



The UK MOD Wreck Management Programme

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Salvage and Marine Operations (SALMO)



Overview

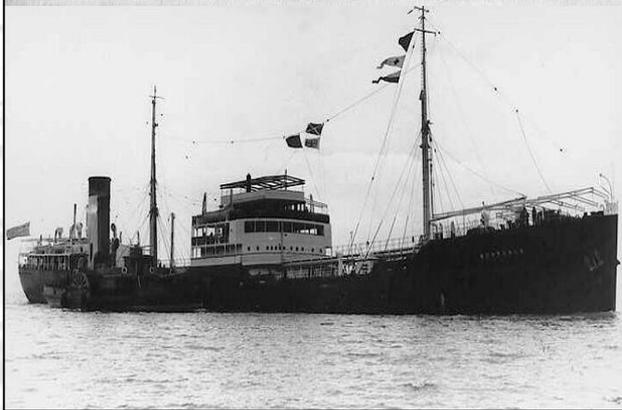
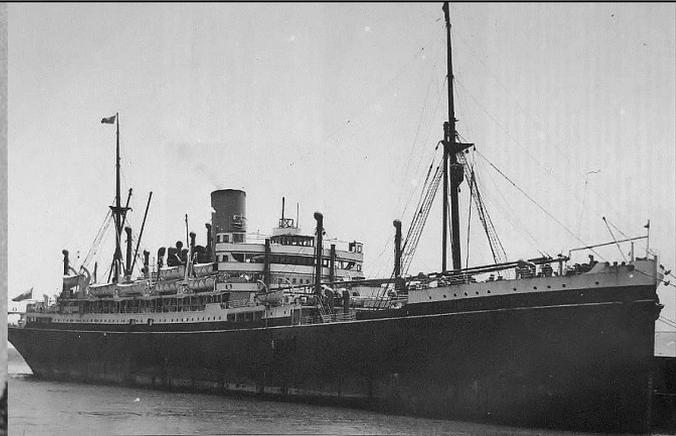
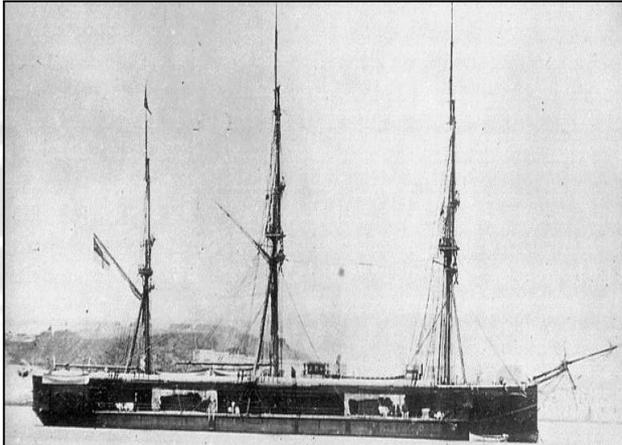
- SALMO and the Wreck Management Programme (WMP)
- RFA *Darkdale*
- HMS *Royal Oak*
- Questions

An aerial photograph of a large shipwreck in the ocean. The ship's hull is visible, partially submerged, with a large section of the deck or superstructure protruding above the water. The water is dark and shows ripples and waves. The overall scene is in black and white.

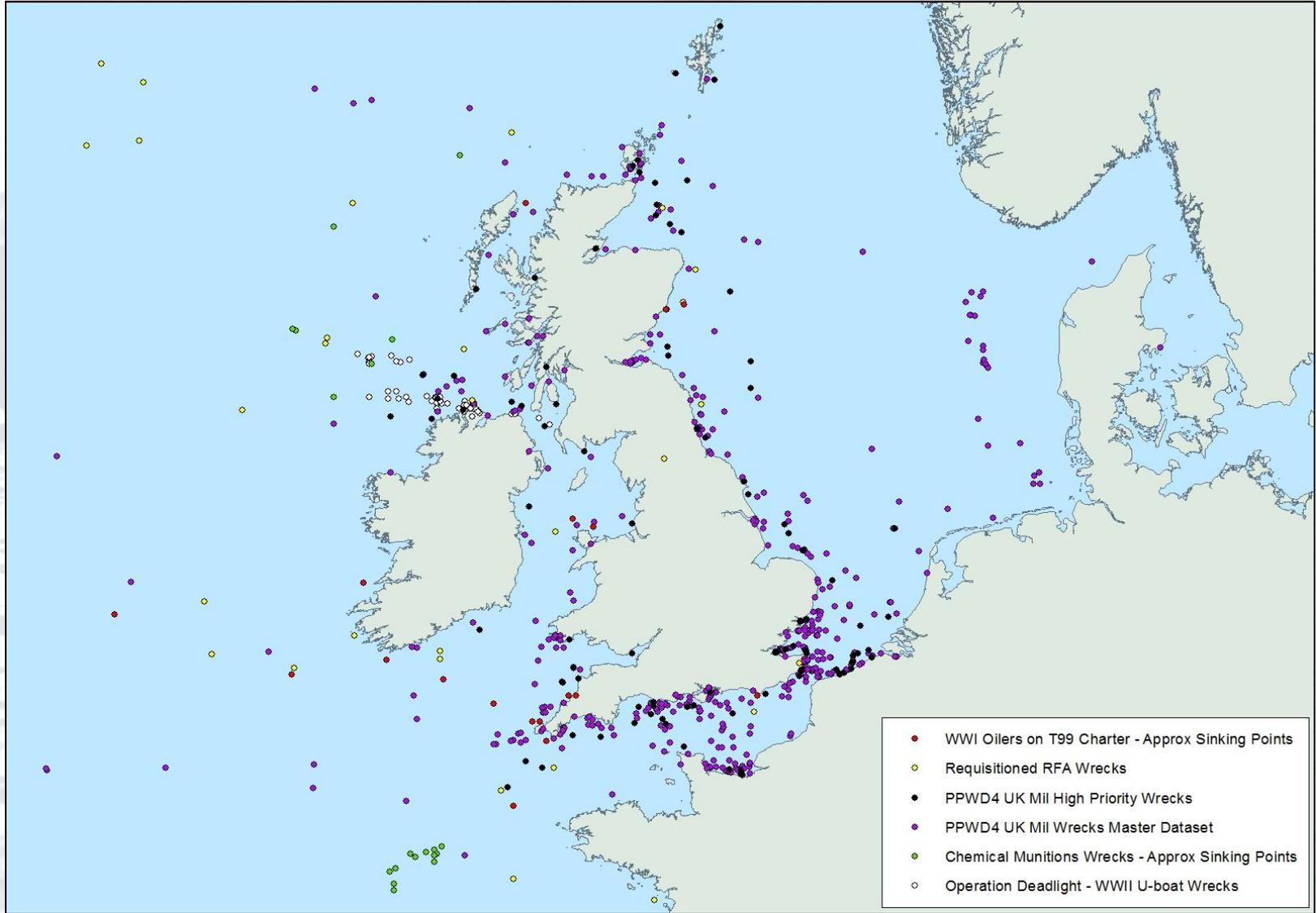
SALMO and the Wreck Management Programme



