The Independent Fact Group

Subject: The visor floatability and impossible sinking scenario

Type: Analysis
By: The Independent Fact Group
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Status: Proved
Date: 2021
Version: Report-English

Methodology:

In the course of this task, we have assumed that the solution of a problem is never better than the validity of the basic assumptions. As a result, we have stipulated some methodological principles, of which the following are the most fundamental:

1. All scenarios must be considered to be true until the contrary is proved.
2. All observations, assumptions or statements on which a scenario is based must be considered false until the contrary is proved.

We have defined a number of criteria for concluding that an observation, assumption or statement may be considered to be true or false, and processes and routines for the route to be taken in clarifying an observation, assumption or statement. These criteria involve technical, empirical, statistical and/or semantic requirements which, if they are relevant, must all be met if the observation, assumption or statement is to be classified as an objective fact.

The materials we have worked with are primarily the documents, audio recordings and films in the Swedish Accident Investigation Commission's Estonia archive, together with supplementary information from other public sources and, in addition documentation from the Meyer shipyard and its independent commission.

Summary

In this report the Independent Fact Group prove that the visor, if it had fell off according to JAIC, impossible could have floated and thereafter could have hit MV Estonia about midship causing the big hole as found by the documentary filmmakers Henrik Evertsson and Linus Andersson "Estonia - the find that changes everything".

The report also proves, as a consequence of more than 140 tests in water tank, that the visor could not have landed on the seabed and standing up- side down.

We have used a functional analysis-based probabilistic approach for which we present random results based on scalable experiments of dynamical studies in water.

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Purpose of the examination, floatability and the alleged sinking of the visor

In 2020 the new underwater footage featured in a five-part Discovery Network documentary about the disaster of MV Estonia was presented.

The film was titled: The Find That Changes Everything. The film crew discovered a large hole in the ship's hull while using a remote controlled vehicle (ROV) to explore the wreck. As a result, different people presented different proposals for the origin of the hole. One such claim is that the visor after it fell off would have floated along the side of the ship and then broken the hull and created a 4-meter high and 1.5-meter-wide hole in the hull.

The Independent Fact Group completely opposes this scenario. We have previously shown that the visor scenario presented by JAIC is impossible. Furthermore, we have analysed and shown the damage inflicted on the visor during the salvage of it. JAIC commented the damage as "significant damages that occurred when the visor fell off the ship."

This report proves that the visor could not have floated along the side of MV Estonia and then at "midship" cause the damage. Today we also know that in addition to the hole that Henrik Evertsson and Linus Andersson found, there are additional and larger holes in the ship. In addition, there are large indentations and scratches between the holes. The visor cannot have caused them because there is no physical evidence for such a scenario.

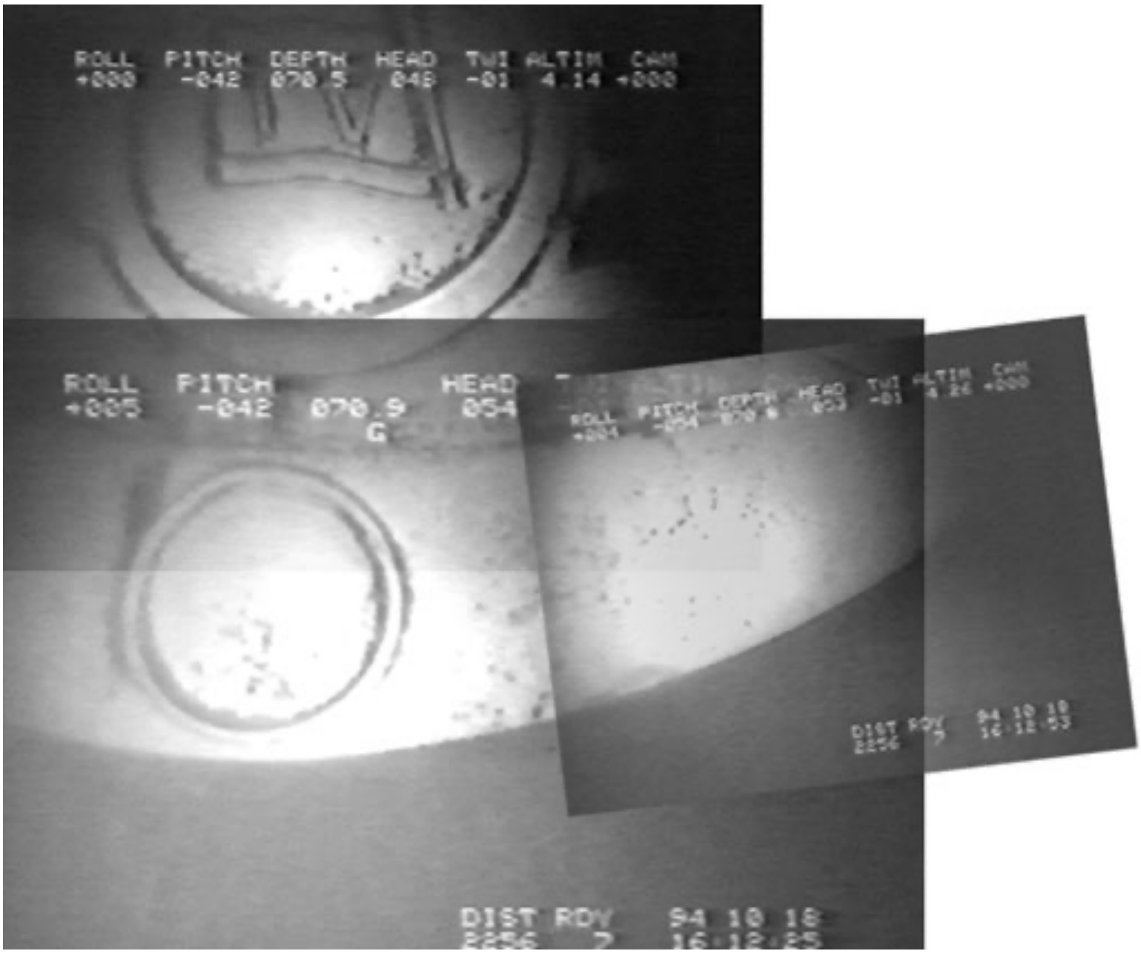
The purpose of this report does not cover it, but in this context, it is worth noting. If the holes were to be explained because the ship had hit rocks or stones on the bottom during the sinking process, it does not explain scratches and indentations between the holes.

