

# A Study on the Collision Accident between *Ferry Golden Jindo* and *Ferry Princess*

Jin-Kwon Kim\*

\* Department of Maritime Transportation Science, Korea Maritime University, Busan 606-791, Korea

**Abstract :** *Ferry Golden Jindo* collided with *Ferry Princess* near the No.7 light buoy of Incheon Port No.1 Passage in restricted visibility due to dense fog. The result was that *Ferry Golden Jindo* got a hole at the starboard midship section shell plating and *Ferry Princess* sustained damages at the starboard bow and 25 persons injured. The aim of this paper is to investigate this collision accident, to clarify its causes, and to prevent such accident from occurring again. In short, this collision resulted from *Princess'* high speed in restricted visibility, *Golden Jindo's* carelessness of watchkeeping, lack of proper safety training of crew, lack of instruction of supervisor, carelessness of PTMS Center and indifference of Korea Shipping Association, etc.

**Key words :** Marine accident, Collision, COLREG, PTMS, *Golden Jindo*, *Princess*

## 1. Introduction

As there is a sharp increase in the number of vessels caused by the increased volume of trade among nations today, there are more and more collision accidents between them. The collision accidents occurred even during the era of sailing vessel. But as the vessels are getting larger and faster, the marine accidents not only take precious lives and valuable property, but also, if they involve oil spillage, cause serious damage such as environmental disruption.

In response to this, when we look into the total marine accidents, we could find the marine accidents were declining from 1999 to 2003, i.e. a total of 849 in 1999, 634 in 2000, 610 in 2001, 557 in 2002, and 531 in 2003 respectively (KMST, 2003; KMST, 2005; KCG, 2005). But the marine accidents in 2004 concentrated in the later half, which amounted to 804 accidents (involving 1,070 vessels) and meant an increase by 54.1% (involving 273 vessels) compared with the previous year.

The classification of marine accidents in 2004 according to type shows that accidents from fire/explosion accounted for 7% (involving 57 vessels), sinking accidents 8.6% (involving 69 vessels), grounding accidents 9.3% (involving 75 vessels), vessel's machinery failure accidents 18.3% (involving 147 vessels)(KMST, 2005a; KCG, 2005). But the collision accidents accounted for 26.1% (involving 210 vessels) which is an increase by 15.4% (involving 28 vessels) compared to the previous year.

This indicates that those marine accidents are coming from various causes such as disregard of COLREG

(International Regulations for Preventing Collisions at Sea) and navigation in restricted visibility due to dense fog, as well as external factors which cause the complex situation. Considering this, this study investigates the collision accident between *Ferry Golden Jindo* and *Ferry Princess* to find out the cause of the collision that becomes more and more complicated and to prevent a recurrence of such accidents.

## 2. Factual Information

### 2.1 *Golden Jindo*

*Golden Jindo* is a ferry ship of 635 gross tonnage, 50.58m in length, 8.60m in breadth, 2.30m in depth, has a diesel engine with maximum continuous horse-power output of 529kW and 2 diesel engines of 411kW. She was built in the Mokpo Shipbuilding Industry Corporation located in Mokpo, Jeollanamdo Province of the Republic of Korea in June 1992 and was registered in Mokpo Regional Maritime Affairs and Fisheries Office, the Republic of Korea. She was classified in Mokpo branch office of Korean Register of Shipping(hereinafter "KR") and took the annual inspection and certificated by KR on 18 September 2002.

*Golden Jindo* performs one-way voyage daily from No.3 quay of Incheon coastal wharf to Yeonpyeongdo. She did not use the designated channel but used the routes crossing No.1 passage of Incheon Port from No.3 quay of Incheon coastal wharf and passes by No.7 light buoy, No.5 light buoy, Haerido, Chochido(which is hereinafter referred to

\* Corresponding Author : Jin Kwon Kim, jinkwon@mail.hhu.ac.kr 051)410-4234

"Palmido North-West Sea Route"), Seonmido and Soyeonpyeongdo.

