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TIRPITZ

An account of the various attacks
carried out by the British Armed
Forces and their effect upon the
German Battleship

Volume 1
REPORT AND APPENDICES

1948

Sea Power Centre - Australia



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Volume 1
REPORT AND APPENDICES

ADMIRALTY,
31st March, 1949

P.03370/47

^{BR 1736(22)(A)}
C.B. 4499(A) *Tirpitz—An account of the various attacks carried out by British Armed Forces and their effect upon the German battleship, Volume 1. Reports and Appendices, 1948,* having been approved by My Lords Commissioners of the Admiralty is promulgated for information and guidance.

By command of Their Lordships,

J. G. Lang

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TIRPITZ.



Completed November 1940 ~ Capsized November 1944.



"gegen England?"

Photograph taken on the
capsized ship.

SECTION I - BRIEF HISTORY

1. TIRPITZ and the ill-starred BISMARCK were planned during the first years of the Nazi Regime as part of a class of heavy battleships which were to have a standard displacement of 45,000 tons; they followed the 33,000 ton battle cruisers SCHARNHORST AND GNEISENAU as a further stage in the re-birth of the German Battle Fleet. It was intended to follow TIRPITZ and BISMARCK with six super-battleships of 60,000 tons, four large battle cruisers of 35,000 tons, six large fleet aircraft carriers, and all the cruisers, destroyers and other attendant craft needed to make a bid for supremacy on the high seas.
2. TIRPITZ was laid down at Wilhelmshaven in October, 1936, launched in April, 1939, and completed in November, 1940. She commissioned on the 25th January, 1941, and spent the remainder of the year carrying out extensive trials, overcoming the inevitable teething troubles and working up into an efficient fighting unit. During this period she visited Kiel, Gdynia and Danzig, returning to Kiel at intervals for repairs and adjustments. (See Figure I).
3. Meanwhile attention was being paid by the Germans to the future employment of their heavy naval units. In spite of the reverses suffered in the loss of, first, the pocket battleship GRAF SPEE and then the battleship BISMARCK and also the blockading of the SCHARNHORST and GNEISENAU which had been at Brest since mid-March, 1941, there still remained formidable operational units for deployment. In August, 1941, Admiral Raeder (Commander-in-Chief of the German Navy) recommended the concentration of heavy ships in northern waters as promising strategic results. In December, 1941, Hitler demanded a concentration of battleships and pocket battleships in northern waters because latest intelligence had firmly convinced him that a British landing in northern Norway was imminent; he was deeply concerned at the possible catastrophic results of such a landing and said "The fate of the war will be decided in Norway". The outcome was that in mid-January, 1942, TIRPITZ sailed for Norway and approximately a month later SCHARNHORST and GNEISENAU made their historic dash through the English Channel in a successful effort to regain German ports.
4. TIRPITZ' first sortie was made from Trondheim in March, 1942, after a Russia-bound convoy had been shadowed by German reconnaissance aircraft. Torpedo carrying Albacores of the Fleet Air Arm made contact with the ship off the Lofoten Islands on the 9th March and launched an unsuccessful attack following which TIRPITZ retired at high speed. She returned to Trondheim and remained in that area until early July, 1942. On 7th July, British reconnaissance aircraft sighted TIRPITZ off Tromsø and on 8th July the Russians claimed to have attacked her off North Cape with torpedoes fired from a submarine. The ship was next located at Bogen Fjord, near Narvik, where she remained until October, 1942, when machinery defects which had developed during the previous months made it desirable for her to return to Trondheim for repairs before the onset of the Arctic winter.
5. On 11th January, 1943, Hitler, furious at the failure of an attack on a convoy by HIPPER and LUTZOW, announced his intention of decommissioning the large ships. He told Raeder that the present critical situation demanded the application of all available fighting power, personnel and material, and that the large ships must not be permitted to be idle for months. On Hitler's instructions Raeder produced a memorandum on the decommissioning of the large ships; he strenuously contested the decision but to no effect. Following this, Raeder resigned and was succeeded by Doenitz. Decommissioning of certain ships was put into effect, but following strong representations from Doenitz, Hitler agreed to keep TIRPITZ and SCHARNHORST in commission; Doenitz reasoned that these heavy units, together with LUTZOW and six destroyers, would form a fairly powerful task force. On 2nd February, 1943, Hitler issued an order for the cessation of work on the building of large ships.
6. The machinery repairs to TIRPITZ (see paragraph 4) appeared to have been completed (with spares brought from Germany) by the end of February, 1943, at

SECTION I - BRIEF HISTORY (Contd.)

which time she was reported as undergoing exercises in Trondheim Fjord. She left the Trondheim area in March, 1943, and joined the SCHARNHORST and LUTZOW in the Narvik area. The three ships left Narvik in company on 27th March and arrived in the Kaa Fjord, between Tromsø and North Cape, on the 2nd April. They stayed in this area until the 7th September. On the 9th September they carried out a raid on the Norwegian Islands of Spitzbergen with the object of destroying Allied bases and installations which were alleged to have been set up there. This raid indicated that the German battleship was likely to become more active and plans were therefore made to attack her with the X-Craft which had just come into operational service.

7. Three of the six X-Craft which were despatched to make this attack in the Kaa Fjord, to which TIRPITZ had returned after the Spitzbergen raid, successfully negotiated the inner defences around her on 22nd September and two of them laid their explosive charges on the sea-bed under or near the ship before being destroyed. At least two of these charges detonated as intended and the resultant damage immobilised TIRPITZ for six months. At the end of this period, that is in mid-March, 1944, she was reported as running trials in the Alten Fjord and arrangements were made to lay on a bombing attack by Fleet Air Arm Barracudas from the Home Fleet Carriers. The first attack was made on the 3rd April by forty Barracudas in two waves escorted by ship-borne fighters, just as TIRPITZ was on the point of leaving her berth to run an extensive series of sea trials to test the repairs. The attack was a complete surprise, fourteen hits were scored in spite of very low cloud, a smoke screen and the difficulty of attacking over mountains, and though the material efficiency of the ship was not seriously impaired, the heavy casualties meant that she would not be able to fight an action for some time.

8. TIRPITZ was still in Kaa Fjord when she was again attacked by Fleet Air Arm aircraft on the 17th July and the 22nd, 24th and 29th August. Observer posts, which had been set up some distance from the anchorage, were able to give warning of these raids and a thick smoke screen, heavy anti-aircraft fire and low cloud prevented the attacks being pressed well home. Two hits were scored on 24th August but again no vital damage to the ship resulted.

9. The urgent necessity of releasing for the Far East the capital ships held at Scapa to counter the menace of TIRPITZ made it imperative to render the ship inoperative at an early date. On 15th September, 1944, she was attacked at her anchorage in the Kaa Fjord with the new 12,000 lb. M.C. bombs (Tallboys) which had been developed primarily for land demolition purposes. Twenty-one Bomber Command Lancasters, operating from a Russian base, found the ship almost completely obscured by smoke. Only one hit (at the fore end) was registered owing to the extreme difficulty of carrying out a high level bombing attack in the poor visibility conditions prevailing, but severe damage was caused and TIRPITZ was henceforth incapable of being a threat to shipping. However, this fact did not become known to the Allies until the termination of the war, and the attacks continued.

10. Following this latest damage the Germans held a Conference at which they decided that as it was no longer possible to make TIRPITZ ready for sea and action again, the ship's remaining fighting efficiency should be utilised as a reinforcement of the defences in the Polar Area. On 15th October TIRPITZ was moved to a berth near Tromsø and arrangements were made to protect her with anti-aircraft and smoke defences and land-based aircraft. This berth was supposed to conform to special requirements laid down at the Conference, one of which limited the maximum depth of water in the anchorage to a figure which would have prevented the ship from capsizing; the depth at the position in which TIRPITZ was finally moored exceeding this limit and a hasty attempt was made to build up the sea-bed by depositing dredged material around and under the ship, which became known as "The Floating Battery".

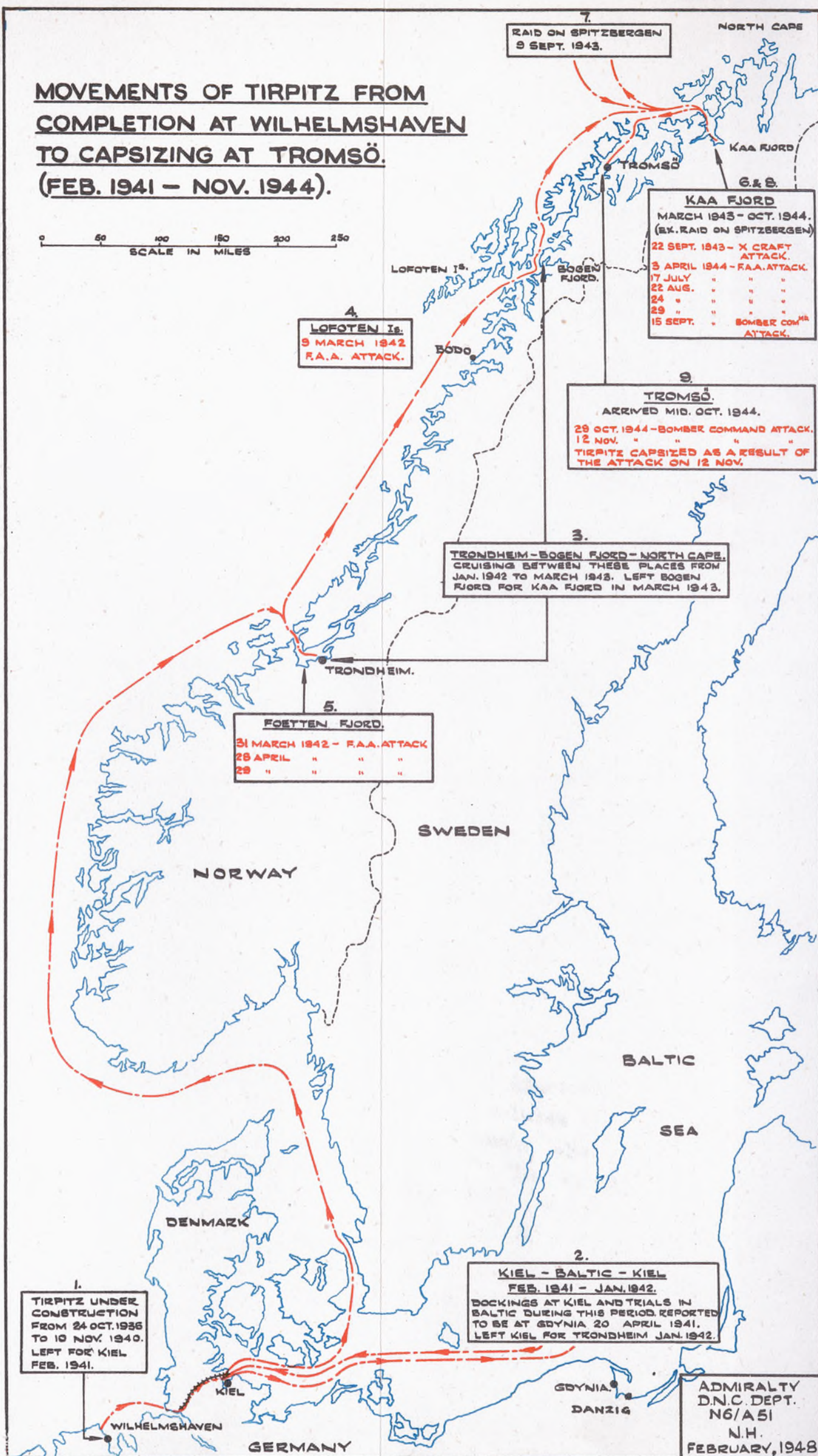
SECTION I - BRIEF HISTORY (Contd.)

11. On 29th October, 1944, Lancasters again attacked with 12,000 lb. bombs. Heavy cloud obscured the Tromsø anchorage and militated against accurate high level bombing but a near miss off the port quarter produced flooding aft.

12. Finally, on 12th November, 1944, the somewhat inactive operational career of TIRPITZ was brought to a close when Lancaster aircraft bombed her with 12,000 lb. Tallboys for the third time, scoring hits which - aided by one near miss - caused the world's only "unsinkable" battleship to capsize in about ten minutes with the loss of some 1,000 lives.

MOVEMENTS OF TIRPITZ FROM COMPLETION AT WILHELMSHAVEN TO CAPSIZING AT TROMSÖ. (FEB. 1941 - NOV. 1944).

0 50 100 150 200 250
SCALE IN MILES



7.
RAID ON SPITZBERGEN
9 SEPT. 1943.

8.
KAA FJORD
MARCH 1943 - OCT. 1944.
(EX. RAID ON SPITZBERGEN)
22 SEPT. 1943 - X CRAFT
ATTACK.
3 APRIL 1944 - F.A.A. ATTACK.
17 JULY " " " "
22 AUG. " " " "
24 " " " "
29 " " " "
15 SEPT. " BOMBER COMND
ATTACK.

4.
LOFOTEN IS.
9 MARCH 1942
F.A.A. ATTACK.

9.
TROMSÖ.
ARRIVED MID. OCT. 1944.
29 OCT. 1944 - BOMBER COMMAND ATTACK.
12 NOV. " " " "
TIRPITZ CAPSIZED AS A RESULT OF
THE ATTACK ON 12 NOV.

3.
TRONDHEIM - BOGEN FJORD - NORTH CAPE.
CRUISING BETWEEN THESE PLACES FROM
JAN. 1942 TO MARCH 1943. LEFT BOGEN
FJORD FOR KAA FJORD IN MARCH 1943.

5.
FOETTEN FJORD.
31 MARCH 1942 - F.A.A. ATTACK
28 APRIL " " " "
29 " " " "

2.
KIEL - BALTIC - KIEL
FEB. 1941 - JAN. 1942.
DOCKINGS AT KIEL AND TRIALS IN
BALTIC DURING THIS PERIOD. REPORTED
TO BE AT GDYNIA 20 APRIL 1941.
LEFT KIEL FOR TRONDHEIM JAN. 1942.

1.
TIRPITZ UNDER
CONSTRUCTION
FROM 24 OCT. 1936
TO 10 NOV. 1940.
LEFT FOR KIEL
FEB. 1941.

ADMIRALTY
D.N.C. DEPT.
N6/A51
N.H.
FEBRUARY, 1948

SECTION II - THE SHIP

1. There was nothing sensational about the design of TIRPITZ; she was merely a very large battleship, designed on conventional lines, propelled by three screws driven by steam turbines and mounting eight 38 cm. (approx. 15 inch) guns in twin turrets, arranged in the conventional way, two forward and two aft. This German mastodon was designed to a standard displacement of 42,600 tons, although the displacement reported for Treaty conditions was 35,000, the same as that of the KING GEORGE V and WASHINGTON classes of battleship, which were genuinely designed to this size. In the deep condition she displaced 50,000 tons and had a draught of nearly 34 feet. Other things being equal this greater displacement would have been accompanied by greater ability to withstand damage. Although she measured 822 feet overall, her most impressive dimension was her beam of 118 feet which would have prevented her from passing through the Panama Canal. It was always thought that this implied a very deep "bulge" for protection against underwater attack, but it is now known that there was nothing remarkable about her underwater protection which was, in fact, inferior to that fitted in both British and American contemporary Capital Ships. The very large beam was adopted to provide an abnormally high initial stability. Such measures, however, may often reduce the resistance of the ship to the more severe states of damage. It is doubtful whether TIRPITZ was at all better than her allied counterparts in this respect.
2. Information gained from a survey of the wreck and numerous drawings brought from Germany confirm that TIRPITZ' reputed fine watertight subdivision, and consequent "invincibility", were a complete myth; her subdivision was very similar to that of our own Capital Ships, and indeed those of all major sea Powers. Her watertight integrity was in several ways subordinated to requirements of convenience; for example, every transverse watertight bulkhead in the ship was pierced by watertight doors on the lower and middle platform decks, a menace which has been eliminated from H.M. ships for many years, and the engine rooms seemed to contain far more space than was needed.
3. Some of the available weight was used to secure a very high speed. TIRPITZ was designed to develop 150,000 shaft horse-power which enabled her to make over 30 knots in the average action condition, and she was capable of developing 165,000 shaft horse-power for sudden bursts of over 31 knots. Her range based on an oil fuel capacity of 5,000 tons was over 10,000 sea miles. More fuel could be carried in an emergency.
4. More of the extra displacement in TIRPITZ was accounted for by the fact that her 38 cm. guns were mounted in twin turrets rather than the weight saving triple and quadruple arrangements used in modern American and British Capital ships. Also the Germans fitted separate low angle and high angle secondary batteries rather than the dual purpose mountings used in Allied ships. She thus had twelve 15 cm. (5.9 inch) low angle guns in twin turrets, three on either side of the amidships superstructure, and sixteen high angle 10.5 cm. (4.1 inch) guns in twin mountings - four on each side. A further battery of sixteen 3.7 cm. (1.46 inch) mountings for close range anti-aircraft work was also provided.
5. This powerful armament was controlled by range-finders and director sights on the forward and after conning towers, and on the fore top. There were smaller range-finders for the secondary armament, one on each side of the bridge. The 10.5 cm. H.A. armament was controlled by four special gyro stabilized directors, one to port and one to starboard of the bridge, and two on the centre line abaft the main mast.
6. TIRPITZ' general layout is illustrated by the small-scale drawing (Figure 2) which has been prepared for this report from larger scale drawings found in the Naval Arsenal at Kiel. It will be seen from the drawing that the machinery spaces, consisting of six boiler rooms, three engine rooms and miscellaneous compartments housing auxiliary machinery, the magazines and shell

SECTION II - THE SHIP (Contd.)

rooms, and other vital compartments such as fire control rooms, were well protected by a long armoured citadel. The sides were of 320 mm. (12.6 inches) thick cemented armour plates from 8 feet below the waterline up to the battery deck and thinner plating of 145 mm. (5.7 inches) thickness to the upper deck. In addition, the third deck down was armoured with 80 mm. (3.15 inches) non-cemented plating over the machinery spaces and 100 mm. (3.94 inches) over the magazines between the torpedo bulkheads, while the sloping deck armour between the centre portion and the base of the side armour was 110 mm. (4.33 inches) in way of machinery spaces and 120 mm. (4.72 inches) in way of magazines. There were extensions of the citadel by thinner armour, the lower belt being 60 mm. (2.36 inches) plating forward and 80 mm. (3.15 inches) aft and the upper belt being 35 mm. (1.38 inches) forward and aft. While there was no deck armour before the forward magazines, deck protection aft over the steering gear compartments was 110 mm. (4.33 inches) in thickness. This armoured citadel, re-inforced by a strength deck (the upper deck) which was 50 mm. (1.97 inches) thick generally, afforded efficient protection against splinters and all but the largest bombs dropped from a considerable height. Barbettes, and turret sides and roofs, and conning towers were protected by armour on the same generous lines.

7. Four sea-planes which were carried for spotting and reconnaissance were accommodated in special hangars abreast the funnel and under the main mast. They were launched by a fixed athwartships catapult between the funnel and the main mast.

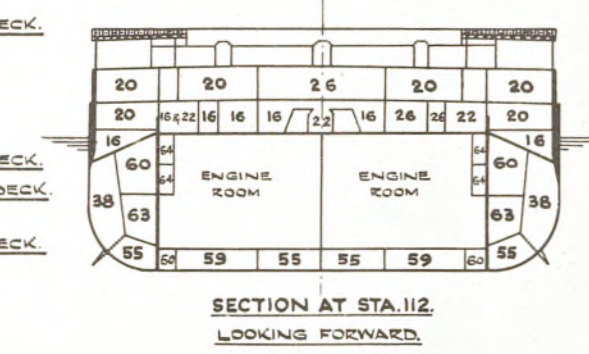
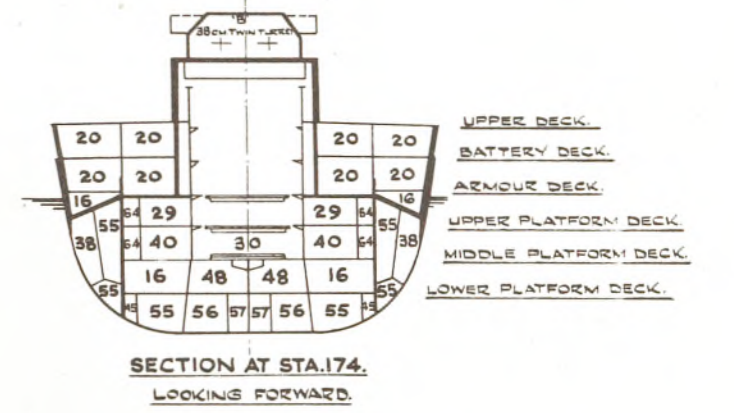
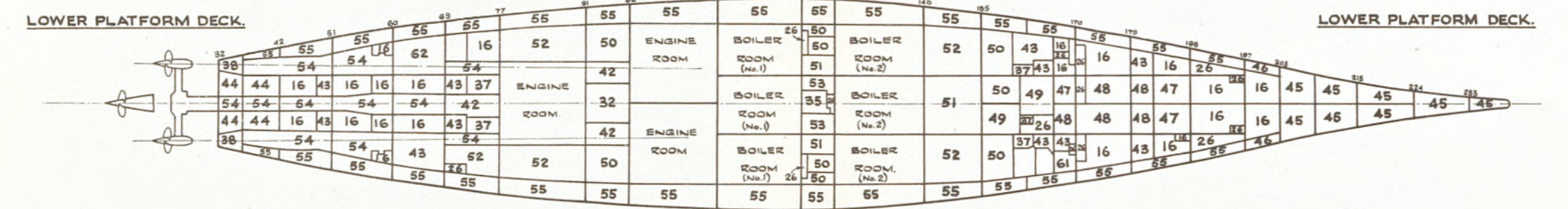
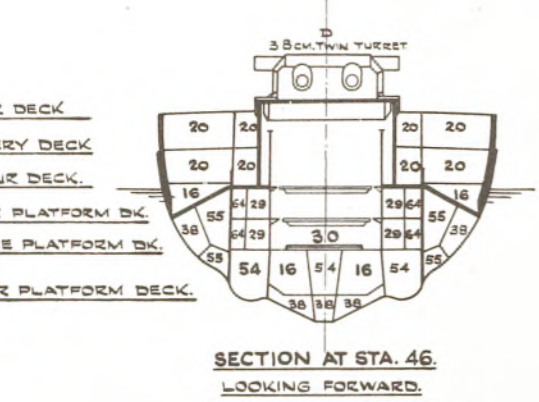
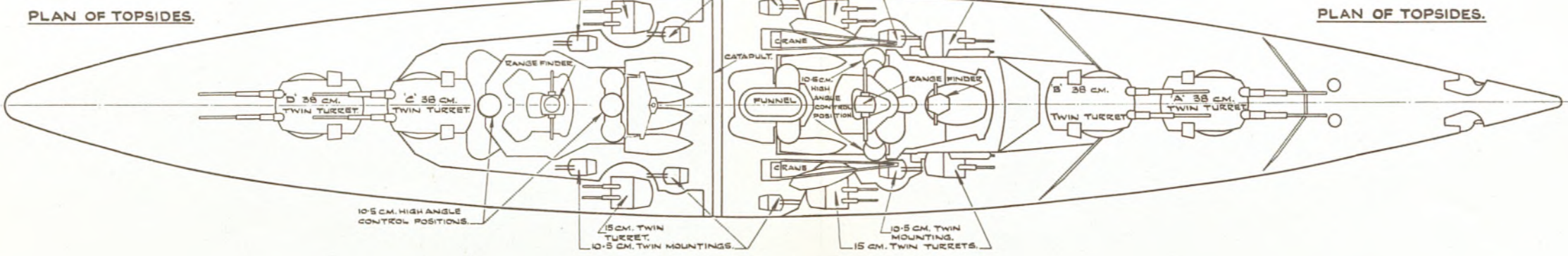
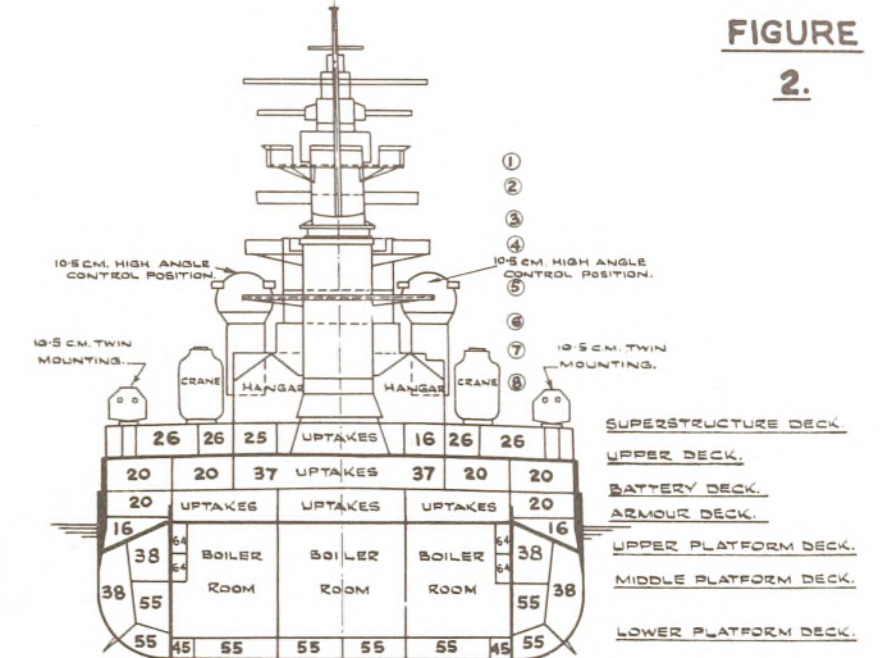
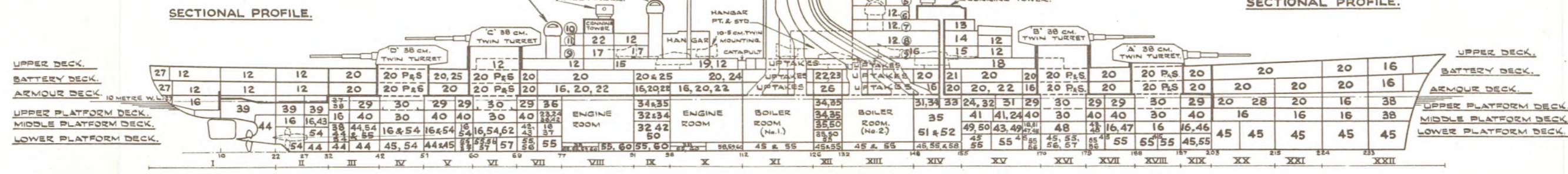
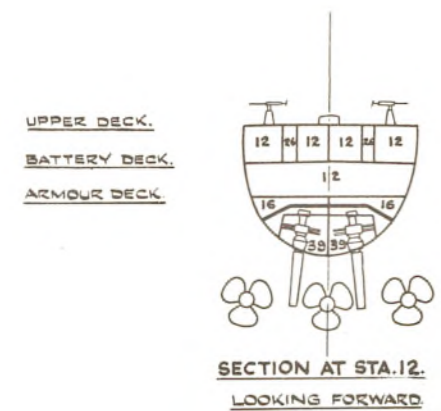
8. It will be seen from this description that the TIRPITZ and her sister ship, the BISMARCK, were formidable - if conventional - fighting units which required our best ships and weapons to counter them, and which were capable of defeating attacks by heavy shell and all but the heaviest bombs. While TIRPITZ remained in the Norwegian Fjords, powerful British units had to be kept in Home waters to protect our shipping.

