ESTONIAN SAFETY
INVESTIGATION
BUREAU

M/V Estonia – preliminary assessment

09.07.2021

The purpose of the preliminary assessment

The purpose of the preliminary assessment is to consider whether, in the light of the new information (openings and deformations on stb.s), the 1994 Joint Accident Investigation Commission (JAIC) findings on the cause of accident of M/S Estonia should be reassessed and further investigation on the matter conducted. To this end, the new factual information will be assessed and comparted to the published JAIC report.

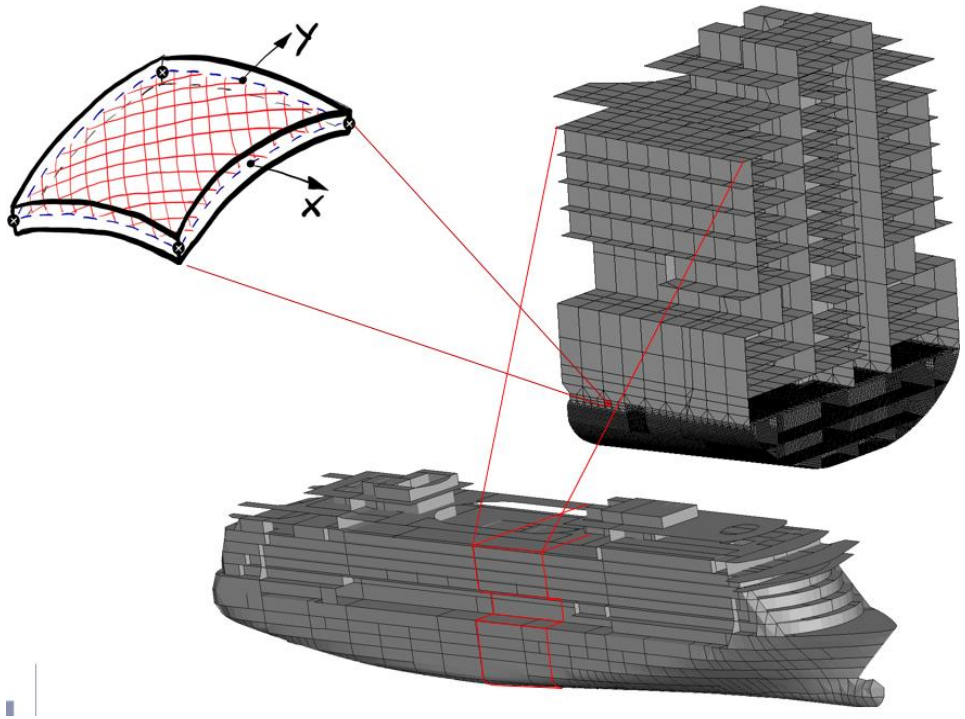
1. Preparation
2. Digitalisation, calculations and modelling
3. Pre-survey
4. Main survey
5. Assessment and reporting

1. Preparation

- Review of previously made videos: https://www.youtube.com/watch?v=ZVVmaKa0V0o
- Review of Discovery's unedited materials
- Obtaining detailed information about the site
- Obtaining ship's drawings from Meyers Werft GmbH
- Familiarization will documents and records stored in different archives
- Preparation of detailed project plan, recruitment of the project team etc.

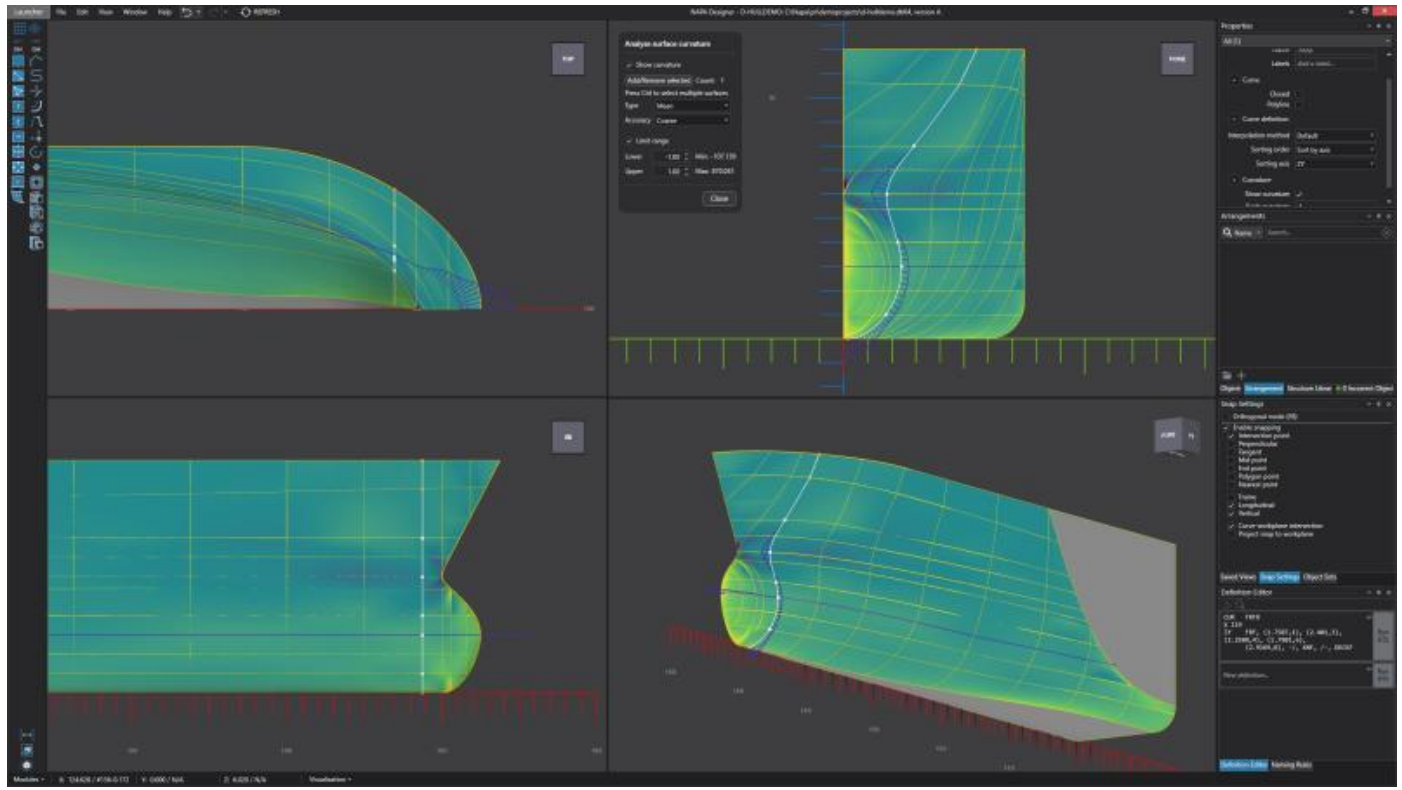
2. Digitalisation, calculations and modelling (1/4)

- Preparation of the detailed ship's model (NAPA-model) for different kind of simulations



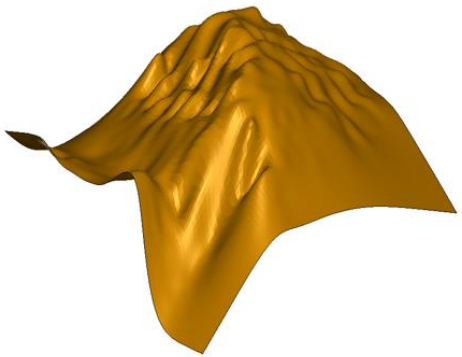
2. Digitalisation, calculations and modelling (2/4)

