



# **STATE MARINE ACCIDENT INVESTIGATION COMMISSION**

## **FINAL REPORT 15/15**

Very serious marine casualty

### **SAILING YACHT DOWN NORTH**

Capsize and sinking of the yacht with the loss of a crew member  
in the Pomeranian Bay on 30 May 2015

**November 2016**



The investigation of very serious marine casualty of the yacht *Down North* was conducted under the State Marine Accident Investigation Commission Act of 31 August 2012 (Journal of Laws of 2012, item 1068 and of 2015, item 1320) as well as norms, standards and recommended procedures agreed within the International Maritime Organisation (IMO) and binding the Republic of Poland.

The objective of the investigation of a marine accident or incident under the above-mentioned Act is to ascertain its causes and circumstances to prevent future accidents and incidents and improve the state of marine safety.

The State Marine Accident Investigation Commission does not determine liability nor apportion blame to persons involved in the marine accident or incident.

The following report shall be inadmissible in any judicial or other proceedings whose purpose is to attribute blame or liability for the accident referred to in the report (Art. 40.2 of the State Marine Accident Investigation Commission Act).

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## 1. Facts

On 30 May 2015, at approximately 19:00 near the Greifswalder Oie Island in the Pomeranian Bay, the Canadian-flagged yacht *Down North*, sailing from Świnoujście to Oslo (Norway) engaged in a sail-training and mile-building cruise, suffered a deep heel in result of ca. 7° B windgust. Attempted manoeuvre of letting out the mainsail and bearing away from the wind failed. The yacht heeled over with its starboard side in the water and failed to right itself.

All 12 members of the crew evacuated to a life raft and a tender. Evacuation of one of the crew members unable to move independently due to disability resulting from multiple severe medical conditions, was extremely difficult. After being transported to the life raft, he suffered a cardiac arrest. He died inside the life raft despite resuscitation efforts taken by the crew.

The yacht, lying on its starboard side, took in water and sank within approximately 20 minutes. The life raft and the tender with the survivors were noticed by the German vessel *Palucca*, which took the remaining 11 persons on board and called for help by radio.

The survivors were taken from the vessel *Palluca* by the Polish SAR vessel *Pasat* and transported to Świnoujście.

Four months later, the wreck of the yacht *Down North* was lifted from the bottom of the Pomeranian Bay and towed to the port of Świnoujście, and then transported to Szczecin by land.



Photograph 1. Yacht *Down North* at Łasztownia Wharf in Szczecin. December 2015



## 2. General Information

### 2.1. Yacht Particulars

Name:	Down North
Flag:	Canadian
Owner:	DIK Mariusz Nawrot
Classification society:	vessel not classified
Vessel type:	sailing yacht - schooner
Call signal:	none
Year of build:	ca. 1980, rebuilt in 1993 and 2011/12
Power:	64 kW
Beam:	4,36 m
Length overall:	17 m hull (23 m including bowsprit)
Hull material:	steel
Minimum crew:	not specified



*Photograph 2. Yacht Down North in Svalbard waters in 2014*



## 2.2. Yacht Voyage Information

Ports en route:	Świnoujście
Port of destination:	Oslo (Norway)
Type of navigation:	high-sea
Manning:	yacht master and 11 trainee crew members
Passengers:	no passengers

## 2.3. Accident Information

Type of accident:	very serious marine casualty
Date and time of event (UTC):	30.05.2015, 19:15 LT (17:15 UTC)
Geographical position of the accident:	$\varphi = 54^{\circ} 09,3' N$ ; $\lambda = 014^{\circ} 06,2' E$
Geographical area of the accident:	near Greifswalder Oie Island
Nature of the water region:	Baltic Sea, Pomeranian Bay
Weather during the event:	wind W 4 – 5° B, sea state 2 – 3, gust 7° B, good visibility
Yacht operating state during the event:	charter cruise with trainee crew
Effects of the accident on yacht:	yacht sank

## 2.4. Shore-based Assistance and Information on Rescue Operation

Distress message was transmitted from the yacht *Down North* by manual activation of an EPIRB 406 MHz radio beacon. The first signal, received within several minutes by a geostationary satellite (GEOSAR) of the COSPAS-SARSAT system, did not allow to determine the yacht's position, since the EPIRB radio beacon had no built-in GPS receiver. The next, low-orbit satellite (LEOSAR) Sarsat-11, received a signal providing an approximate position at 20:48 LT (18:48 UTC).

At this time, the vessel *Palucca* (German flag) approached the accident site. *Palucca* crew noticed the liferaft and tender at 20:25. The vessel reached the liferaft at 20:40 and took 11 persons on board. The raft with corpse of one of the *Down North* crew member was towed alongside.

Call for medical evacuation was transmitted from the vessel *Palucca* by radio (VHF), contacting VTS Świnoujście and SAR Service in Świnoujście. The *Palucca* then headed towards Świnoujście towing the raft and the yacht's tender.



The rescue vessel *Pasat* departed from Świnoujście towards the *Palucca* to take over the 11 survivors. Another attempt of resuscitation of the person from the raft was made on board of *Pasat*, without success. At 23:35 the rescue vessel *Pasat* moored in Świnoujście.

### 3. Circumstances of the Accident

#### 3.1. Beginning of the Cruise to Polar Waters

The cruise of the yacht *Down North* commenced on 30 May 2015 in Świnoujście. The first leg was to cover the distance between Świnoujście and Oslo (Norway) where a crew change was planned. During preparation work, the future crew of the first leg of the cruise cleaned and cleared the yacht chartered for the period of 4 months, loading supplies and removing from inside and deck of the yacht ca. 200-300 kg of different items, not needed for the voyage.

Additional navigation equipment was installed (AIS transponder) and a new tender – a boat with rigid hull made of polyethylene was hanged on davits behind the stern transom. The freshwater tank was emptied, rinsed and filled with fresh water.

The yacht sailed from Szczecin to Trzebież on 29 May 2015 to fill in all fuel tanks. Maximum volume of fuel was bunkered. In the late evening on the same day, the yacht moored in Świnoujście.

Upon embarking the crew on 30 May 2015 in Świnoujście, at approximately 12:00 the crew received training on safety procedures and on handling of the yacht equipment.

At 14:40 the yacht left Świnoujście, sailing into the Pomeranian Bay, heading NW towards the Rügen Island in order to sail round the Cape Jasmund. The wind blew from SW to W with variable strength of 2 – 5° B. The yacht had been initially powered by engine, however as the wind strength allowed sailing, 5 sails were raised: mainsail, main staysail, foresail, jib and flying jib, which made up for practically full set of sails for close hauled course (Figure 1). Sailing on the port tack, the yacht reached speeds from 2 to 3.5 knots.

At approximately 18:30 – 19:00 the wind strength and continuous heel of the yacht increased. The third mate and two crew were on watch. The skipper stood on deck, near the pilot-house/navigation cabin. The remaining 8 crew members were down below. The yacht was steered from the deck station at midship.



*Figure 1. Down North's sail configuration at the time of accident*

To sail round Greifswalder Oie Island, the yacht's course was altered towards North, to a close reach. Shortly before the accident, the second mate entered the pilot house and noticed yacht speed readings of 5.7 – 6.3 knots.

No signs of approaching gust or squall were noticed on the yacht. The gust occurred at approximately 19:00. The yacht accelerated to observed 7.4 knots, increasing at the same time the heel to starboard.

The skipper started letting out the mainsail sheet and the female helmsman, on command of the third mate, put the helm hard to starboard to bear away from the wind. Upon ordering to bear away, the third mate joined the skipper to assist him with handling the mainsail sheet.

The manoeuvres taken proved to be ineffective and the yacht continued to heel to starboard, until the masts and sails touched the surface of the sea. It began to take in water, initially by the pilot-house door. It rested for some time lying on the starboard side, with sails partially immersed in water and then started to submerge, stern first.

The skipper attempted to activate the DSC alert button on the VHF radiotelephone, however the DSC VHF was already under water, since it was located on the starboard near the pilot-house door. The skipper ordered the second mate to launch the 12-person life raft from the midship and the third mate to launch the tender. The crew was ordered to abandon the vessel.

Before abandoning the yacht, the skipper activated the 406 MHz EPIRB. The hand-held VHF radiotelephone was not taken from the yacht.

After several minutes, the water level reached the centrally located midship companionway and yacht flooding accelerated significantly. The entire crew abandoned the yacht. 10 persons boarded the raft, whereas 2 persons were in the tender, equipped with an outboard engine.

After approximately 20 minutes, at 19:30 on 30 May 2015, the yacht sank and settled at the depth of 12 meters. The masts remained visible above the surface.

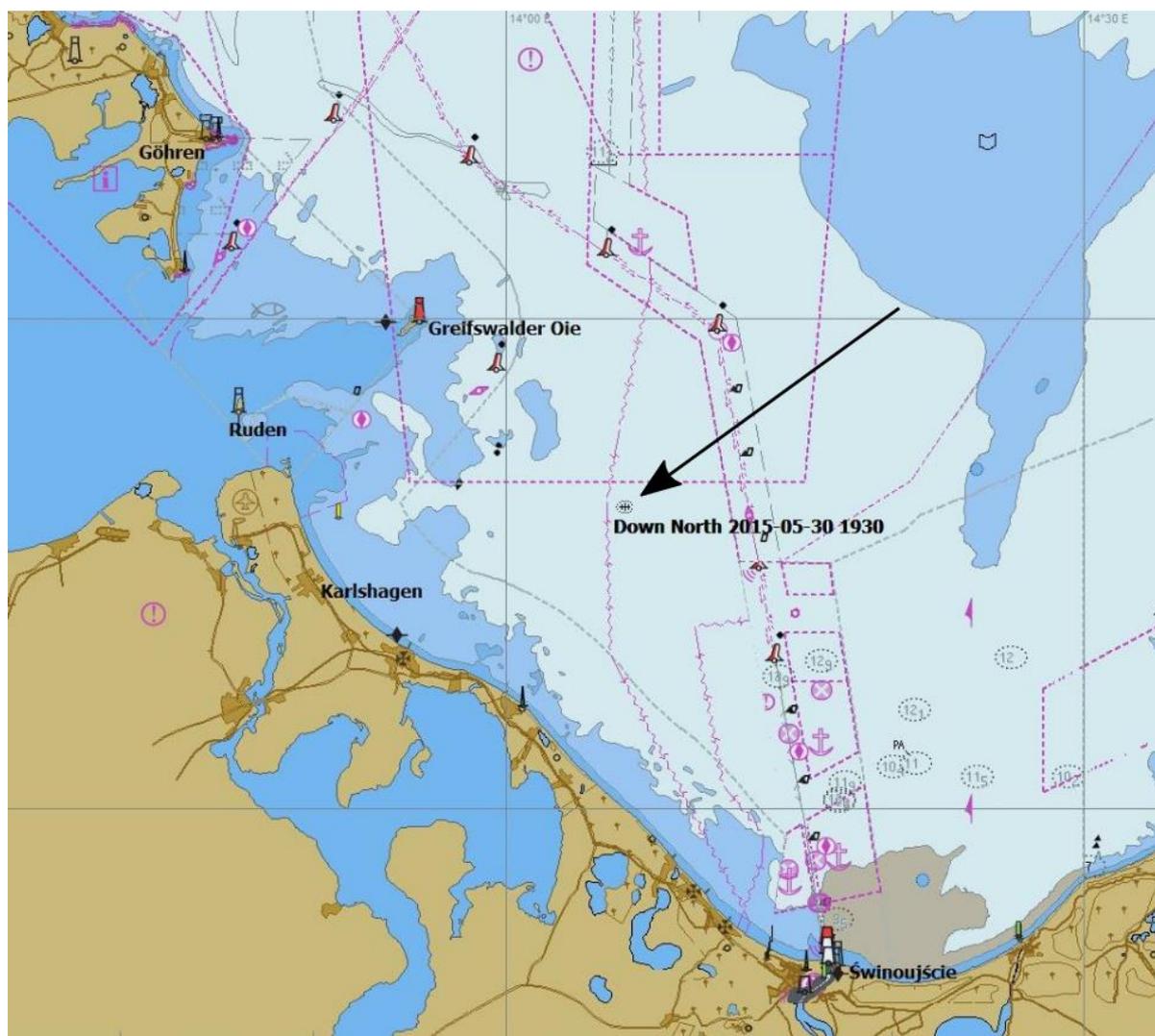


Figure 2. Position of sinking of the yacht Down North

### 3.2. Rescue Operation

Upon successful launching of the life raft, which inflated in the water near the midship, between two masts, the crew focused on placing the disabled crew member in the raft.



Leaving his berth in the bow part of the vessel and moving out to deck by a twisty route via the central companionway required an immense effort of the watch member who was transporting him due to narrow space and significant obesity of the transported person. Thanks to common efforts of several persons he was transported to the raft, which was boarded by the remaining crew members, except the third mate and one crew from the 3rd watch, who were manning the tender.

After the yacht sank, the life raft remained near the wreck, attached to it with the drouge line, which was caught in the rigging. During this time, the crew of the tender attempted to repair the steering system. This took about 40 minutes (the system was disconnected and the boat was then steered by manual turning of the motor; the equipment was new and tested by the crew before the cruise, but used in action for the first time). Until the problem was resolved, the boat drifted nearby.

In the meantime, the persons in the raft attempted to resuscitate the disabled crew member who suffered from cardiac arrest. Resuscitation and indirect heart massage by chest compression were performed. Effectiveness of these actions was reduced by obesity of the victim and lack of underlying hard surface – the victim rested upon the bottom of a pneumatic raft. Resuscitation lasting between 30 to 60 minutes was carried out until exhaustion by several crew members designated by the skipper from among the persons trained in medical rescue.

At the same time a two-masted yacht heading towards NE from the raft was noticed. A parachute rocket launched from the raft went unnoticed and the unidentified yacht sailed away without altering course.

At 20:25 the crew of the vessel *Palucca* sailing from Sassnitz to Świnoujście noticed an orange object in a distance of app. 1 Nm. The vessel turned this way and reached the liferaft and tender. The masts of the wreck were seen protruding from the water.

At 20:40 the *Palucca* approached the raft and took 11 persons on board, generally in good condition with symptoms of minor hypothermia. The survivors were given assistance, provided with hot beverages, towels, blankets and dry clothes.

The skipper of the *Palucca* notified the VTS Świnoujście by radio, reporting the casualty and requesting medical evacuation. Poor reception quality (VHF) prevented passing of information that the *Palucca* had on board survivors from the sunken yacht *Down North*.



The VTS retransmitted information received from the *Palucca* to the SAR Service (*Maritime Auxiliary Coordination Centre*) MPCK Świnoujście. The SAR vessel *Pasat* from Świnoujście was designated to support the operation.



*Photograph 3. Vessel Palucca*

At 21:00 the *Pasat* rescue vessel left Świnoujście port. After 45 minutes it met the *Palucca* heading towards Świnoujście with survivors and upon radio consultation with the MPCK inspector it launched the fast rescue boat *R2* to ferry the people over, then lifted the *R2* boat, raft and yacht's tender on deck. On board of the *Pasat* another attempt of resuscitation of the lifeless crew member was taken, however with no effect.

At 23:35, the *Pasat* rescue vessel with survivors moored in Świnoujście.

The 406 MHz EPIRB belonging to the yacht *Down North* had no built-in GPS receiver, thus more precise determination of its position was possible only upon crossing this area by a LEOSAR satellite of COSPAS-SARSAT system at a relevant polar orbit and after analyzing the Doppler effect measurements.



