



Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation
Bundesoberbehörde im Geschäftsbereich des Bundesministeriums
für Verkehr, Bau- und Wohnungswesen

Investigation Report 343/04

Very serious marine casualty:

**Collision between MV RITHI BHUM
and MV EASTERN CHALLENGER
with subsequent foundering of
MV EASTERN CHALLENGER
on 14 November 2004
in the South China Sea / Taiwan Strait**

15 July 2005

The investigation was conducted in conformity with the law to improve safety of shipping by investigating marine casualties and other incidents (Maritime Safety Investigation Law - SUG) of 24 June 2002.

According to this the sole objective of the investigation is to prevent future accidents and malfunctions. The investigation does not serve to ascertain fault, liability or claims.

As to the interpretation of this Investigation Report, the German version is prevailing.

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1 Summary of the marine casualty

The general cargo ship EASTERN CHALLENGER left KUALA, Vietnam on 11 November 2004 at 11:10 h¹. It was carrying a cargo of 6100 mt ilmenite ore and was on the way to Omahama, Japan.

The container ship RITHI BHUM left Hong Kong at 18:30 h on 13 November 2004 and was making for Shanghai.

On both vessels the second nautical officers took over the bridge watch at 00:00 h on 14 November. The radar sets of both vessels were in operation, and visibility and weather were good.

According to the voyage planning EASTERN CHALLENGER was steering a course of 065° since passing the last waypoint at 18:00 h on 13 November at a speed of 10.2 kn. The voyage plan of RITHI BHUM provided for a change of course from 076° to 063° at the waypoint at 01:30 h. She was proceeding at a speed of 21.5 kn and had already picked up and plotted EASTERN CHALLENGER running ahead on its radar screen. At about 01:54 h, at a distance of 3.5 nm aft, RITHI BHUM was also detected on the radar set of EASTERN CHALLENGER. On the basis of the AIS² data transmitted, RITHI BHUM was recognised with its vessel name, made out on an approximately parallel course at a speed of 22 kn. RITHI BHUM was assessed as a vessel overtaking on the starboard side.

At about 01:58 h RITHI BHUM carried out an evasion manoeuvre to starboard for another vessel. After passing the vessel RITHI BHUM turned back to port and at about 02:04 h was proceeding on the course of 057° at an unchanged speed of 21.5 kn.

About ten minutes later the bulbous bow of RITHI BHUM collided with the starboard stern of EASTERN CHALLENGER.

As a result of the strong flooding after the collision the crew of EASTERN CHALLENGER left the vessel. RITHI BHUM had sustained heavy damage to the bulbous bow and in its fore ship area. However, it succeeded in manoeuvring back to the scene of the collision and picking up the crew of EASTERN CHALLENGER. After this, RITHI BHUM returned to Hong Kong and EASTERN CHALLENGER sank later about nine nautical miles northnorthwest of the collision location.

(Remark: The Federal Bureau has not received any reports about damages other than those caused by the collision. Also no further information have been provided as to how EASTERN CHALLENGER got to the foundering position after the collision. According to the available results of the investigations of Marine Department Hong Kong and Korean Maritime Safety Tribunal it is only stated that „The „Eastern Challenger“ later sank completely in the area“ and „... and she (EASTERN CHALLENGER) sank in 24hrs“ respectively. The aim of the investigation of the Federal Bureau is not to ascertain liability or claims. In this respect the present report is limited to identify the circumstances leading to the collision.)

¹ All times in this report relate to local time = UTC + 8h

² Automatic Identification System

2 Scene of the casualty

Nature of the incident: Very serious marine casualty
Date/Time: 14 November 2004, approx. 02:12 h
Location: South China Sea / Taiwan Strait
Latitude/Longitude: ϕ 22°35' N λ 116°25.8' E

Extract from Sea Chart 2702, BSH

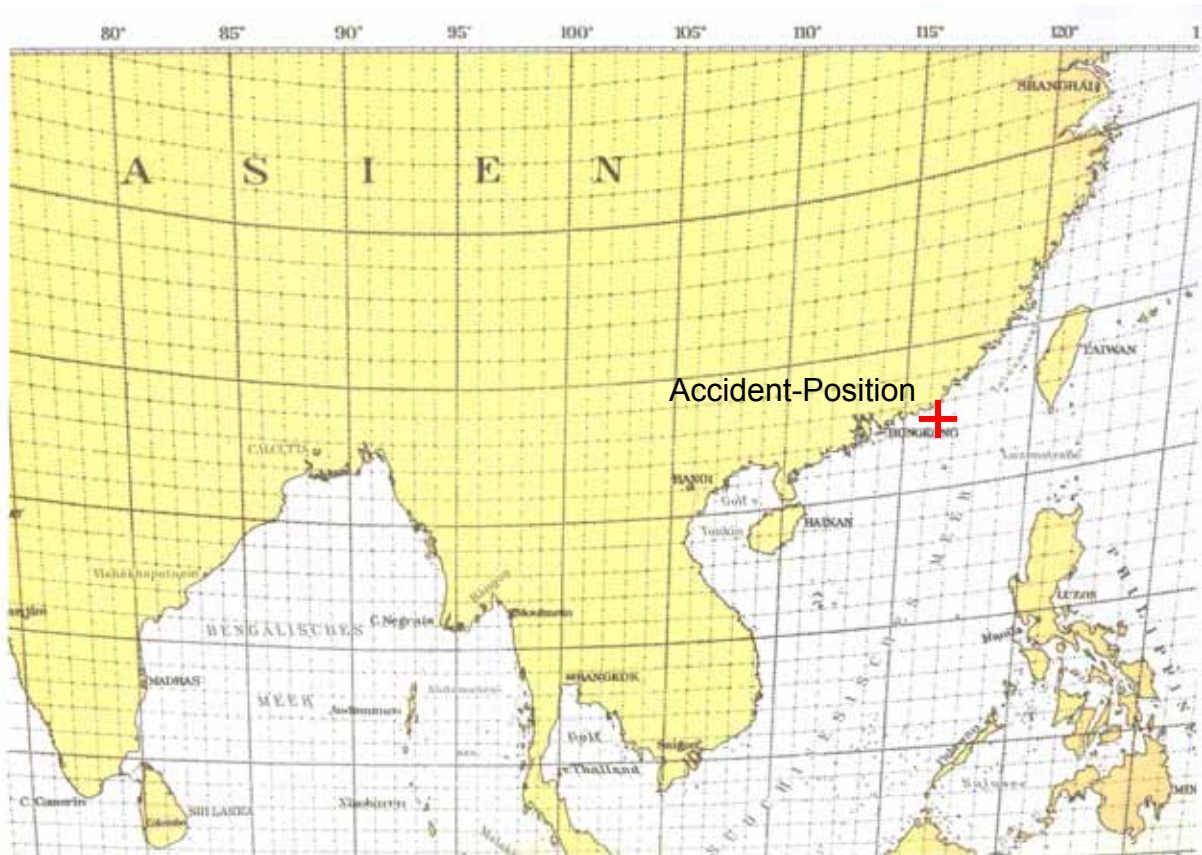


Figure 1: Scene of the accident

3 Vessel particulars

3.1 Photo of vessel 1



Figure 2: RITHI BHUM
(Photo: Jacky Rickmers Schiffahrtsgesellschaft mbH & Cie.KG)

3.2 Vessel particulars 1

Name of vessel:	RITHI BHUM
Type of vessel:	Container ship
Nationality/Flag:	Germany
Port of registry:	Hamburg
IMO-Number:	9270804
Call sign:	DAMI
Vessel operator acc. 3.1 ISM Code:	Rickmers Reederei GmbH & Cie.KG, Hamburg
Year built:	2004
Building yard/building number:	Jiangsu Yangzijiang Shipyard, China/634C46
Classification Society:	Germanischer Lloyd
Length over all:	196.83 m
Width over all:	27.88 m
Gross tonnage:	21932 gt
Deadweight:	24235 t
Max. draft:	11 m
Service speed:	23 kn
Engine rating:	21660 kW
Main engine:	MAN B&W, Diesel Engine, 6K80MCC
Crew:	24