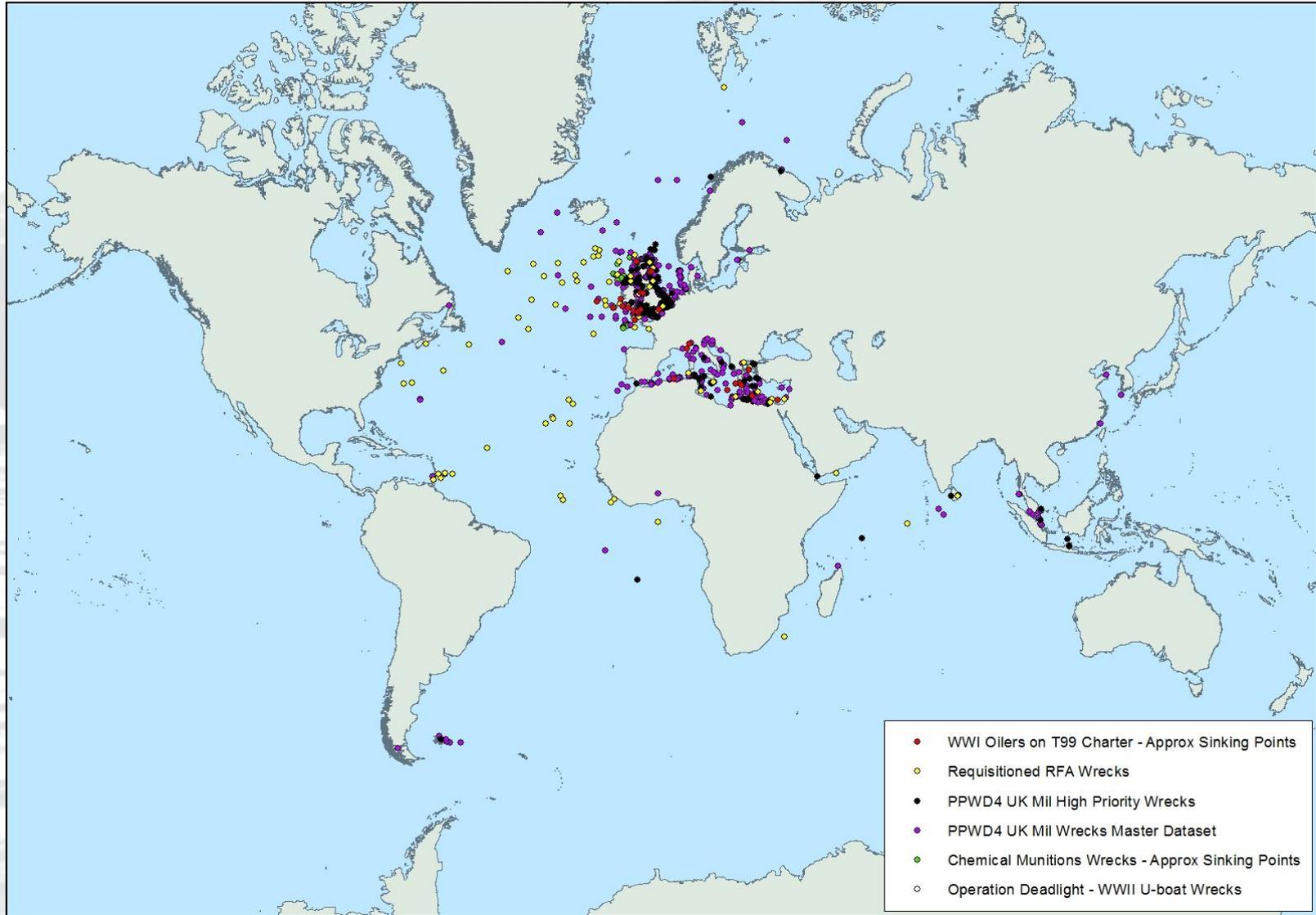
The Ships



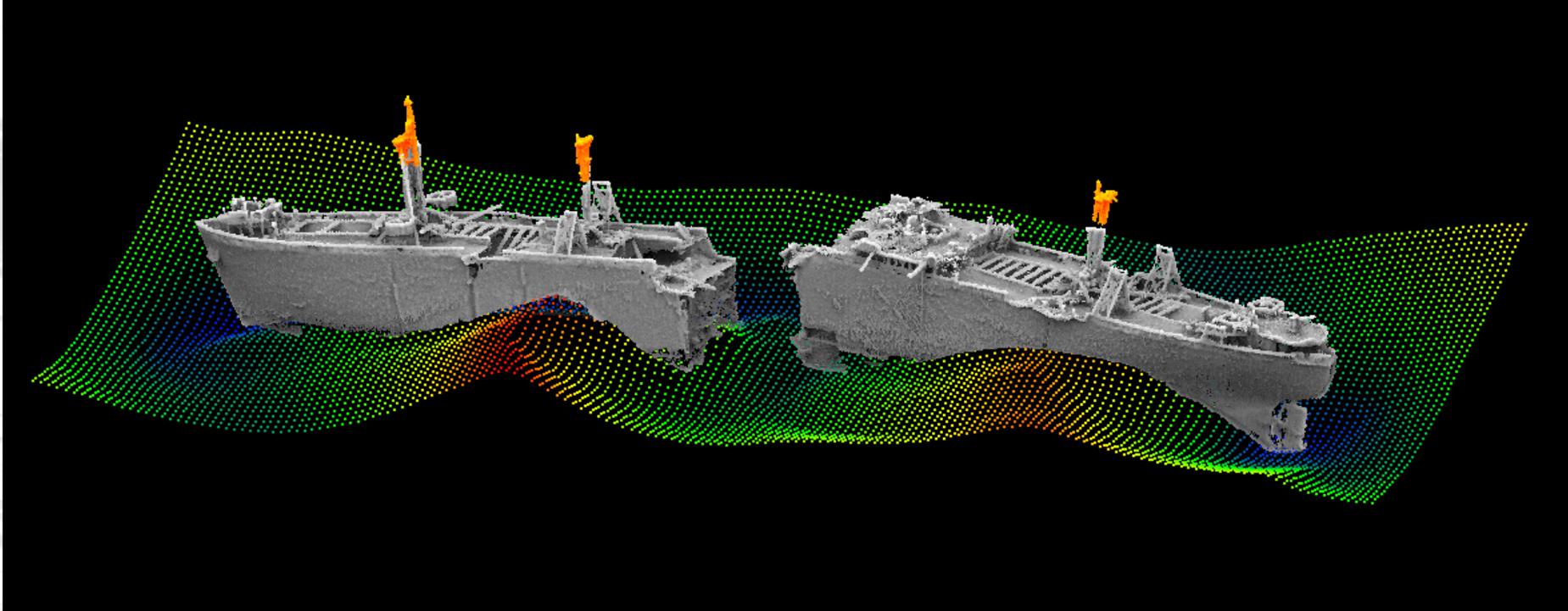
Post 1870 MOD Wrecks



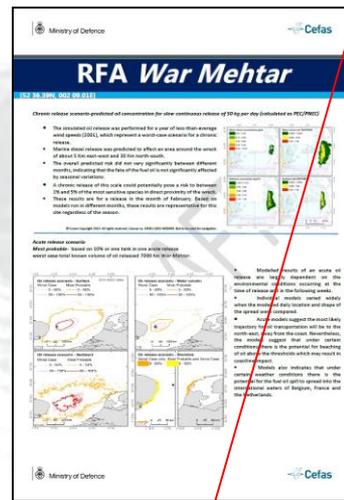
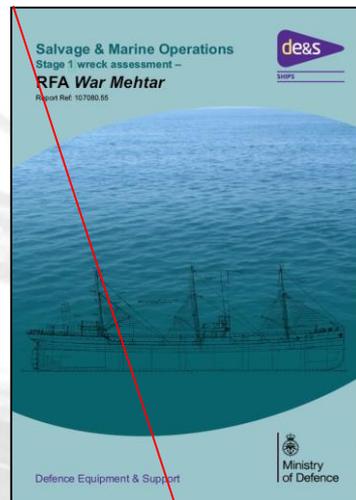
Post 1870 MOD Wrecks



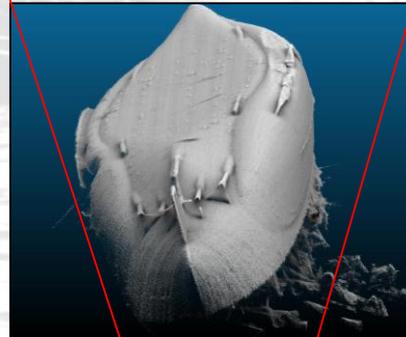
Collaboration with Other Government Departments



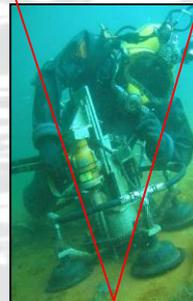
Methodology



Stage One – H-DBA /
E-DBA



Stage Two – On Site Survey



Stage Three – Intervention



RFA Darkdale



RFA *Darkdale*



RFA *Darkdale*



© Courtesy of the Museum of St Helena



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RFA *Darkdale*



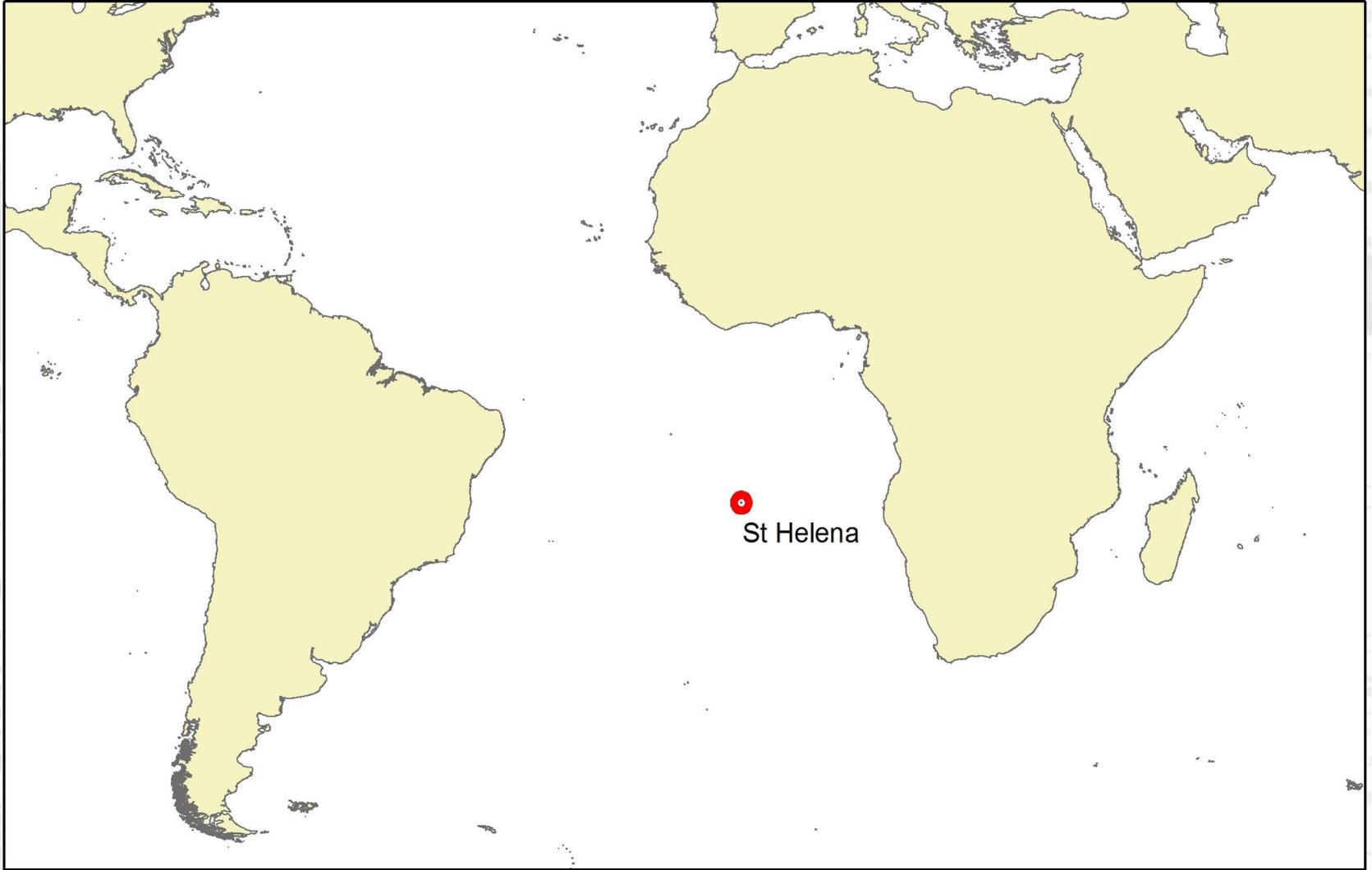
© Courtesy of the Museum of St Helena



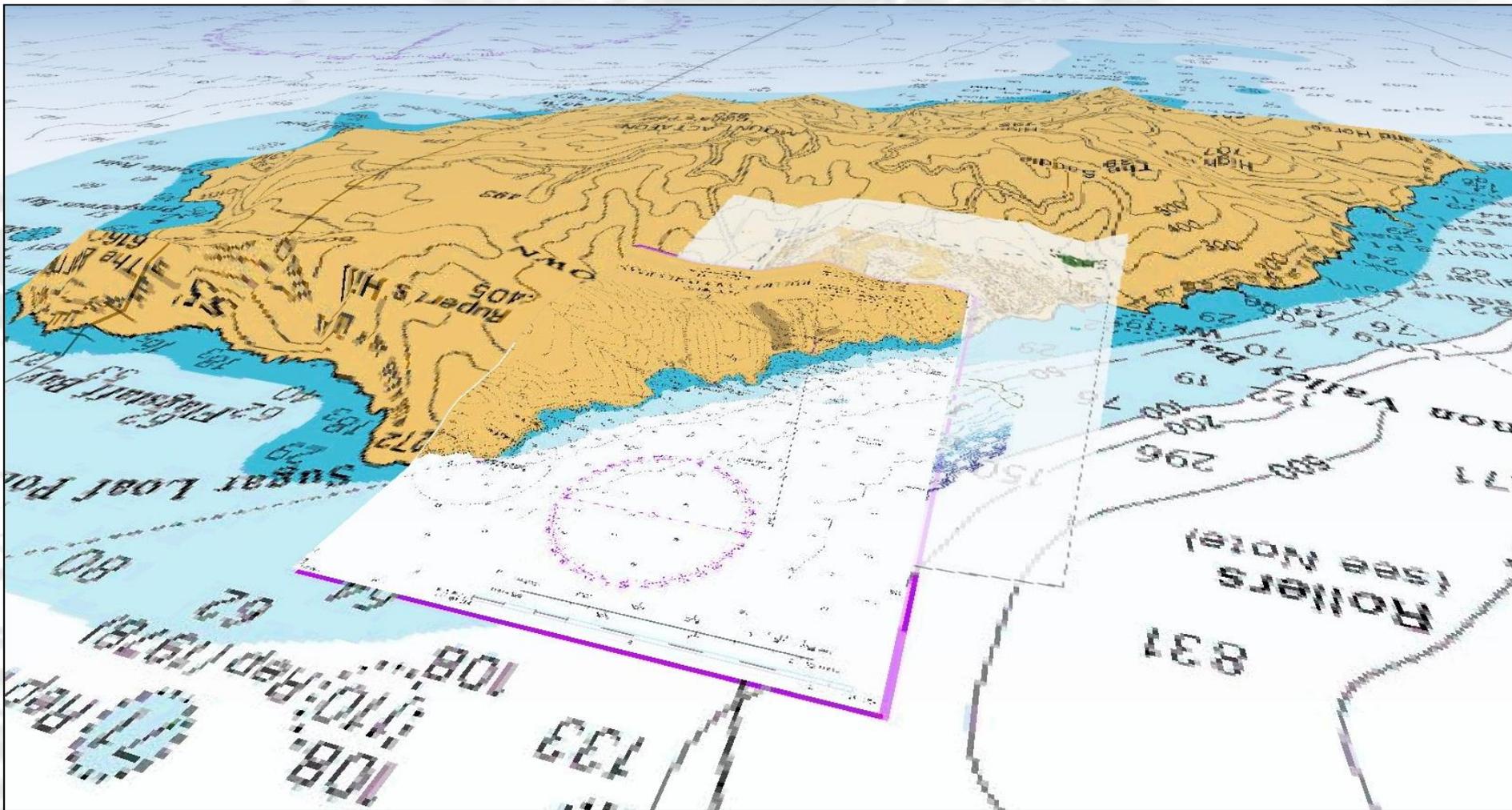
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RFA Darkdale