The registration information recorded for the EPIRB was not up to date, so JRCC Halifax, which received the alert message on a geostationary satellite detecting a radio beacon signal, was initially unable to identify the yacht owner. In effect, the radio beacon signal failed to initiate the rescue response. The rescue was initiated in effect of *Palucca* actions.

The MRCK in Gdynia received the alert message on the polar orbit satellite signal detection by fax from MRCC Bremen at 21:00. This message contained position data (probability rate 69%) indicating a location that was later shown to be 7 nautical miles towards West from the actual position of the event. At the same time, phone information from the yacht owner was received, who was just then notified about the accident, also by phone, by the skipper of the *Down North*.

#### **4. The Analysis and Comments about Factors Causing the Accident with regard to Examination Results and Experts Opinions**

Upon sinking, the wreck of the yacht remained under water for 4 months. During this period, 6 attempts to lift it were undertaken, of which 5 were unsuccessful due to excessive sea state or loss of stability of the wreck during lifting. After several failed attempts, the rigging and masts were cut off at the height of 1.5 – 2 m above the deck.

The lifted yacht's wreck was surveyed by the Commission on shore. The survey included measurements of theoretical hull lines to calculate the vessel stability data. Inspection of underwater part of the hull revealed that modifications had been made to the original hull.

##### **4.1. History of Yacht *Down North***

The yacht *Down North* was self-built in Canada in approximately 1980. The steel hull built according to *Colvin 45* design by Tom Colvin<sup>1</sup> was rigged as a brigantine. In the late 1980s, the yacht was sold to a new owner. In 1993 the new owner modified – also by himself (Annex 1)<sup>2</sup> – the rig and hull, extending it by approximately 2.5 m at the stern and adding the bulbous bow in which a bow thruster was installed. The added stern extension increased the deck surface and provided space for a hold and a fuel tank. Aluminium boxes – lockers

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<sup>1</sup> *Colvin Design No. 112*. The schooner *Yankee Point* is a representative vessel of this type.

<sup>2</sup> The second Canadian owner of the yacht *Down North* issued the Builder's Certificate for First Title, however the *Down North* was actually only rebuilt by him. Self-building of the yacht is proven by the statement of the Canadian owner in the left bottom corner of the document (Letter A) stating that the owner performed the construction personally. The document provides the length of yacht (14.8 m) as it was before the rebuild. Upon the rebuild, the hull length increased to 17 m.

intended for storage of e.g. rescue equipment, ropes, etc. were added on roofs of low deckhouses. In this form the schooner *Down North* was operated until 2011 sailing usually with 2 – 4 crew members.

In 2011, the yacht was sold for the second time. The purchaser sailed the vessel to Poland, where he performed – also personally – another rebuilding, adapting the yacht for commercial use with the intention of chartering it out on a bareboat basis.

A steel superstructure was added at the stern. It extended for the entire width of the hull and provided space for 4 berths. The yacht was now prepared to carry 12 persons. Straight-six Perkins 6354 engine was replaced with straight-four M92B engine, lighter by approximately 100 kg.

Schematic drawing of the original *Colvin 45* hull and of the yacht *Down North* upon the first modification (Canadian – blue line) and the second one (Polish – brown line) is shown on the figure below<sup>3</sup>.



Figure 3. Successive modifications of *Down North*'s hull

In effect of these modifications, the hull length increased from 14.8 m to more than 17 m and the displacement of complete and unladen yacht increased from less than 25 tonnes to more than 35 tonnes.

#### 4.2. Yacht's Stability

The yacht *Down North* sank in result of being capsized by a wind gust of approx. 7° B, which occurred in average wind strength of approximately 5° B. No event which could have a significant negative impact on the vessel's stability took place on board. The crew were at

<sup>3</sup> Drawing made by the Commission. None of the owners of *Down North* keeps any documentation of his rebuilding.



their stations or in berths. Supplies were stowed in planned locations. The deck load was fastened. Bilges were dry, checked and pumped out on routine basis by the skipper within one hour before the accident.

During the survey of the wreck, performed on shore upon lifting it from the Bay bottom, the Commission found no hull leak, which could have caused a rapid leakage, except for some corrosion found on deck. The sea state during the accident was 2 – 3 and the waves did not flood the deck, thus any possible deck leaks had no impact on yacht flooding before the capsizing.

After all modifications the yacht had successfully completed many cruises with same form of the hull as of the day of the accident,. Interviews with persons participating in these cruises recall a similar event taking place between the Shetlands and the Faroe Islands. Sailing on a close hauled course in light wind of 2 – 3° B , a sudden and unexpected strong gust caused the yacht to heel deeply. The deck and portholes in the midship section were flooded and water entered through the pilot-house door. The crew managed to let go the sheets of all sails and the yacht, following its natural trend to head up in the heel, luffed up. One of the foresails was lost due to flapping, however the yacht lifted itself. During this event the yacht had both side fuel tanks empty, the supplies were running low, and there were less than the maximum number of persons on board.

The previous Canadian owner of the yacht in his correspondence with the Commission has also recalled a similar situation, which took place during one of the past voyages.

Stability of this heavy but narrow yacht's hull of low draught and low freeboard, was insufficient to balance a violent gust. Additionally, the components increasing the transverse moment of inertia were situated above the gravity centre, thus decreasing the righting moment in heel.

A detailed and precise reconstruction of the rig and load of the vessel at the time of the accident is impossible. Based on the measurements of the theoretical lines of the hull, findings on the actual waterline at the day of departure and explanations of the crew on loading state, the Commission calculated (twice) the stability data for the yacht<sup>4</sup>, adopting the location of centre of gravity initially on the basis of assumptions and subsequently – after re-launching of the yacht in August 2016 – on the basis of the inclining experiment.

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<sup>4</sup> Hydrostatic calculations were performed using the CHGK (Hull Shape Geometry Specification) software, approved by Polish Register of Shipping and designed by employees of the Chair of Ship Construction Technology at the Faculty of Ocean Engineering and Ship Technology of Gdansk University of Technology.



The yacht's stability analysis was performed for 4 loading conditions:

- 1) *Colvin 45* condition – the state in which the originally designed and built *Down North* was operated, without any later modifications, with 4-member crew;
- 2) condition 1 – complete unladen yacht, no crew and no deck load (location of centre of gravity calculated on the basis of the performed inclining experiment);
- 3) condition 2 – complete yacht with 12-member crew and standard consumables, with additional load placed at the aftdeck (2 tonnes) and amidships (2 tonnes) – state as of the day of the accident, according to the owner's explanations;
- 4) condition 2a – complete yacht with 12-member crew and standard consumables, with additional load placed at the aftdeck (0.8 tonne, including tender hanged on davits behind the stern transom) and amidships (0.7 tonne) – state as of the day of the accident, according to the skipper's explanations.

Despite careful calculations, it should be emphasized that all obtained results are only indicative. The comparison of analyzed loading conditions enables formulation of significant conclusions, which might indicate possible causes of accident.

No.	Specification	State Colvin 45	State 1	State 2	State 2a
1.	D – displacement [t]	24.7	35.4	40.7	38.2
2.	GM <sub>0</sub> – initial metacentric height [m]	1.59	1.19	0.88	1.05
3.	Positive stability range [°]	98	132	119	127
4.	MP <sub>30</sub> – righting moment for 30° [tm]	13.33	13.56	9.65	12.19
5.	MP <sub>max</sub> – maximum righting moment [tm]	13.59	13.56	9.69	12.15
6.	φ <sub>max</sub> – heel angle for MP <sub>max</sub> [°]	36.6	33.5	28.7	31.5
7.	GZ <sub>30</sub> – righting arm for 30° [m]	0.54	0.383	0.249	0.319
8.	GZ <sub>max</sub> – maximum righting arm [m]	0.55	0.383	0.237	0.318
9.	φ <sub>Z1</sub> – pilot house door flooding angle [°]	47.5	29.7	21.3	25.3
10.	φ <sub>Z2</sub> – deck edge flooding angle [°]	17.5	11.5	8.6	9.9

Table 1. Basic stability data for analyzed loading conditions



The shape of curves illustrating righting arms and flooding angles of pilot house<sup>5</sup> for the analyzed conditions is presented on Figure 4. The figure displays visibly the deterioration of static stability caused by hull modifications and the additional load.

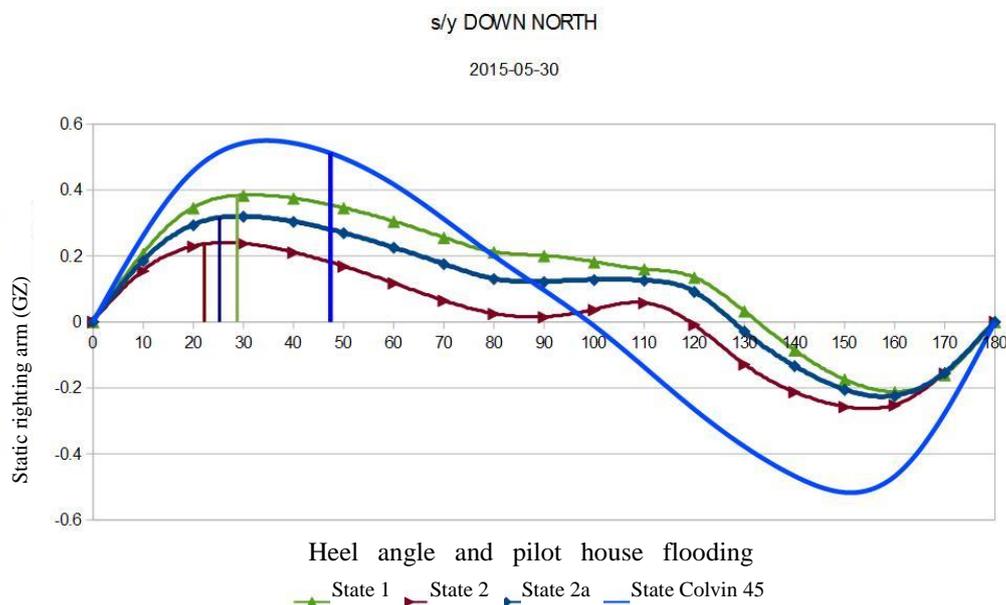


Figure 4. GZ curves and pilot-house flooding angles

The yacht *Down North* was not subject to any classification survey neither in Canada – the state under whose flag it sailed, nor in Poland – the state of ports where the vessel operated from (Szczecin and Dziwnów).

The Polish PRS classification society specifies 4 basic stability criteria for sea-going yachts<sup>6</sup>:

- 1) criterion of the righting moment value at heel angle of 30° ( $M_{P30}$ ):

$M_{P30} \geq 60 S h$ , [Nm]; where:  $S$  stands for the nominal sail area and  $h$  stands for the value of the heeling arm<sup>7</sup>;

- 2) criterion of the maximum righting moment  $M_{Pmax}$ :

heel angle for  $M_{Pmax} \geq 50^\circ$  and  $M_{Pmax} \geq 80 S h$ ;

- 3) criterion of positive stability range for yachts of length  $15 \leq L \leq 20$  m (unlimited area of operation):  $\geq 100^\circ$ ;

<sup>5</sup> The original design of *Colvin 45* hull most probably contained no pilot-house as seen on the *Down North*, but only low deckhouses and an open cockpit at the aftdeck. Thus, the flooding angle of the yacht interior was most probably much higher. According to available sources, the brigantine *Down North* was built with such pilot-house and therefore its door is the interior downflooding point for all loading conditions.

<sup>6</sup> Provisions for classification and construction of sea-going yachts. Part III. Equipment and stability. Polish Register of Shipping, Gdansk 2013 (uniform text, containing the amendments no. 1/1998, no. 2/2012, no. 3/2013 comparing to the issue of 1996; amendments did not apply to stability criteria).

<sup>7</sup> Definitions of both terms are provided in Clause 1.2.2 of the provisions listed in footnote 6.



- 4) criterion of minimum downflooding angle for yachts of length  $12 \leq L \leq 20$  m (unlimited area of operation):  $\geq 60^\circ$ ,

Ad. 1. Evaluating the criterion 1 requires knowledge of the yacht sail plan. The yacht operator and owner holds no such plan. The Commission made an approximate assessment of sail area on the basis of a yacht photograph (Figure 2). Excluding the square foresail, the following values for nominal sail area  $S$  were adopted: mainsail  $40 \text{ m}^2$ , main staysail  $16 \text{ m}^2$ , fore triangle  $40 \text{ m}^2$ . Graphically determined centre of sail area was located at 6 m above the waterline, which allows to adopt the probable value of the heeling arm for condition 1 as  $h = 6.94$  m. Considering the variations of draught, the following may be adopted for indicative comparisons: for loading condition 2 –  $h = 6.89$  m and for condition 2a –  $h = 6.91$  m.

No.	Specification	State 1	State 2	State 2a
1.	D – displacement [t]	35.4	40.7	38.2
2.	$M_{P30}$ – righting moment at $30^\circ$ [kNm]	133	94.6	119.6
3.	$M_{Pmax}$ – maximum righting moment [kNm]	133	95	119.2
4.	heeling moment from sails at $30^\circ$ [kNm]	39.9	39.7	39.8
5.	maximum heeling moment from sails at [kNm]	53.3	52.9	53.1

Table 2. Values of righting moments and heeling moments

For assessing the circumstances of the accident, analysis of state 1 and state 2a (vessel state on 30 May 2015) is of particular significance.

Criterion 1 is met for all loading conditions, since the righting moment is greater than the heeling moment in each case. In loading condition 2, the stability margin is significantly lower, however the load weights adopted for this condition are not realistic.

Ad. 2. Criterion 2, requiring the maximum righting moment to occur at heel angle of at least  $50^\circ$ , is not met. It should be added however that it is highly restrictive. Nowadays practice requires usually the maximum to occur at least above  $30^\circ$  (e.g. in the Polish Yachting Association criteria)<sup>8</sup>. In the analyzed conditions, only the state *Colvin 45* i.e. the original structure of the yacht can be considered safe. The rebuilt *Down North* in conditions 1 and 2a has only a minimum safety margin. Condition 2, displaying an unrealistically high yacht load, fails to meet any of the stability criteria.

<sup>8</sup> Provisions for control, construction and equipment of sea-going yachts. Annex 2, Clause 4.4.1. Maritime Technical Team of the Polish Yachting Association, Warsaw 2012.



Ad 3. Criterion 3 is met for all loading conditions, however the vessel safety depends on watertightness of the upper part of the hull and openings in deck and superstructures. Considering low interior flooding angles, the yacht is not resistant to large angles of heel.

Ad 4. Criterion 4 is not met for any of the analyzed loading conditions. Flooding angles are very low and amount to: for loading condition 2a – 9.9° (deck edge immersion angle) and 25.3° (interior downflooding angle – pilot-house) and for condition 1 (complete unladen yacht) 11.5° and 29.7°, respectively. This criterion had not been met also for the original *Down North* (before the rebuild), which is primarily due to the design of pilot-house located at stern.

In the summary of stability criteria analysis the Commission states that if the yacht *Down North* was subject to supervision of the Polish PRS classification society as a commercial vessel or a recreational craft of hull length of 17 m (> 15 m), it would not receive the class certificate and would require further detailed tests and trials to obtain such certificate – perhaps with certain navigational restrictions.

