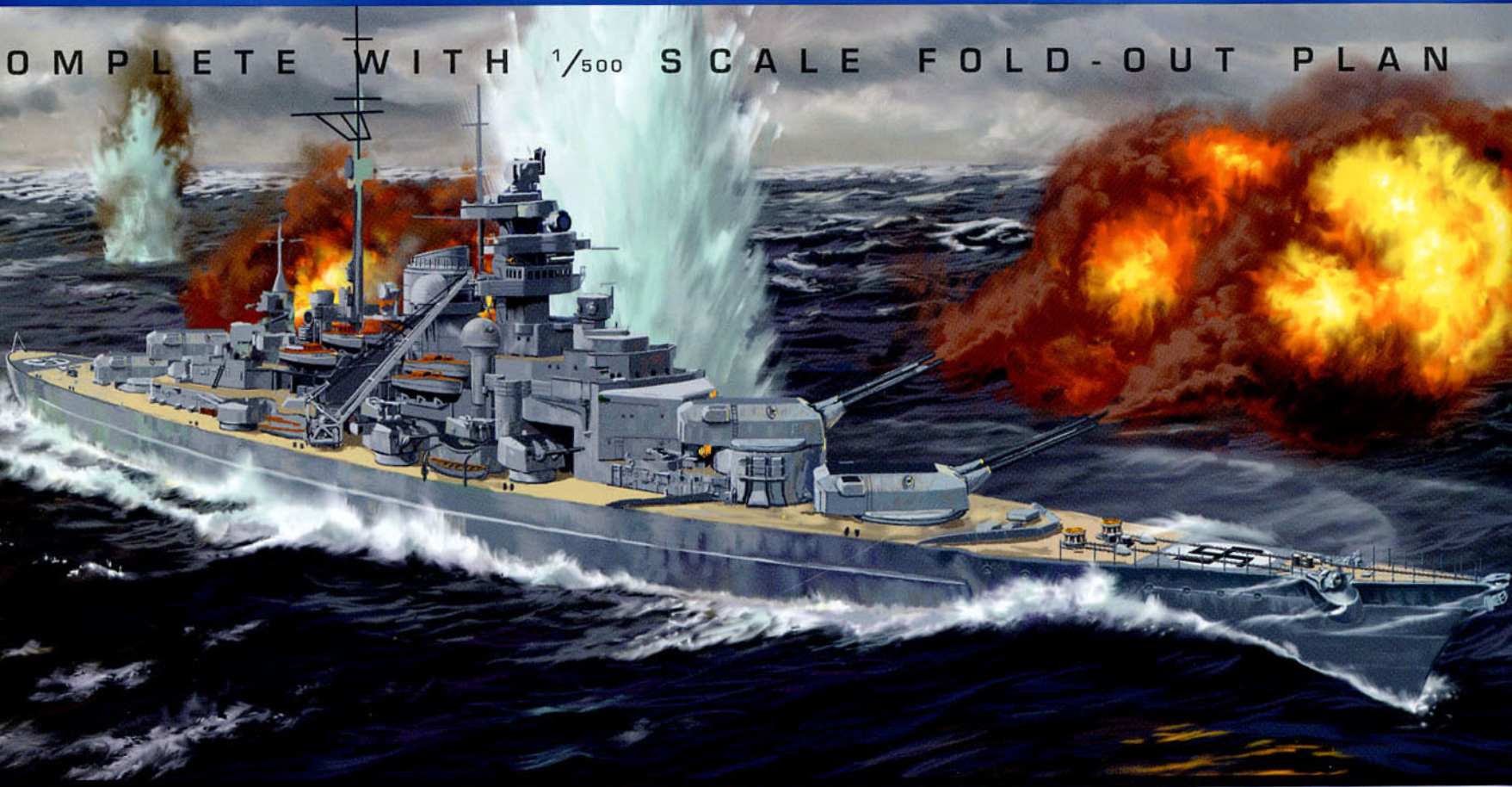


A N A T O M Y O F T H E S H I P

The Battleship **BISMARCK**

COMPLETE WITH $\frac{1}{500}$ SCALE FOLD-OUT PLAN



A N A T O M Y O F T H E S H I P

The Battleship **BISMARCK**

J A C K B R O W E R