The distance of this route is about 66 miles and it takes about 4 hours and 5 minutes for a vessel to sail at a speed of 17.5kts. Normally, she was operated by one-way voyage (and by round-trip on Friday). However during the summer holidays she was run daily by round-trip by permission of the Incheon Regional Maritime Affairs and Fisheries Office (which is hereinafter referred to as "Incheon RMAFO").

## 2.2 Princess

*Princess* is an aluminium alloyed ferry of 312 gross tonnage, 37.20m in length, 10.10m in breadth, 3.9m in depth with two diesel engines of maximum continuous horsepower output of 1,969 KW. She was built in the Kvaerner Shipbuilding Corporation in Singapore on 29 May 1996 and was registered in Incheon, the Republic of Korea, classified in Incheon branch office of KR. She was annually inspected and certificated by KR on 22 June 2001.

## 3. Outline of Accident

### 3.1 Golden Jindo

Passenger ships leaving and entering the Incheon Port should use No.1 Passage designated by the administrator of the Incheon RMAFO and East and West traffic lane of Traffic Safety Specific Area under the Public Order in Open Ports Act. However, neither the master of *Golden Jindo*

nor the master of *Princess* did request for new establishment of sea route or report the route alternation to the Incheon RMAFO. They just strayed from the designated passage or traffic lane and customarily used "Palmido North-West Sea Route".

This route is not equipped with navigational aids for safe navigation because it is not the designated sea route. So that, marine accidents are likely to occur in case that passenger ships and fishing vessels are crossing. Especially in some area around No.7 light buoy of No.1 Passage, bottled-neck situation occurs frequently thus entailing high risk of collision.

When visibility was reduced within 1km, the commissioner of Incheon Maritime Police Station prohibited coastal ferries from leaving the Port at about 1010 on 3 August 2003. At about 1410 on the same day coastal ferries were admitted to sail out after visibility got better.

*Golden Jindo* left No.3 quay of Incheon coastal wharf for Yeonpyeong harbor with 6 crew including the master, 244 passengers and 20 vehicles on board. She moved on crossing No.1 Passage of Incheon Port slightly tilted with a true course of 210° for approaching to No.7 light buoy and increased ship's speed from 7kts to 14kts gradually.

The visibility was over 1 km until *Golden Jindo* moved to No.1 Passage, but visibility was restricted again under 50 meters due to dense fog. However, the master of *Golden Jindo* only rang fog signal and proceeded with the same course and speed.

