



**Bundesstelle für Seeunfalluntersuchung**  
**Federal Bureau of Maritime Casualty Investigation**  
Federal Higher Authority subordinated to the Ministry of Transport,  
Building and Urban Development

Investigation Report 015/09

**Very serious marine casualty**

**Capsize of the SY TAUBE with six fatalities  
off the Atlantic coast of Morocco  
on 20 January 2009**

15 February 2010

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 16 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.

The present report should not be used in court proceedings or proceedings of the Maritime Board. Reference is made to art. 19 para. 4 SUG.

The German text shall prevail in the interpretation of the Investigation Report.

Issued by:  
Bundesstelle für Seeunfalluntersuchung - BSU  
(Federal Bureau of Maritime Casualty Investigation)  
Bernhard-Nocht-Str. 78  
20359 Hamburg  
Germany

Head: Jörg Kaufmann  
Phone: +49 40 31908300  
posteingang-bsu@bsh.de

Fax: +49 40 31908340  
<http://www.bsu-bund.de>

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## **1 Summary of the marine casualty**

On the afternoon of 20 January 2009, the German sailing yacht TAUBE sank while sailing from Larache, Morocco, when entering the Sebou River on the Moroccan Atlantic coast. The international crew consisted of seven young people aged 17 to 28 years. The TAUBE capsized while attempting to head for the port of Mehdia on the Sebou in heavy swell. Severely damaged, she drifted keel uppermost and sank shortly afterwards. Of the seven crew members, only one German female sailor managed to save herself by swimming ashore.

The rescue services summoned by shore-based witnesses were unable to reach the scene of the accident due to the heavy swell. All search measures were unsuccessful.

Eight days after the accident, the body of the Danish female co-sailor was found and three days after that the body of the Slovenian female co-sailor. The other four crew members, three German males and an Austrian female, were not found. The wreck of the TAUBE had also not been located as of completion of the marine casualty investigation.

## 2 Scene of the accident

Type of event: Very serious marine casualty, capsizing with six fatalities  
 Date/Time: 20 January 2009, 1710<sup>1</sup>  
 Location: Approach to the Sebou, Morocco  
 Latitude/Longitude:  $\phi$  34°16.00'N  $\lambda$  006°41.06'W

Excerpt from nautical chart, British Admiralty (BA) 1912

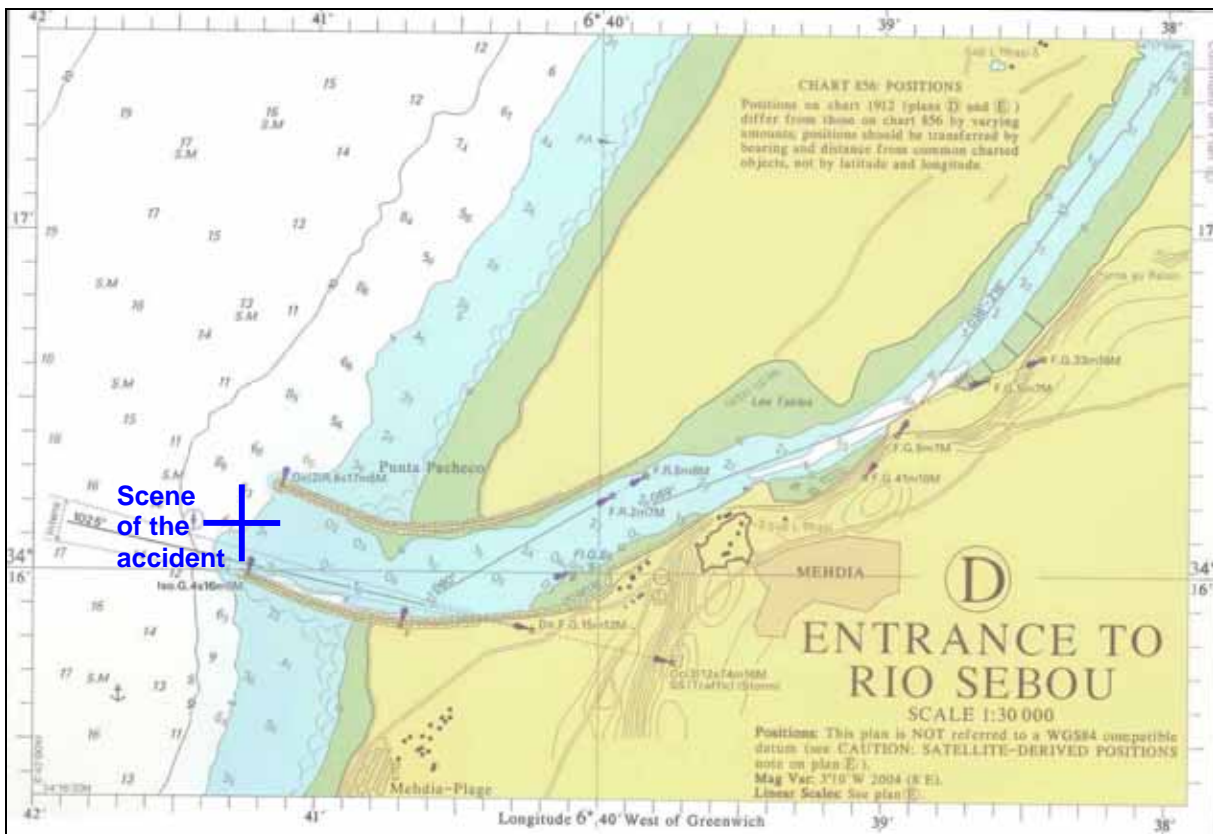


Figure 1: Nautical chart

<sup>1</sup> All times shown in this report are local = Universal Time Coordinated (UTC).



### 3 Vessel Particulars

#### 3.1 Photo



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Figure 2: Photo of vessel taken in the port of Cabo Pino, Spain

#### 3.2 Particulars

Name of the vessel:	TAUBE
Type of vessel:	Keel yacht
Nationality/flag:	Federal Republic of Germany
Port of registry:	Kappeln
Call sign:	DD2319
Owner:	Migrobirdo, Verein für Völkerverständigung e.V.
Year built:	1971
Shipyard:	Banange Shipyard <sup>2</sup>
Length overall:	8.25 m
Breadth overall:	2.45 m
Draught:	1 m
Displacement:	Approx. 3 - 3.5 t
Engine:	Farymann, Type 18 ES Q135
Performance:	4.41 kW (6 HP)
Hull material:	Steel
Number of crew:	7

<sup>2</sup> Information taken from the International card for pleasure craft.

## 4 Course of the accident

### 4.1 External conditions

#### 4.1.1 Sea area

The marine casualty occurred in the Sebou estuary on the North Atlantic coast of Morocco (see Fig. 3).



Figure 3: Geographic location of the sea area

The Sebou (Oued Sebou) is the largest river on the Moroccan Atlantic coast. The port cities of Mehdiya (1.5 nm upriver) and Kenitra (10 nm upriver; see Fig. 4) are situated on the south bank of the river.



Figure 4: Satellite image of the Sebou estuary

The almost 415 m wide river estuary is bounded by north and south moles. The two 650 m rip-rap revetments, which reach into the Atlantic (see Fig. 5), serve as breakwaters.



Figure 5: South mole at the Sebou

The approach to the estuary is challenging even in good weather conditions. The water depth of only 3 to 3.5 m between the mole-heads decreases significantly to depths of less than one meter in the estuary (see excerpt of nautical chart at Fig. 1) due to a variable bar<sup>3</sup>. The bar can usually be crossed between two hours before and two hours after high tide (see Handbook for the West Coast of Africa, BSH). The most favourable channel with water depths of between 1.8 and 2.8 m runs through a narrow corridor of about 80 m wide along the southern mole. It is marked on the nautical chart (see Fig. 1) with a leading light beam.

The bar facilitates groundswell and tidal surges. In particular, the aft swell and surf make steering difficult when combined with strong westerly winds. The entrance is generally closed when the sea state reaches 5 to 6.

#### 4.1.2 Weather at sea

Germany's National Meteorological Service (DWD) prepared an expertise on the weather at sea for the area relevant to the accident for the Federal Bureau of Maritime Casualty Investigation (BSU) (see para. 5.2 for further details). That indicates that on 20 January 2009 the sea area off Morocco was situated on the eastern flank of a strong high-pressure system west of the Azores. The cold front of a storm depression off the Faroe Islands crossed the sea area off the Moroccan coast on that day. According to the information available, the strongest wind occurred at midday on the day of accident. This was a north-westerly force 7 wind, which at times reached 8 Bft with gusts of up to 10 Bft. The DWD estimates that the highest wind sea was 5 to 6 m with swell of 3 to 4 m; accordingly, in deep water the significant wave height would have probably been 6 to 7 m.

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<sup>3</sup> Sand or mud bank with barrier effect for shipping.

The significant sea state remained at levels of around 7 m due to high swell until the early morning of 21 January 2009 and then dropped to about 6 m by midday.

A higher significant wave height must be allowed for the area of the Sebou estuary because the water depth drops from 15 m to 6 m within half a nautical mile. A further consideration is the narrow surf zone bounded by moles and the bar. Therefore, during the period relevant to the accident single wave heights of up to 10 m are likely to have been encountered at the river estuary.

## **4.2 Course of the TAUBE**

### **4.2.1 General information about the sailing project**

The TAUBE belonged to an association and had been on a long term sailing trip since May 2008 as part of a project to promote mutual understanding between peoples. The intended voyage was from Europe to South and Central America via Africa. The rotating crews were composed of association members, their friends and spontaneous co-sailors. Many took the opportunity to sail on short trips from one port to the next under the "work for a berth" principle. There was no regular crew.

The TAUBE left European waters on 9 January 2009 and sailed from Tarifa, Spain to Tangier, Morocco. As a member of the association's committee, the German skipper co-initiated the sailing project and accompanied it from the outset. He was on the TAUBE almost continuously since May 2008 and was familiar with the vessel.

### **4.2.2 Sailing trip from Larache to Mehdia**

The TAUBE sailed into the port of Larache, Morocco at about 0300 on 17 January 2009. The skipper carried out the clearance formalities with the harbour master. On 18 January 2009, the crew consisted of the German skipper and one other German male, who also belonged to the association that operated the TAUBE, and five passengers. The passengers had only recently joined the vessel. One German female and one Austrian female boarded on 2 January 2009 in Cabo Pino, Spain, a Slovenian female boarded on 7 January 2009 in Tarifa and a Danish female and a German male boarded on 16 January 2009 in Asilah. None of the passengers had sailing experience. A safety briefing did not take place.

On 19 January 2009 at 0945, the Moroccan meteorological service (Maroc Météo) issued a gale warning for the Atlantic Coast. The report (Bulletin Météorologique Spécial, BMS) contained a warning concerning dangerous wave heights of 5 to 6 m and gale force winds of 8 Bft (equivalent to 34 to 40 kts). The skipper informed himself on board the TAUBE about the expected weather conditions for the planned onward voyage to Rabat via the Internet from wind forecast portals.



There was no deadline or schedule for reaching the next port, but the online wind forecast predicted a short term change of wind direction from south-west to north-west, which would have favoured the crossing to the port of Rabat, located 80 nm to the south. The north-westerly winds would supposedly persist only until 22 January 2009, after which the wind would turn south-west again. Wind speeds of about 16 kts (equivalent to 5 Bft) were predicted for 19/20 January 2009 and of about 14 kts (equivalent to 4 Bft) for 21 to 26 January 2009.

A joint decision was made on the TAUBE to set sail on 19 January 2009. The crew had previously assembled and discussed the options: stay in Larache or set sail. The results of the wind research on the Internet were presented and two crew members informed themselves of the current sea conditions individually by viewing the waves outside the harbour basin of Larache. The skipper announced that it would be a 'choppy' session. He had familiarised himself with the port entrances of Mehdia and Rabat in advance using a copied port handbook.

However, the only ports en route to Rabat, Mehdia and Kenitra, had already been closed since the morning of 19 January 2009 due to the weather conditions. It is unclear whether the skipper of the TAUBE was aware of that.

There were no required clearance formalities for leaving the port. On the night of 19 to 20 January 2009, the crew of the TAUBE thus sailed on the high tide out of the port of Larache without giving any notice. Due to the limited space, much of the personal property, including the copy of the port handbook, was stowed on the cabin roof under a rubber dinghy (see Fig. 6).



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Figure 6: The TAUBE with rubber dinghy, photo taken in autumn 2007

A course close to the shoreline was chosen for the passage under sail. The current position of the yacht was checked several times with a portable GPS receiver. To begin with, the skipper steered the TAUBE alone and then changed with the other member of the operating association at about 0900 on 20 January 2009. At that point, most of the crew were suffering from seasickness below deck. Throughout the whole journey, the swell and wind conditions affected the entire crew; therefore, the original watch roster and any rest periods for the skipper were not implemented. The TAUBE's speed over ground was approx. 6.5 to 7 kts.

In the early afternoon, the Austrian and the other member of the operating association alternated at the helm when an oncoming wave washed over the yacht. In the process, it swept away some of the items stowed on the cabin roof. Following that, the crew stowed the remaining items in the cabin and three of the seven automatic life-jackets carried on board were issued to the two helmsmen and the third German male, who was also sitting in the cockpit. Additionally, all three connected to safety lines. The skipper, the survivor, and the Slovenian and Danish females were below deck and did not wear life-jackets.

At about 1700, the yacht approached the Sebou estuary. The skipper raised the possibility of continuing to Rabat, but was outvoted by the rest of the crew, who favoured sailing into Mehdia. A look at the copy of the port handbook revealed that the information concerning the approach to Mehdia had apparently been washed away by the wave mentioned above. However, the skipper remembered the bar in the estuary and the navigation corridor along the southern mole. He gave appropriate instructions to the Austrian female, who stood at the helm. Neither was radio contact established with the harbour master's office in Mehdia/Kenitra nor was the port's signalling system that indicated the port was closed sighted.

