



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

Investigation Report 314/03

Marine Casualty

**Serious back injury of a passenger on board
HSC HALUNDER JET
on 11 October 2003
on the Elbe estuary/German Bight**

3 May 2004

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

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

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1 Summary of the maritime casualty

On Saturday, 11 October 2003, the high speed craft (catamaran) HALUNDER JET sailing under German flag was proceeding from Hamburg via Wedel and Cuxhaven to Heligoland.

The vessel had already left Cuxhaven and was on the way to Heligoland when at about 12.15 h¹ one of the passengers left her seat, despite the heavy weather and the instructions by the crew not to do so. When the vessel dived into the sea again, the lady fell and sustained a serious back injury.

The ship's crew provided first-aid while HALUNDER JET continued on its way to Heligoland.

Upon arrival at Heligoland at 13.29 h the accident victim was admitted to the local hospital there for further medical treatment.

¹ All times stated in the report are local time, Central European Summer Time (CEST) = UTC + 2 h

2 Scene of the accident

Nature of the incident: Marine casualty
Date: 11 October 2003
Time: approx. 12.15 h
Location: Elbe estuary/German Bight, River Elbe fairway outbound, between buoys Elbe 6 and 4
Latitude/Longitude: $\phi 54^{\circ}00.7'N$ $\lambda 008^{\circ}17.5'E$