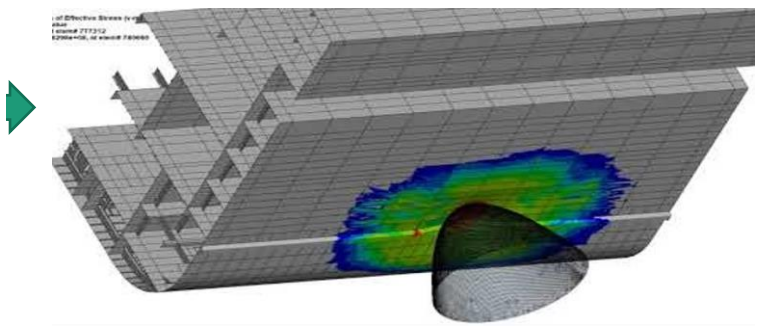
- Modeling of ship's flooding and sinking the for assessment of the sinking speed and acting physical forces

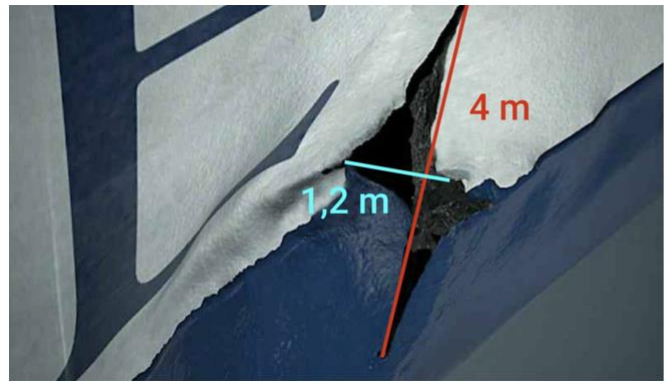


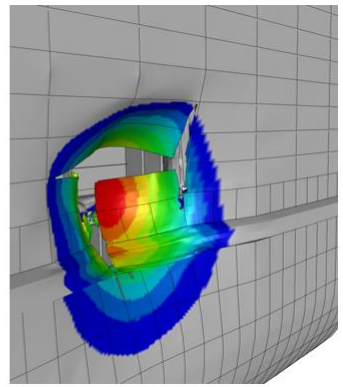
2. Digitalisation, calculations and modelling (3/4)

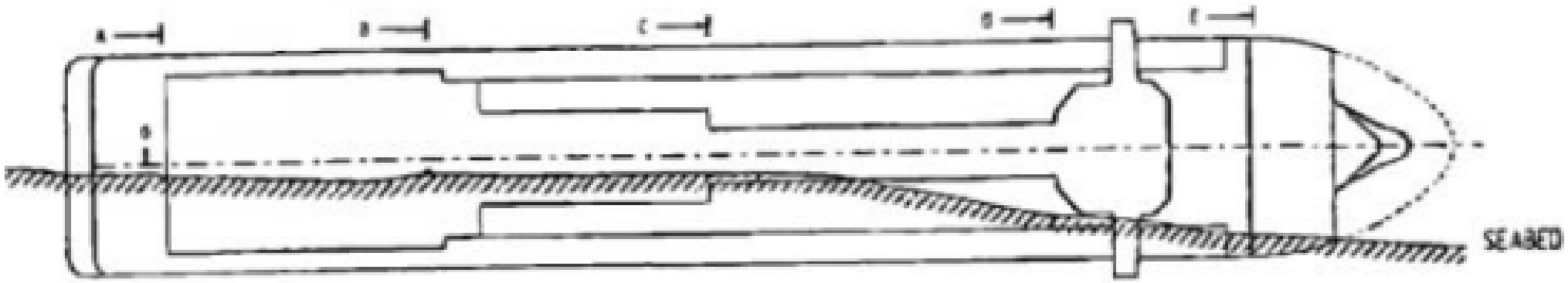
- Modelling of the ship's bottom impact, movement and deformations

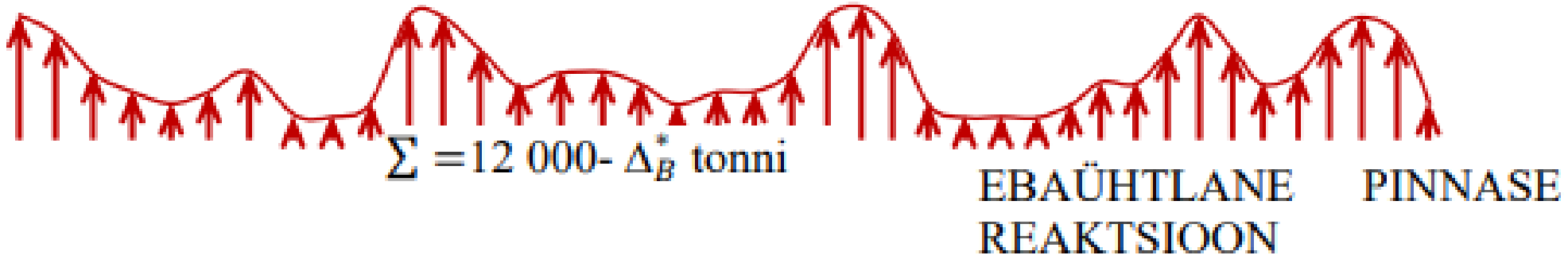












Δ_B^*- LAEVA VEEVÄLJASURVE PÕHJAS, CA 1550 TONNI

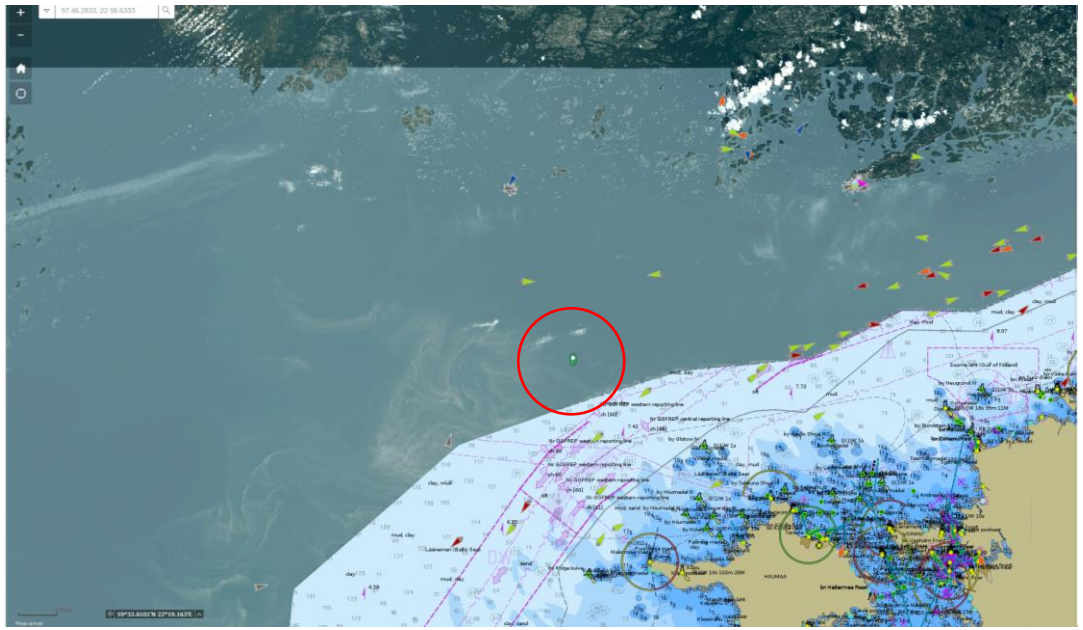
Joonis 3. Põhimõtteline lähenemine ava tekkepõhjuste selgitamiseks merepõhjas.

