

§ 5 - 2 - 1 Chain of events leading up to the accident

Time	Movement	Who
10:40 (Approx.)	Received contact that cargo handling work of the previous vessel at the port of Hiroshima Ujina berth was approximately 2 hours delayed.	Master
15:00 (Approx.)	Cleared out of Kurushima Strait. Predicted arrival at outside port of Hiroshima to be approximately just under 3 hours from that point. Because she was to arrive at the outside port at approximately 18:00, it was decided that 30 to 40 minutes time adjustment was required.	Master
18:00 ~ 18:30	At the Miyajima Seto South Side Area, adjusted by approximately 30 minutes by turning round once.	Master
18:33	Judged that further adjustment time was needed, intended to turn round at North Asami Island Northwest Seas, and ordered that course be altered to starboard 10 degrees after confirming the state of the surrounding environment via radar (4 nautical mile range).	Master
Just after 18:33	Boatswain completed preparation for entering port at the forward station, returned to the bridge and started lookout. Immediately after, he noticed the marked light of an oyster raft and reported it to the Master.	Boatswain
18:37	He felt a shock to the hull and realized that the vessel had collided with the oyster raft.	Master
18:40 (Approx.)	Ordered the Chief engineer to check the condition of the hull by sounding etc. After that, because no flooding was detected, she continued to navigate as before.	Master
21:55	After completion of cargo handling, he contacted the Japan Coast Guard.	Master

Table 66 Chain of events leading up to the accident

The chain of events that led up to the accident are summarized in Table 66. They received a telephone call from the local agent requesting for time adjustment at around 10:40, because the cargo handling work of the previous vessel at the port of Hiroshima Ujina berth was delayed. Following this, they cleared out of Kurushima Strait at around at 15:00, and it was decided that 30 to 40 minutes time adjustment was required. Then, at Miyajima Seto South Side Area at approximately 18:00, time was adjusted by approximately 30 minutes by turning round once.

However, it was still decided that further adjustment time was needed. When turning round at North Asami Island Northwest Seas, the accident, which was a collision with an oyster raft, occurred.

The Master explained the following when questioned by the Japan Transport Safety Board.

Because the Master predicted arrival to be at approximately 15:00, which was earlier than ETA, he kept maneuvering believing that the time could be adjusted following confirmation of the ship's position and the previous vessel's situation at around 16:00 or 17:00.

Although the Master knew an oyster raft was located at the North Asami Island Northwest offing, he did not know the exact location as this was not his usual navigating area. He assumed that it might be located on the east side of the North Asami Island Northwest offing.

Moreover, because his visibility was restricted by wind and waves, he experienced difficulty in confirming the marked lights close to the sea level.

Only after the accident, he thought that he should have looked more carefully at the radar screen or electronic chart that displayed the oyster raft.

§ 5 - 2 - 2 Analysis by Japan Transport Safety Board and Marine Accident Tribunal and Preventive Measures

Analysis of the accident and preventive measures by Japan Transport Safety Board are as follows.

(1) Analysis

Following the announcement of the gale warning and high wave caution, the situation was such that it was difficult to visually confirm the marked lights near the sea surface. During the passage/navigation to the north-northeast of North Asami Island Northwest offing, the Master started right turn in order to adjust the time. Because look-out was not appropriately arranged utilizing the radar, he operated the right turn without noticing the oyster raft that was situated at the North Asami Island Northwest offing, which caused a collision with the oyster raft during turning round.

(2) Preventive measures

- Keep appropriate look-out by utilizing radar etc.
- In the event of operating away from of a standard charted course, check the condition of the channel beforehand using a Nautical chart etc.

In addition, the judgement and cause analysis by Marine Accident Tribunal was as follows.

Main text of judgement:	One month suspension of seamen's competency certificate as operating Master
Cause:	Insufficient hydrographic survey Neglected to conduct a hydrographic survey, such as using navigational passage information and electronic chart data to check location information of the oyster raft. The Master didn't think that there would be an oyster raft in the area of sea some distance away from Asami Island.