Excerpt from the sea chart 87, BSH

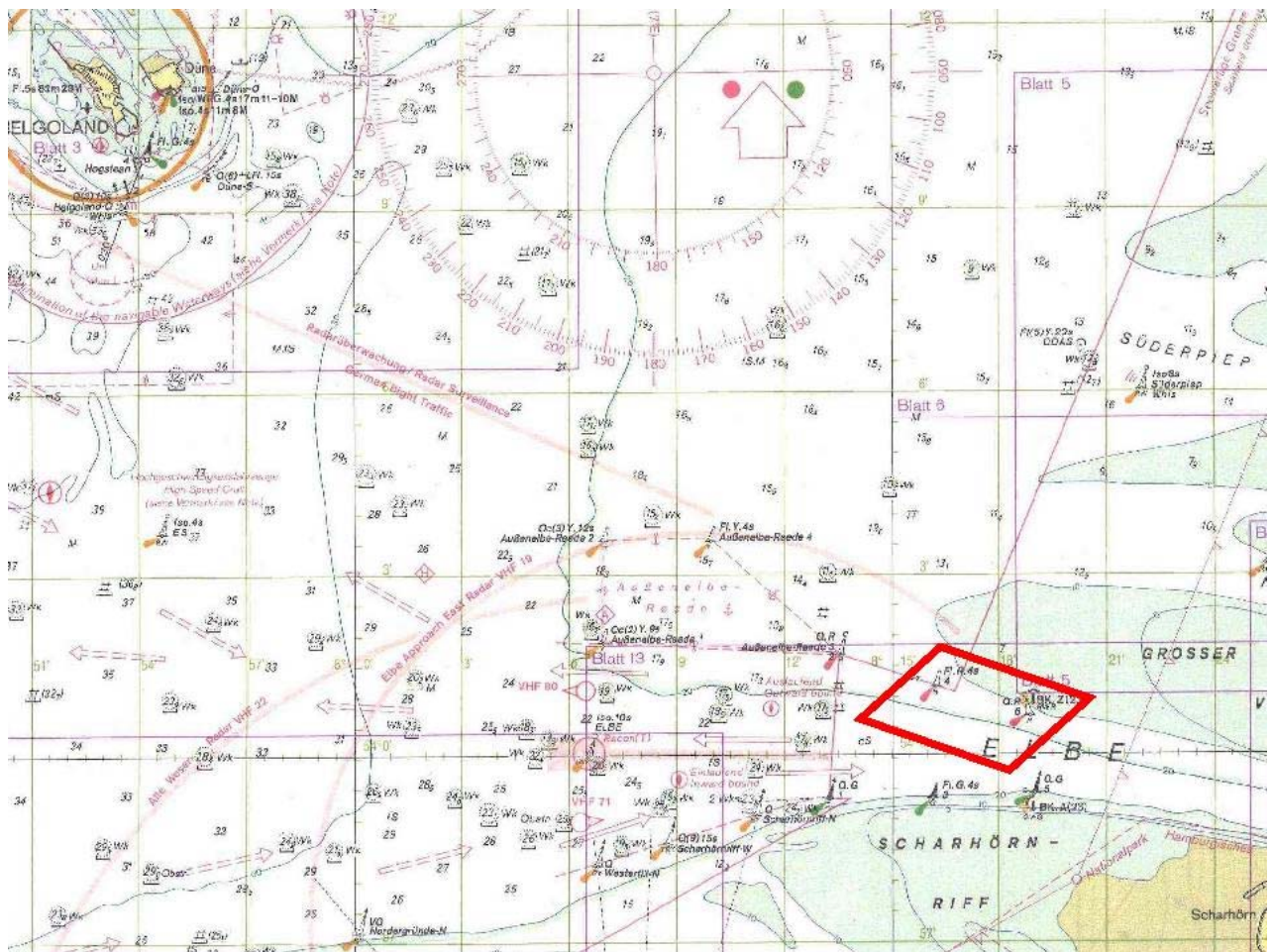


Figure 1: Scene of the accident

3 Vessel particulars

3.1 Photo



Figure 2: HSC HALUNDER JET

3.2 Particulars

| | |
|-------------------------------|--|
| Name of vessel | HALUNDER JET |
| Type of vessel | High Speed Craft-Passenger B (catamaran) |
| Nationality/flag | Federal Republic of Germany |
| Port of registry | Hamburg |
| IMO number | 9281671 |
| Call sign | DHFW |
| Operator | Förde Reederei Seetouristik GmbH & Co. KG, Flensburg |
| Year built | 2003 |
| Building yard/building number | Fjellstrand AS, Norway/Nb. 1670 |
| Classification society | Germanischer Lloyd |
| Length overall | 51.0 m |
| Width overall | 12.3 m |
| Draft at time of accident | 2.6 m |
| Gross tonnage | 910 gt |
| Deadweight | 80 t |
| Engine rating | 6960 kW |
| Main engine | 4 x MTU 12 V 4000 M 70 |
| Speed | 33 kn |
| Number of crew | 5 + 5 Stewards (min. if passengers on board) |
| Number of passengers | 579 (max.) |

4 Course of the accident

4.1 Statement by the Master and the Chief Mate

Before departing from Hamburg on 11 October 2003 various weather reports had been obtained, all of which reportedly predicted west to north-west winds at wind forces 6 to 7 Bft and a significant wave height of 2.5 m to 3.5 m.

At 11.27 h HALUNDER JET had left Cuxhaven after a scheduled intermediate stop with 312 passengers and 13 crew members. At 12.00 h the Chief Mate had called upon the passengers by public address system to take their seats and pointed out that the open decks would be barred since the vessel would be moving violently. The purser had issued a similar announcement.

From about buoy 4 on the Elbe estuary there had been an extremely steep, choppy sea with a significant wave height of approx. 3 m, mainly from the westerly direction. The wind force had been 7 to 8, in gusts up to 9 Bft. The wave height at the time of the accident had been 3 m to 3.5 m.

From about 12.05 h up to arrival at Heligoland at 13.29 h HALUNDER JET had pitched and rolled heavily. The shipboard management had reduced the speed to 5 kn and tried to evade the very high waves.

At about 12.15 h the Chief Mate had been called to an injured person on the main deck. The lady lying on the ground and complaining of pains in her back had said that she had fallen against an armrest when the vessel dived into the sea. The lady had been covered with blankets, but had not been moved further because of her back injury. An emergency physician and ambulance had been ordered for arrival at Heligoland and the accident victim had been disembarked there after the vessel arrived at 13.38 h.

Subsequent questioning by the shipboard management of the lady's daughter travelling with her revealed that the accident victim had got up from her seat intending to find a quieter seat. In doing so she had fallen.

4.2 Testimony by the daughter accompanying the accident victim

The mother and daughter had sailed for Heligoland with the HALUNDER JET from Hamburg, St. Pauli Landungsbrücken, at 09.00 h on 11 October 2003.

Safety instructions had been received.

The sea had been rough, but not too bad on the River Elbe. After passing Cuxhaven there had been an announcement that passengers should remain seated. The waves had got worse and the panorama windows had been constantly flushed by water.

Because of the heavy weather both the mother and the daughter had had to hold themselves fast on the tables in front of their seats in the first row on the main deck.

The mother, who suffered from a valvular heart disease, had looked very ill. Worried about the health of her mother, the daughter had suggested moving to other seats. When the sea appeared to be sufficiently calm first the daughter and then the mother had stood up. There had been nothing in the aisle on which they could hold themselves fast. During the first or second step the vessel had moved suddenly and both of them had fallen. While nothing had happened to the daughter, her mother had fallen on or against an armrest.

The mother had been covered with a blanket and informed by a crew member that the rescue service at Heligoland had been notified.

HALUNDER JET had reached Heligoland at about 14.00 h and paramedics had taken over the care of her mother, who had been taken into a hospital.



Figure 3: Seats on the main deck
HALUNDER JET

4.3 Weather conditions

On 11 October 2003 a west-north-westerly wind of constant direction was blowing in the sea area of Heligoland between 09.00 h and 14.00 h at average strengths of 6 to 7 Bft and gusts of consistently 8 Bft, with individual shower gusts of strength 9 Bft.

Under these wind conditions it was possible for a wind sea to develop with significant wave heights of 2.5 m to 3 m and periods of about 6 s. At the same time there was a swell of approx. 2 m of height with periods of about 8 s from the northwest. The significant wave height of the sea resulting from the wind sea and the swell was 3.5 m in the sea area of Heligoland during the relevant period, and the maximum individual wave height to be expected was 6 m to 7 m.

For the area Cuxhaven up to about the position of Scharhörn a significant wave height of 2 m to 2.5 m could be expected, and for the area Scharhörn to Lightship Elbe 1 a height of 2.5 m to 3 m.

4.4 Voyage route

During the season from 5 April to 26 October 2003 HALUNDER JET travelled along a scheduled route Hamburg-Cuxhaven-Heligoland and back. The total length of the route from Hamburg to Heligoland was 91.1 nm, the planned travel time 3 hours and 38 minutes. The leg Cuxhaven to Heligoland was 35.8 nm and the expected travel time 1 hour and 18 minutes. Apart from the manoeuvre times at Cuxhaven and Heligoland and the speed-restricted area at the buoy Heligoland 1, an average speed of 33 kn was generally travelled on this leg.