With regard to unclear official status of the vessel<sup>9</sup>, unambiguous identification of criteria which it should meet is impossible. Therefore this analysis considers in parallel Polish PRS criteria for sea-going yachts and Canadian criteria for sail-training vessels<sup>10</sup> for stability, based on the British standards of the *Maritime and Coastguard Agency* (MCA) for such vessels.

The MCA methodology of assessing the stability margin is focused on obtaining practical guidelines to be used by the crew for on-going assessment of heel risk, posing a threat of interior downflooding as result of a gust or a squall.

Using this methodology, the Commission determined maximum steady heel angles for loading conditions 1 and 2a, i.e. typical loading conditions of the hull after both rebuildings and produced graphs of yacht resistance to squalls for these scenarios.

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<sup>9</sup> The *Down North* was used in Canada as recreational craft on the basis of the obtained *Pleasure Craft Licence* (Annex 2). Operating a yacht under the *Pleasure Craft Licence*, issued by the *Office of Boating Safety* of *Transport Canada* excludes its commercial use. A vessel used for commercial activity must be registered in the *Canadian Register of Vessels* or in the *Small Vessel Register*.

<sup>10</sup> *Standard Related to Design, Construction and Operational Safety of Sail Training Vessels*. Transport Canada, Transport Publication TP 13313 E. These criteria apply to sailing vessels of length exceeding 14 m, carrying no passengers and engaged in sail-training cruises, that do not include formal professional training in seamanship. The decision on selection of the set of specific provisions applicable for a given vessel rests with Transport Canada. An alternative standard applied in Canada for commercial vessels is based on the International Standard ISO 12217.



The maximum steady heel angle is the angle, at which an increase of wind speed by coefficient equal to 1.4 (corresponding to doubling the heeling moment) increases the heel angle to the limit value of the interior flooding angle.

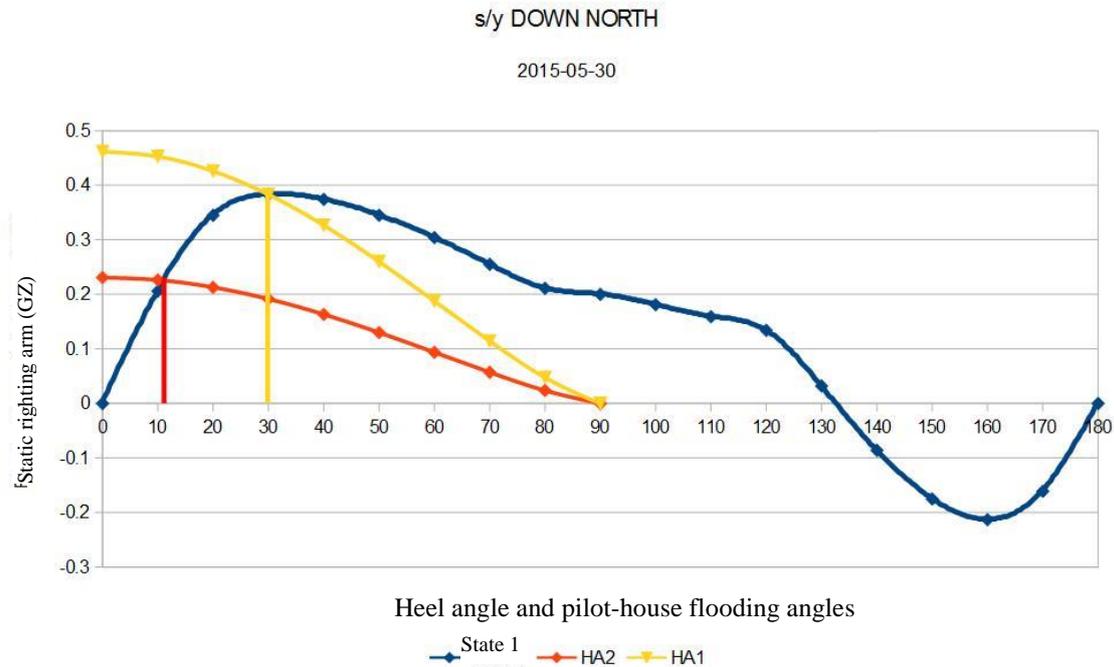


Figure 5. Curve of righting arms for the loading condition 1

On Figures 5 and 6, HA1 (yellow colour) curves correspond to the heeling moments caused by wind pressure on sails, determined in heel angle function and balancing the righting moment at the pilot-house flooding angle. HA2 curves (red colour) determine the half of HA1 value. The crossing point with the static stability arm curve (GZ) indicates the maximum steady heel angle. For the loading condition 1, this angle amounts to 12° (Figure 5). For comparison, the maximum steady heel angle for the original *Colvin 45* hull is 18°.

For the condition 2a i.e. the loading state approximate to the one from the day of the accident, the resistance to gusts is poorer. In this case, the maximum steady heel angle is only 10° (Figure 6).

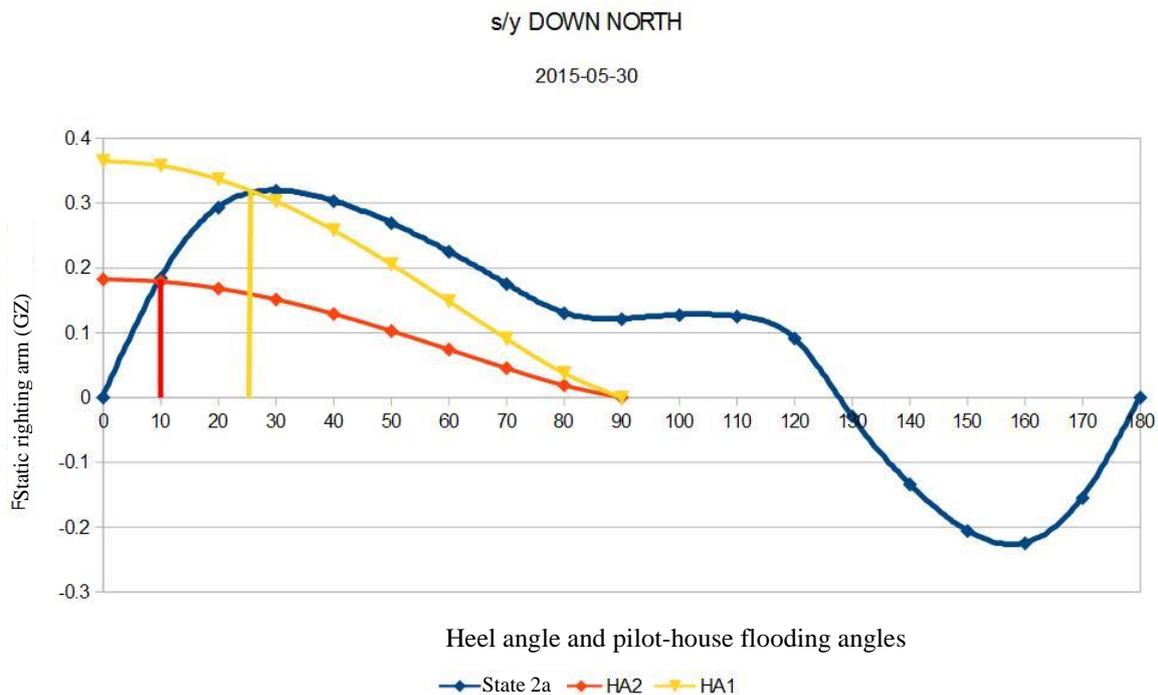


Figure 6. Curve of righting arms for yacht in the loading condition 2a

The Canadian stability criteria for sail-training vessels require meeting the 4 conditions:

- 1) positive stability range  $\geq 90^\circ$  (for vessels shorter than 24 m this range may not be lower than calculated using the formula:  $[90^\circ + 25^\circ \times (24-L)/9]$ ; where L = yacht length);
- 2) maximum steady heel angle  $> 15^\circ$  for all loading conditions;
- 3) interior flooding angle considering the companionways and hatches regularly used by the crew  $\geq 40^\circ$ ;
- 4) sailing at less than the maximum steady heel angle (clause 2), the yacht should be able to resist a gust of strength equal to 1.4 of the current wind speed without immersing the downflooding openings in the hull.

For the yacht *Down North* after hull conversions:

- a) criterion 1 is met subject to clause 3 (minimum range of positive stability of the yacht of 17 m length is  $109.4^\circ$ ),
- b) criterion 2 is not met for any of the loading conditions,
- c) criterion 3 is not met for any of the loading conditions,
- d) criterion 4 may not be applied due to failure to meet clause 2.

The original *Down North* before rebuildings, operated usually with lower load (crew and consumables), does meet all the abovementioned conditions (1 – 4), however the criteria



resulting from publication of TP 13313 (referred to in footnote 10 on page 19) would not apply due to the original hull length, slightly below 15 m, and non-commercial activity.

Despite reservations on the approximate nature of analyzed data, one may assume that the yacht *Down North* in its present hull shape is a vessel:

- 1) quickly reaching the maximum righting moment, which may induce the crew to set possibly the largest sail surface to counteract bothersome transverse rolling in light winds;
- 2) quickly losing resistance to the heeling moment along with increasing the load;
- 3) highly vulnerable to deep heels with low flooding angles;
- 4) practically defenceless against wind gusts exceeding the critical strength leading to a heel causing the pilot house flooding at full load, such as of 30 May 2015;
- 5) which would not be approved either by Polish or Canadian classification bodies for commercial operation in sail-training cruises without due testing and possible modifications and/or restrictions of the area or conditions of navigation.

In the case of the yacht's heeling to the angle, which exceeds the pilot-house downflooding angle, some other properties of the hull structure, omitted in stability analysis presented above, should be considered. These can additionally reduce yacht's righting capacity from a deep heel despite theoretically positive righting moment specified for the hull shape. These features include bulwarks in a form of continuous steel barriers hindering freeing the deck from water and spacious boxes closed with hinged non-watertight covers at the top, located on roofs of both low deckhouses, which in the case of flooding will significantly reduce the resulting righting moment.

Surfaces of freeing ports fitted to the deck should be large enough. The standards in this area are usually focused on flooding the deck by shipping waves rather than by a deep heel. PRS provisions require 1/2 of the value calculated using the formula  $0.01 L H + 0.35 L H^2$ . The Canadian standard assumes that 10% of bulwark area constituting the central 2/3 around the lowest deck point should be open for water outflow.

Total freeing ports area for bulwark of 55 cm height and 10.2 m length according to the Canadian Standards should amount to 0.33 m<sup>2</sup>. The yacht *Down North* has 3 larger and 3 smaller scuppers at each side, of total area of approx. 0.15 m<sup>2</sup>.

According to reports presented by crew members, who were on board during the accident, in the period directly before the capsize the wind strength was 4 – 5° B, whereas the critical gust did not exceed 7° B. The yacht was sailing at a speed of approximately 6 knots. In the

opinion of the Commission, just before the event the yacht had been sailing with the wind speed of 10 – 15 knots and at a heel of approx. 10 – 12°, i.e. at the edge of safe steady heel (to prevent downflooding in gusts).

Wind that knocked-down the yacht *Down North* in the evening of 30 May 2015, was – according to the crew members – in the category of gusts (up to 1.4 increase of steady wind speed) rather than squalls (exceeding the steady wind speed by any factor). The graph presented on Figure 7 demonstrates that a gust hardly stronger than these that actually took place was able to heel the yacht above the interior downflooding angle.

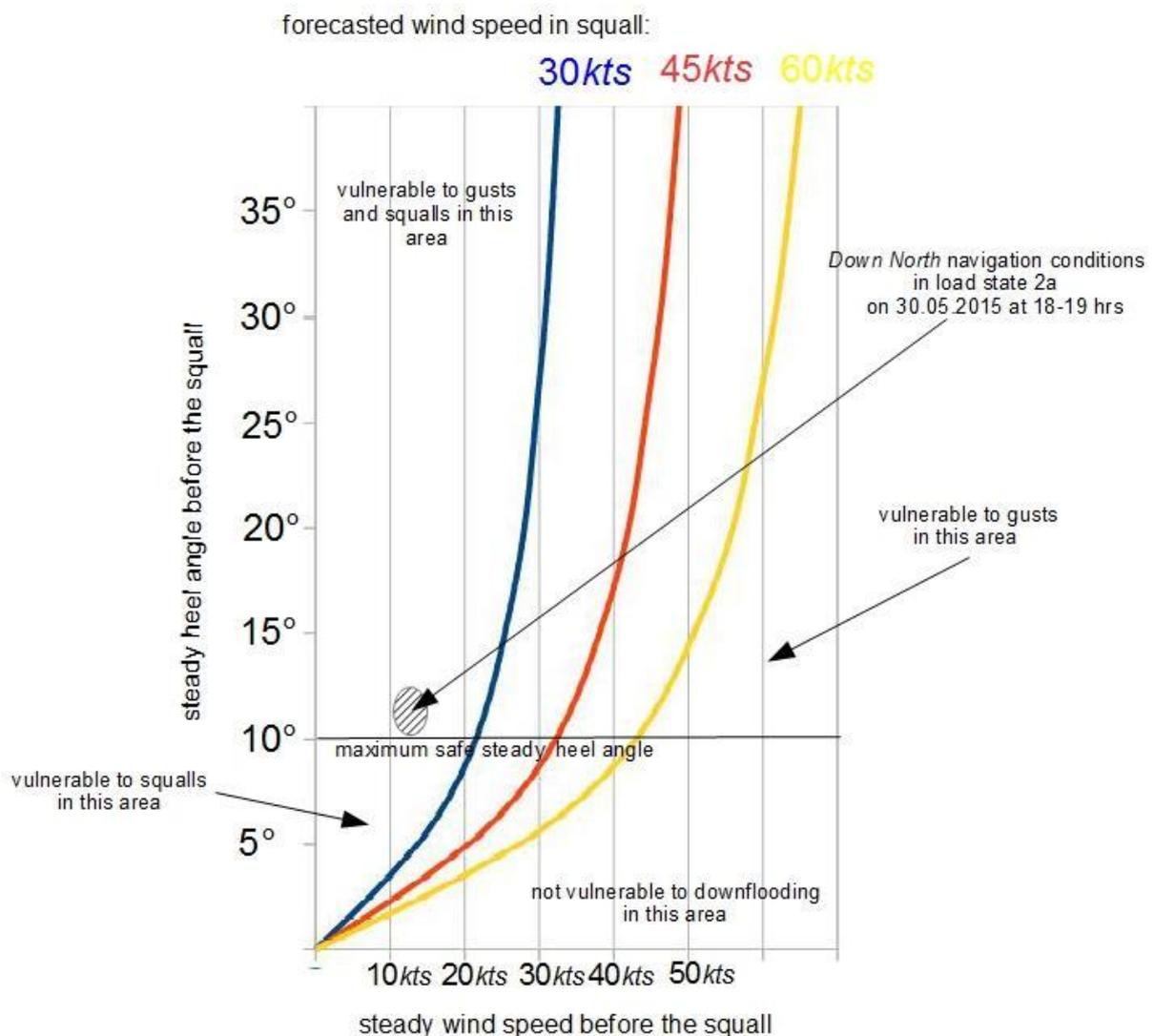


Figure 7. Vulnerability to squalls according to the MCA



Upon entering these data into the MCA graph presenting the resistance of the yacht to squalls (Figure 7)<sup>11</sup> it is clear that a squall of 30 knots was able to heel the yacht above the interior flooding angle.