2. Digitalisation and modelling (4/4)

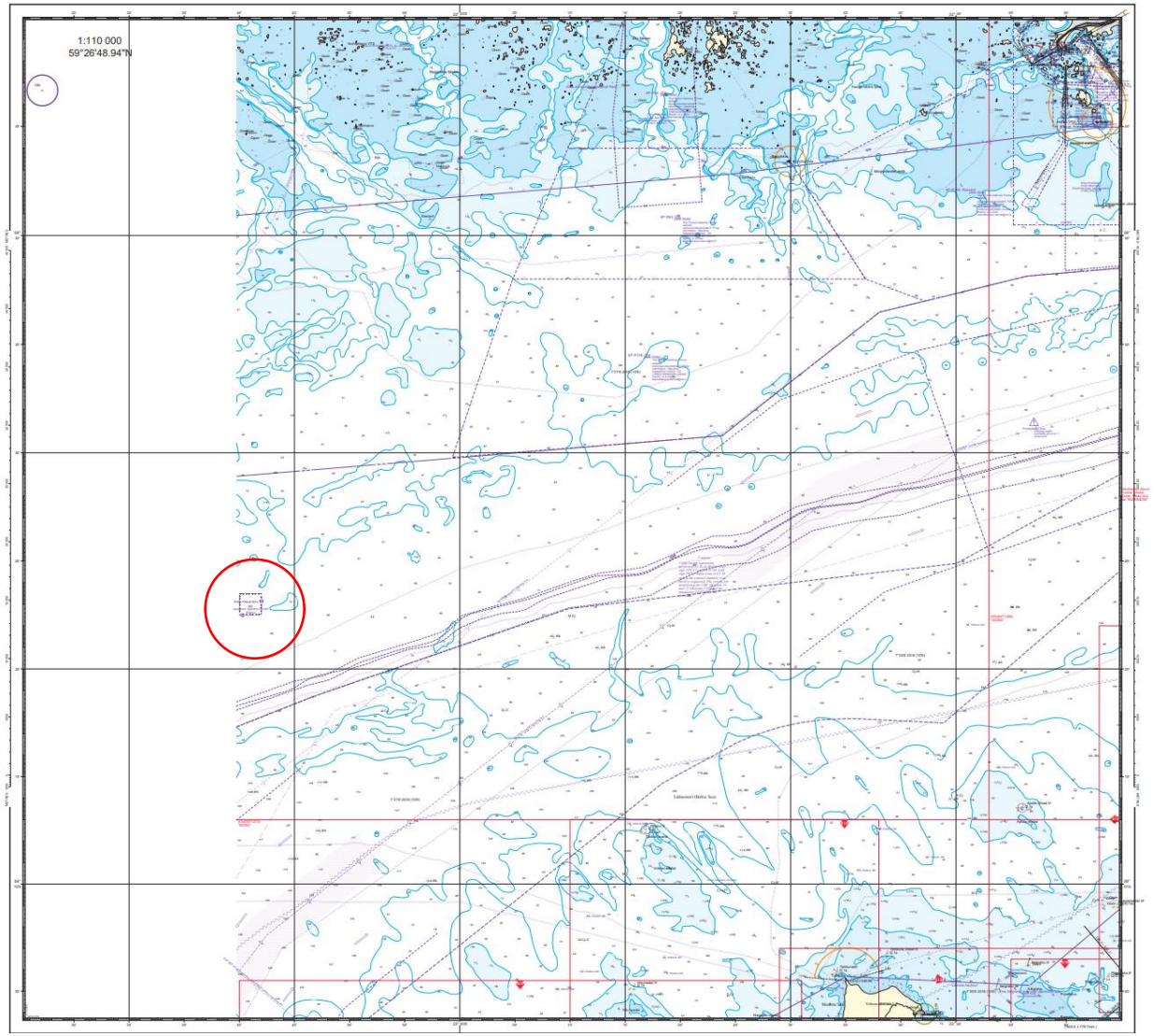
- Visor buoyancy simulation to assess whether the visor (at least 56 mt) could stay afloat instantaneously when detached from the locks and finges and cause deformation by colliding with the stb hull. Planned to carry out 3D laser scanning of bow visor, comparison with its 3D model and analysis of various deformations.

Sketch by TalTech

3. Pre-survey (1/9)



https://gis.vta.ee/nutimeri/



3. Pre-survey (2/9)

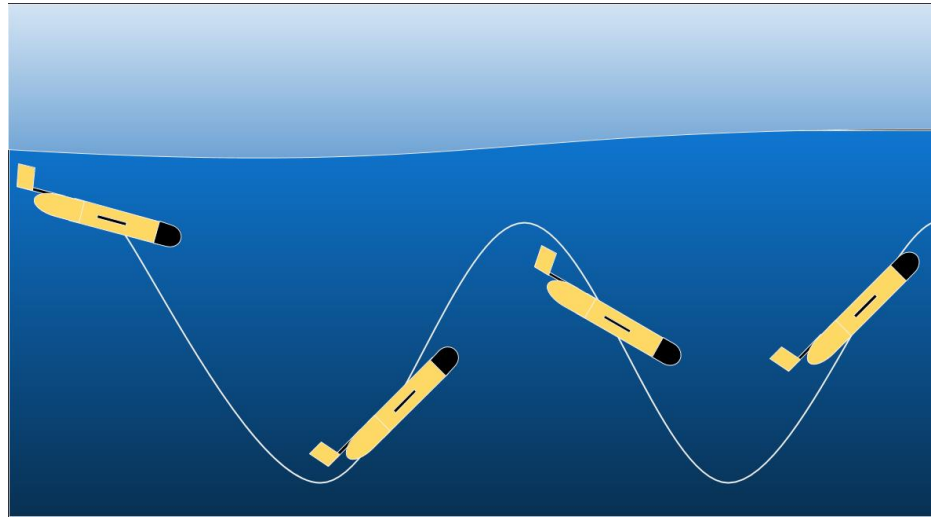
Survey vessels: Electra
(Stockholm University)

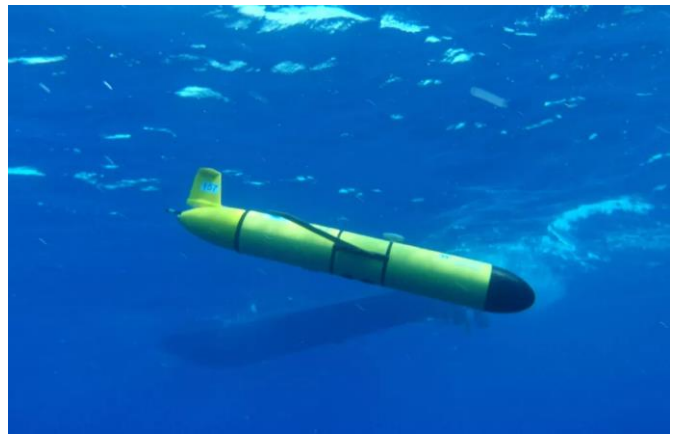
Mother ship: multipurpose icebreaker EVA-316
(Estonian Transport Administration)