The maximum permissible speeds depending on the prevailing significant wave height were specified as follows in the Route Operating Manual:

| Significant wave height | Maximum permissible speed |
|-------------------------|----------------------------|
| up to 2.2 m | 33.5 kn |
| 2.2 – 2.5 m | 28 kn |
| 2.5 – 3.0 m | 24 kn |
| 3.0 – 3.5 m | 21 kn |
| 3.5 – 4.0 m | 18 kn |
| above 4.0 m | seek shelter at slow speed |

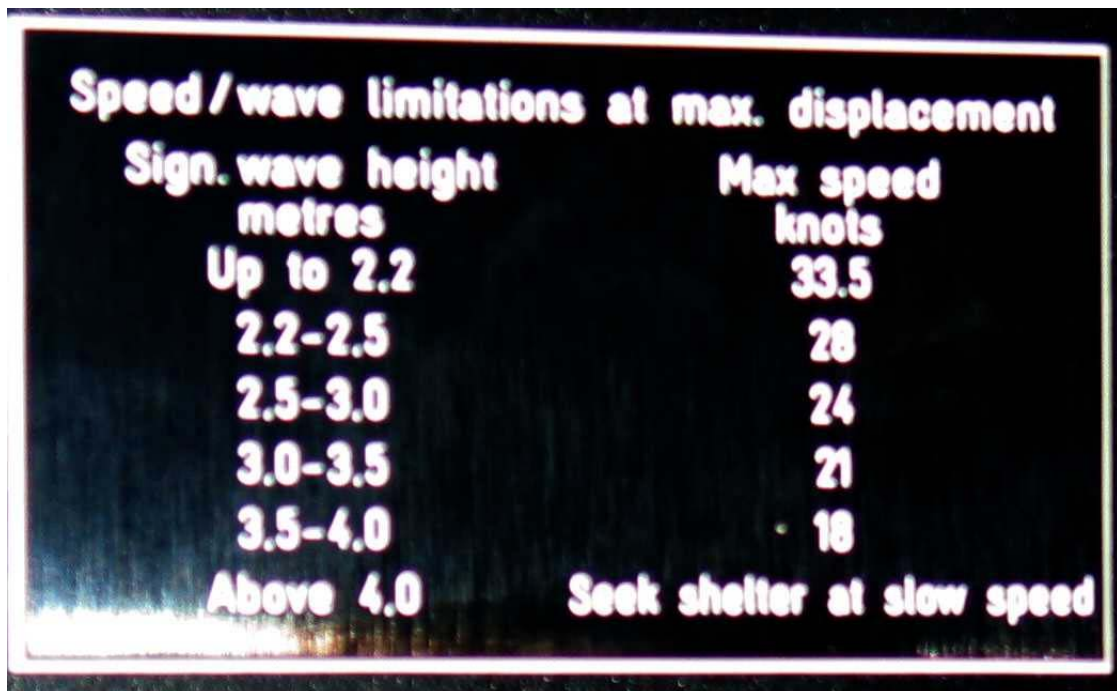


Figure 4: Speed/wave height limitations
Plate on the bridge of HALUNDER JET

On 11 October 2003 the total voyage from Hamburg to Heligoland took 4 hours and 29 minutes, and the leg Cuxhaven to Heligoland took 2 hours and 2 minutes. At the time of the accident the speed had been reduced to as slowly as 5 kn. In deviation from the normal route the vessel did not leave the Elbe fairway at buoy Elbe 6 with a north-north-westerly course to Heligoland. In order to keep clear of the edge of the sea at Grosser Vogelsand, HALUNDER JET only left the Elbe fairway at the easterly border of the Elbe estuary roads between buoys Elbe 4 and 2.