Background.

In 2006, the Independent Fact Group made repeated trials and tests in a preliminary investigation to find the probability of the claim that the visor fell off and came to rest upside down on the seabed. We performed 140 drops of the visor in a pool with a scalable depth of 70 meters.

The model we used in 2006 was made of sheet metal which was bent to form a copy in the shape of MV Estonia's bow visor with a scale of 1: 100. The model had no side towards the ship's front bulkhead but it had a foredeck. The intention was to study the movements in water from an object with the same external shape as MV Estonia's bow visor. Unfortunately, floatability tests were not possible with such a simple model.

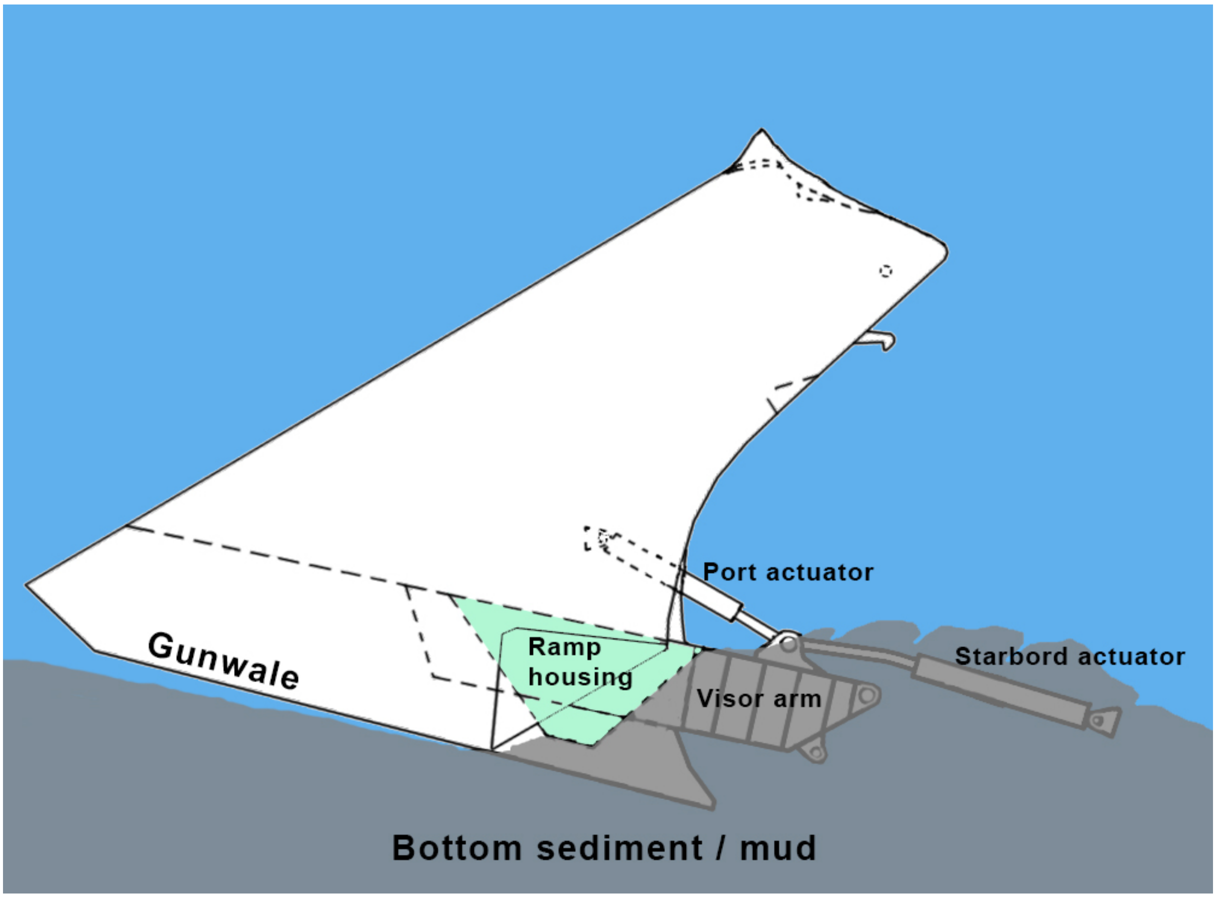
Not in one single case the visor came to rest upside down like it was found on the seabed, officially on the 18th of October 1994 at the position 5923,0' N - 2139,2' E about one nautical mile west of the wreck.