There was no ship anchored at East-Anchorage of No.1

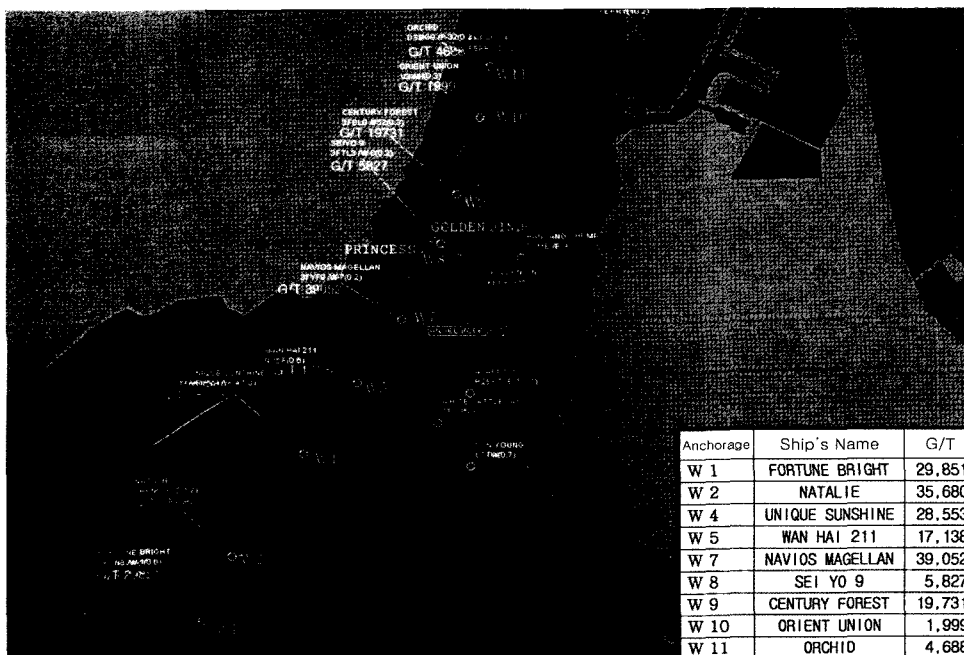


Fig. 1 Anchoring vessels around Incheon Port No.1 Passage

Passage on the intended course, but *Seiyo 9* of 5,827G/T anchored at W-8 anchorage and *Century Forest* of 19,731G/T at W-9 anchorage. Thus, *Golden Jindo* propelled west corner of No.1 Passage passing the south of *Century Forest* and entered into Palmido North-West Sea Route.

The master of *Golden Jindo* monitored 2 radars in range scale of 3 miles and 0.5 mile respectively and proceeded southwesterly at a speed of 14kts. He paid attention to only W-8 and W-9 anchorage vessels, while his ship crossing No.1 Passage. Eventually he could not notice *Princess* entering the Incheon coastal wharf through the west side of No.1 Passage from the Palmido North-West Sea Route.

After passing *Century Forest* at W-9 anchorage with  $210^\circ$  true course, *Golden Jindo* avoided the shoals area on her starboard side and altered course to  $190^\circ$  for approaching to Palmido North-West Sea Route. At that time, the master found *Princess* approaching quickly to his ship from 1 o'clock direction and in about 50 meters distance and stopped the main engine. Eventually, at about 1430 on 3 August, *Golden Jindo* collided with her starboard midship against the starboard bow of *Princess* by the crossing angle of  $30^\circ$  at Lat.  $37^\circ 25' 12''$  N Long.  $126^\circ 33' 45''$  E, near No.7 light buoy of Incheon Port No.1 Passage.

After the collision, the master of *Golden Jindo* reported the details of accidents to the Incheon branch office of Korea Shipping Association(hereinafter "KSA") and returned to No.3 quay of Incheon coastal wharf at about 1452 on the same day.

The weather at the accident was a light wind with a slight sea. The visibility was within 50 meters in dense fog.

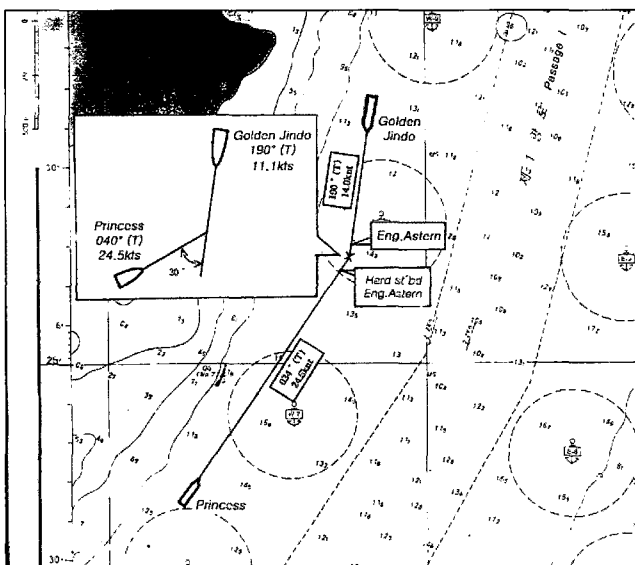


Fig. 2 Track plot of *Golden Jindo* and *Princess* collision

### 3.2 Princess

When *Princess* sailed out from Deokjeokdo Jinli harbor to return to the Incheon coastal wharf with 7 crew including the master, 2 snack bar clerks and 425 passengers at 1330 on 3 August 2003, visibility was about 0.5 mile in dense fog.