A GENERAL ARRANGEMENTS

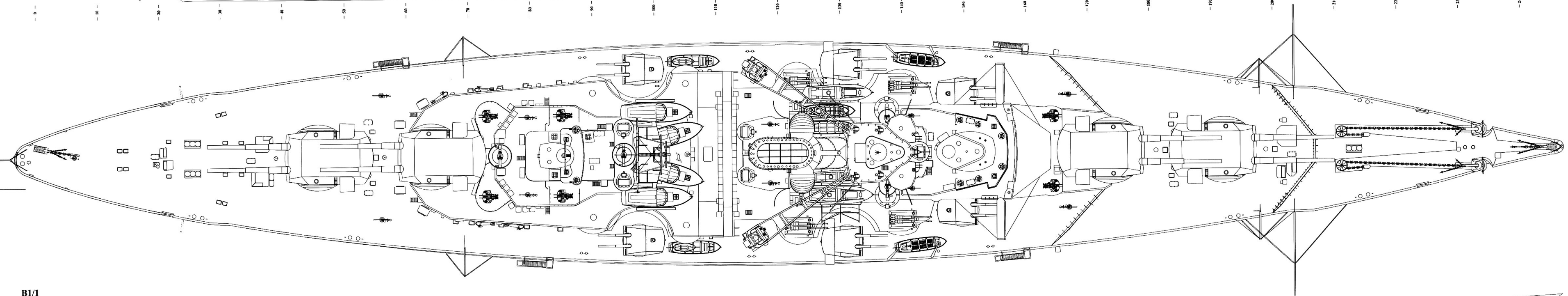
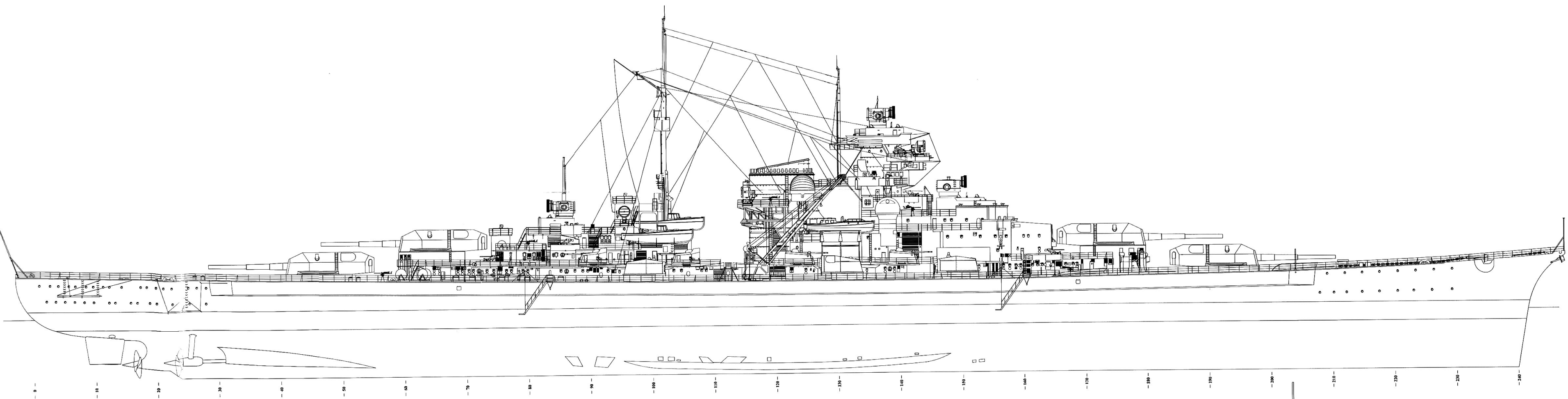
A1 Plan and Profile

- A2/1 External Profile Starboard (1:500 scale)
[As commissioned August 1940]
- A1/1 Plan View (1:500 scale)
- A2/4 Bow (1:300 scale)