3.3 Photo of vessel 2



Figure 3: EASTERN CHALLENGER
 (Photo: Daebo Shipping Co., Ltd., Seoul)

3.4 Vessel particulars 2

Name of vessel:	EASTERN CHALLENGER
Type of vessel:	General Cargo Ship
Nationality/Flag:	South Korea
Port of Registry:	JeJu
IMO-Number:	8601616
Call sign:	DSFJ5
Vessel operator:	Daebo Shipping Co., Ltd., Seoul
Year built:	1986
Building yard/building number:	Imai Zosen K.K., Kochi/548
Classification Society:	Korean Register of Shipping
Length over all:	105.88 m
Width over all:	16.30 m
Gross tonnage:	3927 gt
Deadweight:	6562 t
Max. draft:	6.80 m
Service speed:	12.5 kn
Engine rating:	2581 kW
Main engine:	Makita Diesel Engine Co., Ltd., Diesel Engine, 2SA6CY
Crew:	17

4 Course of the accident

For reconstructing the course of events the Federal Bureau of Maritime Casualty Investigation had available the narratives of the bridge teams of the ships involved, the results of further interviews of crew members by the Federal Bureau and foreign authorities as well as written statements of the vessel operators/responsible operators. Additionally voyage data recorder and electronic chart system of RITHI BHUM were available for analysis. When abandoning the ship the crew of EASTERN CHALLENGER could only retrieve the deck log book. Copies of the relevant pages were also available for analysis by the Federal Bureau. Carriage of a Voyage Data Recorder was not mandatory for EASTERN CHALLENGER.

4.1 Narrative - EASTERN CHALLENGER

At 11:10 h on 11 November 2004 EASTERN CHALLENGER had left Kualo in Vietnam. Carrying a cargo of 6100 mt ilmenite ore it had been on the way to Omahama in Japan. EASTERN CHALLENGER had passed the fixed waypoint 22°00'N 115°00'E at 18.00 h on 13 November and changed its course to 065°. Its speed had been 10.2 kn. At midnight on 14 November the second nautical officer had taken over the 0-4 h bridge watch together with a deck cadet as lookout. All the navigational equipment had been in operation and was running accurately, the weather and visibility had been good. At 01.54 the second nautical officer had noted a vessel approaching from almost right astern on the radar. The distance had been 3.5 nm and on the basis of the AIS information transmitted the vessel had been identified as RITHI BHUM. The course had been approximately parallel to that of EASTERN CHALLENGER, and at a speed of 22 kn the second officer expected it to overtake on the starboard side. As stand-on vessel EASTERN CHALLENGER maintained its course and speed. At a distance of 1 nm no evasion manoeuvre of RITHI BHUM had yet been evident. The bridge team of EASTERN CHALLENGER still considered it necessary to maintain course and speed. During the approach the second nautical officer of EASTERN CHALLENGER had seen both sidelights of RITHI BHUM, but shortly before the collision only the starboard sidelight. He had therefore thought that the vessel had taken evasive action to port.

At 02:14 h RITHI BHUM had collided with the starboard stern of EASTERN CHALLENGER. The latter vessel had sustained heavy damage to the aft part. The second engineer on watch had notified the Captain that the engine room was flooding and that the vessel was sinking via its stern post. After the collision the general alarm had been sounded, about ten minutes later a GMDSS³ emergency call had been sent out and the crew had been instructed to abandon the vessel. As a result of the collision the lifeboat davits had been damaged so heavily or blocked respectively that the lifeboats could not be used. Two liferafts had been activated. All 17 crew members had been able to save themselves in one of the rafts. Contact with RITHI BHUM had been established via VHF Channel 16. In addition EPIRB⁴ and

³ Global Maritime Distress and Safety System

⁴ Emergency Position Indicating Radio Beacon

SART⁵ had been activated and hand held distress flares and rocket parachute signals had been used to mark the position.

At about 03:30 h a lifeboat from RITHI BHUM had approached the liferaft and taken the crew of EASTERN CHALLENGER on board. At 04:10 h all the crew members had arrived safely on board RITHI BHUM. RITHI BHUM had returned to Hong Kong with the crew of EASTERN CHALLENGER on board. EASTERN CHALLENGER had sunk within 24 hours.

4.2 Narrative - RITHI BHUM

The second nautical officer of the watch had been on loading watch in Hong Kong from 12:00 h to 18:00 h on 13 November 2004. RITHI BHUM had left Hong Kong at 19:00 h and was on the way to Shanghai. The second officer was in charge of a manoeuvre station on deck, had appeared briefly on the bridge after the manoeuvre was finished and had then been free until 24:00 h. He had then taken over the 0-4 h bridge watch at midnight on 14 November. The third officer responsible up to midnight had released the lookout from bridge watch duty due to fatigue. The second officer had then not ordered a lookout onto the bridge either.

A course of 076° had been steered at a speed of 21.5 kn. According to the voyage plan entered on the paper sea chart, a change of course to 063° had been planned at 01:30 h on reaching the waypoint 22°29'N 116°15'E.

The navigational equipment had been in operation. The starboard X-band radar had been switched to the 12 nm range, north up and offset, so that a 20 nm range ahead had been displayed. The subsequent other party in the collision had first been detected well on the port side at a distance of 18 to 20 nm at about 01:00 h.

Shortly before 02:00 h the second officer of the watch had carried out an evasion manoeuvre to starboard in order to keep clear of a further vessel. After ending this manoeuvre RITHI BHUM had proceeded on a course of 057° with automatic pilot at a speed of 21.5 kn. The analysis of the radar display had not given rise to any evasion manoeuvre for the other party in the subsequent collision. RITHI BHUM had overtaken the other vessel clearly on its port side. Afterwards the second officer had carried out a position fix with GPS⁶ shortly after 02:00 h and recorded the current position. For this he had stayed at the chart table. The collision had already occurred on his way back to the radar set. No lights had been seen on the other party in the collision.

On board RITHI BHUM the bulbous bow / fore peak tank and the forecastle had been damaged.

After the collision contact had been made by VHF with the Captain of EASTERN CHALLENGER. Immediately after the collision RITHI BHUM had altered course in order to assist EASTERN CHALLENGER and rescue its crew.