At that time she normally sailed along the route consisting of No.1 light buoy of the West traffic lane, Haerido, No.5 light buoy of No.1 Passage, No.7 light buoy of No.1 Passage and the Incheon coastal wharf. The total sailing distance is about 31 miles and it takes 1 hour and 30 minutes. Although she was normally operated twice a day, she was run five times a day on average during the summer holidays.

This extended service in the holidays was done with the Incheon RMAFO's approval on 16 July 2003. When she was delayed due to fog, crew members had to operate her over the midnight to meet the number of operation. All the crew got exhausted after the every voyage but the shipowner did not take measures to relieve the crew members of fatigue.

Especially, the master of *Princess* operated the vessel for 13 hours and 20 minutes daily on average and his daily working hour was over 18 hours considering the commute time. From 26 July to 2 August, he operated 5 times daily with just 6 hours of rest a day, thus he accumulated fatigue caused him not to be able to make a decision clearly.

He, keeping watch with the duty deck officer and the chief engineer on bridge, maneuvered the vessel from Jinli harbor to No.1 light buoy of West traffic lane for himself and took over the watch from No.1 light buoy to Haerido. He was taken over the watch again from Haerido. When *Princess* was passed Chochido at 1356 and Palmido at 1419 on the same day, he notified estimated arrival time to the Incheon branch office of KSA and reported ship's position to the Port Traffic Management Service(which is hereinafter referred to as "PTMS") Center of Incheon Port but could not get any information of safe navigation concerning the presence and movement of vessels in No.1 Passage of Incheon Port.

The personnel in charge of PTMS Center in Incheon Port entered information of *Princess* into his control monitor when receiving her position report. She proceeded at a high speed even after she was acquired in the control monitor, and afterwards she finally disappeared there.

*Princess* was sailing from Jinli harbor to Palmido at a speed of 30kts in restricted visibility within 900 meters. At about 1425, she set a course to  $034^\circ$ (T) when passing

through No.5 light buoy of No.1 Passage. At that time, she was encountered severe restricted visibility due to dense fog. The master of *Princess* did not reduce ship's speed in spite of the restricted visibility. Another Ferry *Angel Hope* of 300 gross tonnage departed from Mueuido was following keeping the distance of about 0.5 mile.

The officer helping the master operated 2 radars without ARPA in the range scale of 3 and 1.5 miles respectively. While she passed No.7 light buoy of No.1 Passage, he noticed a vessel approaching from her starboard bow, about 1 mile away, and reported it to the master.

The master of *Princess* assumed that she would be anchored vessel(*Seiyo 9*) which was already observed. Then, he confirmed that approaching vessel disappeared from the radar in relative distance of 0.3 mile but did not stop the main engine immediately. Eventually he stopped the main engine when the other vessel was approaching him in fairly short distance. Then, he ordered engine full astern and hard to starboard but could not avoid approaching vessel.

At the moment of collision, 18 passengers did not fasten their seatbelts and got injured at the impact of collision. *Princess* came alongside the Incheon costal wharf at about 1445 on the same day after confirming collision position, damages, injured passengers, etc.



Fig. 3 *Golden Jindo* damage photo



Fig. 4 *Princess* damage photo

In this accident, 7 passengers on *Golden Jindo* was injured and 5 vehicles was destroyed. And there damaged to the outer shell plating of her starboard midship at the size of 158 x 70 cm hole and scratched from this hole to the end of poop deck. A crew and 18 passengers on *Princess* were injured and starboard bow damaged.