TIRPITZ.

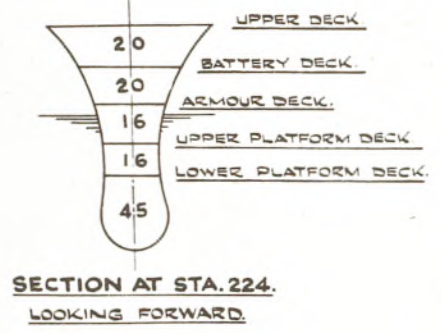
GENERAL ARRANGEMENT.

SCALES (PROFILE: 1 IN. TO 48 FT.
SECTIONS: 1 IN. TO 32 FT.)

FIGURE
2.



- KEY TO NUMBERS.
- | | | | | | | |
|--------------------------------|--------------------------------|---------------------------|---|--------------------------------|-------------------------------------|---------------------------------|
| 1. FORE TOP | 10. DECK HOUSE, AFT (UPPER) | 19. WARD ROOM. | 28. CAPSTAN MACHINERY COMPARTMENT. | 37. FAN ROOM. | 46. E/S GEAR. | 55. OIL FUEL TANK. |
| 2. UPPER SEARCHLIGHT PLATFORM. | 11. " " (LOWER) | 20. CREW SPACE. | 29. 38 CM. MAGAZINE. | 38. W.T.C. | 47. REFRIGERATING MACHINERY. | 56. WASH WATER TANK. |
| 3. LOWER " " | 12. CABINS. | 21. BAKERY. | 30. 38 CM. HANDING ROOM. | 39. STEERING GEAR COMPARTMENT. | 48. COLD STORAGE. | 57. FRESH " " |
| 4. ADMIRAL'S BRIDGE. | 13. ACTION INFORMATION CENTRE. | 22. WORKSHOP | 31. 3.7 CM. MAGAZINE. | 40. 38 CM. SHELL ROOM. | 49. GYRO ROOM. | 58. FEED " " |
| 5. UPPER MAST DECK. | 14. A/S OFFICE. | 23. DRYING ROOM. | 32. ANTI-AIRCRAFT TRANSMITTING STATION. | 41. MAIN TRANSMITTING STATION. | 50. SWITCH-BOARD ROOM. | 59. OVERFLOW TANK. |
| 6. LOWER " " | 15. OFFICE. | 24. W/T OFFICE. | 33. CONTROL CENTRE. | 42. THRUST-BLOCK COMPARTMENT. | 51. AUXILIARY MACHINERY COMPARTMENT | 60. LUBRICATING OIL TANK. |
| 7. UPPER BRIDGE. | 16. STORE. | 25. GALLEY. | 34. 15 CM. MAGAZINE AND SHELL ROOM. | 43. PUMP ROOM. | 52. DYNAMO ROOM. | 61. ANTI-AIRCRAFT MAGAZINE. |
| 8. LOWER " " | 17. ADMIRAL'S APARTMENTS. | 26. LOBBY OR DECK SPACE. | 35. 10.5 CM. MAGAZINE. | 44. BALLAST TANK. | 53. BOILER ACTION STATION. | 62. MAGAZINE COOLING MACHINERY. |
| 9. SUPERSTRUCTURE DECK. | 18. SICK BAY. | 27. SMOKE APPARATUS ROOM. | 36. GUN CALCULATING POSITION. | 45. RES. OIL FUEL TANK. | 54. SHAFT TUNNEL. | 63. AVIATION SPIRIT TANK. |



SECTION III - THE ATTACKS

1. Attack by Fleet Air Arm Torpedo Bombers

1.1 On 6th March, 1942, H.M. Submarine SEALION, on patrol off the northern entrance to Trondheim, reported an enemy heavy ship proceeding on a north-easterly course. As a convoy on passage from Iceland to North Russia had been shadowed by a Focke-Wulf aircraft on the previous day, it was thought possible that the battleship TIRPITZ might have left Trondheim to attack it. The C.-in-C., Home Fleet, in the KING GEORGE V, with the DUKE OF YORK, RENOWN and VICTORIOUS, were at sea covering the convoy. On the following day C.-in-C., Home Fleet, intercepted a distress message from the Russian IJORA in position 72:35 N. - 10:50 E. Early on the 9th, six Albatrosses were flown off VICTORIOUS to search the area in which TIRPITZ was believed to be operating. She was sighted at 0800 and a striking force of twelve Albatrosses armed with torpedoes, which had been flown off VICTORIOUS at 0735, was guided to the target by the shadowing aircraft. At 0842 TIRPITZ was sighted by the torpedo planes which attacked in two waves, one on each side of the ship. The torpedoes appear to have been dropped at an excessively long range which enabled TIRPITZ to "comb the tracks", turning sharply first to port and then to starboard. No hits were scored, but the German command seemed to have been somewhat scared because TIRPITZ retired at high speed to her safe anchorage in the Foetten Fjord near Trondheim.

2. Early Bomber Command Attacks

2.1 In the Foetten Fjord she was immune from most forms of attack; she lay surrounded by mountains and was moored close in to the cliffs on one side and surrounded by torpedo nets on all others. On the occasional fine day which made air attack just possible she had only to put up a smoke screen to rectify the climatic defect. Despite these difficulties she was attacked by Bomber Command aircraft during the early hours of the 31st March, and the 28th and 29th April, 1942. The weather conditions during the first of these attacks were so bad that only one aircraft succeeded in finding TIRPITZ at all, the usual smoke screen was in use and the attack was abortive. During the second and third attacks, most of the aircraft despatched, 32 and 30 respectively, managed to find the ship but again the smoke screen prevented useful results from being achieved. The Germans who were interrogated after the surrender reported that in one of these attacks the bombs (probably hydrostatically fuzed mines) rolled down the cliff into the sea - a mode of attack which they regarded as worthy of more success than it achieved.

2.2 Although the difficulties of carrying out an attack against a Capital Ship under these conditions are fully appreciated, the 4,000-lb. blast bombs with instantaneous fuzes (See Volume 2, Sections 3, 4 and 5) which seem to have constituted the major part of the bomb loads carried in these early attacks, were rather unsuitable. A hit would have caused only superficial damage to superstructures, while near misses would have detonated on the surface with little fragmentation and practically no effect on such a heavy ship. 2,000-lb. A.P. bombs dropped in level flight would have been a better choice, since twice as many of these bombs could have been carried and any hits would have had a direct effect on the vessel's fighting efficiency. The small Mk.XIX mines containing 100 lbs. of explosive and fitted with hydrostatic fuzes to operate at 30 ft. depth had an almost negligible target, and the 500-lb. and 250-lb. G.P. bombs had little chance of producing serious damage against a ship of this size.

3. Operation Source

3.1 TIRPITZ had a very quiet time from April, 1942, until March, 1943, during which period nothing useful was accomplished. At the end of this period SCHARNHORST and LUTZOW joined forces with her in the Alten Fjord; these three

SECTION III - THE ATTACKS (Contd.)

ships with their attendant destroyers constituted a serious menace to Russian convoys, which were suspended during the long daylight of the summer months for this reason. In early September, 1943, the squadron made a raid on Spitzbergen, showing that it was beginning to feel somewhat more aggressive, then returned to the anchorages in various branches of the Alten Fjord. TIRPITZ lay moored in Kaa Fjord - an arm of the Alten Fjord some fifty miles from the sea - completely protected by torpedo nets. Though he disposed a superior Naval Force, it was extremely difficult for the C.-in-C., Home Fleet, to tempt the three ships to action from over 1,000 miles away, or to lay on a successful air or submarine attack against such secluded foxholes. It was finally decided to attack them with the new midget submarines officially known as 'X'-Craft, which each carried two special ground mines, and which had been evolved after a careful study of the specific problem of attacking enemy units in such anchorages.

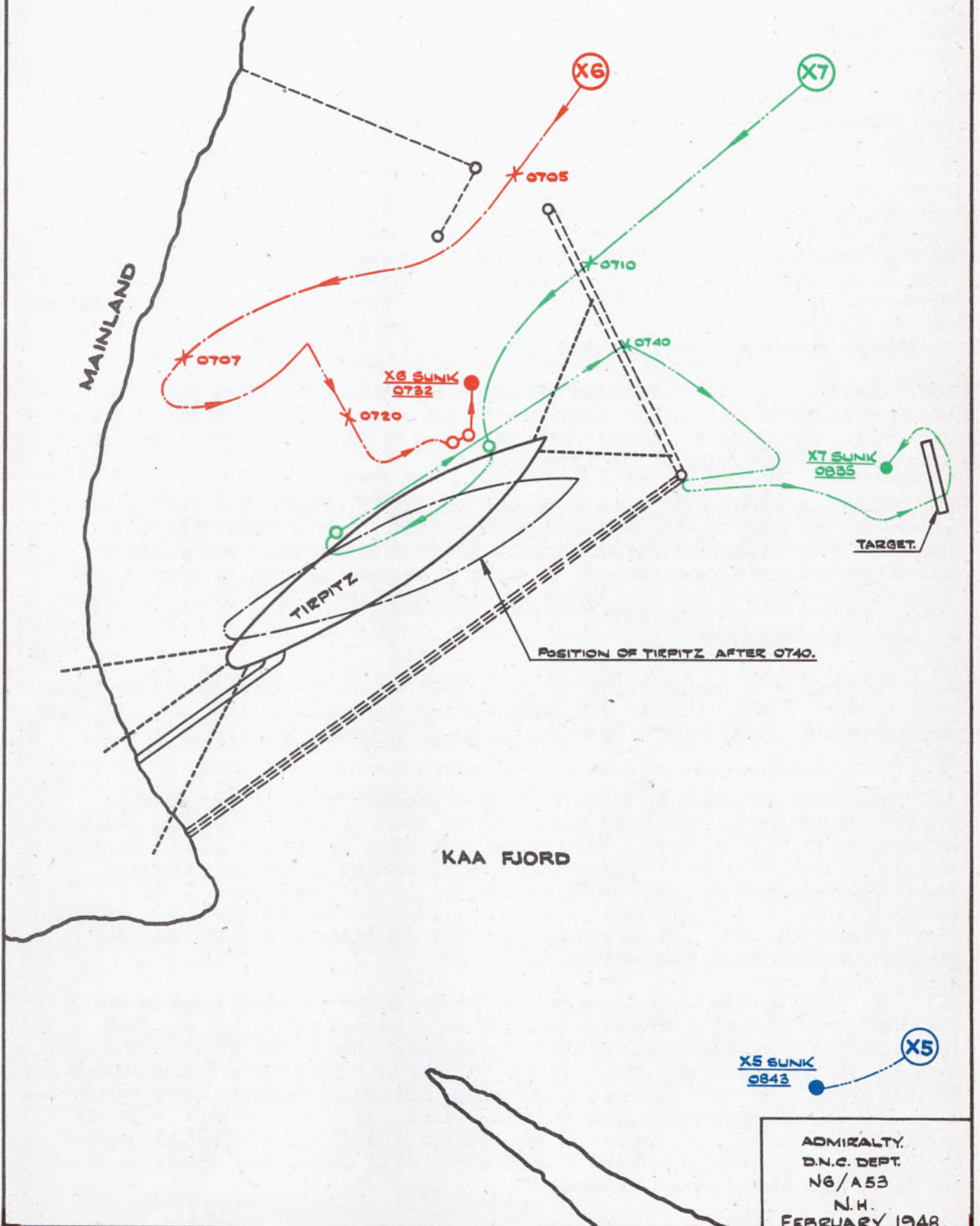
3.2 Six of these novel craft (X.5 to X.10) which had recently joined the Fleet, set out on the night of the 11/12th September, 1943, on the hazardous journey to a position off the Norwegian coast, towed by 'S' and 'T' Class submarines. Two of them, X.8 and X.9, failed to complete this passage but the remaining four reached their rendezvous on the 20th September, slipped their tows and proceeded independently to the attack.

3.3 X.10's periscope and compasses immediately began giving much trouble and eventually failed completely; as a result, she had to retire from the attack. (The plan had been for X.5, X.6 and X.7 to attack TIRPITZ, X.8 to attack LUTZOW and X.9 and X.10 to attack SCHARNHORST). During the 20th, 21st and 22nd September, X.5, X.6 and X.7 successfully negotiated the Alten Fjord as far as the anchorage of TIRPITZ in Kaa Fjord, passing en route mine fields, enemy surface vessels and the anti-submarine boom defence at the entrance to the Kaa Fjord. (For a fuller account of this phase of the operation see Section 6.5 of Volume II).

3.4 X.6 entered the torpedo net enclosure around TIRPITZ at about 0705 G.M.T. using the official entrance which was open at the time for the passage of store ships (see Figure 3). After a series of instrumental defects had caused her to surface three times (she was mistaken for a porpoise on the first occasion, correctly identified on the second (at 0710) and attacked with machine-gun fire and hand grenades on the third), X.6 succeeded in releasing her two charges under the ship abreast 'B' turret. As escape was then impossible, she was scuttled and her crew surrendered. Meanwhile, X.7 endeavoured to penetrate the net defence by passing under it. She experienced a number of setbacks but eventually succeeded in entering the anchorage. Passing down it under the keel of TIRPITZ, from forward to aft, she released one charge abreast 'B' turret and the other further aft, under the after Engine Room. This 'X'-Craft left the enclosure at 0740, this time sliding over the nets, and then dived. During the manoeuvre she was sighted by the Germans and hit several times with machine-gun bullets. At 0812, while still submerged, the crew heard a tremendous explosion which they thought to be due to the explosion of the 'X'-Craft charges. X.7 subsequently became uncontrolled; it was decided to scuttle her and at 0835 she was brought to the surface, but sank again with her hatch open after only one member of the crew had managed to escape. The full movements of X.5 are not known but she was seen at 0835 on the surface some 500 yards outside the nets, when she was fired upon by TIRPITZ and appeared to sink.

3.5 There were thus four charges laid under or near TIRPITZ, namely, one placed by X.7 under the after engine room and three from X.6 and X.7 abreast 'B' turret.

TIRPITZ.
OPERATION SOURCE.
TRACK CHART OF X-CRAFT.
SCALE: 1 IN. TO 220 FT.



X5 SUNK
0843

ADMIRALTY.
D.N.C. DEPT.
N6/A53
N.H.
FEBRUARY 1948.

SECTION III - THE ATTACKS (Contd.)

3.6 From the German point of view, the first intimation that an attack was in progress came at about 0713 when a small craft (X.6) - correctly identified as a submarine - was observed to break surface momentarily inside the torpedo nets about 200 to 250 feet off the port beam. The submarine alarm was sounded, watertight doors were brought to the action state and the anti-aircraft guns were manned. The submarine was sighted again at 0720 and was attacked with 20 mm. and 37 mm. fire from TIRPITZ and hand grenades thrown from a motor boat which had been despatched to attack her. The X-Craft was eventually brought to the surface and abandoned in a sinking condition by her crew. The motor boat tried to tow the submarine, which the Germans suspected might contain explosives, away from the battleship but it sank at 0732, some 50 to 60 yards off the port bow.

3.7 The Germans were aware of the existence of British midget submarines but had no information as to their armament. They were, therefore, undecided as to whether an attack by torpedoes, mines or limpet charges had been made. To clear any limpets which might have been attached to the bottom, they pulled from stem to stern a wire strop slung around the ship under the keel. At the same time, preparations were made to get underway but, in view of the unknown menaces awaiting the ship in the fjord, it was ultimately decided to remain inside the nets. However, TIRPITZ' bow was moved away from the submarine known to have sunk off the port bow by tightening and slackening the port and starboard forward mooring cables. Unbeknown to the Germans this had the effect of clearing the forward part of the ship from the three charges placed abreast 'B' turret. The single charge aft remained effective.

3.8 Shortly after this evolution was complete at least two heavy explosions occurred in quick succession; spray was thrown up over the ship which shuddered violently. The other two X-Craft were destroyed in turn soon after this. An intensive depth charging of the fjord followed.

3.9 Although only one of the six charges originally intended for TIRPITZ was effective, the results were undoubtedly worthwhile. Only a relatively small quantity of water entered the ship but damage to main machinery was enough to immobilize her for six months. It is doubtful whether the repairs carried out in Kaa Fjord restored the ship to her original standard of mechanical efficiency.

4. Operation TUNGSTEN

4.1 The repair of damage caused by the X-Craft attack was complete by the beginning of March, 1944; TIRPITZ then began a series of trials to test the efficacy of these repairs. These were to have culminated in prolonged sea trials in early April.

4.2 The first movements in Alten Fjord were observed by our reconnaissance aircraft and C.-in-C. Home Fleet was therefore asked to lay on a bombing attack using Fleet Air Arm Aircraft. This attack took place on the 3rd April. Forty Barracudas were escorted by eighty-one Corsair, Hellcat and Wildcat fighters. Enemy reconnaissance was avoided by sending the Carrier force about a day behind a large Russia bound convoy. Complete surprise was achieved, the striking force reached the ship just as she was about to get underway for the open sea trials. Weather conditions were good.

4.3 The first strike began its attack at 0530 just as the second anchor was being weighed. Before a smoke-screen could be developed and before the flak batteries had been fully manned, the accompanying fighters were strafing the upperworks with machine-gun fire. Diving attacks by Barracudas carrying 1600-lb. armour-piercing, 500-lb. semi-armour-piercing, and medium capacity bombs followed. A few 600-lb. anti-submarine bombs were also used. In all, nine hits (with one profitable near miss) were scored by this strike on the German ship. The second strike attacked at 0630 but found TIRPITZ obscured by smoke, this time five hits and three near misses were obtained.

SECTION III - THE ATTACKS (Contd.)

4.4 Unfortunately, owing to the low height from which the bombs were released (the Germans gave figures varying between 300 and 1300 feet) none succeeded in penetrating the armour deck - in fact only two reached it. Two other bombs ricocheted off the 2-inch thick upper deck, and one lodged half-way through this deck. As all the vital parts of a large capital ship lie below armour, only superficial damage to living spaces and other unessential compartments was caused by the direct hits. This damage, however, was fairly extensive and several large fires resulted. Heavy casualties were caused both by the bombs and by the fighters. The greatest nuisance value was achieved by a bomb, probably 1600-lb. A.P., which struck the water a few feet from the ship's side, penetrated the side plating beneath the armour belt and detonated near the main longitudinal protective bulkhead. This bomb flooded bulge compartments nearby and extensive work by divers was required to effect a repair.

4.5 In about a month TIRPITZ was again operationally fit, no significant damage to armament or main machinery having been sustained in the attack. About two more months were required to complete the less important repairs.

5. Fleet Air Arm Attacks on 17th July and 22nd, 24th and 29th August, 1944

5.1 Although TIRPITZ showed no signs of leaving the Kaa Fjord it was suspected that the attack on the 3rd April had not inflicted any vital damage as it was realised that the bombs might not have been dropped from a height sufficient to enable them to penetrate the thick deck armour. Intelligence reports and reconnaissance photographs also indicated that the battleship was ready for further action. Attacks on the above dates were therefore made by bomber forces flown from Carriers of the Home Fleet in an attempt to prolong TIRPITZ' stay in the Kaa Fjord.

5.2 The first of these attacks developed during the early hours of the 17th July, the Arctic summer being then at its height. Warning of the attack had been received about half-an-hour before the planes arrived and all necessary preparations, including the smoke-screen, had been made in TIRPITZ. The aircraft dropped 1600-lb. armour piercing and 500-lb. bombs; no hits were scored.

5.3 Two attacks made at noon and in the evening of the 22nd August were also anticipated; again TIRPITZ was enveloped in a smoke-screen, and no hits were registered. 500-lb. semi-armour-piercing bombs were used in these strikes.

5.4 The attack on the 24th August was made during the afternoon, eighty aircraft being employed. The defences were once more in fully effective operation when the planes reached the TIRPITZ, but this time, despite the difficulty of aiming through smoke, two of the 23 large armour-piercing bombs and 10 smaller semi-armour-piercing bombs which were dropped, scored hits. One of these detonated on the armour roof of 'B' turret which was only slightly damaged but the other - a 1600-lb. armour-piercing bomb - hit the port side of the upper deck abreast the forward conning tower, and penetrated through the armour deck to the lower platform (inner bottom) where it came to rest but - because of a fuze failure - did not detonate. Had this bomb been effective the main fire control rooms, switchboard rooms, etc., would have been put out of action. The resultant flooding would probably have extended to the forward auxiliary boiler room. In their official report on this attack the Germans stated:

"The attack on 24th August, 1944, was undoubtedly the heaviest and most determined so far experienced. The English showed great skill and dexterity in flying. For the first time they dived with heavy bombs. During the dive-bombing, fighter planes attacked the land batteries which, in comparison with earlier attacks, suffered heavy losses. The fact that the armour-piercing bomb of more than 1540 lbs. did not explode must be considered an exceptional stroke of luck, as the effects of that explosion

SECTION III - THE ATTACKS (Contd.)

would have been immeasurable. Even incomplete smoke screening upsets the correctness of the enemy's aim, and it has been decided from now on to use smoke in wind strengths up to 9 metres per second irrespective of possible gaps."

5.5 The last of this series of attacks made on the 29th August by twenty-six Barracudas, seven Hellcats, ten Fireflies and seventeen Corsairs from INDEFATIGABLE and FORMIDABLE, was carried out in exactly similar conditions. No hits were obtained.

6. Attack by Bomber Command Lancasters on 15th September, 1944

6.1 A great improvement in technique was made on 15th September, 1944, when TIRPITZ was attacked with the newly-developed Tallboy bombs. These massive bombs contained 5100 lbs. of desensitized torpex in a comparatively thin streamlined case and were fitted with fuzes having a slight time delay of 0.07 sec. (See Plate 12.8 of Volume II for photograph of the bomb). Although it was anticipated that they might be damaged in passing through the heavy deck armour, it was hoped that the very large charge would compensate for any loss of efficiency and that even near misses would have considerable destructive value.

6.2 The operation was carried out by about 30 Lancasters which had previously flown from Scotland to North Russia, where they were based for the attack. The aircraft approached the target at high altitude from the South-East, descending to about 12,000 feet for their attacks which they made in groups of about six, in close formation. The battleship was found moored at her berth; she had been given warning by shore radar installations so that shortly after the attack commenced an extensive and effective smoke-screen covered the greater part of the fjord, leaving only the boom surrounding TIRPITZ and small portions of the ship visible. The main armament, directed by the shore radar installations, was used for putting up a barrage in way of the attacking aircraft.

6.3 Out of the 21 heavy bombs dropped, only one fell sufficiently close to TIRPITZ to damage her. This bomb hit the upper deck on the extreme starboard side some 50 feet abaft the bow, passed out through the flare of the forecastle into the water and detonated below keel level close to the ship. The explosion wrecked a large portion of the fore end, particularly that part below the waterline, and as a result of this damage the first 120 feet of the ship became flooded to the waterline. Although this single hit did not seriously affect either machinery or armament, the damage to the fore end of TIRPITZ could not be repaired without docking her, and she was henceforth unfit to undertake a voyage in the open sea and in consequence ceased to be an effective fighting unit.

6.4 The following resume, extracted from the translation of a captured German document (see 12.13 of Volume 2) shows the German reaction to this attack:-

"It was estimated that repairs, if they could be carried out without interruption, would take at least nine months.

"It was eventually decided at a conference on 23rd September, 1944, at which the C.-in-C. and Naval War Staff were present, that it was no longer possible to make the TIRPITZ ready for sea and action again. It was therefore considered that, in order to preserve the remaining fighting efficiency of the ship, she should be used as a reinforcement to the defences in the Polar Area. For this purpose TIRPITZ was to be moved as soon as possible to the area west of Lyngenfjord, moored in shallow water and brought into operation as a floating battery. A suitable berth had to be selected which would be reasonably secure and would offer favourable operational possibilities for the ship's armament. Adequate anti-aircraft, smoke-cover and net

SECTION III - THE ATTACKS (Contd.)

protection were to be provided. Makeshift repairs were to be made and the TIRPITZ moved with the assistance of powerful tugs.

"The operation of moving the TIRPITZ was carried out on 15th October, 1944. A berth was selected near Tromsø, Haakoy net enclosure, by F.O.I.C., Polar Coast in co-operation with Flag Officer, First Battle Group. The ship was protected against underwater attacks and aerial torpedoes by means of a double net barrage. Shore anti-aircraft guns and smoke-screen units were moved from Kaa Fjord to Tromsø. As the ship was only partially seaworthy, the crew, particularly the engine room complement, was decreased. It was found that there were varying depths of water at the selected berth; in particular there was a hollow below the midship section. Too many difficulties would have arisen if the ship were to be moved again, so it was decided to fill in the hollow till the water was 2 metres deep below the keel. Work was commenced by dredgers on 1st November, and by 12th November about 14,000 cubic metres had been filled in at both sides below the midship section."