§ 5 - 2 - 3 Analysis according to Human characteristics and Preventive Measures

= Analysis of root cause =

Similar to Case , accident causes were analysed along with the Human characteristics. We conclude that the error chain was broken as a result of human error, when Human characteristics are applied. (Each number is applicable to that of Human characteristics shown in Table 56)

Because the Master was experienced and actually had been on board the same vessel on several occasions, it is naturally believed that maneuvering the vessel would not have been a problem for him and that he was sufficiently aware of the hull motion characteristics. We shall examine as to why such an experienced Master caused an accident, along with the “root cause” lurking behind the course of events.

孺 Human beings are sometimes lazy

At approximately 10:40, the local agent requested that the ETA time be adjusted, while he was steering the ship through a narrow channel leading towards Kurushima. From this we can understand that it was not reasonable to start adjusting time at that moment judging by the surroundings and it was too early to adjust the timing, if attempted.

However, even at that time, regarding the sea area he was navigating towards, if the circumstances, weather, sunset time (the sunset time of December in the Hiroshima region is around 17: 00 - 17: 10) and the twilight (stars of the first and second magnitude can be seen and a horizon can be identified, approximately 1 hour before sunrise and 1 hour after sunset) were taken into consideration, time adjustment would need to have been completed at approximately 18:00 at the latest, if this was to be carried out by turning round.

However, in fact, assuming that time adjustment could be carried out at around 16:00 to 17:00 in ample time, the Master did not examine the status of the sea area he was navigating towards or method by which he would adjust time (including reducing speed and changing course).

Human beings sometimes make assumptions

He believed that the oyster raft was located at the east side of North Asami Island Northwest offing. It can be said that there was insufficient investigation regarding route conditions in advance.

Human beings have moments of inattention

Moreover, because his visibility was restricted by wind and waves, he experienced difficulty in confirming the marked lights close to the sea level. Despite this, he did not set up an additional look-out.

Human beings sometimes forget

Regarding the Pure Car Carrier (PCC), he understood that the pressure fluctuation of the wind was significant. However, as a consequence of time adjustment by turning round in a narrow water area, the vessel also flowed significantly. It can be considered that the Master forgot about hull motion characteristics.

Also, in spite of maneuvering in a narrow channel, the bridge arrangement constituted a 3rd Officer as helmsman and the Chief Engineer as engine operator, with only the Master actually Look-out steering. Considering the importance of BTM, the personnel arrangement was not appropriate, which may mean that he forgot about the BTM concept.

On analysing this case we understand that human errors, derived from the above mentioned four Human characteristics, were the cause and may have led to the accident occurring as a result. If one of the errors can be eliminated, an accident can be prevented.

It seems that the accident occurred as a result, because the chains of potential human error related to these kinds of human characteristics could not be eliminated.

= Preventive measures =

The Marine Accident Tribunal reprimanded the Master with a one month suspension of his seamen's competency certificate and the file was closed. We appreciate that the Marine Accident Tribunal judged this case fairly under the revised Act under Marine Accident Inquiry, however, even though the Master who caused the accident deeply regretted it, this is not enough if an accident is to be prevented in the future: punishment is by no means conclusive. As a preventive measure it will be more effective to analyse how to eliminate the human error, found in Human characteristics, that was the root cause.

Regarding the following main Human characteristics that are at the heart of the error causes, preventive measures are to be examined.

孺 Human beings are sometimes lazy

The original problem emanated as a result of carelessness concerning turning round to adjust time, without sufficiently examining route conditions, such as narrow sea area etc.

In the event of time adjustment, a reduction in speed and temporary anchoring are mainly required. It is recommended that work instructions be created in accordance with the safety management manual, which state that, in the event of time adjustment by turning round, it is to proceed into a sea area where more than four to five times of the tactical diameter can be assured, and moreover, where marine traffic is not congested.

Human beings sometimes forget

Regarding the Pure Car Carrier (PCC/PCTC), he forgot that the pressure fluctuation of the wind was significant. In addition, he had undergone BTM training and understood the importance of it in theory, however he either could not recollect or could not carry it out in practice, which is what caused the accident.

