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Interim report on the investigation into the wreck of the motor tanker Waldhof on the Central Rhine 13 January 2011

– Summary –

Introduction

The interim report and this summary represent the investigation commission's current knowledge of how the accident involving the motor tanker Waldhof, taking place on the Central Rhine on 13 January 2011, occurred and of the reasons for the incident. The report is based on the documents, expert statements and opinions currently available to the accident investigation commission as well as on the enquiries, reviews, evaluations and calculations carried out by the Commission itself. It cannot be ruled out that in the course of pending investigations additional facts and insights might emerge that will lead to a revision of the commission's judgement or to a more differentiated evaluation. It will therefore be necessary to wait for the final report at the end of the investigation, which will be made public once all procedures in the investigation of the accident have been completed.

Investigation – basis and structure

Basis of the investigation

In an ordinance issued on 31 January 2011, the Federal Ministry of Transport, Building and Urban Development commissioned the Waterways and Shipping Directorate Southwest (*Wasser- und Schifffahrtsdirektion Südwest*), the navigation police authority with competence in the matter, with the task of investigating the causes of the wreck of the motor tanker Waldhof on 13 January 2011, to be carried out within the framework of independent administrative proceedings not subject to any instructions from outside. Unlike for maritime navigation, German law includes no special legal basis for an official investigation into inland shipping accidents, and consequently this investigation follows analogously the regulations set forth in the Maritime Safety Investigation Law (*Seesicherheits-Untersuchungs-Gesetz*). Specifically this means that the investigation is exclusively for the purposes listed below:

1) To determine the circumstances of the accident, the direct and indirect causes leading to the accident as well as the factors facilitating the occurrence of the damage – including any weak points in the safety system.

2) To prepare an investigation report and, if appropriate, safety recommendations, with the intent of avoiding any circumstances in future that might lead to risk or damage.

3) In the interests of enhanced safety conditions, to reinforce cooperation and partnership in the cause of safety among the authorities responsible for safety on the Rhine.

Not among the purposes of the investigation are, in contrast, to discover facts for the purpose of attributing failure or to determine guilt, liability or any claims. Nor is the investigation for the purpose of investigating or evaluating the consequences of the wreck (how the wreck was handled, closure of the Rhine, economic consequences etc.).

Structure of the investigation

Due to the complexity of the accident and the far-reaching consequences of the wreck, an interdisciplinary expert group has constituted itself to clarify the cause of the accident, representing and concentrating a broad range of specialised fields within the commission.

The commission investigating the wreck of the motor tanker Waldhof is composed of experts from the institutions and specialty fields listed below:

- Waterways and Shipping Directorate Southwest – Mainz
  (nautical science, navigation police, law)
- Trade Association for Transport and the Transport Sector (*Berufsgenossenschaft für Verkehr und Transportwirtschaft*;
  ADN, ship building and marine engineering)
- Federal Waterways Engineering and Research Institute (*Bundesanstalt für Wasserbau,* BAW*)* – Karlsruhe
  (navigation simulation, river systems)
- Federal Waterways Engineering and Research Institute – Hamburg
  (ship building and ship-building theory)
- German Federal Waterways and Shipping Administration, Traffic Technologies Centre (*Fachstelle der WSV für Verkehrstechniken*) – Koblenz
  (radio and traffic safety technology, radar)
- Federal Institute for Materials Research and Testing (*Bundesanstalt für Materialforschung und –prüfung*) – Berlin
  (dangerous goods and substances, chemistry, dangerous goods tanks and accident mechanics)

Summary of current investigation results

Occurrence of the wreck

On 12 January 2011 at about 9:30 pm the TMS Waldhof left the port of Ludwigshafen on the Rhine carrying a load of 2,378 tonnes of sulphuric acid 96% and began the passage downstream towards Antwerp, the port of discharge.

The vessel reported to the regional traffic centre at Oberwesel on entering the “Wahrschaustrecke”, the radar-monitored section of the Rhine between Oberwesel and St. Goar, on 13 January 2011 at approx. 4:32 am. After passing an oncoming pushed convoy and then a motor tanker travelling upstream, at 4:41 am the TMS Waldhof passed an inland container ship heading upstream at the point on the Rhine referred to as “Betteck”, at the 553.4 km mark. At 4:42 am, shortly after passing “Betteck”, at the 553.75 km mark the TMS Waldhof capsized over the starboard side and disappeared from the radar screens of the Oberwesel regional traffic centre. The vessel continued adrift downstream, bottom up and unable to manoeuvre.

The overturned craft drifted (with the bow pointing downstream) past a pushed convoy travelling upstream and then, most likely at 4:46 am at the 554.6 km mark of the Rhine, collided with a motor tanker also travelling upstream. Then, at 4:48 am at the 554.85 km mark, the bow of the vessel was forced by the current into the left bank of the Rhine and became lodged there.