⁵ Search and Rescue Transponder

⁶ Global Positioning System

4.3 Evaluation of the Voyage Data Recorder⁷ RITHI BHUM

According to the data recorded in the VDR, RITHI BHUM proceeded on a course of 076° at a speed of 21.3 kn on 14 November 2004 from the time the second nautical officer took over the watch at midnight to 00:23 h. At this time RITHI BHUM deviated briefly to starboard in order to enlarge the passing distance to a vessel on opposite course. After terminating this manoeuvre at 00:24 h the second officer ordered a new course of 070° on the automatic pilot. At about the same time at 00:24:32 h the other party in the subsequent collision was detected for the first time on the radar at a bearing of 070.7° with a distance of 17.82 nm and acquired as ARPA⁸ target. At 00:28 h ARPA course and speed of the target had been determined for the first time as 063.5° and 10.9 kn. The vessel had a bearing of 070° at a distance of 17.24 nm; RITHI BHUM was steering a course of 070°. At 00:50 h RITHI BHUM changed to 075° with the automatic pilot and at 01:14 the second officer again changed the automatic pilot course to 070°, at 01:20 h to 065°, and at 01:45 h finally to 060°. Throughout the entire period ARPA operated with courses between 060° and 070° and speeds between 10.9 kn and 11.7 kn for the other party in the subsequent collision. The distance decreased continuously; the CPA⁹ varied as a result of RITHI BHUM's own courses. At the time of the course change at 01:45 h from 065° to 060° a new vessel on starboard was acquired as ARPA target in the radar. The old ARPA targets were numbered anew, whereby for a brief time the course and speed data were lost. At 01:46:25 h the ARPA data were available again for the other party in the subsequent collision. This vessel was on a bearing of 059°, approximately right ahead; the other ARPA values were a course of 064.2° at a speed of 11.2 kn and a distance of 3.98 nm. The CPA had been reduced to 0.22 nm. At the same time a course of 265.28° at a speed of 9.2 kn and a CPA of 0.78 nm was calculated for the new target on the starboard side. This target was on a bearing of 075.2° at a distance of 5.97 nm. At 01:57 h this vessel had evidently changed its course to north at a distance of 1.06 nm, the ARPA readings were now a course of 331.5° and a speed of 7.1 kn. The target had a bearing of 086.9° and the CPA was reduced to 0.16 nm. The values for the other vessel in the subsequent collision had only changed slightly at this time. At a bearing of 062.5° now slightly to starboard and a distance of 2.15 nm, ARPA now calculated with a course of 068.9° at a speed of 10.9 kn and a CPA of 0.44 nm. Barely one minute later these values were still almost unchanged. The speed for the new vessel on the starboard side had increased to 10 kn, however, and the distance was 0.72 nm and the CPA had been reduced to 0.04 nm. The second nautical officer of the watch switched to manual steering and initiated an evasion manoeuvre with "Hard to starboard". RITHI BHUM passed the vessel at a distance of about 2 cables. At 02:00 h the second officer had switched back to automatic pilot and RITHI BHUM turned back to port. The other vessel in the subsequent collision was on a bearing of 055.2° at a distance of 1.81 nm. At this time ARPA was calculating with a course of 070.9° with a speed of 11.2 kn. From 02:00 h onwards, beyond the time of the collision up to 03:00 h, only audio data of the bridge microphones and the VHF radio traffic, but no further VDR data had been recorded.

⁷ VDR

⁸ Automatic Radar Plotting Aid

⁹ Closest Point of Approach

At 02:12 h the second officer notified the Captain that something had happened. He did not know exactly what. At about 02:13 h EASTERN CHALLENGER sent out a Mayday call via VHF. After this EASTERN CHALLENGER contacted RITHI BHUM directly and called upon it to stop the engine and provide assistance. The second nautical officer of the watch on RITHI BHUM acknowledged this request.

4.4 Evaluation of the electronic sea chart

The system used on board RITHI BHUM was not approved as an electronic chart display and information system¹⁰. It was an electronic chart system¹¹. The ECS was used as a navigation aid and to supplement the paper sea chart. In addition to chart information and data concerning the own vessel, an electronic sea chart can also display ARPA targets and AIS information of other vessels. The system on board RITHI BHUM was technically equipped for displaying both ARPA and AIS data of other vessels. The corresponding interfaces had not been activated. Only the vessel's own track was shown on the electronic chart. In addition to displaying the current information on the screen these were then also stored internally. The stored data of the ECS only comprised information relating to the vessel itself. It was not possible to store data concerning other vessels, independently of whether or not the corresponding interfaces were activated.

The vessel's own data stored in the electronic chart also documented the evasion manoeuvre of RITHI BHUM shortly before 02:00 h. After this the vessel turned back to port, sailed on an easterly course for approximately 2 minutes, turned further to port at about 02:03 h and from about 02:04 h proceeded on a constant northeast course of 057°. A deviation of about 10° to starboard was recorded at the time of the collision. Further course manoeuvres were documented after the collision. RITHI BHUM returned to the scene of accident turning in a wide circle over port.

4.5 Weather

According to the official weather expertise at the time of the casualty a directionally constant east-northeast wind of moderate strength from 3 Bft to 4 Bft was blowing in the sea area; no striking gusts occurred.

The significant wave height of the sea remained below 2 m.

The horizontal visibility was 10 km, the moon phase was new moon and the lower cloud limit was at an altitude of about 650 m to 700 m.

¹⁰ Electronic Chart Display and Information System (ECDIS)

¹¹ Electronic Chart System (ECS)

5 Investigation

At about 02:12 h on 14 November 2004 the Container Ship RITHI BHUM sailing under German flag collided with the General Cargo Ship EASTERN CHALLENGER sailing under South Korean flag. Both vessels were heavily damaged.

The entire starboard stern on EASTERN CHALLENGER was destroyed. The main engine and generators failed as a result of heavy flooding in the engine room and the vessel was down by its stern post. The two lifeboats could no longer be used. About 20 minutes after the collision the crew abandoned the vessel and entered one of the two liferafts that were launched.



Figure 4: EASTERN CHALLENGER the morning after the collision
(Photo: Daebo Shipping Co., Ltd., Seoul)

On RITHI BHUM the forecastle area was damaged. The bulbous bow had been bent about 120° to starboard, the fore peak tank was ripped open. In addition a hole with a diameter of about 80 cm and many cracks and dents had been sustained in the above-water area forward of the collision bulkhead. The ballast water tanks in the fore ship and on the starboard side were sounded and the fore peak deballasted. The water ingress was under control at about 03:30 h¹². Owing to the damage RITHI BHUM could only proceed at dead slow ahead and return to assist EASTERN CHALLENGER. At about 03:00 h a lifeboat was launched from RITHI BHUM and 20 minutes later all 17 crew members of EASTERN CHALLENGER were on board this lifeboat. At 03:35 h the lifeboat and raft were alongside RITHI BHUM. The Captain

¹² The statement of facts of the Master reads as follows: „02:45 h C/O started with deballasting fore peak; 03:29 h C/O informed that we don't take more water at the forecastle“

manoeuvred RITHI BHUM in order to provide cover on the lee side¹³. At 04:00 h the crew of EASTERN CHALLENGER was on board RITHI BHUM and at 04:15 h the lifeboat had been recovered and secured.



Figure 5: RITHI BHUM after the collision
(Photos: Jacky Rickmers Schiffahrtsgesellschaft mbH & Cie.KG)



Figure 6: RITHI BHUM in the repair dock
(Photo: Federal Bureau of Maritime Casualty Investigation)

¹³ To bring the ship into a position so that the lifeboat is on the off-wind side to facilitate transfer of the crew

As instructed by MRCC¹⁴ Hong Kong RITHI BHUM left the scene of the collision at about 06:30 h and returned to Hong Kong where it arrived at the roads in the morning of 16 November. The container cargo was discharged there; nothing is known about any damage to the cargo as a result of the collision. Following a first survey in the dock in Hong Kong from 20 to 24 November 2004, RITHI BHUM proceeded to the repair yard in Shekou on 6 December 2004. The repair work was completed there on 7 January 2005.

On leaving the collision position on 14 November 2004 RITHI BHUM passed the still floating EASTERN CHALLENGER shortly before 07:00 h. This vessel sank later with its entire cargo about nine nautical miles northnorthwest of the scene of the casualty¹⁵. Nothing is known about any environmental damage sustained as a result. There were no personal injuries on either EASTERN CHALLENGER or RITHI BHUM.

¹⁴ Maritime Rescue Co-ordination Centre

¹⁵ see also remark on page 5 of this report

6 Analysis

6.1 Voyage Data Recorder

In accordance with Chapter V Rule 20 of SOLAS¹⁶, RITHI BHUM was equipped with a voyage data recorder. The vessel command was not given any type-specific familiarisation and instruction concerning the emergency back-up for storing data relevant to an accident period. It was only after making a telephone enquiry that the Captain was able to learn that the emergency back-up key was not integrated in the bridge console, but instead was mounted directly on the unit.



Figure 7: Emergency-Back-Up-Button on the VDR
(Photo: Federal Bureau of Maritime Casualty Investigation)

The data were saved at 10:50 h on 14 November 2004. The data concerning the time of the accident at 02:12 h were within the 12-hour period that should have been stored in this data saving operation¹⁷. The internal re-start, which is initiated routinely every seven days, began at 08:30 h. As a result of the routine re-start there was faulty overwriting inside the voyage data recorder. Vessel data up to 02:00 h and then again from 03:00 h are available. However, only the audio data of the bridge

¹⁶ International Convention for the Safety of Life at Sea

¹⁷ IMO Res. A.861(20) Art. 5.3.3

microphones and the VHF radio traffic have been recorded for the hour between 02:00 h and 03:00 h; all the other ship's data were overwritten.