The crew made preparations to enter the estuary. Typically, the engine was started for this purpose. Additionally, since the TAUBE grounded while entering one of the previous ports, the practise of raising the centre board was established. Initially, it was not possible to start the engine before the Sebou estuary. The three male Germans, among them the skipper, had been weakened by overwork and one of them, who was only sailing as a passenger, was also seasick. Numerous attempts to start the engine were unsuccessful. Meanwhile, the TAUBE was already almost level with the two mole-heads. The skipper was concerned about the risk of grounding on the bar and raised the centre board by means of a hand crank on the cabin table. The yacht immediately began to roll severely. The idea of seeking assistance failed because the radio was not in operation. A few seconds later, they managed to start the engine. Shortly afterwards, the TAUBE was struck by a tidal surge. A cabin window was destroyed by the force of the wave. Sea water flooded through that and the companionway into the cabin, which was not closed with a bulkhead.

The survivor and the Slovenian and Danish females succeeded in reaching the deck, from which they were swept overboard by the next waves that washed over the yacht.

The TAUBE capsized and initially drifted on her side with the sails resting on the surface of the water. The German female managed to cling to a floating sleeping pad and attract the attention of shore-based onlookers.

### **4.3 Search and rescue measures**

The shore-based witnesses to the accident informed the local police of the unsuccessful approach manoeuvre by mobile phone at about 1715 and hastily attempted to help the people in the water until the rescue services arrived. Three of the seven crew members were seen swimming without life-jackets. The water temperature was 12 °C. The witnesses to the accident attempted to climb over the rip-rap revetments to the water; however, this was unsuccessful because the stones on the mole were being moved by the tidal surges. It was also not possible to reach the people in the water using a surfboard as an extension.

The first rescue services from the port authority and the police arrived at the moles approx. 10 minutes later. It was also not possible to advance through the surf to the scene of the accident using two boats.

At 1727, the SAR RCC in Munster<sup>4</sup> called the MRCC<sup>5</sup> distress line in Bremen and gave notification of the receipt of an emergency beacon alarm. The EPIRB<sup>6</sup> had indeed been triggered, but satellite-assisted recording of the emergency position was still in progress. MRCC Bremen then contacted the person registered in the national ship database for the event of an emergency, a relative of the skipper, by telephone. The emergency contact narrowed down the whereabouts of the TAUBE. The satellite report concerning the scene of the accident in the Sebou estuary was received at 1744. At the same time, MRCC Rabat received a similar accident report from the safety authority in Kenitra. Immediately thereafter, MRCC Bremen contacted MRCC Rabat and preliminary information was exchanged. The position was confirmed by further calls from RCC Munster and MRCC Lisbon.

Sunset was at 1745. The rescue operations continued unabated, with helicopter support from 1800. Up to this point, only one person was still sighted afloat in the estuary, probably the Slovenian female. Shortly afterwards, visual contact with her was lost. The German female reached the northern breakwater under her own steam and was met by helpers and taken to a hospital.

The search measures were briefly interrupted during the night and resumed next morning at 0600. Sunrise was at 0729.

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<sup>4</sup> SAR = Search and Rescue, RCC = Rescue Coordination Centre

<sup>5</sup> MRCC = Maritime Rescue Coordination Centre

<sup>6</sup> EPIRB = Emergency Position Indicating Radio Beacon

However, it was impossible to search the estuary in a boat because of the tidal surges. The search was therefore continued on the beach and by helicopter, but without success. Divers were not used because the surf stirred up sand and mud to the extent that there was practically no visibility under water.

#### **4.4 Consequences of the accident**

The German female survived the marine casualty virtually unscathed; the other six crew members lost their lives. The body of the Danish female was found on a beach approx. 8 km to the south of the scene of the accident on 28 January 2009 and the body of the Slovenian female was found about 12 km to the north of the accident site on 31 January 2009. The other four sailors, three German males and an Austrian female, were not found.

The TAUBE sunk, and, eight months after the accident, has still to be located. The TAUBE's rubber dinghy was washed up in the port of Mehdiya on the evening of the accident.



## 5 Investigation

### 5.1 Cooperation

The Federal Bureau of Maritime Casualty Investigation (BSU) began its investigation shortly after the accident. This has involved close cooperation with the other agencies investigating the accident as well as with the operating association of the TAUBE and the manufacturers of individual boat parts and equipment carried on board. Numerous witnesses came forward voluntarily and helped to reconstruct the course of the accident or general conditions on board the TAUBE with the information they gave to the BSU or police. The Moroccan port authority in Kenitra provided information that was crucial to the investigation.

### 5.2 Expertise

The BSU intended to obtain an expertise on the topographical features of the port entrances of Rabat, Mehdiya/Kenitra, Larache and Asilah on Morocco's Atlantic coast in relation to the weather at sea and currents. This was to derive specific approach recommendations for sailors over and above the information already contained in the regional guides. The database necessary for such an expertise would have had to contain local current and weather data as well as weather alerts (BMS). Therefore, the BSU contacted the Moroccan meteorological service both directly as well as through the DWD and the French maritime casualty investigation bureau (BEAmer<sup>7</sup>), but without success. Ultimately, an expertise on the weather at sea was compiled by the DWD. The DWD applied, inter alia, internationally reported weather observations of the Moroccan shore stations, Tangier, Larache and Rabat; however, these are not fully representative of the coastal sea areas. Sea heights were estimated using numerical model analyses. Data pertaining to the current were not available.

The liaison officer of the German Federal Criminal Police Office (BKA) in Rabat was at least able to provide the BSU with the BMS for 19 and 20 January 2009 via the port authority in Kenitra. However, the fundamental investigation intended by the BSU was not possible on that basis.

### 5.3 Witness interviews

The investigation of this marine casualty involved witnesses being interviewed by different authorities and in different countries. The interview records were made available for the marine casualty investigation essentially by the waterway police (WSP) in Brunsbüttel, the liaison officer of the BKA in Rabat, the police in Cologne, the WSP in Friedrichshafen and the Austrian State Office of Criminal Investigation (LKA) in Tyrol. In addition, the BSU conducted its own witness interviews. The focus of the investigation was not limited only to the last sailing trip of the TAUBE, but also covered the entire planning period since summer 2007 due to the particularities of the sailing project.

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<sup>7</sup> BEAmer = Le Bureau d'enquêtes sur les événements de mer

In as far as possible, all statements have been rendered anonymous and where relevant are set forth below.

## **5.4 The TAUBE**

As of completion of the marine casualty investigation the wreck of the TAUBE had not been discovered; therefore, the BSU resorted to database entries, photographs, information from the operating association and information from witnesses.

### **5.4.1 General**

The TAUBE, ex THUN, was sold pre-owned by a German marina on 4 August 2007 to the later deceased skipper, who represented the operating association. The number of previous owners is unknown. Likewise, design documents for the centre board yacht are not available. The yacht was sold 'as seen' without any warranty for 'handiwork'. The following deficiencies were explicitly listed in the contract of sale (translated from German by BSU):

- Engine not running
- Centre board stuck in place
- Electrical system inoperable
- Hull is penetrated and has external damage
- Cracked fillers
- Rig damage and sail missing
- The yacht is not seaworthy

The contract also contained a statement to the effect that it was not registered as a sea-going vessel. The bleak overall condition of the pleasure craft was also reflected in the relatively low purchase price of well under EUR 2,000. According to an association member, a 'cheap little dilapidated boat' was purchased intentionally because additional money was not available at short notice and they did not want to be accused of going on a state of the art amusement ride.

The operating association raised the purchase price with membership subscriptions and donations. The original goal was to sail to the Canary Islands with six association members in November 2007 and continue across the Atlantic to South and Central America. To that end, the TAUBE was first to be repaired at the shipyard by the association itself. The contract of sale included the storage of the yacht until 15 October 2007. Consequently, the operating association had a little over two months to restore the TAUBE. After that the usual rent would be due.

### **5.4.2 Repair**

The repair of the TAUBE was carried out independently by members of the operating association. Work began on 20 August 2007. The original condition of the yacht is documented by the following photographs (Figs. 7 to 10).



Figure 7: TAUBE, ex THUN, before the restoration, view from fore



Figure 8: TAUBE, ex THUN, before the restoration, view from aft



Figure 9: TAUBE, ex THUN, before the restoration, view of the cockpit



Figure 10: TAUBE, ex THUN, before the restoration, view into the cabin



According to witness testimony, the association members involved in repairing the TAUBE reportedly included a carpenter. In addition, a consultant who is said to have gathered experience as a single-handed sailor himself reportedly assisted with specific questions.

The work was partly recorded on video. According to that, paint residues and rust were removed from the hull of the TAUBE and the deck (see Fig. 11).



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Figure 11: TAUBE during the restoration, video excerpt

The hull was sanded and then provided with a coat of paint. Rigging was removed before work began. The jib and mainsail were bought second hand by the operating association of the TAUBE from the pre-owners of the ex THUN. Inter alia, files were used on the heavily rusted centre board compartment to make the centre board operable again. By the middle of September 2007, the hull once again had a coat of paint (Fig. 12) and the centre board was operable again (Fig. 13).

Witnesses with relevant experience considered the overall work to be amateurish. Several futile attempts were reportedly made to dissuade the members of the association from putting their plans into practise or encourage them to work towards using the TAUBE only for coastal cruises on the Baltic Sea.

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Figure 12: TAUBE during the restoration, painting the hull

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Figure 13: TAUBE during the restoration, fitted centre board

### 5.4.3 Yacht's engine and equipment

The BSU reconstructed the TAUBE's equipment using national database entries, sales receipts and information from numerous witnesses who were involved in preparing for the long term sailing trip or were familiar with the yacht or the crew.

According to the International card for pleasure craft, the TAUBE was equipped with a Farymann engine built in 1971. The stated drive rating is 3.68 kW (equivalent to 5 HP). However, according to the operating association, a Farymann Diesel Type 18 ES Q135 with 4.41 kW (equivalent to 6 HP) was on board.

The Type 18 ES Q135 is a single-cylinder four-stroke diesel engine for boats, sea water cooled (Fig. 14).

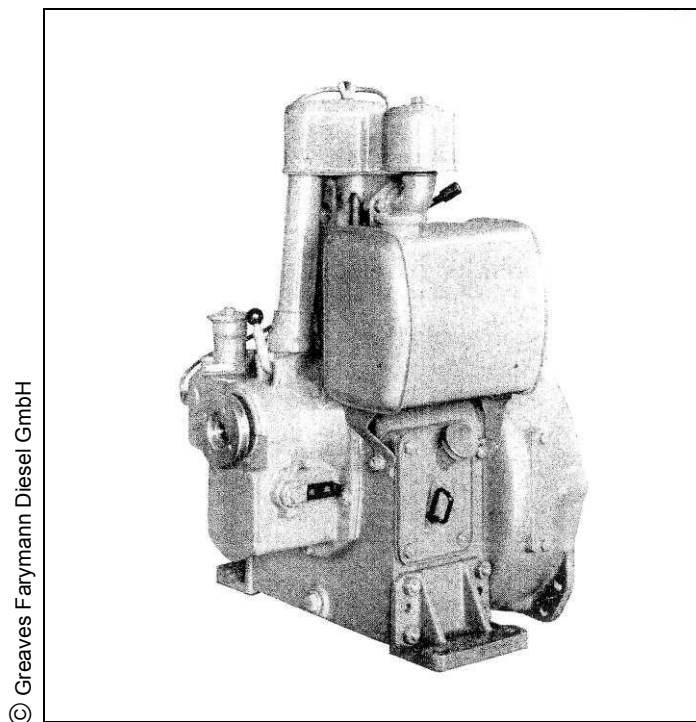


Figure 14: Manufacturer's illustration of the type ES

The nominal rated speed was 2,000 rpm and the stroke volume 442 cm<sup>3</sup>.

Furthermore, in addition to a mechanical bilge pump, the TAUBE also had an electric one on board.

The navigating equipment consisted of two GPS devices: a portable 16-channel GPS device made by Lowrance (type: iFINDER GO2) with WAAS/EGNOS<sup>8</sup> installed and a built-in GPS device made by Furuno (type unknown). In addition, a Type MC 8000 DSC VHF marine radio made by President was located in the cabin. The TAUBE carried copied paper nautical charts; however, it is unclear which sea areas these covered.

Safety equipment consisted of seven automatic life-jackets (150 N) including reserve sets for the maintenance of the jackets, seven safety lines, pyrotechnic signal equipment (hand flares and parachute rockets), a rescue line, a lifebuoy and a 406 MHz Type ACR Satellite2 406 beacon (EPIRB), which can be activated manually but also activates automatically when it is placed in water. There was no life raft on board. The rubber dinghy that was carried on board (see Fig. 6) could have accommodated a maximum of two crew members.

#### **5.4.4 Regulatory control**

Since the TAUBE was not used commercially, but as a club boat, neither the boat nor the work carried out was subject to any regulatory control or approval.

### **5.5 Reconstruction of the travel arrangements**

The BSU reconstructed the travel arrangements using witness statements, online diaries (blogs) of the operating association and individual members, video footage and email correspondence of the future skipper with the manufacturers of marine equipment.