7. Second Bomber Command Tallboy Attack

7.1 On the 29th October, 1944, the lame TIRPITZ now moored at Tromsø off Haakoy Island was again attacked by Bomber Command. A force of thirty-two Lancasters flying this time from British bases and carrying one Tallboy each, began bombing her at 0850. The target was seen obliquely as the aircraft approached, but low clouds obscured her from view during the bombing runs and made accurate bomb-aiming impossible. Once again, prior warning of the approaching raid was received and the ship was in a high state of readiness when the attack commenced. No direct hits were scored but the end was brought one stage nearer by a near miss off the port quarter, which damaged the port shaft and rudder and flooded about 100 feet of the after end of the ship on the port side.

8. Final Bomber Command Attack

8.1 The struggle between the British armed forces and TIRPITZ came to an end on 12th November, 1944, when Bomber Command aircraft executed what was undoubtedly one of the most effective British air operations of the late war. Twenty-nine Lancasters, again carrying one 12,000-lb. M.C. bomb each, attacked the ship as she lay in her anchorage at Tromsø. Bombing commenced at 0941 and finished eight minutes later in clear weather and excellent visibility. TIRPITZ had received ample warning by radio of the approach of the bombers and was again prepared when the attack developed. Intense anti-aircraft fire was augmented from nearby flak ships and shore batteries, but there was no effective smoke-screen. The bombing runs were made at heights varying between 12,500 feet and 16,500 feet. TIRPITZ received severe structural damage from, at least, two direct hits and one near miss, and as a result of this damage she capsized to port about ten minutes after the first bomb was dropped. Part of the starboard side of her hull is still to be seen above the surface (See Plate B.1) - a reminder of the inability of a capital ship without adequate fighter cover to resist a determined and concentrated attack with modern airborne weapons.

SECTION IV - CONCLUSIONS

1. The Second World War (1939-1945) has provided many striking lessons for those who would attack and for those who must defend a modern capital ship. None is more fundamental than those that can be learned from TIRPITZ' long struggle for survival among the Norwegian fjords. The history of TIRPITZ is a classic example of the best way an inferior naval power can use one or more good battleships to pin down a superior enemy Naval Force over a long period, that is, by using them as a strategic threat in an almost unassailable anchorage. In contrast, the story of BISMARCK illustrates the futility of operating an unsupported heavy unit in waters commanded by a superior enemy.
2. The example of TIRPITZ also demonstrates that no anchorage is completely safe - not even the distant and narrow Norwegian fjords which lie in a rugged, mountainous country - unless adequate fighter cover can be provided, because no capital ship can be designed with a thick enough armour deck or sufficient underwater protection to defeat the most modern bombs.
3. As is indicated in Section II, the German designers had done everything in their power to make TIRPITZ invincible; half-way through her life they had firmly convinced themselves that this was so. But no capital ship yet designed is perfect. A very large armament and vast quantities of armour plate were built into TIRPITZ, and to ensure a large margin of stability she was given a disproportionately large beam, but her free-board was small, and her stability at large angles of heel poor compared with contemporary allied battleships. Because of the large beam, however, TIRPITZ' stability at small angles of heel was better than that of most ships, and, until heavy attacks were developed against them, both BISMARCK and TIRPITZ appeared to be able to withstand damage with the greatest of ease.
4. It may be profitable at this juncture to consider how best to attack a ship, or more particularly a capital ship such as TIRPITZ.

The most fruitful attack is one which has as its result the sinking of the target. This can be accomplished by making it sink bodily, plunge or capsize. Each method involves letting water into the ship; capsizing or plunging are the more economical, and in that order, because less water is required.

If sufficient water to produce sinking cannot be let in, the aim should be to flood as many compartments as possible, underwater damage being particularly difficult to repair, and seawater an excellent auxiliary damaging agent.

Again, if flooding cannot be caused, the aim should be to damage the vitals, observing that the vitals of a capital ship are carefully arranged under armour.

5. The weapons which let water into ships and, therefore, have a chance of sinking them, are well known, being those which rupture the sides or bottom. Damage to vitals is produced by weapons of the same types and by the explosion of large charges at a distance, which often causes "shock damage". It is clear that high or medium capacity or general purpose bombs with instantaneous fuzes and semi-armour piercing bombs with short delay fuzes have little chance of producing vital damage.
6. The earlier attacks against TIRPITZ failed, either because tactics were incorrect or the wrong weapons were used or insufficient of them to give a good probability of obtaining the requisite hits to sink. For example, the 4,000-lb. bombs used in the three Bomber Command attacks on TIRPITZ during March and April, 1942, had no chance of producing damage except to upperworks. The charges laid by X-Craft went a large part of the way towards success because they let water into the ship and did extensive shock damage to the main machinery, but the water in which they were laid was too deep for them

SECTION IV - CONCLUSIONS (Contd.)

to produce sufficient flooding to sink the ship. The 1600-lb. armour-piercing bombs dropped during the Fleet Air Arm attacks were quite capable of penetrating TIRPITZ' deck armour and of causing vital damage and flooding if they had been released from a sufficient height. In the attack on the 3rd April, 1944, in particular, several hits were registered but the bombs were dropped from too small a height, and armour-piercing bombs were used in insufficient numbers to give a good probability of sinking.

7. The Tallboy bombs made up for their other deficiencies by their very large charge. As might have been expected they either broke up or detonated prematurely, or both, when they hit TIRPITZ' deck armour, but the radius of destruction was so large that damage to vitals and extensive flooding were inevitable. It is certain that, except when these bombs detonated in the water, the fuze delay of 0.07 sec. had no chance to function. The near miss effect of the bombs was disappointing; only detonation very close to the ship caused serious damage, and it is certainly not correct to attribute the sinking of TIRPITZ primarily to the effects of near miss bombs. This poor performance as a near miss weapon is most probably due to the fact that the cavity of air, opened up by the swift passage of the bomb through the water, had insufficient time to close before the fuze functioned so that much of the energy of detonation was directed up this air cavity to the surface. Certainly, more spectacular results would be expected from such a large charge detonated statically in similar positions.

8. In the last attack, the two direct hits which, with one near miss, wrecked the port side of the amidships portion of the ship, detonated in the optimum positions for capsizing. As is brought out in Appendix B.6 the effect of these three bombs would have capsized TIRPITZ even had she sustained no damage previously. Had these three bombs been more widely distributed or had any one of them been in its corresponding position on the starboard side, three alone might not have proved fatal. This conclusion is, in fact, a perfectly general one; the best place to damage any ship is amidships and on one side only.

9. It is natural to ask - "What of the future?". Should attempts be made to strengthen the case of bombs as big as these to enable them to penetrate intact the deck armour of ships like TIRPITZ (YAMATO had an armour deck 7 inches thick)? - or should the decrease in charge/weight ratio which such strengthening implies be avoided at all costs to retain a very large charge as in Tallboy? The history of TIRPITZ provides no answer to this question.

APPENDIX A - DETAILED ACCOUNTS OF DAMAGE

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APPENDIX 'A' - DETAILED ACCOUNTS OF DAMAGE

A.1 - DAMAGE SUSTAINED AS A RESULT OF "X" - CRAFT ATTACK IN KAA FJORD, 22nd SEPTEMBER, 1943 ("OPERATION SOURCE")

1.1 Narrative and Evidence

See Section III.3 of this Volume and Section 6 of Volume 2.

1.2 Weapons used

Each midget submarine ('X' craft) used in the attack carried two detachable side charges, resembling in shape the main tanks of a normal submarine, each of which contained two tons of Amatex. The charges were fitted with clock time fuzes which could be set before release. Four such charges from two X-craft were released under TIRPITZ, one under the port side of Section VIII (centre engine room), one abreast port side of the fore end of the ship and two close to one another abreast the port side of 'B' turret and rather further from the ship. These charges were off the port side of the ship after the fore end had been moved to starboard as a precautionary measure. Two of these four charges, namely the one under the engine room and one off the port bow, are known to have detonated within a fraction of a second of each other.

1.3 The Depth of Water

3.1 The depth of water in the anchorage varied between 35 and 40 metres (i.e. approximately between 115 and 130 feet) and the ship's draught at the time was about 10 metres (about 33 feet).

1.4 Subsequent Events

4.1 The two heavy explosions occurred at about 0812 G.M.T. and caused heavy spray but no appreciable water columns. The whole ship was shaken violently. All lights and most of the electrical equipment failed immediately. The mooring cables remained intact and the ship listed gradually 2 degrees to port.

1.5 Structural Damage (See Figure A.1)

5.1 The bottom plating in way of the engine rooms was split and dished, the longest split being about 8 metres (approximately 26 feet). The inner bottom and longitudinals in the damaged area were forced upwards and buckled and all the pipes, including condenser inlets and outlets, were subjected to shock.

5.2 At the fore end the explosion of the second charge caused a small split about 1 metre (3.3 feet) long in the port side plating of Section XXII between the upper and middle platform decks. Plating in the vicinity was dished.

5.3 Whipping of the whole ship was most probably responsible for a sudden discontinuity in the straight line of keel and buckled panels of bottom plating in Section XI of the ship. (See Section 4.5 of Appendix B).

1.6 Flooding

6.1 Double bottom compartments in Sections VII to X (mainly on the port side) and No.2 diesel generator room were flooded, and leakage into the port and centre engine rooms, No.1 diesel-generator room, No.2 dynamo control room, the after anti-aircraft control position and No.2 steering gear compartment, was controlled by pumping. This flooding caused TIRPITZ to heel to port 2 degrees. It was estimated that 800 tons of water entered the ship.

6.2 All pumps were put out of action by lack of electric power but one hour after the explosion the centre and port engine rooms were pumped out and, by 1800, No.2 diesel-generator room had been pumped out using the hull and fire pumps.

A.1 - DAMAGE SUSTAINED AS A RESULT OF "OPERATION SOURCE" (Contd.)

1.7 Damage to machinery

All turbine feet, plummer-blocks, thrust blocks and much of the auxiliary machinery were distorted or cracked and as a result the propeller shafts could not be turned. The main defects were in Sections VII to IX. Damage to the port unit was more intense, for example, the port condenser and turbine casings were fractured. None of the boilers could be flashed up for some time because the auxiliary burners were damaged, particularly in the after boiler room; failure of electric current also prevented the fitted pumps being started. The damage took six months to repair.

1.8 Damage to Armament

All turrets jumped off their roller paths and turret clips were stretched. 'A' and 'C' turrets were put out of action temporarily and P.III 15 cm. twin turret was jammed. The after anti-aircraft control position was put out of action by shock and flooding and a considerable amount of range-finding and other optical equipment were severely damaged and needed replacement, including the equipment in the 38 cm. director control towers and the 15 cm. secondary armament control towers on either side of the bridge.

1.9 Damage to Electrical Equipment

Most of the ship's lighting and nearly all her electrical equipment, including her W/T equipment, were put out of action by the explosions. There was some delay before a diesel generator and a small auxiliary plant could be started to supply the ship with power. Turbo-generators were brought into operation about 2½ hours after the explosions. Seven of the eight diesel-generators were put out of action by shock damage to casings and cracked holding-down bolts.

1.10 Damage to Communications Equipment

In addition to the temporary failure of communications and W/T equipment generally, due to loss of power, much of the W/T equipment and aerials were permanently damaged. Similar breakdowns occurred in the radar and echo ranging equipment.

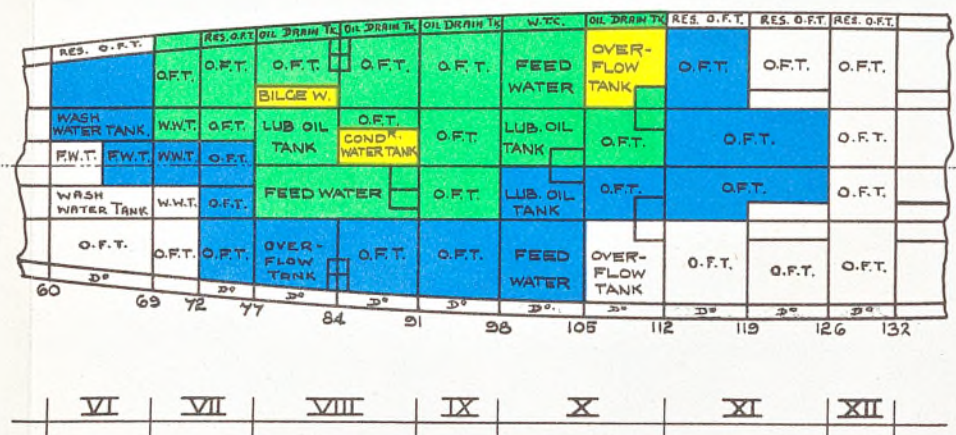
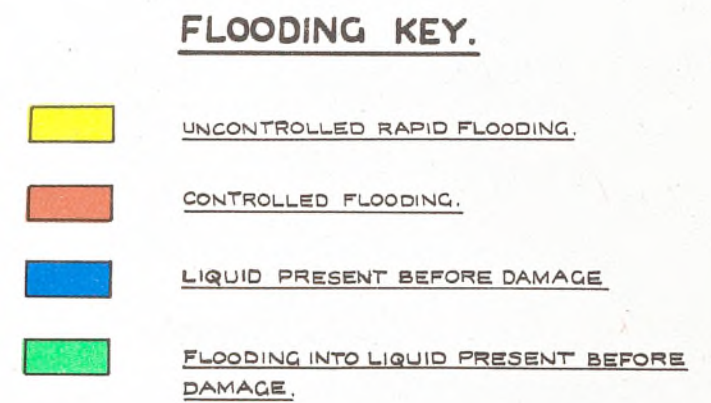
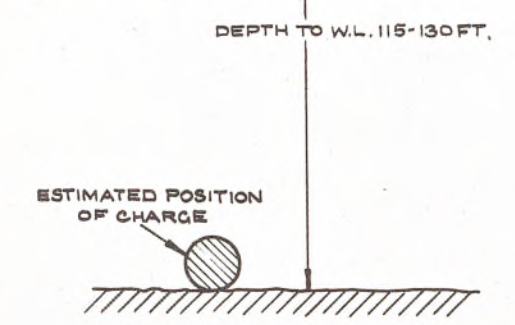
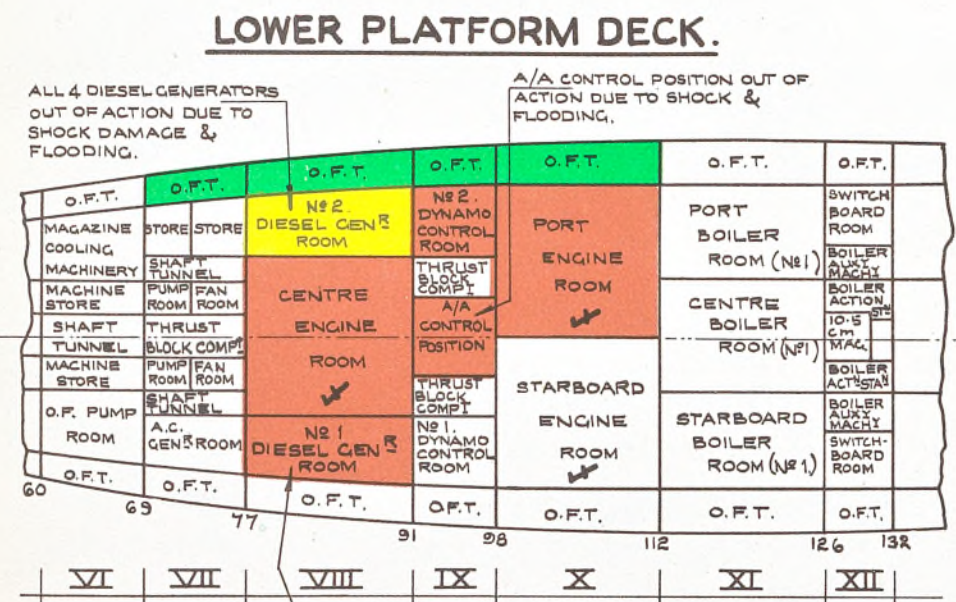
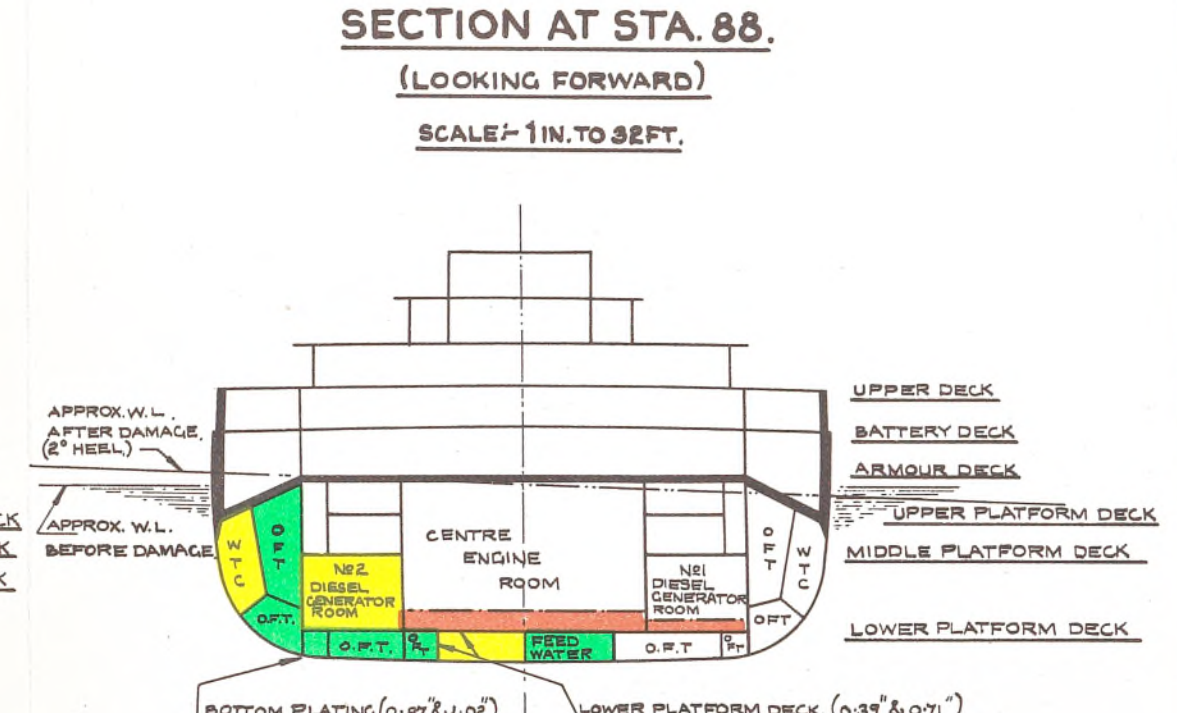
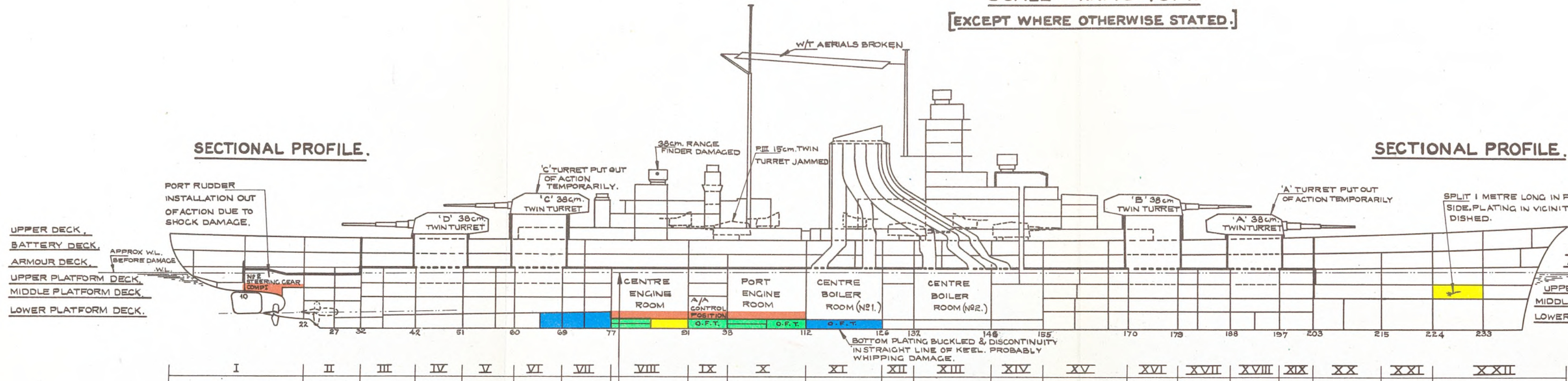
1.11 Miscellaneous Damage

The port rudder installation was put out of action by shock which caused the stuffing gland to leak and the steering gear compartment to flood. Fire and bilge pumps were put out of action by electrical failures and mechanical damage. Two aircraft were badly damaged.

TIRPITZ.

X-CRAFT ATTACK-22ND SEPT. 1943

SCALE - 1 IN. TO 48 FT.
[EXCEPT WHERE OTHERWISE STATED.]



3 OUT OF 4 DIESEL GENERATORS OUT OF ACTION DUE TO SHOCK DAMAGE

ALL THREE MAIN ENGINES PUT OUT OF ACTION DUE TO SHOCK DAMAGE. PORT ENGINE MORE SERIOUSLY DAMAGED THAN THE OTHERS.

APPENDIX A - DETAILED ACCOUNTS OF DAMAGE (Cont'd)

A.2. - DAMAGE SUSTAINED AS A RESULT OF F.A.A. ATTACK
AT KAA FJORD ON 3rd APRIL, 1944. (OPERATION TUNGSTEN)

2.1 Narrative and Evidence

See Section III.4 of this Volume and Section 7 of Volume 2.

2.2 Weapons used

The following bombs were dropped during the attack:-

1600 lb. A.P. bombs fuzed .08 secs. delay	7 + 2
500 lb. S.A.P. " " 0.14 secs. "	27 + 39
500 lb. M.C. " " Nose instant	9 + 9
600 lbs. A/S " " Hydrostatic 35 ft.....	4 + 1

where the two numbers indicate the number of bombs dropped during the first and second strikes respectively.

2.3 Structural Damage (See Figure A.2.)

3.1 The damage sustained by TIRPITZ was mainly of a superficial nature. No bomb passed through the armour deck and only two penetrated to it. In the detailed summary of the damage given below, the bomb hits are numbered from forward; hits 3, 6, 8 and 9 and 10 to 14, occurred during the first strike and the remainder during the second strike; the near miss abreast the funnel occurred during the first strike.

3.2 Hit No.1 (1600 lb. A.P. ?) penetrated the starboard side of the upper deck (1.97 inches) at station 218 over the junction of a deck beam and girder. The bomb failed to detonate and remained lodged in the deck plating.

3.3 Hit No.2 (500 lb. M.C. ?) detonated on impact with the upper deck (1.97 inches) near station 172 on the port side. The deck was dished slightly and the surrounding structure was damaged by blast and splinters.

3.4 Hit No.3 (500 lb. M.C. ?) detonated on impact with the lower mast deck at its forward starboard corner causing severe blast and splinter damage to surrounding structure; splinters were embedded in the conning tower armour (13.8 inches).

3.5 Hit No.4 (500 lb. S.A.P. ?) detonated while passing through the port side of the upper deck (1.97 inches) near station 144 and blew a hole in this deck about 2 metres (6.5 feet) in diameter, the edges being petalled downwards. The surrounding structure above the upper deck and compartments below it in Section XIII were damaged by blast, splinters and a large fire.

3.6 Hit No.5 (500 lb. M.C. ?) detonated on impact with the port upper deck edge at about station 125 causing splinter damage to superstructures and to the degaussing cable.

3.7 Hit No.6 (1600 lb. A.P. ?) struck a boat on the starboard side near station 130, passed through the boat, and the roof (1.38 inches) and gun platform (0.8 inches) of S2, 15 cm. twin turret. It then struck the upper deck (3.15 inches) and was deflected along it into the gun room where it detonated just above the deck at about station 126 and caused severe blast and splinter damage to the surrounding structure. A large fire started in this area which caused extensive damage.

3.8 Hit No.7 (500 lb. S.A.P. ?) perforated the after end of the roof of the starboard hangar and the superstructure deck. It rebounded from the upper deck (3.15 inches) and detonated just above that deck at about station 123 on the starboard side of the gun room. This detonation was in close proximity to that of Hit No.6 and added to the damage caused by that bomb.

A.2. - DAMAGE SUSTAINED AS A RESULT OF F.A.A. ATTACK ON
3rd APRIL, 1944. (Cont'd)

3.9 Hit No.8 (500 lb. M.C. ?) struck the funnel a glancing blow on the port side, detonated a short distance from it and caused considerable blast and splinter damage. The port side of the funnel and six of the twelve uptakes in it were crushed, the roof of the port hangar collapsed and the port searchlight on the funnel was blown from its seating. A fire caused slight damage.

3.12 Hit No.9 (1600 lb. A.P. ?) perforated the superstructure deck (0.4 inch), upper deck (1.97 inches), battery deck (0.24 inch), and detonated about station 110, port in contact with the top edge of the sloping deck armour (4.3 inches) just outboard of the main protective bulkhead. The armour deck was bulged downwards but not holed, and the continuation of the main protective bulkhead (1.8 inches) above the armour deck was torn away from the bulkhead proper at the horizontal riveted lap between the battery and armour decks, and was blown inboard. The battery deck outside this bulkhead was torn at its connection with the bulkhead and forced up against the upper deck. The inboard portion of the battery deck was arched upwards. Severe blast and splinter damage occurred in compartments on the battery and armour decks in Sections X and XI of the ship.

Note. The Germans considered it improbable that the damage done to the main protective bulkhead could have been caused by the explosive in an armour-piercing bomb. They suspected that petrol vapour from the damaged pipe line for fuelling the aircraft exploded and enhanced the effect of the bomb.

This opinion is not necessarily true since 1600 lb. bombs contain slightly more explosive than the 500 lb. G.P. bombs.

3.11 Hit No.10 (500 lb. M.C. ?) detonated on impact with the top edge of the starboard side armour (5.7 inches) at about station 102. Slight damage was caused.

3.12 Hit No.11 (500 lb. S.A.P. ?) struck and perforated a boat at about station 100, on the port side, the roof of the after hangar, the superstructure deck (.4 inch) and detonated in the wardroom in contact with the upper deck (1.97 inches) just to starboard of the middle line. The detonation dished but did not rupture the thick upper deck; surrounding light structure was damaged by blast, splinters and a subsequent fire; the wardroom and adjacent cabins were wrecked.