The microphones for recording the audio data must be installed on the bridge in such a way that appropriate voice recordings at the work stations on the bridge are saved¹⁸. The audio recordings on the VDR of RITHI BHUM were substantially blasted and some of them could only be understood fragmentarily.

A warning notice for informing the vessel command of the technical inadequacy of the voyage data recorder was not mandatory in the above mentioned cases.

The radar equipment was serviced on 7 August 2004. After this no radar images that should have been recorded at least every 15 seconds as video data¹⁹ were stored in the voyage data recorder any more. The values of the targets acquired on the ARPA radar were still transmitted to the VDR as data protocols.

The data of the voyage data recorder that have to be recorded are to be checked for integrity. A warning notice is mandatory in the event of discovery of an error that could not be eliminated. However, the integrity check of the data only requires a comparison of whether the stored data were identical with the received data²⁰, but not whether individual data sets are missing completely. Inside the unit the lack of radar images was logged continuously. The corresponding error log was not accessible to the vessel command, however.

The storage of AIS information in the voyage data recorder is not specified either.

The collision between RITHI BHUM and EASTERN CHALLENGER is not in any way causally connected with the technical problems that occurred.

6.2 Collision avoidance

According to the official weather expertise the horizontal visibility in the night of the accident was 10 km and there was a new moon. The two vessels involved confirmed that visibility was good at the time of the collision. The second officer of EASTERN CHALLENGER had seen the navigation lights of the approaching RITHI BHUM, but the second officer of RITHI BHUM had not made out the sternlight of EASTERN CHALLENGER sailing ahead. The two vessels were considered to have each other in sight for the relevant sections of the collision avoidance regulations (COLREGs)²¹ applying.

According to rule 5 of the COLREGs every vessel shall maintain a proper lookout at all times in order to make a full appraisal of the risk of collision. According to section A-VIII/2, part 3-1, para. 15 of the STCW-Code²² the officer in charge of the navigational watch may be the sole lookout in daylight under certain circumstances.

According to rule 7 of the COLREGs every vessel shall use all available means to determine if risk of collision exists. Such risk shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change. According to rule 8

¹⁸ IMO Res. A.861(20) Art. 5.4.5

¹⁹ IMO Res. A.861(20) Art. 5.4.7 i.V.m. EN 61996:2000 Art. 5.8.1.1

²⁰ IMO Res. A.861(20) Art. 5.2.3 i.V.m. EN 61996:2000 Art. 4.4.3

²¹ Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs)

²² Seafarers' Training, Certification and Watchkeeping Code

of the COLREGs manoeuvres to avoid collisions shall be positive, made in ample time and shall be such as to result in passing at a safe distance.

According to rule 13 of the COLREGs a vessel shall be deemed to be overtaking when coming up in such a position that at night she would be able to see only the sternlight of the vessel she is overtaking but neither of the sidelights. The overtaking vessel shall keep out of the way of the vessel being overtaken. According to rule 16 of the COLREGs every vessel which is directed to keep out of the way of another vessel shall take early and substantial action to keep well clear. According to rule 17 of the COLREGs the vessel that is overtaken is considered to be a stand-on vessel and basically shall keep her course and speed. The stand-on vessel may, however, take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action. The stand-on vessel must take action when she finds herself so close that collision cannot be avoided by the action of the give-way vessel alone.

6.2.1 RITHI BHUM

The Safety Management Manual of the vessel's operator according to 3.1 ISM Code refers expressly to the international regulations regarding the presence of a lookout on the bridge. In addition the Captain of RITHI BHUM ordered continuous assignment of a lookout on the bridge during night watches in his "Standing Orders". At the time of the collision the second officer of the watch was alone on the bridge. The lookout had already been sent to his bunk due to tiredness during the previous watch and the second officer did not order any lookout onto the bridge when he started his watch. The personnel prerequisites under STCW were not fulfilled.

More than one-a-half hours before the collision the other vessel in the subsequent collision was picked up by the radar and plotted too. Prior to the evasion manoeuvre to starboard shortly before 02:00 h the second officer had conducted a further evasion manoeuvre to starboard and five course corrections in his watch since midnight.



Figure 8: Changes of course of RITHI BHUM between midnight and 02:00 h on 14.11.2004 (Print from VDR RITHI BHUM, times UTC)

The last three course corrections between 01:00 h and 02:00 h were each made 5° to port. As a result the other party in the subsequent collision always remained approximately right ahead. After the last course correction at 01:45 h from 065° to 060° EASTERN CHALLENGER was again on a bearing right ahead and up to the start of the evasion manoeuvre shortly before 02:00 h had a slight bearing movement to starboard. This was only about 0.36° per minute, and at the same time the distance was reduced to about 2.3 nm.

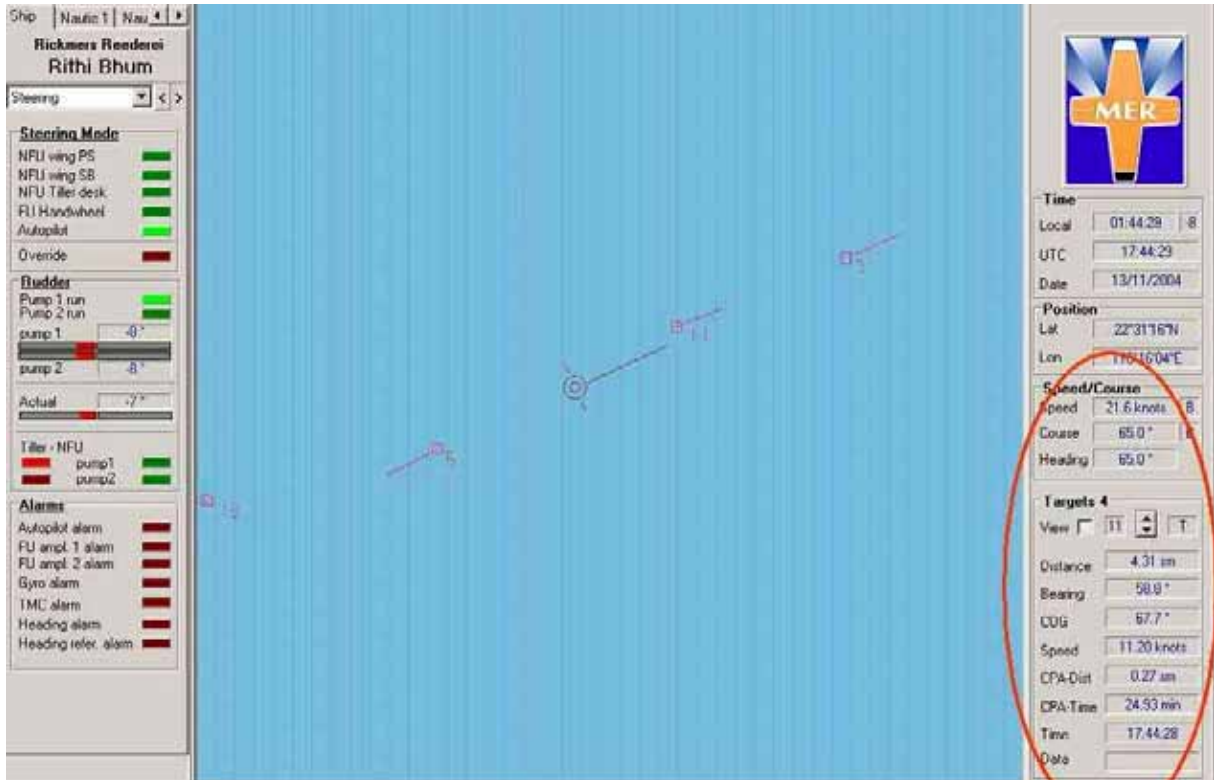


Figure 9: VDR data for EASTERN CHALLENGER on change of course at 01:45 h (print out from VDR RITHI BHUM)

Following the change of course at 01:45 h the second officer of the watch on RITHI BHUM could no longer assume that he would overtake EASTERN CHALLENGER on the port side of his vessel. With a vessel right ahead with a slight change of the compass bearing to starboard, he should instead have assumed at this time that he would pass at close quarters on starboard. At about the same time as the change of course at 01:45 h a further vessel had been recorded and tracked on the starboard side as an ARPA target. In the following minutes this vessel quickly became a close-quarters opponent on a crossing course from starboard due to changes in its course and speed. The second nautical officer of the watch on RITHI BHUM switched over to manual steering shortly before 02:00 h and initiated a hard to starboard evasion manoeuvre. The vessel was passed at a distance of about two cables. After this the second officer switched back to the automatic pilot mode and RITHI BHUM turned back to port. The last course ordered had been 057°.