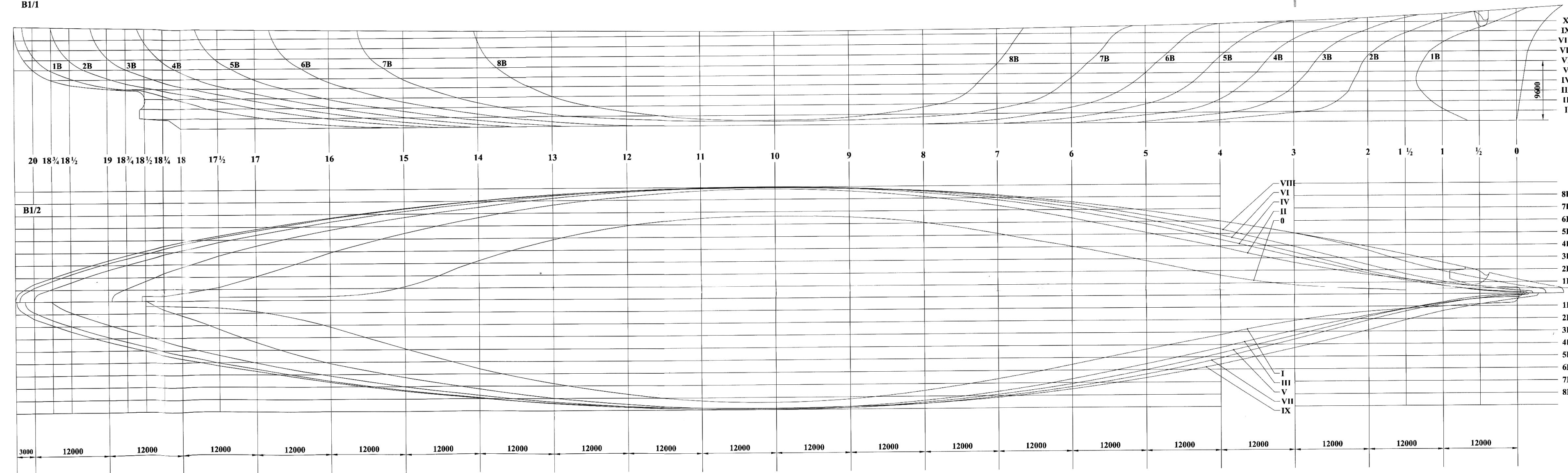
B HULL STRUCTURE

B1 Lines and Body Plans

- B1/1 Sheer Elevation (1:500 scale)
- B1/2 Waterline Plan (1:500 scale)