3.13 Hit No.12 (1600 lb. A.P. ?) perforated the starboard side plating (0.55 inch) just below the lower edge of the side armour at about station 97 and penetrated the bulge and detonated in the vicinity of the main protective bulkhead (1.77 inches). The main protective bulkhead was dished inboard to a maximum depth of 6 inches for a length of about 16 feet, some riveted connections in the lower portion of the bulkhead were strained and permitted leakage. Bulkheads in Sections IX and X of the bulge were damaged and there was a hole in the side plating about 3 feet by 1.5 feet (see also Plate B.4.3),

3.14 Hit No.13 (500 lb. S.A.P. ?) perforated the superstructure deck (0.4 inch) struck the upper deck (1.97 inches) and rebounded into the air where it detonated some 3 feet above the starboard side of the upper deck at about station 72. Splinters from the bomb penetrated the upper deck and several cabins were wrecked by blast and splinters; there was a small hole in the upper deck due to the ricochet of the bomb.

3.15 Hit No.14 (500 lb. S.A.P. ?) perforated the upper deck (1.97 inches) and the battery deck (0.24 inch) and broke up on impact with the sloping armour deck (4.72 inches), about station 40, starboard. There was probably a low order detonation of a portion of the bomb filling and the remainder burned causing a fire.

TIRPITZ.

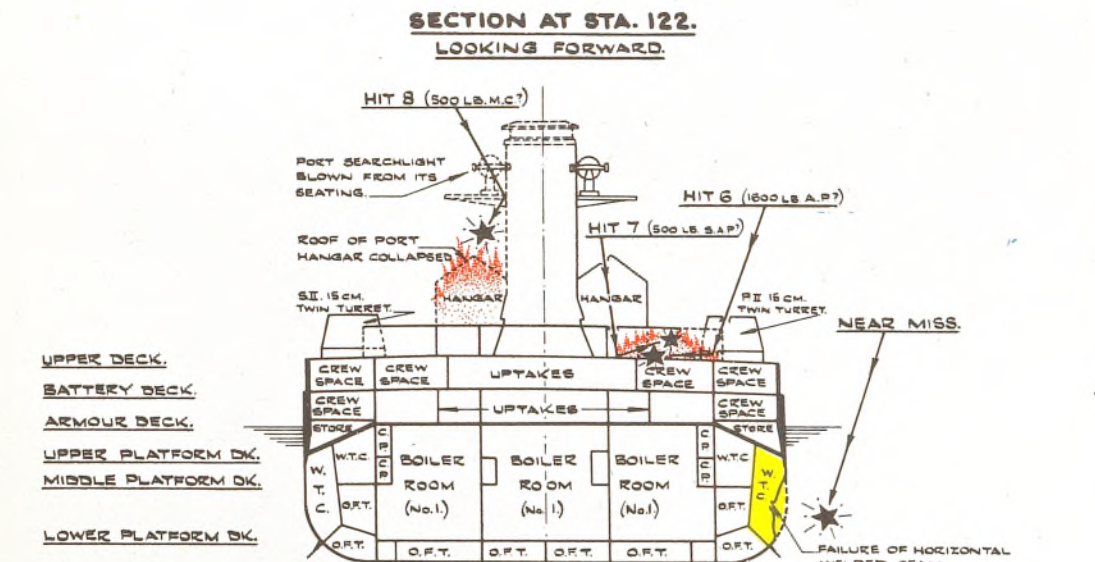
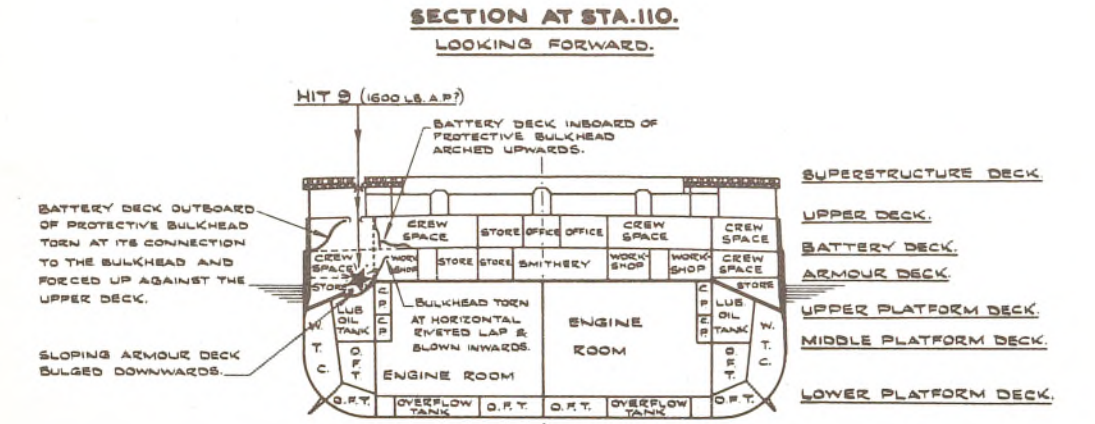
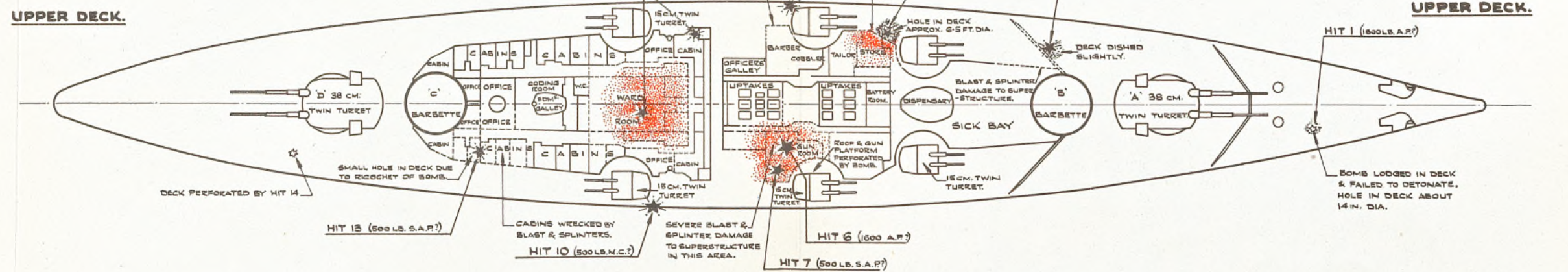
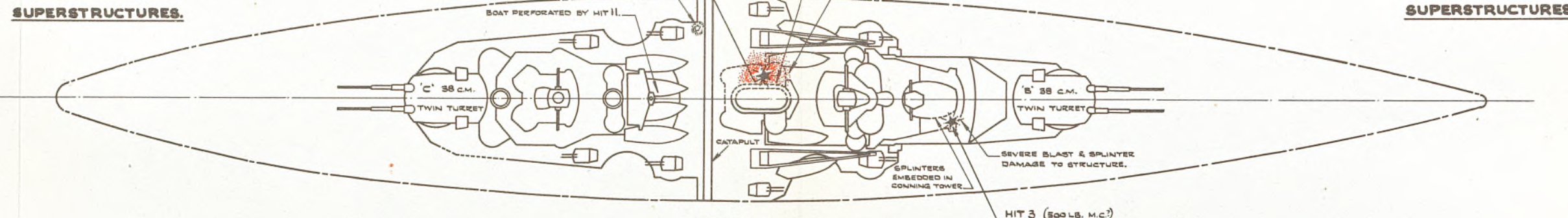
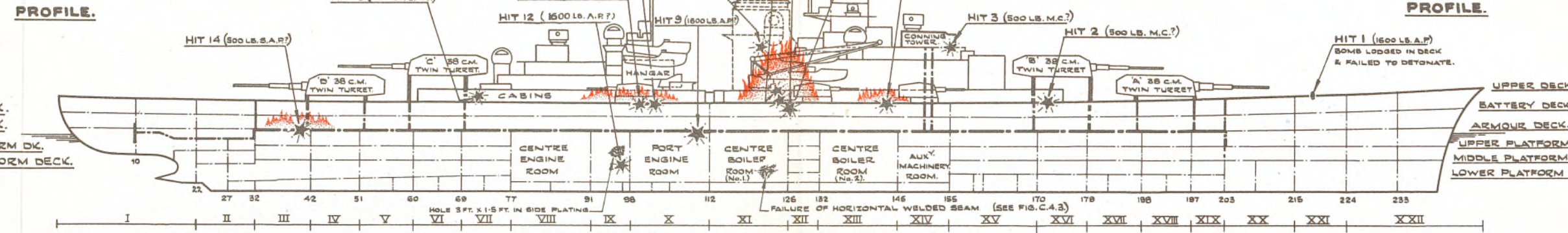
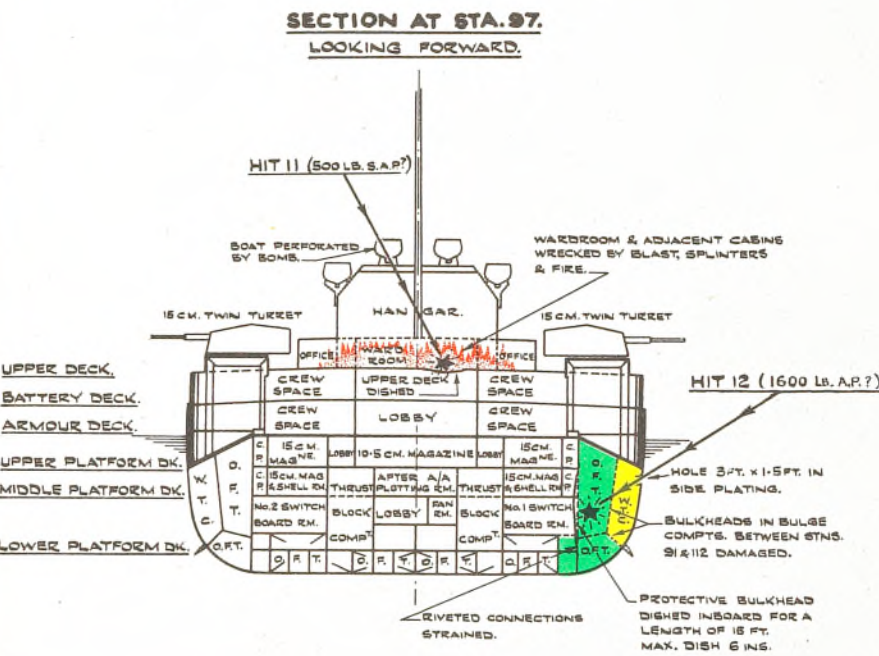
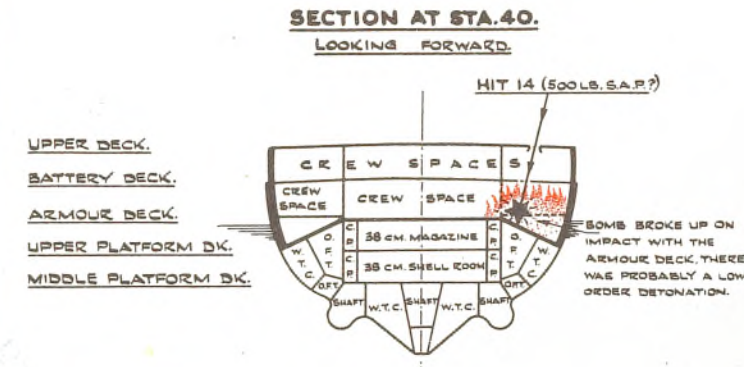
F.A.A. ATTACK - 3RD APRIL 1944.

SCALES { PROFILE & DECK PLANS - 1 IN. TO 48 FT.
SECTIONS 1 IN. TO 32 FT.

FLOODING KEY.

- UNCONTROLLED RAPID FLOODING.
- FLOODING INTO LIQUID PRESENT BEFORE DAMAGE.
- FIRE.

FIGURE A.2.



A.2. - DAMAGE SUSTAINED AS A RESULT OF F.A.A. ATTACK ON
3rd APRIL, 1944. (Cont'd)

3.16 Near Misses There were probably four near misses, all off the starboard side. One, probably 500 lb. M.C. or 600 lb. A/S, detonated close to the ship's side abreast the funnel and caused a hole in the side plating (0.5 and 0.8 inch) about 7 feet long by 3 feet deep, and another abreast the outer shaft bracket caused splits and dishing in the adjacent bottom plating.

2.4 Flooding

Starboard bulge compartments in Sections VIII, IX and X flooded to the waterline from Hit No.12 and in Section XI through the near miss abreast the funnel. (See Near Misses above). A slight list to starboard resulted. Sea water also entered compartments aft as the result of the near miss abreast the starboard shaft bracket.

2.5 There was no damage to Main or Auxiliary Machinery

2.6 Damage to Armament

3.6.1 The pedestal mounting of P1, 10.5 cm. twin anti-aircraft gun was damaged by blast and splinters, the gun platform was bent upwards and the gun was put out of action, from Hit No.4. Two machine guns on the starboard side of the lower mast deck were damaged by Hit No.3 and the port quadruple gun on the funnel was damaged by Hit No.8. An armour-piercing bomb (Hit No.6) perforated the roof and gun platform of S.II 15 cm. twin turret without affecting its efficiency.

3.6.2 The 10.5 cm. flak batteries were put out of action soon after the commencement of the attack by machine gunning of the guns' crews.

2.7 Damage to Communications Equipment

All W/T aeriels were damaged.

2.8 Casualties

There were 122 killed and 316 wounded. Many of the casualties were the result of machine gunning by the fighters, which accompanied the bombing force and strafed the upperworks before the bombers went in.

APPENDIX A - DETAILED ACCOUNTS OF DAMAGE (Cont'd)

A.3. - DAMAGE SUSTAINED AS A RESULT OF F.A.A. ATTACK
AT KAA FJORD ON 24th AUGUST, 1944.

3.1 Narrative and Evidence

See Section III.5 of this Volume and Section 10 of Volume 2.

3.2 Weapons used

The following bombs were dropped during the attack:-

1600 lb. A.P. bombs	fused	.08	secs. delay	-	18	in No.
1000 lb. " " "	"	.08	" "	-	5	in No.
500 lb. S.A.P. " "	"	.14	" "	-	10	in No.

3.3 Damage sustained. (See Figure A.3.)

3.1 TIRPITZ sustained the following damage as the result of two hits:-

Hit No.1 (1600 lb. A.P.) which failed to detonate, perforated the upper deck (1.97 inches), battery deck (.24 inch), armour deck (3.15 inches) and upper and middle platform decks (.24 inch and .28 inch respectively) and came to rest on the lower platform deck (.35 inch), about station 161, port.

Hit No.2 (500 lb. S.A.P. ?) detonated on top of 'B' turret, the roof (5.1 inch) of which was dished. A four-barrelled gun on top of 'B' turret was destroyed.

TIRPITZ.

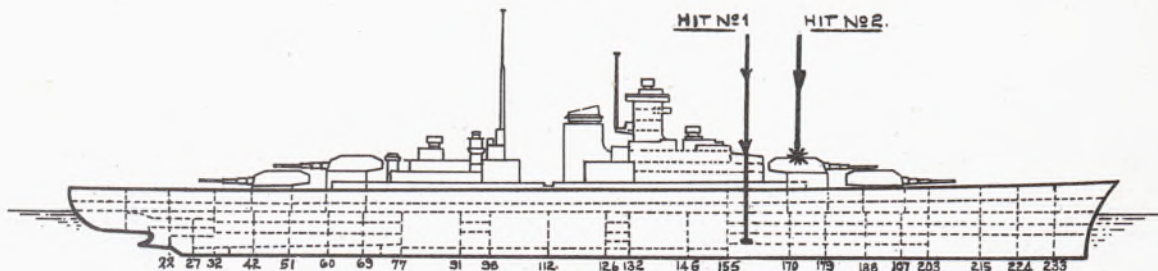
FIGURE
A.3.

F.A.A. ATTACK - 24TH AUGUST 1944.

SCALES AS SHOWN.

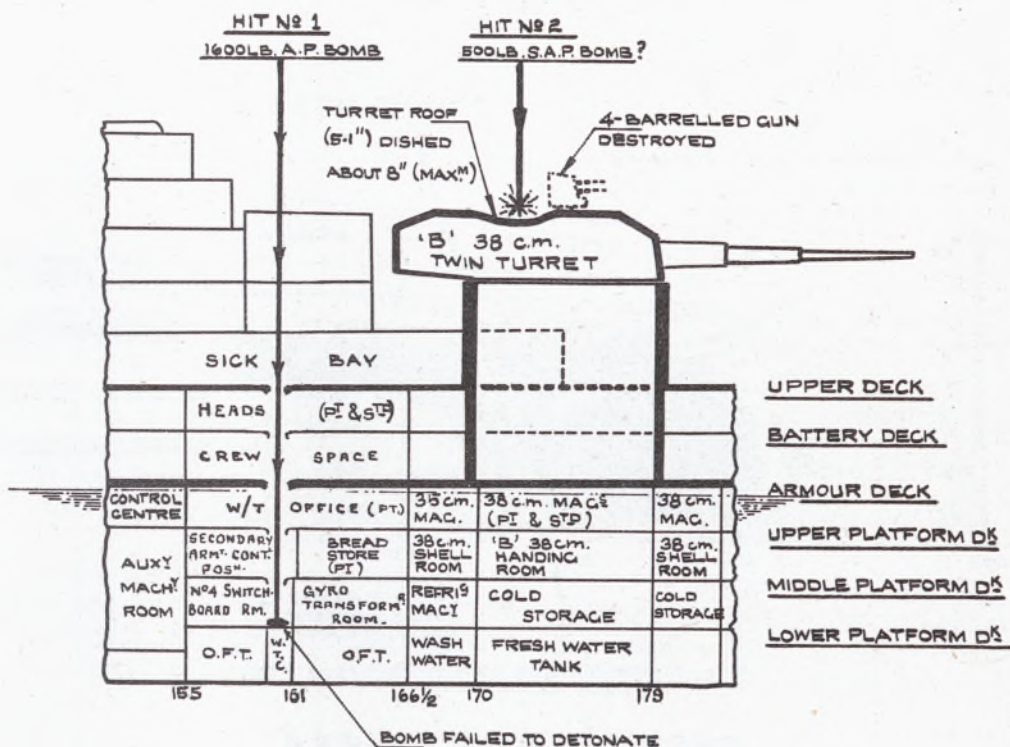
PROFILE

SCALE: 1 IN. TO 150 FT.



PART SECTIONAL PROFILE

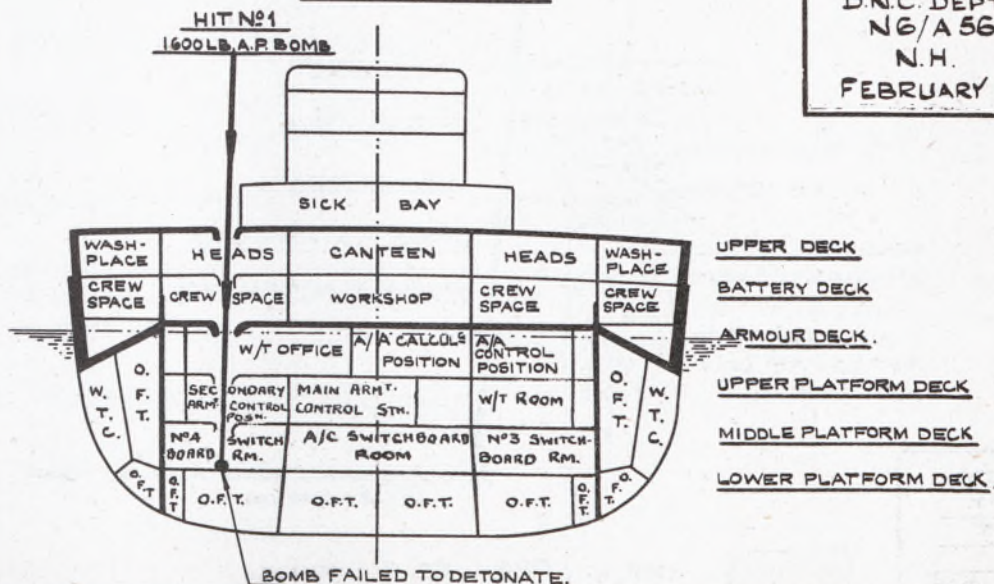
SCALE: 1 IN. TO 32 FT.



SECTION AT STA. 159

LOOKING FORWARD

SCALE: 1 IN. TO 32 FT.



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NG/A 56
N.H.
FEBRUARY 1948

**FIGURE
A4.**

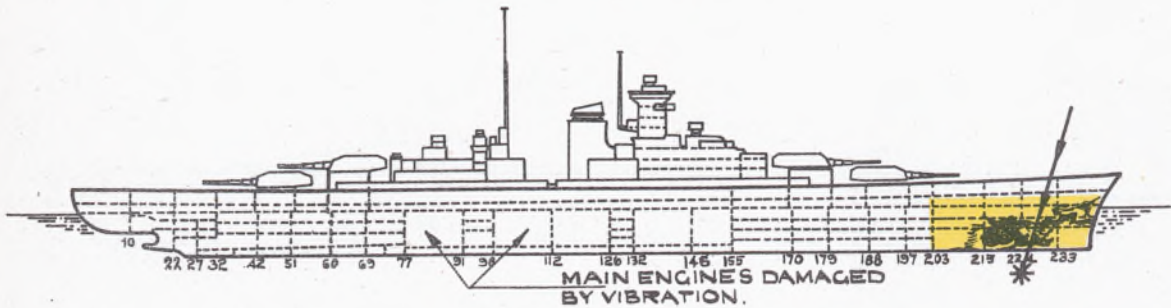
TIRPITZ.

BOMBER COMMAND ATTACK - 15TH SEPT. 1944.

SCALES AS SHOWN

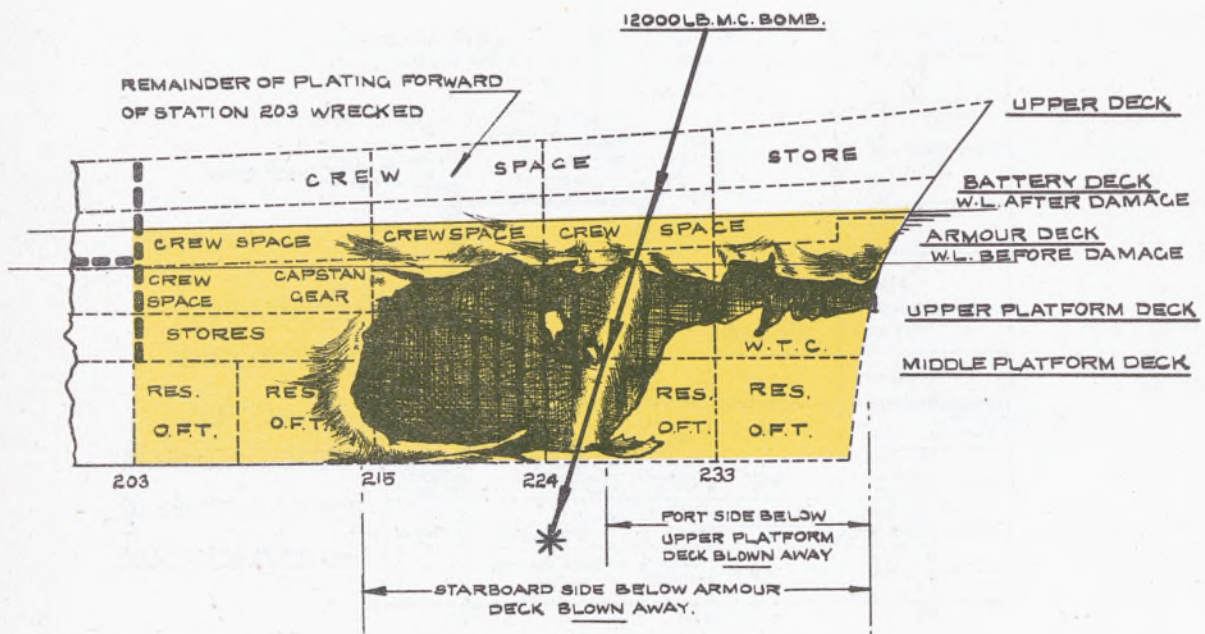
PROFILE.

SCALE: 1IN TO 150 FT.



PART PROFILE

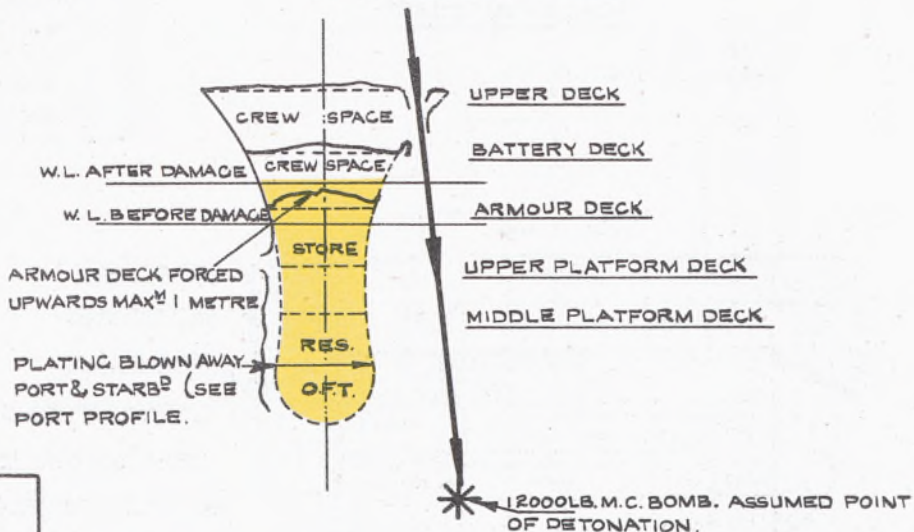
SCALE: 1IN TO 32 FT.



SECTION AT STA. 224.

[LOOKING FORWARD]

SCALE: 1IN TO 32 FT.



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UNCONTROLLED FLOODING.

APPENDIX A - DETAILED ACCOUNTS OF DAMAGE (Cont'd)

A.4 - DAMAGE SUSTAINED AS A RESULT OF BOMBER COMMAND ATTACK
AT KAA FJORD ON 15th SEPTEMBER, 1944

4.1 Narrative and Evidence

See Section III.6 of this Volume and Section 12 of Volume 2.