## 4. Analysis of Cause

### 4.1 Cause of Occurrence

#### 1) Conduct of vessels in restricted visibility

When vessels are underway in harbor limit with the visibility restricted to about 50 meters due to dense fog so as to involve risk of collision, vessels should take a proper action to avoid collision according to the article 27(Conduct of Vessels in Restricted Visibility) of Maritime Traffic Safety Act and vessels have duties and responsibilities to navigate according to the article 11(Sea route, etc.) of the Public Order in Open Ports Act.

Specially every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility and a power-driven vessel shall have her engines ready for immediate manoeuvre(COLREG Rule 19(b)). And a vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists. If so, she shall take avoiding action in ample time, provided that when such action consists of an alteration of course, so far as possible the following shall be avoided: (i) an alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken; (ii) an alteration of course towards a vessel abeam or abaft the beam(COLREG Rule 19(d)). Moreover, a power-driven vessel making way through the water shall sound at intervals of not more than 2 minutes one prolonged blast. And a power-driven vessel underway but stopped and making no way through the water shall sound at intervals of not more than 2 minutes two prolonged blasts in succession with an interval of about 2 seconds between them according to the article 42 (Sound Signals in Restricted Visibility) of Maritime Traffic Safety Act.

However, *Golden Jindo* proceeded at a speed of 14kts after departure from Incheon coastal wharf under the condition where visibility was restricted to 50 meters and stopped the main engine right before the collision. And *Princess* sailed at a speed of 24.5kts from the Palmido and stopped the main engine and changed the course hard to starboard before the collision.

Rule 19(b) of COLREG requires every vessel to go at a safe speed in restricted visibility. But the term 'safe speed' is relevant when considering what is meant. The density of fog which will make it necessary for a vessel to reduce speed will depend upon the speed of the ship, own ship's maneuverability, the traffic in the vicinity and other factors. If the visibility is less than 5 miles it would be prudent for any vessel to, at least, have the engines on stand-by (Cockcroft et al, 1982; Kim, 2001; Lee, 2004).

Both vessels did not maintain a safe speed in the Incheon harbor limit in the extremely restricted visibility. Especially *Princess* sailed at a speed of 24.5kts which is not understandable in common sense. And she did not take a proper action to avoid collision such as stopping the main engine or going astern when confirming *Golden Jindo* at a distance of one mile by radar and when the other vessel disappeared on the screen. Therefore, *Princess* was to blame for not maintaining a safe speed and not stopping her engines on seeing *Golden Jindo*. Then, she also did not sound signals in restricted visibility. The circumstances of this case were very similar to *Linda vs Elazig* in Mankabady (1978).

On the other hand, *Golden Jindo* sailed at a speed of 14kts and did not maintain a proper lookout for the anchored vessels on port side and shoals area. Thus, she could not find *Princess* and take a proper action to avoid collision.

## 2) Lack of ability to use radar

The masters of both vessels did not watch the radar screens properly even when visibility was extremely restricted due to fog. They confirmed the existence of each other just before collision or near collision spot. Collision could have been avoided if any one of masters watched the radar display properly but neither did.

Also They used 3-mile range scale which was a very short range considering the speed of each vessel. The distance of three miles was equivalent to 7 minutes for *Princess* at a speed of 24.5kts and equivalent to 12~23 minutes distance for *Golden Jindo* at a speed of 14kts. In this situation at sea, collision is likely to occur even crew take eyes off from the radar for just a moment. The officer of the watch should ensure that range scale employed is changed at sufficiently frequent intervals so that echoes can be detected as early as possible.

In *Marie Skou vs Chitose Maru*, *Marie Skou* was navigating by radar in dense fog at her full sea speed of 16.5kts. But a lookout by radar was conducted only on the 6 mile scale and no effort was made to plot (AMC, 1971;

Cahill, 2002). In this case, she should have extended the range periodically at intervals appropriate to the circumstances to inform herself of the general situation. Therefore, the range scale which is most suitable for the locality should be selected but the scale should be changed at regular intervals.