#### **5.5.1 Crew**

##### **5.5.1.1 Sailing experience**

On 23 June 2007, the operating association held an initial sailing event on Lake Constance. This was also attended by the future skipper. Following that, a decision was made to acquire the TAUBE at the beginning of July 2007. After the repairs to the yacht were completed on 8 October 2007, she was put into use for the first time on 16 October 2007. This happened against the backdrop that the long term sailing trip was originally scheduled for November 2007. During the subsequent trip in a westerly direction through the Kiel Canal, it became apparent to the crew members that their sailing experience was not yet sufficient for carrying out the trip as planned. Therefore, a decision was made to turn-round on 23 October 2007 in Rendsburg. The TAUBE was then taken to Kappeln for the winter. Five months later, on 12 March 2008, the start of the season and thus the long term sailing trip were prepared for. From that point, the initial crew, including the future skipper, lived on the TAUBE and familiarised themselves with the yacht. Several short sailing trips on the Baltic Sea followed.

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<sup>8</sup> WAAS (Wide Area Augmentation System) and EGNOS (European Geostationary Navigation Overlay Service) are systems that employ additional satellites to extend the GPS system and thereby improve the precision of GPS positioning, especially on the open sea.



On 1 May 2008, they took part in the so-called 'Herring Regatta' (Kappeln to Sønderborg, Denmark, and back). In the middle of May, they sailed to Travemünde before the long term sailing trip officially began on 16 May 2008 with the passage through the Kiel Canal towards Amsterdam, Netherlands.

The original plan of the TAUBE's operating association provided for a crew consisting of six association members. The participants were to acquire the requisite knowledge for the sailing trip from books and through 'learning by doing'. However, as stated above, the crew ultimately changed constantly. Therefore, it was only possible for a very limited number of crew members to acquire at least a basic knowledge of sailing, to the extent that there was – especially on the part of the spontaneous co-sailors – any interest in doing so. A founding member of the association posted a confident entry in an Internet blog regarding the use of the TAUBE even in a storm<sup>9</sup>:

*"Our boats<sup>10</sup> are stable and can deal with high waves in our (by then trained) hands because they are fitted out accordingly. We know the boats down to the finest detail. Once the wind gets too strong, we reduce the sail area, if necessary, strike the sails altogether, then the wind can do us no harm. If the boat takes in water, it still continues to float like a raft; we can bale it out and keep sailing. We choose our route so that giant breakers are highly unlikely, everything else is a question of proper handling (not too much sail area, otherwise it's like a car that drives around a bend too quickly)."*

Three association members were in possession of a Pleasure Craft Skipper's Licence - Sea. The skipper on the day of the accident acquired his on 11 March 2007 at Lake Constance. He thus met the legal requirements for sailing as skipper on a non-commercial trip in the TAUBE. He was not in possession of a radio operating certificate. He had the most sailing experience of all the association members. He gained initial experience as a teenager on inland waters. During the nine months before the accident, he spent practically all of his time sailing with the TAUBE. During this period, he safely navigated the TAUBE even in wind conditions of up to 8 Bft and sailed on sections of seaway that can certainly be rated as demanding, such as the Biscay crossing.

The other member of the association, who was on board on the day of the accident, was also familiar with the TAUBE due to previous sailing trips. According to witness statements, it can be assumed that at least basic sailing skills existed. The German was not in possession of a Pleasure Craft Skipper's Licence.

The third German, who first boarded in Asilah on 16 January 2009, and the Austrian female, who was on board since 2 January 2009, were said to have grasped the interaction of wind and waves quickly. Although both possessed no sailing experience, they could be allocated the role of coxswain in order to relieve the other two German sailors. However, the German was only partially seaworthy.

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<sup>9</sup> Informal translation from German to English by BSU.

<sup>10</sup> The association also has a second sailing yacht.

### **5.5.1.2 Language skills**

The crew's language skills covered English and French learned at school and Spanish. According to a witness, the skipper only possessed a basic knowledge of French, which is instrumental to the extent that Moroccan (BMS) weather warnings are issued in French.

### **5.5.1.3 Hierarchy on board**

Most of the decisions that needed to be made on the TAUBE were arrived at democratically. A strict hierarchy on board, under which the skipper made decisions alone, was difficult to reconcile with the object of the sailing trip, notably, sharing a community experience. The difficulties that emerged with regard to the lack of sailing experience of the remaining crew members in particular are discussed in para. 6.2 of the analysis.

## **5.5.2 General voyage planning**

Selection of the next port of call was made jointly. Weather information was routinely obtained before setting sail. To that end, a free wind forecasting service on the Internet was referred to and telephone contact was maintained with the operating association in Tübingen at regular intervals, from which information about the weather was also provided.

Each planned voyage was entered into the portable GPS device with the start and finish coordinates. It remained unclear which copies of paper nautical charts were kept on board. According to several witnesses, the skipper referred to port information in the copy of the handbook before setting sail if the ports of call were shown in it. The current and tidal conditions were also considered when selecting the most favourable time to set sail. It is no longer possible to ascertain the extent to which voyage planning was recorded in the logbook, because the logbook was not found after the accident.

## 5.6 Reconstruction of the long term sailing trip

The BSU felt it was necessary to retrace the voyage of the TAUBE from May 2008 onwards, as this would make it possible to draw conclusions on both the technical condition of the boat and the level of knowledge and experience possessed by the future skipper. Therefore, the BSU reconstructed the long term sailing trip from the beginning to the extent subsequently possible using the documentation and available witnesses. In that respect, the operating association only provided rudimentary information as the planning and execution of the project was essentially in the hands of the future skipper and any written records that had been kept were only sketchy.

### 5.6.1 Route

The route of the TAUBE is shown on the following table; a geographical summary can be seen in Fig. 15.

Date	Place
01/05/2008	Sønderborg, Denmark
13/05/2008	Travemünde, Germany
16/05/2008	Kappeln, Germany
18/05/2008	Cuxhaven, Germany
25/05/2008	Amsterdam, Netherlands
??/06/2008	Vlissingen, Netherlands
12/06/2008	Zeebrugge, Belgium
16/06/2008	Calais, France
21/06/2008	Boulogne-sur-Mer, France
30/06/2008	Dieppe, France
10/07/2008	Fécamp, France
??/07/2008	Barfleur, France
21/08/2008	Saint Vaast-la-Hougue, France
22/08/2008	Omonville-la-Petite, France
28/08/2008	Alderney, Guernsey/UK
29/08/2008	St. Peter Port, Guernsey/UK
06/09/2008	Trébeurden, France
09/09/2008	L'Aber wrac'h, France
15/09/2008	La Coruña, Spain
??/09/2008	Ferrol, Spain
26/09/2008	Cabo de Finisterre, Spain
??/10/2008	Isla de Ons, Spain
03/10/2008	Bueu-Beluso, Spain
??/10/2008	Baiona, Spain
13/10/2008	Leixões, Portugal

<b>(Continued)</b>	
<b>Date</b>	<b>Place</b>
21/10/2008	Aveiro, Portugal
25/10/2008	Cascais, Portugal
01/11/2008	Alvor, Portugal
11/11/2008	Faro, Portugal
??/11/2008	Cádiz, Spain
24/11/2008	Strait of Gibraltar, Spain
28/11/2008	Málaga, Spain
11/12/2008	Almería, Spain
20/12/2008	Cala San Pedro, Spain
24/12/2008	Cabo de Gata, Spain
31/12/2008	Cabo Pino, Spain
07/01/2009	Gibraltar, UK
08/01/2009	Tarifa, Spain
10/01/2009	Tangier, Morocco
11/01/2009	Asilah, Morocco
17/01/2009	Larache, Morocco
20/01/2009	Kenitra, Morocco

Table 1: Itinerary of the TAUBE from May 2008 to the day of the accident



Figure 15: Voyage of the TAUBE from May 2008 to the day of the accident

### **5.6.2 Crew rotation**

Crew rotation was part of the agenda throughout the entire sailing trip. The operating association promoted the project and offered co-sailing opportunities via several announcements in Internet forums and at information events in Germany. Interested parties established contact spontaneously by these means or through acquaintances at the port at which the TAUBE was moored. In this manner, in the nine months before the accident up to ten young people sailed on the yacht simultaneously.

### **5.6.3 Weather**

As was to be expected, depending on the location and season the weather conditions to which the TAUBE and her respective crew were exposed during the long term sailing trip were certainly challenging. According to the crew, wind speeds of 6 Bft and 2 m high waves prevailed during the 20-hour journey from Boulogne-sur-Mer to Dieppe, France on 30 June 2008. Wind speeds of 8 Bft and 3 m high waves were reported for the 26-hour passage from St. Peter Port, UK to Trébeurden, France from 4 to 6 September 2008. Accordingly, the skipper of the TAUBE had been confronted with heavy weather conditions before the accident. It is documented that onward voyages were sometimes postponed for several days because of weather forecasts predicting 6 Bft; therefore, one cannot assume that general recklessness prevailed as regards the weather at sea.

### **5.6.4 Engine problems**

The yacht's engine failed on several occasions during the course of the long term sailing trip. It is not clear whether it was in regular operation since being installed in 1968. Maintenance intervals are also unknown. When purchasing the vessel, the operating association was informed explicitly that the engine was not operational.

Engine problems and repairs are recorded after the major overhaul by the association members for the following dates: 12 June 2008 at Zeebrugge, Belgium; eleven days later at Boulogne-sur-Mer, France and shortly before the accident on 14 January 2009 at Asilah, Morocco, following water ingress in the engine compartment. The specific measures taken to seal the leak that emerged during the crossing to Asilah are not known.

## **5.7 Reconstruction of the sailing trip from 10 January 2009 to the day of the accident**

The voyage of the TAUBE from arriving in North Africa to the accident on 20 January 2009 is shown below in Fig. 16.



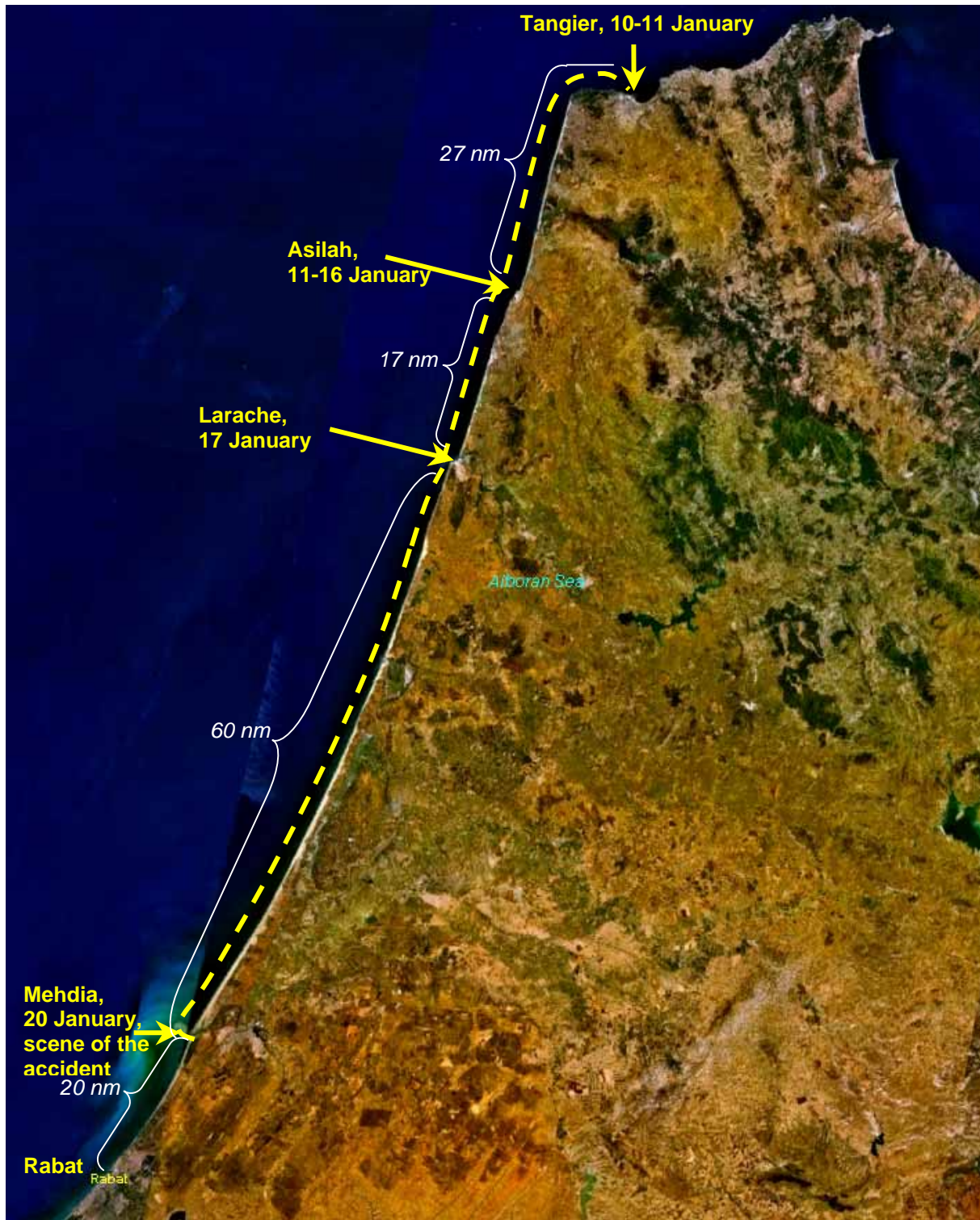


Figure 16: Voyage of the TAUBE in North Africa

### 5.7.1 Tangier to Asilah

The TAUBE sailed into the port of Tangier on the evening of 10 January 2009 with a ten-man crew. The entrance to the port of Tangier is situated on the Strait of Gibraltar. Due to its geographical position and mole, it is not directly exposed to the

swell and current of the North Atlantic (see Fig. 17). Therefore, the approach did not cause any difficulties.