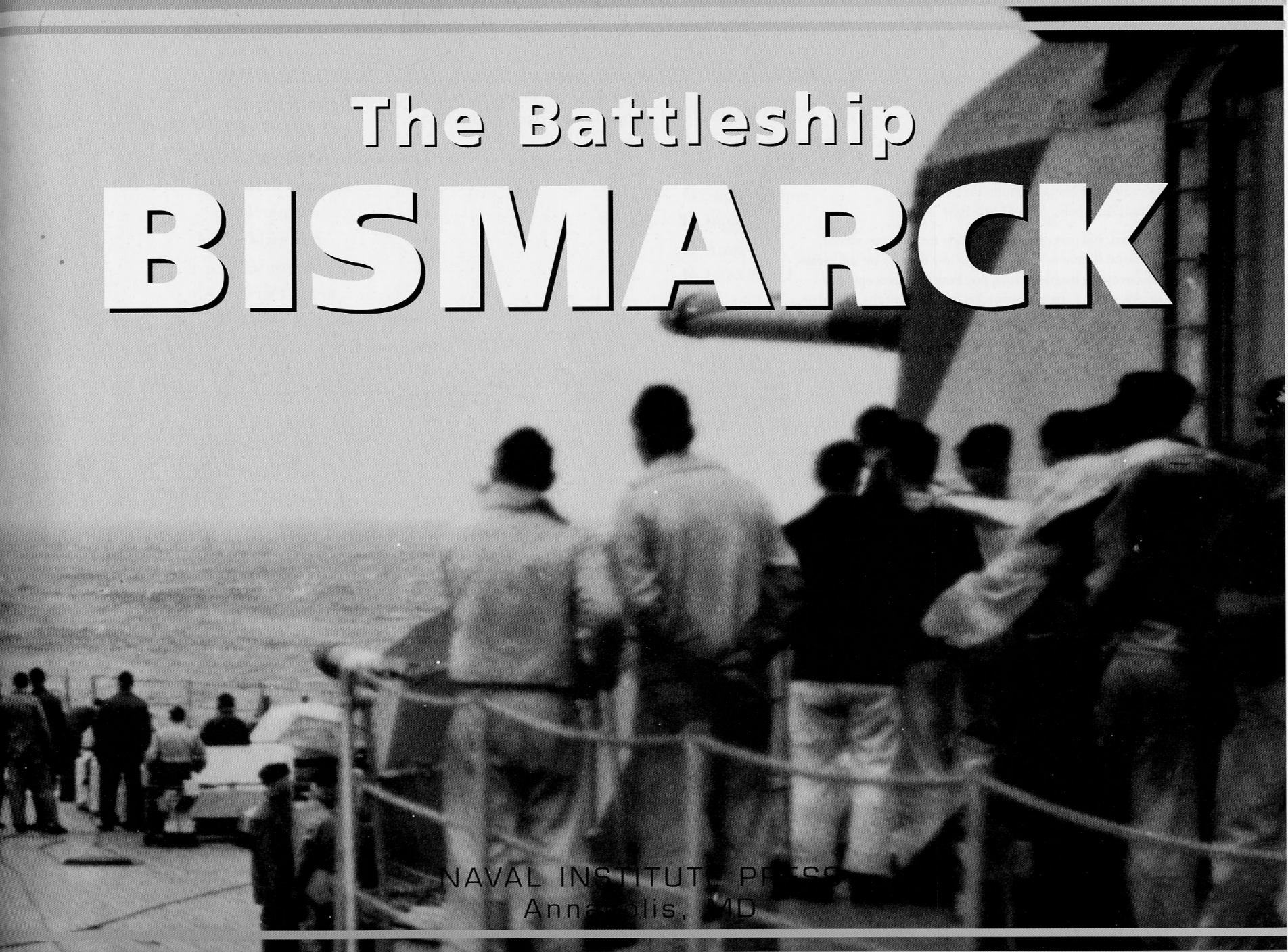
B1/1





A N A T O M Y O F T H E S H I P

The Battleship **BISMARCK**



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Frontispiece:

Bow view of *Bismarck* refuelling, taken
from *Prinz Eugen* in the Baltic.

(CPL)

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Bismarck (1939) was the sixth, and to date the last German ship named in honour of Otto von Bismarck, who is considered the founder of the German Empire. Born in 1815, he became Germany's first Chancellor in 1871, and remained in this position until 1890. The first *Bismarck* was a 3,300-ton flush-decked corvette launched on 25 July 1877 and commissioned on 27 August 1878. She was used mainly as a training vessel before being stricken and used as a barrack hulk in 1891. The second ship, *SS Fürst Bismarck*, a liner of 8,430 tons built for the Hamburg-American line, was launched on 29 November 1890. After making regular runs between Hamburg and New York, she was sold to the Russian navy in 1904. The third ship was the 10,690-ton armoured cruiser *Fürst Bismarck* launched on 25 September 1897. She remained in active service until 1915, when converted for use as a training and office vessel, and was sold for scrap on 17 June 1919. The fourth ship was again a liner for the Hamburg-American line. *SS Fürst Bismarck* displaced 8,320 tons and was launched on 10 June 1905. In 1913 she was renamed *Friedrichsruhe* and renamed again as *Amboise*, which sailed under the French flag before being scrapped in 1925. The *SS Bismarck*, a large three-funneled liner of 56,550 tons was to be the fifth vessel named in honour of the Chancellor. Although launched on 20 June 1914 as another Hamburg-American line vessel, construction was halted due to the First World War. As part of the Treaty of Versailles at the end of the war, the liner was completed in March 1922 and handed over to the British, who renamed her *RMS Majestic*. When *Majestic* was commissioned, she was the largest liner afloat. The final *Bismarck* (and subject of this book) was built in 1939. She and her sister ship *Tirpitz*, launched in April 1939, were the largest and heaviest warships ever completed by any European nation.

When Germany entered the First World War on 1 August 1914, the *Kaiserliche Marine* (Imperial Navy 1871–1919) comprised, in front line service, four battleships of the *Nassau* class armed with 28cm guns, nine battleships armed with 30.5cm guns (four of the *Helgoland* class and five of the *Kaiser* class) and four battlecruisers armed with 28cm guns, *Von Der Tann*, *Moltke*, *Goben* and *Seydlitz*. Also in German service were twenty-two older pre-dreadnoughts, most of which served as training and coastal-defence ships during the war. By the end of the war, Germany had increased its fleet with four battleships of the *König* class as well as three battlecruisers of the *Derfflinger* class armed with 30.5cm guns, and two battleships of the *Bayern* class armed with 38cm guns. Two further ships of the *Bayern* class and two battlecruisers of the *Mackensen* class were launched, but never commissioned. When Germany signed the Armistice on 11 November 1918, it was required to have seventy-four of its ships interned in neutral ports. On 19 November

1918, the German fleet, including eleven battleships and five battlecruisers, sailed for the Firth of Forth and was subsequently interned at Scapa Flow. It was always the hope of the German navy that the interned ships would be returned to Germany, but under the peace terms the German fleet was to be surrendered to the Allies. However, on 21 June 1919, while still interned at Scapa Flow, the German fleet was scuttled to prevent them being seized by the British. With the exception of the battleship *Baden*, which was taken in tow and beached, all German capital ships were successfully scuttled. When Germany signed the Versailles Treaty on 28 June 1919, the war was officially over. Under the terms of the treaty, Germany was permitted to retain only six battleships, with two others in reserve. The newly established *Reichsmarine* (National Navy 1919–1935) retained six pre-Dreadnoughts: three ships of the *Braunschweig* class – *Braunschweig*, *Elsass* and *Hessen* all completed between 1904 and 1905; three ships of the *Deutschland* class – *Hannover*, *Schlesien* and *Schleswig-Holstein* completed between 1907 and 1908. Under the terms of the treaty, these ships could not be replaced until twenty years after their launching date. The Versailles Treaty also limited new armoured ship displacement to 10,000 tons, but did not place restrictions on gun calibre.