## 3) Violation of sea route navigation

The article 11 (Sea Route, etc.) of Public Order in Open Ports Act stipulates that any vessel other than miscellaneous vessel, which enters or leaves the boundaries of an open port, or passes through an open port, shall navigate along the sea route as designated by the administrator of Regional Maritime Affairs and Fisheries Office.

Therefore ferries should proceed along the No.1 Passage of Incheon Port designated by Notification No.2003-47 of Incheon RMAFO. And also according to the Article 45 (Establishment and Management of Traffic Safety Specific Area) of Maritime Traffic Safety Act, any vessel should enter or leave the boundaries of outside Incheon Port through the East and West traffic lane of Traffic Safety Specific Area. Namely, both vessels should have propelled through the No.1 Passage within Incheon harbor limit, East traffic lane when entering the port and West traffic lane when leaving from the port.

However, both vessels did not navigate through such passage and traffic lane and followed the sea route commonly called Palmido North-West Sea Route, thus did not observe the sea route navigation.

## 4.2 Contributory Factors of Accident

### 1) PTMS Center of Incheon Port

The PTMS Center of Incheon Port provides the traffic information such as the navigation or movement of vessels in traffic lanes or port (harbor limit) for the safety of vessel traffic. The PTMS Center's service extended to ferry ships for maintaining the safety and public order in vessel traffic and preventing marine accident in coastal area from October 2004.

The service area of PTMS Center is very extensive including the No.1 Passage, No.3 Passage, East and West traffic lane, etc. Also it has to do additional duties other than vessel control works, so concentrated and effective monitoring such as control for each sector and provision of navigational information was not achieved properly.

At the time of accident, personnel in charge of traffic information service acquired targets of *Golden Jindo* and *Princess* and obtained their navigational information. Even

though the target has been removed on the radar screen due to high-speed of *Princess*, they were not aware of disappeared target. Eventually they could not provide navigational information on risk of collision to both vessels. This is because three persons by day and four persons by night are not enough to do works such as the observation of vessels, the acquisition of targets, the provision of navigational information and the performance of general affairs, etc.

## 2) Ferry safety management system

Effective control and safety management can be achieved in a department rather than 2 departments in the aspect of both effectiveness and convenience. However, the ferry safety management is separately taken care of since Ministry of Maritime Affairs and Fisheries authorized a part of it's work to the commissioner of Maritime Police Station. Namely, the ferry safety management is dispersed and there is lack of unity of operation(Lee, 2004; Maritime Traffic Safety Act Article 7 and 52).

The Incheon branch office of KSA was instructed and supervised by the Incheon Maritime Police Station. The staffs of KSA are assigned as Operating Managers and they are executing the safety and operation management of ferry ships according to the Article 6 of Passenger Ship Operating Management Regulation. Therefore, the commissioner of Maritime Police Station takes required action for the safe navigation of ferry ships such as departure control in restricted visibility through Operating Managers but in fact control concerning the status of navigating ferry ships have not been performed continuously.

Also sea route of ferry ships is notified in the "Operating Management Regulation" and KSA deliberates the regulation, confirms the propriety of the route and executes the on-board instruction and inspection by the safety manager. Ferry ships of Incheon Port navigate through the designated route when safety manager is instructing and inspecting on board but in other cases they just use commonly called Palmido North-West Sea Route and such a collision broke out.

## 3) Accumulated fatigue of crew of Ferry *Princess*

Ferry *Princess* performed so many as 5 round-trips from 0700 to 2020 of 9th in summer, when the accident broke out. Crew of this ferry was under accumulated fatigue due to less than 6 hours' rest a day. According to the International Convention on Standards of Training Certification and Watchkeeping for Seafarers, 1978, as amended in 1995(1995 STCW) Chapter VIII Regulation VIII/1

Fitness for duty and IMO Resolution A.772(18), each Administration shall, for the purpose of preventing fatigue, establish and enforce rest periods for watchkeeping personnel. Consequently, the Article 55 (Working Hours of Person on Sailing Duty) of Seaman Act of Korea stipulates "When a person who is assigned to the duty of watchkeeping, the working hours therefor shall be eight hours per day and forty-four hours per week". And "The shipowner shall give watchkeeping personnel the hours of recess more than 10 hours per day and seventy-seven hours per week. The hours of recess shall include consecutive 6 hours of recess." But the owner of *Princess* did not take proper measures to prevent fatigue of crew. Therefore, all the crew got exhausted after the voyage.