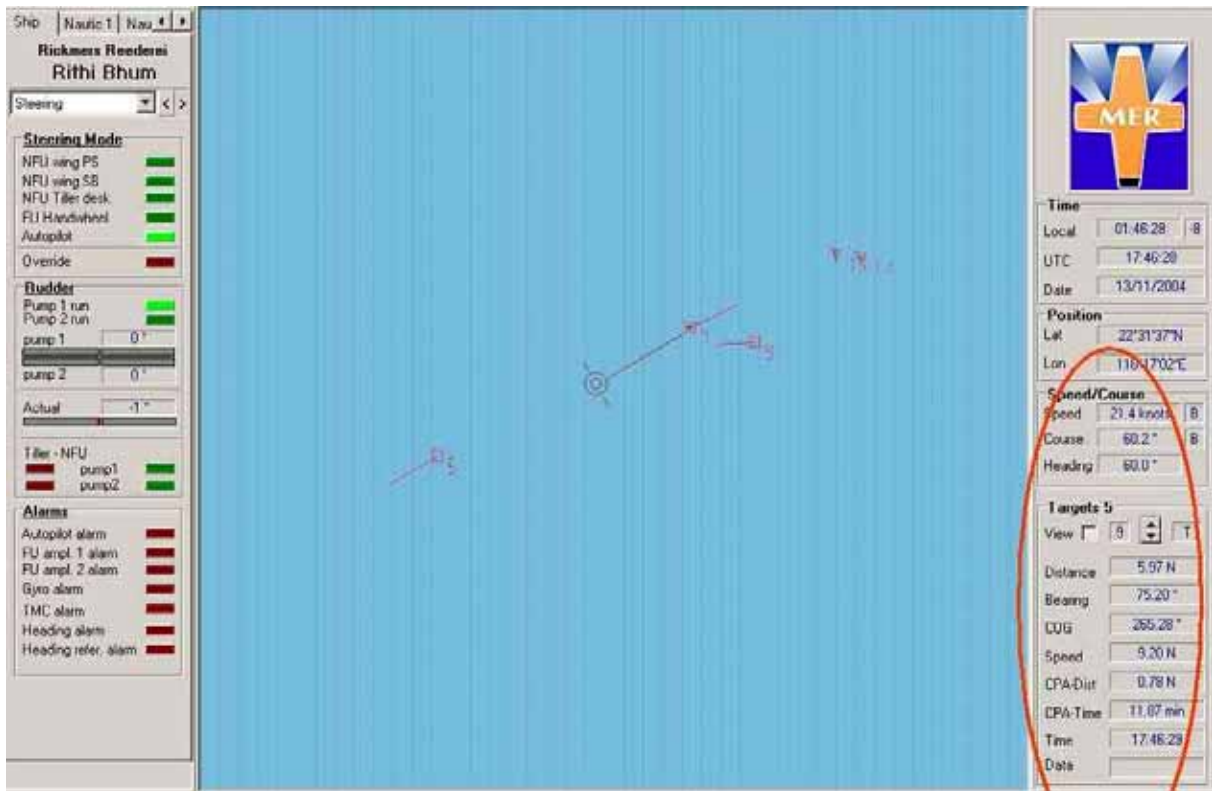


Figure 10: VDR data for the new ARPA target recorded at 01:46 h (print out of VDR RITHI BHUM)

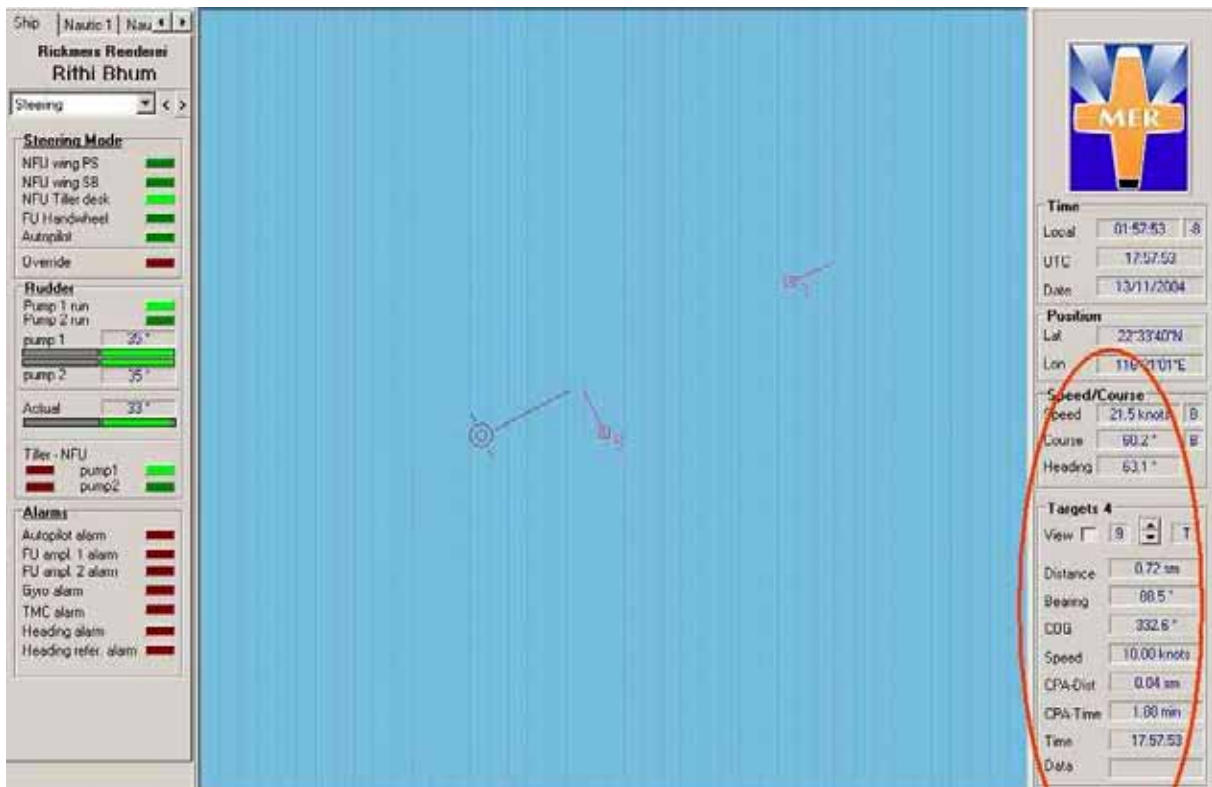


Figure 11: VDR data for the new ARPA target on initiation of the evasion manoeuvre at 01:58 h (print out from VDR RITHI BHUM)