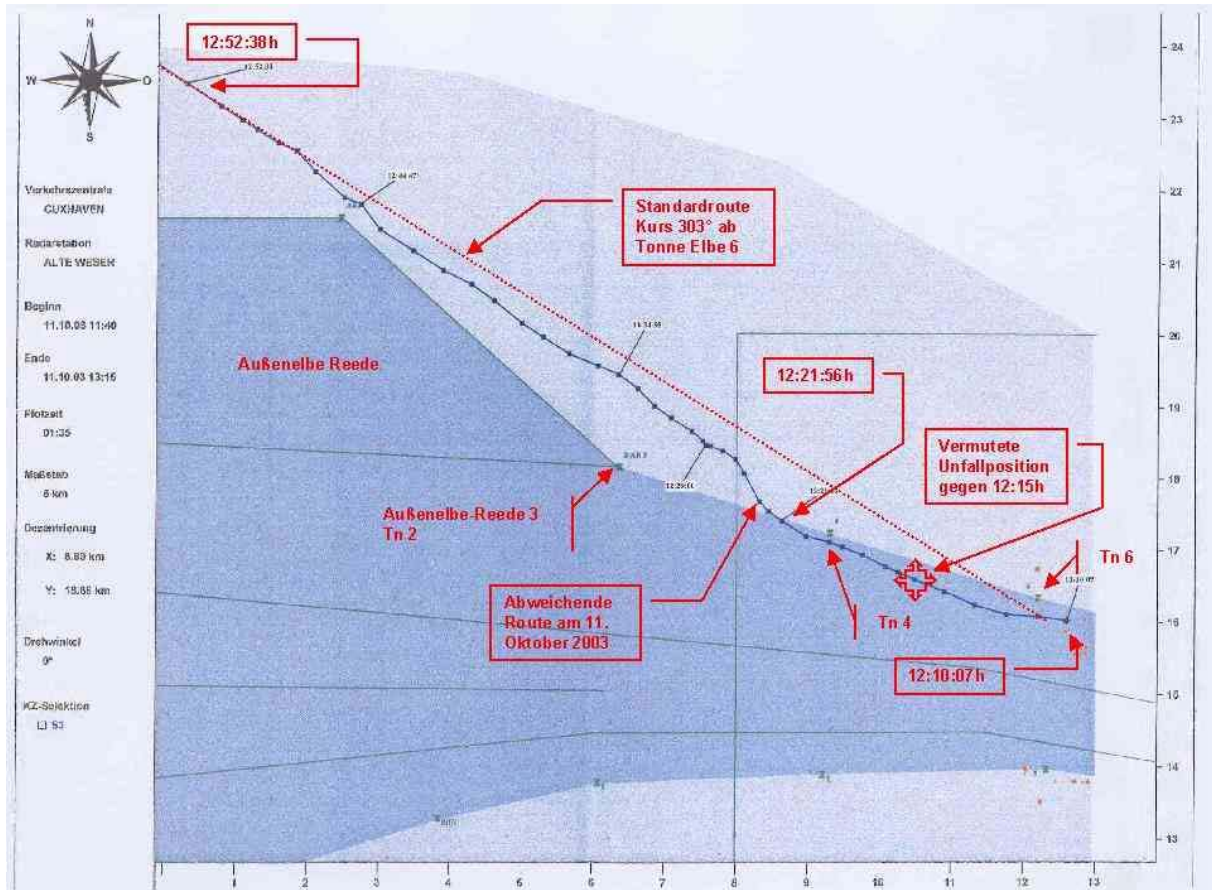


Figure 5: Deviating voyage route
 from buoy Elbe 6
 Radar plot VTS Cuxhaven, radar station Alte Weser
 from 12.10.07 h to 12.52.38 h

5 Summary of the damage

In the accident on the main deck of the high speed craft HALUNDER JET in the Elbe estuary/German Bight on 11 October 2003 at about 12.15 h a passenger sustained a severe back injury and had to be admitted for in-patient treatment at the Paracelsus-Nordseeklinik after arrival at Heligoland. The daughter of the injured, who also fell, was not hurt.

A further passenger sustained a minor injury to the right eyelid resulting from a bounce with a folding table fitted in front of the seats as a result of HALUNDER JET diving into the sea. Her contact lens was also damaged by the bounce, but nothing is known about in-patient treatment of the injury. No further personal injury had been reported.

Roughly at the same time as the accident, the shackle of the starboard mast stay broke on the vessel. Intake of a water-air mixture into the water jets caused by the pitching and rolling led to excessive heating of the exhaust gas, the starboard engine was running slowly. As a result of the unfavourable weather conditions HALUNDER JET lost approx. 1 hour on the transit from Hamburg to Heligoland. No further damage to property was sustained on the vessel or by its equipment.

No other vessels or marine structures were involved in the incident, and there was no damage to the marine environment.

6 Analysis

The high speed craft (HSC) HALUNDER JET was classified by Germanischer Lloyd. The certificates required by the International Code of Safety for High Speed Craft, 2000 (HSC Code 2000) for operating a high speed vessel (High Speed Craft Safety Certificate and Permit to Operate High Speed Craft) had been issued by the safety organisation See-Berufsgenossenschaft (SeeBG) and were valid.

6.1 Organisational measures in bad weather

The two inner decks of HALUNDER JET (main deck and upper deck) were divided into four passenger salons and licensed for carrying a maximum of 579 passengers. No limitation of the number of passengers in case of bad weather being expected was stipulated.

On 11 October 2003 one purser and seven service staff were responsible for looking after the 312 passengers on board after leaving Cuxhaven. On the basis of the experience gained up to this time, the shipboard management could at its discretion issue an additional bad weather warning prior to leaving Cuxhaven when extreme weather was expected and offer the passengers the opportunity of disembarking in Cuxhaven and embarking again for the return voyage. On the day of the accident this additional announcement was not made, since the shipboard management assessed the prevailing weather situation as difficult, but not as extreme. The requests by the shipboard management to the passengers required in accordance with Section 4.2.4 HSC Code 2000 to remain seated for their own safety were issued by the Chief Mate via public address system at about 12.00 h. The purser repeated the announcement and the service staff additionally instructed the passengers directly not to leave their seats. Furthermore, the service staff were to be the contact persons if necessary to provide any first aid and to replace sick bags on the spot, in order to ensure that none of the guests had to leave a seat. Active escorting of passengers leaving their seats was not provided for.

Leaving of the seat contrary to the bad weather warnings issued by the crew, which was confirmed by all participants, and without requesting support from the service staff is considered to be the root cause of the accident. In particular with consideration given to the low number of staff in the passenger salons, the measures taken by the crew are basically considered to be sufficient.

There was a visual information system on board as required in accordance with Section 4.2.3 HSC Code 2000 showing a text to supplement the public announcements, but on the day of the accident it was out of order. Since the announcements were ignored, it appears questionable whether an additional visual warning in the form of a text would have achieved the desired effect. Consequently the lack of this facility on the date of the accident is not to be considered as promoting the accident.