Picture 1. *The upper forward part of the visor standing upside down in the soft sediment. The forward part of the visor was not in contact with the seabed.*

From a video recorded by the Finish authorities on 18 October 1994 (Finnish archive "visiri 17-18/10 -94"), the visor position can be seen on the bottom of the Baltic. The visor was standing upside down with all of its gunwale (the upper part) free from the seabed. The only parts of the visor that had sunk in the mud were the visor arms and the ramp's housing.
See also Picture 2 below.

In a telefax 26/10 1994 from Kari Lehtola (Finnish Accident Investigation Board) to Olof Forssberg (Swedish Accident Investigation Board) there is an enclosure, "A preliminary summary of observations on the bow visor video" (SHK archive Estonia I 33). The visor position was confirmed as "The bow visor lies on the seabed upside down. The visor arms are buried in clay and cannot be seen. A large part of the visor operating cylinder on the right side (starboard side) is also under the clay."



Picture 2. *The visor was found like this, upside down, with only parts of the visor sunk in the bottom sediment.*

Summary of conditions for the alleged visor loss according to JAIC

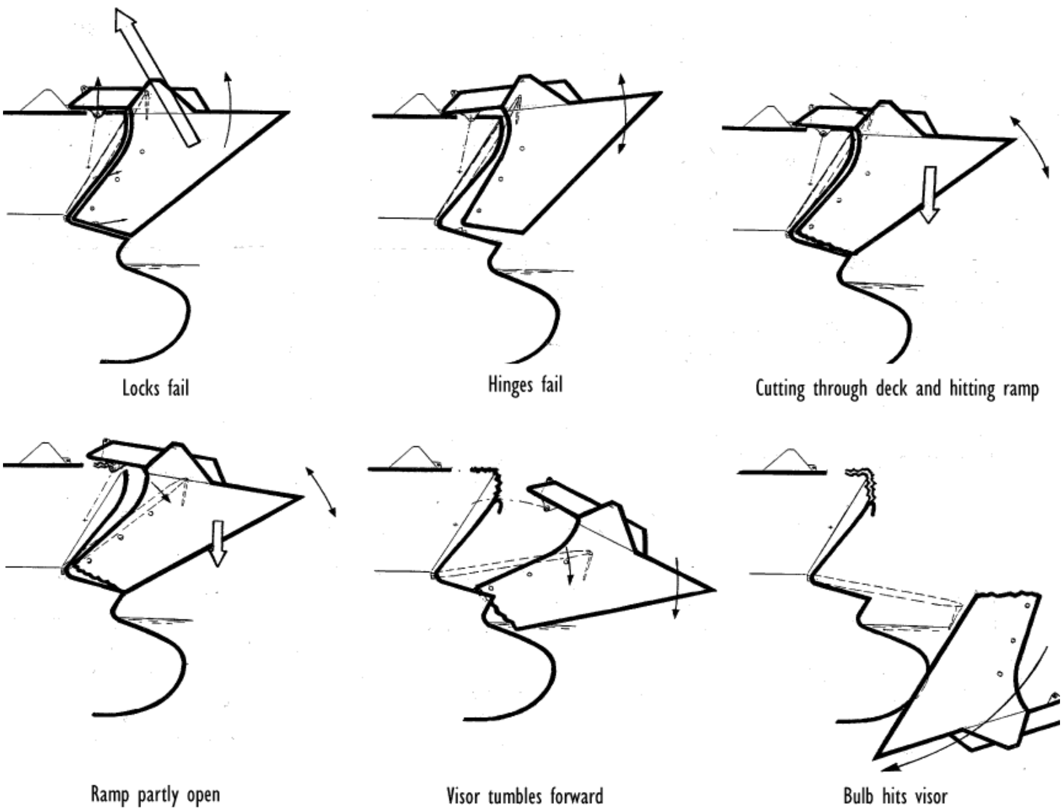
JAIC report 13.5 Failure sequence of bow visor and ramp.