4.2 Weapons used

2.1 The following weapons were dropped during the attack:-

12,000 lb. M.C. (Tallboy) bombs fuzed .07 secs. delay - 16 in No.
J.W. Mk. II Mines (Special Type) - 72 in No.

2.2 Their details are as follows:-

12,000 lb. M.C. bomb

Type of filling - Torpex II
Weight of filling - 5,100 lbs.
Charge/weight ratio - 44%
Photograph of bomb - See Plate 12.8, Volume 2.

J.W. Mark II

Type of filling - Torpex
Weight of filling - 100 lbs.
Charge/weight ratio - 25%

4.3 Structural Damage (See Figure A.4)

3.1 Severe structural damage was caused to the fore end of the ship by a 12,000 lb. M.C. bomb which passed through the ship via the upper deck (1.97 inches) and out through the flare of the starboard side plating (1.38 inches) and detonated in the water below keel level and very close to the ship.

3.2 The structure below the armour deck from the stern up to the transverse armour bulkhead at station 203 was blown away or wrecked. The starboard side was more severely damaged than the port side. The upper, battery and armour decks were bulged upwards, the latter a maximum of about one metre.

4.4 Flooding

The portion of the ship forward of station 203 was flooded to the water-line and the draught forward increased about 2.5 metres (8.2 feet) in consequence.

4.5 Counterflooding and Transference of Oil Fuel

Counterflooding of port and starboard wing compartments aft was carried out; it was estimated that about 1,500 tons of water were admitted to the ship.

4.6 Damage to Machinery

The main engines were damaged by vibration and required overhauling. Eight days were taken to make them serviceable. Auxiliary machinery, which was seated on special resilient mountings was unaffected.

4.7 Damage to Communications Equipment

The aerials were broken.

4.8 There were 5 casualties.

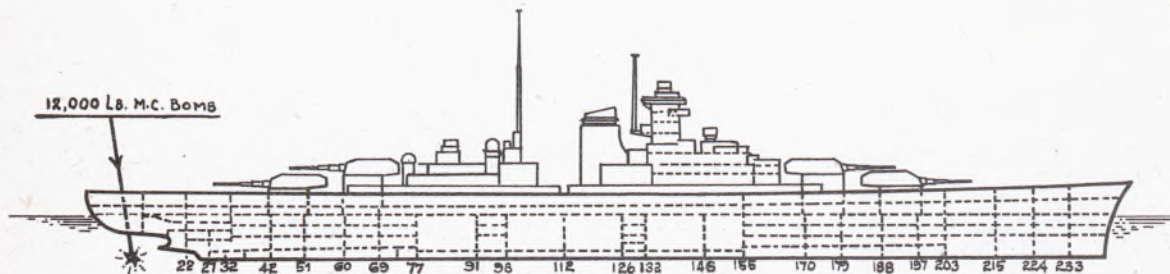
**FIGURE
A.5.**

TIRPITZ

BOMBER COMMAND ATTACK -29. OCT. 1944.

SCALES AS SHOWN.

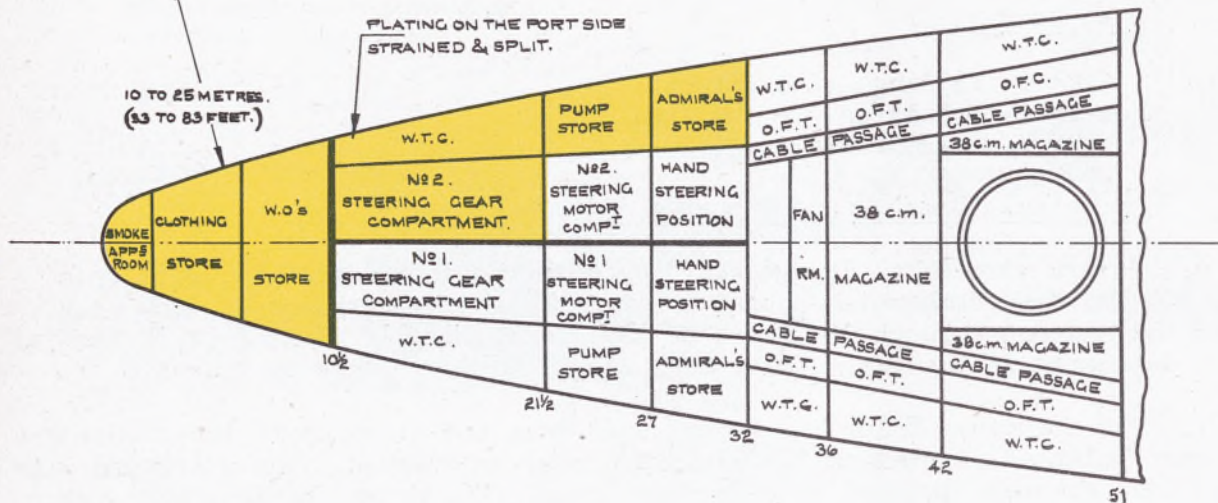
PROFILE
SCALE - 1IN TO 150FT.



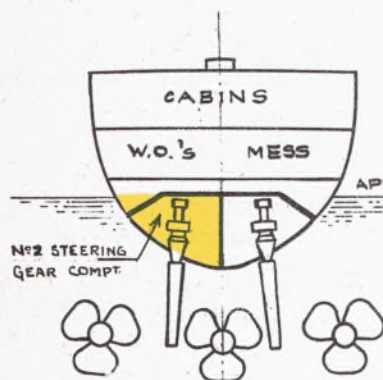
PART PLAN OF UPPER PLATFORM DECK

SCALE - 1IN. TO 32FT.

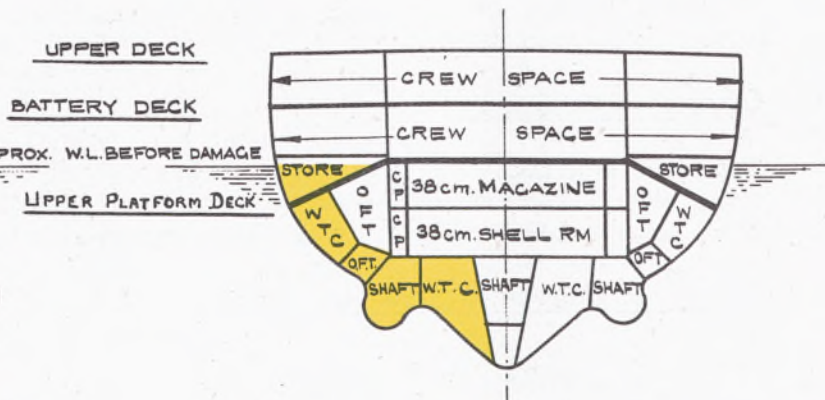
ESTIMATED POSITION OF
DETONATION OF 12,000LB.M.C.
BOMB.



SECTION AT STA. 13.
LOOKING FORWARD
SCALE - 1IN. TO 32FT.



SECTION AT STA. 39.
LOOKING FORWARD.
SCALE - 1IN. TO 32FT.



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CONTROLLED & UNCONTROLLED FLOODING.

APPENDIX A - DETAILED ACCOUNTS OF DAMAGE (Cont'd)

A.5 - DAMAGE SUSTAINED AS A RESULT OF BOMBER COMMAND
ATTACK AT TROMSØ ON 29th OCTOBER, 1944

5.1 Narrative and Evidence

See Section III.7 of this Volume and Section 13 of Volume 2.

5.2 Weapons used

Thirty-two 12,000 lb. M.C. bombs (for main particulars see Section A.4.2) were dropped during the attack.

5.3 Structural Damage (See Figure A.5)

The port side plating at the after end of the ship was strained and split by a near miss which is reported to have hit the water off the port quarter between 10 and 25 metres (about 30 to 80 feet) from the shipside.

5.4 Flooding

Water entered compartments on the port side aft over a length of approximately 35 metres (about 115 feet); those affected included the steering gear compartment and shaft passages. No serious leaking of decks and bulkheads occurred far inboard. It was estimated that about 800 cubic metres of water entered the ship. Some of the flooded compartments were subsequently pumped out.

5.5 Damage to Shaft and Rudder

The port shaft was bent and the port rudder was damaged by the explosion.

5.6 There were three casualties.

APPENDIX A - DETAILED ACCOUNTS OF DAMAGE (Cont'd)

A.6 - DAMAGE CAUSED BY THE FINAL BOMBER COMMAND ATTACK
AT TROMSØ ON 12th NOVEMBER, 1944

6.1 Narrative and Evidence

See Section III.8 and Appendix "B" of this Volume, and Section 14 of Volume 2.

6.2 Weapons used

Twenty-nine 12,000 lb. M.C. bombs each containing 5,100 lbs. desensitized Torpex and fuzed 0.07 secs. delay were dropped by the attacking aircraft.

6.3 Structural Damage

Deduced from survey of wreck at Tromsø - see Figure A.6 and Section B.5 of Appendix "B".

3.1 Hit No.1 The bomb struck the port side of the ship on the upper deck near the end of the athwartships catapult at about station 113 and penetrated to about the armour deck (3.2 inches). It is considered that it detonated while passing through the armour deck, a short distance inboard of the protective bulkhead. The bomb blew a large hole about 45 feet long in the side plating (0.55 to 0.8 inches), extending from below the bilge keel probably to the upper deck, between stations 107 and 118. The plating at the edges of this hole was petalled outwards.

3.2 The protective bulkhead (1.8 inches) was blown outwards and the hole in it took the form of a large 'V', apex downwards, giving the impression that it had failed down the line of welding connecting it to the transverse bulkhead at station 111.

3.3 The main side armour in this area was probably blown off the ship's side. The position of parts of the 110 mm. (about 4.3 inches) sloping deck armour indicated that some of the side armour had hinged outwards about the upper deck connection.

3.4 The 110 mm. (4.3 inches) sloping armour deck in the damaged area had been fractured in at least two places and was displaced outboard. A considerable portion of the 80 mm. (3.2 inches) armour deck was missing.

3.5 Hit No.2 This bomb struck the port side of the ship about station 99. It is impossible to deduce an exact point of detonation from the evidence obtained during the survey of the wreck, the only certainty is that the bomb detonated prematurely somewhere between the upper deck and about mid-draught.

3.6 The bomb blew a hole about 45 feet long in the side plating (0.55 to 0.8 inches) between stations 95 and 106. This hole extended from just above the bilge keel probably to upper deck level. There was also a smaller hole about 13 feet deep x 6 feet wide between stations 92 and 94, the top edge coinciding with the lower edge of the 320 mm. (12.6 inches) side armour. The edges of each of these holes were petalled outwards.

3.7 There was a very large hole in the protective bulkhead in the same area.

3.8 Side armour plates in this area had either been ripped completely away or hinged outboard about their upper edge.

3.9 The 110 mm. (about 4.3 inches) sloping deck armour in the same area was bent downwards, but not ruptured, into the form of a trough 7 to 8 feet deep.

A.6 - DAMAGE CAUSED BY THE FINAL BOMBER COMMAND ATTACK
ON 12th NOVEMBER, 1944 (Cont'd)

3.10 In paragraphs 4 (d), 4 (h) and 4 (j) of Section 14.1 of Volume 2 it is stated that the hit abreast the after range-finder (Hit No.2) was followed by an explosion, that some time after this TIRPITZ moved bodily to starboard, a line of white froth was seen along the port side of the hull and that the near miss which followed developed into a high column of black smoke and that no other bomb which fell in the water produced a similar disturbance. This suggests that ammunition exploded subsequent to this bomb hit but, as stated in Section 5.3.6 of it is improbable that this explosion was responsible for the majority of the damage which followed this bomb hit.

Note:- The two large holes caused by hits 1 and 2 were joined just below the waterline into one large uninterrupted hole about 100 feet long.

3.11 Near miss. This occurred close to the port side abreast station 128, probably when the ship was heeled about 20 degrees. It blew a hole 40 feet long x 17 feet deep in the side plating between stations 122 and 134, the top edge of the hole being from 3 to 10 feet below the lower edge of the thick side armour. The plating around the hole was petalled inwards. Side plating over a more extensive area was dished inwards and split.

3.12 The protective bulkhead was dished inwards over a large area and there was at least one split about 9 inches wide caused by fracture of the welding connecting this bulkhead to transverse bulkhead 132.

3.13 There was probably a direct hit on turret 'B' which caused damage to superstructures of unknown extent. There is also a possibility that a further near miss off the starboard side of the fore end accentuated the damage caused by the near miss during the September 15th attack.

6.4 Flooding

It was impossible to ascertain the extent of uncontrolled flooding but it is certain that the following sections of the ship at least flooded very rapidly:-

- All bulge compartments between stations 77 and 146
- All port machinery spaces over the same length of the ship;

that is, at least 5,000 tons entered the ship. The Germans estimated that about 12,000 tons of water entered the ship in all.

6.5 Subsequent Events

The ship heeled rapidly to port immediately after the first hit, attained an angle of about 20 degrees and steadied momentarily, probably owing to the port bilge keel coming into contact with the mud of the sea bed. During this period the second direct hit and the near miss occurred extending the damage and increasing the rate of heeling. The ship continued to list and at some angle between 25 degrees and 70 degrees there was an explosion in the after main armament magazines as a result of which turret 'C' was blown out of the ship. The order to abandon ship was then given and she subsequently heeled 145 degrees, the angle at which she still lies.

6.6 Casualties

About 1,000 officers and men were drowned.

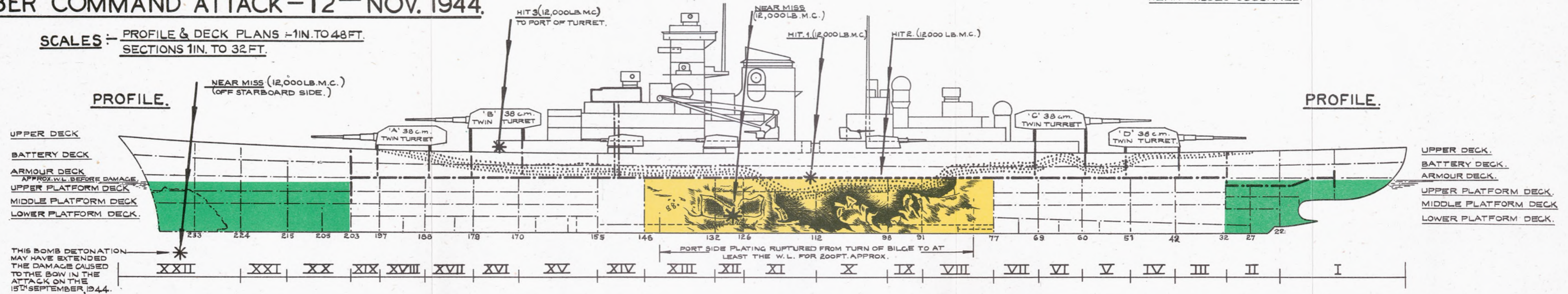
TIRPITZ.

BOMBER COMMAND ATTACK - 12TH NOV. 1944.

FIGURE
A.6.

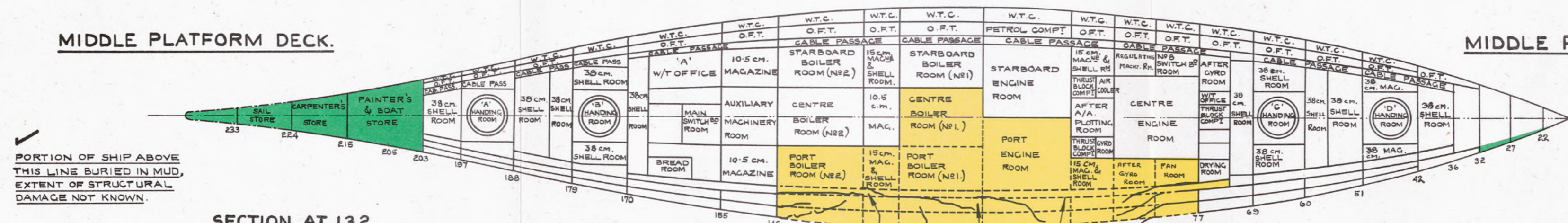
NOTE -
THE EXACT PATHS OF THE BOMBS ARE NOT KNOWN. THE ARROWED LINES MERELY INDICATE APPROXIMATE POSITIONS IN WHICH THE HITS & NEAR MISSES OCCURRED.

SCALES - PROFILE & DECK PLANS - 1 IN. TO 48 FT.
SECTIONS 1 IN. TO 32 FT.



MIDDLE PLATFORM DECK.

MIDDLE PLATFORM DECK.



PORTION OF SHIP ABOVE THIS LINE BURIED IN MUD, EXTENT OF STRUCTURAL DAMAGE NOT KNOWN.

FLOODING KEY.

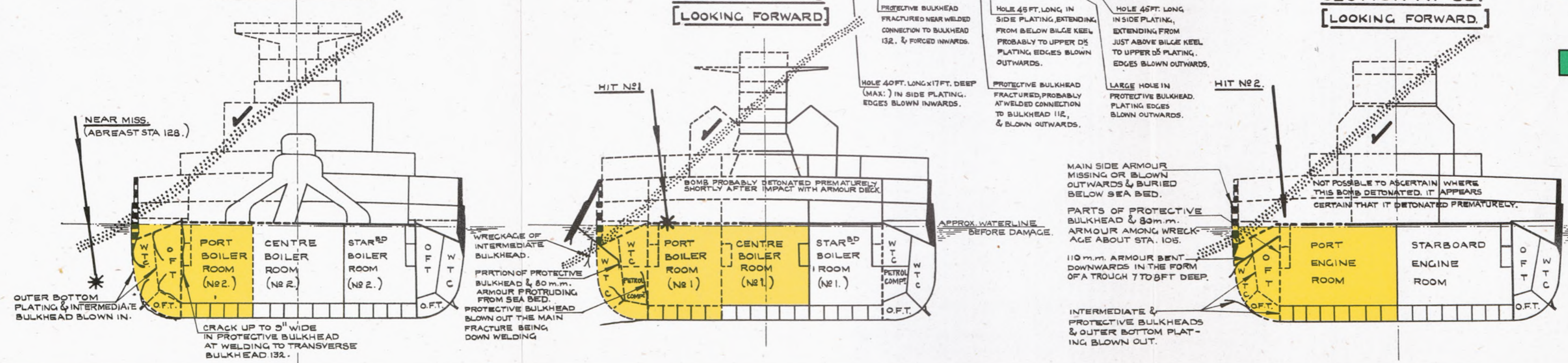
UNCONTROLLED RAPID FLOODING DUE TO 12TH NOVEMBER ATTACK (NOTE - EXTENT SHOWN IS THE MINIMUM THAT OCCURRED - SEE B.6.3. OF ENCLOSURE B.)

UNCONTROLLED FLOODING PRESENT IN SHIP IMMEDIATELY PRIOR TO ATTACK ON 15TH NOVEMBER - DUE TO ATTACKS ON 15TH SEPTEMBER. (FLOODING FORWARD) & 29TH OCTOBER. (FLOODING AFT.)

SECTION AT 132. [LOOKING FORWARD.]

SECTION AT 113 [LOOKING FORWARD.]

SECTION AT 99. [LOOKING FORWARD.]



SUPERSTRUCTURE DECK.
UPPER DECK.
BATTERY DECK.
ARMOUR DECK.
UPPER PLATFORM DECK.
MIDDLE PLATFORM DECK.
LOWER PLATFORM DECK.

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NG/A 59
N.H.
FEBRUARY 1948.

APPENDIX B

SURVEY OF WRECK AT TROMSØ - 4TH SEPTEMBER TO 15TH OCTOBER, 1945

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"TIRPITZ."

Plate B.1

General views of capsized ship.



APPENDIX B - SURVEY OF WRECK AT TROMSØ,
4TH SEPTEMBER TO 15TH OCTOBER, 1945

B.1 - INTRODUCTION

1.1 TIRPITZ was the second capital ship to be despatched by bombs alone, the first being the Italian battleship ROMA which was sunk in deep water off Sardinia by German rocket bombs shortly after the Italian surrender. TIRPITZ however was sunk in very shallow water by the new massive Tallboy bombs. She therefore provided a unique opportunity for:-

- (a) Obtaining direct evidence of the effectiveness of direct hits and near misses with the 12,000 lb. M.C. (Tallboy) bombs, which was then urgently required because this weapon was being recommended as a Category 1 bomb for the attack of Japanese capital ships, aircraft carriers and cruisers;
- (b) Examining the effectiveness of her structure against this form of attack;
- (c) Ascertaining the extent of flooding caused by the bombs and the reason for her capsizing;
- (d) Providing information as to the fuze delay achieved by the bomb in practice, with particular reference to the susceptibility of its Torpex filling to premature detonation when used against heavy deck armour.

1.2 A further consideration was that no facilities existed for carrying out controlled tests with the bomb, because its large diameter (38 inches) was more than twice that of our largest gun and its weight of 12,000 lbs. prevented it being fired even from projected rocket runways. The possibility of obtaining useful information from tests against an actual battleship was remote owing to the great difficulty of obtaining a suitable modern battleship for such trials and the very small probability of scoring the right sort of hits from the operational bombing level of about 12,000 feet.

1.3 The Director of Naval Construction therefore considered it imperative that the opportunity of carrying out a careful survey of the wreck should not be missed and in March, 1945, when the end of the War with Germany was in sight, the collection of information as to the enemy's intentions regarding possible demolition of the wreck was commenced and it was also stated officially that D.N.C. was anxious to carry out such a survey if at all possible. Information obtained by D.N.C.'s representatives in Northern Germany confirmed that it was essential to inspect the wreck to assess the damage caused by the Tallboy bombs during the last attack, and in June, 1945, D.N.C. sought approval to carry out the survey which would include inspection by divers of the underwater portions of the damage. Board approval for this operation was given in mid-July but there were certain difficulties which had to be overcome before the survey could proceed. The only British diving tender, H.M.S. TEDWORTH, could not be used owing to her lack of endurance for the lengthy sea voyage to Tromsø and urgent requirements for her use elsewhere. Consideration was then given to obtaining an American salvage vessel, but this was found to be impossible. It was then suggested that the German salvage vessel S.S. RICHARD which had been standing by TIRPITZ and which was being used to bring armour plate ex-TIRPITZ to England, might be used for the purpose. There was some delay in getting RICHARD sailed to England but she was inspected at Rosyth on 17th August when it was found that, contrary to previous reports, she was a ship designed for harbour use only and that her speed, endurance and accommodation were unsuitable for the operation. Action was therefore taken to obtain an L.C.Q. for use as the accommodation ship and D.N.C.'s representatives visited Tromsø by air (through the courtesy of the Air Ministry) to make preliminary arrangements for the survey. It was found that a pontoon suitable for use as a diving platform was available at Tromsø. Arrangements

B.1 - INTRODUCTION (Contd.)

were also made for the supply by D.T.M. of an Officer and twelve divers with all the necessary diving and underwater cutting equipment required for the inspection and the supply by D.A/S.M. of an echo sounding set and a competent officer to carry out a survey of the sea-bed in the vicinity of the wreck.

1.4 L.C.Q.492 was allocated for the operation by C. in C. Rosyth and she was sailed on the 31st August for Tromsø, arriving there on 4th September. The Officers then assembled in L.C.Q.492 for the survey were:-

Constructor Captain J.L. Bessant, directing the operation;
Constructor Lieutenant North, who supervised the operation
at the site during the whole period;
Lieutenant Hughes, R.N.V.R., commanding H.M. L.C.Q.492;
El. Sub Lieutenant Tennent, R.N.V.R., in charge of echo sounding
operations;
Mr. Chadwick, Commissioned Gunner, R.N., with twelve divers from
H.M.S. VERNON.

1.5 The first few days at Tromsø were spent in arranging for the use of auxiliary craft and equipment, including an ex-German motor minesweeper to act as general diving tender and a motor cutter for operating the echo sounding set, and in rigging a 65 feet x 20 feet concrete pontoon as a diving stage. The survey proper began on the 8th September and falls conveniently into four main sections:-

- (a) Interrogation of witnesses;
- (b) Survey of the area surrounding the wreck for bomb craters;
- (c) Survey of the above water portions of the wreck; and
- (d) Survey of underwater portions of the wreck,

These are described in the following sections B.2, B.3, B.4 and B.5 of this enclosure.

APPENDIX B - SURVEY OF WRECK AT TROMSØ,
4TH SEPTEMBER TO 15TH OCTOBER, 1945. (Contd.)

B.2 - INTERROGATION OF WITNESSES

1. A number of people who had either seen the sinking of TIRPITZ or who could give any useful evidence about the ship were interrogated. The most useful information about the actual final attack was given by two Norwegian civilians, Anton and Edmund-Rikkardson, who live on Kvaloy and witnessed the action from beginning to end, and by the master of the German salvage ship SCHEIBENHOF, who supervised the German diving operations which followed the capsizing.

2. ANTON AND EDMUND-RIKKARDSON

2.1 The point from which they witnessed the sinking is indicated on the plan of the anchorage given in Figure B.2 and was about two miles on the starboard quarter of TIRPITZ.

2.2 During their interrogation a one-hundredth scale model of TIRPITZ (prepared in D.N.C. Department) was used to obtain a clear reconstruction of what the witnesses saw, including the position of hits and the subsequent angles of heel. They agreed that the large quantity of smoke produced during the attack might have obscured later bomb hits, but stated that the sequence of bombs affecting the ship was as follows:-

- (i) Hit on the upper works just forward of the bridge and slightly to starboard which blew away all the superstructures in the vicinity but did not damage the ship below the upper deck;
- (ii) Hit on the port side in way of the catapult and about 20 feet in-board from the ship's side which produced a great deal of smoke but no flame, the ship began to heel immediately: This hit has been confirmed by other sources;
- (iii) Near miss just off the port side abaft hit number (ii).
(A direct hit in this vicinity was confirmed by the diving survey; it is thought that this was mistaken for a near miss);
- (iv) Near miss, starboard side forward, some distance from the ship's side. The survey of the seabed confirms this near miss. No damage additional to that caused by the September attack was found by diving;
- (v) Direct hit on the starboard side of the quarter-deck after the ship had heeled to about 25 degrees which produced red flame and a considerable amount of smoke.