Thus, in order help them remember, if they forget, as a preventative measure, it would be effective to have in place a re-training system requiring that training be retaken if a certain period of time has passed since the last BTM training.

§ 5 - 3 Case Fair way buoy damage

Case Fair way buoy damage

Date and time of occurrence:

On an unspecified day of December 2015, approximately 21:27 Japan time (JST)

Accident site:

Port of Murooran No.2 light beacon

Vessel particulars:

499 GT L x B x D = 75.52m x 12.00m x 7.20m
Cargo ship Fore draft 3.65m Aft draft 4.75m Loaded
Steel product (1,599kt)

Port of departure:

Port of Murooran, Berth 1-9

Port of destination:

Hanshin Port Osaka-ku

Crew members:

A Master aged 58 and 4 other members on board

Weather and sea conditions:

The weather was sunny, NNW wind, wind force 2, the tide was low wave and Good visibility. There were neither marine navigational warnings or high waves.

Arrangement in place when the accident occurred

After leaving the wharf, the Bridge Watch personnel constituted the Master only. One radar had a range of 1.5 nautical miles and the other a range of 3 nautical miles. However, at the time of passing the No.3 light beacon, the radars were switched o , and he increased speed while setting the engine to full speed ahead.

Traffic condition in fairway

Before entering the sea route, she passed a vessel inbound. After, there were no other vessels concerned.

Damage condition

No2. light beacon:

Dent with a crack at the floating part and bending damage to protective fence.

Vessel particulars:

Bending loss on her port side bow and no flooding.



Photograph 67 Damaged state of No.2 light beacon

Label of No.2 light beacon: visible distance four nautical miles, red flash once every three seconds. Light height was 8.2 meters