RFA Darkdale



RFA Darkdale

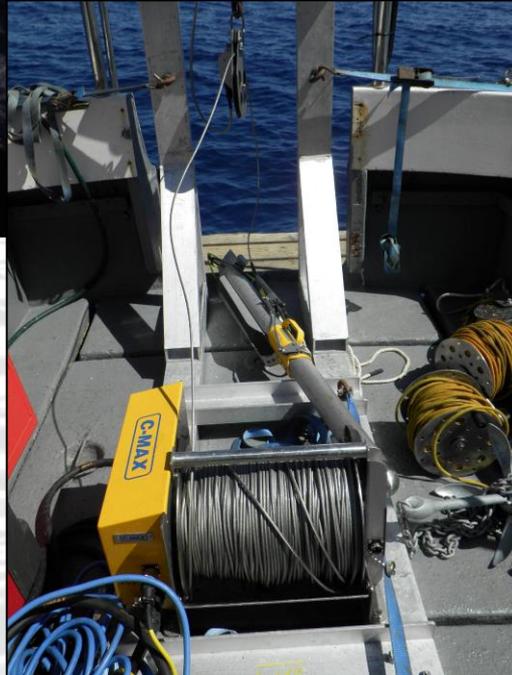
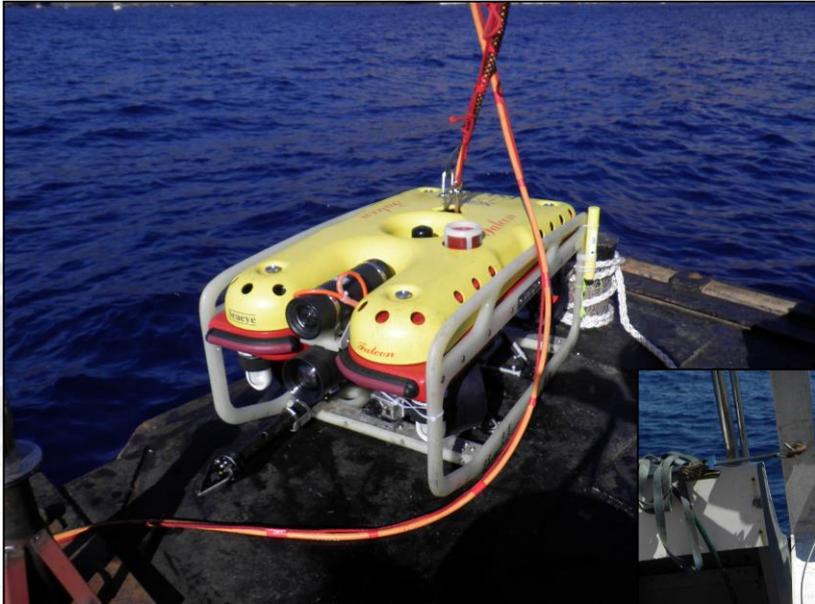
Anlaufskizze mit Schußbild. Wie sind Schußunterlagen erworben? Besondere Beobachtungen, Abwehr, Erklärung für Fehlschuß:



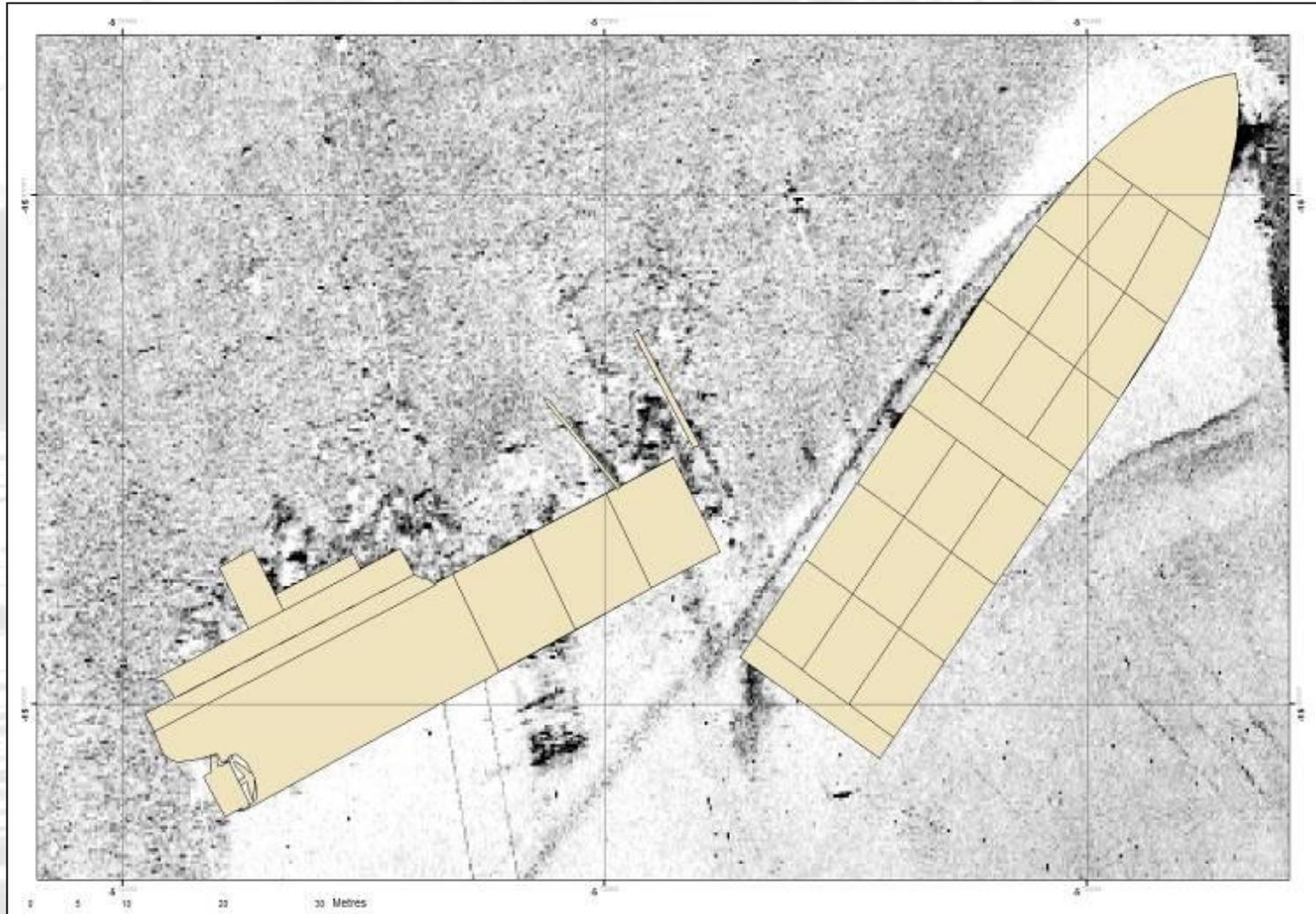
Ziel war vor Anker liegender Tanker von 8100 t. Tanker mußte unter allen Umständen sofort und restlos vernichtet werden. Dahernach den vorherigen ungeklärten Schüssen 4 Torpedos mit Schußwinkel 0.