Figure 17: Entrance to the port of Tangier

The skipper carried out the clearance formalities with the port authority. As was the case in other ports, the crew spoke with other sailors, who drew the skipper of the TAUBE's attention to extensive weather information from the local meteorological service. Due to the persistently strong winds, the meteorological service had been issuing warnings with regard to the wave heights for days. The skipper of the TAUBE referred to these reports in front of witnesses with a laptop. On 11 January 2009, they set sail for Asilah, which was just under 27 nm away.

### 5.7.2 Asilah to Larache

The port of Asilah is situated directly on the North Atlantic coast of Morocco and is protected by a breakwater and a dam (see Fig. 18).



Figure 18: Entrance to the port of Asilah



The entry on 11 January 2009 was again uneventful. The TAUBE stayed at Asilah for six days. By all accounts, friendliness to one another prevailed on board. The original project goal, the Atlantic crossing, was not planned specifically. Rather, it was agreed that a spontaneous decision would be made on when and where the voyage would take them next. In the medium term, they intended to sail for the Canary Islands.

Five of the ten crew members disembarked in Asilah. Witnesses reported that the crew was joking about the fact that there were not enough life-jackets for everyone on board in any case. An agreement was made to meet one of the people who disembarked on 21 January 2009 in a port situated further to the south, because this date was the birthday of the Austrian female who remained on board.

Furthermore, it was reported that the skipper of the TAUBE discussed the local weather conditions in detail with the skipper of a French sailing yacht on 16 January 2009. The two individuals had already become acquainted at the port of Tangier. The Frenchman and his family had travelled to Asilah by bus for a day trip and had left their yacht in Tangier because of the weather conditions. The Frenchman reportedly spoke with the skipper of the TAUBE about the heavy swell in particular, which despite moderate wind speeds of less than 20 kts (equivalent to 5 Bft) had been the subject of warnings by the meteorological service for days. During this conversation, the German was reportedly strongly advised that in such sea conditions it would be safer to weather it out off the coast than attempt to head for a port. However, the German is said to have replied that the TAUBE was quite capable of entering even under such conditions. This discussion reportedly resulted in the skipper of the TAUBE assembling the crew, which at that time comprised seven people, and asking them if they wanted to set sail. The crew reportedly replied that it was unable to assess the situation and would therefore leave it to the discretion to the skipper, who decided to set sail.

In the afternoon, the TAUBE set sail from Asilah for the port of Larache 17 nm away. This opportunity was used to photograph and film the TAUBE (Figs. 19 and 20).



Figure 19: Close-up of the SY TAUBE sailing out of Asilah



Figure 20: SY TAUBE, sailing

Estimates by the BSU indicate that the freeboard was no more than 50 cm. The filmshots also show the TAUBE dip into the light swell within the port's exit area.



Figure 21: Dipping of the TAUBE while sailing

### 5.7.3 Larache to Mehdia

The entrance to the port of Larache is similar to that of Mehdia, but is supplemented by a southern mole. In the official nautical chart number BA 1912, as amended in 2008, the original point of entry is still shown (see Fig. 22); in contrast, the new version of 26 February 2009 shows the current layout of the moles (see Fig. 23). Both charts show, inter alia, the site of each port signal point (outlined in red circles in Figs. 22 and 23). Whether the TAUBE possibly carried a copy of the nautical chart from 2008 is not known.

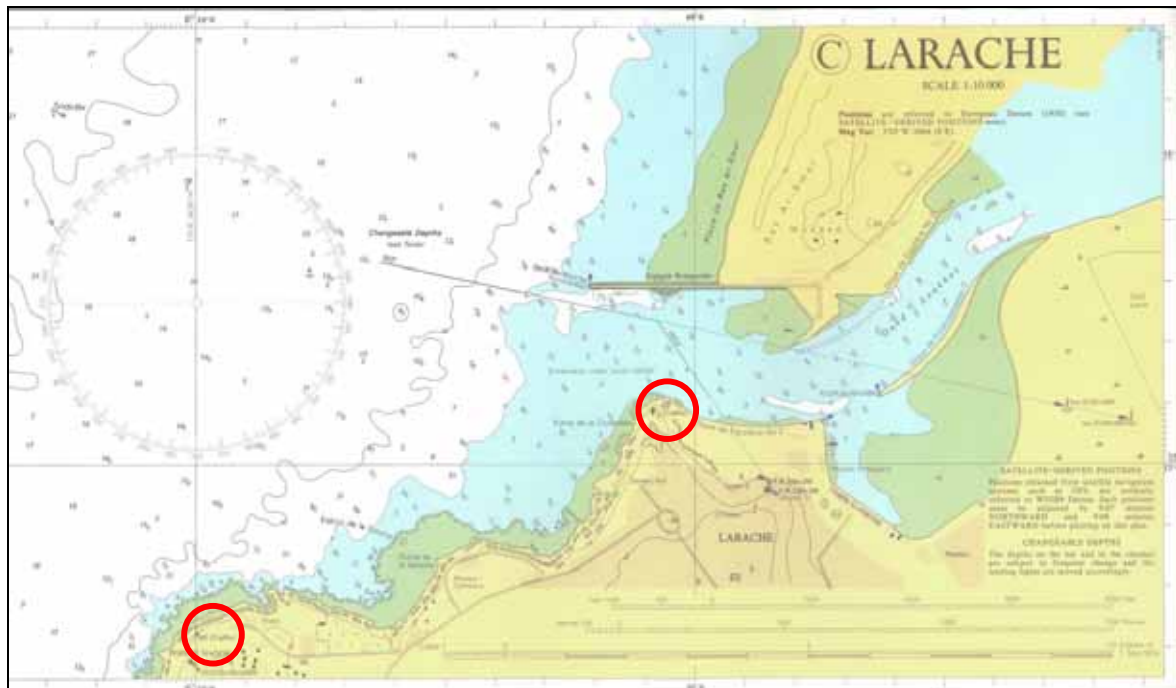


Figure 22: Detailed chart of Larache from nautical chart BA 1912, amended in 2008

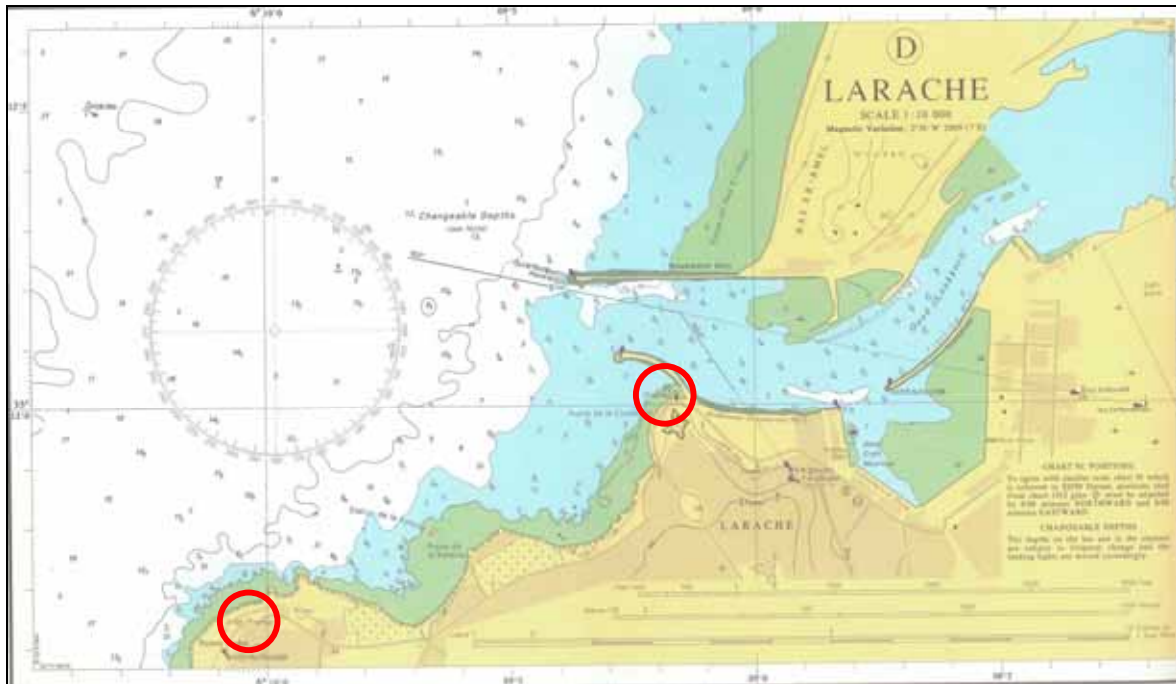


Figure 23: Detailed chart of Larache from nautical chart BA 1912, amended in February 2009

The TAUBE sailed into the port of Larache at about 0300 on 17 January 2009 without encountering any difficulties. The skipper carried out the clearance formalities with the harbour master. On the next day, a German male and a Danish female joined the crew as casual acquaintances. Thereafter, the now seven-man crew consisted of the German skipper and the other German association member, the Slovenian female, the German female, the Austrian female and the two new passengers, who possessed no sailing experience whatsoever. The Austrian female had the occasional opportunity to practise steering and turning manoeuvres on the recent short sailing trips undertaken since crossing the Strait of Gibraltar. The skipper explained theoretically a man overboard manoeuvre (MOB) to her, the German female and the other association member during the stay in the port of Cabo Pino. The two new passengers reportedly received no instruction.

The local port authority in Larache were said to have inspected the TAUBE and her crew sometimes several times per day. Consequently, the crew reportedly had little interest in staying in Larache for an extended period.

### 5.7.3.1 Knowledge of severe weather warnings

Information from witnesses with regard to whether the skipper was aware of the severe weather warning issued by the Moroccan meteorological service and the related closure of the ports of Larache, Mehdia and Kenitra on 19 January 2009 varies. On one hand it is reported that an official from the port authority personally informed the skipper; however, he reportedly did not take the warning seriously and referred to his experience in the North Sea. On the other hand it was said that the prediction for the onward voyage was created solely on the basis of the Internet forecast portal and the telephone call with association members in Tübingen.



Ref.: 015/09

In hindsight, it is not possible to clarify unequivocally which representation is ultimately true. However, the BSU believes that it is unlikely that the skipper of the TAUBE would have set sail in the certain knowledge that several ports were closed. This would not only have meant concealing the warnings from the crew, but also deliberately endangering his own life. In the opinion of the BSU, it is more plausible that either the crew of the TAUBE did not obtain information on the latest weather warnings from the port authority before deciding to set sail, but relied on their own knowledge of the weather, the Internet forecasts and the messages from Tübingen, or that they were aware of the warning, but had not been informed of the port closures.

The archive version of the provider indicates that the Internet forecast used on board the TAUBE is as follows (see Figs. 24 to 26; time = local time).

Morocco - Plage d'Asilah, Lat: 35.47, Lon: -6.04, Zeitzone: GMT+ [Detail / Karte], Archiv erhältlich: 09.01.2006 - 22.10.2009																																								
GFS	Windgeschwindigkeit (Knoten)								Windrichtung								Welle (m)								Wellenrichtung								Wellenperiode (s)							
	01h	04h	07h	10h	13h	16h	19h	22h	01h	04h	07h	10h	13h	16h	19h	22h	01h	04h	07h	10h	13h	16h	19h	22h	01h	04h	07h	10h	13h	16h	19h	22h	01h	04h	07h	10h	13h	16h	19h	22h
19.01.2009	9	9	12	13	16	11	11	11	↗	↗	↗	↗	↗	↗	↗	↗	2.3	2.4	2.4	2.5	2.6	2.7	2.7	2.7	↘	↘	↘	↘	↘	↘	↘	↘	16	16	16	16	16	16	16	16
20.01.2009	14	10	14	15	17	17	12	14	↘	↘	↘	↘	↘	↘	↘	↘	2.7	2.7	2.6	2.7	2.9	3.2	3.4	3.5	↘	↘	↘	↘	↘	↘	↘	↘	16	16	16	16	16	16	16	15
21.01.2009	15	14	12	11	15	9	10	9	↘	↘	↘	↘	↘	↘	↘	↘	3.6	3.6	3.5	3.4	3.4	3.3	3.1	3	↘	↘	↘	↘	↘	↘	↘	↘	15	15	15	15	15	15	16	16
22.01.2009	8	7	10	11	19	18	17	17	↗	↗	↗	↗	↗	↗	↗	↗	2.9	2.7	2.8	2.5	2.5	2.8	2.8	2.9	↘	↘	↘	↘	↘	↘	↘	↘	16	16	14	14	14	6	6	7
23.01.2009	21	14	11	14	18	14	15	13	↗	↗	↗	↗	↗	↗	↗	↗	3	2.9	2.6	2.4	2.4	2.4	2.4	2.4	↗	↗	↗	↗	↗	↗	↗	↗	7	7	7	7	7	7	7	7
24.01.2009	13	15	18	10	12	9	7	5	↗	↗	↗	↗	↗	↗	↗	↗	2.4	2.8	2.8	2.8	2.7	2.8	2.6	2.8	↗	↗	↗	↗	↗	↗	↗	↗	7	7	7	7	12	13	13	13
25.01.2009	10	11	14	15	20	18	16	15	↗	↗	↗	↗	↗	↗	↗	↗	2.7	2.0	2.9	3	3.1	3.3	3.3	3.4	↘	↘	↘	↘	↘	↘	↘	↘	14	14	14	14	14	14	13	13
26.01.2009	15	11	9	10	17	13	12	9	↘	↘	↘	↘	↘	↘	↘	↘	3.5	3.7	3.9	3.9	3.9	3.8	3.7	3.5	↘	↘	↘	↘	↘	↘	↘	↘	13	13	16	15	15	15	15	15

Figure 24: Forecast for the weather at sea by the Internet portal for the area around Asilah