"All the attachments of the visor, the locking devices, the deck hinges and the lifting cylinder mountings failed under local overload tension. The attachments may have failed in one or, possibly, a few steps. The partial initial failure may have coincided with a single metallic bang, observed by the AB seaman.

The main failure is believed to have happened in a subsequent wave impact, shortly after the metallic bang. In this main failure the remaining locking devices failed completely, allowing the visor to open partly. Once the visor had lifted off its locating horns, the port side hinge failed under the overload generated by the high twisting and yawing moments and the vertical force. [1] *The starboard side hinge failed as a result of twisting when the visor was rotating clockwise. Hydrodynamic loads pressed the visor against the front bulkhead along which it slid upwards. The hydraulic lifting cylinders may have failed at the same moment or may have remained connected for some further time. The port side actuator, which at some stage was pulled out of the hull by failure of the already weakened bottom mounting platform, had extended by about 0.4 m at least. The starboard side actuator failed hydraulically but remained connected and was ripped out of the hull, fully extended, as the last physical connection between the visor and the hull.*

[2] *After the locking devices and hinges had failed and the actuators had lost their restraining effect, the visor had a natural tendency to tumble forward due to its forward-located center of gravity relative to the new center of rotation, i.e. the stem post area. The visor's position was at this stage governed by the actuators and the actuator attachment lugs on the hinge beams, protruding into openings in the forecastle deck. The visor was thereby constrained in the longitudinal direction.*

Subsequent wave impacts caused the visor to move backwards and forwards in combination with some vertical movements, resulting in various impact damage to the bulkhead and the hinge beams. Impact marks indicate violent transverse movements, and upward movements of about 1.4 m. The damage is described in detail in Chapter 8."



Picture 3. "JAIC Figure 13.6 Probable failure sequence of the bow visor"

The Independent Fact Group comment

We state that the description is contradictory and unclear. On the one hand, it was claimed that the visor fell off in a longitudinal motion (straight ahead) after all the locks broke in an initial stage. At the same time, starboard hydraulics have been the last part to come loose, which meant that the visor must have turned because the port's upper hinge was breaking due to overload in a twisting movement. The starboard upper hinge broke due to rotation when the visor rotated clockwise (seen from the starboard side).

First, it is described that [1] "The starboard side hinge failed as a result of twisting when the visor was rotating clockwise," and then that the rotating movement occurred [2] "After the locking devices and hinges had failed and the actuators had lost their restraining effect, the visor had a natural tendency to tumble forward ..."

These two assumptions are contradictory, [1] cannot have happened before [2], and [2] cannot have happened before [1].

Further on, the description is based entirely on assumptions and conjectures summarized with "may", "is believed", "for some further time", "at some stage" and so on.

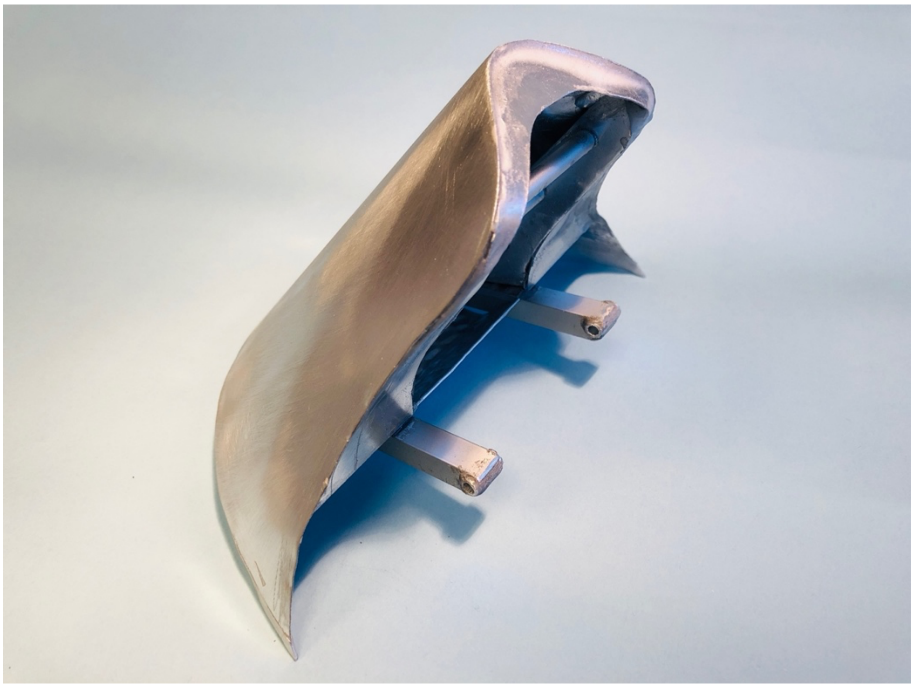
In summary, we state that the entire description is complete nonsense. In the long run, it also means that damage, as described in detail in JAIC Chapter 8, is incorrect.