There is evidence that there was a magazine explosion and an explosion in turret 'C'. With the ship at 25 degrees, turret 'C' would be in line with the estimated position of the direct hit and the magazine explosion may have been mistaken for a bomb hit.

2.3 MASTER OF SCHEIBENHOF

Three German vessels, RICHARD, SCHEIBENHOF and MELLUM, were used after the capsizing to remove the propellers and main side armour. The Master of SCHEIBENHOF obtained, from one of the survivors, sketches of the after end of TIRPITZ which showed the position of the wine stores aft. He had considerable spare time and made several attempts to gain access to the stores by diving. Using a system of small charges detonated simultaneously, he blew off an area of plating 36 feet x 16 feet from the ship's side aft and found that the accommodation spaces aft on the battery deck and armour deck had been wrecked by a major explosion which had occurred forward of this. On reaching the wine

B.2 - INTERROGATION OF WITNESSES (Contd.)

stores he discovered only 36 bottles intact, the remainder were either smashed or had their corks blown in by the explosion. His evidence was useful in that it gave the extent of the damage aft due to the internal explosion. This is indicated in Figure B.5.

2.4 KRISTIAN PETERSEN

4.1 His house and farm were very close to where TIRPITZ was moored and one of his buildings had been damaged during the first attack; he was much impressed by the accuracy of the bombing.

4.2 Pettersen was able to give accurately the position of the local anti-aircraft sites; these are shown on Figure B.2. The guns had been sited before TIRPITZ arrived but a number of her crew were put ashore on arrival to assist in manning them.

4.3 Every day between the last two attacks, two or three 120 foot barges brought what he described as a mixture of gravel and clay and dumped it around TIRPITZ.

4.4 There was a persistent local rumour that a large party was held on board TIRPITZ the night before the final attack and that the crew was far from efficient as a result. Pettersen had heard this rumour but could give no evidence. He said that the survivors had behaved very oddly and were either frightened or drunk.

2.5 OBERLEUTNANT MOHRMFELT

5.1 This officer was on shore on the mainland (see Figure B.2) and did not see the attack but visited the ship between 3 and 4 o'clock in the afternoon when rescue operations were in progress. He said that about 50 men were rescued after the ship capsized.

5.2 A number of liberty men were ashore at the time of the attack and the majority of the "technical" personnel (he presumably meant engine room personnel) had not been on board for some time. (Kapitan Sommer, an engineer officer and probably the damage control officer, was ashore during the attack). He did not think that TIRPITZ had settled very much after capsizing, possibly a metre or so. After the attack he spoke with Ober Lieutenant (Ing.) Schultz who was below in the engine room when the ship was attacked but who managed to reach the upper deck and jump overboard before she capsized. Schultz stated that there was a direct hit on the port side which caused the ship to heel to about 45 degrees, at which angle she stopped for some time. "C" Magazine then blew up, the order to abandon ship was given and TIRPITZ continued to heel into the position she now holds. He felt certain that all watertight doors would have been closed before the attack commenced but considered that many would have been opened again on the order to abandon ship.

5.3 Mohrmfelt said that it had been decided to make up the sea bed around TIRPITZ and silt was dredged from the northwest end of Tromsø and dumped around the ship continuously for three weeks before the final attack.

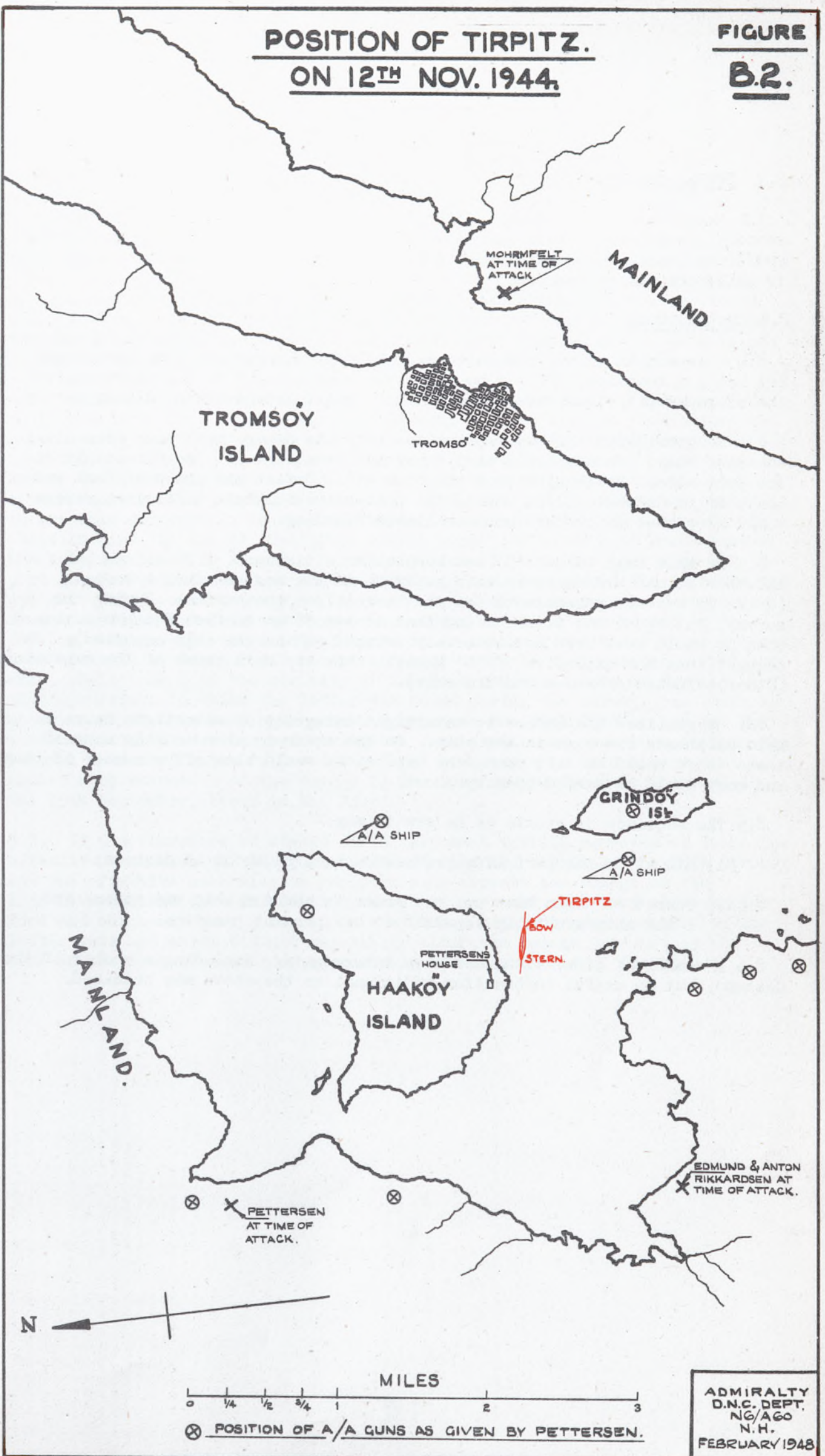
2.6 OBERLEUTNANT HAMANN

6.1 This officer was in command of Repair Ship FL71 which had been detailed to carry out rescue work on TIRPITZ. Work was commenced about noon on November 12th and continued for approximately 24 hours. Attempt was made to burn through the sea inlet of the starboard engine room but the equipment available was inadequate. Eventually access was gained into the electrical machining room (Section XIV of the ship) from there an effort was made to enter the starboard boiler room but this compartment was so hot inside that the attempt was abandoned.

POSITION OF TIRPITZ.
ON 12TH NOV. 1944.

FIGURE

B.2.



B.2 - INTERROGATION OF WITNESSES (Contd.)

2.7 OBERMASCHINEMANN SNEUER

7.1 Sneuer was also attached to F171. He stated that about 50 men were rescued; small holes were burned into the electrical machinery room and food and drink passed in to survivors trapped inside, later larger holes were burned to allow the men to escape.

2.8 BAURAT VOSS

8.1 Voss was in no way connected with TIRPITZ and had not seen the attack but being a technical officer he had given some thought to the capsizing of the ship and his views were borne out to a great extent by the diving survey.

8.2 He considered that to capsize the ship the damage must have been along one side only. He had heard that there had been at least one direct hit on the port side. He thought that the bomb would defeat the armoured deck and that, if it detonated just inside the protective bulkhead sufficient damage would be caused to produce uncontrollable flooding.

8.3 He said that turret 'C' had been blown a distance of 20 metres (66 feet) and that it had been seen in this position in the sea bed from a boat. (Note: It was not possible to see the turret from the surface during the survey, but by diving it was found that it was 30 to 40 feet further outboard than it would have been had it merely dropped out as the ship capsized). He thought that the explosion of 'C' Magazine was the main cause of the capsizing. (Other evidence does not confirm this).

8.4 He realized the menace to watertight integrity of watertight doors in main bulkheads low down in the ship. On the order to abandon ship many of these doors would be left open, the explosions would blow off a number of them and many would be jarred open by shock.

8.5 The sequence of events as he saw it was:-

- (i) Hit(s) on the port side produced a heel to about 45 degrees;
- (ii) Turret 'C' then blew up, the order to abandon ship was given, and the ship gradually capsized to her present position.

8.6 A number of other witnesses were interrogated, including a member of the Gestapo, but no useful information additional to the above was obtained.

APPENDIX B - SURVEY OF WRECK AT TROMSØ,
4TH SEPTEMBER TO 15TH OCTOBER, 1945. (Contd.)

B.3 - SURVEY OF AREA AROUND SHIP

3.1 A systematic survey of the sea-bed around the wreck was made using a Type 766 echo sounding set to obtain the positions of the bomb craters. The set gave good records from which the craters were easily identifiable (Figure B.3.1 shows two typical records). Figure B.3 is a chart of the area around TIRPITZ showing depth corrected to mean low water springs and areas in which the sea-bed close to the wreck had been made up by dumping silt. As a result of the latter the area around the wreck was of a very uneven nature.

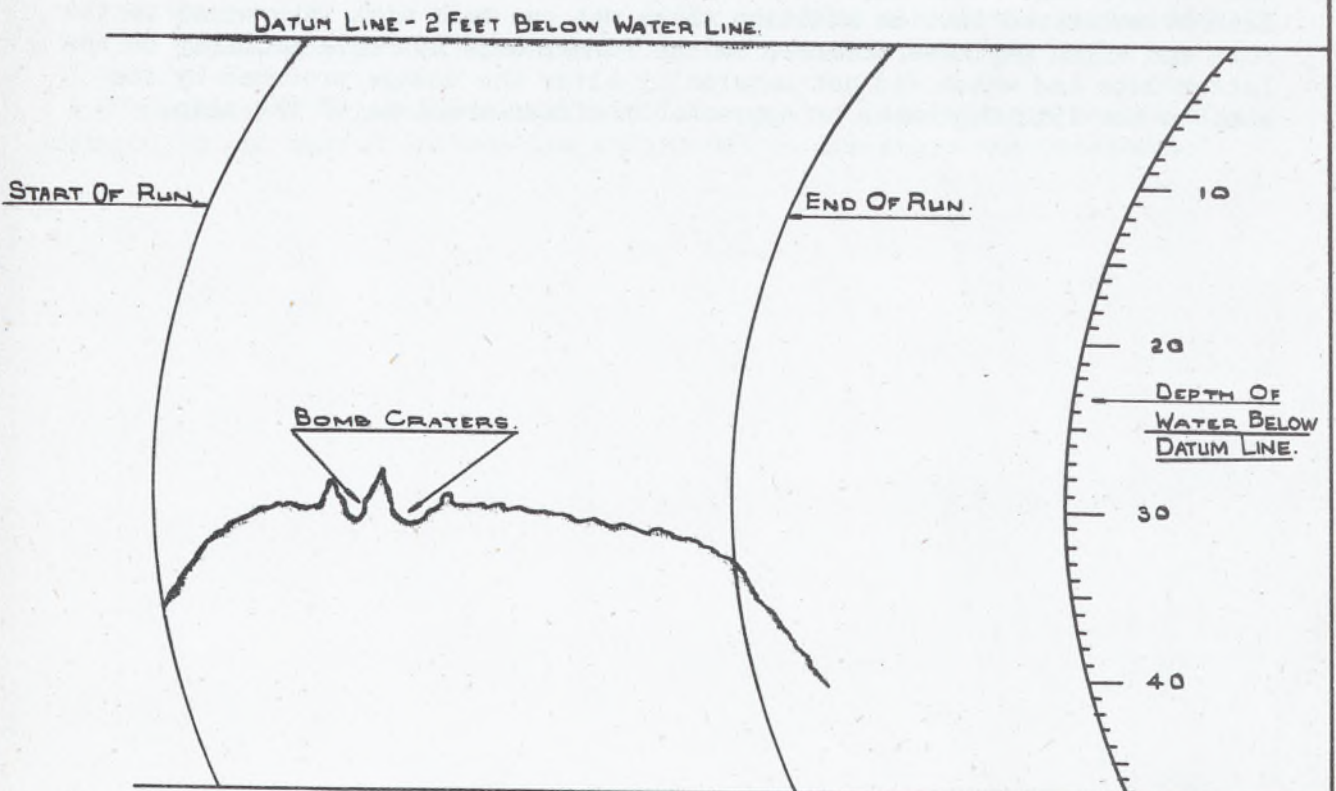
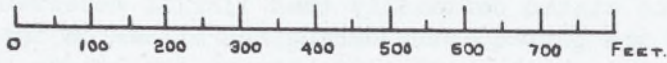
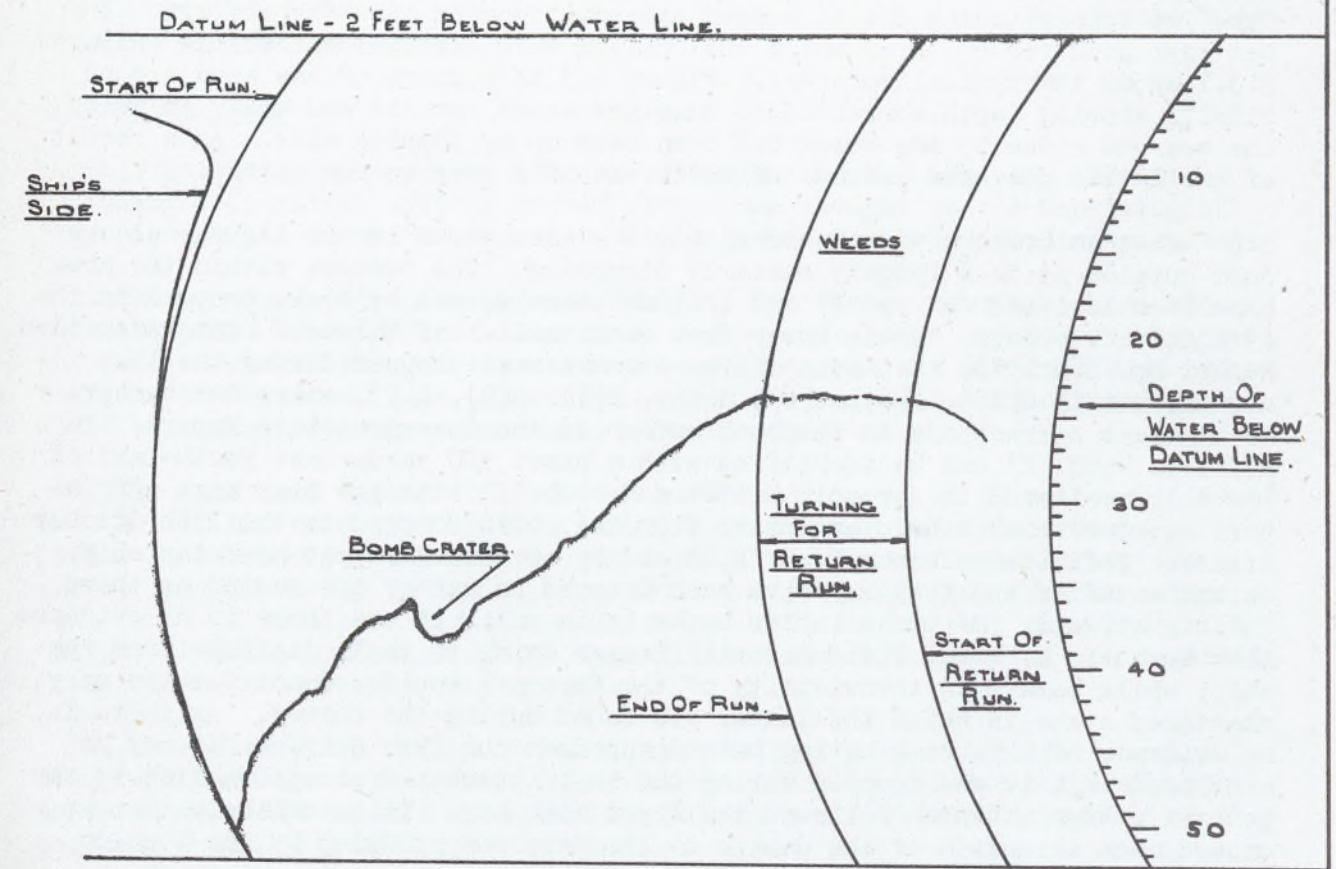
3.2 Sixteen craters were found within the area shown in the figure and one just outside it in a roughly easterly direction. The craters within the area have been lettered 'A' to 'P' and include those caused by bombs dropped in the 29th October attack. It is known from Section 14.1 of Volume 2 (Interpretation Report No. S.A.2923) that some of these bombs were dropped during the last attack, namely C(10), D(8), E(6), G(14), H(7), J(9), L(2), where the number in brackets corresponds to the bomb number in the Interpretation Report. In addition bomb 'K' can be identified with a burst 300 yards East North-East of the ship mentioned in Appendix B.1301 and bomb 'I' with the near miss off the port quarter which caused extensive flooding, both dropped in the 29th October attack. This leaves bombs F, M, N, O and P, of those dropped near the ship, as unidentified and they may have been dropped in either the second or third Tallboy attacks. Of these latter bombs it is unlikely and there is no evidence that bombs F, M, N and P did material damage owing to their distance from the ship, while bomb O in the vicinity of the fore end would account for the very shattered state in which the latter was found during the survey. As there is no evidence of this bomb having been dropped on the 29th October, it may be concluded that it was dropped during the last attack and escaped notice in the general confusion which followed the first bomb hit. It is unlikely that it caused much extension of the damage to the fore end produced by the bomb in the 15th September attack in Kaa Fjord.

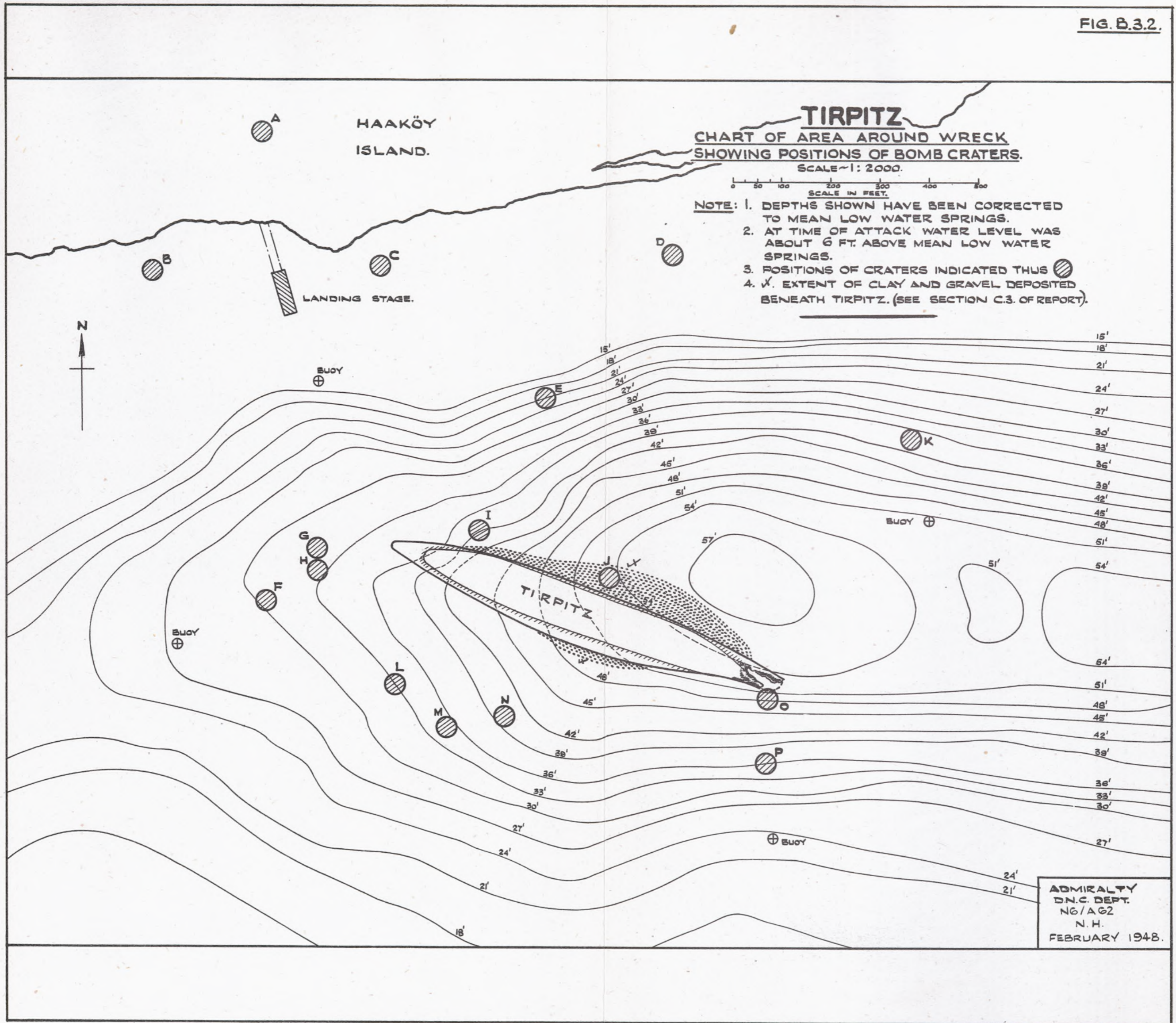
3.3 It can therefore be stated definitely that TIRPITZ received at least one effective near miss off the port quarter during the attack on the 29th October and one effective near miss on the port side abreast the bridge on the 12th November and that in addition there was one near miss very close to the fore end which may have occurred on the former date but more probably on the latter date and which did not materially alter the damage produced by the bomb on the 15th September or appreciably affect the loss of the ship.

FIGURE
B.31.

TIRPITZ

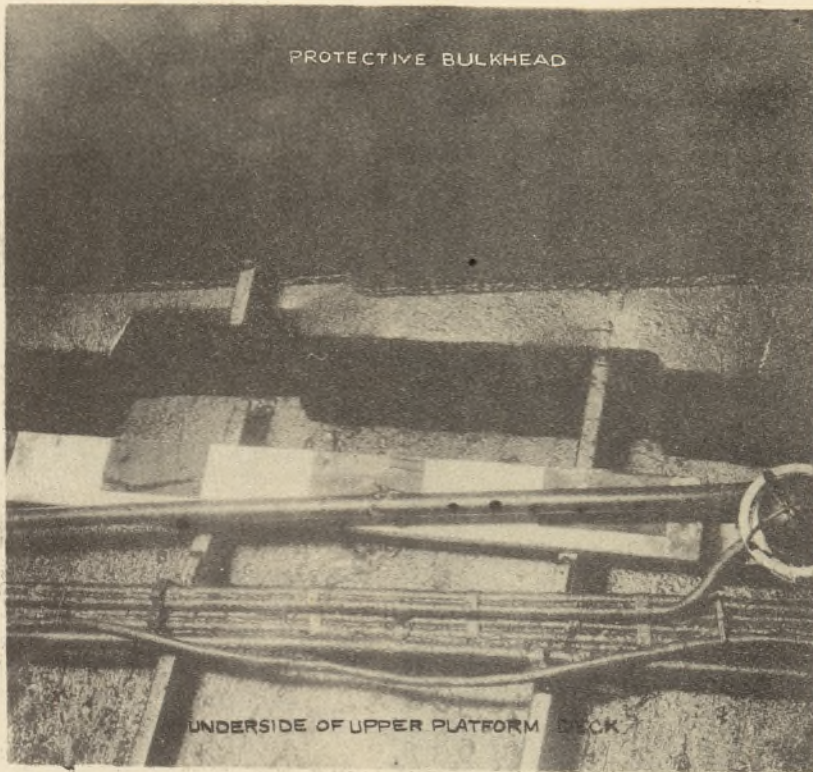
TYPICAL ECHO SOUNDING RECORDS.





"TIRPITZ."

Damage due to internal explosion.



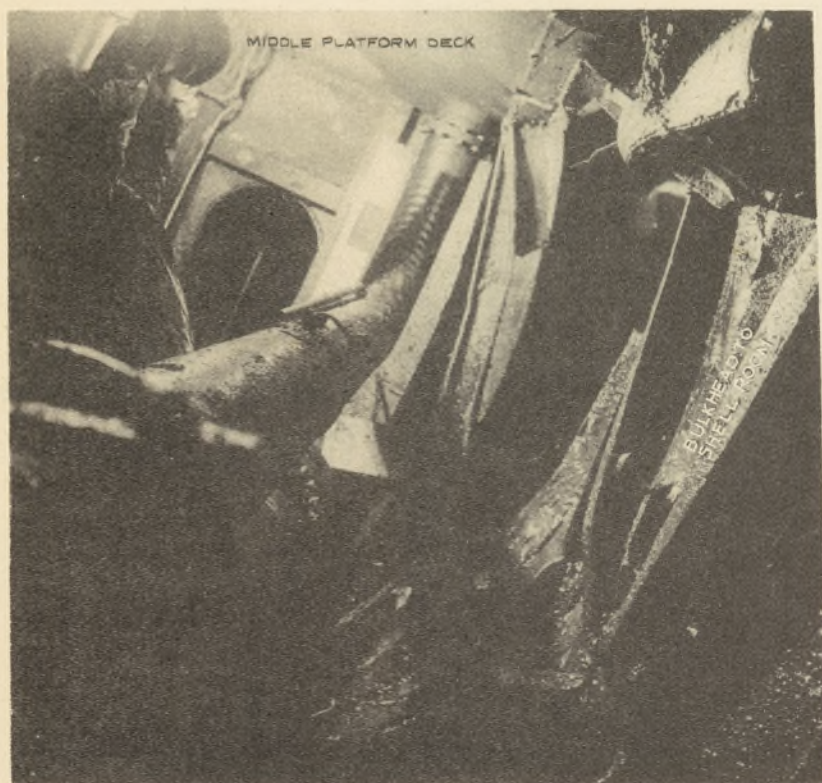
Crack in deck.
(See ① fig.B.4.2)



Bulkhead to
shell room
between C and
D turrets blown
out; crack down
line of welding.
(See ② fig.B.4.2.)