Morocco - Plage de Mehdiya, Lat: 34.21, Lon: -6.7, Zeitzone: GMT+ [Detail / Karte], Archiv erhältlich: 09.01.2006 - 22.10.2009																																								
GFS	Windgeschwindigkeit (Knoten)								Windrichtung								Welle (m)								Wellenrichtung								Wellenperiode (s)							
	01h	04h	07h	10h	13h	16h	19h	22h	01h	04h	07h	10h	13h	16h	19h	22h	01h	04h	07h	10h	13h	16h	19h	22h	01h	04h	07h	10h	13h	16h	19h	22h	01h	04h	07h	10h	13h	16h	19h	22h
19.01.2009	6	6	8	8	12	12	14	16	↗	↗	↗	↗	↗	↗	↗	↗	4.1	4.2	4.3	4.5	4.7	4.8	4.8	4.8	↘	↘	↘	↘	↘	↘	↘	↘	16	16	16	17	17	17	17	17
20.01.2009	11	10	11	16	17	17	12	14	↘	↘	↘	↘	↘	↘	↘	↘	4.7	4.8	4.5	4.6	5	5.1	5.7	5.9	↘	↘	↘	↘	↘	↘	↘	↘	16	16	16	16	16	16	16	16
21.01.2009	13	14	13	11	11	8	7	6	↘	↘	↘	↘	↘	↘	↘	↘	5.1	5.1	5.1	5.1	5	5	5.3	5.7	↘	↘	↘	↘	↘	↘	↘	↘	16	16	16	16	16	16	16	16
22.01.2009	7	7	10	10	13	10	13	13	↗	↗	↗	↗	↗	↗	↗	↗	5.4	5.2	4.9	4.6	4.3	4	3.7	3.5	↘	↘	↘	↘	↘	↘	↘	↘	16	16	16	16	16	15	15	15
23.01.2009	15	14	13	16	16	13	13	11	↗	↗	↗	↗	↗	↗	↗	↗	3.4	3.3	3.2	3.1	3.1	3	3	3	↘	↘	↘	↘	↘	↘	↘	↘	15	14	14	14	13	13	13	13
24.01.2009	11	12	13	11	7	6	6	3	↗	↗	↗	↗	↗	↗	↗	↗	3	3	3.1	3.2	3.3	3.4	3.5	3.7	↘	↘	↘	↘	↘	↘	↘	↘	13	13	13	13	13	13	13	14
25.01.2009	9	9	13	13	14	13	14	14	↗	↗	↗	↗	↗	↗	↗	↗	3.9	4.1	4.2	4.1	4	3.9	3.9	4	↘	↘	↘	↘	↘	↘	↘	↘	14	14	14	14	14	13	13	13
26.01.2009	13	12	10	9	12	12	8	7	↘	↘	↘	↘	↘	↘	↘	↘	4.3	4.9	5.4	5.8	5.8	5.7	5.5	5.1	↘	↘	↘	↘	↘	↘	↘	↘	13	16	16	16	16	15	15	15

Figure 25: Forecast for the weather at sea by the Internet portal for the area around Mehdiya

Morocco - Rabat, Lat: 34.03, Lon: -6.84, Zeitzone: GMT+ [Detail / Karte], Archiv erhältlich: 09.01.2006 - 22.10.2009

GFS	Windgeschwindigkeit (Knoten)												Windrichtung												Welle (m)												Wellenrichtung												Wellenperiode (s)											
	01h	04h	07h	10h	13h	16h	19h	22h	01h	04h	07h	10h	13h	16h	19h	22h	01h	04h	07h	10h	13h	16h	19h	22h	01h	04h	07h	10h	13h	16h	19h	22h	01h	04h	07h	10h	13h	16h	19h	22h	01h	04h	07h	10h	13h	16h	19h	22h												
19.01.2009	6	6	8	8	12	13	13	16	↗	↗	↗	↗	↗	↗	↗	↗	4.2	4.2	4.3	4.5	4.7	4.8	4.9	4.8	↘	↘	↘	↘	↘	↘	↘	↘	16	16	16	17	17	17	17	17																				
20.01.2009	14	10	10	16	16	17	12	14	↗	↗	↗	↗	↗	↗	↗	↗	4.8	4.6	4.5	4.6	5	5.4	5.7	6	↘	↘	↘	↘	↘	↘	↘	↘	16	16	16	16	16	16	16	16																				
21.01.2009	13	13	13	11	10	7	7	6	↘	↘	↘	↘	↘	↘	↘	↘	6.1	6.1	6.2	6.1	6.1	6.1	5.9	5.8	↘	↘	↘	↘	↘	↘	↘	↘	16	16	16	16	16	16	16	16																				
22.01.2009	7	7	10	10	12	10	13	12	↗	↗	↗	↗	↗	↗	↗	↗	5.5	5.3	5	4.7	4.4	4	3.8	3.6	↘	↘	↘	↘	↘	↘	↘	↘	16	16	16	16	16	15	15	15																				
23.01.2009	15	14	13	16	14	13	12	11	↗	↗	↗	↗	↗	↗	↗	↗	3.4	3.3	3.2	3.1	3.1	3	3	3	↘	↘	↘	↘	↘	↘	↘	↘	15	15	14	14	13	13	13	13																				
24.01.2009	10	11	12	11	6	6	6	3	↗	↗	↗	↗	↗	↗	↗	↗	3	3	3.1	3.2	3.3	3.3	3.5	3.7	↘	↘	↘	↘	↘	↘	↘	↘	13	13	13	13	13	13	13	14																				
25.01.2009	9	9	13	12	13	13	14	13	↗	↗	↗	↗	↗	↗	↗	↗	3.9	4.1	4.2	4.2	4.1	4	3.9	3.9	↘	↘	↘	↘	↘	↘	↘	↘	14	14	14	14	14	14	13	13																				
26.01.2009	12	11	9	9	11	11	7	6	↗	↗	↗	↗	↗	↗	↗	↗	4.2	4.8	5.4	5.8	5.8	5.7	5.6	5.4	↘	↘	↘	↘	↘	↘	↘	↘	13	16	16	16	16	15	15	15																				

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Figure 26: Forecast for the weather at sea by the Internet portal for Rabat

The north-westerly winds would supposedly persist only from the morning of 20 January to late evening on 21 January 2009, after which the wind would turn south-west again. Wind speeds of about 16 kts (equivalent to 5 Bft) were predicted for 19/20 January 2009 and of about 14 kts (equivalent to 4 Bft) for 21 to 26 January 2009, while for the area around Asilah wind speeds exceeding 20 kts were forecast from 23 January 2009. The forecast coincided with the information that the crew of the TAUBE received from Germany by telephone. It is unclear whether the skipper also took account of the predicted wave heights and, in particular, the wave periods, which could provide insight on the swell (see sub-para. 6.2.3).

If the crew of the TAUBE paid preferential attention to the wind forecast, they had three options:

1. Extend the stay in Larache for an indefinite period to wait for longer lasting wind conditions
2. Set sail on 21 January 2009 at approximately wind speed 4 if the forecast had materialised by that time in order to then be able to sail against the wind during the crossing or use the engine
3. Set sail immediately.

After consultation, a decision was made to set sail, which due to the tide took place at night on 19 January 2009. Prior to that, the skipper used the port handbook to inform himself, inter alia, about the approach to Mehdiya. It is unclear whether he was familiar with the signals that indicated port closure or the respective signalling system sites. What is certain, is that the TAUBE must have directly passed both of the port signalling systems (permanent red beacons) when sailing out of Larache. The exact time that the ports of Larache and Mehdiya closed could not be established by the BSU. However, since the TAUBE set sail at night, it is assumed that the signals had already been put into operation by that time.

Despite these signs, the mood on board at the beginning of the journey was described to the BSU as not being one of concern, but rather one of confidence. This changed only when – as already discussed in sub-para. 4.2.2 – the majority of the crew was suffering from seasickness below deck and the weather conditions visibly deteriorated.

### 5.7.3.2 Approach to the Sebou estuary

The TAUBE reached the Sebou estuary on 20 January 2009 at about 1700. As already discussed, the crew members considered whether to continue sailing to Rabat or whether it would be better to head for Mehdia. The majority of the crew, who were exhausted from the duration of the voyage and seasickness, spoke in favour of Mehdia. The distance to Rabat would have been an additional 20 nm.

The skipper, the German female, the Slovenian female and the Danish female were below deck and did not wear life-jackets. The Austrian female in the capacity of coxswain and the two other Germans were in the cockpit with life-jackets and secured by safety lines. The estuary was not seen physically, but located by means of GPS. The following photos (Figs. 27 to 29) illustrate that the entrance is not easy to identify even at low swell and clear visibility.



Figure 27: Approach to the Sebou estuary from a distance of 2 nm





Figure 28: Approach to the Sebou estuary from a distance of 1 nm



Figure 29: Approach to the Sebou estuary from a distance of 0.5 nm



Ref.: 015/09

It was not understood that the port was closed. The corresponding signalling system is located below the radio tower, which stands out from the horizon when the visibility on the estuary is clear (see Figs. 29 till 31).

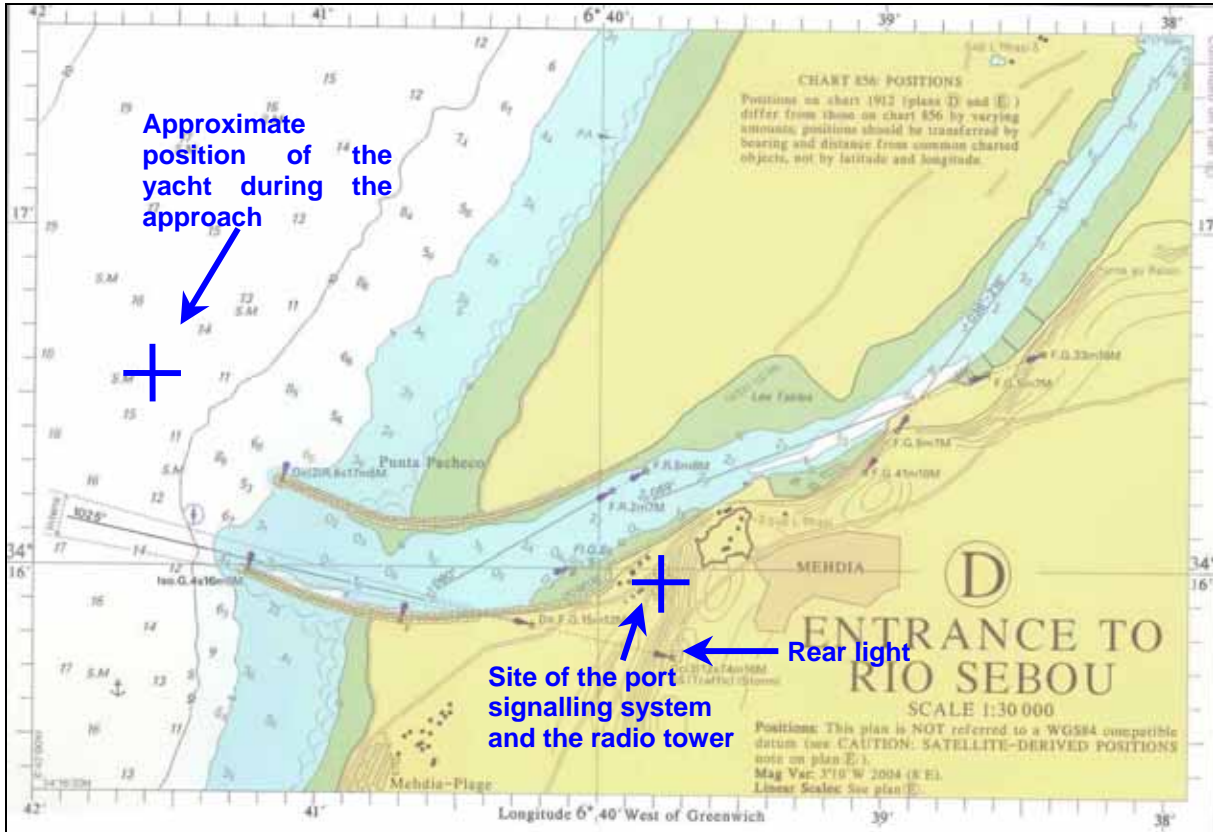


Figure 30: Excerpt from nautical chart BA 1912 with site of the port signalling system

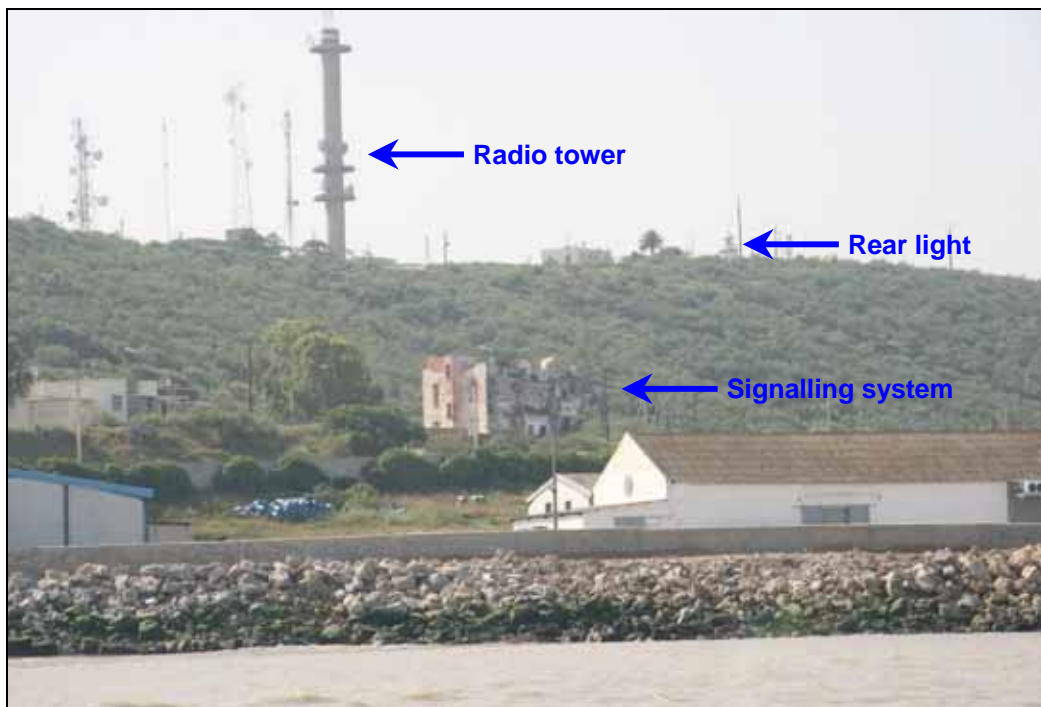


Figure 31: Radio tower and port signalling system at Mehdiya

Even up close the port signalling system is difficult to make out against the backdrop of the port authority building situated behind it (Fig. 32 and 33).