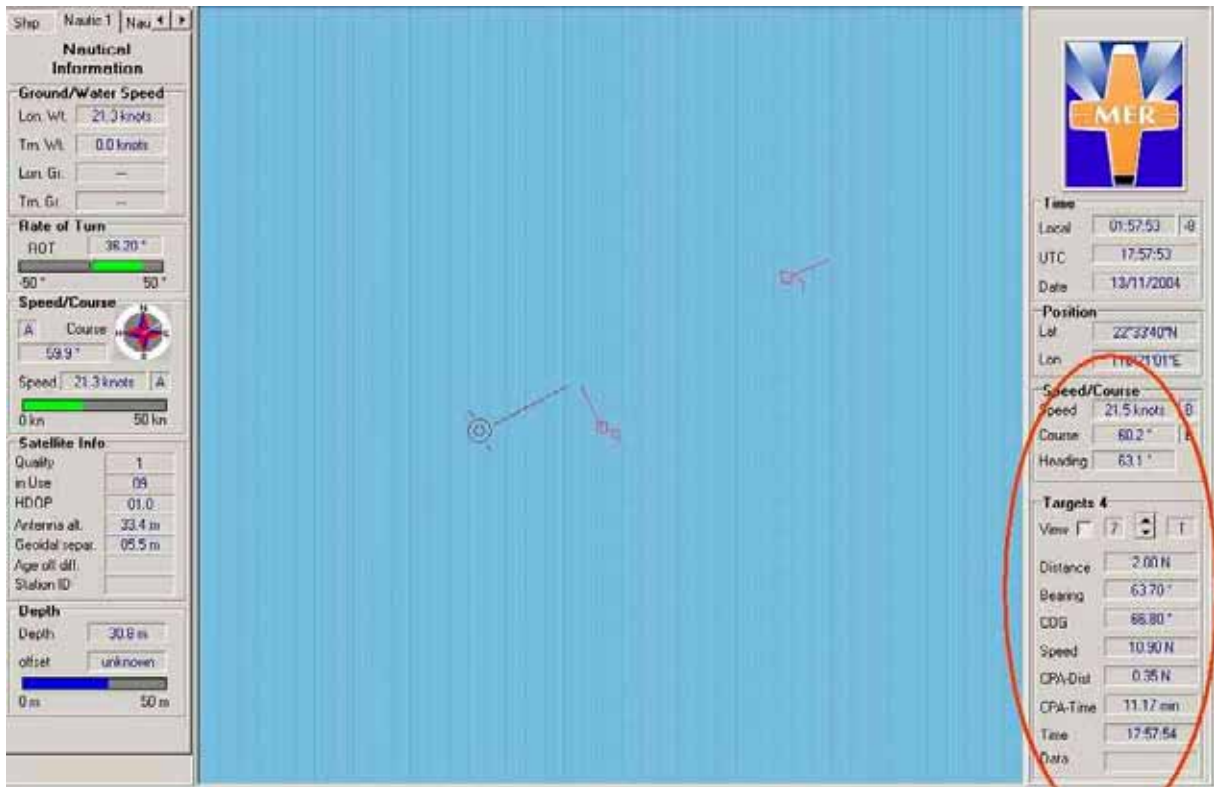


Figure 12: VDR data for EASTERN CHALLENGER on initiation of the evasion manoeuvre at 01:58 h (print out from VDR RITHI BHUM)

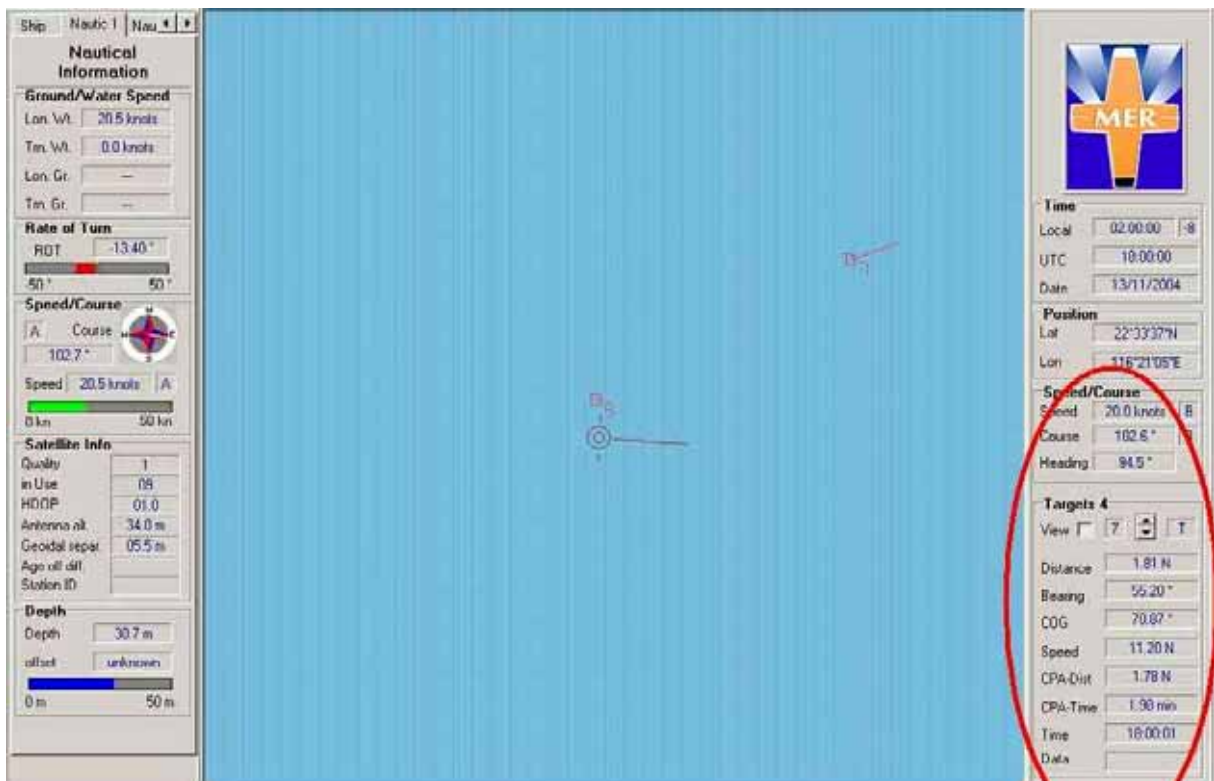


Figure 13: VDR data for EASTERN CHALLENGER on termination of the evasion manoeuvre at 02:00 h (print out from VDR RITHI BHUM)

The situation with regard to EASTERN CHALLENGER changed again with the evasion manoeuvre to starboard for the new vessel detected in the radar shortly before 02:00 h. The other vessel in the subsequent collision was again on a port bearing at a distance of now only 2 nm. On subsequently turning back to port to then 057° the distance had become even further reduced and EASTERN CHALLENGER was now on a bearing approximately right ahead. The second officer on RITHI BHUM should now have assumed the possibility of the risk of a collision. Up to the collision she continued on a constant course, no last minute manoeuvre was initiated.

