by volume
upper flammability limit:	16% by volume
Combustion Properties	
flash point:	43°C (110°F) open cup 39°C (103°F) closed cup
autoignition temperature:	426°C (800°F)
Densities	
liquid (water=1):	1.05
vapor (air=1):	2.1
U.N. Number:	1842 (solution), or 2789 & 2790 depending on solution concentration
CHRIS Code:	AAC
Cargo compatibility group:	4 (Organic Acids)