Figure 32: Port signalling system, taken close up



Figure 33: Port signalling system, details

The BSU assumes that the crew of the TAUBE was unable to discern the signalling system with the weather conditions prevalent on the day of the accident.

On board the TAUBE, the skipper informed the coxswain of the approach course (presumably 102.5°, see Fig. 30), which he was still able to recall after reading the port handbook. They failed to steer the boat onto this course on the first attempt and therefore turned. At the same time, an attempt was made in the cabin to start the engine, initially without success. The German sailor, who was also a member of the operating association, entered the cabin from the cockpit to assist the skipper in starting the engine. While doing so he removed his life-jacket.

In the second attempt they succeeded in steering the TAUBE onto the approach course and in starting the engine. The yacht was almost level with the mole-heads and the waves were approaching from aft. Immediately afterwards, a tidal surge washed over the TAUBE. A cabin window was destroyed due to the force of the wave. Sea water flooded through that and the companionway into the cabin, which was not closed with a bulkhead. The survivor and the Slovenian and Danish females succeeded in reaching the deck, from which they were swept overboard by the next wave that washed over the yacht.

The TAUBE capsized and initially drifted on her side with the sails resting on the surface of the water. The course of events that followed, in particular the search and rescue measures and the rescue of the German female, have already been discussed under sub-para. 4.2.2 and para. 4.3.

In the days following the accident, numerous items of equipment from the TAUBE, including the rubber dinghy, were washed ashore and taken into custody by the local police. In close collaboration with WSP Brunsbüttel and the BKA liaison officer in Rabat, the BSU was finally provided with details about these exhibits in November 2009. The exhibits consisted of a non-inflated life vest, a few wooden pieces, supposedly of the TAUBE (Fig. 33) and the sleeping pad used by the only survivor to swim ashore (Fig. 34).



Figure 34: Wooden pieces, washed ashore after the accident





Figure 35: Sleeping pad, used by the survivor to swim ashore

These exhibits did not provide additional information to the investigators.

## 6 Analysis

After completion of the investigation, the BSU is of the opinion that in spite of the exceptional circumstances of the sailing project the accident was generally brought about by severe weather and could also have occurred with a far more experienced crew and larger, better equipped yacht. The Sebou estuary and thus the entrance to the port of Mehdia and Kenitra are virtually unprotected on the North Atlantic coast. According to the local port authority, fatalities occur there every year, especially when fishing boats attempt to put to sea despite port closure.

The sense and purpose of the investigation by the BSU does not consist in making someone responsible for the accident involving the TAUBE. Rather, it seeks to provide a means for learning from the mistakes which – as with any accident – subsequently reveal themselves. In particular, the derived safety recommendations aim to inform other sailors and contribute to the avoidance of similar accidents.

### 6.1 Suitability of the TAUBE and her equipment

From the outset, the investigation focussed on answering the question as to whether the TAUBE was fit for performing the planned sailing project.

#### 6.1.1 Sea-going pleasure craft

The Enhancement of Maritime Safety Act (SUG<sup>11</sup>) forms the legal basis for the investigation by the BSU, excerpts of the objective and scope of which in art. 1 para. 1 are set forth below<sup>12</sup>:

The present Act serves the purpose of improving precautions and arrangements for *maritime* safety, including the therewith inextricably related working safety of those employed on board *sea-going ships* as well as the protection of the marine environment, through the conduct of investigations, (...) into incidents that have caused damage or danger. (*Emphases added by BSU.*)

Accordingly, competence of the BSU in the case of the TAUBE presupposes that the yacht was a sea-going pleasure craft and thus a sea-going vessel within the meaning of the SUG. Pleasure craft are defined in various acts as "water crafts that are built and used for sports and recreational purposes"<sup>13</sup>. The TAUBE is indisputably a pleasure craft within that meaning. Indeed, the co-sailors were encouraged to make a contribution to the on board cash box, but only to cover the costs incurred for boat and provisions. Contrary to the operating associations initial plans, larger sums did not have to be paid for sailing on the yacht because the Atlantic crossing was

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<sup>11</sup> Act to improve maritime safety through the investigation of marine casualties and other incidents of 16 June 2002 (BGBl. [Federal Law Gazette] I p. 1815, 1817 No. 35/2002), last amended by art. 15 para. 114 of the 'Gesetz zur Neuordnung und Modernisierung des Bundesdienstrechts' (Act to Reform and Modernise Federal Civil Service Legislation) of 5 February 2009 (BGBl. I p. 160 No. 7/2009).

<sup>12</sup> Informal translation.

<sup>13</sup> See, inter alia, art. 1 para. 1 p. 1 of the German Maritime Pleasure Yachting Navigating Licences Ordinance and art. 2 (1) of the Maritime Pleasure Yachting Ordinance.

postponed indefinitely. Hence, the TAUBE was not used commercially, but purely privately for recreational purposes.

On the issue of distinguishing a pleasure craft from a sea-going pleasure craft, in 1988<sup>14</sup>, the then Federal High Court of Enquiry into Maritime Casualties found that:

- Sea-going vessels are vessels that are fit and intended for use at sea and are also used regularly for that purpose.
- Pleasure craft must at minimum be fit for sailing safely on navigable maritime waterways as well as in estuaries and coastal sea areas during ordinary sea and weather conditions.
- Ordinary sea and weather conditions are considered to be those under which pleasure craft are regularly operated.

In that respect, the Federal High Court of Enquiry into Maritime Casualties limited it to a wind speed of 5 Bft ('fresh breeze') and sea state 4 ('moderate waves, spray'). It was shown that in terms of her design the TAUBE was fit for sailing in such wind and sea conditions. After all, she was used without difficulty for months in European coastal waters, sometimes even in challenging weather conditions. The operating association of the TAUBE also intended that she should be used as a sea-going vessel for in the context of the sailing project she was to sail both in coastal waters as well as on the open sea. Accordingly, she was used on German navigable maritime waterways as well as in international coastal sea areas from the outset.

For further definition, in line with the German Maritime Pleasure Yachting Navigating Licences Ordinance as well as the guidelines and building regulations of the classification society Germanischer Lloyd, the Federal High Court of Enquiry into Maritime Casualties stated that:

- Sea-going pleasure craft must have an engine drive of at least 3.68 kW (equivalent to 5 HP).
- They must have a watertight deck and closed cabin structure; if a cockpit is fitted, this must be self-draining.
- The length overall must be not less than 6.2 m.

Since the TAUBE was not rediscovered after she capsized, it was not possible for the BSU to investigate her structural properties in more detail. However, it is clear that she met the above three criteria formally. Therefore, the TAUBE was to be generally classified as a sea-going pleasure craft, even if experienced sailors would have certainly tended to use her on inland waterways because of her low freeboard and presumably for that type of boat inappropriately designed sail area. This was compounded by current operating limitations due to engine problems and the penetrated hull.

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<sup>14</sup> Verdict of the Federal High Court of Enquiry into Maritime Casualties on 21 January 1988 regarding the pleasure craft 'PIRAT'.

### 6.1.2 CE marking

Pleasure craft which enter the market of the European Community after 15 June 1998 may only be put into operation in Germany if they bear the European CE marking<sup>15</sup>. This marking is appended by the manufacturer and confirms that the pleasure craft and its components are conform to all the basic requirements and assessment procedures set forth in European legislation.

The TAUBE did not require a CE marking because she was already in operation in the 1970s. Anything else would have applied only if she was modified so extensively by the rebuilding and restoration work that she would have had to be considered 'new'. The film footage of the restoration work on the ex THUN suggests that although the boat underwent provisional repairs, no significant changes were made.

The seller of the TAUBE was not in possession of technical documentation for the ex THUN. Furthermore, in the absence of a CE marking there was no so-called 'Owner's manual'<sup>16</sup>, from which the most important properties of the boat, such as maximum load capacity, could have been derived. Before purchasing the boat, the operating association arranged for her to be inspected by, inter alia, the later deceased skipper and considered her to be fit for the transatlantic sailing project. In hindsight, that assessment is astonishing, not least because of the clear language used in the contract of sale, in which the boat was described as non-buoyant and only being fit for handiwork. The catalogue of defects listed in the contract makes the severity of the necessary repairs so apparent, that when viewed objectively it seems impossible that these defects could be repaired without skilled workers and largely without materials. The operating association took a total of six weeks to complete the repair work (20 August to 8 October 2007). No funds were available to extend the repair period because then the usual shipyard rent would have been due. Although the TAUBE was buoyant again at the end of six weeks, it is the opinion of the BSU that her operating state was not appropriate for her to perform the planned sailing project (see sub-para. 6.1.4).

### 6.1.3 Yacht's equipment

Minimum carriage requirements exist internationally<sup>17</sup> for sea-going pleasure craft built after 30 June 2002, regardless of whether the vessels are used privately or commercially. For the TAUBE however, a sea-going, privately used pleasure craft

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<sup>15</sup> See art. 3 of the Regulation on the commissioning of pleasure craft and personal watercraft as well as the leasing and commercial use thereof in coastal areas (Maritime Pleasure Craft Ordinance Sea).

<sup>16</sup> See EN ISO Norm 10240:2004 as well as art. 3 para. 1 Tenth Ordinance to the Equipment and Product Safety Act (Ordinance on the Bringing into Circulation of Recreational Craft- 10th GPSGV) of 9 July 2004 (BGBl. I p. 1605) in conjunction with Directive 94/25/EC of the European Parliament and of the Council of 16 June 1994 on the approximation of the laws, regulations and administrative provisions of the Member States relating to recreational craft (OJ L 164, 30.6.1994, p. 15).

<sup>17</sup> See 14th SOLAS-Amendment Ordinance to SOLAS (International Convention for the Safety of Life at Sea), chapter V.

below 150 GT<sup>18</sup> built in 1971, only limited carriage requirements applied<sup>19</sup>:

- Official or non-official versions of nautical charts and sailing directions
- Logbook
- Steering compass
- Means for taking bearings

Moreover, other safety-related equipment (such as life-jackets, lifebuoy and distress signal devices) must be carried on pleasure craft according to the principles of the ordinary practice of seamen to the extent required by good seamanship or the situation. According to the German Federal Ministry of Transport, Building and Urban Development (BMVBS), the ordinary practice is given the same legal relevance as the traffic and carriage regulations.<sup>20</sup>

The TAUBE's equipment was the result of a compromise between limited financial capacity and the sense of responsibility of the association members. The financial resources of the operating association were virtually exhausted with acquisition of the TAUBE. Therefore, a replacement engine was just as inconceivable as the acquisition of appropriate sails or a life raft. Nonetheless, attempts were made to equip the yacht adequately for the sailing project. The BSU learned from discussions with boat chandlers that the safety aspects of the project were addressed in detail in advance. The skipper and other association members personally held, inter alia, several discussions with a chandler regarding life-jackets. These also included practising repair and maintenance of the jackets. The jackets were provided as a material donation. In addition, the association used its own funds to acquire the EPIRB, which ultimately transmitted the emergency signal on the day of the accident. It is clear from the email correspondence of the operating association that this acquisition was considered to be overpriced but necessary.

In contrast, the TAUBE was insufficiently equipped with nautical charts and handbooks. The BSU is not of the opinion that the TAUBE carried all the necessary nautical charts. The described travel preparation suggests that the copied paper nautical charts were used to gain an overview at most, because they were essentially relying on entering the next port of call into the portable GPS device. The latest information on port entrances and contour lines was thus barely available to the crew of the TAUBE.

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<sup>18</sup> According to estimations by BSU the TAUBE had a Gross Tonnage (GT) of 5 to 6.

<sup>19</sup> See SOLAS 2001 Chapter 5 Regulation 12 (c) and art. 13 para. 1 (2) (a) and art. 5 para. 3 of the German Ordinance for the Safety of Seagoing Ships of 18 September 1998 (SchSV; BGBl. I p. 3013, 3023), both in conjunction with section C.I.4 of annex 1 to art. 5 of the SchSV.

<sup>20</sup> See brochure of the Federal Ministry of Transport, Building and Urban Development (BMVBS): Sicherheit auf dem Wasser – Wichtige Regeln und Tipps für Wassersportler (Safety on the Water – Important Rules and Tips for Water Sport Enthusiasts), p. 15.