### 4.3. Stability conclusions

The yacht *Down North* was never surveyed by any classification society and had no stability analysis performed considering the changes (resulting from at least two hull rebuilds<sup>12</sup> and from change of operating mode) compared to the original design of standard *Colvin 45* hull assumed as the basis for the original version.

When analysing stability data of the discussed loading conditions one may state that:

- 1) successive modifications of the yacht, including increasing the number of crew, have significantly deteriorated its stability and in particular lowered the downflooding angles;
- 2) carrying the deck load had additional negative impact on stability;
- 3) structural features of the yacht provided insufficient protection against flooding in a deep heel;
- 4) prior to the windgust, the yacht had been sailing at the edge of stability margin under practically full sail.

The fact that the accident occurred on 30 May 2015, despite previous successful cruises in apparently similar weather conditions, results from coincidence of unfavourable circumstances, including among others maximum supplies level at the very beginning of extremely long voyage, extreme violence of the wind gust and ineffective manoeuvre which caused the yacht to receive the wind from the beam, having completely sheeted fore sails and partially slacked gaff sail.

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<sup>11</sup> Each curve at Figure 7 for specific wind strength in squalls (usually drawn for 30, 45 and 60 knots) divides the area into the safe part (below the curve or to its right side) and the unsafe part (above the curve or to its left side). In the unsafe part the heel (induced by squall) exceeding the interior flooding angle is possible. The yacht, which at the given steady wind strength sails with steady heel exceeding the angle that is indicated by the curve on the graph (above the curve corresponding to the forecasted speed of possible squall) for actual wind strength should reduce sail in order to decrease the steady heel to a safe level. Selection of the suitable curve is made with consideration to the weather forecast and meteorological conditions. In the time and place of *Down North*'s accident, one should consider the forecasted wind above 30 knots, i.e. at wind speed of 10 – 15 knots the steady heel during navigation should not exceed 5°.

<sup>12</sup> The PRS recommend to re-examine the stability whenever modifications to yacht structure result in change of displacement by more than 5%. Many sources suggest repeating the stability testing every 10 years, since unavoidable changes in installed equipment may accumulate and change the stability significantly.



#### 4.4. Crew Competences

The yacht *Down North* sailed under command of a Yacht Master, who at the same time acted as the organizer of the entire, multi-stage voyage. The cruise was intended as sail-training and mile-building for the crew. Apart from the skipper, the crew included 11 persons of different sailing competence and experience (6 Yacht Skippers, 3 Inland Skippers, 2 persons with no sailing license). Several of them had additional qualifications – instructor licenses of the Polish Yachting Association (PYA), completed safety trainings (STCW) and additional trainings in the area of medical rescue and first aid.

*All of the crew were Polish. Those who had formal certificates of competence had received training and passed examinations according to standards set by the Polish Yachting Association (PYA). The training and certification path for skippers of sail-powered vessels involves 3 levels of competence: Inland Skipper, Yacht Skipper and Yacht Master. Obtaining an Inland Skipper licence is not a prerequisite for the higher licenses. The Inland Skipper and Yacht Skipper is issued upon passing a formal examination and proving sailing experience.*

In 2013-2015, the skipper had already completed several cruises on this vessel, including a voyage to Spitsbergen. In total, his experience with the *Down North* in the Baltic Sea, North Sea, Norwegian Sea and Barent's Sea accounted to about 5 months.

The first mate had been sailing since 3 – 4 years and was on the *Down North* for the second time. His first cruise with this yacht in the previous season included participation in a two-day delivery voyage between two Polish ports.

The second mate had similar experience with the *Down North* as the skipper, since she participated in the Spitsbergen voyage in 2014. Total time spent on this yacht, including several Baltic Sea cruises, amounted to ca. 4 months.

During the interviews with the crew members, the Commission found no knowledge on the yacht stability. The skipper and mates, as well as the owner, felt no need to use any documented information on stability. According to the mates, yacht stability was the responsibility of the skipper, who in turn relied only on his experience gained during previous voyages.

The Commission examined the training and assessment requirements for the upper competence levels. To receive a Yacht Master license, no training or exam is required. The license is obtained on the basis of proven sea experience, duration and type of which is laid



down in the Ordinance of the Minister of Sport and Tourism of 2013<sup>13</sup>, subject to holding the Yacht Skipper license.

To obtain a licence of a Yacht Skipper, it is necessary to pass the required knowledge test and practical skills test. Such examination is passed before a special commission appointed by the relevant Polish sport association<sup>14</sup>. The assessment requirements laid down for testing the knowledge required to obtain the Yacht Skipper license include no topics related to yacht stability<sup>15</sup>.

Before the examination, vast majority of yachtsmen applying for sailing licenses take trainings according to the model training course syllabus for state-issued sailing licenses adopted by the PYA. The Association prepared two training programmes: for persons taking the training for Inland Skipper license and for persons taking the training for Yacht Skipper license. The training programme for Inland Skippers under “navigation theory” includes the “yacht stability” topic, whereas the training for Yacht Skippers under “sailing theory and rules of sea-going yacht manoeuvring” includes the topic of “yacht stability and buoyancy”. However, in the test questions database of the Association, the questions on stability are included only in test sets for Inland Skipper candidates.

The PYA assumed in its training system that all forms of training are allowable, provided they ensure completion of the adopted training programmes. Therefore the PYA did not provide detailed training syllabus specifying the precise scope of knowledge e.g. in the area of stability that should be presented to the trainees. The choice of scope of material presented to the trainees is left to instructors i.e. the persons holding the Yachting Instructor or Junior Yachting Instructor license of the PYA.

The candidates for Yacht Skippers are trained by instructors, who are themselves required to hold the licence of at least Yacht Skipper, thus qualified as Yacht Skippers or Yacht Masters. Since there are no trainings and no examinations for Yacht Master license, the knowledge of the instructor carrying out the Yacht Skipper training in the area of yacht stability may be limited to knowledge previously gained by the instructor during his own training for Inland Skipper license and during his instructor training for the Yachting Instructor and Junior Yachting Instructor license of the PYA.

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<sup>13</sup> Ordinance of the Minister of Sport and Tourism of 9 April 2013 on exercising nautical tourism (Journal of Laws item 360).

<sup>14</sup> The provision of § 16, clause 2 of the Ordinance, referred to in footnote 13 permits also appointing of such examination commissions by other entities authorized by the minister competent for physical culture.

<sup>15</sup> The assessment requirements are specified in Annex 4 to the Ordinance, referred to in footnote 13. The topic of stability is included in the section on sailing theory required for the Inland Skipper license.



The Commission found that the training programmes for PYA Instructors<sup>16</sup> allow for 4 hours per each course for sailing theory or sailing theory and yacht manoeuvring, which include the stability-related topics. In the case of training for junior instructor license, sailing theory contains 6 and in the case of instructor license – 12 separate topics, one of which is stability. This means that when assuming equal time division for theory at this training, the topic of yacht stability is discussed in 40 or only 12 minutes, respectively.

Provided that the PYA instructors dedicate the same period of time for training of Yacht Skipper candidates as they have personally received for learning about yacht stability, the Commission believes it is completely insufficient to ensure proper preparation of the future yacht masters for safe navigation.

The Yacht Skipper license permits its holder to operate unaided all yachts of hull length of up to 18 m in all sea waters, i.e. large vessels usually carrying crews of above 10 persons. In the opinion of the Commission, the person taking command of such a yacht should be capable to interpret the information found in the stability information booklet, which may be available for the vessel and to predict its behaviour in a given loading condition in practice. The skipper should also be aware of the need of having such a stability information document on board.

#### **4.5. Maneuvers Taken by the Crew**

At the moment of the wind gust, the yacht, sailing on port tack, close-reaching, took a deep heel. The response of the skipper, the mate on watch and the crew member at the helm was consistent and resulted in immediate attempt to bear away to run with the wind. The helm was put hard a starboard. The mainsail sheets were eased to decrease the effective surface of the mainsail.

The yacht usually responded poorly to the shallowly immersed rudder and in a deep heel the rudder effectiveness deteriorated additionally. The sheets of all triangular sails were kept fastened, and the mainsail sheet was let go, so the centre of effective sail area moved forward, what assisted in bearing off. However, the deep heel caused that the bottom part of the mainsail entered the water and the sail did not spill, just as the yacht course changed towards a beam reach. In this configuration, the yacht was lying flat on its side.

A yacht sailing in a heel develops a natural trend to round up, caused by the luffing moment. According to interviews with *Down North* crew members, the yacht always had

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<sup>16</sup> System szkolenia instruktorów PZŻ (Polish Yachting Association Instructors Training Programme). Resolution of the PYA Board of 7 December 2009, with later amendments. Most recent amendment: 17 May 2016.



weather helm in heel and the crews usually acted to counter this trend. In this case, the effect of turning the helm and partial easing of mainsail to a large degree balanced with luffing-up effect resulting from large heel.

The Commission points out that bearing away in squalls may be effective, however only if it is started sufficiently early, before the yacht starts heeling deeply. When close-reaching this means that bearing away should be started before the gust and that the yacht should alter the course to a completely different that the one leading to the point of destination. Such manoeuvre might be taken by the crew only upon seeing clear signs of the approaching squall, which would justify such an important decision.

The *Down North* crew, navigating on 30 May 2015 through the Pomeranian Bay saw no signs of the approaching gust neither in the clouds nor at the sea surface. They were also unaware of the stability margin of the yacht.

The Commission states that is not possible to ascertain now whether taking any other manoeuvre could possibly prevent the capsizing. The Commission considered several other scenarios of possible crew response, including:

- 1) leaving the helm in midship position and letting go the sheets of all sails, in particular these on the foremast (a similar scenario took place near the Faroe Islands in 2013, where easing started from the mainsail);
- 2) supporting bearing away or luffing up with engine power before the heel became too deep; the engine could be started and controlled from the pilot-house only, not from the helm station amidships; during the accident, the engine was not running and the watch manned the stations amidships;
- 3) easing the peak halyard. The gaff sail usually does not respond fast to sheet slacking. A traditional way, rarely used today, of decreasing the gaff sail surface in emergency was peak halyard easing. A heavy gaff spar when falling down takes the sail with it, automatically reducing the effective sail area and lowering the center of wind pressure, perhaps by half, depending on construction of the gaff jaws<sup>17</sup>.

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<sup>17</sup> This method, referred to as sail „scandalizing” was for example used by the sailing fishing vessels to reduce speed during trawling or anchoring as well as emergency reefing. The foot of the sail, not bent to a boom was then lifted up.



#### 4.6. Weather Forecast and Meteorological Conditions

Before unmooring, the skipper obtained weather forecasts from two sources: a GRIB file from an Internet site and Institute of Meteorology and Water Management (IMGW) maritime weather bulletin broadcast from Witowo Radio.

The yacht was equipped with a Navtex navigational warnings system receiver. A SSB radio transceiver was also on board (operating in Medium and High frequency) which could also enable reception of the German DWD Deutsche Wetterdienst weather forecasts transmitted using the RTTY protocol, but it was permanently inoperative and was not used.

The morning GRIB forecast produced by the GFS model for 18:00 UTC (20:00 LT), available on the accident day since 00:00 UTC forecasted for this area wind between 15 and 17 knots, with gusts up to 23 knots. The forecasted wind speed and related gusts increased along with approaching Jasmund Peninsula in Rügen Island, reaching 20 knots in the entire open sea area. For GRIBs, forecasting the wind speed at the height of 10 m above sea level, this meant significantly strong wind along the route.

The German DWD forecast<sup>18</sup> from 11:00 UTC (13:00 LT) on the accident day for the East of Rügen area forecasted the following winds until the upcoming morning:

SOUTHWEST 5 TO 6. LATER DECREASING A LITTLE. THUNDERY GUSTS.

<sup>18</sup> Available in the Navtex and SSB RTTY systems.

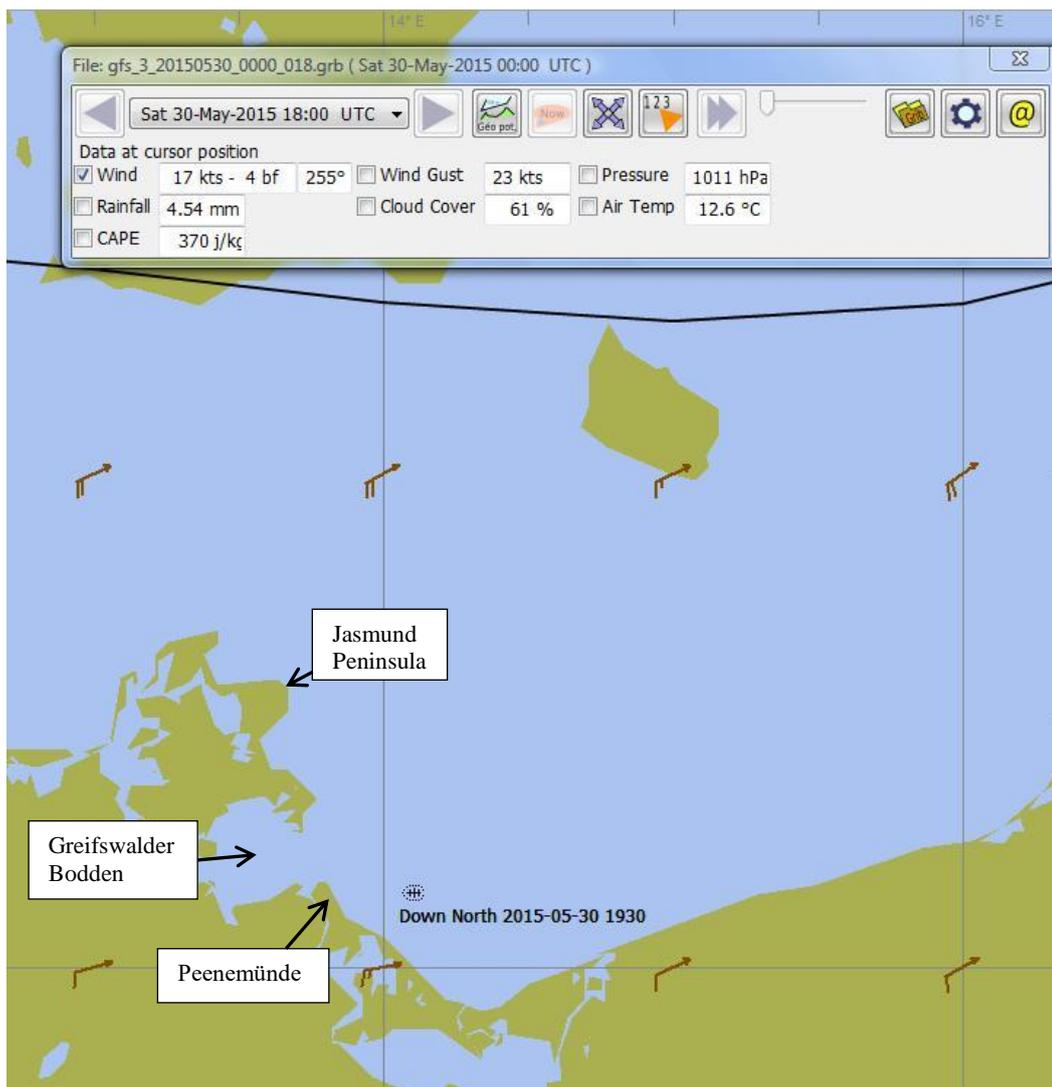


Figure 8. Morning GFS GRIB forecast for 20:00 LT

Both forecasts suggested the possibility of encountering strong gusts as the distance from Świnoujście increased on the route towards the Jasmund Peninsula, however both the DWD forecast and the later IMGW analyses connected strong gusts with storm cloud formations, which were not seen from the yacht *Down North*.