3. Pre-survey (3/9)

- Flow direction and speed, salinity, oxygen and visibility sensors

NOAA

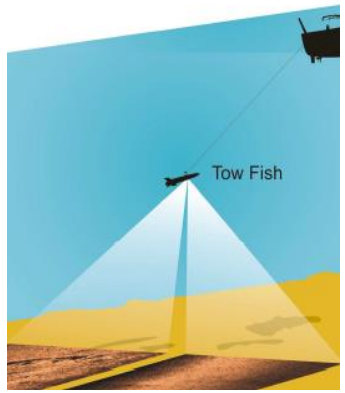


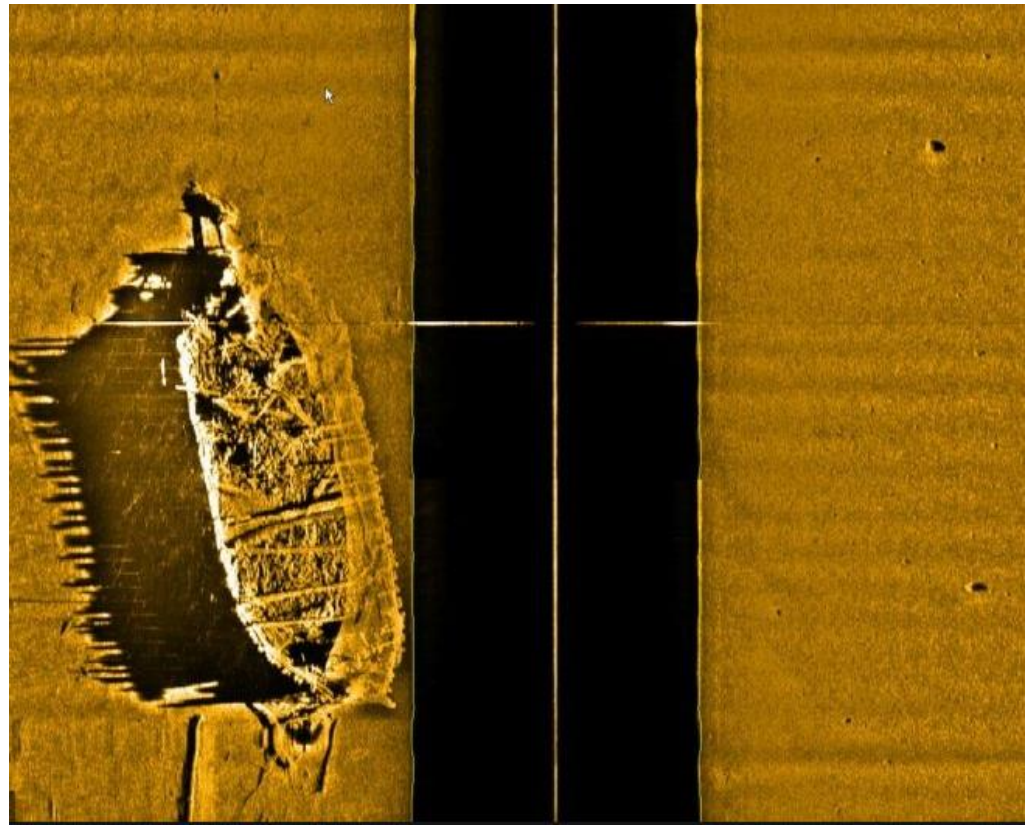


SCUBA

3. Pre-survey (4/9)

- Side-scan sonar survey for mapping the seabed, wreck and surrounding objects.

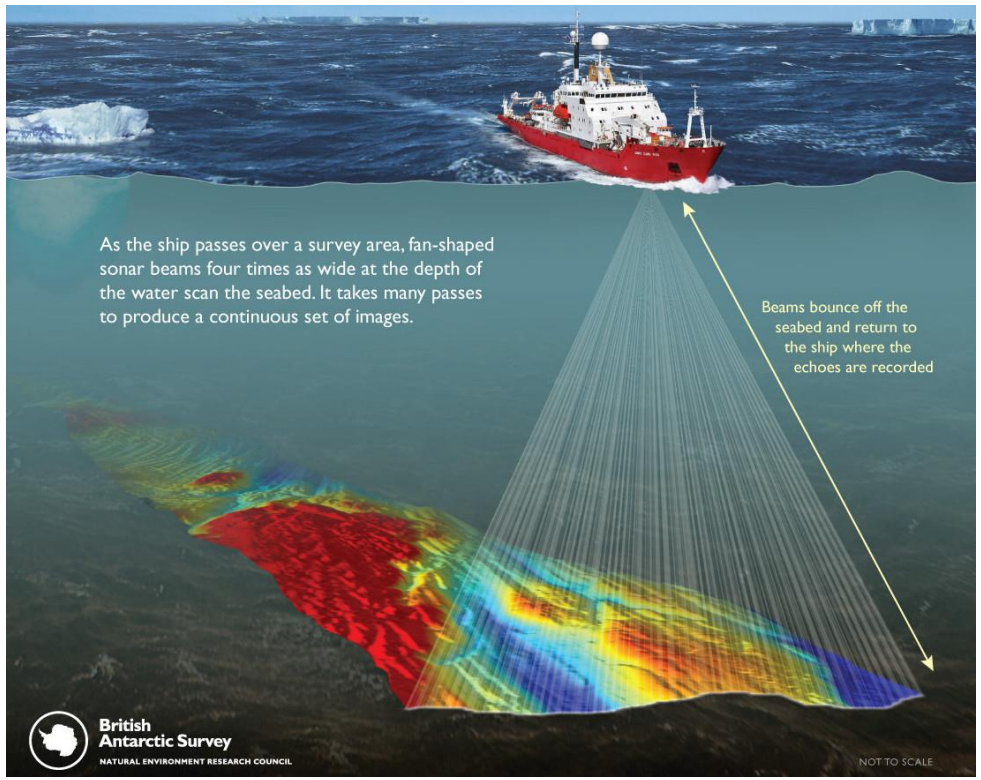




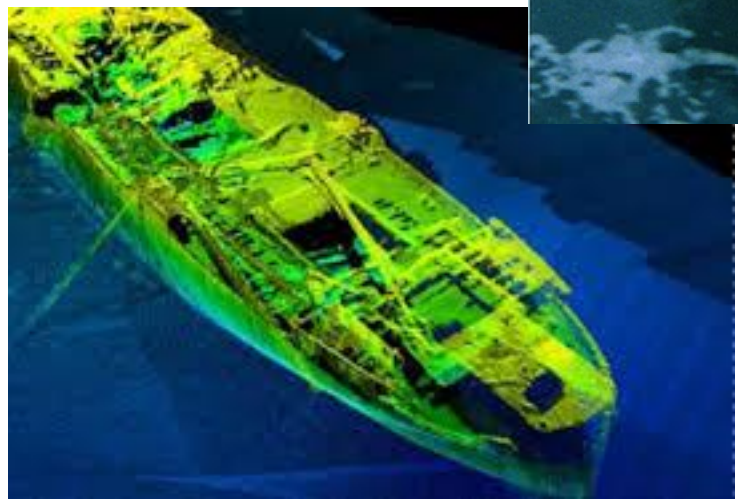
Sketch by Archaeology Team ; Photo made by Tuukritööde OÜ „Kihelkonna“ wreck

3. Pre-survey (5/9)

- <u>Mutlibeam survey</u> for mapping the seabed, wreck and surrounding objects.



- Multibeam



3. Pre-survey (6/9)

- Bathymetric survey to identify the exact bottom profile and depths of the shipwreck area