The BSU was not able to ascertain unequivocally which handbook was used on the TAUBE, although quite a number of indicators suggest that it was an outdated edition of the Handbook for the West Coast of Africa issued by the BSH. This assumption is based on the following factors:

Both the latest issue of the BSH handbook and the corresponding official publication of the British Admiralty Service ('Africa Pilot Volume I') at the time of the accident explicitly refer to the sites and the signalling for the port of Larache. Since the port of Larache is said to have been closed due to the weather on 19 January 2009, it can be assumed that both signalling sites (see Figs. 22 and 23) were displaying the corresponding signal (permanent red beacons) when the TAUBE set sail that night. This information was added to the BSH handbook as part of a subsequent amendment. Therefore, if the TAUBE was sailing with an outdated amendment of the German handbook, the skipper would have had no way of obtaining this information when researching the port of Larache. However, it is equally possible that a current or a completely different handbook was used and the information contained therein was simply overlooked.

Moreover, had the German handbook been used on board, the statement already discussed in sub-para. 4.1.1 regarding the fact that the port of Mehdia always closes when the sea state reaches 5 to 6 must have given cause for concern. According to the Beaufort scale, sea state 5 applies in deep ocean water such as the Atlantic from wave heights as low as 2 m. The wave heights of 4.5 to 5 m at Mehdia forecast on the Internet portal were considerably higher than that benchmark.

Hence, up-to-date handbooks coupled with careful voyage preparation could have helped to prevent the accident.

The radio on board was not in operation on the day of the accident. The skipper did not possess a radio certificate. Had contact been established by radio before approaching Mehdia, it may have been possible to learn of the port closure. Excepting advice to weather it out off the coast, assistance would not have been possible by radio. Shore-based assistance could not reach the TAUBE because of the sea conditions.

#### **6.1.4 Seaworthiness of the TAUBE**

It is generally accepted that a ship is seaworthy if the hull material is in all likelihood able to withstand the dangers of the proposed voyage with the specific charge. This principle applies to both commercial shipping and pleasure craft.

For privately operated pleasure craft such as the TAUBE, which bear neither a CE marking nor are subject to the effective international SOLAS regulations, no mandatory structural requirements and therefore no official monitoring exist either in Germany or elsewhere in Europe. However, international and European standards have been established, the observance of which the BSU explicitly recommends to

all owners of sea-going pleasure craft, especially when use of the boat extends beyond short sailing trips in coastal waters.

The international safety guidelines<sup>21</sup> introduced for regattas by the Offshore Racing Congress (ORC, formerly the Offshore Racing Council), a voluntary standard on the yachts' construction, equipment, personal protective equipment and training, are advisable irrespective of participation in a regatta. Reduced to its general requirements, it provides important suggestions for both novices and professionals on how the safety of a vessel and her crew can be improved. The guidelines were summarised by the Cruiser Section of the German Sailing Federation (DSV) in German and – like the British ORC guidelines – can be downloaded on the Internet free of charge<sup>22</sup>. The 'Sicherheit auf dem Wasser' brochure by the BMVBS also provides sailors with information on operating their pleasure craft safely<sup>23</sup>.

It remained unclear whether and to what extent the association members studied the information set out above before the start of the sailing project or on what basis they planned the repair and equipping of the TAUBE. The operating association did not answer corresponding questions asked by the BSU. It would have been helpful for the investigation to learn whether measurements and calculations regarding the maximum load capacity, the freeboard<sup>24</sup> and the capsizing angle were carried out.

Since the wreck of TAUBE was not available for more in-depth measurements, the BSU was unable to carry out its own calculations. The details available, such as length overall, hull width and draught are not reliable enough to determine, for instance, the maximum load capacity. With regard to the displacement, information differs between 3 t (recorded in the International card for pleasure craft) and 3.5 t (stated by the skipper to a witness). Therefore, assessment of the seaworthiness of the TAUBE was performed on the basis of photographs and information from witnesses. Figures 19 and 20 illustrate the low freeboard of the TAUBE, estimated to a maximum of 50 cm, upon sailing out of the penultimate port before the accident. The sail area could not be determined by the BSU. There are apparently no photographs that show the TAUBE under sail.

A lack of detailed information prevented the so-called light displacement of the yacht, i.e. the unladen weight plus normal load, from being determined.

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<sup>21</sup> ISAF (International Sailing Federation) Offshore Special Regulations 2008/9

<sup>22</sup> ISAF Special Regulations: <http://www.sailing.org/specialregulations.php>; in German by the Cruiser Section: [http://www.kreuzer-abteilung.org/Public\\_PDF/5520.PDF](http://www.kreuzer-abteilung.org/Public_PDF/5520.PDF)

<sup>23</sup> See <http://www.bmvbs.de/publikation-,302.1913/Sicherheit-auf-dem-Wasser-Leit.htm>; see also para. 6.4.

<sup>24</sup> See European Norm (EN) ISO 14946: Small craft - Maximum load capacity

In addition to the unladen weight, the light displacement<sup>25</sup> includes the weight of the engine and batteries, the mast, the boom and the spars, all the standing and running rigging as well as the attached sail. The light displacement is a key factor for determining the maximum recommended load capacity. Here, the entire load of the mass of the pleasure craft is included in the light displacement to determine from which additional load weight the stability, freeboard and buoyancy of the pleasure craft are no longer sufficient. The ISO norm for the maximum load capacity (ISO 14946:2001) applies a fixed 75 kg per person on board plus added weight for basic equipment, supplies and cargo, consumption fluids (fresh water and fuel) and the dinghy.

The BSU assumes that basically neither the light displacement nor the maximum load capacity were calculated for the TAUBE before the start of the sailing project, which is in fact not mandatory for boats that do not require CE marking. However, this information would have assisted the skipper in deciding the number of co-sailors the TAUBE could accommodate before she was overloaded and thus not seaworthy for the next sailing trip. The BSU is, without any specific calculation hypotheses, of the opinion that in the end the TAUBE was regularly overloaded and thus in all probability not seaworthy, especially when crossing the Strait of Gibraltar with ten crew members, but also on the last sailing trip from Larache to Mehdia with seven. From the information provided by witnesses, it is obvious that those on board the TAUBE were quite aware that she was overloaded. After all, they joked about the at times insufficient rescue equipment, had to stow luggage on deck because there was no room in the cabin and there were not always enough beds available.

The BSU cannot understand how the skipper was able to assume that the TAUBE was seaworthy on the day of the accident. After all, the boat was carrying seven crew members along with luggage and provisions. Here, the freeboard must have been less than 50 cm. That the TAUBE sailed in Europe several times with such a load without encountering problems was not authoritative for the planned trip along the west coast of Morocco. The sea conditions along the African North Atlantic coast differ considerably from those of European coastal waters, because the swell is usually the dominant wave type. The plan was to sail for at least 60 nm to Mehdia and possibly even 80 nm to Rabat in wind force 5 and with wave heights of between 3 and just over 5 m. The crew was not given a safety briefing and was – apart from the other association member – inexperienced in sailing. In addition, only five days earlier in Asilah there was water ingress in the engine compartment, after which they provisionally sealed the penetrated hull. These indications suggested that it was unlikely that the TAUBE would be able to withstand the usual hazards associated with the voyage. Under certain circumstances, they may have succeeded in riding out the strong wind and swell off the coast. However, the BSU assumes that a scheduled approach to the port of Rabat would have failed in the same way as it would have with Mehdia, since wave heights of 6 m were also forecast there.

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<sup>25</sup> See European Norm (EN) ISO 12217:-2:2002: Small craft - Stability and buoyancy assessment and categorization, Part 2: Sailing boats of hull length greater than or equal to 6 m

## **6.2 Suitability of the crew of the TAUBE**

The BSU is of the opinion that the ever changing composition of the crew and the absence of a clear hierarchy on board the TAUBE were ultimately disastrous. In itself, the capsizing was primarily due to the sea conditions in that area and to that extent was independent of the crew's sailing experience. However, the decisions to sail out of Larache and into Mehdia were the result of sailing inexperience, lacking hierarchy on board and insufficient knowledge of the area.

### **6.2.1 Sailing experience**

#### **6.2.1.1 Skipper**

The skipper of the TAUBE passed the Pleasure Craft Skipper's Licence - Sea on his first attempt in March 2007. The practical test only includes sailing under engine, but not under sail. Sailing in theory and practice is tested to a greater degree in the scope of the Pleasure Craft Skipper's Licence (Power/Sail) Inland or the Coastal Sailing Skipper's Licence, both of which the skipper did not possess, but which were as well not required for the sailing project involving the TAUBE. From a purely legal standpoint, one single skipper in possession of the Pleasure Craft Skipper's Licence - Sea was sufficient for the project. The skipper acquired the practical experience in dealing with the TAUBE through 'learning by doing' in the months before the accident. As already discussed, after several months of practice, he sailed the TAUBE from one port to another safely even under demanding weather conditions at sea. This may have led to a confidence in his ability to sail, which viewed from the outside was unjustified.

Even at the planning stage of this ambitious project, the skipper as co-initiator of the project was advised of the unsuitability of the TAUBE and an untrained crew by third parties. Warnings were given both before the boat was purchased and later by sponsors and sailors with many years of experience. Numerous witnesses reported that impassioned discussions were held with the skipper; however, he always remained – most recently in the port of Asilah – intransigent.

The BSU considers that it must have been difficult for the skipper to see his ambitious project being criticised by other sailors. After all, they subsequently succeeded in circumnavigating central and southern Europe without major difficulties, in spite of many believing that neither the TAUBE nor the skipper would be capable. In retrospect, it is clear that the skipper had gathered experience on the sailing trip, but still demonstrated considerable gaps in knowledge and experience. The port closures were not recognised, i.e. the beacons were either overlooked or incorrectly interpreted, especially in Larache. The importance of providing the entire crew with a safety briefing was not recognised, nor was the importance of donning life-jackets at the moment they set sail. The substantial differences in the development of swell between the European and the North African coast seem to have been unknown. Otherwise, under the prevailing weather at sea sailing for the unprotected ports of Mehdia or Rabat should have been rated infeasible from the outset.

The skipper was lacking in the knowledge and experience required for a thorough and judicious assessment of the sailing options before sailing out of Larache. The fact that the skipper raised the centre board just before the yacht capsized is also to be seen against this backdrop. Indeed, this reflected the general procedure on the TAUBE for approach manoeuvres, but it was a fatal decision in this specific situation in the port entrance of Mehdia. However, the BSU assumes that the TAUBE would have probably capsized with or without the centre board lifted. The tidal surges were so powerful that even with the centre board the overloaded TAUBE would have had little to resist them. From a sailing perspective, lifting the centre board reduced the lateral plane and thus had a detrimental effect on manoeuvrability. The information from witnesses, according to which the TAUBE began to roll immediately after the centre board was raised, corresponds with that. According to the port authority of Kenitra, the centre board did not have to be raised for the navigation corridor to the south of the bar in the estuary.

#### **6.2.1.2 Crew**

Excepting the other association member, the crew of the TAUBE was not experienced in sailing. Even though the Austrian female in particular is said to have exhibited a certain skill in handling the boat, a stay of 18 days on board without specific instruction cannot be sufficient for any more than maintaining the course. In particular, the crew could not recognise beacons and sea markers nor assess the safety aspects of the sailing trip or the required amount of travel planning. The TAUBE therefore had more passengers on board than actual crew members. The original plan to sail with a regular crew, who was to teach itself sailing in theory and practise, had been abandoned. Most of the crew members on the last voyage of the TAUBE had neither the time nor the interest to tackle the issue of sailing or prepare for the sailing trip. The respective stay on board was too short for that.

According to information from witnesses, the skipper made no secret of his limited sailing experience. However, the fellow travellers were reportedly neither concerned by that nor did they attempt to obtain information themselves in order to be able to understand the decisions of the skipper. One exception to this was the decision in Larache to set sail, where at least two crew members attempted to inform themselves of the sea conditions. However, they lacked the necessary knowledge about the interaction between swell, wind sea and current to be able to realistically interpret what they saw and derive conclusions for the travel planning. Ultimately, as with the other co-sailors, they trusted the judgement of the skipper.

The BSU is of the view that a lack of risk awareness is the reason that most of the crew did not display a greater level of interest in their own safety on board and planning the route. Their interest seemed to be confined to establishing the next port of call. Everything else was left to the skipper and the other association member. Information suggests that doubts first began to emerge among the co-sailors on the voyage in which the accident occurred, when four of them were seasick and the skipper was exhausted. In spite of that, they did not find it necessary to don the life-jackets.

This lack of sailing experience ultimately led to the crew overruling the skipper during the decision on sailing for Mehdia. The crew was not aware that at the time sailing for the port entrance was far more dangerous than weathering it out off the coast.

### **6.2.2 Hierarchy on board**

From a legal standpoint, the skipper of a pleasure craft is responsible for his crew and the vessel. For this reason, a clear hierarchy is essential even for private leisure cruises, in particular, for safety-related manoeuvres that require a rapid relaying of commands without prior discussion. Even if decisions are, where necessary, jointly discussed in advance, the skipper must still have the final word. That applies even more in a situation such as the one on board the TAUBE, where ultimately only two people possessed sailing experience. In retrospect, it is no longer possible to determine why the skipper of the TAUBE allowed himself to be overruled in terms of sailing for Mehdia in spite of the heavy surf. The BSU considers it likely that the skipper's level of exhaustion was already too high at that time to endure weathering it out virtually alone with the other association member. Almost all the others were no longer capable because of seasickness.

### **6.2.3 Knowledge of the area**

To be able to approach unprotected ports along the Moroccan Atlantic coast, sufficient knowledge of the prevailing particular conditions of the weather at sea there was essential. In that respect, the BSH Handbook for the West Coast of Africa states the following on page 113<sup>26</sup>:

"Along the West African coast, swell is usually the dominant wave type. The speed at which the swell waves approach increases with the size of their wave period. Even a low but long swell on the open sea can produce surf of considerable height on entry into shallow water. Therefore, the swell surf on the coast of West Africa is of particular relevance for shipping. (...) A common manifestation in the area of the Moroccan coast is a medium to long swell from western to northern directions. (...) Between Mehdia and Cape Cantin (Mehdia, Rabat, Casablanca, El Jadida) the swell, and correspondingly the surf, is most frequently at its strongest from north-west and west-north-west."

