

AN ANALYSIS OF HEAVY FIRES OCCURRING IN CHINESE AND
FOREIGN SHIPS IN CHINESE TERRITORIAL WATERS

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ABSTRACT

Ships on fire at sea are the main cause of sea accidents, this paper has made an analysis of the condition, types, location and causes of ships on fire. It also indicates that the timely analysis of ships on fire has a great importance to the prevention from fire, stipulation of Rules and Regulations as well as to the promotion of scientific research into fire.

1. General Description

According to certain statistics, the number of current Chinese ships over 500 grt at sea and in rivers are 3,000 odd belonging to Ministry of Communications, Ministry of Petroleum Industry, Ministry of Geology and Mineral Resources, Ministry of Agriculture, Animal Husbandry and Fishery, National Bureau of Oceanography as well as local shipping companies, among which the majority are owned by China Ocean Shipping Co.(COSCO), Maritime Transportation Administration, and Changjiang (Yangtze River) and Heilongjiang shipping enterprises under the Ministry of Communications. The COSCO alone owns more than 600 ocean-going ships. Along with the development of foreign trade and economic ties with overseas, Chinese shipping activities have been thriving rapidly in connection with 1,100 ports in 150 countries and regions with carrying volume striding into the shreshold of international super shipping circle.

Shipping transportation is of great importance in national economy with the advantage of huge carrying capacity, lower costs and less power consumption. In the field of international transport, shipping takes the 70% of the total trade volume, which can be hardly replaced by any other transport modes. Since 1970's, drastic development in World shipping and ship-building resulted in increase of global ship ownership by 20% during a period from the date adopting 60's International Convention to compiling the 1974 Internaitonal Convention (draft).

Ships in sailing are independent individuals with less spaces and close cargo stowage. Once a fire is caught on board a ship, it spreads fast and fiercely, and will bring deaths and injuries to people and heavy losses because it is extremely difficult to the put out.

Modern ships are equipped with many machineries and all obtainable sophisticated equipments which sometimes require liquid fuel and lubricants in working condition of high temperature and pressure. In such circumstance, occurrence of fire and explosion are more vulnerably inducing. Complicated electrical equipments, implementation of automation, emergence of unmanned engine-room, all these make fire-fighting on ships more difficult.

The rate of danger of ship's catching fire will increase greatly when raw materials and semi-products of chemicals in solid, liquid or gaseous state, as well as huge volume of crude oil, various petroleum products are carried by ships.

Fire and explosion are becoming one of major cases for ship's accidents in the World. The information of statistics of British Liverpool Insurance Committee shows that alone in the 5 years (1970-1974) there were 239 cases of fire or explosion in ships which ranked the first in terms of number of ship and GRT as 26.9% and 29.7% respectively in comparison with ships touching ground. In 20 years, the number of Chinese ships fully wrecked due to accidents of fire and explosion amounted to 0.33% of total ships.

2. Analysis of Ships on Fire

A preliminary statistics from 1969 to date reads the total heavy fires in ships in Chinese waters amounted up to 109 with foreign ships of 18, death toll of 100, injury of 607 and direct losses of 244 million in corresponding Yuan. In the field of shipping and port, the economic losses by fire in ships are more than 90% of total fire losses. Table 1.

Table 1 Heavy fires in domestic and foreign ships in Chinese waters between 1969 - March, 1992

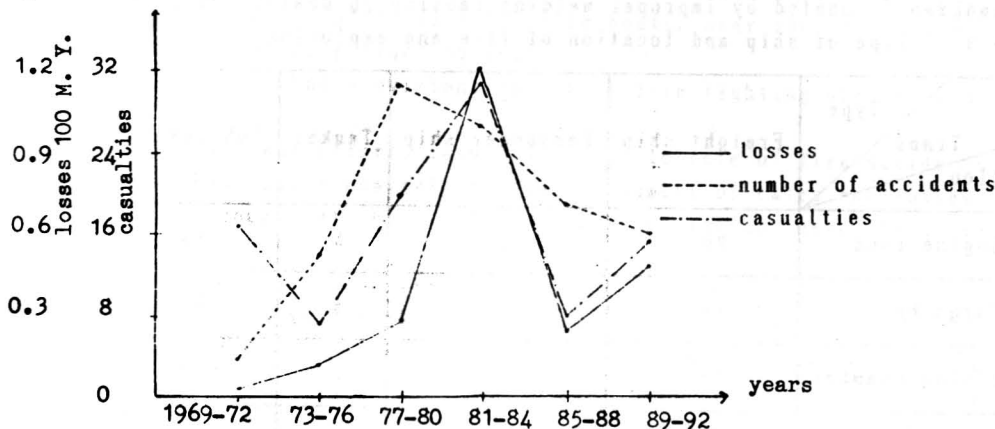
Figure Year	Item		Losses in Million Yuan	Death	Injury
	Times of fire accidents	Sub-total Foreign ships			
1969-1972	4	1	410	17	538
1973-1976	14	4	1,387	11	19
1977-1980	31	4	2,924	20	-
1981-1984	27	4	12,102	29	36
1985-1988	17	2	2,460	8	4
1989-1992.3	16	3	5,117	15	10
Total	109	18	24,400	100	607

(1) Followings are explanation and a figure display of analysis of number and losses of heavy fires in ships:

During the 12 years before 1980, the fire accidents indicated a trend of escalation while from 1981 to date, the number of fire accidents has decreased, but the losses strikingly increased. It should be noted that cases of explosion in ships have been steadily increasing.

Indication of heavy-fires in domestic and foreign ships in Chinese waters between 1969 - March, 1992

Fig. 1.