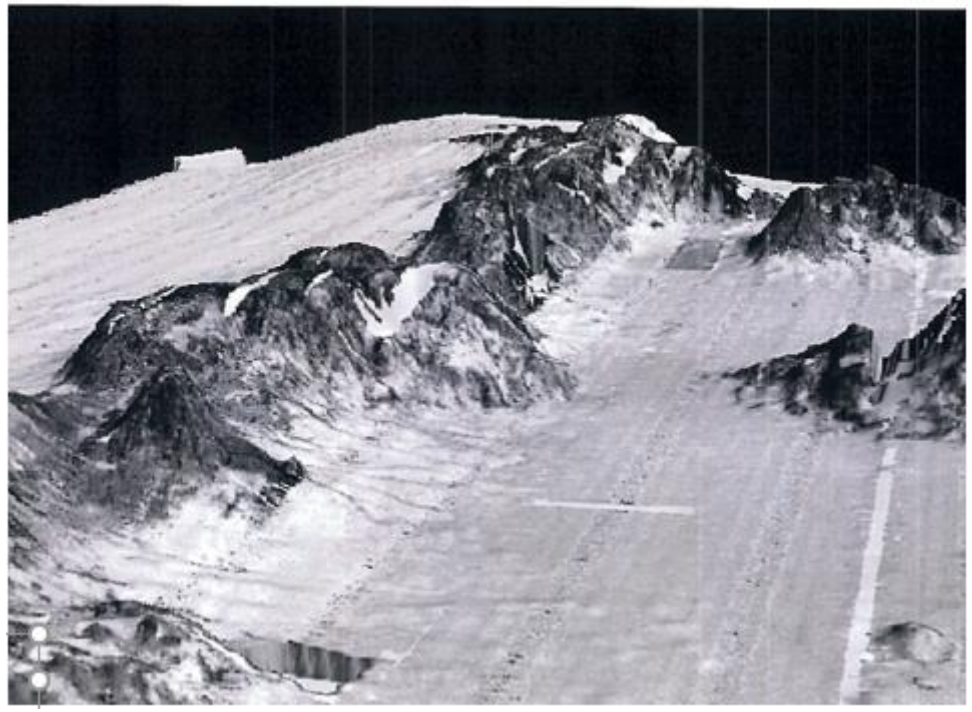
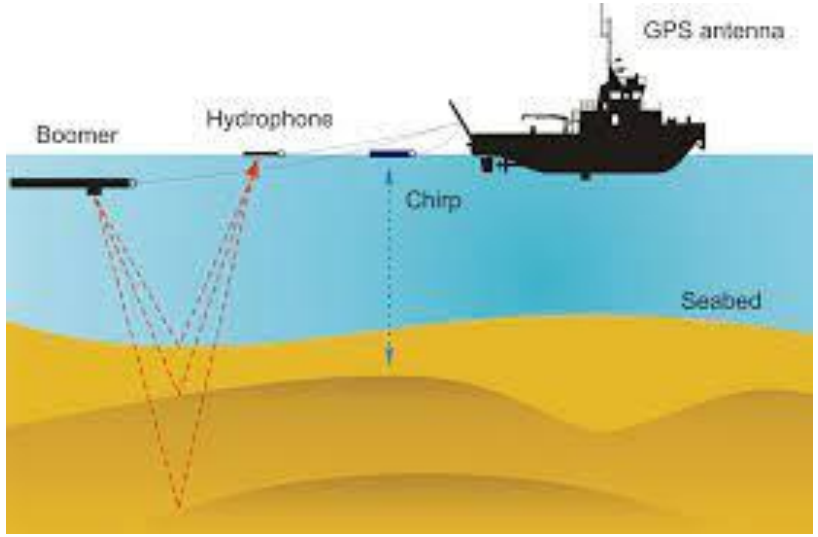


Photo made by TS Shipping

3. Pre-survey (7/9)

- Hydrogeological survey reflection seismology for geological assessment of the seabed to determine the locations of rocks, and the thickness, density and arrangement of the different layers.



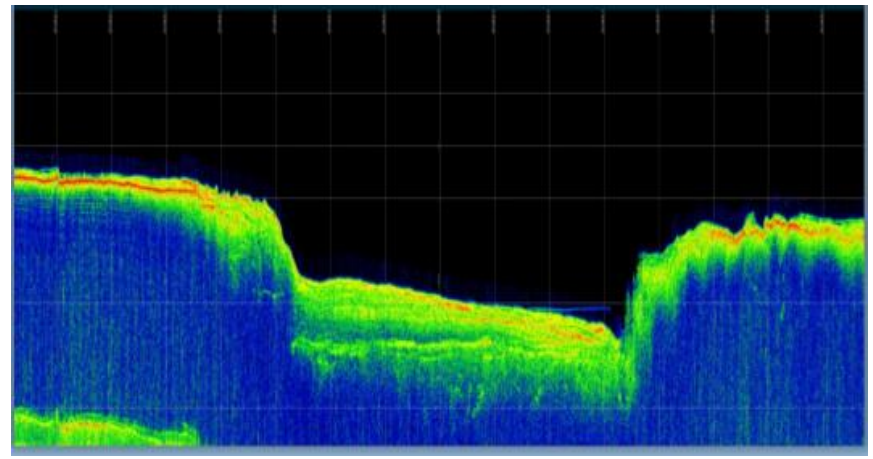
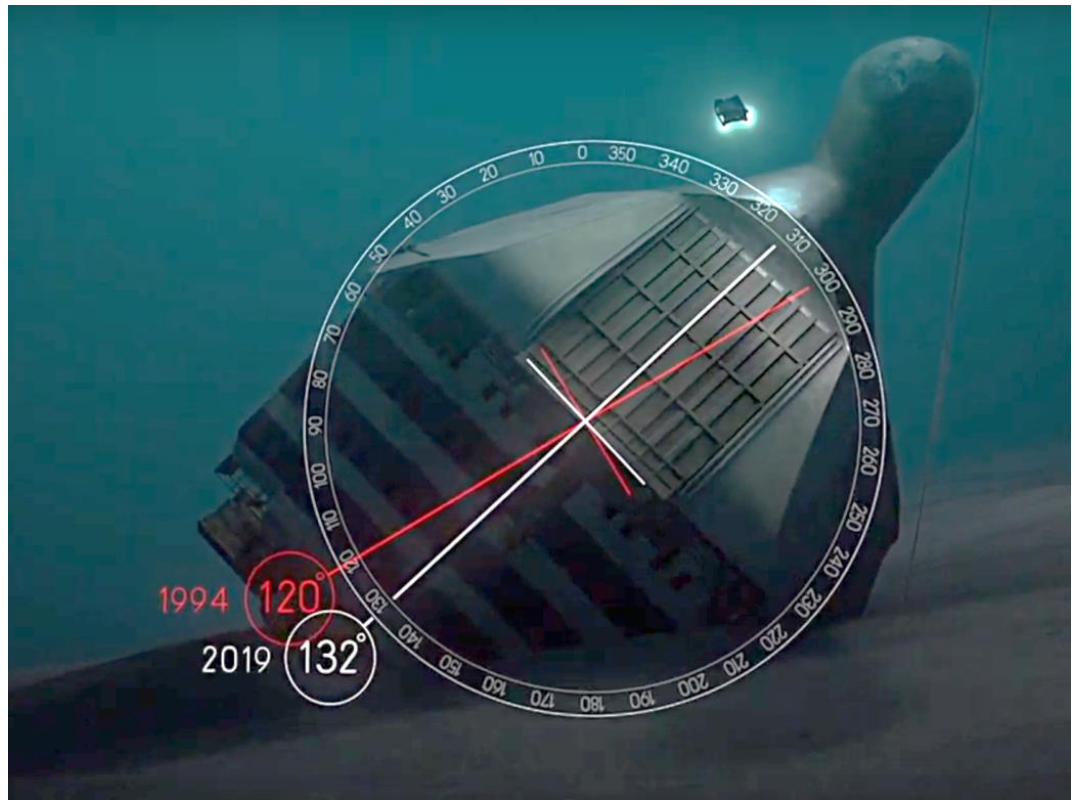


Image prepared TS Shipping

3. Pre-survey (8/9)

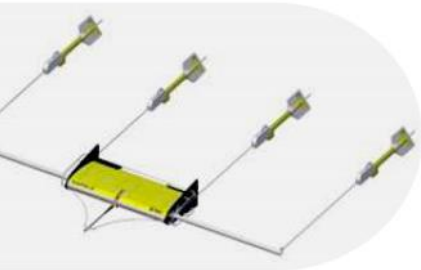
- *<u>Light ROV survey</u> to record general conditions of the wreck and exact location of deformations and openings on stb.s.*



Discovery printscreen:
https://www.youtube.com/watch?v=t1Z4ID7git4

3. Pre-survey (9/9)

- Ferromagnetic survey (magnetometric survey) to find magnetic material around the shipwreck and on the ship's sinking bath.