6.2 Significant wave height and vessel speed

6.2.1 Determination of the significant wave height

The significant wave height of the sea results from the wind sea and the swell. It corresponds to the arithmetical average of the upper third of the wave heights within an observation period. Individual waves can be higher than the significant wave height, and in rare cases can exceed this by 70 % to 100 %.

Forecasts obtained by the shipboard management prior to the start of the voyage served as a basis for determining the significant wave height on board HALUNDER JET. These forecasts were then compared with the current data of the sea buoys Elbe 1 and Heligoland in the internet, and via telephone with the estimates of the pilot station Cuxhaven and the pilot boats. This procedure served to clarify whether the voyage was basically feasible. During the passage the shipboard management constantly checked the significant wave height and adapted the speed of the voyage accordingly. There were no technical aids in the form additional equipment to the navigation radar on board HALUNDER JET for determining the significant wave height.

The significant wave height for the Elbe estuary area was predicted by the meteorological service Deutscher Wetterdienst (DWD) at 09.00 h on 11 October 2003 with 3 m for 12.00 h. The sea buoys Elbe 1 and Heligoland did not supply any data from 08.42 h on 10 October 2003 to 19.27 h on 11 October 2003. Consequently the shipboard management did not have any actual sea data available for comparison purposes on 11 October 2003. It had to rely on the forecasts and its own estimates of the sea state, as well as those of the pilots.

The significant wave height determined according to the official weather report by Deutscher Wetterdienst for the day, period and place of the accident in the sea area off Heligoland was about 3.5 m; the maximum individual wave height to be expected was probably about 6 m to 7 m. A significant wave height of 2 m to 2.5 m was to be expected for the area Cuxhaven to about Scharhörn, and a significant wave height of 2.5 m to 3 m for the area Scharhörn to Lightship Elbe 1.

The procedure for determining the significant wave height is not described in the Route Operating Manual, still the measures explained as carried out are considered to be basically sufficient.

6.2.2 Adaptation of speed

The maximum permissible ship's speed depending on the significant wave height was stipulated in the Route Operating Manual in accordance with Section 18.2.2.2 HSC Code 2000 (see 4.4).

| Significant wave height | Maximum permissible speed |
|-------------------------|----------------------------|
| up to 2.2 m | 33.5 kn |
| 2.2 – 2.5 m | 28 kn |
| 2.5 – 3.0 m | 24 kn |
| 3.0 – 3.5 m | 21 kn |
| 3.5 – 4.0 m | 18 kn |
| above 4.0 m | Seek shelter at slow speed |

The maximum permissible speeds were calculated on the basis of the structural integrity of the vessel. The procedure in accordance with Section 18.2.2.3 HSC Code 2000 for operating the craft under the specified limitations according to Section 18.2.2.2 related exclusively to a maximum permissible speed. No additional specifications for recommended speeds or courses against the sea or notes on special areas of the route to be considered under the aspect of the well-being of the passengers were laid down. The shipboard management knew from experience that at lower wave heights, higher speeds led to an altogether calmer motion of the HALUNDER JET. Reduction of the speed in heavier seas was not to be carried out in accordance with the specifications concerning the maximum permissible speed, but instead drastically in order to achieve a perceptible effect for the passengers. Moreover the shipboard management knew that the leg of the voyage from about buoy Elbe 8 outbound River Elbe was particularly critical due to the steep and choppy sea that builds up with westerly and north-westerly seas. The reduction of speed down to as slow as 5 kn carried out during this passage, the deviation from the normal route selected between buoys Elbe 6 and 2 (see Figure 5), and the evasion courses to avoid very high waves lay exclusively within the navigational discretion of the shipboard management. The lack of entries in the ship's logbook and the fact that the data were not saved on the Voyage Data Recorder (VDR) made investigations into the exact speed at the stated time of the accident more difficult. The analysis of the radar records of VTS Cuxhaven revealed the following speeds between 12.10 h and 12.20 h:

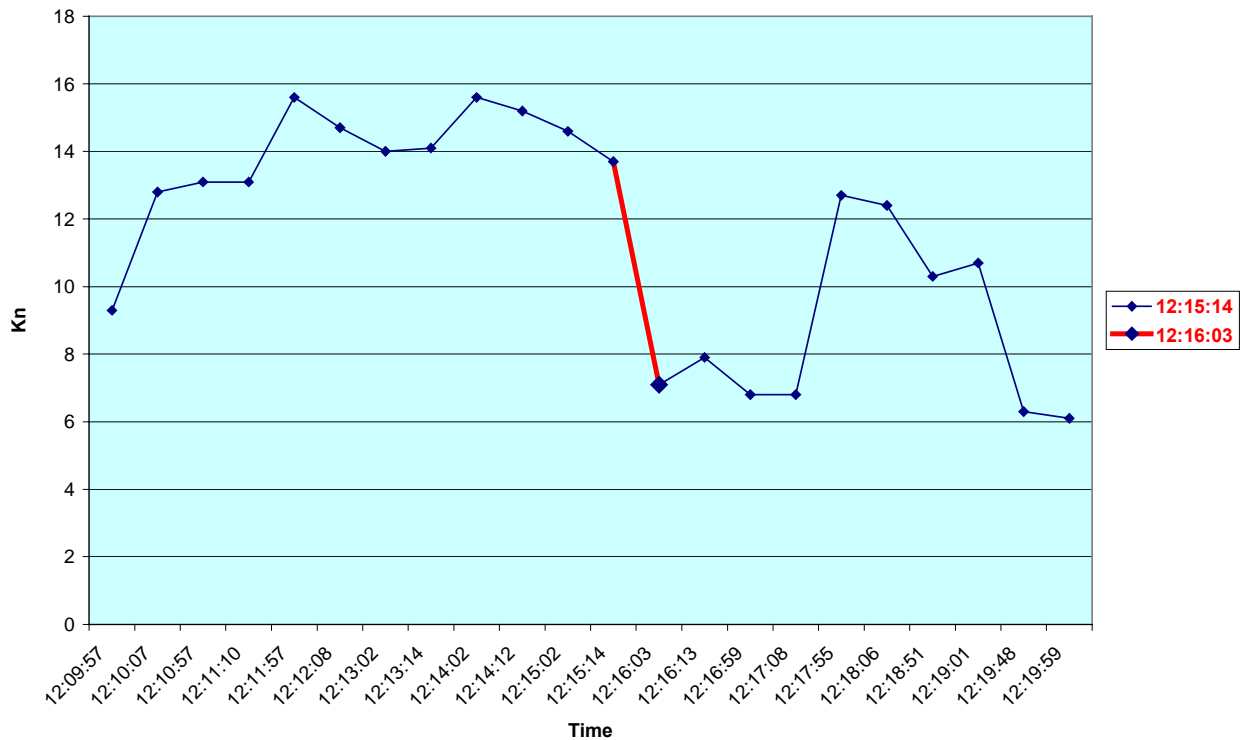


Figure 6: Speed
HALUNDER JET at the time of the accident

After leaving Cuxhaven at 11.27 h HALUNDER JET proceeded up to the buoy Elbe 10 at the usual speed for this leg of above 30 kn. A first distinct reduction of speed to about 20 kn took place between buoy Elbe 10 and passing buoy Elbe 8 at shortly after 12.00 h. According to the official meteorological expert report, a significant wave height of 2 m to 2.5 m could be expected for the area from Cuxhaven up to about Scharhörn, and from Scharhörn, off buoy Elbe 12, a significant wave height of 2.5 m to 3 m was expected. Actual sea data were not available for comparison purposes (see 6.2). The critical value for reducing the maximum permissible speed from 33.5 kn to 28 kn was at a significant wave height of 2.2 m according to the table in the Route Operating Manual. Consequently the time and place at which the speed of HALUNDER JET was reduced and the time and place at which it was expected that the critical value would be exceeded virtually coincided. At about 12.05 h a brief increase in speed to 24.7 kn was registered. At the time of the accident at about 12.15 h a clear reduction in speed from 13.7 kn (12.15.14 h) to 7.1 kn (12.16.03 h) (see Figure 6) was carried out. It was not possible to ascertain clearly whether this measure occurred directly before the accident, as a reaction to it, or completely independently of it. Finally, up to the end of the radar observations at 12.53 h speeds ranging from a maximum of 20.1 kn to the lowest speeds of 2.2 kn were recorded. At about 12.20 h the vessel left the Elbe fairway after passing the buoy Elbe 4 with a north-north-westerly course, and the shipboard management began to counter the bad weather situation with changes in course in addition to reducing speed.

HALUNDER JET arrived Heligoland at 13.29 h. The 17.2 nm from buoy Elbe 6 to buoy Heligoland 1 were covered in approx. 1 hour and 15 minutes, corresponding to an average speed of a little over 13.5 kn.

It is assumed that the visual determination of the significant wave height by the shipboard management after passing Scharhörn/buoy Elbe 12 was correct. The resulting reduction of speed during the passage up to Heligoland was partly well below the maximum speed still permissible according to the Route Operating Manual. In so far the speed factor is not considered to have triggered the accident. It was not possible to determine precisely to what extent excessive speed directly prior to the incident promoted the accident.

6.3 Possibilities for passengers to hold tight

The only opportunities for passengers to hold fast when walking round the salon were the ceiling support columns located on a level with every third or fourth row of seats on one side of an aisle, and the backrests and armrests of the aisle seats. The latter are recognised as adequate by both the safety organisation See-Berufsgenossenschaft as flag state authority and Germanischer Lloyd as classification society as fulfilling the requirements in accordance with Section 4.4.5 HSC Code 2000 for „adequate handholds on both sides of any passage to enable passengers to steady themselves while moving about“. Real hand grips were only fitted in the corridors bounded by flat walls in accordance with the specification of Germanischer Lloyd.² Whereas mounting such grips also in the seating area would involve additional hazard potentials as a consequence of exposed components. The safety organisation See-Berufsgenossenschaft voices concerns against mounting additional grips in the area of the seats, pointing out that there is no type approved seating on the market, respectively an existing type approval would be invalidated if grips were mounted supplementary.

The seats of a Norwegian manufacturer mounted in the passenger salons of HALUNDER JET had a type approval from Det Norske Veritas for use on board high speed craft. In the area of the main deck salon seats were installed with armrests defined as additional equipment in the product description of the type certificate. The necessary padding/upholstery of these armrests in accordance with Section 4.5.4 HSC Code 2000 was not subject to any particular specification and was executed with rigid foam, whereby the material satisfied the fire resistance requirements. The form and stability of the armrest frame satisfied the specifications of Annex 10, Section 2.6.5 HSC Code 2000 that “rigid parts of the seat with which the occupant may come into contact with shall present a curved surface with a radius of at least 5 mm.” Seats with additional grips that are firmly connected to the backrest with a special clamp are also offered by this manufacturer. Since there has been no request for use of these on high speed crafts so far, no corresponding type approval has yet been applied for. If appropriate it would have to be analysed in the course of the necessary type approval process what hazard potentials emanate from this design.