Regardless of how the scenario developed, provided that the visor was lost before the ship sank, we must in this report relate to the visor falling into the sea, and during this sequence also been hit by the ship, which according to JAIC, has caused great damage to the visor bow.

Already this conclusion excludes the possibility that the visor would then regain a buoyancy, float up to the surface and pass aft, where it then again collided with the ship now with such force from the side that it could tear up a 4 meters high and 1.5 meters wide hole.

Test model of the visor

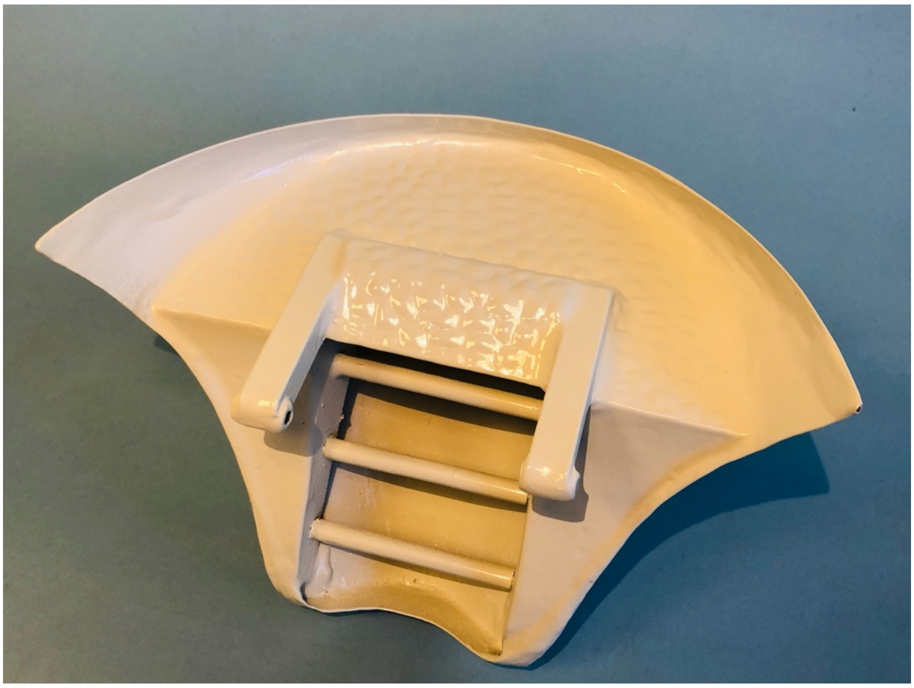
We built the model in aluminum. We restricted the model from such details as visor locking and lugs, Atlantic lock and hydraulic cylinders. The report aimed to determine if the visor could float and if it was likely possible that it would have been landing at the seabed standing up-side-down as found.



Picture 4. Building the visor model, visor bottom and bulkhead side.

Picture 5. Building the visor model, inside the visor.

Picture 6. Building the visor model, visor arms and ramp housing.



Picture 7. Building the visor model, first layer of paint.

Conditions for testing in a water tank

We performed the tests in an open water tank which allowed 70 meters depth (scale 1:100). In addition, the tank permitted induced waves.

Picture 8. Building the visor model, prepared for first test in tank.

In a possible floating position, the visor must displace its weight, 64 m^3 of water, which corresponds to the weight of the visor (64 metric tons) when measured after the salvage. The total volume of the visor, which only theoretically could contribute to flowability, has been measured at approx. 130 m^3.