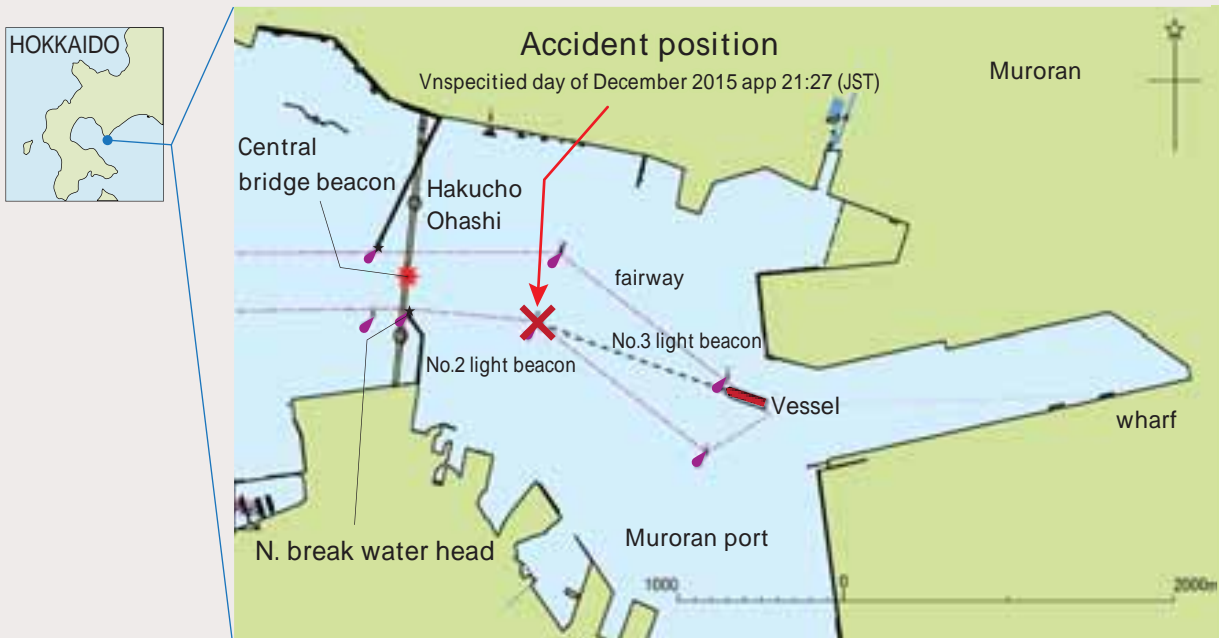


Fig. 68

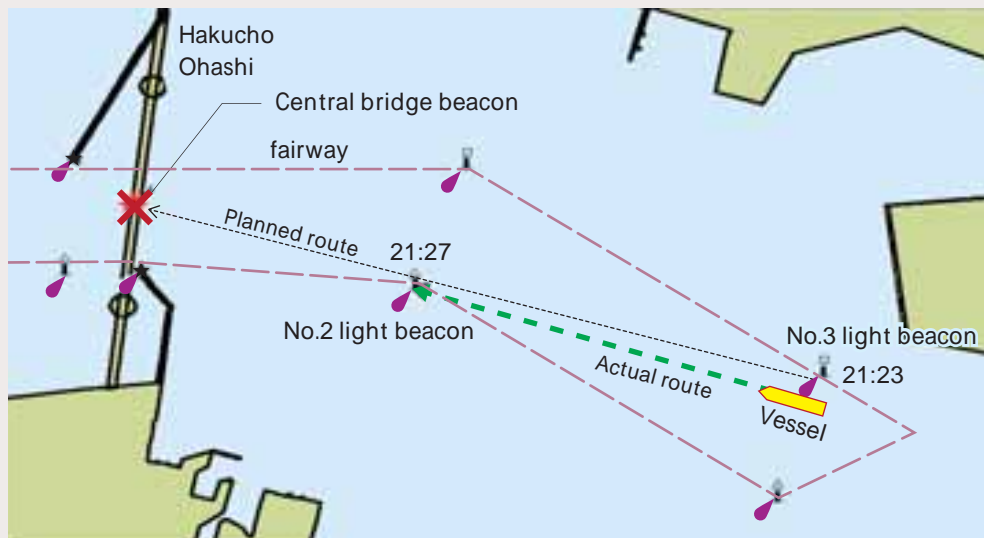


Fig. 69

§ 5 - 3 - 1 Chain of events leading up to the accident

Time	Movement	Who
21:13 (Approx.)	Departed from port of Muroran Harbour. Dismissed Departure S/B mid-channel and Master started steering by himself. Hand Steering.	Master
21:18 (Approx.)	Because he recognised that there was a ship in port at the west end of the Fairway, he steered to starboard because of passing port to port. He saw the No.3 light beacon on the starboard side, and altered course in order to pass.	Master
21:20 (Approx.)	Headed bow to Muroran port Hakucho Ohashi central bridge beam light at 90 meters south of No. 3 light beacon. Set engine to full speed ahead.	Master
21:20 ~ 21:26	Judged that there was enough time to reach Hakucho Ohashi. Moved to the engine operation console on the starboard side and adjusted Eng. R.P.M. Mainly watched the M/E R.P.M indicator and from time to time confirmed visual estimated distance to Hakucho Ohashi. When he noticed the red light of the No.2 light beacon before his very eyes, it was too late to take action.	Master
21:27 (Approx.)	Collision into No.2 light beacon. Contacted Japan Coast Guard.	Master

Table 70 Chain of events leading up to the accident

Table 70 shows the chain of events leading up to the accident.

At approximately 21:13, she departed the Port of Muroran harbour, and started navigating to Hanshin Port Osaka-ku. Dismissed Departure S/B mid-channel with the Master being the only person at the bridge, where he commenced his duties. (Hand steering)

Because he recognised that there was a ship (West end of Fairway) prior to entering the port at approximately 21:18, he steered to starboard because of passing port to port. He saw the No.3 light beacon on the starboard side, and altered course in order to pass. At the same time, he set engine to full speed ahead.

At Approximately 21:20, he headed the bow towards the beam light of Hakucho Ohashi central bridge and at approximately 21:23:30, he changed to automatic steering at the time of passing No. 3 light beacon which was on the starboard side. At that time, because the main engine rpm did not increase, but rather fluctuated up and down, the Master started engine adjustment. While mainly watching the main engine, he noticed the red light of the No.2 light beacon before his very eyes. Unable to act otherwise, the vessel made contact with the light beacon. Promptly, they contacted the Japan Coast Guard.