Discussions on how to replace the older battleships began in 1920 under the direction of Admiral Behncke. Still bound by the Versailles Treaty, any new vessels could not displace more than a maximum of 10,000 tons, but Germany was not part of the Washington Treaty, drawn up in 1922 to limit the calibre of guns (see page 7). Preliminary designs for German naval ships were the responsibility of the Construction office in consultation with the Weapons office. These preliminary designs would then be presented to Navy Command Office for approval, or additional direction. There were two different ideas of what composition the new ships should be: (a) slow monitors with good protection; (b) fast, well-armed cruisers with less protection. At that time option (a) was rejected, as the ships would only be suitable for coastal defence. However, in 1923 option (a) was again studied and a design known as I/10 was produced with four 38cm guns. In order to keep this ship within the weight restrictions, several compromises were made which made the design unsuitable. It was felt that a 200mm belt and 30mm deck was too weak, and a ship speed of 22 knots was too slow. Design work then progressed on to option (b), which resulted in a ship armed with eight 21cm guns in four turrets, two forward and two aft. This design known as II/10 had the guns mounted on a ship with a twin turbine powerplant capable of driving the ship at 32 knots, and a light armour protection of an 80mm belt and 30mm deck. Again the Navy Command Office rejected this design as unsuitable, and further design work was halted.

The following year further discussions suggested that it might be possible to mount 38cm guns on a hull displacement of 10,000 tons, but it was felt the allies would not permit this size of gun. Subsequent design sketches were produced for a ship mounting six 30.5cm guns.¹ The first of the new designs known as *Entwurf II/30* featured diesel propulsion. Germany had great success with diesels in the hundreds of U-boats used during the First World War. Diesel engines offered many advantages over steam plants. They required less space, power was immediately available with no waiting time for steam to be generated, there was greater freedom in speed selection, fewer engine-room personnel were needed, and the economic engines allowed for greater range. They also had some disadvantages in that the plant was heavy and not yet as reliable. Further designs were put forth, but once again all these proved to be unsatisfactory. In 1925, several design conferences were held in an attempt to come up with a suitable design that would fit within the restriction placed on Germany by the treaty. This resulted in six completely new designs, all of which were also dismissed. In 1926 and early 1927 yet more design sketches were produced.

After eighteen different design sketches and eight years of discussion, the design for a 10,000-ton ship armed with 28cm guns was finally agreed upon. The order for the first new *Panzerschiff* (Armoured ship) was placed on 17 August 1928 with the Deutsche Werke yard in Kiel. This vessel, which would be named *Deutschland*, was laid down on 9 February 1929, and launched on 31 May 1931. *Deutschland* was powered by eight diesel engines driving two shafts; a maximum speed of 28 knots was achieved with 48,390 bhp. The vessel was armed with six 28cm guns in two triple mountings, eight 15cm guns in single mountings, and six 10.5cm guns in three twin mountings. *Deutschland* was listed with a standard displacement of 10,000 tons, but had an actual standard displacement of 12,630 tonnes. It was not an uncommon practice in the years prior to the war to understate warship displacements. *Deutschland* and her near sister ships, *Admiral Scheer* commissioned 12 November 1934 and *Admiral Graf Spee* commissioned 6 January 1936, were revolutionary warships that had the speed and displacement of a cruiser but the armament of a battleship. They were intended to be superior to any Washington Treaty cruiser and faster than any battleship. Two larger 20,000-tonne *Panzerschiffe* were also under construction: 'Panzerschiff D' Ersatz Elsass and 'Panzerschiff E' Ersatz Hessen were laid down 14 February 1934.

The appearance of the *Deutschland* class was a cause of concern for some of the major naval powers signed up to the Washington Treaty. France saw these vessels as a threat, and promptly ordered two larger battleships of the *Dunkerque* class: *Dunkerque*, laid down on 24 December 1932, and *Strasbourg*, laid down on