## 4) Negligence of KSA to instruct and supervise the ferry ship companies

The Incheon branch office of KSA was indifferent to instruct and supervise the ferry ships that operate the commonly called Palmido North-West Sea Route customarily violating regulations to navigate through proper sea route. This route also has risks of collision in the sea area where bottled-neck situation occurred due to concentrated entry of ferry ships and grounding risk in the shoals area, etc(Passenger Ship Operating Management Regulation Article 6).

## 5. Conclusions

Until now, the author looked into the causes of the collision accident between *Golden Jindo* and *Princess*. To sum up, this collision broke out since *Princess* did not maintain a safe speed and did not sound fog signals in restricted visibility. On the other hand, *Golden Jindo* did not keep a proper lookout and did not take a proper action to avoid collision. In addition to these causes, there are contributory factors of accident as follows; lack of proper safety training of crew, lack of instruction of supervisor, carelessness of PTMS Center and indifference of KSA, etc.

This indicates that the collision accidents are coming from various causes such as disregard of navigation regulations in restricted visibility due to dense fog, as well as external factors which adds to the complex situation.

Especially every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility, and a power-driven vessel shall have her engines ready for immediate manoeuvre. In case of ferry ships, safety speed is requisite for the marine safety. Besides, the officer of the watch should ensure that range

scales employed be changed at sufficiently frequent intervals so that echoes can be detected as early as possible.

In addition to these causes, the author thinks that PTMS Center has to play an important role for preventing occurrence of such accidents. In this case, PTMS Center should have established the navigational order and the system providing the information required in a safe navigation for the prevention of accident in the Incheon harbor limit and Traffic Safety Specific Area. However, it did not perform control operation effectively, as a result this collision accident happened.

The service area of PTMS Center in Incheon Port is very extensive including the No.1 Passage, No.3 Passage, East and West traffic lane and others. And also they have to do additional duties other than vessel control works, so concentrated and effective monitoring such as control for each sector and provision of navigational information was not achieved properly. Therefore, the Center should assign the adequate number of personnels to control the vessels effectively, need to notify the risk of collision in advance and provide the proper information concerning navigational warning.

## References

- [1] AMC(1971), American Maritime Cases, pp.472.
- [2] Cahill, R.A.(2002), *Collisions and Their Causes*, Nautical Institute, pp.8-9.
- [3] Cockcroft, A.N. & Lameijer, J.N.F.(1982), *A Guide to the Collision Avoidance Rules*, Stanford Maritime Ltd., pp.125-126.
- [4] KCG(2005), "The Analysis of Marine Accidents in 2004", Korea Coast Guard, pp.1-4.
- [5] Kim, In-Hyeon(2001), *Maritime Traffic Law*, Dasom Publishing Co.(Korean edition), pp.142-143.
- [6] KMST(2003), *KMST Annual Report of Marine Accidents 2002*, pp.1-2.
- [7] KMST(2005), "The Analysis of Marine Accidents in 2004", Korean Maritime Safety Tribunal, pp.5-7.
- [8] Lee, Yun-Cheol(2004), *Maritime Traffic Law*, Dasom Publishing Co.(Korean edition), 2004, pp.466-468, 654-657.
- [9] Mankabady, Samir(1978), *Collision at Sea -A guide to the legal consequences-*, North-Holland Publishing Co., pp.210-211.

---

**Received** 24 January 2005

**Accepted** 24 March 2005