§ 5 - 3 - 2 Analysis by Japan Transport Safety Board and Marine Accident Tribunal and Preventive Measures

Analysis of the accident and preventive measures by Japan Transport Safety Board are as follows.

= Analysis =

Insu cient confirmation regarding ship s position

Although a GPS chart plotter was available, the nautical chart that he was using at Muraran port was too old an edition and did not indicate the fairway side line and light beacon on the east side of Hakucho Ohashi (inside of port).

Also, one of the causes of this accident was down to the fact that he switched off the two radars. The radars at setting ranges 1.5 nautical miles and 3 nautical miles were used after leaving the wharf until around the time of passing the vessel inbound. Because there was no record of the ship's position on the nautical chart, it is presumed that the ship's position fixing was not originally conducted.

There was a problem in setting the course.

After passing 90 meters south of No.3 light beacon, intending to take a short-cut, he headed bow to the beam light of the central bridge. Analysing the AIS record at the time of when the accident occurred, it was confirmed that there was no pressure fluctuation in tidal stream or wind.

Human beings sometimes make assumptions

Because she was passing the edge of the starboard route, he assumed that she could pass to the north of the No.2 light beacon.

Insu cient Look-out

He was preoccupied with adjusting the main engine rpm, and neglected to monitor what was happening ahead of the vessel. Also, he checked only the beam light of the central bridge which was located at 65 meters above the sea surface without paying attention to the sea surface.

Inappropriate feedback to abnormal situation

He believed that he could adjust the main engine rpm by himself and did not ask for help from the chief engineer.

= Preventive measures =

While solely watchkeeping at the bridge, concentration on maneuvering is a requirement. In the event that it is necessary to adjust the remote control device, including the engine, take measures that allow the staff members of the engine department to come up to the bridge.

In addition, judgement by Marine Accident Tribunal was as follows.

Main text of judgement:	Official reprimand of the Master
Cause:	Duty of care was insufficient regarding the carrying out of sufficient look-out of the surroundings in order to not miss the light of No.2 light beacon located at the south of the sea route during night time. He was preoccupied with adjusting the main engine rpm, and neglected the duty of sufficient look-out.

§ 5 - 3 - 3 Analysis according to Human characteristics and Preventive Measures

= Analysis =

Accident causes were analysed along with the Human characteristics in the same way. The following four of Human characteristics are applicable and we again conclude that the error chain was broken as a result of human error. (Each number is applicable to that of Human characteristics shown in Table 56)

✎ Human beings sometimes transgress when no one is looking

It would appear that the next two are violations.

Did not possess the most updated nautical chart. (It is supposed that both vessel and company had this problem.)

Navigated the Fairway diagonally by short cut.

Article 12 of Act on Port Regulations (Act No. 174 of July 15, 1948) is as follows.

When vessels other than Miscellaneous Vessels enter into or leave from or go through the Specified Port, they **shall use the Fairway provided in the Ordinance of the Ministry of Land, Infrastructure, Transport and Tourism** hereinafter simply (referred to as "Fairway" until Article 37 ; provided, however, that this shall not apply) to the cases in which they intend to keep away from a marine accident or other compelling reasons exist.

Here, "the Fairway provided" means to navigate alongside the sea route, and diagonal navigation can be regarded as being in conflict with Port Regulations Law.

Human beings have moments of inattention

Both radars were switched o .

Did not confirm the ship s position on the nautical chart.

Human beings sometimes make assumptions

Because she was passing the edge of the starboard route, he assumed that she could pass to the north of the No.2 light beacon.

Believed that he could adjust the main engine rpm by himself and did not ask for help from the Chief Engineer.

Human beings are sometimes only able to see or think about one thing at a time

He was preoccupied with adjusting the main engine rpm, and neglected to monitor what was happening ahead of the vessel.

Only checked the beam light of the central bridge and did not monitor the sea surface.