² for differing interpretations of the term „passage“ see also 7.1



Figure 7: Passenger seats with additional handholds
(Photo: advertisement of seat manufacturer)

The Federal Bureau of Maritime Casualty Investigation (BSU) considers it problematic to accept only the grip facilities offered by the seats without any additional handholds as sufficient for passengers to steady themselves. Due to their mounting height the armrests are without doubt basically suitable for children and relatively small persons, but not for tall persons. If the seat is occupied and the armrest is used for its original purpose, it is not available for other passengers to hold onto fast at all. The same also applies for the backrests, since if the seats are occupied there is not sufficient opportunity for other passengers to hold fast on them. Even an empty seat is only restrictedly suitable for providing passengers with a firm hold while moving about due to its upholstery fabric.

The accident victim who fell against an armrest sustained a severe back injury, while her daughter, who also fell, remained uninjured. After the fact that the persons left their seat contrary to the instructions of the crew (see 6.1), which is considered the primary cause of the accident, the lack of sufficient facilities for holding fast is considered to have promoted the accident. However, it was not assessed that the design or the padding of the armrests promoted an accident or injury.

7 Recommendations

7.1 Handholds in passages

In its Chapter 4 "Accommodation and escape measures" the HSC Code 2000 deals in Section 4.4 with the "Accommodation design ", and specifies under 4.4.5 that "there shall be adequate handholds on both sides of any passage to enable passengers to steady themselves while moving about." The term "any passage" in the original English text in Section 4.4.5 is translated with "jedes Ganges" (any aisle) at this point. In Section 4.7 "Exits and means of escape" are discussed, and it is specified in Section 4.7.13 that "corridors, doorways and stairways which form part of the evacuation paths ...". The term "corridors" used in the original English text in Section 4.7.13 is again translated with "Gänge" = "aisles" here. In the circular of the Maritime Safety Committee MSC/Circ.1102 of 15 September 2003 "Interpretations of the 2000 HSC Code and SOLAS Chapter X" it is stated as interpretation for Section 4.7.13 "Corridors, doorways and stairs" that "An aisle is a fore to aft passageway separating seating areas between seats. As such this paragraph does not apply to aisles". However, the circular does not contain any interpretation by analogy as to whether Section 4.4.5 is not to be applied for "aisles" either.

Since similar accidents might be expected during of the forthcoming season for high speed crafts in Heligoland traffic, the Federal Bureau of Maritime Casualty Investigation (BSU) has already issued the following safety recommendation before completion of the entire investigation in its letter of 5 January 2004 to the operators of such vessels, the safety organisation See-Berufsgenossenschaft and the relevant classification societies in accordance with § 15 Paras. 1 and 10 Marine Safety Investigation Law (SUG) in conjunction with § 19 Aviation Accident Investigation Law (FIUUG):

Handholds in passages: Prior to restarting operations in spring (probably at the beginning of April) 2004, Section 4.4.5 HSC Code 2000 requiring "adequate handholds on both sides of any passage to enable passengers to steady themselves while moving about" is to be implemented consistently.

After receiving the statements of the safety organisation See-Berufsgenossenschaft and the classification society Germanischer Lloyd and analysing the unclear points set out above regarding the interpretation of the relevant section of the HSC Code 2000 it appears that clarification is necessary prior to implementing measures.

The Federal Bureau of Maritime Casualty Investigation (BSU) therefore requests the Federal Ministry of Transport, Building and Housing (BMVBW) to bring about clarification in the relevant committees of the International Maritime Organization (IMO) as to whether the passages between the rows of seats in the salons of high speed crafts fall under the provisions of Section 4.4.5 HSC Code 2000 requiring „adequate handholds on both sides of any passage to enable passengers to steady themselves while moving about“. If this is the case, it should also be clarified what technical solutions are available, with appropriate consideration given to safety aspects.

7.2 Use of the Voyage Data Recorder (VDR)

The Federal Bureau of Maritime Casualty Investigation (BSU) calls on owners and operators of seagoing vessels to implement following recommendation:

The law to improve the safety of shipping by investigating maritime casualties and other incidents (Maritime Safety Investigation Law - SUG, published in the Federal Gazette 2002 Part I No. 35, P. 1815 ff.), § 1 Para. 1, serves to improve precautions for shipping safety by investigating incidents that cause damage or danger and represents the basis for the activities of the Federal Bureau of Maritime Casualty Investigation (BSU).

Incidents that cause damage or danger are defined in § 1 Para. 2 SUG. These include incidents caused in connection with the operation of a seagoing vessel which lead to human death, disappearance or severe injuries (§ 1 Para. 2, number 1).

In order to enable the Federal Bureau of Maritime Casualty Investigation (BSU) to fulfil its objective in accordance with § 1 Para. 1 SUG, according to § 5 SUG the owners of a vessel sailing under German flag must ensure that the relevant Master of this vessel is unmistakably instructed to prevent data recorded during an incident causing damage or danger from being deleted on exhaustion of the memory capacity by actuating the relevant emergency device on the Voyage Data Recorder in time.