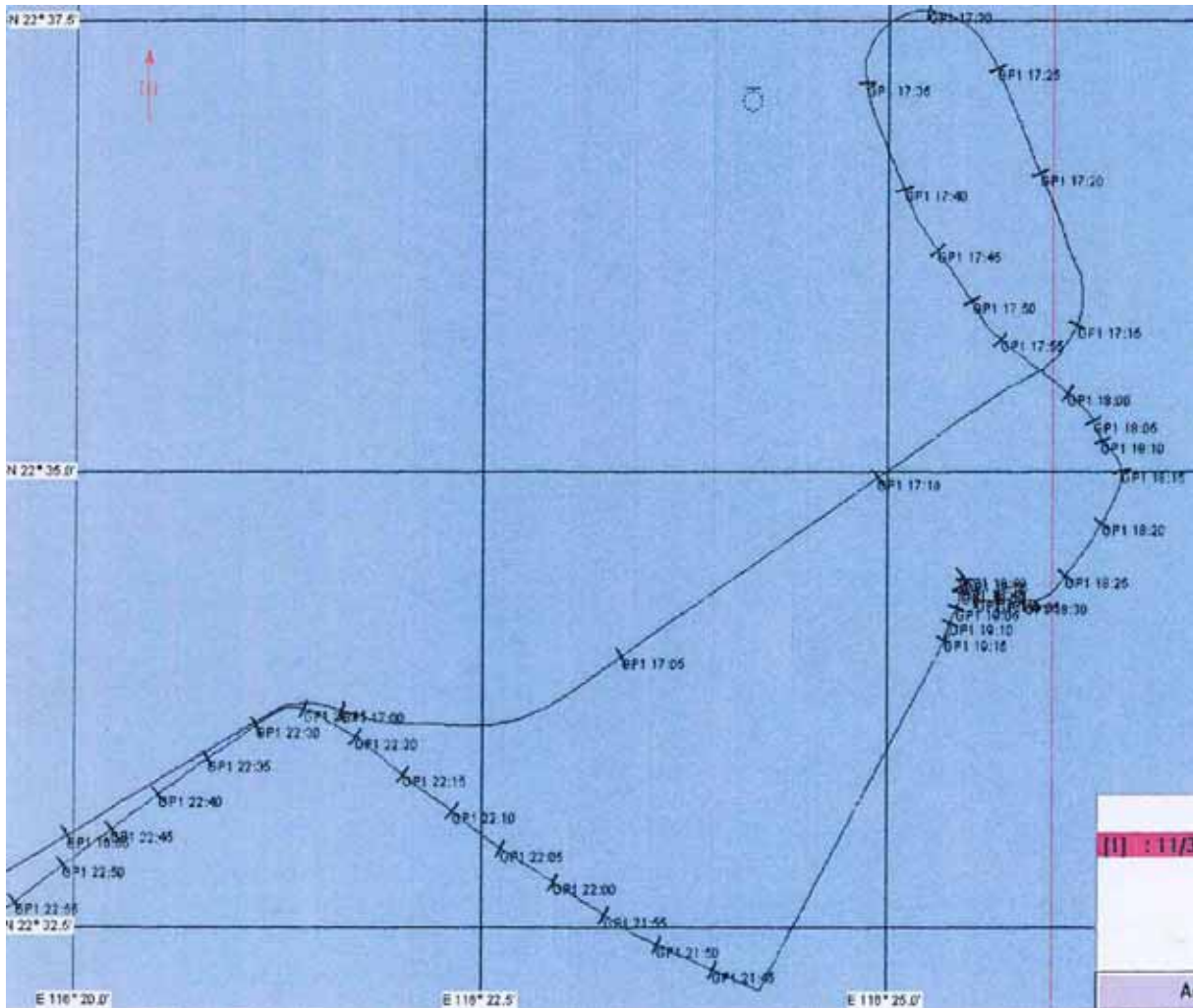


Figure 14: Course of RITHI BHUM
(ECS recording, all times UTC – 1h)

After ending the evasion manoeuvre the second officer then fixed and recorded the current position with GPS and for this had stayed at the chart table. The chart table on RITHI BHUM was in the aft area of the bridge on the starboard side. The 02:00 h position was entered on the paper chart, the longitude and latitude of the position were entered in the ship's log. In addition course and weather data for 02:00 h were noted in the log. About 10 minutes after reaching the ordered course upon completion of the preceding evasion manoeuvre RITHI BHUM collided with EASTERN CHALLENGER.

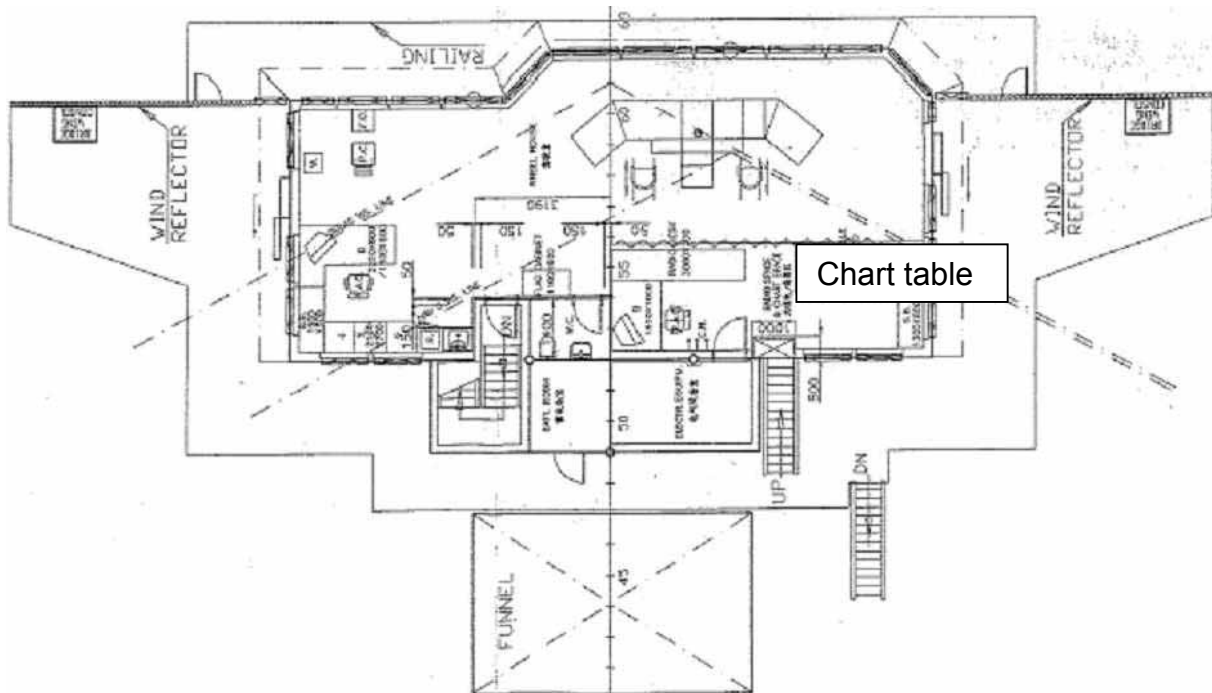


Figure 15: Bridge Arrangement Plan RITHI BHUM

6.2.2 EASTERN CHALLENGER

At the time of the collision a deck cadet was on the bridge of EASTERN CHALLENGER as lookout along with the second nautical officer. The manning conditions in accordance with STCW were satisfied.

With a vessel approaching from approximately right astern, of which the masthead lights and both sidelights can be seen and whose excess speed is greater than 10 kn at a distance of 3.5 nm, the second officer of EASTERN CHALLENGER had to assume the possibility of the risk of a collision, but at least of a close-quarters situation in less than 20 minutes. The bridge crew had assumed that it would be overtaken on the starboard side. At a distance of 1 nm still no manoeuvre of the approaching vessel was evident. The evasion manoeuvre of RITHI BHUM shortly before 02:00 h and subsequent turning back required about 6 minutes and were apparently not observed as such on the bridge of EASTERN CHALLENGER. The recognition of only the starboard sidelight by comparison with the fact that initially both sidelights had been seen suggested an evasion manoeuvre to port of the overtaking vessel.

6.2.3 Summarising analysis

Prior to the collision there was neither a manoeuvre to avoid the collision by the give-way vessel RITHI BHUM for EASTERN CHALLENGER, nor an attempt by the stand-on EASTERN CHALLENGER to avoid the collision by a "last minute manoeuvre". VHF contact between the two vessels involved was only established directly after the collision.

The second nautical officer of the watch of RITHI BHUM assumed up to the time of the collision that he would overtake EASTERN CHALLENGER on the port side of RITHI BHUM. After terminating his evasion manoeuvre at 02:00 h the overtaking situation concerning the other vessel in the subsequent collision was not reviewed. The second officer assumed that his previous estimation of the situation was correct. Only inadequate use was made of all available means to determine the possibility of the risk of a collision and this was thus the cause of the collision.

The close-quarters situation developing on starboard up to 02:00 h called for the complete concentration of the officer of the watch and distracted him from the other vessel in the subsequent collision. In so far the conduct of this vessel promoted the subsequent collision.

Owing to the lack of the dedicated lookout on the bridge, the second officer could not secure ongoing observation of the other vessel in the subsequent collision during the evasion manoeuvre and thereafter. In so far the undermanning on the bridge was a joint cause of the collision.