RFA Darkdale



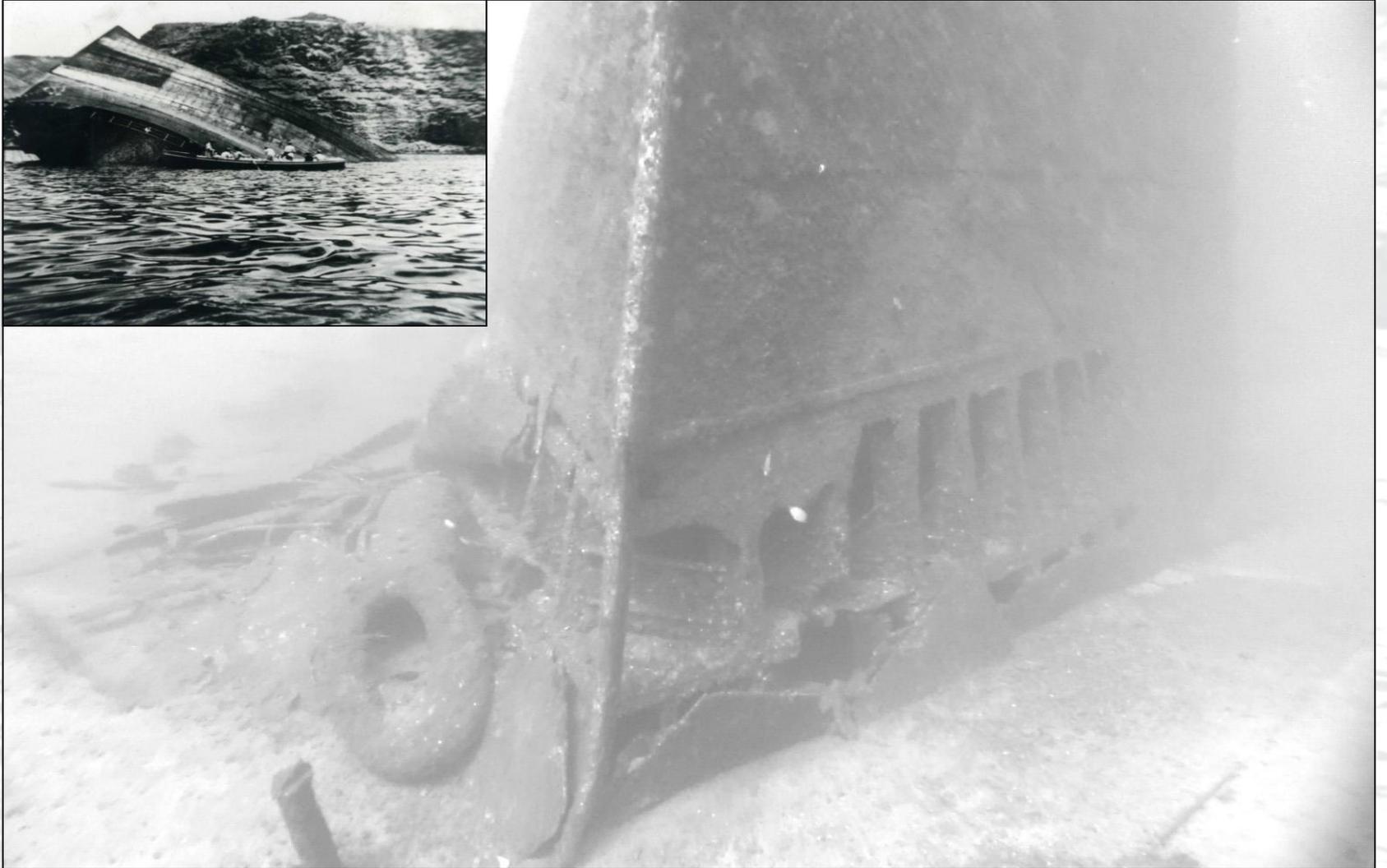
RFA Darkdale



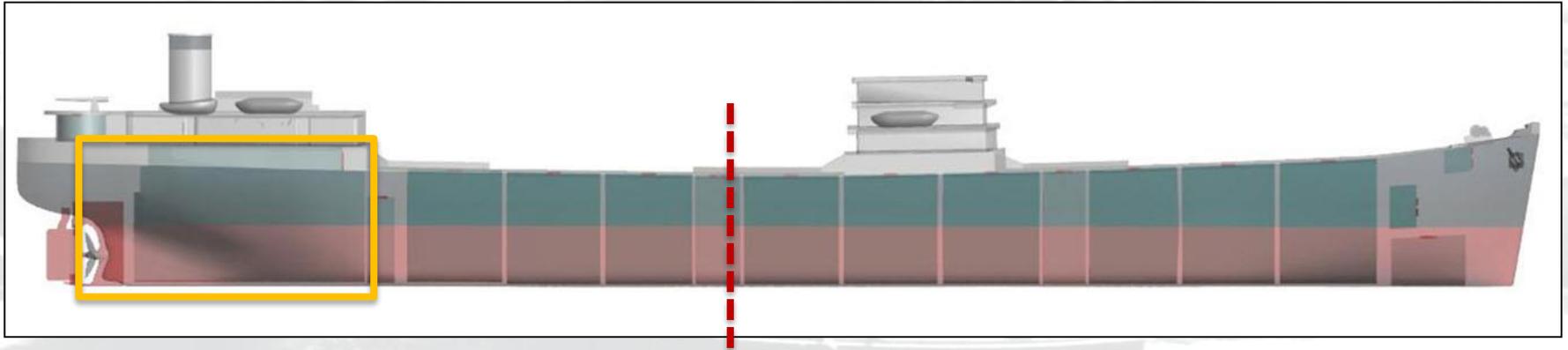
RFA *Darkdale*



RFA Darkdale

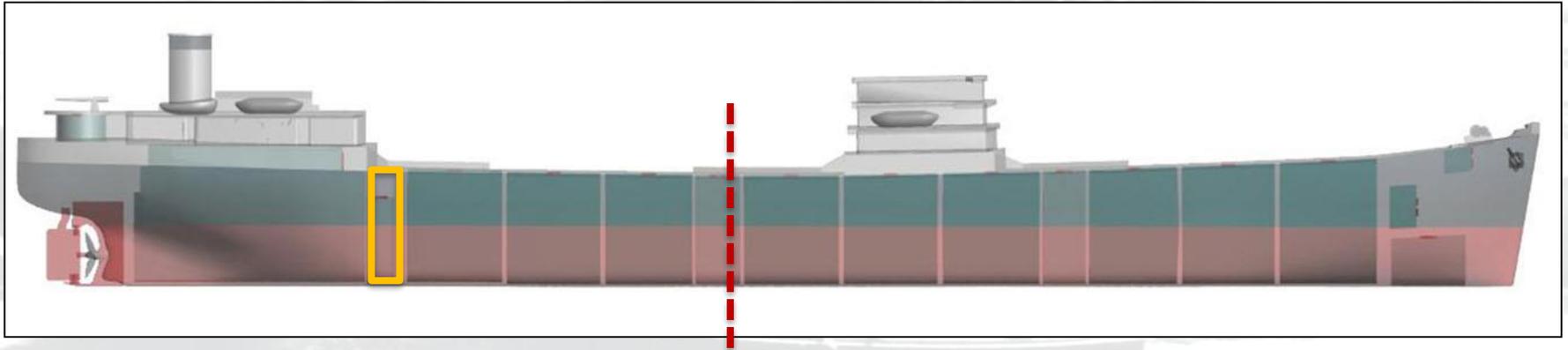


RFA *Darkdale*



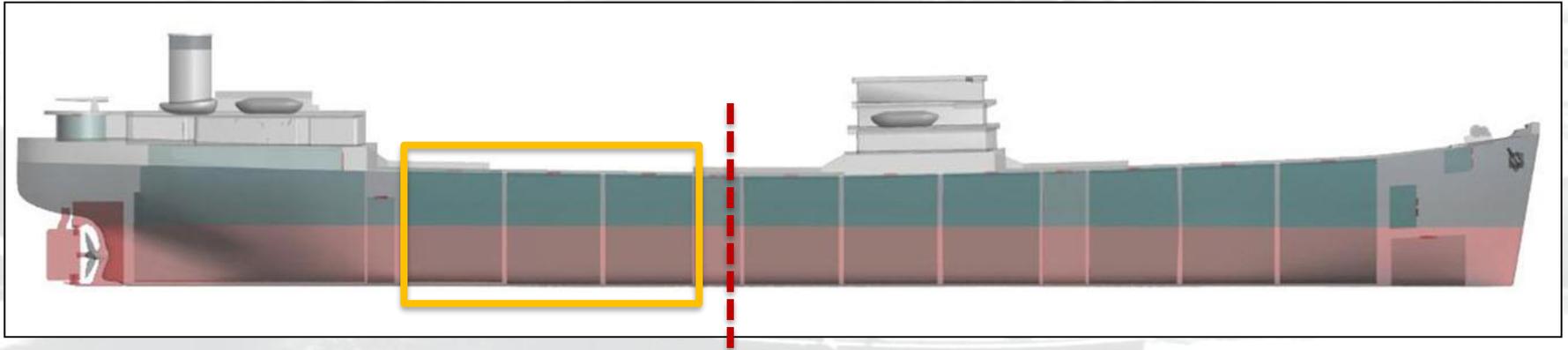
- Engine room likely to have torpedo damage to port side
- Mainly intact plating on starboard side will trap small residual quantities of oil

RFA *Darkdale*



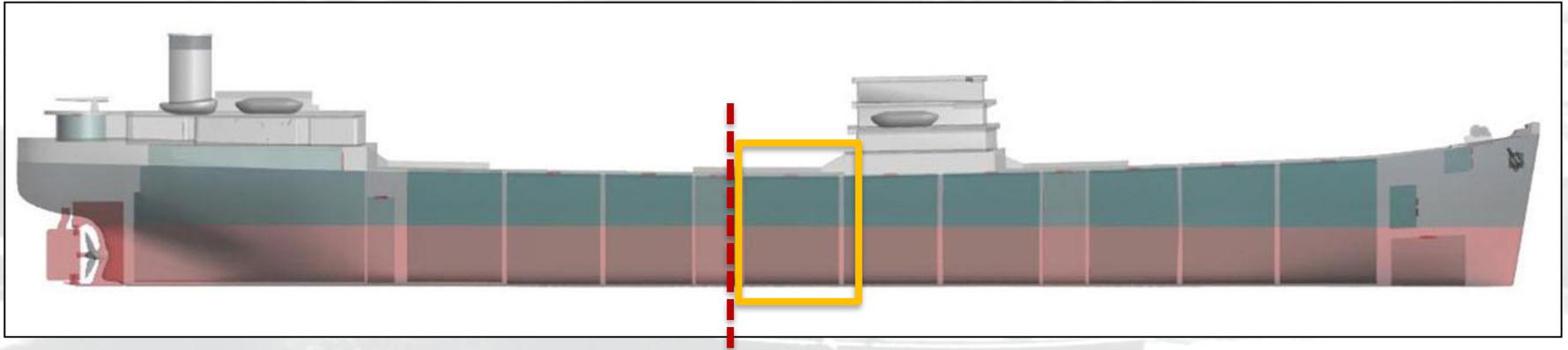
- Bunker tanks likely to contain some oil
- Most likely source of leak in 2010

RFA *Darkdale*



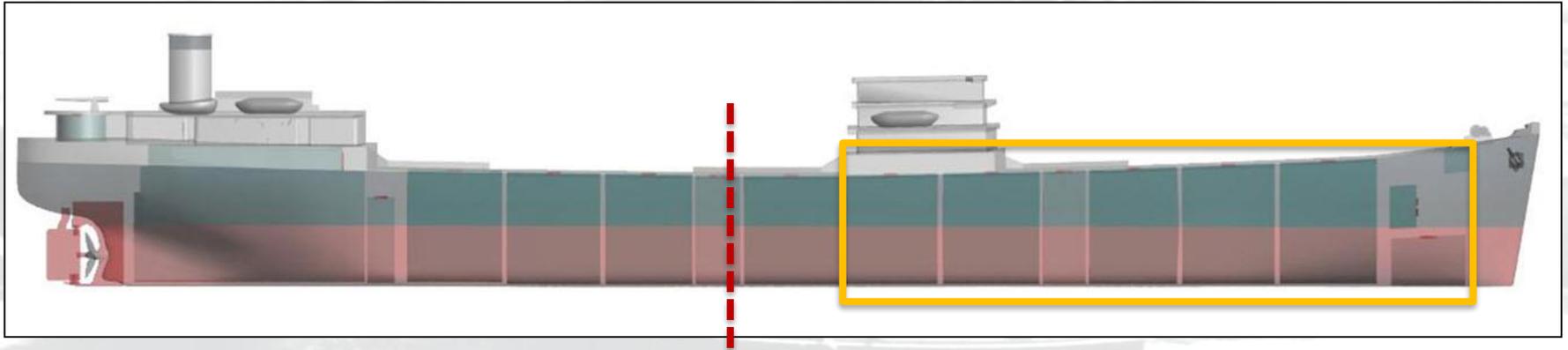
- Badly torpedo damaged
- Cargo tanks 1 to 3 open to the sea; no significant oil content

RFA *Darkdale*



- No. 4 Cargo tank partially open to the sea but known to contain some oil
- Estimated to be circa 150m³