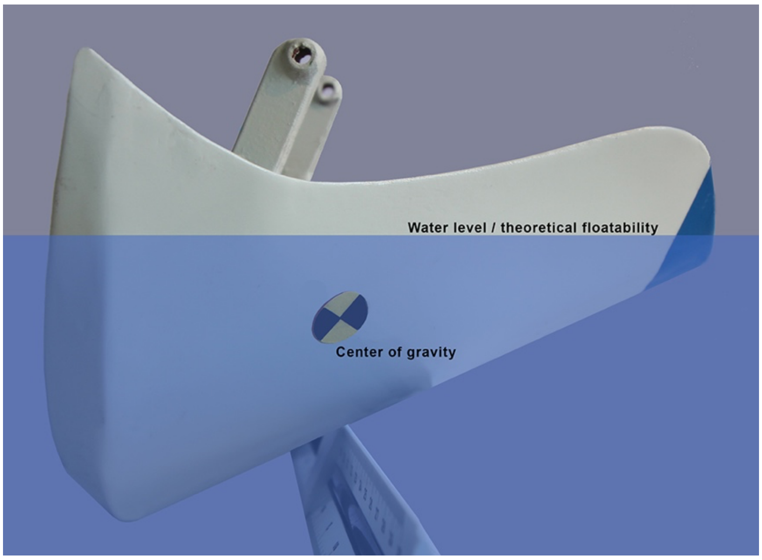
Water temperature and salinity

The water in the Baltic Sea and the Gulf of Finland is almost always stratified due to temperature and/or salinity. Thanks to the inflow of water from Kattegatt, there is a clear variation in salinity from high to low. The surface water decreases from about 15-25 PSU (practical salinity unit) to almost 0 in the innermost parts of the Gulf of Finland. Usually, the salinity also increases with depth. We have assumed that the salinity in the area of Estonia's sinking was about 4 PSU and that the temperature in waters was 12 degrees Celsius.
We have measured the PSU and water temperature in the tank before testing and found the levels to be accurate for testing in regard to the surface water.

Wave condition and acceleration effect due to gravity

The acceleration in the event of a fall from the ship combined with the effect of waves, flooding, the angle and rotation of the visor is vital. When it fell to the water surface, and not least in consideration of the extensive damage in the visor base plate, we have concluded that even in theory, the visor would not be able to float after it had fallen into the sea.

We have made the visor model from an assumption that the weight and balance of the model must be adapted to how the visor had displaced water relative to the center of gravity of the visor. The weight of the model is thus of secondary importance. Of course, it is possible to scale the weight of the visor, but in reality, it is of less importance though we can not scale gravity.

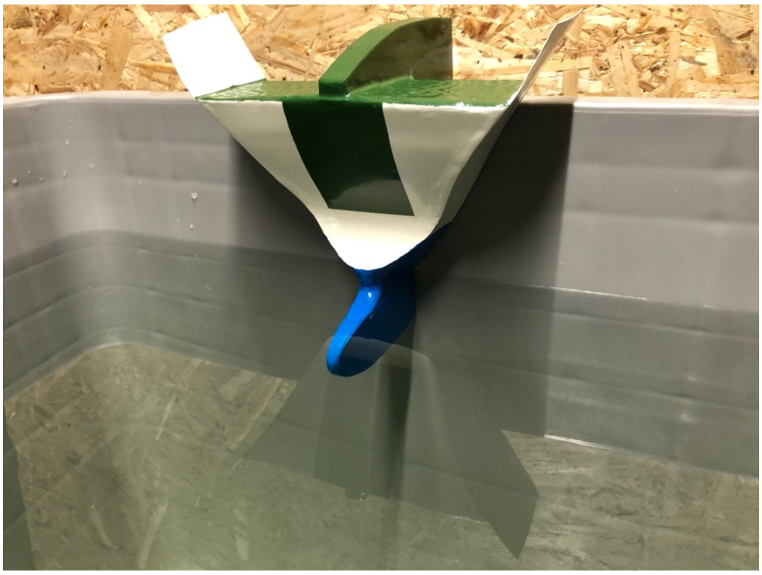


Picture 9. Visor balance and water level in still water and perfect circumstances.

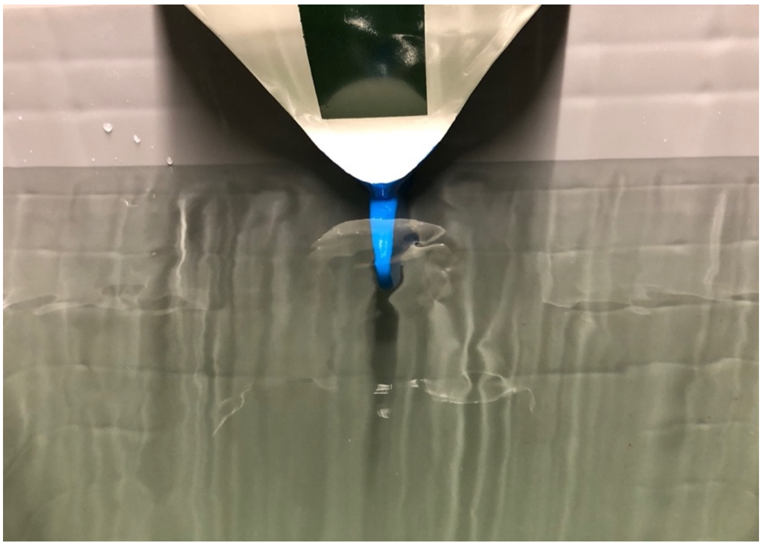
We adjusted the weight of the visor model to result in a theoretical floating position that corresponded to the actual visor.