According to SOLAS, Chapter V, Regulation 20, passenger vessels including Ro-Ro passenger vessels engaged on international trade, must be equipped with such a Voyage Data Recorder as of 1 January 2004, regardless of their age. Furthermore, other vessels engaged on international trade with a gross tonnage of 3000 or more built on or after 1 July 2002 must also be equipped with such a device. According to Article 2 Para. 1 in conjunction with Art. 10 Para. 1 and Annex II Section II Para. 1 of Directive 2002/59/EC of the European Parliament and the Council, the above specifications apply in principle for vessels on domestic voyage too. According to Annex II Section II Para. 3, however, the Member States can under certain conditions exempt passenger vessels used only on domestic voyage from the obligation to carry a Voyage Data Recorder. For the Federal Republic of Germany such an exemption rule is planned in accordance with the draft of an 11th Regulation amending regulations under commercial maritime law (Status 10 Dec 2003) to implement the Directive 2002/59/EC.³

Death or serious accidents of passengers are fundamentally to be understood as incidents causing damage or danger in the meaning of § 1 Para. 2 Maritime Safety Investigation Law (SUG).

³ according to the provisional voyage permit certificate HALUNDER JET was authorised for the region "restricted foreign travel" at the time of the accident, and accordingly a voyage data recorder was part of the compulsory equipment.

Immediate storage of the data of an existing Voyage Data Recorder⁴ for the relevant accident period is indispensable in this case, as in all other cases of incidents causing harm or danger, in order to allow a comprehensive investigation of the marine casualty to prevent future incidents of the same or a similar kind.

7.3 Course and speed in bad weather

The Federal Bureau of Maritime Casualty Investigation (BSU) recommends that operators and shipboard management of high speed crafts observe the following notes:

The seaway behaviour of a high speed catamaran is not determined exclusively by the significant wave height and the craft properties. The direction and period of the sea, that depend not only on the weather development, but also – and in the "funnel" of the Elbe estuary in particular - on the bottom topography and the currents too, as well as on the vessel's course in relation to the sea state are equally critical parameters. It is certainly possible for different speeds to be recommendable at the same significant wave height depending on the other parameters mentioned. There can be parameter configurations in which a higher speed leads to smaller movements. In most cases, however, at reduced speed at least smaller accelerations can be assumed. Furthermore the criterion of safety and welfare of the passengers must be taken into account more strongly in these considerations when implementing HSC Code 2000, alongside the criterion of structural integrity of the vessel. Practical experience gained by the shipboard management must also be taken into account and implemented here too.

Recommendations derived from this must be provided for the shipboard management in the Route Operating Manual by the vessel operator in accordance with Section 18.2.2.3 in conjunction with Sections 18.2.2.2 and 17.2.2 HSC Code 2000. Taking into account the restricted freedom of course, especially in the Elbe estuary area, it is necessary to think about a greater operating restriction than the maximum permitted significant wave height specified in the Permit to Operate High Speed Craft.

The sole competence and decision-making authority of the Master for all measures regarding ship safety and prevention of marine pollution in accordance with IMO Resolution A.443(XI) and Section 5.2 ISM Code as well as responsibility for deciding whether to stop or defer the voyage in accordance with Section 18.2.2.7 HSC Code 2000 remain unaffected by this.

⁴ according to Annex II Section II Para. 2 of the Directive 2002/59/EC of the European Parliament and the Council, freight vessels built before 1 July 2002 that call at a port in a Member State of the community must also be equipped with a voyage data recorder, as of 1 January 2007 freight vessels with 20000 GT or more, as of 1 January 2008 freight vessels with 3000 GT or more but less than 20000 GT, unless the IMO specifies any earlier dates.

7.4 Organisational measures in bad weather

The Federal Bureau of Maritime Casualty Investigation (BSU) recommends that the operators of HALUNDER JET implement the following measure:

Since the passage from Hamburg to Cuxhaven is only insignificantly affected by the sea state, there is a considerable danger of non-observation of warnings issued to the passengers already in or directly after Hamburg. The heavy weather warnings for passengers should strictly be repeated prior to departing from Cuxhaven.

When bad weather is forecast, attention should be drawn especially to the danger resulting from diving of the vessel into the sea. In addition, prior to leaving Cuxhaven passengers should be instructed for their own safety not to leave their seats until Heligoland is reached. Should it become necessary to leave a seat despite this in exceptional cases, assistance from the service personnel should be requested. After leaving Cuxhaven the service personnel should check whether all passengers are seated and confirm this to the shipboard management prior to the vessel arriving the edge of the sea at Grosser Vogelsand.

8 Sources

- Investigations by the Water Police (WSP) Heligoland
- Testimony by the daughter of the accident victim
- Written statements/comments by
 1. the shipboard management
 2. the vessel operator
 3. the classification societies Germanischer Lloyd and Det Norske Veritas
 4. the manufacturer of the seats
- Scientific paper by the Institute for Fluid Dynamics and Navigation Theory of the Technical University Hamburg-Harburg
- Sea charts of the Federal Maritime and Hydrographic Agency (BSH)
- Official expert weather report by the German Meteorological Service (DWD)
- Radar recordings by the VTS Cuxhaven
- Documents and written statement of the safety organisation See-Berufsgenossenschaft (SeeBG)