The analysis of actual hydrometeorological conditions for the region of the Pomeranian Bay prepared by the IMGW after the accident states as follows:

Wind SW-W force 5 to 6 in Beaufort scale (8-13 m/s), increasing to 7 and 8 in gusts in Beaufort scale B (15 to 20 m/s). Very strong wind blasts related to movement of rain and storm clouds. Bay state 3-4. Temperature between 12°C and 10°C. Good visibility (above 6 nautical miles), moderate under showers (app. 3 nautical miles). Showers of storm nature. Storm possible.

This analysis confirms the morning forecasts broadcaste from Witowo Radio:



FORECASTS FOR THE SZCZECIN LAGOON AND PORT COMPLEX valid from 13:00 of 30.05.2015 to 01:00 of 31.05.2015  
STRONG WIND WARNING  
Wind southwest force 4 to 6, initially force 7 in gusts in Beaufort scale. Lagoon state 3. Air temperature from 15°C in day to 8°C in night. Visibility good but moderate. Showers. Storm possible initially.

FORECASTS FOR BALTIC SEA  
Weather forecast for Baltic Sea, valid from 06:00 UTC 30.05.2015 to 18:00 UTC 30.05.2015  
WIND WARNING FOR WESTERN, SOUTHERN, SOUTHEASTERN, CENTRAL, NORTHERN BALTIC AND POLISH COASTAL WATERS  
INFERENCE FROM 03:00 UTC: Trough of low over France, Germany and western Poland moving east. Ridge of high over Finland, Bielarus and Ukraine moving east too.  
FORECAST FOR 12 HOURS:  
WESTERN BALTIC:  
Wind southwest force 4 to 6 increasing 5 to 6 and 7 in gusts. State of sea 3 but 4 later. Temperature near 12°C. Visibility good but moderate in showers. Risk of thunderstorms locally.

According to reports of witnesses on shore and the report of the *Palucca* captain, who at this time proceeded in the opposite direction from Sassnitz to Świnoujście, there was very strong wind in the Rügen area, approximately 7° B. It is possible that in the area of the southern coast of the Pomeranian Bay, the yacht leaving Świnoujście has initially not felt it, however after passing Peenemünde it experienced full force of the dominating wind blowing from the Greifswalder Bodden Bay.

#### **4.7. Death of the Crew Member**

In the opinion of the Commission, a death of 53-year old Mr Leszek Bohl, crew member with mobility impairments, is strictly connected both with his health condition and with circumstances of the accident. All remaining crew members managed to abandon the sinking vessel safely.

For Mr Bohl, who occupied the berth located at the very bow and who moved only with the use of crutches or wheelchair, leaving the narrow forward cabin (when heeling deeply) could not be possible without brave support of the colleague watch member. For both of them it must had been a huge effort taken under extreme stress.

The crew managed to move Mr Leszek Bohl to the deck and then into the raft, where after several minutes a cardiac arrest was noticed. Resuscitation and indirect heart massage performed by several crew member for approximately 30-60 minutes were not successful.



Mr Leszek Bohl enrolled in the cruise responding to an announcement and did not hide his health condition. He was accepted as crew by the skipper – who was also organizing the cruise – following a personal interview. He was joined by another crew member who was to provide him with continuous assistance, acting as a buddy. Mr Leszek Bohl was a man of broad interests. He mostly intended to participate in the Arctic stages of the cruise and the short voyage to Oslo was supposed to be only a test of his capabilities. The yacht has been partially adjusted to his needs by installing additional grabhandles and railings.

The Commission notices that participation in the cruise of a person at increased risk due to his or her reduced mobility or health condition puts on additional risk not just for this person but also for the rest of the crew, which may face the necessity of taking actions dangerous for them as well. The decision on accepting the risk related to including this person in the crew is an autonomous decision of the yacht master, who however should consider also the consent of each cruise participant.

In the opinion of the Commission, in cases of advanced disability, the yacht master should accept persons unable to participate in full in the vessel operation rather as passengers than as crew<sup>19</sup>.

In previous years, there were provisions in force in Poland authorizing for deep sea sailing only persons in good health condition confirmed by a physician. Such confirmation was a discretionary decision of the physician. There were no detailed guidelines specifying limits of acceptable conditions. The rules, initially requiring a formal opinion of a Sports Physician, had been gradually mitigated. At present there is no obligation to present any medical certificates also when applying for sailing licenses<sup>20</sup>.

The organizers of various cruises, courses, regattas and other sailing events frequently include in their internal rules and regulations as well as agreements made with the participants special clauses exempting them from liability for any incidents connected with health condition of the event participants.

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<sup>19</sup> Enrolling up to 12 passengers does not result in change in the classification of the vessel under the Polish flag. Under the Canadian flag, a recreational yacht may not carry passengers at all (Article 2 of the *Canada Shipping Act, 2001*). A vessel carrying more than 12 passengers is considered a passenger vessel.

<sup>20</sup> Ordinance of the Minister of Sport dated 9 June 2006 on practicing of sailing activities (Journal of Laws of 105 item 712) has included in § 2(5)(4) the requirement of attaching a certified medical statement declaring absence of contraindications to perform sailing activities to the application for issuing of the sailing license. The Ordinance was repealed on 16 October 2010 due to repealing its enabling act. Apart from strictly competitive sport, the only exception today is the windsurfing, in which according to the PYA training system, issuing of the PYA Windsurfing Instructor license requires documenting of absence of medical contraindications to perform this sport.



The agreement to participate in the cruise on board of the yacht *Down North*, made between the crew members and the cruise organizer „Navigare Yacht Club” company contained a statement of every participant that „his/her health and physical condition does not prevent them from taking part in deep sea sailing, including participation in the cruise, and (that the crew member) takes full responsibility for it”.

When observing actual achievements of different individual yachtsmen, yacht operators and organizations<sup>21</sup> it is difficult to draw a formal limit that would exclude the ability to perform deep sea sailing due to health condition. Considering however undoubtedly increased risk for the entire crew, the Commission considers that such risks should be counterbalanced with preventive measures included in emergency plans and safety equipment, both personal and of the vessel itself.

Occupying the bow berth by Mr Leszek Bohl made the evacuation in any emergency situation difficult, practically preventing him from escaping to deck on his own<sup>22</sup>.

In the course of the performed judicial and medical proceedings, the cause of death could not be determined unambiguously. The officially stated, most probable cause of death involved swallowing disorders or aspiration of sea water i.e. a hyperosmotic liquid<sup>23</sup>.

#### **4.8. Message Transmitted by the 406 MHz EPIRB Radio Beacon from the Yacht *Down North***

Distress message transmitted by the satellite 406 MHz emergency radio beacon of the yacht *Down North*, activated by the skipper immediately after the accident, had, in final effect, no impact on the course of rescue operation, since it was initiated by the vessel *Palucca* before the SAR services determined the area of accident.

The Commission analyzed the route of signals sent by the *Down North*'s EPIRB and their processing by the entities receiving the distress message.

1. The first signal from the radio beacon received by a GEOSAR satellite was insufficient for the COSPAS-SARSAT system to determine the position. Information

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<sup>21</sup> E.g. cruises of crews with significant participation of blind persons (STS *Zawisza Czarny*, STS *Pogoria*), sailing vessels designed to enable participation of people of all physical abilities, including support for wheelchairs (STS *Lord Nelson*, STS *Tenacious*), or individual voyages of persons with severe mobility impairments (Tristan Jones: *Outward Leg*).

<sup>22</sup> Placing the handicapped crew member closer to the companionway would not have improved the situation, since the berths located near the companionway leading to the navigation cabin were first at risk of flooding with water flowing into the yacht interior after the capsizing.

<sup>23</sup> Hyperosmotic fluids absorbed in great volume cause water and electrolyte disorders (which may result in arrhythmia) and acid – base disorders.

on signal detection was transmitted to the country relevant for the radio beacon registration – to JRCC Halifax centre in Canada.

2. JRCC Halifax checked the information and on the basis of the Canadian Beacon Registry identified the yacht *Down North* and its previous owner<sup>24</sup>. Phone contact with the previous owner gave information on the sale of the yacht and provided the contact data for the broker handling this transaction. The broker provided contact data for the current Polish owner. Registration data of the radio beacon were not available in global registration systems ITU MARS and COSPAS-SARSAT IBRD.
3. JRCC Halifax found the yacht *Down North* in the AIS MarineTraffic (Figure 9) system showing the position timestamped as being 22 hours old, near the Brama Torowa 3 beacon in Zalew Szczeciński (Szczecin Lagoon, position marked with a letter A at Figure 12).

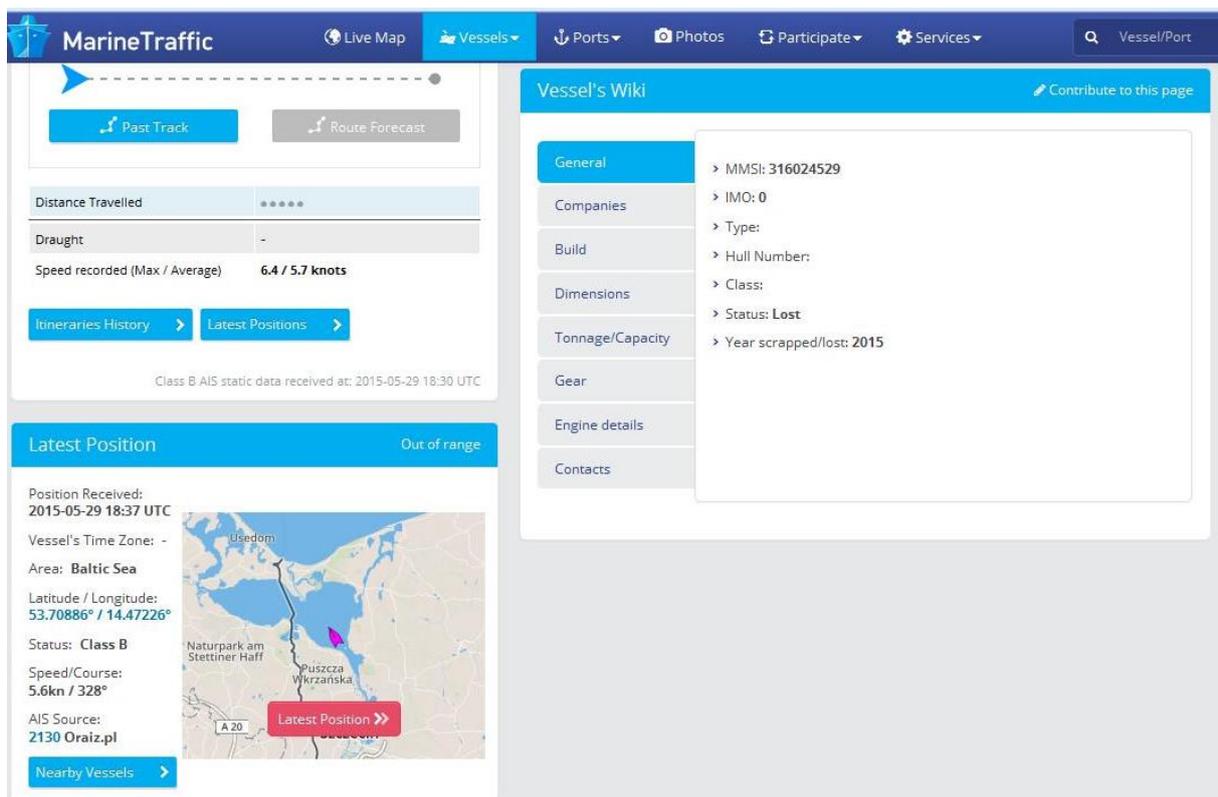


Figure 9. Last position of *Down North* according to *MarineTraffic*

4. This information was immediately relayed by JRCC Halifax by phone to MRCK Gdynia. It provided only the name of yacht, flag and the 22-hours-old AIS position. The message was not a typical one and the Canadian operator failed to ensure that he

<sup>24</sup> Emergency radio beacon (purchased with the yacht) was not re-registered upon sale of the yacht to Poland.



was well understood by the MRCK Gdynia inspector on duty, who did not speak English fluently. The Canadian operator failed to provide MRCK Gdynia with all other information in his possession, including precise time of the alert message, yacht's MMSI number<sup>25</sup>, the vessel's size and 24-hour contact number provided in the radio beacon register. He also failed to tell whether there was any attempt to call the contact number provided in the EPIRB register.

5. MRCK Gdynia duty inspector on receiving the first message failed to observe the procedure in force in the Centre and did not ask JRCC Halifax for sending information in written form, by fax or email. When jotting down the position provided by the Canadian operator, the duty inspector made a mistake in latitude, writing 54° N instead of 53° N (area of Adlergrund marked with letter B on Figure 12) and assumed mistakenly that the provided position concerns the signal from EPIRB rather than from the yacht AIS device. In further activities the operator assumed that the yacht was most probably heading from Adlergrund to Świnoujście.
6. Further phone verification of message data gave information excluding the possibility that the yacht did send a distress alert 22 hours before from the area of Adlergrund. The *Down North* owner provided the MRCK Gdynia duty inspector with information that the yacht was still in Świnoujście what could be checked by looking at the AIS icon of the yacht on the Internet. The Świnoujście Marina dockmaster stated that the yacht unmoored on that day and sailed towards Szczecin<sup>26</sup>.
7. The MRCK Gdynia duty inspector then checked and confirmed that the yacht *Down North* AIS icon could be seen in Świnoujście, vis-à-vis the ferry dock on the western side of the channel on the screens of two systems used in MRCK to visualise vessels movement: SWIBŻ<sup>27</sup> and SARCASS<sup>28</sup>.

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<sup>25</sup> Registration form for Canadian EPIRBs contains only the radio beacon serial no., with no yacht MMSI number. To register the EPIRB, Canada does not require the vessel to hold a radio station licence, an international call sign or a MMSI number. *Down North*'s MMSI number was found by the Canadian operator (JRCC Halifax) from readout of AIS data as shown by the *MarineTraffic* system.

<sup>26</sup> The marina's vessels log book contained the record on the yacht *Down North* departing towards Baltic Sea.

<sup>27</sup> SAR service (including the MRCK being a part of it), under the Ordinance of the Minister of Transport, Construction and Maritime Economy of 4 December 2012 on National Vessel Traffic Monitoring and Information System, (SafeSeaNet) (Journal of Laws, item 1412) – has the right to access the SafeSeaNet system and participates in it in the scope of sharing information on threats to human life at sea. The System consists in - among others - the technical infrastructure, including the information transmission system composed - among others - with the Navigation Safety Information Sharing System (SWIBŻ).

<sup>28</sup> It is technically unexplainable, since in the SWIBŻ system the vessel icons are removed by default from the screen after 20 minutes, unless a new transmission is received from the vessel. At the time the screens were checked the *Down North* transponder had not transmitted since approx. 35 minutes, and the yacht was in Świnoujście only at least 5 – 6 hours earlier.



8. The MRCK Gdynia duty inspector failed to examine the SWIBŻ system indications thoroughly. Even for a wrongly positioned object it could be noticed that the information displayed on the screen originated from several hours before. The history of the object and position archive data from the previous hours including the last 24 hours could also be checked. Data recorded in the SWIBŻ system archive demonstrates that AIS transponder of yacht *Down North* transmitted the position correctly until the sinking (Figure 10).