Situation of occurrences and degree of damages to ships on fire.

Table 2.

Times Situation	Damages	Completely	Heavily	Slightly	Total	%
		Damaged	Damaged	Damaged		
Sailing		7	3	18	28	25.8
Anchorage		4	5	26	35	32.2
Handling		-	1	23	24	22
Repair		2	1	19	22	20
Total		13	10	86	109	100
%		11.9	9.2	78.9	100	

Case 1. In June 1981, Chinese M.V. LIAN HUA CHENG carrying 10,000 ton dangerous cargo and sets electric-mechanic equipments blew up at anchorage in Port of Singapore, which lasted for 20 days and was completely damaged with direct losses up to 45 M. Yuan.

(2) Type of ship and fire site

Rate of fire or explosion in connection with tankers is comparatively low. The major cases can be traced to engine room, cargo hold or tank which brought great losses and casualties. The fire-factor rate in freight ship is higher than passenger ship with the former 76.1% of the total and the latter 8.2%. The sources of the fire in freight ship are mainly in engine rooms, cargo holds, and accommodations, while in passenger ship are mainly in living accommodations and engine rooms which are most serious once a fire is caught. (Table 3)

Case 2. In May, 1982, a Chinese tanker Daqing 53 empty from Shanghai to Qinhuangdao detonated by improper welding causing 20 deaths and 14 M. Yuan.

Table 3 Type of ship and location of fire and explosion

Type Times Location	Freight ship	Passenger ship	Tanker	Sub-total	%
Engine room	28	3	5	36	34.3
Cargo hold	33	-	6	39	37.1
Living chamber	22	6	2	30	28.6
Total	83	9	13	105	100

(3) Causes of fire

A. There are 60 fire cases by naked flames which constituted a major cause amounting for 55% of the total. The 60 cases were from welding, gas-cutting, smoking, heating, lighting and cooking.

B. The second major of 24 cases were caused from malfunction of mechanical and electrical equipments and appliances, out-dated electric panels, power lines, switches etc., over-load and anti-rule usage of electric-thermal appliances, flammable oil leaking on to scorch parts of high temperature.

C. Self-combustion has 9 cases for 8.2%.

D. 2 cases of improper package or stowage of chemical products.

E. 14 cases of collision, lightning, static-electricity and other untraceable ground.

Case 3. In January 1979, a Greek M.V. ABILIO struck reefs when she was navigating in the mouth of Zhujiang River and exploded immediately after calcium carbide in ship holds immersing in water. The ship cracked in the middle and sank afterwards claiming death toll of 19 and losses of couple of million Yuan.

In the light of Chinese guideline in fire-fighting as "Precaution First, Protection and fighting combined", Chinese government and its authorized organs took positive and effective measures in face of fire accidents when ship is under construction, navigation, handling operation and at anchorage as follows:

A. Based on "International Convention for the Safety of Life at Sea", China Classification Society stipulated strict rules and provisions on design, construction, inspection in ship's structure, fire division, outfitting material, fire warning system, fire-fighting equipments.

B. Large and medium-sized ports established fire brigades under Port Security Bureau with investments of several hundred million R. M. B. in equipping a variety of 22 fire-fighting boats, near 100 fire-fighting tug boats and salvage fire-fighting boats.

C. A serial rules and provisions on ship's fire-fighting were proclaimed.

Years of consistent efforts resulted in stable rate of fire accidents which have been kept under control in terms of number of cases and losses, even though the number of ships and cargo transportation have been increased continuously.

3. Contribution of ship-on-fire analysis

Statistic figures depict clearly that disaster of heavy fires in ships makes tremendous suffering and damage to life and property. Profound and detailed analysis of situation, time, location and cause of fire cases are beneficial to summarizing experiences and drawing lessons for decision-makers in charge of ship's fire-fighting, safety as well as of shipping circle to make correct management decisions timely, so as to sufficiently safeguard safety of crew member, passengers, ships and cargoes.

Precise analysis comes from reliability of fire information reflecting realities. Because of variation of year, area, method and personnel of statistics, the statistics of ship-on-fire cases are very similar to that of land fire cases to the extent that the actual losses of fire, especially the heavy fires are by far more than the reported statistics. For this reason, the information collection and analysis of these cases require the spirits of down-to-the-earth and strictly abide by statistical criteria in order to avoid errors in decision-making by incorrect information.

The contents of SOLAS, IMDG and specifications for ship designing and construction relating to fire-fighting are all based on fire statistics and analysis prepared by respective countries. The 1981 Amendments to the International Convention for the Safety of Life at Sea focused more than half its length on ship's fire-fighting. Everything is based on reality which is also the end-result after fact-finding and decision-making, which symbolizes the maturity in prevention of fire accidents, and can undergo long-time tests. In conclusion, current implementation and further development of the fire-fighting cannot go without statistics and analysis of heavy fires.

The science on fire, which has 20 years of development, is a new research branch mainly dealing with theories and rules of fire occurrence, its development and prevention, with big fire case as the research objective. Statistics and analysis of ship's fire cases is a significant part of scientific research into fire which will make coast countries have a comprehensive one. Modern ships nowadays are highlighted by modern industry with integral parts of high-tech, super-structure, petro-chemical industry, electronic instruments and recreation, etc.. Multi-kind fire accidents happening in cities can be found in one big ship. The above analysis for the purpose of controlling heavy fires in ships can be well served for planning and implementation of fire-forecasting, fire prevention and salvage, providing basis of theory and method for scientific management on fire. The study and analysis of fire will no doubt promote and contribute science on fire and fire-fighting technology, and its great significance has been recognized by the whole world.

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