The second officer had to leave both the radar and the range ahead unobserved briefly to plot the position and record weather data at the chart table. Moreover a light source switched on during the prevailing new moon phase necessarily impaired visibility ahead. The speed surplus of 10 kn meant that the distance to EASTERN CHALLENGER was reduced by one nautical mile in six minutes. The time spent by the second officer of RITHI BHUM behind the chart table to plot the position and record weather data represented a further distraction and contributed to the misestimation of the close approach situation between RITHI BHUM and EASTERN CHALLENGER.

Every vessel must maintain a proper lookout and use all available means to make a full appraisal of the risk of collision. The performed observation of the approaching RITHI BHUM on the bridge of EASTERN CHALLENGER and a resulting failure to initiate any "last moment manoeuvre" of its own, supported as appropriate by the attempt to attract the attention of RITHI BHUM by VHF call, light or sound signals, also contributed to the collision between the two vessels.

6.3 Automatic Identification System (AIS)

According to Chapter V Rule 19 Section 2.4 of SOLAS both EASTERN CHALLENGER and RITHI BHUM were equipped with an automatic identification system. The display of AIS information can be transferred to the screens of radar and electronic charts or be displayed on a separate AIS monitor. AIS data can supply helpful additional information to provide a picture of the situation.

The nature of the display of AIS data on the bridge of EASTERN CHALLENGER is not known. The second nautical officer used the system in order to obtain the name, course and speed of RITHI BHUM as information supplementing the radar evaluation.

On the bridge of RITHI BHUM the AIS information was displayed on the separate AIS display. The manufacturer had not provided any interface for transfer to the radar sets. The manufacturer had installed an interface to the electronic chart, but it had not been activated. The second nautical officer did not use this information system.

The radar information was sufficient even without supplementary AIS information. VHF contact between the vessels was only established after the collision. The way in which the AIS was used is not considered to be causal or contributory to the accident.

6.4 Fatigue

The second officer had been on board RITHI BHUM since 27 July 2004; the vessel was operating in the Asia Feeder Service. The last ports of call prior to the collision had been Shanghai on 1 and 2 November, Ningbo on 2 and 3 November, Hong Kong on 4 and 5 November, Singapore on 8 and 9 November, and Hong Kong again on 12 and 13 November 2004. In port operations a 6-6 watch was set-up: the second officer had his cargo watch from 00:00 h to 06:00 h and from 12:00 h to 18:00 h. In sea operation the watch system was changed to a 4-8 system: the second officer was on watch from 00:00 h to 04:00 h and from 12:00 h to 16:00 h. On 13 November 2004 RITHI BHUM left Hong Kong at 19:00 h. The second officer had been on cargo watch from midnight to 06:00 h and from noon to 18:00 h, and was in charge of a manoeuvre station on deck up to 19:00 h. He then appeared briefly on the bridge and after this was free until midnight. He took over the bridge watch at 00:00 h on 14 November. With 13 working hours, the maximum admissible 14 hours²³ were not exceeded, and with 11 hours of rest time the 10 hours minimum rest time²⁴ were not undercut.

Fatigue²⁵ leads to impairment of human performance capability, to slowing down of physical and mental reflexes and/or judgement capability. Furthermore practically all human functions vary systematically in the course of the day and the night. On the basis of this "circadian" rhythm ("inner clock") there is an absolute low point for the human organism at about 03:00 h in the morning. As a result of the many ports of call and short sea passages of RITHI BHUM there was a constant change in watch routines. Independently of port or sea operations the second officer had been on watch regularly in the hours after midnight for three-and-a-half months.

This was not a case of fatigue due to excessive working times or non-observation of minimum rest periods. Yet, with regard to the time of the collision, the working day before the accident, and the frequent change between port routine and sea operation, an impairment of the human performance capability of the second nautical

²³ International Labour Organization (ILO), Convention on working times of sea men and crew strength of ships, Article 5

²⁴ STCW Code, Section A-VIII/1

²⁵ IMO Resolution A.772(18) Section 2.1

officer of the watch could not entirely be ruled out as a contributing factor to the accident.

There are no records concerning working and rest times for the second officer of EASTERN CHALLENGER. Here too impairment of human performance capability due to the time of day is assumed to be co-responsible.



Figure 16: Circadian rhythm of humans

7 Recommendations

7.1 Voyage Data Recorder

7.1.1 Reliability

The Federal Bureau of Maritime Casualty Investigation recommends the manufacturer of the voyage data recorder to evaluate the technical inadequacies of the device that occurred in close co-operation with the Federal Maritime and Hydrographic Agency responsible for type approvals for vessels sailing under German flag and to secure the complete functionality of the system and the required quality of the data to be recorded in accordance with the performance standard of the IMO and the European standard. Furthermore the possibility of a suitable notification to the vessel's command of inadequacies within the device should be reviewed, and if appropriate implemented into practice. This applies especially with regard to the lack of sensor data mandatory for recording.

(Remark: In the statements to the draft of this report the manufacturer of the voyage data recorder and of the responsible operator of the vessel according to 3.1 ISM Code informed about steps already taken for implementation of this recommendation. Regarding the suitable notification about inadequacies within the device the manufacturer explained it would be workable from a technical point of view. It would require a modification of the system, however, to implement „alarm suppression functions“ necessary to not initiate an alarm, e.g. in case a radar is switched off intentionally)

Die Federal Bureau of Maritime Casualty Investigation recommends to the Federal Maritime and Hydrographic Agency as responsible body that the reproduction quality of the audio data to be recorded in sea operation should be checked more intensively as regards blasting and interference when the system is examined prior to use on board.

(Remark: In the statement to the draft of this report the Federal Maritime and Hydrographic Agency already notified about the implementation of this recommendation. The technical difficulties of the implementation were pointed out, however, as the performance standard of IMO accepts the recording of all bridge microphones on only one audio track.)

The Federal Bureau of Maritime Casualty Investigation requests the Federal Ministry for Transport, Building and Housing to suggest in the relevant IMO bodies to modify the VDR performance standard to require a separate audio track for every microphone.

7.1.2 AIS Information

The Federal Bureau of Maritime Casualty Investigation requests the Federal Ministry for Transport, Building and Housing to suggest in the relevant IMO bodies that additional recording of AIS information be mandatory in the voyage data recorder.

7.2 Lookout

The Federal Bureau of Maritime Casualty Investigation recommends that the vessel operator according to 3.1 ISM Code of RITHI BHUM should effectively implement the observation of the international regulations regarding the assignment of a lookout on the bridge as is already described in its safety management system manual and should check that this is observed.

7.3 Manoeuvres for avoiding collisions

The Federal Bureau of Maritime Casualty Investigation recommends that the vessel operators/responsible operators in accordance with 3.1 ISM Code of the two vessels involved, remind the captains and the nautical officers of the watch of the provisions of the Collision Avoidance Regulations to determine if risk of collision exists and to take action to avoid collision, both as give-way and as stand-on vessel as appropriate, and sustainable work towards compliance of those provisions.

7.4 Training

The Federal Bureau of Maritime Casualty Investigation recommends that the responsible operator in accordance with 3.1. ISM Code of RITHI BHUM should provide type-specific instruction and familiarisation with voyage data recorders, electronic charts and automatic identification systems for the bridge crews of its vessels.

In particular special attention should be paid to the possibility of using the interfaces between AIS, radar and electronic chart in order to be able to display the information in a more user-friendly way in future.

8 Sources

- Written statements by the vessel commands of EASTERN CHALLENGER and RITHI BHUM
- Written statements of the vessel operators/responsible operators in accordance with 3.1 ISM Code of the vessels involved
- Questioning of the crewmembers of RITHI BHUM on site
- Transcript of interviews of the crew members of EASTERN CHALLENGER by Marine Department Hong Kong
- Copies of deck log book of EASTERN CHALLENGER
- Investigations of the Korean Maritime Safety Tribunal (KMST)
- Investigations of the Incheon Regional Maritime Safety Tribunal, Korea
- Recording of the voyage data recorder system RITHI BHUM
- Recordings of the electronic chart RITHI BHUM
- Official weather expertise by the German Meteorological Service (DWD)