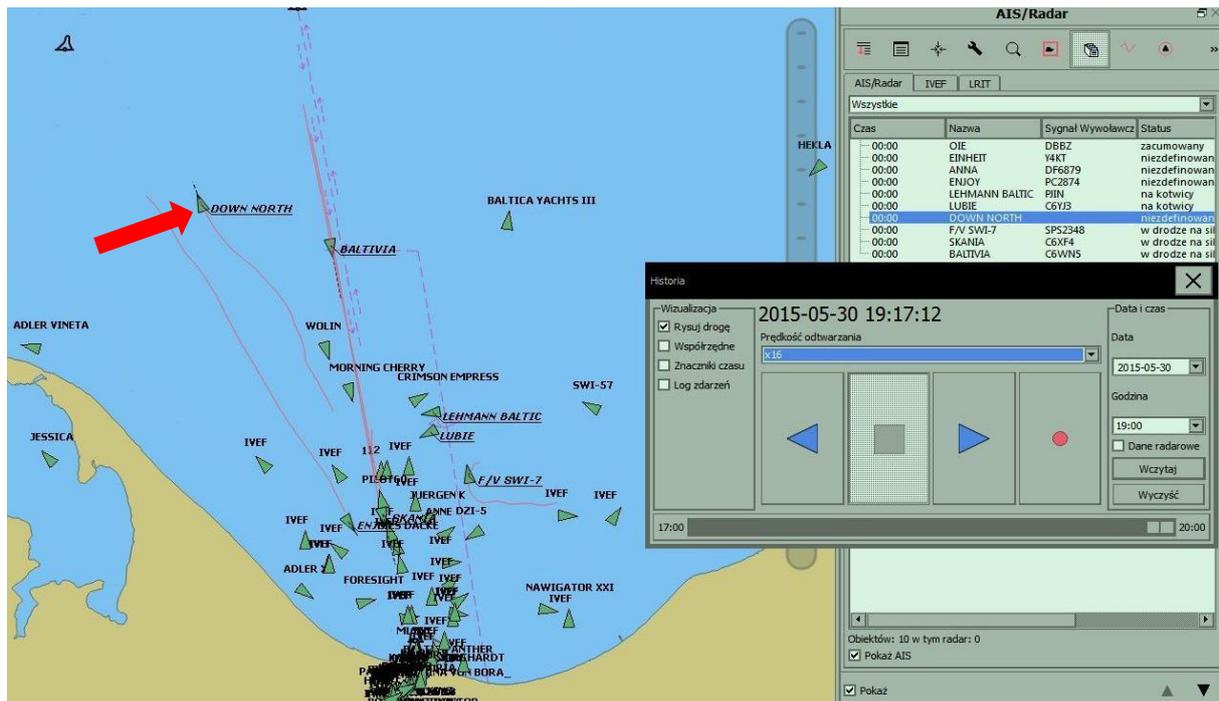


Figure 10. Part of SWIBŻ system screen showing the archive record

9. The MRCK Gdynia duty inspector did not use any publicly accessible system for tracking the vessel movement. The last position of yacht *Down North* was visible in the *Vessel Finder* system (Figure 11) approx. 30 minutes before the inspector received the message on detection of yacht's EIPRB signal from JRCC Halifax.

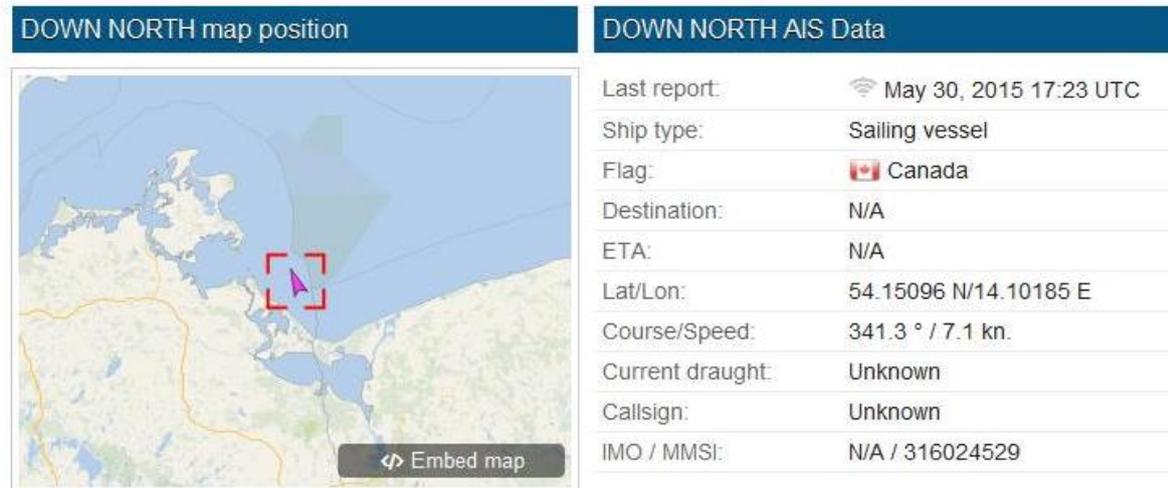


Figure 11. Last position of Down North according to Vessel Finder

10. Considering information in points 5 and 6 above, the MRCK Gdynia duty inspector considered that the unlocated first alert coming from the EPIRB radio beacon was false and might result for example from device test incorrectly performed by the yacht crew (as suggested by its owner in the phone conversation).
11. Another signal from the yacht's EPIRB, detected at 18:48 UTC (20:48 LT) by LEOSAR satellite SARSAT-11, enabled the COSPAS-SARSAT system to determine the radio beacon's approximate position. Position received via LUT station in Toulouse by the French Mission Control Centre (FMCC) indicated the German SAR zone (position marked with a letter C on Figure 10). This information was transmitted to MRCC Bremen in 4 minutes from signal detection.
12. 2 minutes after detection of the radio beacon signal by SARSAT-11, at 20:50 LT, the German vessel *Palucca* sent information via VTS Świnoujście to MPCK Świnoujście requesting medical evacuation. Due to poor VHF reception the MPCK and MRCK have not received information on sinking of the yacht *Down North* at this time yet.
13. MRCC Bremen from information received from the phone conversation with JRCC Halifax learnt that MRCK Gdynia was already working on this case. Information provided from Halifax to Bremen was also incomplete, since MRCC Bremen, when contacting MRCK Gdynia was unaware of the yacht's name and knew only the hexadecimal ID code of the radio beacon<sup>29</sup> (*Hex ID*).

<sup>29</sup> According to Canadian provisions, the only permissible and valid protocol of marine EPIRB coding is *Serial User*, containing only the serial number of the radio beacon according to the Canadian register. In Poland, the only permissible and valid protocol is *Maritime User*, containing MMSI (*Handbook of Beacon Regulations*, Cospas-Sarsat, vol. no. C/S S.007, Issue 1 – Revision 9, July 2016).

14. After 53 minutes from detection of the *Down North*'s radio beacon signal by the first satellite of LEOSAR system, another radio beacon signal was detected and sent to LUT station in Moscow by another LEOSAR satellite SARSAT-13 (position marked with a letter D on Figure 12).

The Mission Control Centre MCC Russia forwarded the information on radio beacon detection to the national SAR contact point (SPOC) in Poland after almost four hours (at 23:39 UTC). MRCK Gdynia received this information after more than one and half hour, at 03:19 LT (01:19 UTC) on 31 May 2016.

Figure 12 presents all the positions of the yacht considered in the second stage of SAR operation (initial actions, upon receiving a danger message). Letter X marks the place of sinking of the yacht *Down North*.



Figure 12. Map showing positions of the *Down North* indicated in subsequent messages



If the mistakes described in point 5 above did not happen, i.e. if the MRCK Gdynia duty inspector found immediately that the vessel, which activated the EPIRB, has an AIS transponder on board and that it is en route in the Pomeranian Bay and that its AIS transponder stopped transmitting 35 minutes earlier, the course of action could be different. However in the opinion of the Commission it is hardly probable that the final result would be different<sup>30</sup>.

In addition, when analyzing information on the *Down North's* EPIRB radio beacon, the Commission noticed that the scope of annual shore-based testing and maintenance of this radio beacon failed to include the check for correctness of EPIRB registration on the basis of documentation or confirmation in the respective national control point, as required by the circular IMO MSC.1/Circ.1040/Rev.1 in clause 3.8 of the annex<sup>31</sup>. The *Down North's* EPIRB was controlled 5 weeks before the accident<sup>32</sup>.

#### 4.9. Formal Status of Yacht Down North

The Commission found that the yacht *Down North* had no right to navigate under the Canadian flag<sup>33</sup>. The *Down North*, self-built in Newfoundland in Canada ca. 1980 and imported to Poland in 2011 was not entered into official registers of vessels in Canada (*Canadian Register of Vessels, Small Vessel Register*). Prior to importing the yacht to Poland, the new owner, citizen of Poland, applied to *Transport Canada*<sup>34</sup> for issuing of the *Pleasure Craft Licence*, authorizing him to use the yacht on Canadian waters and received document

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<sup>30</sup> During the investigation the Commission found that the AIS object (icon) of the *Palucca*, that already had the survivors on board, was visible in VTS Świnoujście system, however it was not visible in the SWIBŻ system in MPCK Świnoujście.

<sup>31</sup> Revised Guidelines on annual testing of 406 MHz satellite EPIRBs.

<sup>32</sup> The *Down North* owner was not aware of the actual registration status of the EPIRB and he did not know what emergency contact number was entered on the registration form. He was not aware that his EPIRB data were not entered into the International Beacon Registration Database (IBRD) and into the ITU Maritime Mobile Access and Retrieval System (MARS) available for SAR services outside Canada.

<sup>33</sup> Pursuant to the definition laid down in Article 2 of the *Canada Shipping Act, 2001*, the term “Canadian Vessel” means a vessel registered or listed under Part 2 of the Act (*Registration, Listing and Recording*). In Part 2, the Act excludes pleasure craft from compulsory registration (Article 46), however enables the owners of such yachts, being Canadian citizens or permanent residents, to register the yacht on their request (Article 47). The official application for entering into the register contains the name of vessel (yacht) which must be accepted by the register keeper (Article 52). Upon completion of formalities, the vessel obtains the certificate of registry (Article 54). The vessel obtains so called official number, with which it must be properly marked (Article 57). Only a „Canadian vessel” (i.e. such that meets the requirements referred to above) has the right to fly the Canadian flag (Article 64(1) of the *Canada Shipping Act*).

<sup>34</sup> *Transport Canada* – governmental administration unit subordinated to the Minister of Transport, responsible - among others – for policies and programs related to maritime safety of commercial vessels and pleasure crafts, as well as vessels’ registers.



no. NL3059558 (Annex 2), with which he was obliged to label the yacht at the bow on both sides before entering it into service<sup>35</sup>.

Since the yacht has not been registered in any Canadian register, it was not allowed to officially bear the vessel name on the bow nor the name of the port of registry on the stern.

The yacht *Down North* held no ship station radio licence. According to Canadian provisions, the vessels equipped only with VHF radio station and navigating in the Canadian waters require no radio license or call sign. The *Down North* had no call sign issued and used none. However, operation of the yacht *Down North* outside the Canadian territorial sea without a radio license infringed the Canadian law.

The Commission found also that the yacht *Down North* used illegally the MMSI no. (316024529), which belonged to another Canadian yacht of the same name (a wooden vessel of 6.63 m in length, port of registry: Victoria in British Columbia). MMSI no. of this vessel had been programmed (entered) into the AIS transponder of the yacht *Down North*, which sank in Pomeranian Bay.

The messages about the yacht's status issued by the owner varied. In announcements on websites offering organization of sea cruises, diving and fishing trips, the yacht was described as a commercial vessel of 23 m – but in contacts with the maritime administration it was presented as a recreational craft of 14.8 m length (e.g. when applying to the harbour authority for permission to tow to the port of Świnoujście<sup>36</sup>).

When importing the yacht *Down North* to Poland, it was not subjected to a test for compliance with the Recreational Craft Directive (RCD)<sup>37</sup>, since the new owner made a statement that this vessel is intended for commercial use in the area of transport of persons and goods<sup>38</sup>.

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<sup>35</sup> Failure to mark the yacht with the number of issued license and failure to carry a copy of this document on board is subject – according to the Canadian law – of a fine of CAD 250.

<sup>36</sup> The Commission noticed that in the request for permit for entry and mooring in the port of Szczecin, submitted to the Szczecin Port Master on 31 July 2015, the legal office authorized to act on behalf of the owner provided false data on the yacht, including the yacht length, year of build and port of registry (St. John's). The Commission found that the yacht had no specified port of registry, since it was not entered into any of the vessel registers in Canada.

<sup>37</sup> 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 EU L 164/15). This Directive was replaced by the Directive 2013/53/EU of the European Parliament and of the Council of 20 November 2013 on recreational craft and personal watercraft and repealing Directive 94/25/EC (OJ EU L 354 of 28.12.2013 p. 90).

<sup>38</sup> In this statement the owner referred to the provision of the RCD Article 1(2)(a)(viii) (entered into the RCD by the amendment under Directive 2003/44/EC of the European Parliament and of the Council of 16 June 2003 amending Directive 94/25/EC on the approximation of the laws, regulations and administrative provisions of the Member States relating to recreational craft (OJ EU L 214 of 26.8.2003 p. 18)), excluding from the scope of the Directive watercrafts specifically intended to be crewed and to carry passengers for commercial purposes.



As a result of such a statement, which was inconsistent with the presented *Pleasure Craft Licence*, the yacht should be removed from the Canadian list of recreational crafts and registered in the Canadian register of vessels or any register of another country selected by the owner.

The fact that the RCD does not apply to vessels intended for transport of passengers for commercial purposes does not mean that in Poland any vessel used for commercial transport of persons, including vessels offered for charter, may be exempt from supervision. In this case, it doesn't matter that the yacht did not sail under the Polish flag, since both pursuant to the Canadian and Polish law, supervision over such vessel is required<sup>39</sup>.

The actual yacht status could be determined upon an inspection performed by the officers of the harbour master's office, where the yacht was based regularly or by port state inspectors (PSC). Such inspection would reveal lack of documentation required for the intended operation mode of the yacht (commercial) together with the certificate indicating that this yacht is licensed as a recreational craft.

The difference between a recreational (pleasure) and a commercial yacht lies not in its structure, declared operation mode nor type of documents carried on board but in the actual way the yacht is being used. Under Polish law this issue is regulated in the Act on maritime safety, supported by two definitions, one of them being a complex definition of a commercial yacht. The Canadian law provides definition of a pleasure craft as "a vessel that is used for pleasure and does not carry passengers" (Article 2 of the *Canada Shipping Act, 2001*), and in the case of any doubts as to whether the yacht is being used as a pleasure craft or a commercial vessel, maritime administration recommends answering the simple question: "are the people on board the vessel paying to be on board?". If the answer is "Yes" this means that the yacht is not used as a pleasure (recreational) craft<sup>40</sup>.

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<sup>39</sup> According to the Canadian provisions, commercial vessels of gross tonnage (GT) between 15 and 150 GT (12 – 24 m) must be inspected prior to enter a service. Obligation to lodge an application for control rests upon the operator. For such vessels carrying no passengers, the subsequent inspections should be performed every 4 years (*quadrennial inspection*). The vessels transporting passengers should be inspected on annual basis (*annual inspection*).