The TMS Waldhof afterwards broke free from the left bank of the river and continued adrift bottom up downstream, transverse to the current and lying in the navigation channel, at 4:49 am subsequently passing another motor tanker travelling upstream. The capsized TMS Waldhof passed at 4:50 am an oncoming pushed convoy moving upstream. Then, at 4:51 am at the 555.3 km mark, the vessel ran aground with first the stern becoming lodged, so that it uprighted with the force of the current. The ship was subsequently forced by the

current to the right edge of the navigation channel, where it finally came to rest at 4:52 am with the bow pointing downstream and lying on the port side.

Consequences of the wreck

Due to the TMS Waldhof capsizing, one boatman lost his life and another continues to be missed. Two crew members who were injured during the incident were able to be saved.

By the time salvaging operations were completed, the Rhine had been partially or fully closed to vessel traffic for a 32-day period; in particular upstream from the scene of the accident, as many as 450 vessels were unable to continue travelling downstream for longer periods.

As a direct consequence of the TMS Waldhof capsizing and lying on its side for an extended period, approx. 900 tonnes of sulphuric acid leaked into the Rhine. An additional 800 tonnes of sulphuric acid were drained into the river under controlled conditions as part of the salvaging operation.

Preliminary evaluation of the events on the day of the accident

The investigations carried on up to now by the present accident investigation commission have resulted in the preliminary findings and evaluation of the events on the day of the accident as listed below:

- How the wreck occurred has been clarified: i.e. where it occurred, how the TMS Waldhof capsized and the events leading up to the vessel running aground opposite the port at the Loreley.

- The TMS Waldhof was built and equipped to comply with the specific regulations of navigation law and laws regulating dangerous goods transports which were in effect at the time of the accident (or at the time when the motor tanker was built or retrofitted).

- The level of skill and the number of crew members on board complied with the provisions of the Rhine Vessel Inspection Regulation (refer to Annex XI on the inspection regulation for inland shipping).

- The passage of the TMS Waldhof downstream on 13 January 2011, at an elevated water level above high water mark I and at correspondingly high current speeds as well as in the presence of a particularly high amount of river traffic, was in accordance with the general and specific navigation authority traffic regulations defined in the Rhine Police Regulation.

- The TMS Waldhof was permitted to transport sulphuric acid 96%, based on the ADNR certificate issued for the vessel in conjunction with the substance list issued by the classification society (sub-section 7.2.2.8.3 ADNR 2009).

- According to the stability documents, which were examined and approved by the classification society, stability after damage is documented for the TMS Waldhof only for loading conditions involving a cargo density (rho) of 1.62 t/m^3 at a maximum draught of 3.11 m.

- When the wreck occurred, the TMS Waldhof did not comply with the stability criteria specified in ADN 2011 or ADNR 2003 and did not meet the specifications contained in the general stability regulation set forth in Article 1.07 (3) of the Rhine Police Regulation.

- Improper load distribution (i.e. partial filling of all seven tanks) should be viewed as the cause of the TMS Waldhof's poor stability conditions; this manner of load distribution resulted in overly large free surfaces, reducing stability.

- Probably there was also ballast water in ballast tank 5 due to two holes in the port bilge, which consequently aggravated the already critical stability conditions.

- Mathematically, the capsizing of the TMS Waldhof cannot be accounted for strictly on the basis of the poor stability conditions existing on the day of the accident, even though the dynamic effects produced by movement of the liquid in the tanks have been taken into account. Heeling moments are produced by the vessel turning and by the shear force at the rudder, and these forces influence cargo movement (i.e. dynamic surging effect); due to the complexity of these forces, investigation into them has not yet been completed.

Additional investigations and procedures

For the further course of proceedings, the investigation commission plans the following:

- More closely examine the questions raised by the two holes in the port bilge (ballast tank 5) and the hoses in the ballast tank venting pipes, with the aim of clarifying whether there was water in ballast tank 5 during downstream travel on 12 and 13 January 2011 and, if so, what effects such ballast water had on the stability of the motor tanker.

- Conduct additional investigations into the ship dynamics using the nautical simulator for inland vessels at the BAW in Karlsruhe, in order to:

  - evaluate with respect to safety and ease the situation in which the TMS Waldhof encountered the GMS Acropolis;

  - determine the operating condition of the main engine when the ship began to capsize as well as the manoeuvres likely to have been initiated immediately before the shipwreck and the resulting dynamic contributions to heeling moments (i.e. force on the rudder, turning manoeuvre) while taking into account the discharge conditions at the time of the wreck;

  - re-enact the situation after capsizing until the TMS Waldhof ran aground.

- Commission an independent expert with analysing, additionally using complex mathematical techniques, the behaviour of the cargo, i.e. the dynamic surging effect of the liquid cargo in the partially filled tanks, which also occurs in response to navigating a curved path.

- Verify whether, in determining the dynamic vessel data for the TMS Waldhof, it is necessary or possible to conduct real-life roll trials for validating the inertia radius.

- Include statements and opinions by third parties in further assessments and evaluations.

In addition, the results of the police and public prosecutor's investigations, which are currently not yet available to the commission, are to be incorporated in the commission's investigations.

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