25 November 1934. These ships had a standard displacement of 26,500 tons mounting eight 33cm guns, a speed of 30 knots and armour sufficient to withstand 28cm shells. On hearing of the *Dunkerque* class Germany was forced to review its plans for the fourth and fifth *Panzerschiffe*, which were both ordered on 25 January 1934. On 5 July that year, Adolf Hitler, despite the 10,000-ton limit of the Treaty of Versailles, gave his permission to add a third triple turret increasing the number of guns to nine 28cm. Work halted on the *Panzerschiff D* and *E*, while new designs were drawn up for a ship that would displace 31,500 tons. On 16 March 1935, Hitler unilaterally chose to ignore any restrictions placed on Germany by the Treaty of Versailles, and declared sovereignty in Germany's defence matters. This meant that the new ships were no longer to be bound by the 10,000-ton limit. This allowed Germany to proceed with the construction of larger ships. The newly redesigned *Panzerschiff E* was laid down again on 6 May 1935, followed by *Panzerschiff D* on 15 June. *Panzerschiff D* was launched on 3 October 1936 as *Scharnhorst*, with *Panzerschiff E* launched on 8 December that year as *Gneisenau*. *Scharnhorst* and her sister were armed with nine 28cm guns in three triple mountings, twelve 15cm guns in four twin mountings and four single mountings, and fourteen 10.5cm guns in seven twin mountings. Each vessel had a standard displacement of 31,847 tons and armour that would withstand hits from a 33cm shell. Their high-pressure steam boilers and turbines gave the ships a speed of 31½ knots at 160,050shp.

The British Government, aware of the developments within Germany, thought that restrictions should be put in place to limit the strength and size of the German navy. Adolf Hitler, desiring reconciliation with the major naval powers, entered into negotiations with Britain, which resulted in the Anglo-German Naval Agreement signed on 18 June 1935. This agreement permitted Germany thirty-five per cent of Britain's capital ship displacement. At this time the Royal Navy's capital ships amounted to 525,000 tons, which allowed Germany 184,000 tons. Once the *Scharnhorst*-class, and *Deutschland* vessels were subtracted from the equation, this left Germany with 101,000 tons available for new ships. The design of new vessels would be subject to the Washington Treaty, which had been signed by the five major naval powers of United States, Great Britain, France, Italy and Japan, on 6 February 1922, in an attempt to stop a naval arms buildup. Restrictions were placed on standard displacement and gun calibre. A capital ship was not to exceed 35,000 tons displacement, or carry guns with a calibre in excess of 16 inches (406mm). Non capital ships were not to exceed 10,000 tons.

From the particular circumstances of this new agreement came the design and construction of the two ships of the *Bismarck* class.

SHIP'S HISTORY

- 16 November 1935** Blohm & Voss are awarded the building contract for *Bismarck*.
- 1 July 1936** The first keel plates are laid.
- 14 February 1939** The hull is launched, with Adolf Hitler in attendance. Frau Dorothea von Loewenfeld, a grand daughter of Prince Otto von Bismarck, christens the ship. In keeping with German tradition, the name of the vessel is not known until the moment of christening, when a board bearing the name is swung over the side to hang on the forecastle. The hull remains in the hands of the shipyard, where outfitting work proceeds on schedule. The straight stem of the original design is replaced by an Atlantic bow, which was designed to reduce wetness forward by flaring out the hull.
- 24 August 1940** *Bismarck* receives her commission.
- 15–17 September 1940** Begins sea trials. Sails from Hamburg via Kiel Canal to Scheerhafen near Kiel. Minor collision with tug *Atlantik*, neither ship sustains damage. Anti-aircraft guns participate in defence of Brunsbüttel Roads; expends 13 x 10.5cm, 136 x 3.7cm, and 191 x 2.0cm. No visible results.
- 17–28 September 1940** Anchors near Kiel. Ship's guns aligned.
- 28 September –** Sails to Gotenhafen naval base in the Gulf of Danzig.
- 05 December 1940** Conducts sea and speed trials in Baltic Sea, reaching maximum speed of 30.1 knots.
- 05–09 December 1940** Ship returns to Hamburg.
- 09 December 1940 –**
- 06 March 1941** Ship receives finishing touches.
- 06–08 March 1941** Leaves Hamburg, sails to Scheerhafen.
- 08–17 March 1941** Camouflage paint added. Supplies embarked (ammunition, fuel, water etc). Two Arado 196 floatplanes (T3+DL, T3+MK) embarked.
- 18 March –**
- 02 April 1941** Conducts trials in the Baltic.
- 02 April 1941** Docks in Gotenhafen. Last two Arado 196 floatplanes (T3+IH, T3+AK) embarked.
- 05 May 1941** Adolf Hitler, Field Marshal Wilhelm Keitel, Admiral Lütjens, and other staff visit *Bismarck* in Gotenhafen.
- 13–14 May 1941** Conducts various exercises in Baltic, including refueling with heavy cruiser *Prinz Eugen*, and light cruiser *Leipzig*. Port side crane damaged and disabled as result of exercise with *Leipzig*.
- 16–18 May 1941** Ship docked at Gotenhafen. Port side crane repaired.
- Operation Rheinübung** Commerce raiding was at the centre of German Navy doctrine during the Second World War. Following the success of Operation Berlin, in which under the command of Admiral Günther Lütjens twenty-two allied ships totalling 115,622 tons were sunk by the battleships *Scharnhorst* and *Gneisenau*, the German Admiralty laid plans for another operation. Operation *Rheinübung* ('Exercise Rhine') was to conduct warfare in the North Atlantic against the allied convoys. The objective was to destroy as much shipping as possible from the USA and Great Britain.
- Originally *Bismarck* was to be accompanied on the operation by *Scharnhorst* and *Gneisenau*, but it was not possible to use them due to damage from British air attacks and mechanical failure, and so the heavy cruiser *Prinz Eugen* became *Bismarck*'s accompanying vessel. Admiral Günther Lütjens was chosen to lead Operation *Rheinübung* and on Sunday, 18 May 1941,