In the Polish legislation, the obligation to inspect commercial sea-going yachts is laid down in the Ordinance of the Minister of Maritime Economy and Inland Navigation of 12 August 2016 on Inspections of sea-going yachts, sea-going yacht safety instruction manual and on template yacht safety certificate (Journal of Laws item 1407). The safety requirements for technical condition of sea-going yachts are specified in the Ordinance of the Minister of Transport, Construction and Maritime Economy of 28 February 2012 on safe navigation by sea-going yachts (Journal of Laws item 326) amended by the Ordinance of the Minister of Infrastructure and Development of 21 July 2015 amending the Ordinance on safe navigation by sea-going yachts (Journal of Laws item. 1118).

<sup>40</sup> *Transport Canada*. <http://www.tc.gc.ca/eng/marinesafety/oep-vesselreg-menu-4416.html>.



#### **4.10. Mechanical Factors**

Changes made to the yacht compared to the original design from the 1980s, in particular adding the steel superstructure on the stern and allowing for new yacht loading conditions (more crew and more supplies) decreased the vessel stability margin, which in combination with actual meteorological conditions and sail area carried at the time of accident, failed to counterbalance the wind heeling effect.

Additional factor involved insufficient watertight integrity of the superstructure, that gave way, allowing for fast downflooding the interior with sea water resulting from heeling deeply. The structure of pilot-house door located near the deck edge was not strong enough and enabled rapid inflow of water to the yacht interior.

Corroded in a few places deck was not watertight, which accelerated the flooding of interior upon immersing of this part of deck in water.

#### **4.11. Human Factors (errors and abandonment)**

The Commission stated that the owner of the yacht *Down North* should not enter it into commercial service and should not allow the yacht to sail without obtaining knowledge of its stability characteristics and so without specifying safe limits of loading the yacht with crew, supplies and equipment and without providing guidelines on safe surface of sail that can be carried in the forecasted weather conditions.

The owner should not enter the yacht into commercial service without appropriate classification supervision, full survey of its technical condition, stability analysis and a written stability information booklet for the yacht master.

Any master of a sea-going yacht is obliged to perform a comprehensive review of the vessel before taking command to go out to sea. The Commission admits that in the case of a yacht chartered as bare boat this task is difficult in practice, unless the yacht is a typical vessel meeting the common standards. In particular, this is difficult when the skipper is subject to pressure either from the side of operator and crew, or frequently from media and sponsors who wish to see the vessel cast off as soon as possible and start performing the programme of the scheduled cruise.

The yacht *Down North* was clearly not a typical vessel, and that should induce the skipper to perform a careful review of the flag state requirements for this yacht before the takeover. This review would easily reveal deficiencies and non-compliances in yacht documentation.



The Commission considered that taking over the command of the yacht in the condition as the *Down North* presented on 31 May 2015, i.e. without safety documentation<sup>41</sup>, without information on stability, without radio license and with a document stating that the yacht is licensed as a recreational craft is a neglect of the master's duty. The skipper himself, as the cruise organizer, conducted the commercial activity in the form of a paid transport of persons for sail-training purposes, so he should appreciate the fact that the vessel chartered for this purpose held only a pleasure craft license.

Erroneous information on whereabouts of the yacht provided by phone to the MRCK Gdynia duty inspector by the yacht owner and by the dockmaster of the Świnoujście Marina, together with incorrect interpretation by the MRCK duty inspector of the message received from JRCC Halifax on the EPIRB activation, delayed dispatching the rescue team to assist the crew of the sunken yacht.

The MRCK Gdynia duty inspector should not rest satisfied with information received only by the casual phone contact or retrieved from a single system used for visualization of AIS transponder positions. The yacht was indeed equipped with an operational AIS transponder and determining its actual or last known position was technically feasible.

In the opinion of the Commission, the probability of a successful rescue of the disabled crew member at this time was low; however there were no objective reasons for the 40 minutes of delay in initiating the SAR response.

#### **4.12. Organizational Factors**

When analysing the documents related to the transfer of ownership and change in the mode of operation of the yacht *Down North* following its sale and import to Poland in 2011, the Commission noticed significant discrepancies in terminology used in Customs documents, EU legislation and provisions issued by the minister relevant for economy and the minister relevant for maritime economy.

The fact that the yacht *Down North* was not subjected to any supervision appropriate for its commercial operation in the Polish territorial waters may result, to a significant degree, from misunderstanding of applicable provisions and inadequate translations of foreign legal acts and documents. Correct interpretation and differentiating or unifying terms and definitions applying to the yacht *Down North* such as:

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<sup>41</sup> The agreements signed with the cruise participants by the skipper, acting also as the cruise organizer, included provisions assuring that the yacht to be used for the cruise would hold valid safety documents and would be equipped in line with the regulations in force.



- 1) “sea-going excursion sailing vessel” (customs declaration form);
- 2) “vessel intended for commercial sailing activity in the scope of carrying passengers and goods” (import declaration);
- 3) “craft specifically intended to be crewed and to carry passengers for commercial purposes” (Directive 94/25/EC);
- 4) “passenger vessel” (Ordinance of the Minister of Economy and Labour of 2004)<sup>42</sup>;
- 5) “vessel intended for sport or recreational purposes, used to carry not more than 12 passengers under the activity consisting in paid training cruises performance (Act on maritime safety)<sup>43</sup>
  - certainly requires advanced specialist knowledge, often missed by the interpreting entities.

The Polish harbour master’s offices and the inspecting authorities focus on the vessels officially registered as commercial and operated professionally by authorized entities. The yacht *Down North* was not registered as a commercial vessel in any register. It held the recreational craft license and its operation was of clearly commercial nature. It navigated under the Canadian flag, which in a manner of speaking “prevented” the Polish maritime authorities to perform the inspection.

Polish Flag State Control inspectors (FSC) may inspect vessels under the Polish flag. The officers of the harbour master’s offices may visit any vessel moored in the port, regardless of its flag, and perform an inspection<sup>44</sup>. The inspections of foreign flagged vessels in Polish ports are performed by the inspectors of the Port State Control (PSC).

For more than 3 years, since the yacht had been imported to Poland until it sank in the Pomeranian Bay on 30 May 2015, there was no inspection that would allow to establish whether the yacht *Down North* had any documents entitling it to fly the Canadian flag or whether it held any safety documents allowing it to perform commercial navigation in the Polish territorial waters.

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<sup>42</sup> Ordinance of the Minister of Economy and Labour of 19 November 2004 on the basic requirements for recreational vessels (Journal of Laws No. 258, item 2584). The Ordinance implemented the Directive 94/25/EC, repealed in June 2016.

<sup>43</sup> Act of 18 August 2011 on maritime security (Journal of Laws of 2016, item 281). The quoted definition of the commercial yacht is included in Article 5(9)(b) of the Act.

<sup>44</sup> Right of the harbour master’s office officers to visit the vessels in the port and inspect the vessel and crew documents results from the orders of the Maritime Office Director, including, respectively: Order No. 5 of the Maritime Office Director in Gdynia of 20 February 2013 – § 11 and § 12 (Voivodeship Official Journal of the Pomeranian Voivodeship item 1314); Order No. 3 of the Maritime Office Director in Szczecin of 26 July 2013 - § 9 and § 10 (Voivodeship Official Journal of the West Pomeranian Voivodeship item 2323) and Order No. 1 of the Maritime Office Director in Słupsk of 13 June 2014 - § 10 and § 11 (Voivodeship Official Journal of the Pomeranian Voivodeship item 2157).



As a matter of principle, recreational (pleasure) yachts are not subject to Port State Control (PSC). In practice, there are cases, when it is not clear whether a certain yacht is a recreational or commercial vessel, in particular when it is used for a time period as a commercial craft and for some other time as recreational one. Determination, whether the yacht is or is not subject to the PSC rests upon the PSC authority itself, according to the guidelines of the Paris Memorandum of Understanding (MoU) on eligibility of yachts to Port State Control<sup>45</sup>.

For the PSC purposes, the MoU guidelines for differentiation between the recreational and commercial yachts formulate the criterion of yacht engagement in trade. A yacht that is not engaged in trade – in other words the operator of which gains no material benefits from its operation – is a recreational yacht. In the opposite case it is assumed that the yacht is a commercial one.

The MoU guidelines assume that the PSC authorities may determine the status of the vessel during an on board verification. If the yacht holds a document indicating its status as recreational, the control authority should assume that it is just the case. However in case of any doubts, and in particular where there are any indications that the yacht is actually used for commercial purposes, i.e. when the yacht operator initiates marketing activities by advertising on the Internet that the yacht is available for chartering, the PSC may consult on this fact with the flag state of the yacht. Upon determination that the yacht is operated on a commercial basis – the PSC should carry out the complete inspection in line with the MoU provisions.

The status (recreational or commercial) of the yacht *Down North* during its operation in Poland has not been clearly determined. The PSC did not apply the Paris MoU in this case.

The lack of action in this case by the PSC may result, in the opinion of the Commission, from awaiting by this authority for a clear notification from the authorities (harbour masters) of ports, where the yacht regularly moored<sup>46</sup>, or for information from the flag state inspectors, who performed inspections of other vessels in these ports and who were aware of the way of operation of the yacht *Down North*. Such a notification might inform the PSC that the yacht has an officially declared status of a recreational yacht, that it navigates under a foreign flag and in fact it is engaged in commercial activity without meeting the basic requirements such as keeping reports of technical inspections and safety documents, including stability documentation.

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<sup>45</sup> *Eligibility of Yachts to Port State Control*, Paris MoU Secretariat, Adopted by PSCC46, 1st June 2013.

<sup>46</sup> The yacht *Down North* participated in 2014 in a collision in Świnoujście Port. In consequence of this event it should be selected for control by the PSC, however because the consequences of the collision were minor and no claims were filed by the parties, the appropriate notification was not forwarded.



The Commission believes that without due cooperation of all control authorities operating under the Polish maritime administration, elimination in future of such cases as the case of the *Down North* and preventing similar accidents as the one which took place in the Pomeranian Bay on 30 May 2015 will be impossible<sup>47</sup>.

The organizational factor which hindered an earlier commencement of the search and rescue response was a deficiency in operation of the SWIBŹ and SARCASS systems used in MRCK Gdynia to visualise the AIS icons representing the vessels positions. The MRCK controller and the assistant on duty attempted to check the position, however due to deficiencies in training received in the scope of SWIBŹ system handling they failed to obtain consistent and reliable information on the position of the yacht *Down North*.

#### **4.13. Impact of External Factors, including these related to Marine Environment, on Casualty**

The direct cause of capsizing and sinking of the yacht *Down North* in the Pomeranian Bay on 30 May 2015 at about 19:00 was a wind gust of approximately 7° B, which occurred in conditions of steady wind force of ca. 5 – 6° B. At this time, the yacht was carrying practically full sail, which was a common practice for this vessel in similar conditions.

### **5. Description of Examination Findings Including the Identification of Safety Issues and Conclusions**

As the result of the performed investigation the Commission stated that the cause of the *Down North* sinking was downflooding of the yacht due to a starboard windgust-induced heel, exceeding the flooding angle, which had been significantly lowered compared to the original yacht structure during successive hull rebuildings. The Commission found that construction changes of the yacht were performed without classification supervision and that the yacht was operated for commercial purposes without known stability characteristics.

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<sup>47</sup> The Commission notes that in December 2015 the provision of Article 110(2a) of the Act of maritime safety entered into force, which includes (however in unclear manner) the commercial yachts bareboat chartered but used by the charterer for commercial purposes as inspection objects of the Port State Control (as in the case of the yacht *Down North*). This provision has the following wording: „Shall a commercial yacht bareboat chartered against payment be used for commercial purposes in scope of an activity referred to in Article 5(9)(a-e), the provisions referring to a commercial yacht chartered with crew against payment are applied to such a yacht”.



The Commission believes that even meeting all the stability criteria guarantees no resistance of a sailing vessel to wind gusts in all conditions. However, failing to meet even one of the criteria should induce the operator and the yacht master to take appropriate measures in the area of safe operation of the vessel.

Yachts, that plan cruises to remote and little-frequented regions, with numerous crew, and in particular commercial yachts, where participants make formal agreements with the organizers in belief that the organizer takes all possible effort to ensure safety, should be equipped with emergency radio beacon (EPIRB) of the COSPAS-SARSAT system with built-in GPS receiver to enable faster location of the vessel in case of distress.

The MRCK inspectors on duty, when analysing the reports arriving at the Centre, should verify information on vessels in distress using all technically available sources, including these publicly available on the Internet. Public systems, such as *MarineTraffic* and *Vessel Finder* frequently provide more up-to-date data than dedicated internal systems. One should not rely completely on a single system<sup>48</sup>.

In the performed investigation the Commission found that due to lack of appropriate user knowledge not all technical capacities of the SWIBŻ system were used by the MRCK inspector on duty and by his assistant to verify the reported distress. The MRCK Gdynia duty inspectors were not trained nor encouraged to use the more advanced system functions.

Both systems currently in use in the MRCK Gdynia to support search and rescue operations - SWIBŻ and SARCASS – require a revision and enhancement of functionality<sup>49</sup>. Qualifications of MRCK Gdynia operators should be upgraded and procedures for removing the identified deficiencies should be improved.

According to the Commission the case of sinking of the yacht *Down North* leads to an important conclusion that the vessels that had been rebuilt or modified to a significant degree compared to the original design and the intended function should be treated by the operators and masters with additional caution.

On the yacht *Down North* the officer standing watch outside the pilot house, e.g. near the deck pilot station, has no fixed communication devices within his/her immediate reach. In the opinion of the Commission, in such case the officer on watch should always carry the hand-

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<sup>48</sup> This does apply to publicly available systems as well.

<sup>49</sup> The Commission found that in April 2016 the management of MRCK Gdynia decided on modernization of the SARCASS system. The related work is performed by the Research and Development Institute of the Maritime Technology Centre in Gdynia.



held VHF radio telephone. The yacht master should ensure continuous performance of radio watch and possibility of immediate use of VHF radio station in every case.

The crew which has abandoned a yacht in emergency should remember not to deploy the sea anchor from the life raft too early since it poses a threat of getting entangled in the equipment of the sinking vessel. The instruction manual for the “Viking” raft carried on the yacht *Down North* clearly indicated this fact.

Yachts used for cruises in water regions with icing or ice should be equipped with appropriate rescue equipment, including immersion suits<sup>50</sup>.

## **6. Safety Recommendations**

The State Marine Accident Investigation Commission has deemed it expedient to provide recommendations, which are proposals of actions which could contribute to preventing similar accidents in the future.

### **6.1. The Operator of Yacht *Down North***

The State Marine Accident Investigation Commission recommends that the operator of the yacht *Down North*, DIK Mariusz Nawrot company, in case of deciding to return the yacht to service, should select an appropriate register into which the yacht would be entered (flag state) and an appropriate mode of yacht operation, ensuring meeting of the flag state requirements in the scope of safety, construction and equipment.

### **6.2. The Organizer of Sail-Training Cruise on the Yacht *Down North***

The State Marine Accident Investigation Commission recommends that the organizer of maritime sail-training cruises, Navigare Yacht Club company, takes all efforts to ensure due diligence in checking that the yachts to be used for cruise purposes hold valid safety documents, in line with obligations made by the organizer in statements included in the agreements signed with the cruise participants.

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<sup>50</sup> The Commission found that the organizer of *Down North* cruise to Spitsbergen in the Arctic Sea did not provide participants with rescue suits that increase the survival chance of persons in cold water by preventing hypothermia.