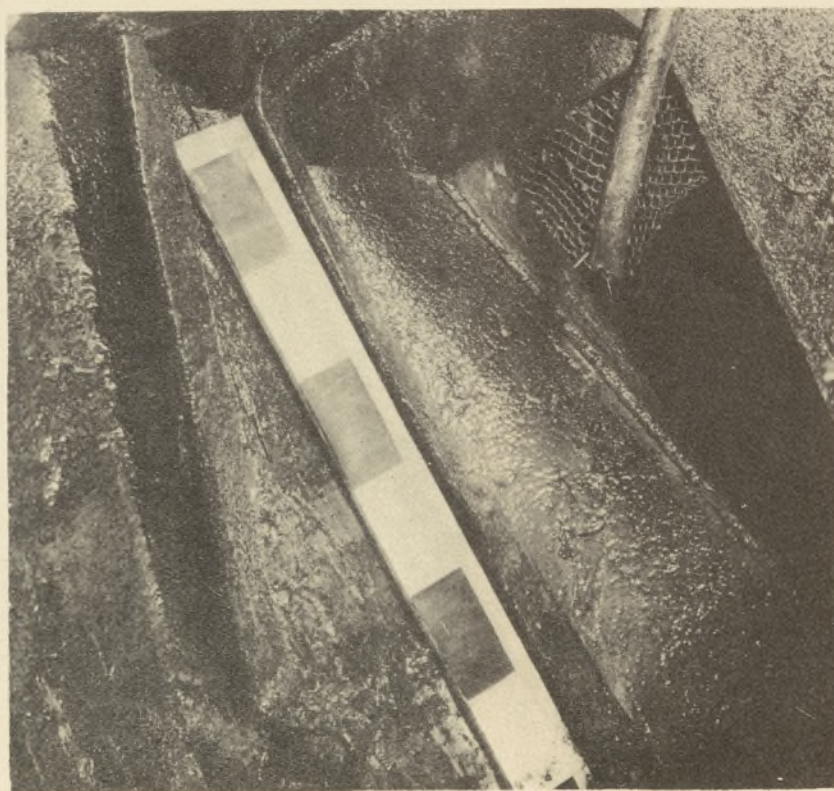
"TIRPITZ."

Port cable passage on Middle Platform deck (Section III).



Shell room bulkhead fractured along line of vertical welding and blown in-board.

(See ③ fig.B.4.2)



Hole in transverse bulkhead.

(See ④ fig.B.4.2).

APPENDIX B - SURVEY OF WRECK AT TROMSØ
4TH SEPTEMBER TO 15TH OCTOBER, 1945. (Contd.)

B.4 - SURVEY OF ABOVE WATER PORTION
OF WRECK

4.1 Object of survey

The above water portion of the wreck was examined for evidence of damage and anything noteworthy in the construction of the ship.

4.2 Damage due to internal explosion aft

2.1 It was found that considerable damage had been caused by an internal explosion in the vicinity of 'C' and 'D' magazines. The majority of this damage was underwater at the time of the survey, but it was possible at very low water to get access to the area through holes burnt for escape purposes and along the cable passages. Photographs on Plates B.4.2(a) and B.4.2(b) show details of the damage found and Figure B.4.2 shows the general extent.

2.2 The seat of the explosion was in the magazine between turrets 'C' and 'D'. On the starboard side of the ship the explosion damaged the inboard bulkhead of the cable passage and vented down the cable passage damaging decks and bulkheads as far aft as bulkhead 36 and as far forward as bulkhead 68.5. In both cable passages there were watertight doors at each transverse bulkhead. The hinges of all these doors in the area were broken and one of the doors was blown aft about 27 feet. The longitudinal bulkhead forming the starboard boundary of the shell room just forward of turret 'C' had a number of holes blown in it and gave the impression that a number of explosions had occurred in the shell room rather than one large explosion such as had occurred in the magazine. The products of the explosion had had sufficient force however to blow the watertight door in the main transverse bulkhead 68.8 on the lower platform deck a distance of 20 feet aft. Everything in this shell room had been blackened by the products of the explosion.

2.3 'C' gun-house when examined by divers was also found in a badly wrecked state. The starboard longitudinal protective bulkhead on the outboard side of the cable passages did not appear to be damaged.

4.3 Damage caused by underwater hit with 1600 lb. A.P. bomb in Fleet Air Arm attack of 3rd April, 1944. (See paragraph 3.13 of Section A.2 of Appendix A)

3.1 Most of the damage caused by this bomb had been repaired. A large bulge in the protective bulkhead had been left but all other damaged structure had been made good by cutting away the damaged portions and welding in new. The hole in the ship's side caused by the entry of the bomb had been stopped by welding a square patch over it under water. A crack in the outer bottom plating caused by the detonation of the bomb had been made watertight by driving in steel liners and underwater welding (see Plate B.4.3). The compartment had subsequently been pumped dry and the repair continued from inboard.

4.4 Damage caused by 500 lb. M.C. or 600 lb. A/S bomb in Fleet Air Arm attack of 3rd April, 1944. (See paragraph 3.16 of Section A.2 of Appendix A)

4.1 Figure B.4.4 shows damage caused by a near miss which detonated off the starboard side abreast the funnel. The dishing in the outer bottom plating extended over an area of 50 feet x 16 feet, the maximum inboard deflection at the centre being about 33 inches. Some authorities have wrongly supposed that this damage had been caused by a near miss with Tallboy. The bomb had caused splits in way of welding over a considerable area and these splits had been made watertight by driving in steel liners and welding on patches under water. The repair had been continued from inboard after pumping out the compartment.

B.4 - SURVEY OF ABOVE WATER PORTION
OF WRECK (Contd.)

Damage to plating and frames was extensive and the repairs must have taken many weeks (see Section 7 of Volume 2). No attempt had been made to alter the shape of the bulge in the bottom plating and fabricated transverse frames had been built around it. The pressure pulse from this near miss had caused considerable damage at the inboard end of the sea inlet which was close to the above-mentioned damage. As this was quite inaccessible no repair work had been carried out.

4.5 Damage to Flat Bottom probably due to 'X' Craft attack

5.1 Photographs on Plate B.4.5 show buckled panels of plating near the flat keel Section XI caused by excessive whipping of the whole ship. A number of chalk lines were drawn on the plating to show up the buckling more clearly. This damage suggested that the ship had received a permanent set and observations made to ascertain the breakage discovered a hog of 5 inches between the fore-foot and the after cut up, the discontinuity being local in the region of the buckling. Panels of bottom plating in Sections VIII, IX and X of the ship were dished over a large area in the manner typical of the detonation of a large charge at some distance. Seams of plating split along welds had been made watertight by driving in wooden wedges from inboard, no attempt at further repairs had been made.

5.2 The whole of this damage is consistent with that expected from the 'X' craft attack (see A.1 of Appendix A).

4.6 Damage caused by explosion subsequent to the sinking

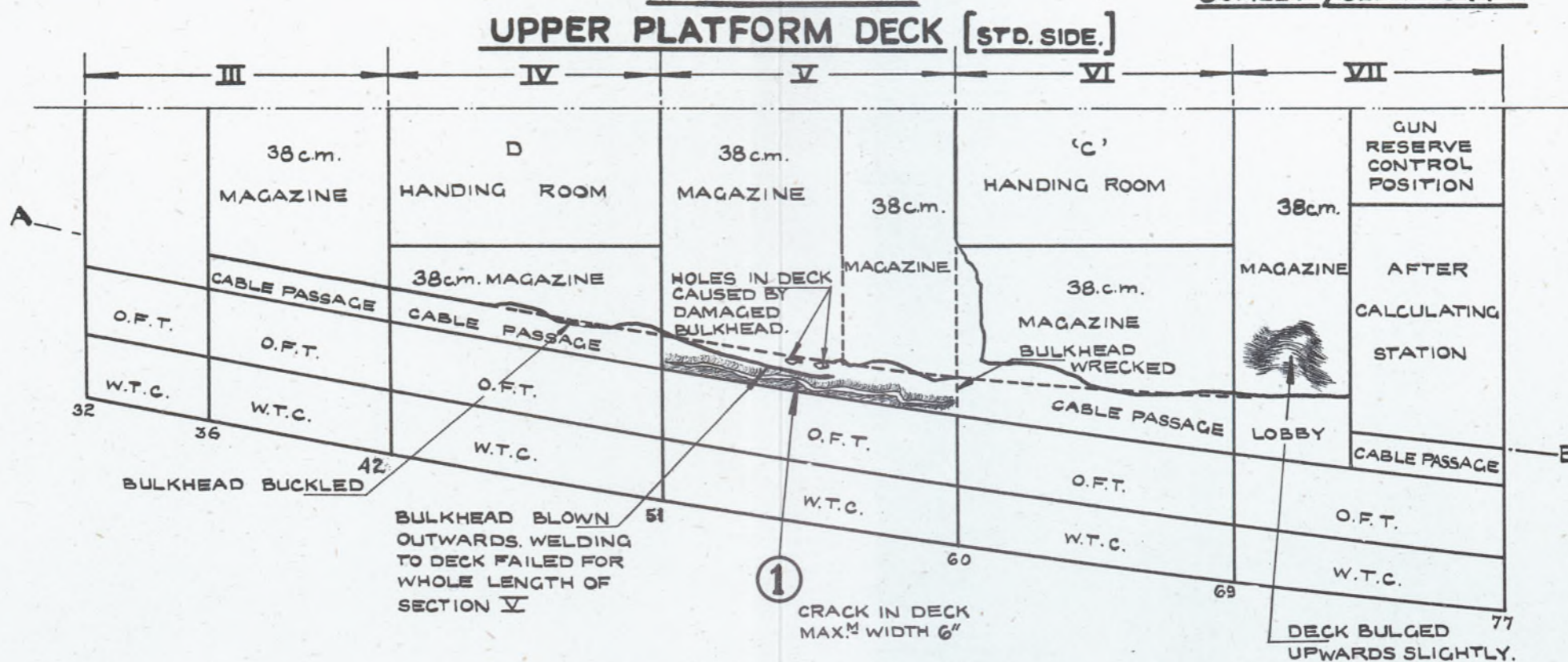
6.1 Although this damage had no bearing on the loss of the ship, it throws some light on the quality of her construction. Photographs on Plate B.4.6 show damage caused by the explosion of what was probably a demolition charge. The transverse bulkhead shown in the photograph failed along a line of welding to the longitudinal bulkhead and was torn away from the stiffeners which had been designed with tapered ends. The intermittent welding which had been used to connect the stiffeners to the bulkhead was of such poor quality that when the explosion occurred the welding failed and the stiffeners took only a small proportion of the load for which they had been designed. It was observed that all similar stiffeners throughout the ship were likewise connected by intermittent welding. Detailed examination carried out at H.M. Dockyard, Portsmouth, of a number of specimens of welding cut from TIRPITZ indicated that the German welding technique was of a poor standard.

TIRPITZ

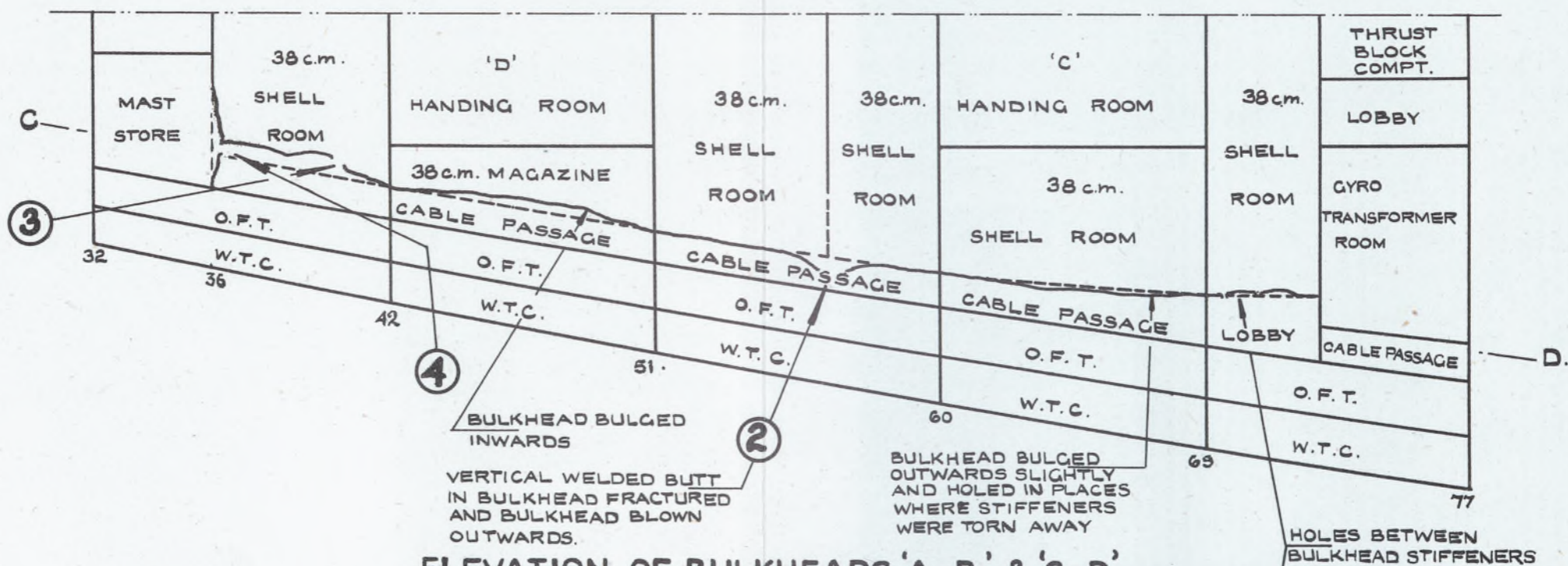
DAMAGE DUE TO INTERNAL EXPLOSION AT AFTER END.

FIGURE
B.4.2.

SCALE: 1/32 IN TO 1 FT.



MIDDLE PLATFORM DECK.



ELEVATION OF BULKHEADS 'A-B' & 'C-D'. [VIEW FROM OUTBOARD.]



○ — INDICATES THE DIRECTION IN WHICH PHOTOGRAPHS ON PLATES B.4.2(a) & B.4.2(b) WERE TAKEN.

ADMIRALTY
D.N.C. DEPT.
NG/A 63
N.H.
FEBRUARY 1948.

TIRPITZ.

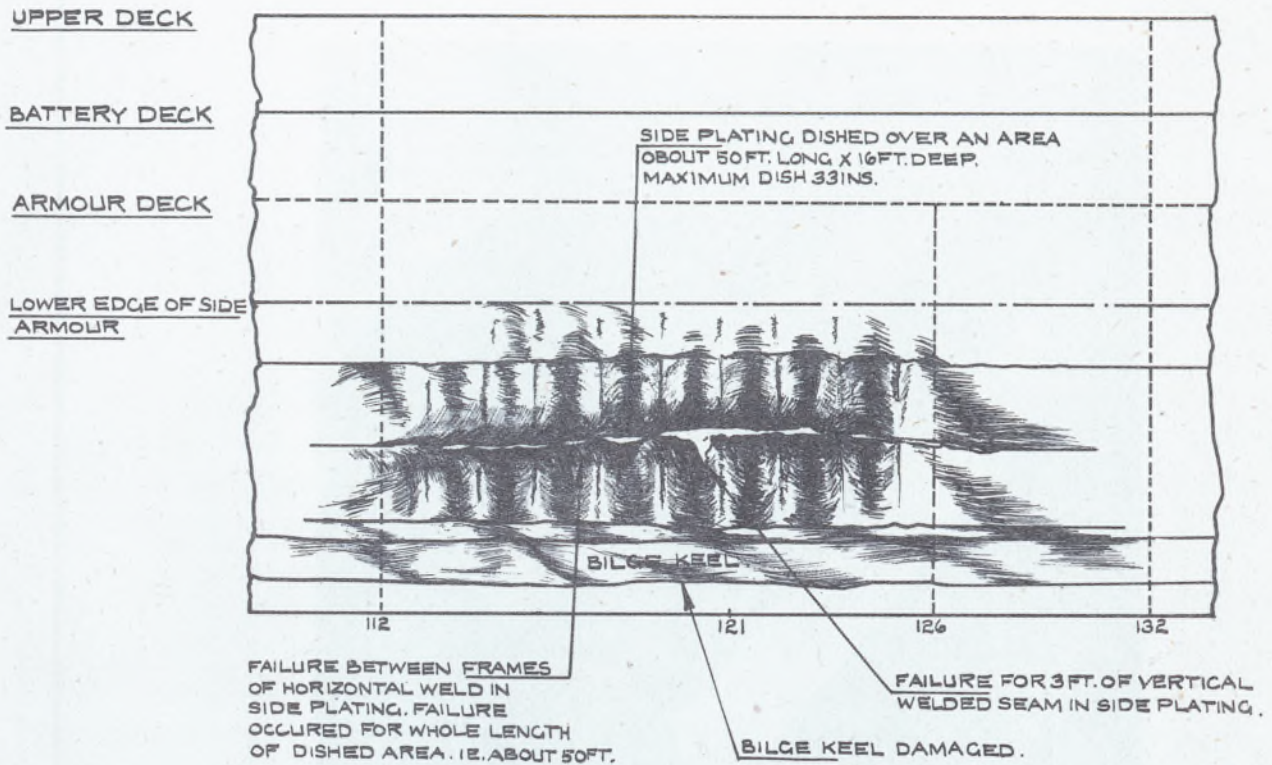
FIGURE
B.4.4.

DAMAGE CAUSED BY NEAR MISS BOMB.
[POSSIBLY 500LB. M.C. OR 600LB. A/S.]
DURING F.A.A. ATTACK ON 3RD APRIL '44.

SCALE=1IN TO 32 FT.

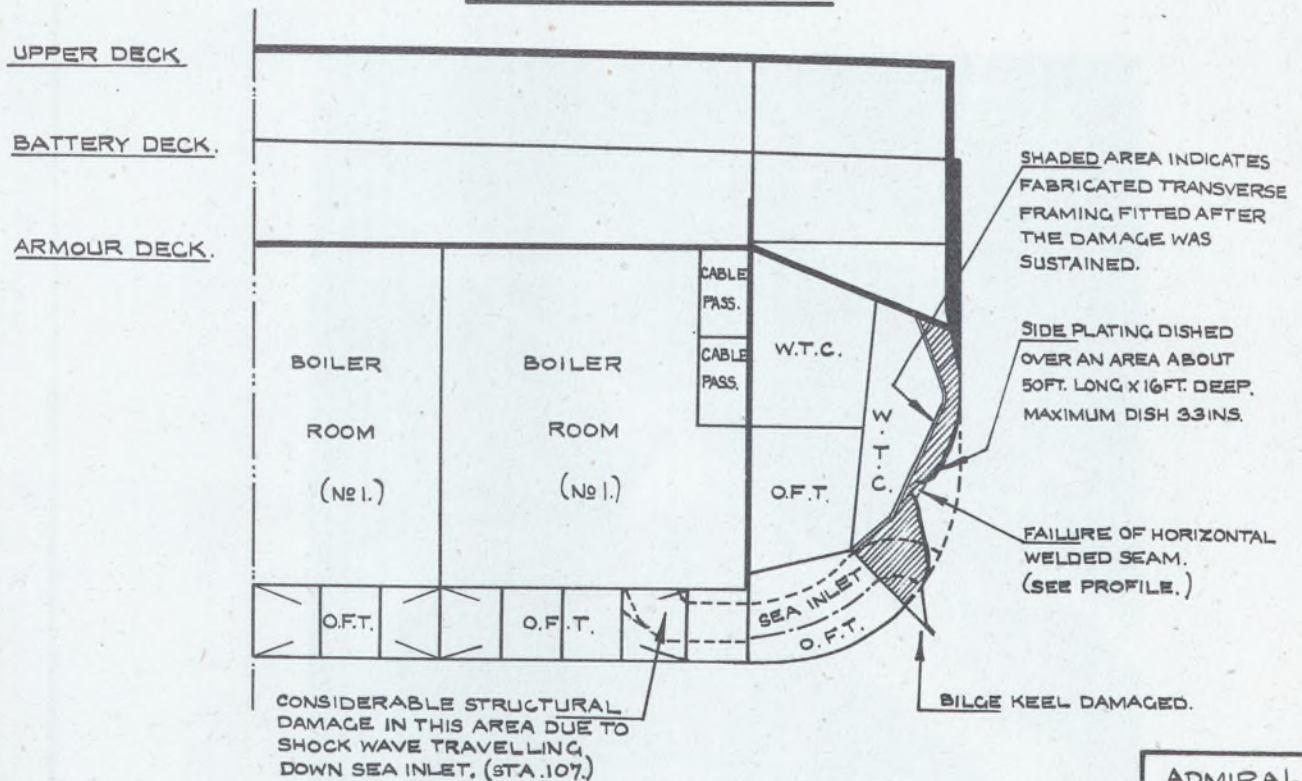
PART PROFILE

STARBOARD.



PART SECTION AT STA. 121.

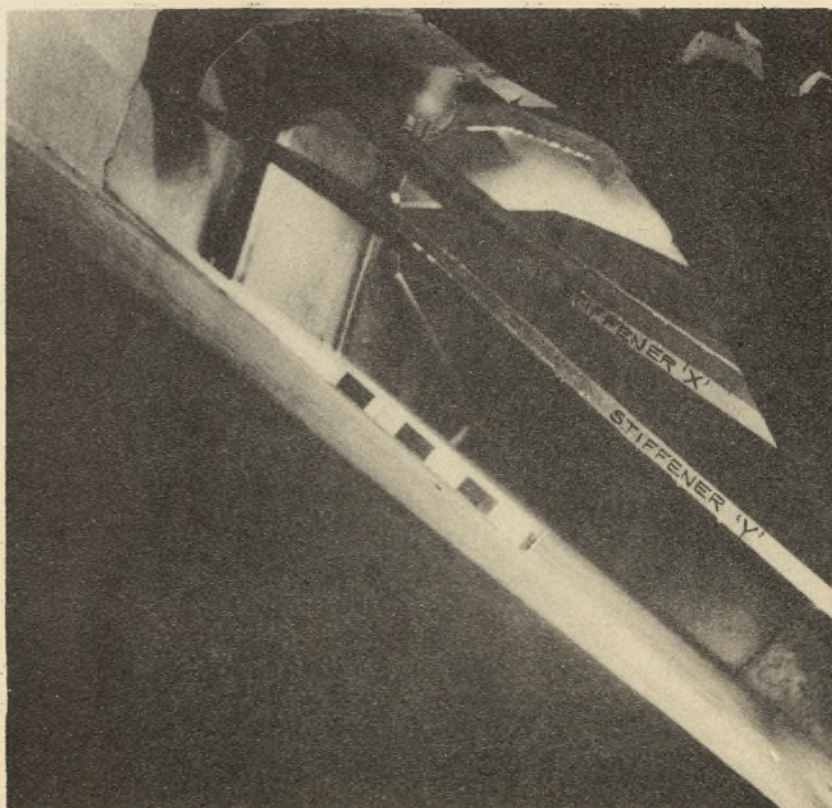
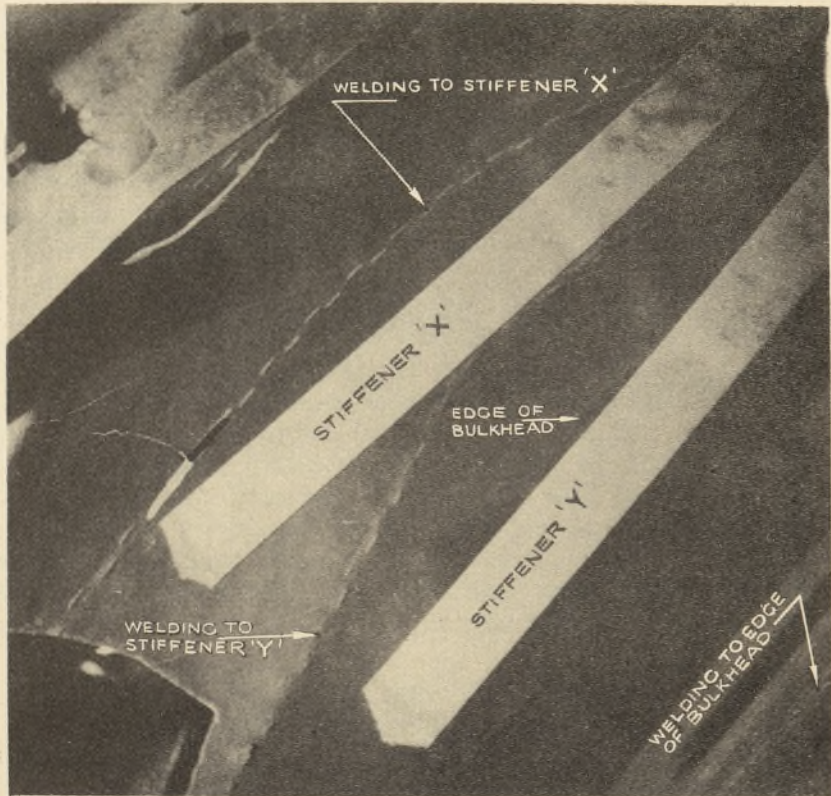
LOOKING FORWARD.



ADMIRALTY
D.N.C. DEPT
NG/AG4
N.H.
FEBRUARY, 1948

TIRPITZ

Transverse bulkhead blown away
from stiffeners, leaving stiffeners
in original position.



APPENDIX B - SURVEY OF WRECK AT TROMSØ
4th SEPTEMBER TO 15th OCTOBER, 1945 (Cont'd)

B.5 - SURVEY OF UNDERWATER PORTION OF THE WRECK

Note: In the following sections "above" and "below" refer to the ship as she was at the commencement of the last attack, that is, upright and on even keel.