Admiral Lütjens briefed the officers of the *Bismarck* and *Prinz Eugen* of his intentions.

Sunday 18 May 1941 With Admiral Günther Lütjens (group commander), Captain Ernst Lindemann and 2198 other officers and men aboard, *Bismarck* leaves Gotenhafen to anchor in the bay to take on fuel and supplies.

Monday 19 May 1941

02:00 Departs Gotenhafen sailing West.
12:00 Course set at 54° 54' north 13° 20' east. Joins formation with *Prinz Eugen* and destroyers Z-16 *Friedrich Eckoldt* and Z-23 off Rügen Island.
22:30 Destroyer Z-10 *Hans Lody* joins formation.

Tuesday 20 May 1941

02:00–06:00 Passes through the Great Belt with *Prinz Eugen* and escort of three destroyers.
13:00 Sighted by Swedish cruiser *Gotland* in the Kattegat.

Wednesday 21 May 1941

08:00–09:00 Enters Korsfjord near Bergen.
11:00 Anchors in the Grimstadfjord.
13:15 Photographed by Spitfire of British Coastal Command.
20:00 Leaves Grimstadfjord with *Prinz Eugen* and escort of three destroyers.
23:40 Course set at 0°.

Thursday 22 May 1941

04:20 Destroyer escort leaves formation. *Bismarck* takes position in the lead.
12:00 Position 65° 53' north, 03° 38' east. Course 0°, speed 24 knots.
12:37–13:07 U-boat and air alarm. Zig-zagging.

Friday 23 May 1941

12:00 Position 67° 28' north, 19° 28' west. Average speed 24 knots.

18:48 *Bismarck* and *Prinz Eugen* reach the ice limit. Steer to avoid large ice.
19:22 *Bismarck* sights *Suffolk*. *Suffolk* reports *Bismarck* and *Prinz Eugen* in the Denmark Straits.
20:30 *Bismarck* sights *Norfolk* in the fog and fires five heavy artillery gun salvos. No hits scored. The forward radar set on *Bismarck* is disabled. *Prinz Eugen* takes over position in the lead.
22:00 *Bismarck* reverses course to try and engage *Suffolk*, which manages to avoid contact.
23:30 *Bismarck* and *Prinz Eugen* enter a snowstorm.

Saturday 24 May 1941

05:47 Sights two ships at the horizon. Speed 28 knots.
05:52–05:53 British ships *Hood* and *Prince of Wales* open fire.
05:53 *Prince of Wales* fires both its forward turrets at *Bismarck*.
05:55 *Bismarck* and *Prinz Eugen* open fire, concentrating on *Hood*.
05:56 *Prinz Eugen* scores hit on *Hood* with 4th salvo, on port side of the shelter deck by main mast. Fire starts among ready-use munitions.
05:59 Lütjens commands *Prinz Eugen* to shift target to *Prince of Wales* after she fires her 6th salvo.
06:00 *Hood* changes course by 20° to port, to bring the after turrets (C, D) into action. Speed: about 28 knots.
06:01 *Bismarck*'s 5th full salvo. *Hood* blows up. *Prince of Wales* changes course to avoid collision. *Bismarck* shifts target to *Prince of Wales*.
06:02 *Prince of Wales* now under concentrated fire from *Bismarck* and *Prinz Eugen*.
06:03 *Prince of Wales* takes direct hit on the bridge, turns south and leaves the battle scene with smoke billowing from her superstructure. *Prince of Wales* hit by seven shells – four 38.0cm and three 20.3cm.

06:20 Ceasefire ordered after *Bismarck* has fired 93 x 38.0cm shells and *Prinz Eugen* has fired 183 x 20.3cm shells. *Prinz Eugen* received no hits, while three shells hit *Bismarck*.