RFA *Darkdale*

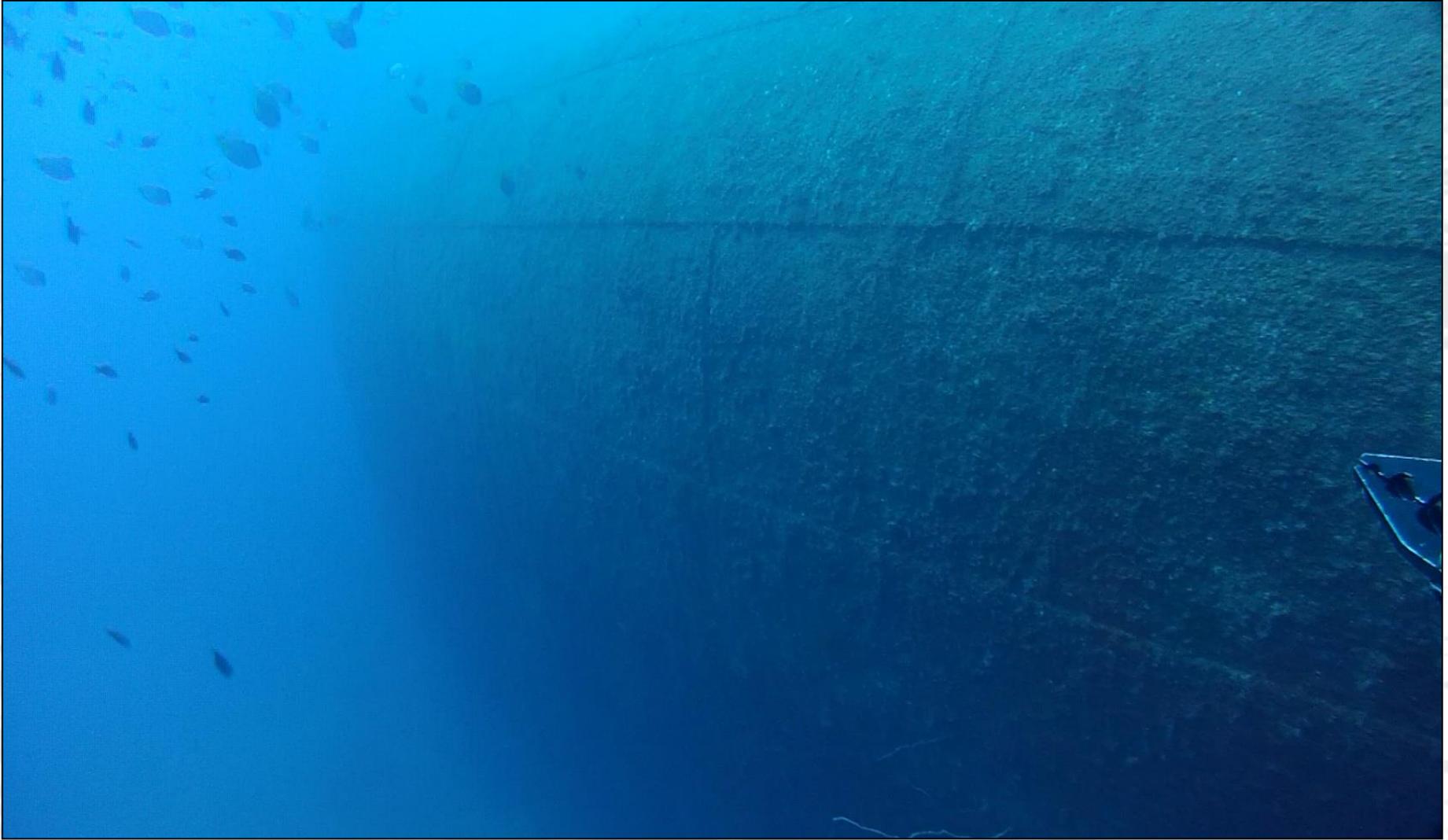


- Cargo tanks 5 to 9 intact
- Estimated quantity of oil remaining onboard 2800 to 4500m³
- Oil removal technically possible via hot tap but should be carried out in the near future to avoid thin steel causing difficulties

RFA *Darkdale*



RFA *Darkdale*



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RFA Darkdale



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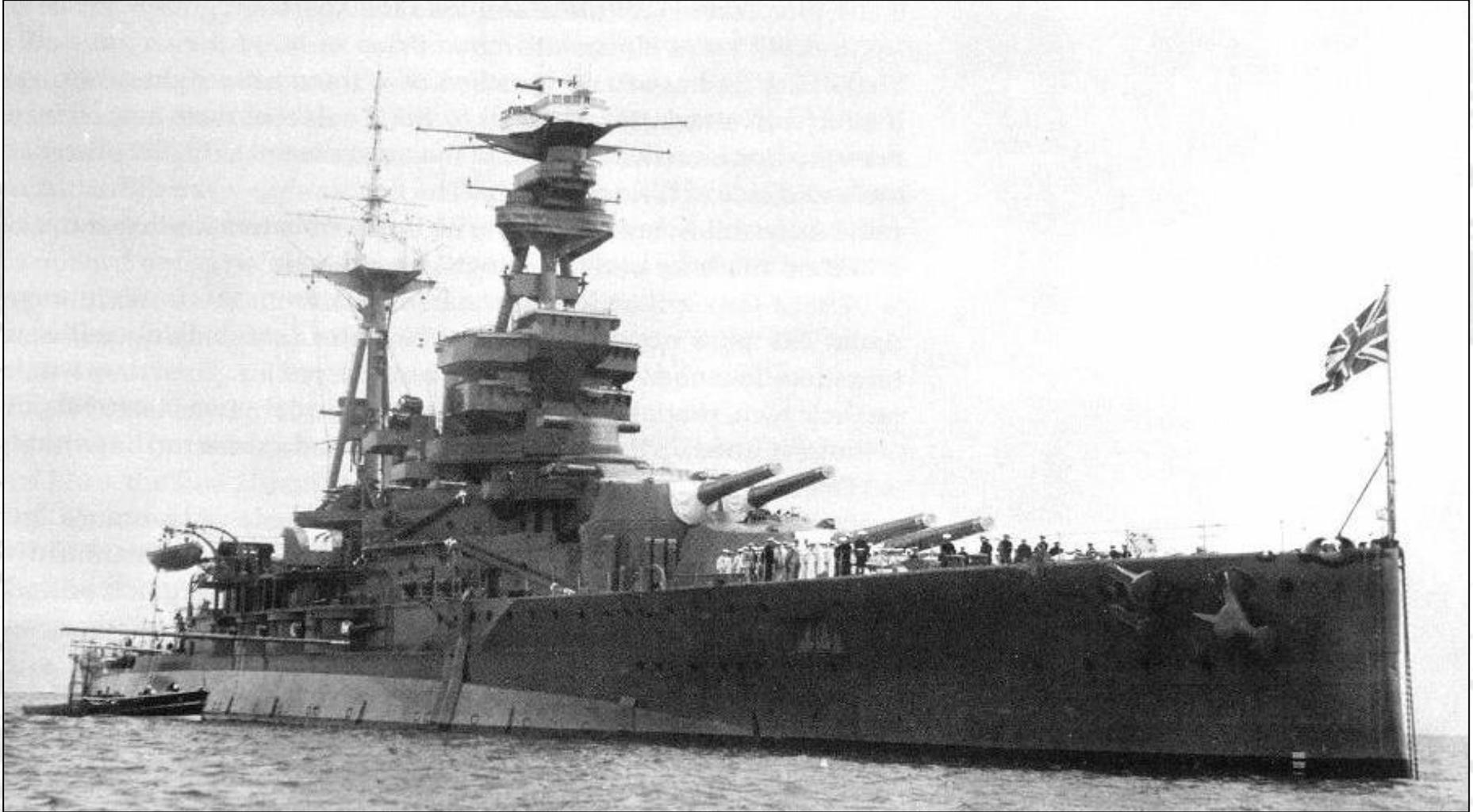




HMS Royal Oak



HMS *Royal Oak* - The Ship



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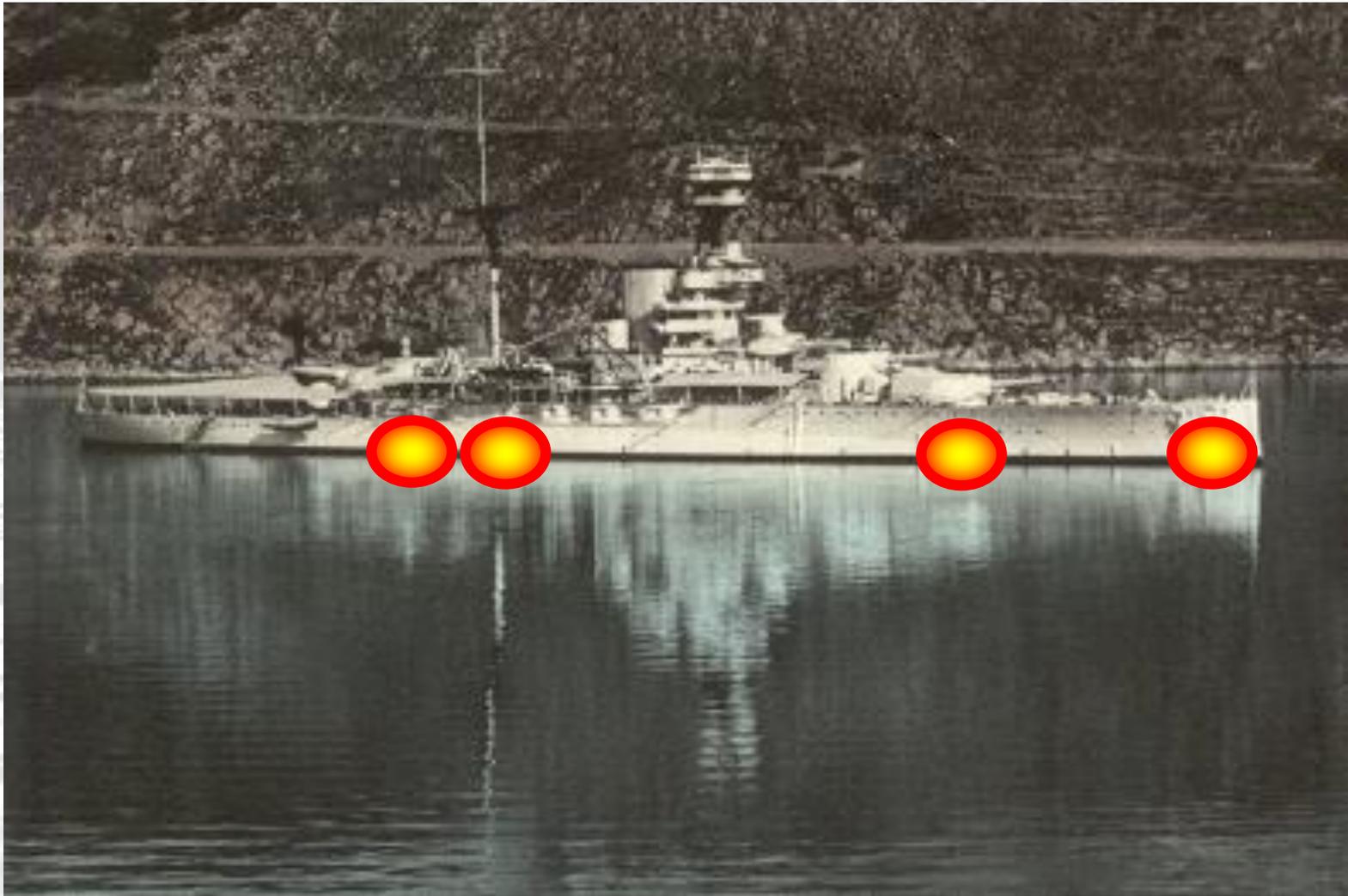