5.1 General considerations affecting the survey

1.1 The programme of diving had to be arranged so that at any given time a maximum of useful information was being obtained, because it was clear that lack of daylight and bad weather would eventually put an end to diving. Any tendency to concentrate on one specific part of the damage had to be resisted. Diving was made difficult by the fact that the slightest movement stirred up the soft mud of the sea-bed and reduced visibility in the water to two or three feet. The water never really cleared during the time for which the diver was down. Entry into damaged areas released large quantities of oil fuel which also hampered diving.

1.2 At the commencement a quick survey of the whole of the submerged portion of the wreck was made to determine the position and nature of the major areas of damage. This preliminary survey, which took about eleven days, made it clear that the most important damage had occurred along the port side of the ship in Sections VIII to XIII, and it was decided to carry out a more detailed survey of this region. The damage to the bow, which occurred during the attack in Kaa Fjord on 15th September, 1944, may have been increased by a near miss during the final attack but, in view of the limited time available, was not considered to justify a detailed examination. The remainder of the damage to bottom plating was mainly in the nature of splits along welded butts and seams.

5.2 Damage resulting from direct hit by 12,000 lb. M.C. bomb at approximately station 113

2.1 Damage to side plating is shown in Figure B.5. It will be seen that there was a large hole about 45 feet long in this plating extending from below the bilge keel up to the level of the bottom of the side armour. Plating at the edges of the hole was petalled outwards. The centre of damage was approximately at station 113. The level of the sea bed in this area was just above the lower edge of the side armour and it was not possible to find out whether the side armour had been displaced by the explosion, but parts of the 110 mm. (4.33 inches) sloping deck armour were sticking out of the mud almost vertically. The general disposition of this armour and wrecked structure indicated that the main side armour had been blown out into some such position as indicated in the appropriate section of Figure B.5 and it is highly probable that the ship's side in this area was damaged right up to the upper deck.

2.2 It was possible, but only with some difficulty to get through the wreckage, consisting of portions of 110 mm. (4.33 inches) and 80 mm. (3.12 inches) deck armour and parts of the intermediate bulge bulkhead, as far as the longitudinal protective bulkhead. It was found that the latter had been blown outwards and that the hole in it was in the form of a large 'V', apex downwards, giving the impression that failure had occurred down the line of welding connecting it to the transverse bulkhead at station 112. The cables in the cable passage just inside the bulkhead were visible but it was impossible to get further inboard.

2.3 Having in mind the 0.07 secs. fuze delay which for bombs dropped from 12,000 feet or over, implies detonation 50 feet or more after impact, the sensitivity of even desensitized Torpex and the weakness of other Tallboy bombs, (for example, those which broke up on the concrete roofs of 'U' - boat pens and the broken nose of a bomb found on Haakoy Island) it appears probable that this bomb detonated prematurely after hitting the deck armour.

"TIRPITZ."

Damage to outer bottom plating
due to 1,600 lb. A.P. bomb (Fleet
Air Arm attack on 3rd April 1944;
-Hit No. XII).

Crack made good by driving in
liners, and by under water
welding.



"TIRPITZ."

Views of damage probably due to
the X-Craft attack (22nd Sept. 1943).

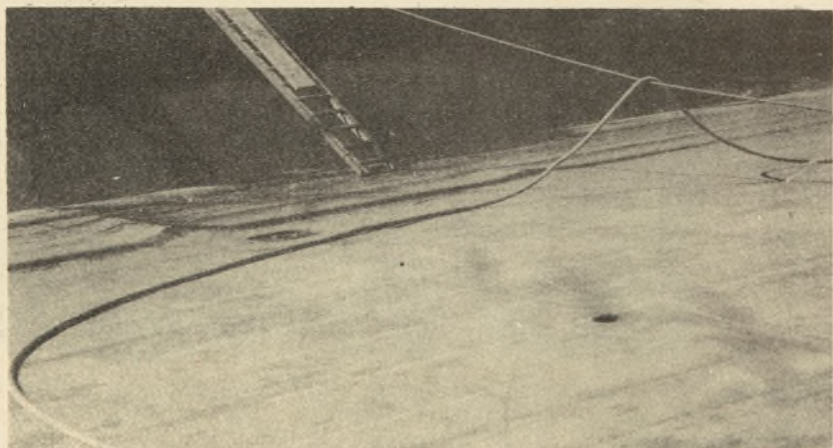


Crack in weld
and dishing in
flat keel plating.

Wedges driven
from inboard.

Hole cut to
examine damage
from inboard.

Buckling of
flat bottom
plating due
to whipping.



B.5 - SURVEY OF UNDERWATER PORTION OF THE WRECK (Cont'd)

5.3 Damage resulting from direct hit by 12,000 lb. M.C. bomb at approximately station 99

3.1 There was another large hole in the side plating, with edges petalled outwards, centred about station 99 as indicated in Figure B.5. This hole was about the same length as that described in the previous section (B.5.2), that is about 45 feet, but the damage to side plating was confined to an area above the bilge keel. A smaller hole centred about station 92 was also petalled outwards and was tightly packed with 15 cm. ammunition, which prevented access into it.

3.2 The level of the sea bed fell rapidly towards the fore end of Section VIII of the wreck and, at station 88, it could be seen that the main side armour had been ripped off the the ship's side. Forward of this at about station 90, one of the side armour plates was either missing or had been blown out so far that it was completely buried in the mud. It was possible to gain access into the ship above the sloping armour deck at this point but only for a short distance because of the way being barred by debris and wrecked structure. In the vicinity of station 98 the main side armour was also missing or completely buried in the mud and the 110 mm. (4.33 inches) sloping deck armour was well clear of the sea bed, being bent downwards into the form of a trough 7 to 8 feet deep. It is probable that in this area also the ship's side was damaged up to the upper deck.

3.3 Debris made it impossible to gain access through the larger hole up to the protective bulkhead, but the type of wreckage found in this area made it quite clear that there was a very large hole in that bulkhead and the general impression of the divers was that it had been blown outwards.

3.4 It is impossible to reach any definite conclusion as to where this bomb detonated as it is somewhat difficult to reconcile the sloping deck armour being arched downwards, but not ruptured, with a hole in the side plating extending to just above the bilge keel. The first feature suggests that this bomb detonated directly above and some distance from the sloping deck armour, but this thick deck plating should have screened the side plating below it. The evidence does, in fact, indicate that there may have been two explosions, one above and the other just below the level of the deck armour. For the same reasons as given in Section B.5.2. it is most improbable that this bomb detonated correctly.

3.5 There was a combined magazine and shell room, supplying P.III 15 cm. mounting just inboard of the protective bulkhead between stations 91 and 98. It is possible that the ammunition in it exploded and in fact, the evidence in paragraphs 4 (d), 4 (h) and 4 (j) of Section 14.1 of Volume 2 does suggest a small explosion in this area, but it is most improbable that such an explosion would have produced a hole of the same shape and position as that found in the side plating. Had the protective bulkhead abreast this magazine not been damaged previously, such an explosion would have vented through the thinner transverse bulkheads at the ends of the magazine.

3.6 It is therefore concluded that the damage in this area was caused by a bomb which detonated prematurely.

5.4 Damage resulting from the near miss with 12,000 lb. M.C. bomb at approximately station 128

4.1 The extent of damage to the outer bottom is shown in Figure B.5. It will be seen that there was a hole about 40 feet long x 17 feet deep, the plating around this hole being dished over a larger area. As the hole in the wreck was above the sea bed a ladder had to be rigged to gain access and it was found that the intermediate longitudinal bulkhead was blown in. The longitudinal

"TIRPITZ."

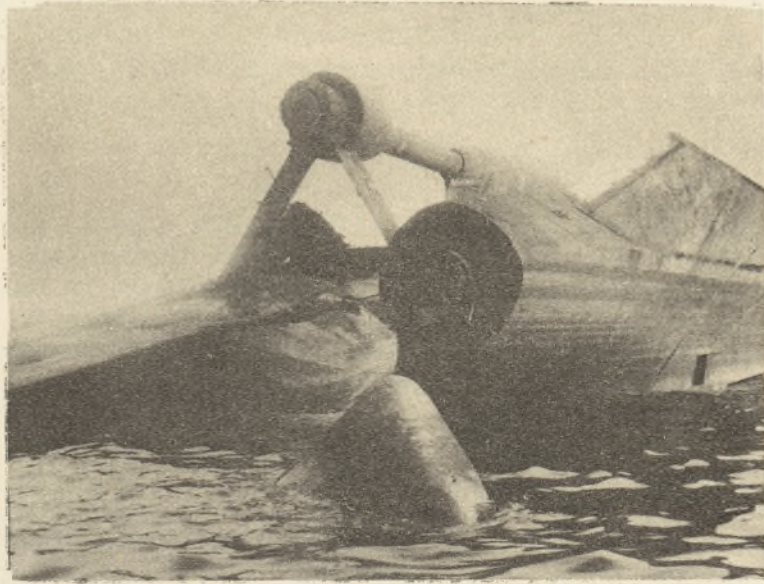
Damage at fore end due to near
miss bomb (15th Sept. 1944).



"TIRPITZ."

Plate B.57

Cracks in welding of hull plating
at after end.



B.5 - SURVEY OF UNDERWATER PORTION OF THE WRECK (Cont'd)

protective bulkhead could not be examined in detail in the time available but one diver gained access through the wreckage up to the protective bulkhead at the point where it joins transverse bulkhead 131.8. He found that the protective bulkhead was dished inwards and had fractured near the welding, the resulting gap varied up to 9 inches in width.

5.5 Damage to bow

5.1 Damage to the bow was consistent with various reports of the damage caused at Kaa Fjord on 15th September, 1944 except that a large portion of the wreckage was so loose and insecure that it was difficult to imagine that TIRPITZ could have steamed from Alten Fjord to Tromsø without it having been torn away. It was deduced that a further near miss had aggravated the damage in this area, but as this was of little importance as regards the capsizing the matter was not pursued further.

5.6 Damage in vicinity of port shaft swell

Interrogation of survivors had reported a near miss off the port quarter and, as pointed out in Section B.3, there was a crater caused by a near miss off the port side towards the after end abreast Sections III and IV of the ship. Diving confirmed considerable damage to the outer bottom plating in this region consistent with a near miss. Panels of plating were dished inwards and there were a number of cracks in welded seams. For example, there were two cracks 25 feet long and 12 feet long, both about 3 inches wide, along welded seams in the outer bottom, and several cracks in the port shaft swell, one being about 3 feet long x 4 inches wide.

5.7 Miscellaneous damage

7.1 There were a number of instances of dishing, cracks and splits of a minor nature in the outer bottom plating chiefly at the after end of the ship, which could not be directly attributed to any particular attack. The majority of the cracks and splits had been made watertight by underwater welding or by welding patches over them.

7.2 One area of plating had been blown away from the ship's starboard side, just above the upper deck in Section I of the ship and had been hauled up on to the wreck. The mess decks inside this hole showed evidence of damage having been caused by an explosion forward of this position. Although it was not at first clear what had caused this damage, later interrogations elicited that it had been cut away by a salvage party. (See Section B.2.)

7.3 There was a hole in the outer bottom plating between the arms of the port "A" bracket about 10 feet square. Inside the hole the structure had been wrecked by an internal explosion which had occurred somewhere forward of this position. It could not be ascertained whether the hole had been made by this internal explosion or whether it had been made deliberately by salvage parties.

5.8 Damage in turret 'C'

8.1 As had been expected, all turrets had fallen out of the ship as she turned over and all were on the sea-bed and partly buried in the mud. It was found, however, that turret 'C' was some 30 to 40 feet further outboard than had been expected and wreckage inside the up-turned gun house indicated that a large explosion had occurred inside the turret and had thrown it overboard. It was not possible to find the source of the explosion and suggestions that a bomb had hit turret 'C' or the deck in the vicinity led to a second survey being made. The whole of the quarter deck, with the exception of small regions to port of the turrets, was examined and was found to be intact. Had a bomb penetrated the regions which could not be examined, damage to the outer bottom plating on the port side would have occurred but no such damage could be found. Neither had turret 'C' roof been penetrated by a bomb and it was therefore

B.5 - SURVEY OF UNDERWATER PORTION OF THE WRECK (Cont'd)

concluded that no bomb had hit the ship in this area and that the explosion must have resulted from internal causes.

APPENDIX B' - SURVEY OF WRECK AT TROMSØ -
4th SEPTEMBER TO 15th OCTOBER, 1945 (Cont'd)

B.6 - CONCLUSIONS

6.1 Hits and Near Misses which caused damage to the ship

1.1 Consideration of the evidence obtained from this survey in conjunction with all the other evidence given in Section 14 of Volume 2 strongly suggests that in the final attack TIRPITZ received the following direct hits and near misses:-

- (a) Direct hit on the port side at about station 113 which detonated prematurely very shortly after impact on the armour deck just inside its junction with the longitudinal protective bulkhead.
- (b) Direct hit on the port side at about station 99 which detonated prematurely.
- (c) Direct hit to port of turret 'B' which detonated prematurely shortly after impact.
- (d) Near miss off port side abreast station 128
- (e) Near miss very close to starboard bow.

6.2 Structural Damage

2.1 It is not known whether near miss (e) added materially to the damage caused by the previous near miss in a similar position in September, but there is no evidence to suggest that this bomb appreciably affected the loss of the ship; nor is there any evidence as to the damage caused to the upper works by hit (c) but the survey confirmed that there was no damage to side or bottom plating in this area.

2.2 It was impossible completely to dissociate the damage caused by direct hits (a) and (b) and near miss (d), but between them they ruptured port side plating from the turn of bilge to at least the waterline over a length of approximately 200 feet amidships in Sections VIII to XIII. The longitudinal protective bulkhead, the bulge bulkheads outboard of it and the sloping armour deck were ruptured over a similar length. While it is probable that damage inside the ship extended inboard and above this, it was impossible to confirm these points in the survey as these parts of the ship were either obscured by a mass of debris or by the wreck being buried in the mud.

6.3 Flooding

3.1 The following sections of the ship at least would have been open to the sea and would have flooded very rapidly as a result of the damage indicated in the preceding paragraph:-

All bulge compartments between stations 77 and 146.

All port machinery spaces over the same length of the ship.

The Germans stated that immediate flooding extended forward of this to station 155, which is quite probable.

Note:- Calculations, using authentic stability data for TIRPITZ brought back from Germany by D.N.C's officers, show that the immediate flooding indicated above, together with the known flooding at the fore end and after end caused by the two previous attacks, was more than sufficient to capsize the ship. Flooding was probably much more extensive than this and may have been spread by the watertightness of doors in main bulkheads being vitiated, or doors may have been left

B.6 - CONCLUSIONS (Cont'd)

open by the escaping crew. In addition the internal explosion aft undoubtedly increased the extent of the flooding. Nevertheless, further calculations show that the above-mentioned immediate flooding with the ship otherwise, intact and in the best condition to resist capsize, would have produced the same ultimate result but, as pointed out elsewhere, the two hits and one near miss which caused this flooding could not have been in more effective places.

6.4 Capsizing

As a result of the flooding the ship heeled rapidly to port, attaining an angle of 20 degrees and then steadied momentarily. (At this angle of heel the port bilge keel would come into contact with the mud of the sea-bed which would check the rate of heeling). Some time after this, at an angle variously stated to be between 25 degrees and 70 degrees, an internal explosion occurred in the vicinity of the after main armament magazines, the order to abandon ship was given and the ship subsequently heeled to 145 degrees. She still lies in this position with the port side and the superstructures resting on the sea-bed.

TIRPITZ

DAMAGE DEDUCED FROM SURVEY OF WRECK.

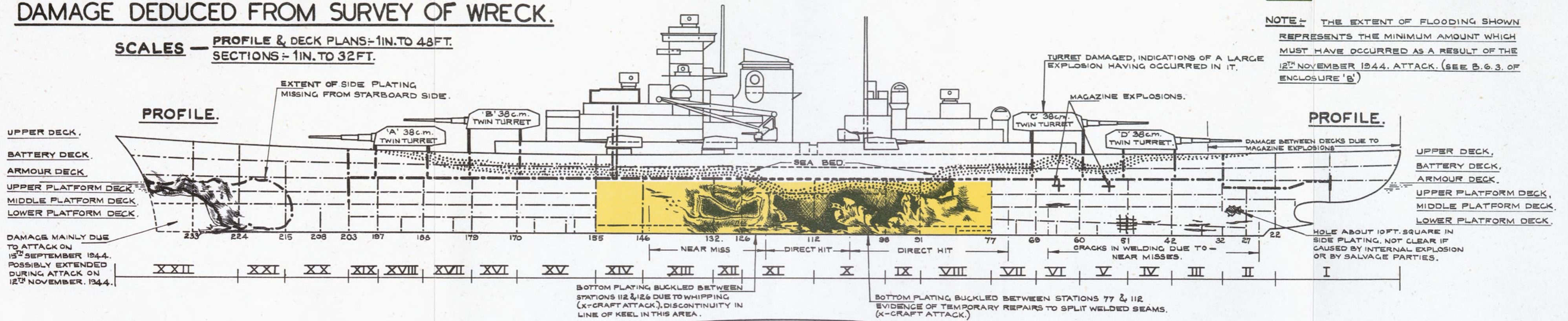
SCALES — PROFILE & DECK PLANS: 1IN. TO 48FT.
SECTIONS: 1IN. TO 32FT.

FLOODING KEY.

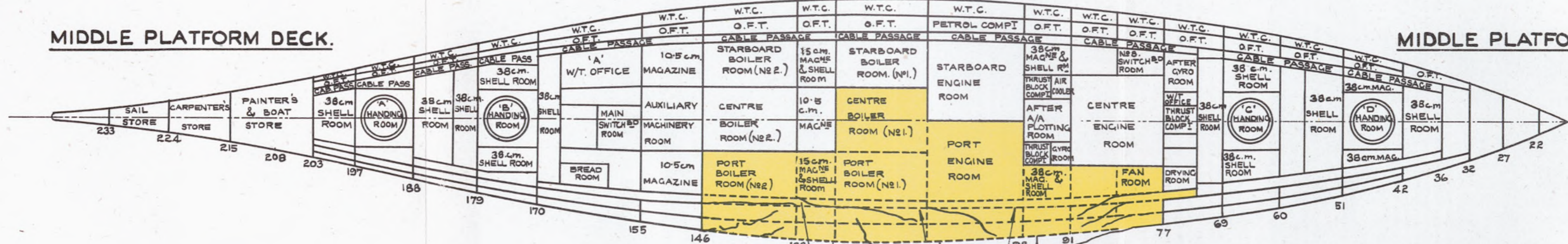
 UNCONTROLLED RAPID FLOODING.

FIGURE B.5.

NOTE — THE EXTENT OF FLOODING SHOWN REPRESENTS THE MINIMUM AMOUNT WHICH MUST HAVE OCCURRED AS A RESULT OF THE 12TH NOVEMBER 1944. ATTACK. (SEE B.6.3. OF ENCLOSURE 'B')

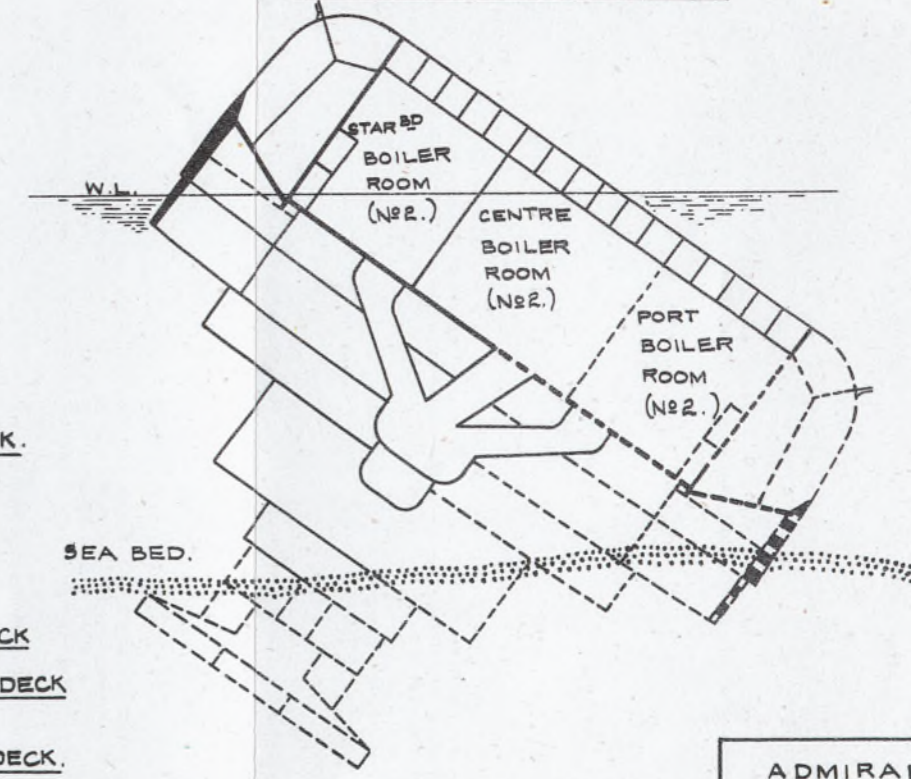


MIDDLE PLATFORM DECK.

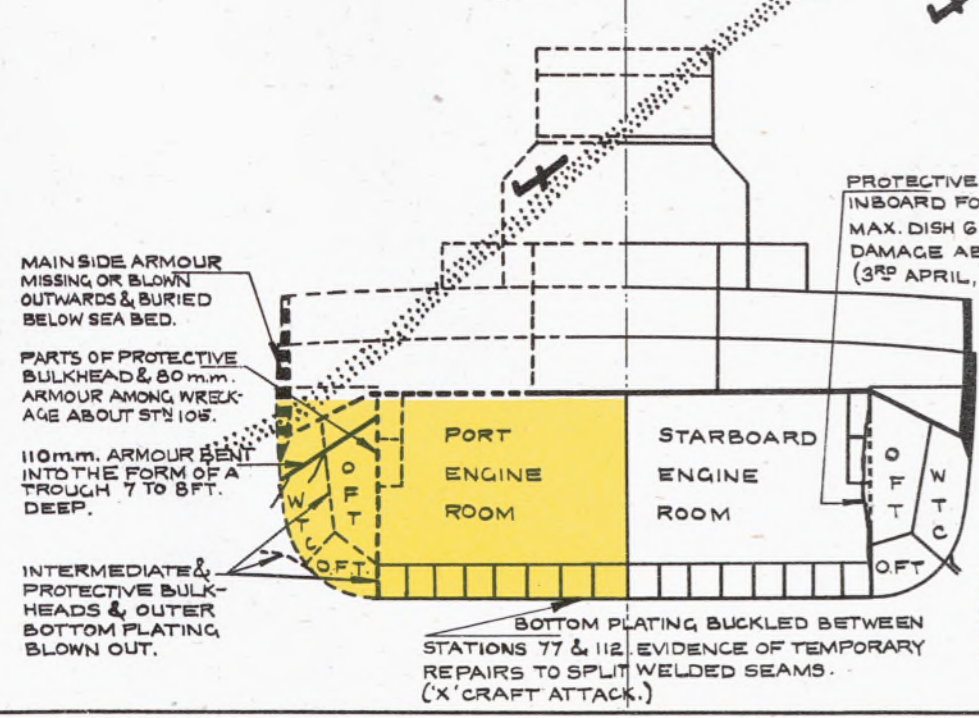


MIDDLE PLATFORM DECK.

SECTION AT 132. [LOOKING FORWARD]
SHOWING POSITION OF SHIP AT TIME OF SURVEY.

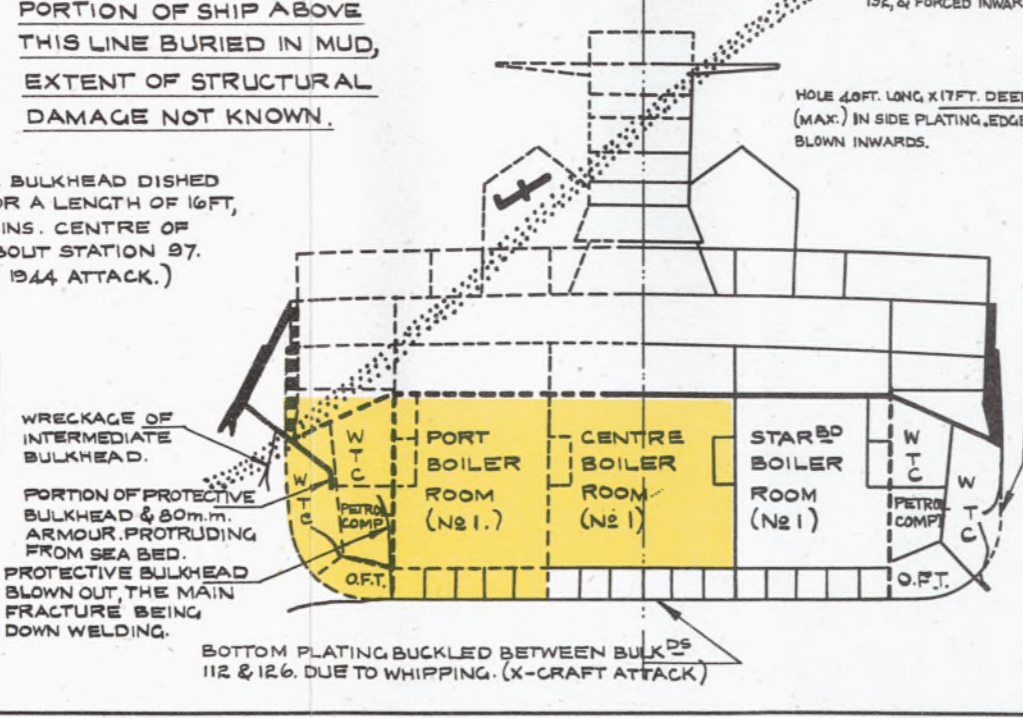


SECTION AT 99. [LOOKING FORWARD]



PORTION OF SHIP ABOVE THIS LINE BURIED IN MUD, EXTENT OF STRUCTURAL DAMAGE NOT KNOWN.

SECTION AT 113. [LOOKING FORWARD]



SECTION AT 132 [LOOKING FORWARD]