Reference is made to the following on page 207 with respect to the Sebou estuary:

"The bar in the estuary can usually be crossed between two hours before and two hours after high tide. (...) Bar signals are shown on Msella Hill: (...). The approach into the estuary is difficult because of the changing bar. The most favourable channel with the greatest water depth does not always run along the leading light lines. Aft swell and surf in strong westerly winds make it difficult to steer. The entrance is generally closed when the sea state reaches 5 to 6."

The BSU assumes that the skipper of the TAUBE did not realise the full extent of this particular danger. Otherwise, he would have had to follow the example of the other sailor from Tangier or Asilah and remain in port.

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<sup>26</sup> Informal translation.

When attempting to enter the Sebou the waves were approaching from aft of the TAUBE. Whether she was first raised or immediately over-rolled by tidal surges is irrelevant to the findings of the investigation. What is certain, is that the TAUBE was exposed to precisely those difficult conditions (north-westerly winds and a long swell from aft, which had been building up for days) referred to in the handbook. Under those conditions, it was virtually impossible to withstand the approach manoeuvre intact.

#### **6.2.4 Ordinary practice of seamen and safety regulations for water sport enthusiasts**

Under the given conditions (amateurish repairs, incomplete equipment, crew without sailing knowledge or training, skipper with little experience) the sailing project of the TAUBE could hardly have met the applicable German safety regulations.

Legislation provides for minimum rules of conduct even for the operation of pleasure craft, the observance of which should be a matter of course for every informed sailor. The regulations stipulate, inter alia, the following:

Every person taking part in shipping traffic shall, in particular, take any precaution as may be required by the practise of good seamanship or by the special circumstances of the case<sup>27</sup>.

"Whoever uses a ship for marine navigation shall be obliged to ensure its safe operation and in particular to see to it that it is kept, together with its accessories, in a reliable condition, that it is navigated safely and that the necessary arrangements are made for the protection of third parties and of the marine environment against the dangers emanating from its operation. This shall also include that persons entrusted with these tasks within the shipping company and on board the ships are effectively selected, guided, instructed, observed and supported<sup>28</sup>."

"Whoever uses a ship for marine navigation shall ensure that sources of danger that arise while operating ships are inspected, that knowledge acquired during operation as well as other important related information and documents including the records kept by persons charged with operating ships are analysed as part of the precautionary efforts for safety, and that the necessary measures are taken to prevent and limit hazards<sup>29</sup>."

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<sup>27</sup> See art. 3 para. 1 (2) of the German Traffic Regulations for Navigable Waterways (SeeSchStrO), informal translation.

<sup>28</sup> See art. 3 (principle) of the Ship Safety Act (SchSG), informal translation.

<sup>29</sup> See art. 2 (self-regulation) of the Ship Safety Ordinance (SchSV), informal translation.



Regardless of that, every water sport enthusiast is bound to observe the 'Ten Safety Rules for Water Sports'. These safety rules are an integral part of training to acquire the official Pleasure Craft Skipper's Licence - Sea. They are:

1. Assess your skills and abilities correctly.
2. Familiarize yourself with the characteristics and equipment of your vessel.
3. Equip your vessel with appropriate safety equipment.
4. Inform yourself about the seafaring area you intend to visit.
5. Instruct yourself on the prevailing and forecast weather and sea conditions.
6. Instruct your crew members and passengers on the safety precautions on board.
7. Take steps to prevent people from falling overboard and review methods for rescuing people overboard.
8. Never leave a safe mooring in fog.
9. Stay away from commercial shipping whenever possible.
10. Always keep a proper lookout.

Many of the duties of care and safety regulations listed above were either not or not sufficiently put into practise on board the TAUBE. Personal skills and the handling characteristics of the TAUBE were overestimated. In particular, the TAUBE was generally not designed for voyages in heavy weather and most certainly not for the originally planned Atlantic crossing. There were insufficient financial resources for a life raft. Information on the area was not available on the scale required. The co-sailors did not receive a safety briefing, while practising – for example, also in the rapid opening of an inserted safety line – could have saved lives. In general, life-jackets were not worn and on the day of the accident only issued to those situated in the cockpit. Under the prevailing conditions of the weather at sea, the BSU is of the view that it was crucial for everyone to wear the self-inflating jackets from the beginning of the sailing trip.

### **6.3 Planning and execution of the sailing project by the association**

The planned sailing project to promote mutual understanding between peoples was the reason Migrobirdo, the association, was founded. The association purchased two boats for that purpose, of which the TAUBE was the first to be used for the project.

The association used the Internet and information events to advertise for material donations from an early stage. Management of the donations was conducted professionally, i.e. standard letters were created and regular contact was also maintained with the sponsors after donations were received. The equipping of the TAUBE was essentially organised by the future skipper.

After the accident, the remaining committee and association members cooperated with the BSU only to a limited extent. Overall the information that the association was able to provide was largely not very specific. For example, the voyage could be traced by locality, but not by date. No information was given regarding the restoration works and the safety preparations. Crew lists were not available at the premises of the association in Tübingen. The BSU considers that it is imperative for any operating

association of a sea-going vessel on a long term sailing trip to always be informed as to the current crew and location as far as modern means of communication permits this. It should certainly be noted that the association to which the TAUBE belonged was not managed full-time by its members who did not participate in the voyage. However, it should be ensured for emergencies that rescue services and relatives can be provided with information regarding the crew (number, name, place of residence) and the last port of departure as well as the next planned port of call.

#### **6.4 Legal uncertainties as regards required equipment and duty of care**

The marine casualty involving the TAUBE gave rise to ascertain what information is available to novice and experienced sailors with regard to equipping pleasure craft to the extent necessary for a voyage and the responsibility of the skipper.

Both international and national regulations do not provide for exhaustive lists or the like for good reason. The requirements vary too much for that depending on the type of boat, area and type of use (private, commercial), duration of the trip as well as the composition of the crew. A multitude of regulatory documentation is freely available on the Internet. However, the BSU considers that the comprehensibility and readability of the legal requirements could be improved. For pleasure craft such as the TAUBE, for which inter alia the Ordinance for the Safety of Seagoing Ships was authoritative, excerpts of arts. 5 and 13 are set out below<sup>30</sup>:

Art 5 para. 3 SchSV:

Whereas the international regulations within the meaning of sections A and C of the annex to the Ship Safety Act apply to a vessel bearing the German flag, this vessel must also observe the respective provisions set forth in section C of annex 1.

Reference to the Ship Safety Act pertains in this context to the applicability of generally accepted international rules and norms (section A of the annex to SchSG; including SOLAS, International Convention on Load Lines, International Convention on Tonnage Measurement of Ships) as well as international directives and standards, on which specific regulations and norms set out in section A must be based (section C of the annex to SchSG). Moreover, art. 5 para. 2 SchSV as well as art. 13 SchSV, which was applicable for the TAUBE, also refer to section C of annex 1 to the SchSV. Excerpts of art. 13 SchSV are set out below:

Art 13 para. 1 SchSV<sup>31</sup>:

The owner of a ship bearing the flag of Germany is responsible for ensuring that

1. (...)

2. The following documents are always available on the bridge:

a) the official versions of nautical charts and sailing directions required for each voyage within the meaning of section C.I.4 of annex 1; for pleasure

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<sup>30</sup> Informal translation.

<sup>31</sup> Informal translation.

craft within the meaning of the German Maritime Pleasure Yachting Navigating Licences Ordinance, it is sufficient if non-official versions are carried on board,

(...)

However, excerpts of the regulation in section C.I.4 of annex 1 to SchSV read as follows:

C.I.4. to chapter V of the annex to SOLAS

1. Details of compliance for vessels with a gross tonnage of less than 150 GT

1.1 (...)

1.2 (...)

2. Navigating equipment requirements for pleasure craft

On large pleasure craft within the meaning of art. 2 (2) of the Maritime Pleasure Yachting Ordinance of 29 August 2002 (BGBl. I p. 3457) with a gross tonnage of less than 150, which are exclusively not used commercially for sports and recreational purposes, regulation V/18 applies for the navigating equipment carried in accordance with sub-paras. 2.1.1, 2.1.4, 2.1.5 and 2.1.7 of regulation V/19 of the annex to the SOLAS Convention.

In this case, references to the SOLAS regulations also frustrate the readability and comprehensibility of the content of the provision. After reading the relevant SOLAS regulations, interested pleasure craft skippers would scarcely be able to familiarise themselves with the items of equipment listed above under sub-para. 6.1.3. Do familiarise oneself for boats like the TAUBE one would need the SOLAS version effective prior to the 1 July 2002.

Both the BMVBS and numerous lobbies representing sailors have released their own publications because of the complexity of the legal requirements. These are intended to inform sailors of carriage requirements and rules of conduct in a concise and simplified form<sup>32</sup>. Here, the official publication of the BMVBS 'Sicherheit auf dem Wasser' focuses on newly built vessels rather than older ones. For example, according to SOLAS, minimum equipment includes a radar reflector or transponder, which under legislation is not a mandatory requirement for boats such as the TAUBE.

The BSU considers it relevant to safety and important for every sailor to be able to obtain information on carriage requirements and rules of conduct in an intelligible form. The frequent incorporation of international regulations and standards in German regulatory documentation by the legislator is certainly complicated by the multiplicity of norms and the amendment thereof. However, when updating the regulations it would be desirable to refrain from cross-referencing in as far as possible.

The BSU has already pointed out the problems regarding the complexity of carriage requirements for pleasure craft during the investigation into the sinking of SY ALLMIN (investigation report 203/04, published on 1 October 2005). Even the German

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<sup>32</sup> By way of example, see also the publication by the Cruiser Section of the DSV, 'Seemännische Sorgfaltspflichten', which can be downloaded at [http://www.kreuzer-abteilung.org/Public\\_PDF/5521.PDF](http://www.kreuzer-abteilung.org/Public_PDF/5521.PDF).

Bundestag addressed this subject matter and requested the German Federal Government back in May 2007<sup>33</sup>:

- To merge the regulations for sport and pleasure craft used in sea areas
- To revise the existing mandatory carriage standards in order to gain clear and concise requirements. Additionally, an information campaign prepared and launched in collaboration with associations should promote the compliance with voluntary safety standards.

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<sup>33</sup> Bundestag printed paper 16/5416, II. sections 6 and 12; informal translation.

## **7 Safety Recommendation(s)**

The following safety recommendations shall not create a presumption of blame or liability, neither by form, number nor order.

### **7.1 Owners and skippers of sea-going pleasure craft**

The Federal Bureau of Maritime Casualty Investigation recommends that owners and skippers of sea-going pleasure craft observe the relevant carriage requirements and rules of conduct. The seaworthiness of the pleasure craft must be verified before every sailing trip and careful voyage planning carried out. That includes examining whether the equipment carried is appropriate for the planned sailing trip. Current information on the area and weather at sea must – if available – be obtained from the local harbour master's office before setting sail. Furthermore, the crew must be given a safety briefing before setting sail.

### **7.2 Operating associations of pleasure craft**

The Federal Bureau of Maritime Casualty Investigation recommends that operating associations of pleasure craft maintain regular contact with their boats to the extent possible using common means of communication so that in the event of an emergency it is possible to provide information as to the vessel's approximate position and the composition of the crew on board to rescue services and relatives.

### **7.3 Co-sailors and passengers**

The Federal Bureau of Maritime Casualty Investigation recommends that co-sailors and passengers on pleasure craft familiarise themselves with the safety precautions on board before setting sail. If this information is not volunteered by the skipper, it is recommended to actively inquire thereafter.

### **7.4 Federal Ministry of Transport, Building and Urban Affairs**

The Federal Bureau of Maritime Casualty Investigation recommends that, to improve the comprehensibility of safety-related equipment requirements for pleasure craft, the BMVBS work towards making the regulatory documentation comprehensible for everyone by using concise formulations.



## 8 Sources

- Witness reports:
  - the survivor of the accident,
  - committee members of the association,
  - co-sailors during previous trips on the TAUBE,
  - the skipper of the French yacht,
  - harbour master in Kenitra, Larache and Kappeln,
  - shore-based witnesses to the accident,
  - shipyard employees,
  - employees of companies which supported the TAUBE with material donations,
  - engine manufacturer,
  - relatives of the victims.
- International card for pleasure craft of the TAUBE
- National database entry of the TAUBE
- Information from the Gendarmerie Royale (Kenitra) and the harbour master in Larache
- Situation reports (SITREPs) from MRCC Rabat and MRCC Bremen
- Investigations, witness interviews and reports in particular by WSP Brunsbüttel, the liaison officer of the BKA in Rabat, the police in Cologne, WSP Friedrichshafen and the Austrian LKA in Tyrol
- Charter of the operating association of the TAUBE and excerpt of the association register
- Internet video by the operating association showing the repair of the TAUBE
- Internet blogs of the operating association
- Photographic documentation of the TAUBE and the ex THUN
- Contract of sale for the TAUBE
- Receipt for the marine radio
- Association correspondence
- Technical product information sheets for the Farymann marine diesel engine
- Weather expertise by the DWD
- Official German 'Handbook for the West Coast of Africa'
- Official British Sailing Directions 'Africa Pilot Volume I'
- Official British 'Admiralty Tide Tables Vol. 2'
- Unofficial 'North Africa' sailing directions by the Royal Cruising Club Pilotage Foundation
- Official British paper nautical chart BA 1912 in various amendments

All satellite images were created using NASA World Wind.