ScanFish Katria

An intelligent wide-sweep underwater remotely operated towed vehicle (ROTV) solution for time-efficient magnetometer/ UXO survey operations.

TVG (Transverse Gradiometer)

Remotely controlled towed underwater device that allows testing in a gradient magneto metric system.

G-882 Magnetometer

Cesium vapor marine magnetometer provides high sensitivity and sampling rate for professional work in shallow or deep water. Used for TVG and ScanFish.

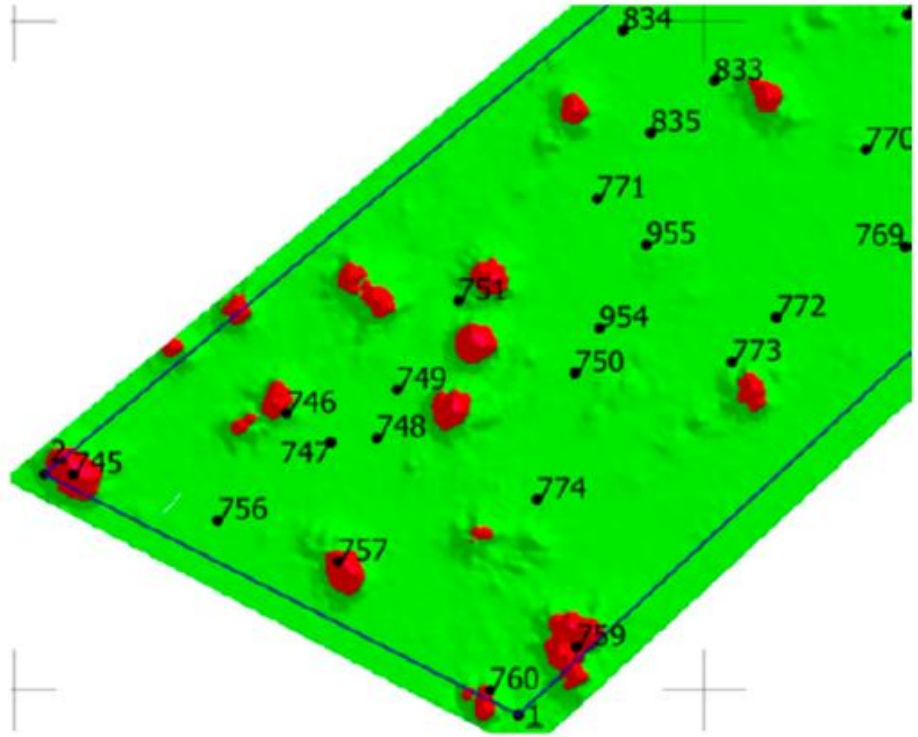
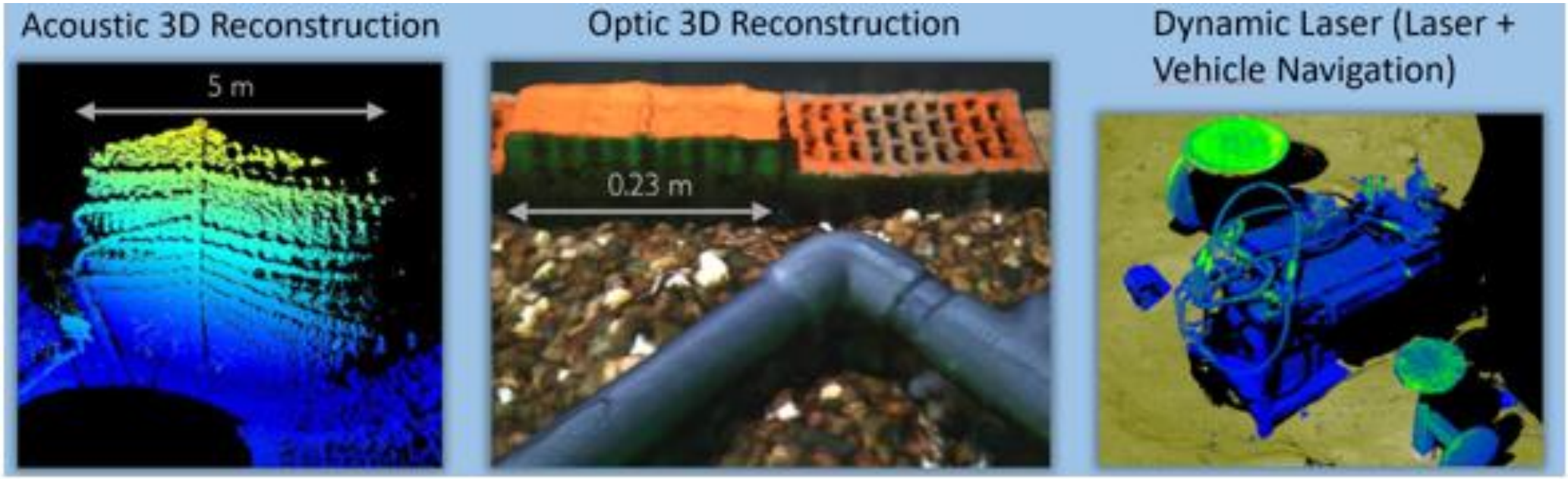


Image preapred by ESC

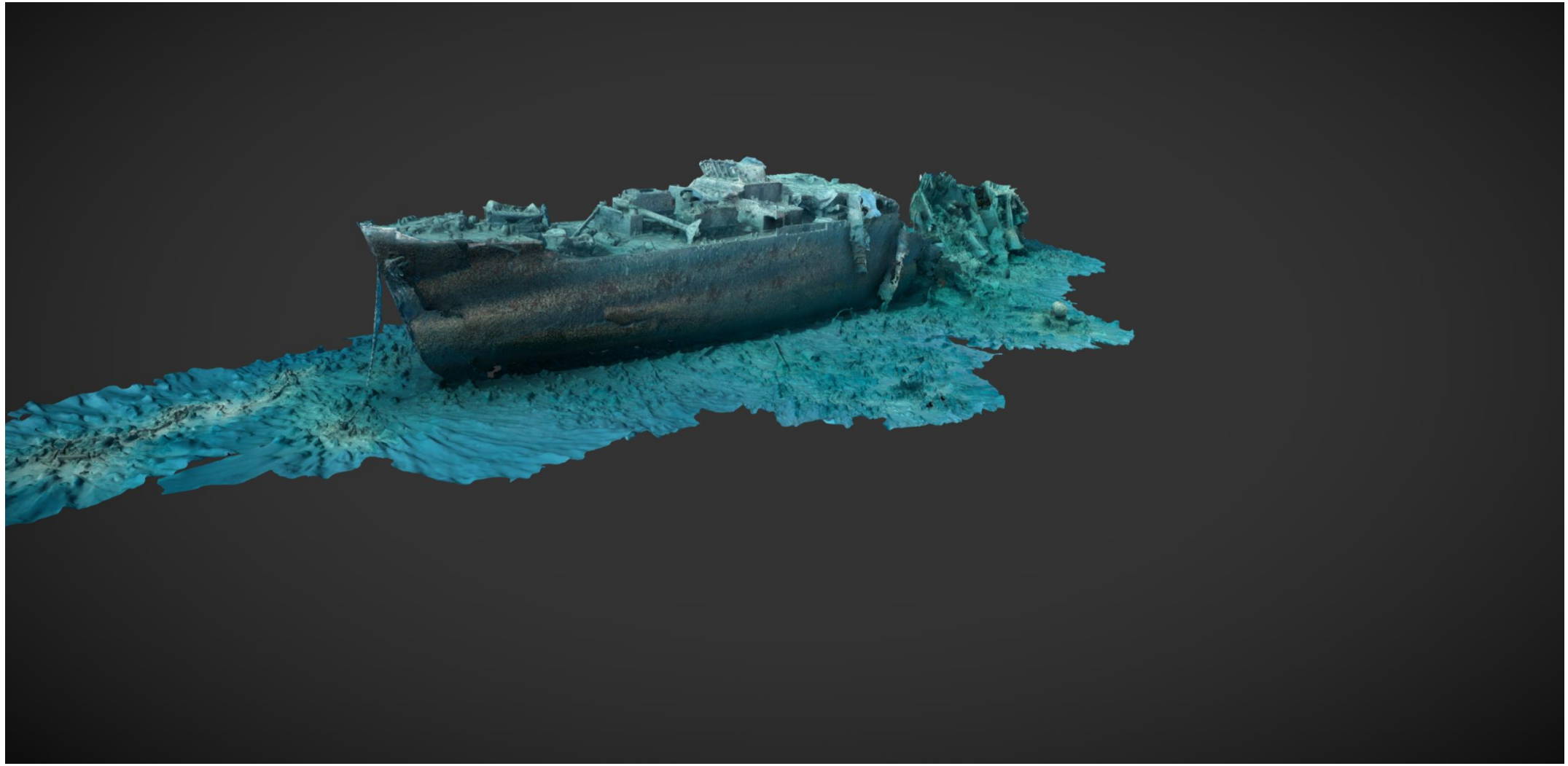
3. Main survey (1/7)