Performed tests

We performed 140 tests of the two scenarios, visor "separation and falling into the sea" and "visor sinking."



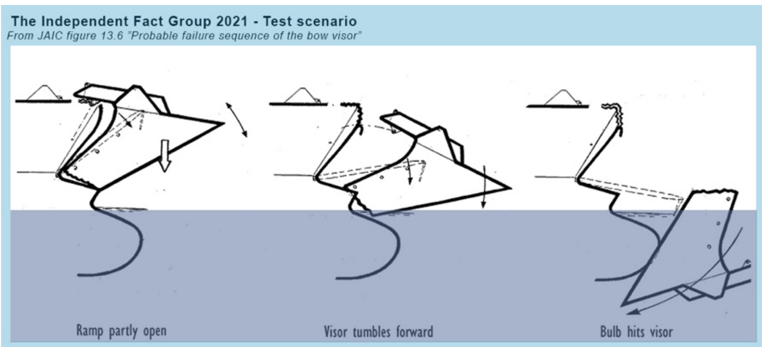
Picture 10. The model of the forward bulkhead ready for testing.



Picture 11. The model of the forward bulkhead in water with the water level adjusted.

Test result, part 1, the visor falling off the ship

We let the visor fall off in a forward direction, described in the JAIC report Figure 13.6 "Probable failure sequence of the bow visor." Our test scenario starts at "Ramp partly open" to "Bulb hits visor."



Picture 12. The test scenario.

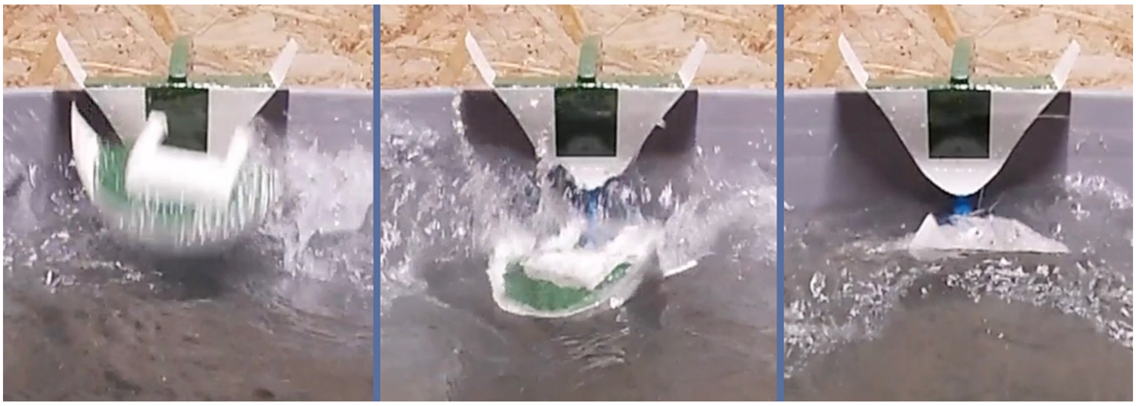
We did not include the ramp in the model test because it did not influence the scenario when the visor fell off after all the locks and hinges had broken, according to JAIC.

Our model was built undamaged in the bottom structure. Therefore, if the visor fell off during the shipwreck and hit the water, the damage heavily should have reduced its floating capacity.

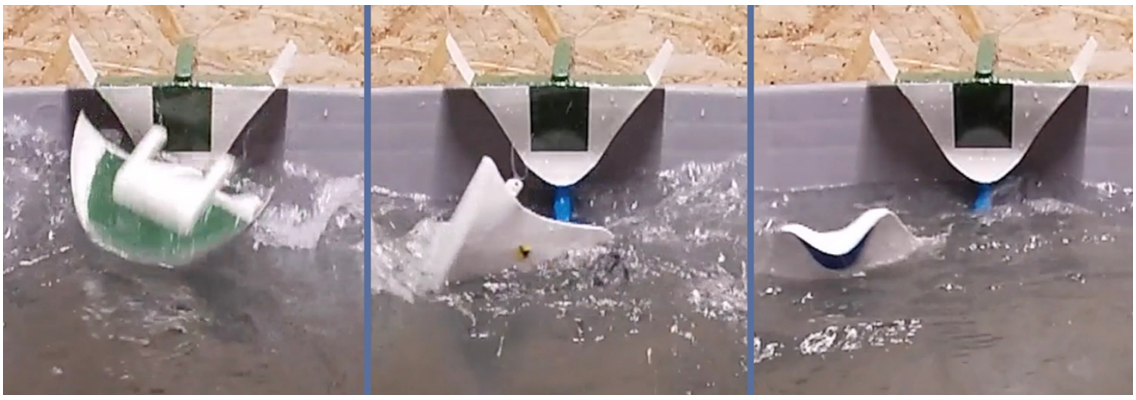
We reduced our test scenario to find whether the visor could float or not. We did not try to find out if the bulbous bow could have hit the visor. To make such a test, we would have needed a full-scale model where the ship had made speed in the water.