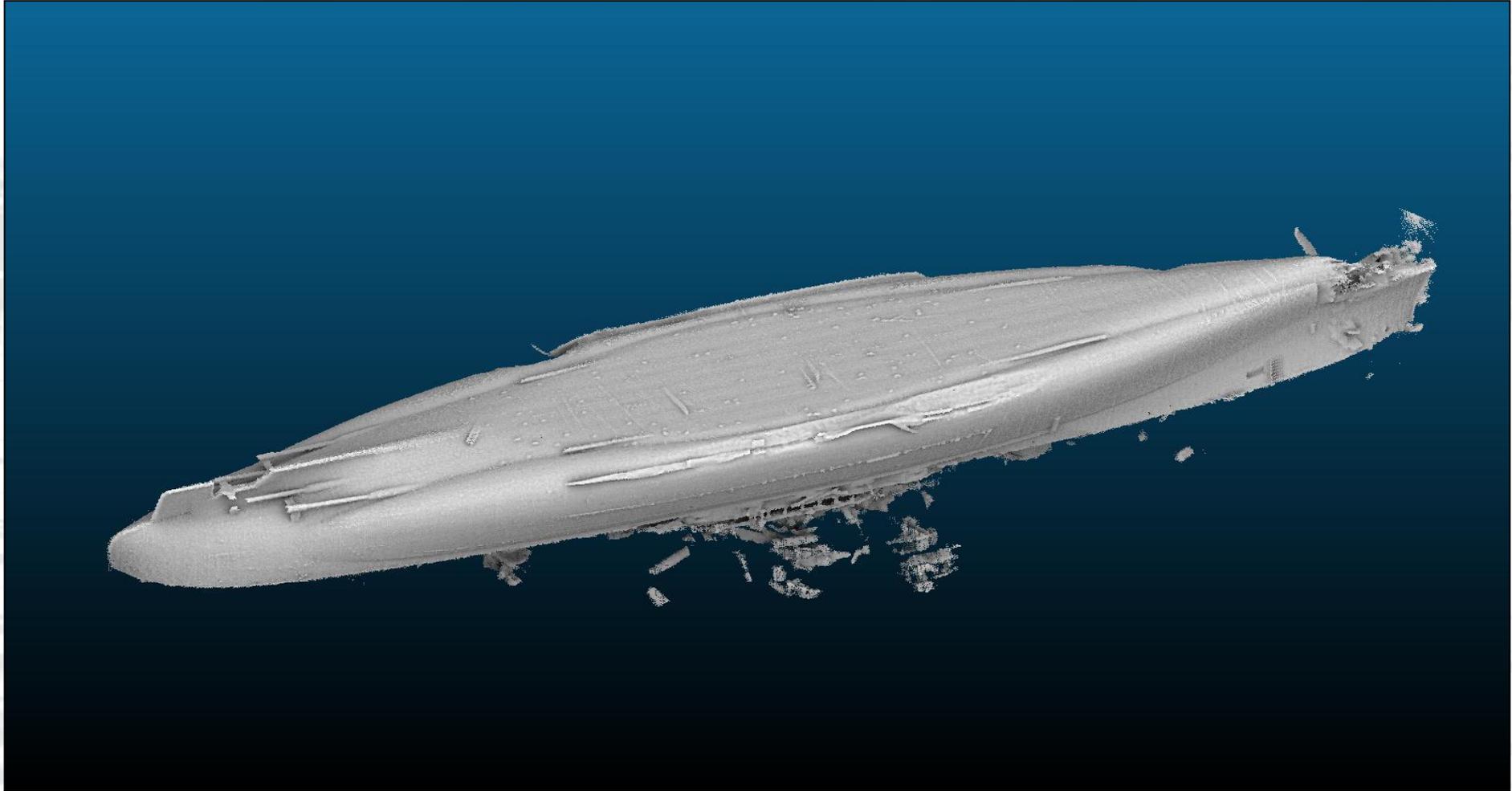
HMS *Royal Oak* - History

- One of five Royal Sovereign Class Dreadnought Battleships.
- Displacement 29,000 tons, 600 feet in length.
- Designed pre First World War -initially for coal – part way through design process decision taken to switch to oil.
- Took part in the Battle of Jutland in 1916.
- Some modifications in inter-war period including fitting of anti-torpedo bulges.
- While anchored in Scapa Flow in the early hours of 14 October 1939 HMS Royal Oak was struck on the starboard side by four torpedoes fired by U-47. The ship capsized, over 800 crew were lost.
- Wreck lies upturned in 30 metres of water with her starboard side down at 145° from upright.



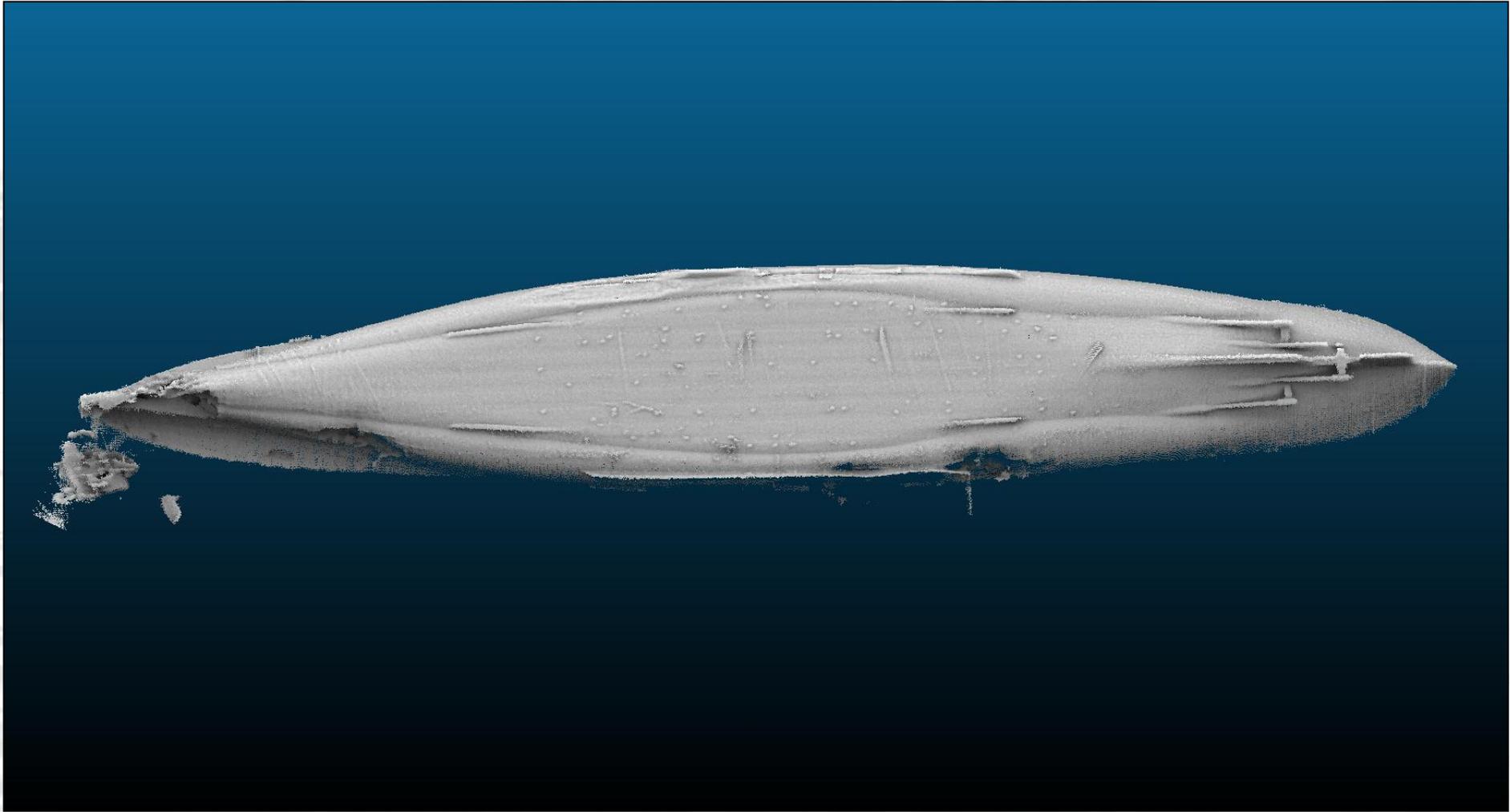
Torpedo Hits





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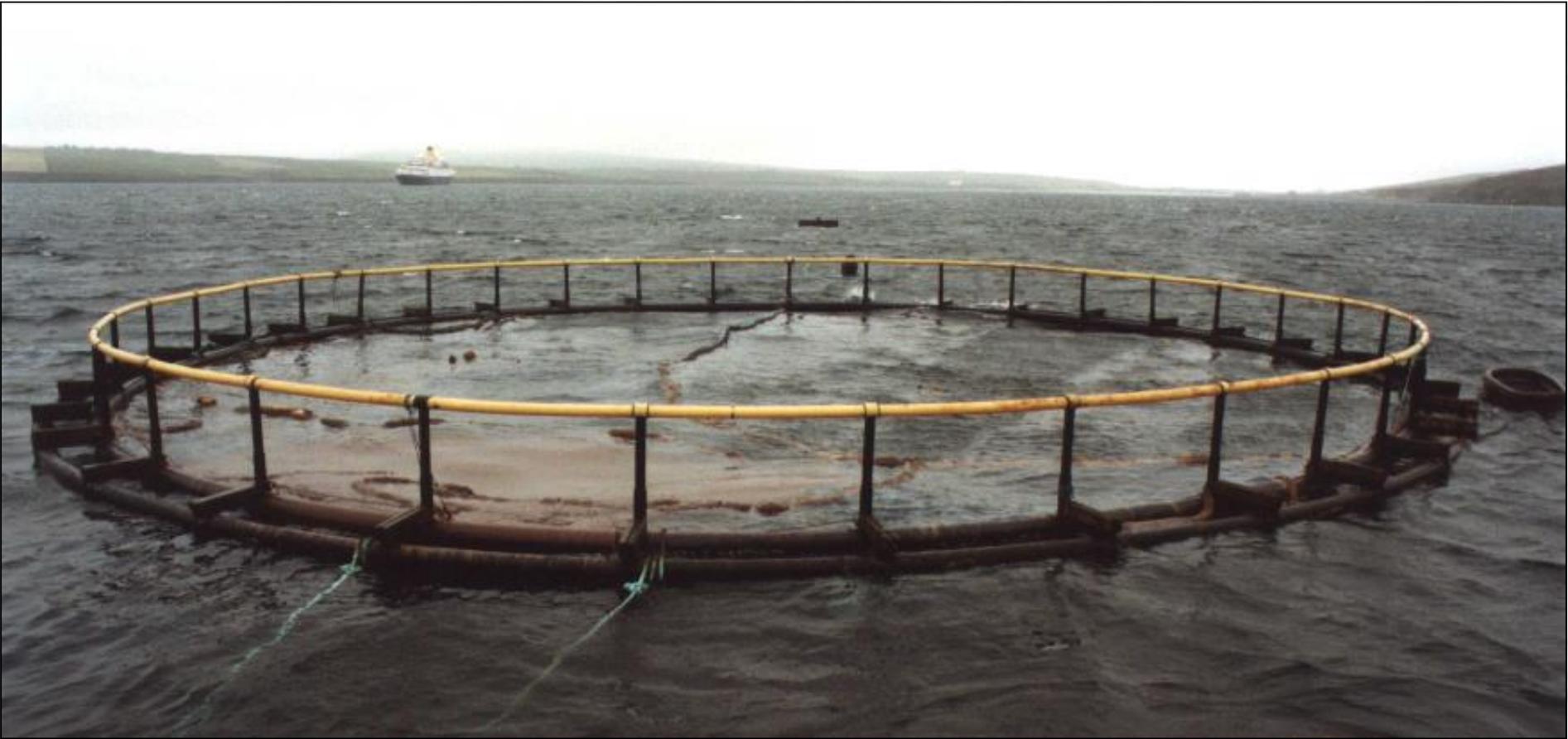
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HMS *Royal Oak* – oil leak



HMS *Royal Oak* – oil leak



HMS *Royal Oak* – oil leak



Oil Leak Timeline and Early Containment Efforts

Early years

Oct 1939 - **At the time of sinking the ship was fully fuelled – 3000 tonnes of furnace fuel oil.** Large, though unquantifiable amounts of oil lost at time of sinking.