- Combined 3D sonar/laser survey of wreck and surrounding seabed scanning (3D sonar or laser scan) to get a detailed 3D image of the hull and its surroundings.



Images made byT S Shipping

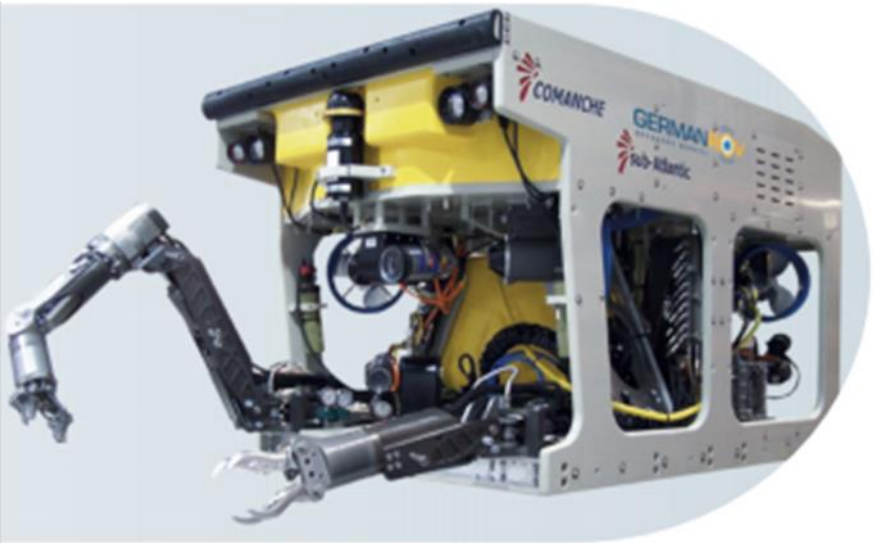
3. Main survey (2/7)



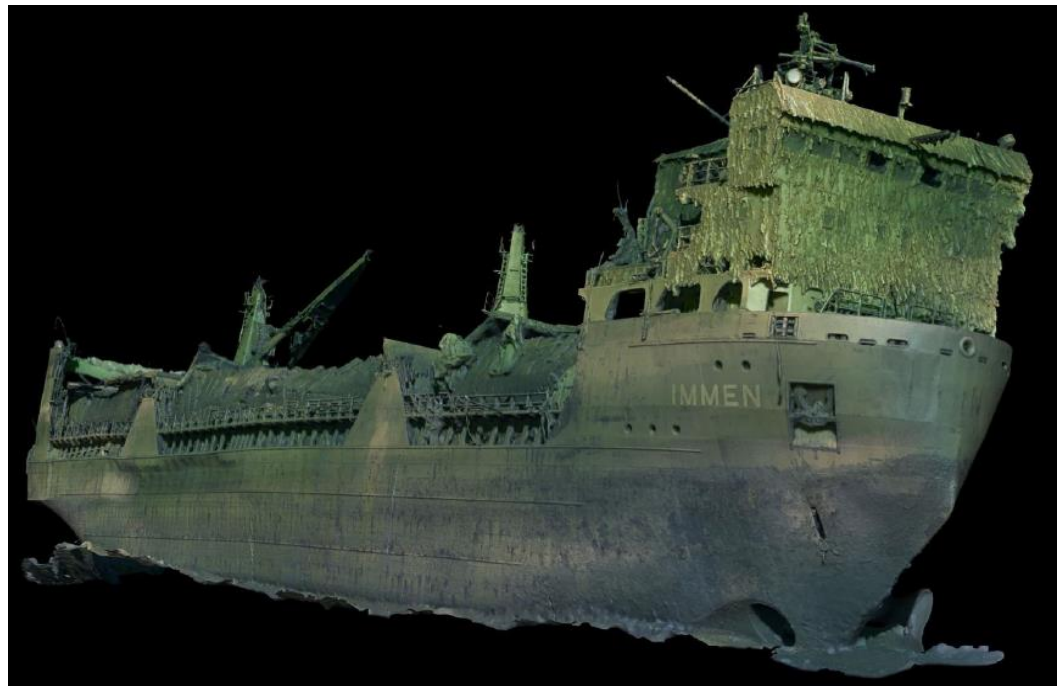
https://sketchfab.com/3d-models/wreck-of-the-ss-thistlegorm-d0dd1b0a2d1c4cffb8d91ca82de26b0c

3. Main survey (3/7)

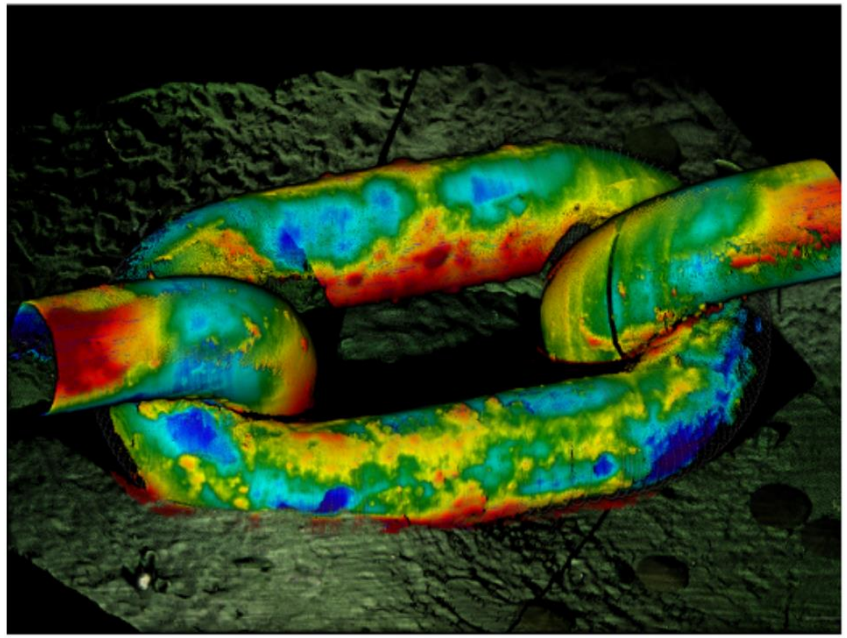
- Filming of the hull and wreck area with a ROV (imaging, hull/seabed, photogrammetry), including to identification and detailed recording of deformations, including compartments next to the openings. The projection of the sinking bath on the seabed and its immediate surroundings (500 m) shall be investigated and recorded.