### **6.3. The Minister Competent for Maritime Economy**

The State Marine Accident Investigation Commission recommends that the minister competent for maritime economy should implement the amendments in the Act of 11 August 2011 on maritime safety (Journal of Laws of 2016, item 281), which will enable performing the on-board verifications and inspections by controllers of the port state control (PSC) on foreign sea-going yachts mooring in Polish ports, for which the status related to their mode of operation (commercial or recreational) is unknown or raises justified doubts.

The Commission proposes implementation of the following amendments to the provisions of the Act:

- 1) Article 33(1)(5):
  - a) Clause 5 should have the following wording:

“5) commercial yachts chartered for remuneration without manning, subject to Article 110(2a)” or
  - b) repeal Paragraph 1(5);
- 2) After Article 35, add Article 35a in the following wording:

„Article 35a. 1. Foreign sea-going yachts mooring in the Polish ports may be controlled by the port state carried out by the controlling authority.

2. Foreign sea-going yacht raising justified doubts whether it is a recreational or commercial yacht, is subject to on board verification.

3. When performing the on board verification, the controllers of port state control follow the applicable guidelines of the Paris Memorandum of Understanding”.

In addition, the Commission put under consideration of the minister competent for maritime economy to allocate additional funds for the SAR Service for training of the MRCK and the MPCK inspectors that will allow to increase skills of persons employed in these centres and to complete the necessary courses in specialized foreign centres.

### **6.4. The Maritime Rescue Coordination Centre**

The State Marine Accident Investigation Commission recommends that the SAR Operational Director supervising the Maritime Rescue Coordination Centre in Gdynia should:

- 1) expedite the development and implementation of the procedure ensuring that the Centre duty inspectors will remember, at each phone report from another MRCC, to



request information in writing on the reported event and will use all available sources of information, including publicly available Internet services, to verify the received reports and assess the actual situation (position) of the vessel in distress based on its name and AIS signal;

- 2) request the entities managing the systems supporting the search and rescue operations (SWIBŻ and SARCASS) to adjust the systems used in the Centre and to provide them with functions facilitating searching of information on the position and particulars of the vessel in distress based on incomplete data within the period of at least 48 hours backwards;
- 3) promote training the users of the systems supporting the search and rescue operations in techniques of using the functions facilitating checking data and correctness of the position of the vessel in danger, including its navigation history (archive) and from information derived from the radar VTS sensor of the iMARE VTS system of the National Maritime Safety System (KSBM);
- 4) ensure effective reporting of any deficiencies in the systems supporting the search and rescue operations to their managing and supervising entities to ensure resolving of such deficiencies.

The Commission additionally proposes considering development in the future of a general policy for recruitment of operational inspector candidates (including e.g. initial requirements, preparatory courses), among others to avoid employing at this position persons without due knowledge of English language.

## **6.5. Directors of Maritime Offices**

The State Marine Accident Investigation Commission recommends that the Directors of Maritime Offices in Gdynia, Słupsk and Szczecin draw the attention of the subordinated harbour masters, in which the foreign flagged sea-going vessels moor, to the need of more thorough checks of registration and safety documents of yachts by the officers of the harbour master's office. In the case of finding irregularities or raising justified doubts as to the yacht status (whether it is a commercial or a recreational one), this fact should be reported to the nearest controller of the port state control or the PSC coordinator in Gdynia.



## 6.6. The Port State Control (PSC) Coordinator

The State Marine Accident Investigation Commission recommends that the Port State Control officers perform the inspection and verify the status of the yacht *Down North* navigating under the Canadian flag and conducting commercial activity in the Polish territorial waters, at the nearest mooring of the yacht in a Polish port.

The Commission recommends that the PSC inspectors use the right laid down in the Paris MoU guidelines - *Eligibility of Yachts to Port State Control* - to determine whether the foreign yacht moored in the port is subject to a PSC inspection despite lack of information on the yacht in the THETIS information system.

The Commission recommends that determination of the status of a yacht which is unknown or to which there are justified doubts, should be performed in line with these guidelines and that further proceeding should follow the Paris MoU provisions.

The Commission recommends that a closer cooperation should be established between the PSC and harbour master's offices in the scope of determining the status of yachts raising justified doubts as to their status (commercial or recreational).

## 6.7. The Minister Competent for Physical Culture

The State Marine Accident Investigation Commission recommends that the Minister competent for physical culture should include into the scope of certification examination for the Yacht Skipper license the issues related to yacht stability in a way ensuring that the skipper will be capable to use typical stability information documents issued for the yacht.

Yachts of length exceeding 15 m may navigate in all maritime waters under command of persons holding the Yacht Skipper license. Such vessels are subject to technical inspection. Upon inspection performed by a recognized organization or an authorized official body, those yachts receive the document confirming the yacht's technical capacity for sailing. Many yachts, including some commercial yachts, have the 'Information on Stability' document on board, containing the stability data related to basic loading conditions and other guidance information for the skipper's assessment of proper navigation, thus increasing safety of skipper and the crew. The yacht skipper should have basic knowledge and skills sufficient for practical use of information on stability provided by classification societies according to valid standards and common practices.



## 6.8. The Company Escort sp. z o.o.

The State Marine Accident Investigation Commission recommends that the company Escort Sp. z o.o., Szczecin, carrying out the maintenance service of radio communication equipment, follow the recommendations of the Maritime Safety Committee of the International Maritime Organization (IMO) presented in the circular MSC.1/Circ.1040/Rev.1 during performance of annual testing of EPIRBs of the COSPAS-SARSAT system. The Test Protocol Form should include all recommended annual testing items indicated in the circular and duly recorded performance or non-performance of the individual items of the test<sup>51</sup>.

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<sup>51</sup> The Commission notes that the circular MSC.1/Circ.1040 referenced by the company in *Down North's* EPIRB test report was replaced with circular MSC.1/Circ.1040/Rev.1 in 2012.



## 9. Glossary and Abbreviations

- ARCC – *Aeronautical Rescue Coordination Centre (Warsaw)*
- CMC – *Cospas Mission Center = Russian Mission Control Centre – (Moscow, Russia)*
- DSC – *Digital Selective Calling*
- DWD (*Deutsche Wetterdienst*) – German Meteorological Service
- EPIRB – *Emergency Position Indicating Radio Beacon*
- FMCC – *French Mission Control Centre of the COSPAS-SARSAR system*
- GFS – *Global Forecast System*
- GRIB (*GRIdded Binary*) – data exchange format
- HA – *heeling rm*
- IMGW – (Polish Abbreviation) *Institute for Meteorology and Water Management*
- ITU – *International Telecommunications Union*
- IBRD – *International Beacon Registration Database*
- JRCC – *Joint Rescue Coordination Center (Halifax, Canada)*
- LT – *Local Time*
- LUT – *local user terminal of the COSPAS-SARSAT system*
- MARS (*Maritime mobile Access and Retrieval System*) – system enabling checking data reported to the ITU maritime database
- MCC – *Mission Control Centre of the COSPAS-SARSAT system*
- Nm – Nautical mile
- MPCK – (Polish Abbreviation) *Maritime Auxiliary Coordination Centre (Świnoujście)*
- MRCC – *Maritime Rescue Coordination Center (Bremen, Germany)*
- MRCK – (Polish Abbreviation) *Maritime Rescue Coordination Center (Gdynia)*
- PRS – (Polish Abbreviation) *Polski Rejestr Statków S.A. – classification society*
- PYA – *Polish Yachting Association*
- SARCASS - *Search and Rescue Coordination and Support System*
- SPOC – *SAR point of contact*
- SW – wind direction (southwest)
- SWIBŻ – (Polish Abbreviation) *Navigation Safety Information Sharing System*
- UTC – *coordinated universal time*
- knot* – knot (speed)
- W – wind direction (west)



## 10. Information Sources

Notification about the accident

Interviews with witnesses

Interviews with participants of previous cruises of the *Down North*

Documents received from the yacht master and the present and previous operator of the yacht *Down North*

Documents received from customs agency handling the import of the yacht *Down North*

*Down North* stability analysis performed by Mr R. Wojtyra – individual expert of the State Marine Accident Investigation Commission

Expert opinion prepared by Mr P. Carlson – individual expert of the State Marine Accident Investigation Commission

Report from SAR response

Phone calls recorded in the MRCK Gdynia

Information received from Canadian maritime administration (*Transport Canada*)

## 11. Composition of the Accident Investigative Team

The team conducting the examination was composed of:

Team Leader: Marek Szymankiewicz – secretary of the SMAIC

Team Member: Krzysztof Kuropieska – member of the SMAIC

Team Member: Cezary Łuczywek – president of the SMAIC

Team Member: Piotr Carlson – expert of the SMAIC



Annexes

Annex 1

Builder's (rebuilding) certificate of yacht Down North



Transport Canada / Transports Canada

PROTECTED A (WHEN COMPLETED) / PROTÉGÉ A (LORSQUE REMPLI) FORM/FORMULAIRE 2

BUILDER'S CERTIFICATE FOR FIRST TITLE

CERTIFICAT DU CONSTRUCTEUR POUR PREMIER TITRE

NOTE: This certificate must not be completed by an importer or an importer's agent. Execution of this document conveys title from the builder to the owner(s). REMARQUE: Ce certificat ne doit pas être complété par un importateur ou l'agent d'un importateur. Exécution de ce document fait passer le titre du constructeur au(x) propriétaire(s).

Form containing fields for vessel identification (Down North), intended port (St. John's NL), construction details (propulsion, length, breadth, depth, tonnage), and owner information (64 shares).

\* 64 shares represent 100% ownership of a Canadian vessel - 64 parts représentent 100% de la propriété d'un bâtiment canadien

If the builder is a corporation incorporated under the laws of Canada or a province the certificate should be made by an officer of the corporation authorized by company resolution or by affixing the seal of the corporation on this form.

Lorsque le constructeur est une personne morale constituée en vertu des lois du Canada ou d'une province, le certificat doit être fait par un agent de la personne morale autorisé par une résolution de celle-ci ou doit porter le sceau de la personne morale.





Pleasure Craft Licence document received from operator of yacht Down North



PLEASURE CRAFT LICENCE
THIS LICENCE IS NOT A TITLE DOCUMENT
IMPORTANT DOCUMENT - DO NOT LOSE

PERMIS D'EMBARCATION DE PLAISANCE
CE PERMIS N'EST PAS UN TITRE DE PROPRIÉTÉ
DOCUMENT IMPORTANT - NE PAS PERDRE

Form containing license details: Name(s) - MARIUSZ JAN NAWROT, Licence No. - NL3059558, Address - STREET, City - ST. JOHN'S, Newfoundland and Labrador, Postal/Zip Code - A4, Description of Pleasure Craft, Length - 14.8, Propulsion Type - Aux Sailing, Primary hull colour - Green, Secondary hull colour - White, Date of Issue - 05-07-2011, Expiry Date - 31-07-2021.

In accordance with the Canada Shipping Act, 2001, s. 204, licensed vessels must be marked with the licence number of the vessel in block characters not less than 75 mm high and in a colour that contrasts with their background. The number is to be located: (a) on each side of the bow of the vessel, or (b) on a board permanently attached to the vessel as close to the bow as practicable, so that the number is clearly visible from each side of the bow.

For information on pleasure craft licensing or boating safety, please contact:

1-800 O-Canada
TTY/YYD 1-800 926-9105

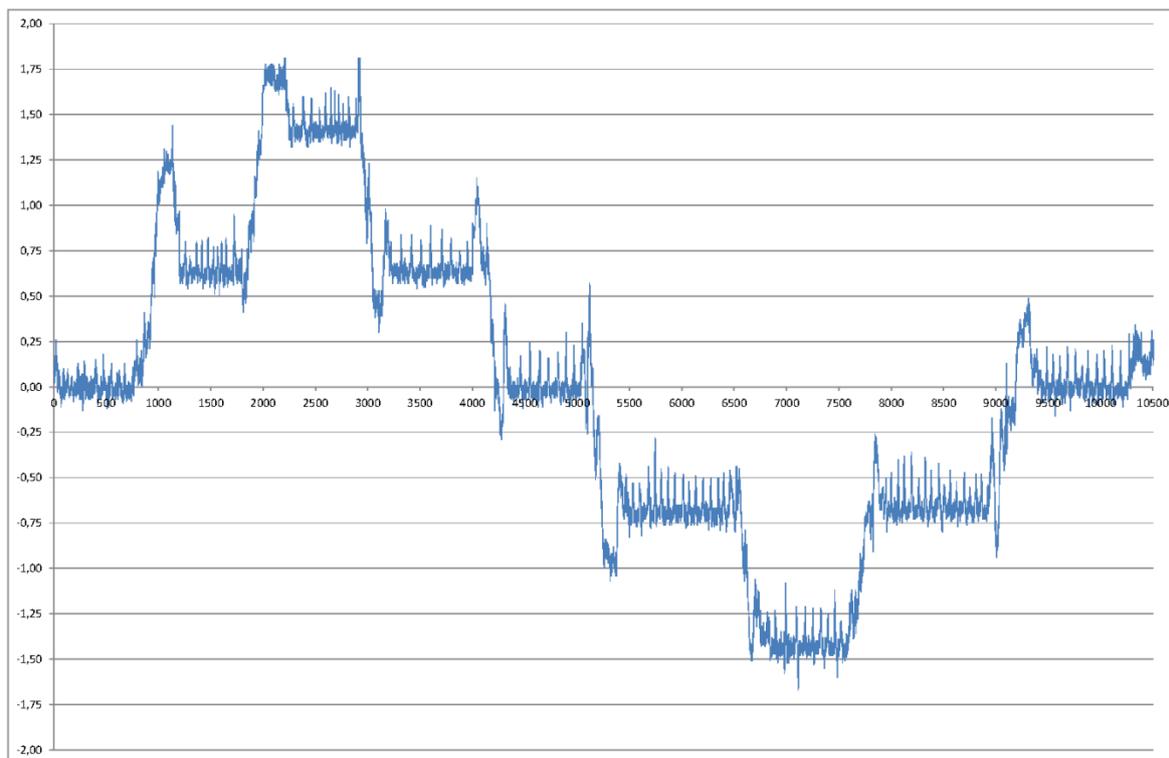
Pour de plus amples renseignements sur les permis d'embarcation de plaisance ou sur la sécurité nautique en général, veuillez contacter:

Transport Canada / Transports Canada
www.boatingsafety.gc.ca / www.securitenautique.gc.ca





### Record of angles during inclining test to determine the gravity centre of the yacht *Down North* (9 August 2016)



#### Determination of gravity centre of complete and unladen vessel

Specification	weight [t]	x [m]	z [m]	Mx [tm]	Mz [tm]
Inclining weight on bow	0.250	11.60	2.85	2.900	0.713
Inclining weight on stern	0.250	6.50	2.75	1.625	0.688
Handlers for bow perpendicular	0.000	0.00	0.00	0.000	0.000
Handlers for stern perpendicular	0.140	6.40	2.15	0.896	0.301
Foreign weights	0.000	0.00	0.00	0.000	0.000
	<b>0.640</b>	<b>8.47</b>	<b>2.66</b>	5.421	1.701

#### Weight of complete and unladen vessel

Specification	weight [t]	x [m]	z [m]	Mx [tm]	Mz [tm]
Vessel weight during trial	35.80	8.25	1.87	295.350	66.871
Missing weights	0.240	6.75	1.55	1.620	0.372
Foreign weights	0.640	8.47	2.66	5.421	1.701