When we let the visor fall into the water, the visor fell in two specific ways. We named them V1 and V2.

V1, the visor sunk directly,
V2, the visor bounced on the water surface and sunk directly after that.



Picture 13. The visor sunk directly, V1.



Picture 14. The visor bounced on the water surface and sunk directly after that, V2.

The visor did not stay afloat in any of the 140 performed fall tests.

The result (frequency) of the fall tests 1-140 was as follows:

V1 occurred in 104 test drops. (74 %)
V2 occurred in 36 test drops. (26 %)

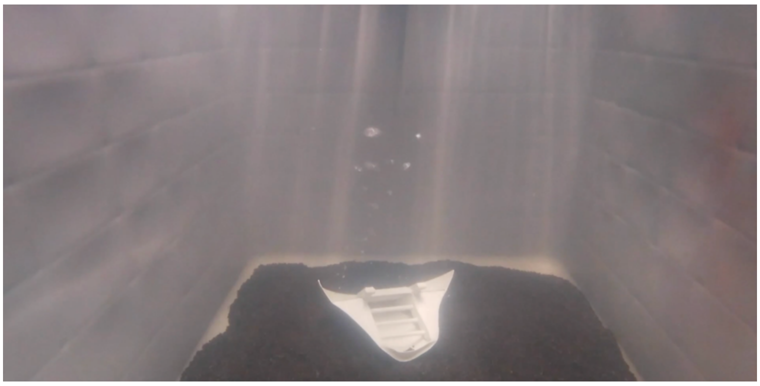
Test result, part 2, sinking of the visor

When we dropped the visor in the tank, the visor came to rest in 2 specific positions. We named them P1and P2.

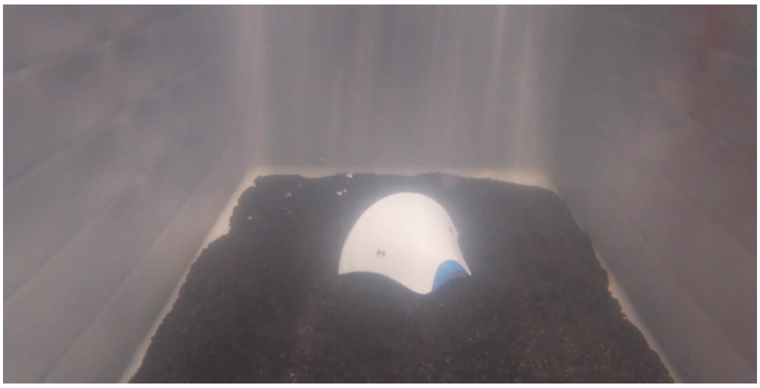
No drop test resulted in a position as described in picture 2 and following the JAIC report.

The result (frequency) of the drops 1-140 was as follows:

P1 occurred in 96 test drops. (68 %)
P2 occurred in 44 test drops. (32 %)



Picture 12. The visor came to rest in P1-position in 68% of the drops.



Picture 13. The visor came to rest in P2-position in 32% of the drops.

Videos from the testing

Part 1:
- Test video 1. *Preliminary test*
- Test video 2. *Visor separation*
- Test video 3. *Visor separation II*

Part 2:
- Test video 4. *Visor drop test summary*

Part 3:
- Test video 5. *Visor excerpt clip*

You find a link to the test videos separately.

The Fact Group commentary and report conclusion:

We came to a conclusion, based on the tests, that the visor impossibly could have stayed afloat if it fell off following the JAIC report. Therefore the visor could not have hit the ship, causing the hole midship MV Estonia on the starboard side.

We also came to a conclusion, based on the tests, that it is highly unlikely that the visor came to rest upside down like it was found on the seabed. The circumstances that lead to that the visor was found standing upside down are unknown (Picture 2).

This report again proves that the JAIC final report is a piece of disinformation and that the cause of and the sinking scenario of the MV Estonia is still not explained.

DEDICATION

We dedicate this statement report to all those who still 27 years after the tragedy struggle to find the truth.

If MV Estonia had been seaworthy many of the more than 850 persons who lost their lives would have had a chance to survive no matter what caused the sinking.

The Independent Fact Group
Troon, Scotland 2nd of August 2021