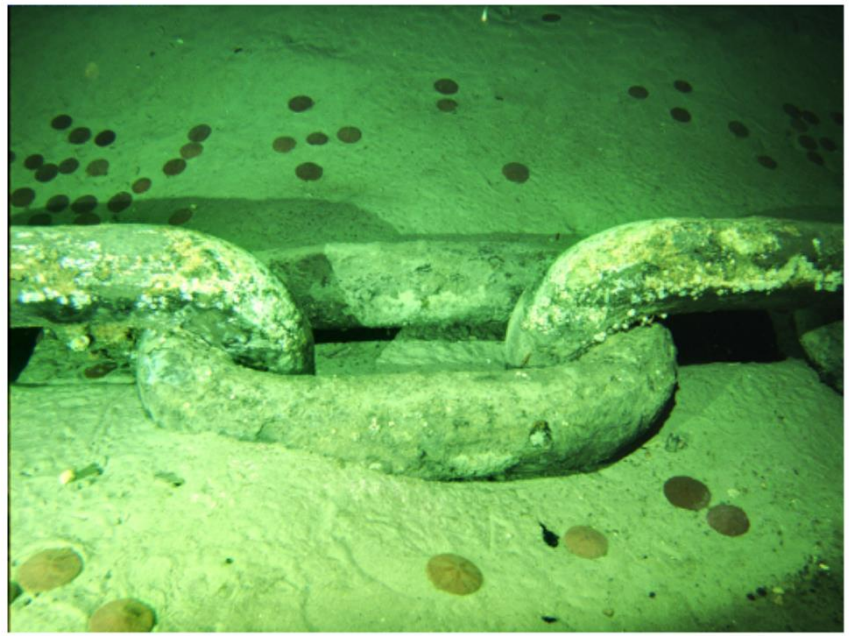


Photogrammetry: LA Survey AB



3. Main survey (4/7)





Example of the detailed laser scan

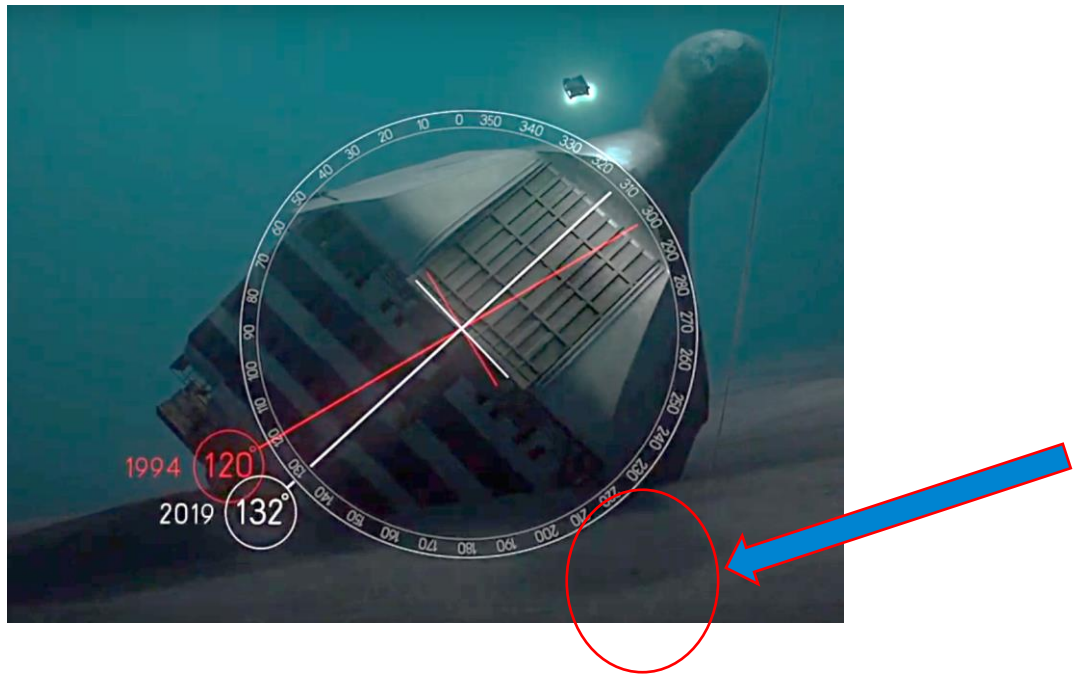
- ✓ Light blue - 2mm material loss, i.e. general corrosion
- ✓ Dark blue - 5 mm material loss, i.e. pitting
- ✓ Green - nominal size
- ✓ Yellow.- 2mm material gain, i.e. marine growth

3. Main survey (5/7)

- Bottom sampling (hydrogeological survey seabed sampling) to determine sediments at the bottom, their physical parameters.
- A ROV may be used, as well as a bucket, sediment cage, etc.

3. Main survey (6/7)

- Wet hull survey/exposing of the wet hull part of the sediment (wet hull survey/exposing of the wet hull) so that the part of the hull under the waterline that is currently covered by sediments.
- Video: https://www.youtube.com/watch?v=la6h2QGCPV8

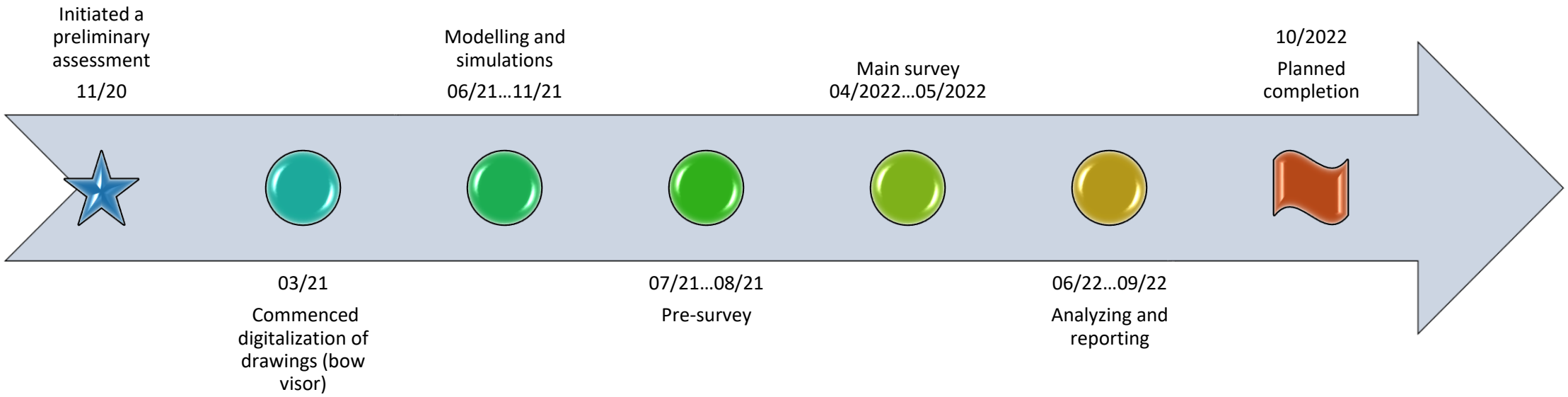


Discovery dokfilmi kuvatõmmisest tehtud joonis

3. Main survey (7/7)

- Evidence recovery, such as metal samples next to openings and bringing up evidences related to the subject preliminary assessment.

3. Timeline


Initiated a preliminary assessment
11/20
03/21
Commenced digitalization of drawings (bow visor)
Modelling and simulations
06/21…11/21
07/21…08/21
Pre-survey
Main survey
04/2022…05/2022
06/22…09/22
Analyzing and reporting
10/2022
Planned completion

ESTONIAN SAFETY
INVESTIGATION
BUREAU

Thank you!

09.07.2021