= Preventive measures =

It appears that the main root cause comes from over-confidence due to being accustomed with the work. The Master was experienced just as the Master in Case was, he had entered the Muroran Harbour on many occasions. After the accident, the Master regretted and reflected adequately, however re-training will still be necessary.

The company determined the following are to be preventive measures and informed all vessels.

Accident summary

After dismissed Departure S/B, all crew arranged at the bow are to go up to the bridge. They are also to maintain watchkeeping arrangement on the bridge until outside of harbour and system to assist the Master.

Navigation speed that is slower than slow ahead engine is recommended in the harbour.



Photograph 71 (Image)



Photograph 72 (Image)

The guideline determined by this company can be amply evaluated, because of its specific watchkeeping arrangement and operating guideline. However, it is necessary to get more involved in order to regulate it.

When trouble occurs, it is also necessary not to cope with it independently and to clarify priority order of work. This time, the first priority is naturally to concentrate on maneuvering and look-out during ship operating in the harbour. It is necessary to take action by asking for help from the chief engineer immediately, if the main engine rpm does not increase.

The collapse of one person BTM was the main cause and a gap between each resource manifested. Furthermore, human error added to the equation.

§6

Conclusion

The statistics of the accidents regarding harbour and fishery facilities and examples of three related cases that were reported to our Club were introduced.

As shown in Graph 13 on page 8, in coastal vessels, the ratio of the total number of the accidents regarding harbour and fishery facilities is approximately 60% (the number of accidents) and approximately 40% (insurance money) of the total respectively. In addition, it is presumed that almost 90% of the total marine accidents are caused by human errors, however, it is no exaggeration to say that collision accidents, groundings, and damage to harbour and fishery facilities are all 100% caused by human error.

All experienced Master, chief engineer and crew are on board. They are expected to obtain the technical skills and knowledge and to be more than familiar with the law including the Maritime Collisions Prevention Act (COLREGs).

However, even these professional technicians induce human error caused by a behavioural characteristic that anyone may have, and it is these chains of errors that cause accidents.

Therefore, we can say that not causing human error leads to the elimination of accidents. BTM and ETM are effective means.

On the premise that “human beings are error-prone”, BTM and ETM were established with the purpose of “achieving safe navigation” in order to further prevent human error chains, and to bolster team ability at the bridge and in the engine room, in order not to cause an accident following one person’s direct human error.

In the event of coastal vessels, because there are a large number of operating ships with a single watchkeeping arrangement, some crew might think BTM is not available. However, even during single watchkeeping, BTM can be performed by imagining there is another L (yourself) who tries to find an answer to your own question.

For example, in the event that you recognize another vessel that does not change relative bearing while monitoring the radar display, you may check the Navigation Act along with the Maritime Collisions Prevention Act (COLREGs). If the other vessel is a give-way vessel, you may think or even utter “Strange! This vessel does not seem to be changing relative bearing.” This what your other self will tell you.

In the end, it is important to eliminate errors by supporting each other so that an accident is not caused by a single person’s error by establishing communication with the surrounding resources including the other L (yourself), shown in the “M-SHELL Model” of Fig. 58 on page 32.

References

- A collection of determinations by Marine Accident Tribunal
- Report by Japan Transport Safety Board of Ministry of Land, Infrastructure, Transport and Tourism
- "Bridge Team Management -A Practical Guide" by Captain A.J.Swift
- "Practical Navigator", by Japan Marine Science Inc.
- Japan Captains' Association, DVD "For Effective Practice of the BRM - Are you sure about your BRM?-"

CD-ROM

Ship maneuvering related English version of Loss Prevention Bulletin and technical reference
Please make a good use of the enclosed CD-ROM file which contains the following documents.

- P&I Loss Prevention Bulletin Coaster Vessel Vol.4.pdf (Japanese only)
- P&I Loss Prevention Bulletin Coaster Vessel Vol.4 Technical Reference. pdf (Japanese only)
- P&I Loss Prevention Bulletin Coaster Vessel Vol.4.pdf (English only)
- P&I Loss Prevention Bulletin Coaster Vessel Vol.4 Technical Reference. pdf (English only)

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