1945 - Oil flush-out ceased.

Environmental problem

1960 - First signs of oil leakage apparent.

Early 1990s - Concerns become serious.

1995 - Minister accepts MoD has moral responsibility - statutory liability not tested.

Early remediation efforts

1996 - Patch fitted over prime leak.

Jan 1999 - Canopy installed over prime leak; torn off within two weeks, taking patch.

1999 - Salmon cage put in place by Orkney Harbours.



Oil Removal Timeline

Early 2001:

Independent Risk Assessment;
Pilot Operation (and permanent boom vice salmon cage)

Summer 2001:

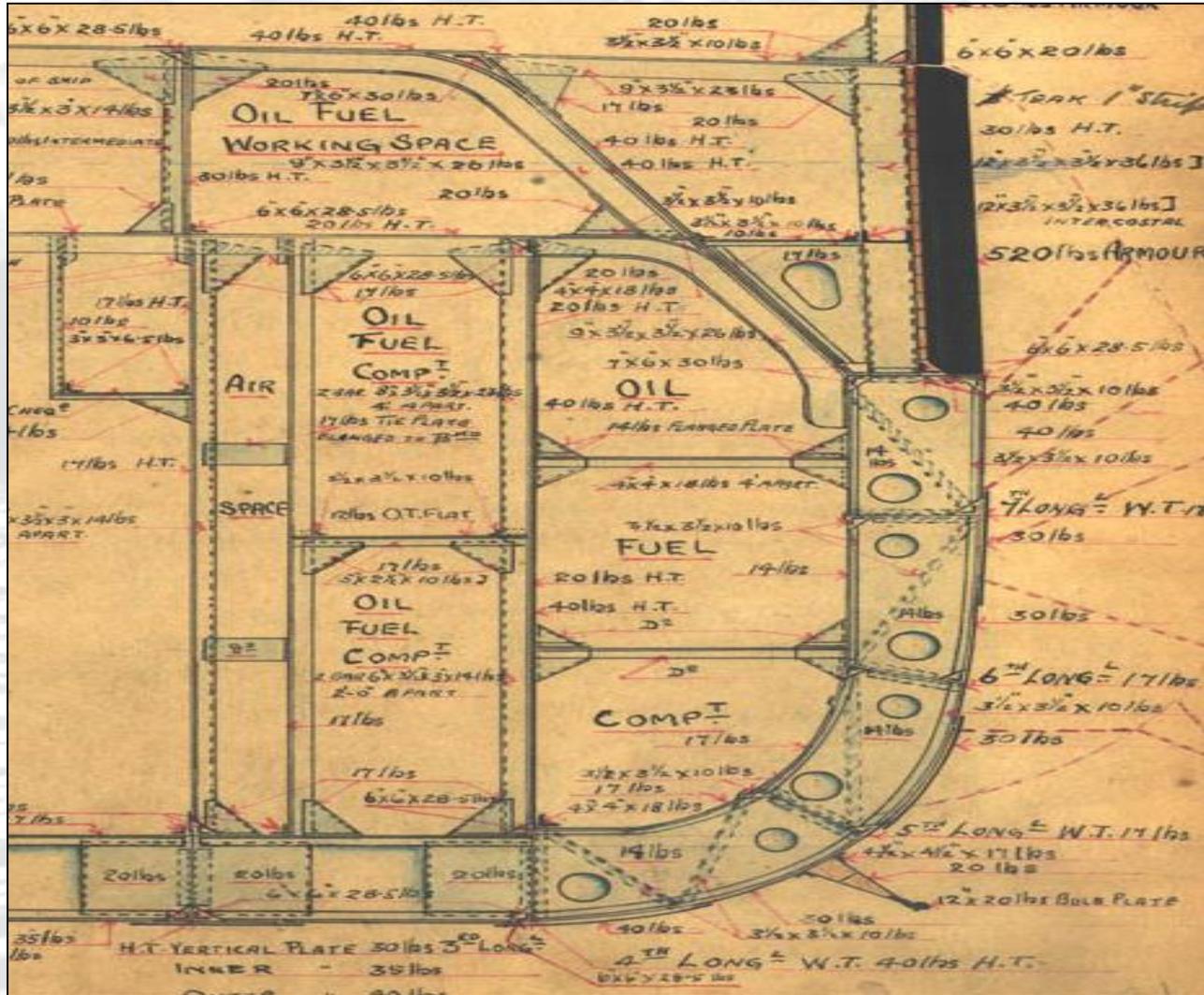
High-resolution sonar swathe survey
Survey, marking (reference grid)
Sampling and selective hot-tapping
Early October – Permanent boom reinstated after repairs

2002:

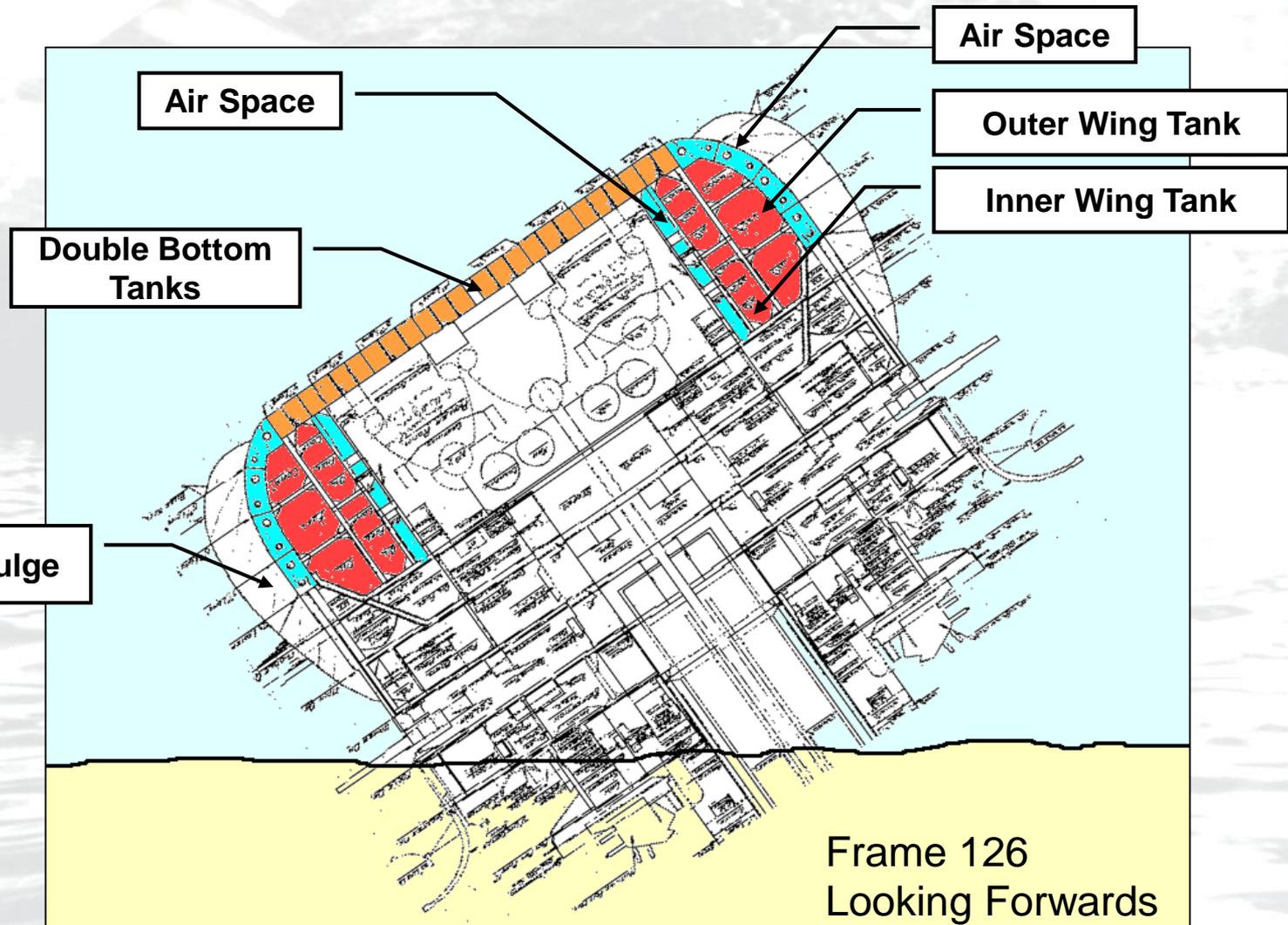
Early February – Boom wrecked in storm and removed
May – ROV survey
July-August – Hot-tapping operations
September - Site designated under [PMRA86](#)



HMS Royal Oak – Fuel Tank Section



HMS Royal Oak – Cross Section



Hot Tapping – Gate Valves Fitted and Oil Removal

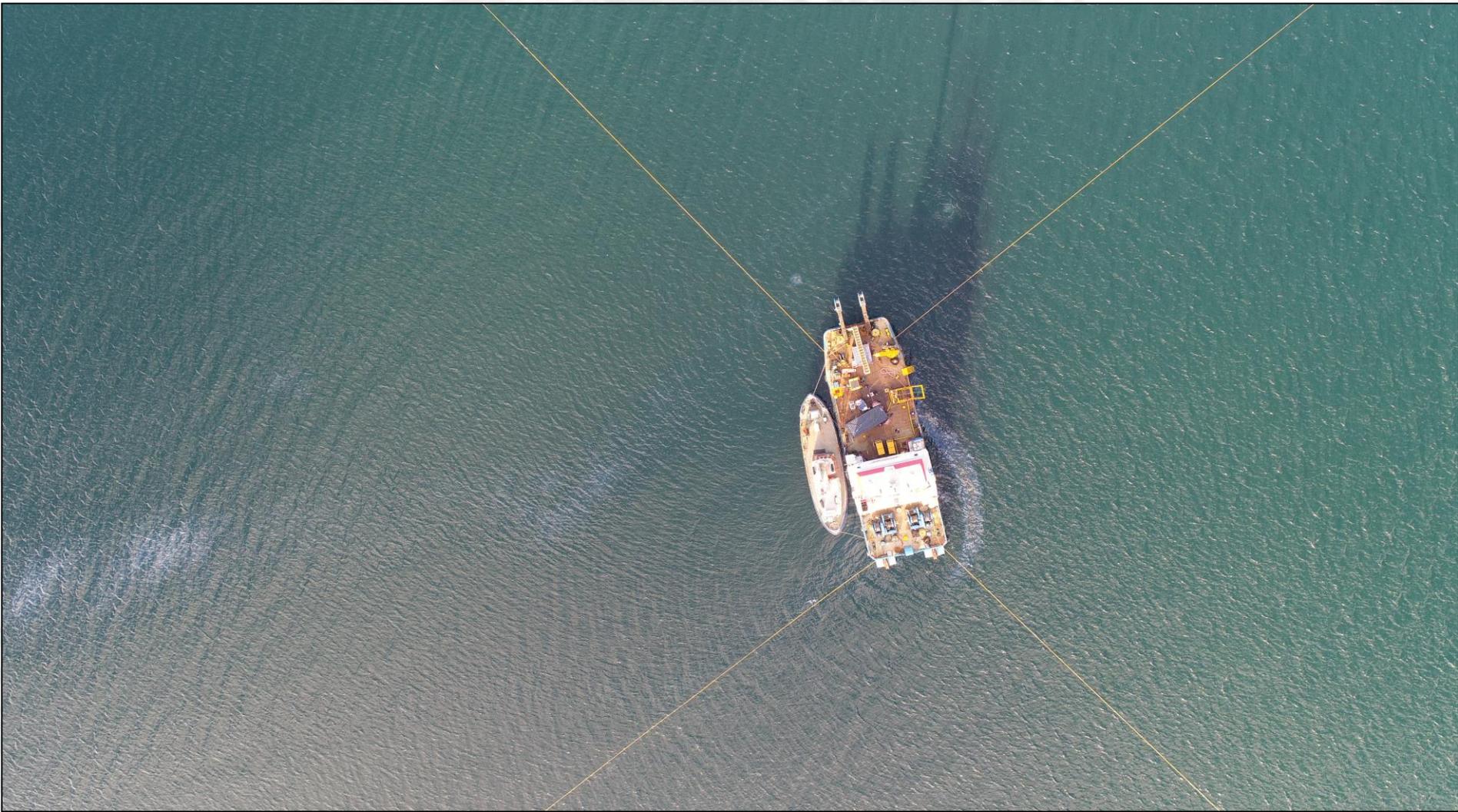


- 2001:**
170 cubic metres of oil recovered
- 2002:**
434 cubic metres of oil recovered
- 2003:**
July-August Hot tapping operations - 70 cubic metres of oil recovered
- 2004:**
Update of BMT Risk Assessment
July-August – Hot Tapping Operations - 26 cubic metres of oil recovered
- 2005:**
20 cubic metres of oil recovered from DB tanks
185 cubic metres of oil recovered using water jet cutting tool
- 2006:**
60 cubic metres of oil recovered from Port inner wing tanks using water jet cutter
- 2007:**
164 cubic metres of oil recovered from inner wing tanks and boiler room #3
- 2008:**
176 cubic metres of oil recovered from boiler rooms #1 and #2
- 2009:**
10 cubic metres of oil recovered from wing tank

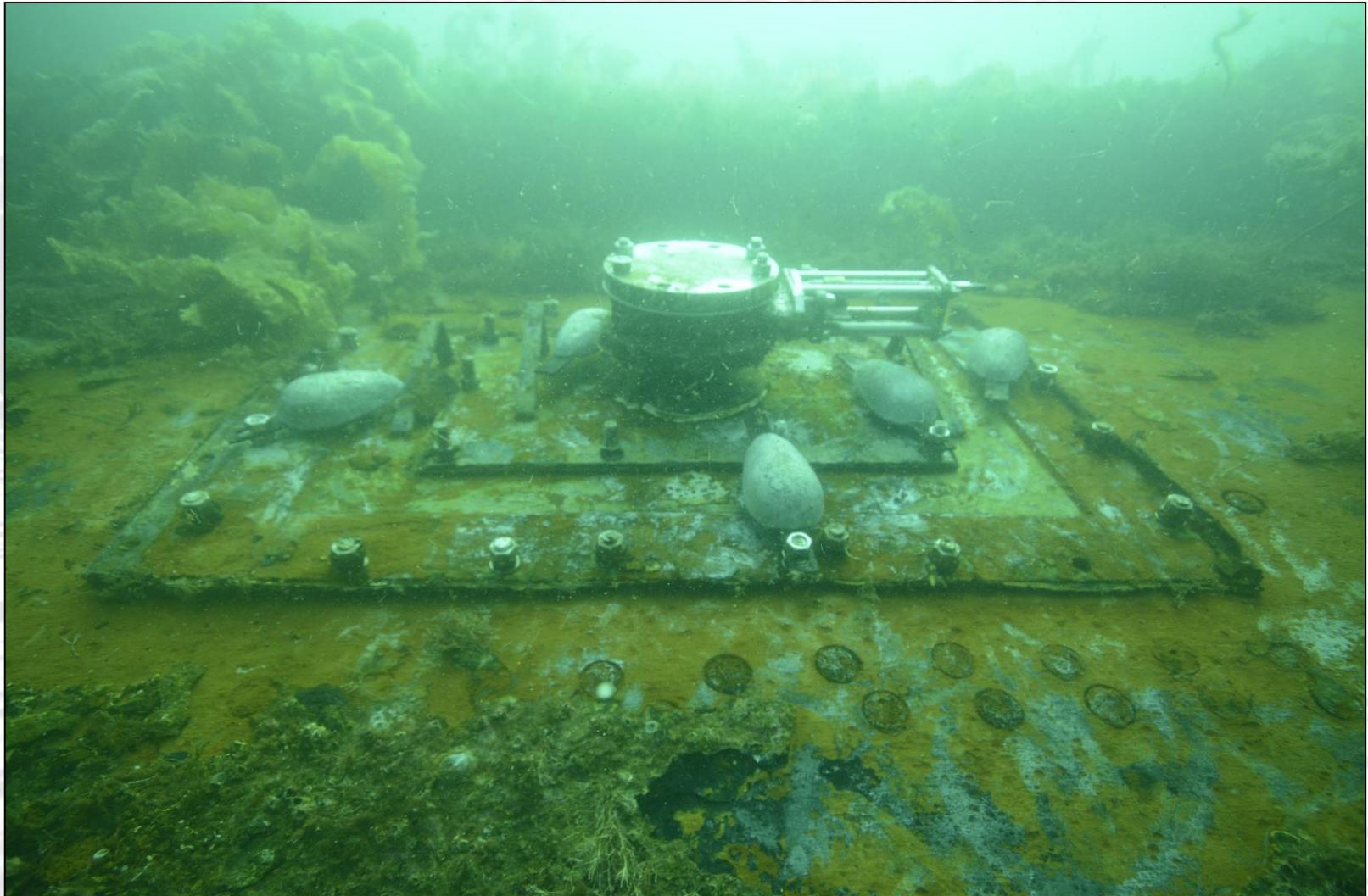
1292 CUBIC METRES OF OIL RECOVERED TO 2009

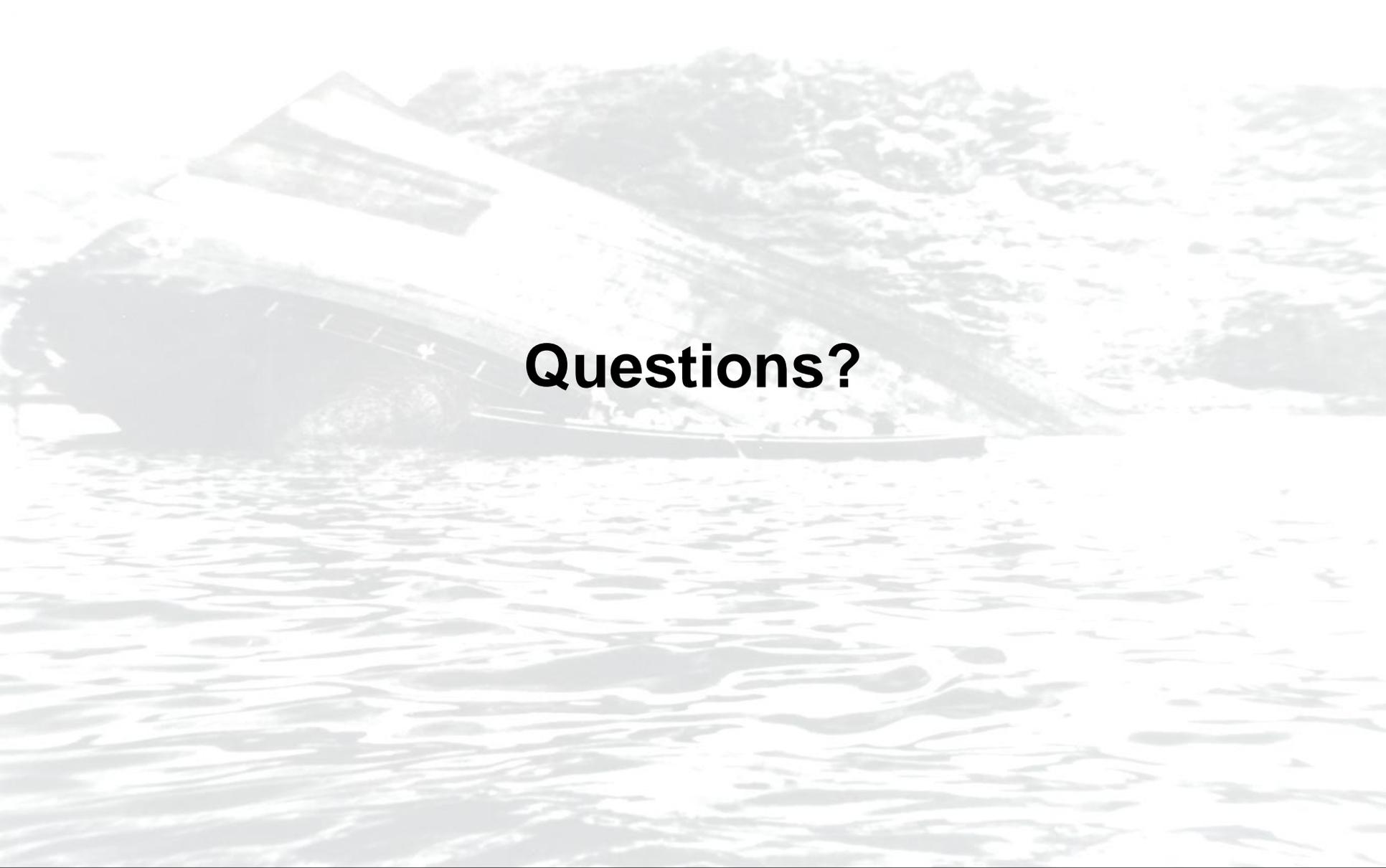


HMS *Royal Oak* - 2018



HMS *Royal Oak* - 2018



A large, dark-colored ship is shown listing heavily to its starboard side in a body of water. The ship's hull is partially submerged, and its deck is visible. The background shows a hazy, overcast sky and distant landmasses. The overall image has a faded, monochromatic appearance.

Questions?