Shell one hit in the forward sections XX–XXI entering port side and exiting starboard without exploding. Between 1,000 and 2,000 tons of water filled these spaces and the forward pump room, causing *Bismarck* to be down 3° by the bow. As a result of this flooding approximately 1,000 tons of fuel could not be transferred. Shell two hit amidships below the water line in section XIV, and exploded against the torpedo bulkhead, near the transverse bulkhead at frame 145.6. This caused the flooding of port dynamo No. 4 necessitating the shut down of generators in that compartment. Port Boiler Room 2 also took on some water. Shell three demolished the Admiral's gig on the port side, before entering the water. Fragments from the gig damaged the catapult swing and severed a compressed air line that supplied air to the catapult.

The effects of the shells meant that *Bismarck* had a 9° list to port and was down 3° by the bow, although counter flooding improved this. Speed was reduced to 28 knots. No casualties as a result of action with *Hood* and *Prince of Wales*.

12:00 *Bismarck* and *Prinz Eugen* change course to 180° south.

14:20 Speed reduced to 24 knots.

18:14 *Bismarck* turns 180° to starboard back towards *Suffolk*, while *Prinz Eugen* maintains previous course to separate from *Bismarck*.

18:40–18:56 *Bismarck* fires shells at *Suffolk* and *Prince of Wales*.

23:30–23:45 Aircraft carrier *Victorious* launches nine Swordfish torpedo planes and six Fulmar fighters. Eight of the Swordfish attack *Bismarck*. Her speed increases to 27 knots when aircraft are spotted. She is hit by one torpedo on the starboard side, amidships near frame 145.6 at the armour belt level. Shock damage from torpedo causes complete flooding of Port Boiler Room 2. During manoeuvres to avoid torpedoes the collision mats in forward sections are loosened, which causes bow trim to increase. Speed reduced to 16 knots. After temporary repairs are made speed increased to 20 knots.

Sunday 25 May 1941

03:06 *Bismarck* begins long turn to starboard; zig-zagging British vessels turn to port. When British ships turn to port at next leg of zig-zag and to regain radar contact on *Bismarck*, no signal is found and contact is lost.

04:06 *Bismarck* continues turn to starboard until course of 130°.

09:00 Admiral Lütjens sends long radio message to Group West. British using radio direction finding gear narrow their search.

Monday 26 May 1941

10:30 *Bismarck* sighted by Catalina flying boat at 49° 20' north, 21° 50' west.

11:14 *Ark Royal* planes make contact and shadow.

13:50 *Sheffield* detaches from Allied fleet to maintain radar contact with *Bismarck*.

14:50 *Ark Royal* launches fifteen Swordfish torpedo planes. *Sheffield* attacked by mistake.

- 17:47 *Bismarck* sighted by *Sheffield*.
- 19:10 *Ark Royal* launches second attack of fifteen Swordfish.
- 20:30 Aircraft alarm sounded on *Bismarck*.
- 20:47 Attack begins. *Bismarck* makes violent course corrections to avoid torpedoes, but two hit their target. One hits port side amidships, between compartment VIII and IX, and one hits the starboard rudder area. The rudders become jammed at 12° to port, and *Bismarck* is unable to manoeuvre.
- 21:45 *Bismarck* fires six salvos against the *Sheffield*. No hits scored.
- 22:38 Captain Vian's British 4th Destroyer Flotilla of five destroyers (*Cossack*, *Maori*, *Piorun*, *Sikh*, *Zulu*) sights *Bismarck*. Polish destroyer *Piorun* closes on *Bismarck* and comes under fire.
- 23:15 *Bismarck* changes course to northwest.
- 23:24–07:00 The 4th Destroyer Flotilla continue to attack *Bismarck* in pairs or individually. *Bismarck* turns back each attack and suffers no additional damage.
- 23:45 A message is sent from *Bismarck* to Commander Group West: "Ship unable to manoeuvre. We'll fight to the last shell. Long live the Führer."

Tuesday 27 May 1941

- 05:00–06:00 Two attempts were made to launch one of the ship's Arado 196-A aircraft. It failed, as the compressed-air-line to the catapult was severed.
- 07:10 Admiral Lütjens sends a last message from *Bismarck* to Group West 'Send a U-boat to save War Diary.'²
- 08:00 Alarm on *Bismarck*: battleships *King George V* and *Rodney* sighted off port bow at range of 24,000m. *Norfolk* off starboard bow, while *Dorsetshire* astern

- 08:47 *Rodney* opens fire.
- 08:48 *King George V* opens fire.
- 08:49 *Bismarck* returns fire from *Rodney*.
- 08:54 *Norfolk* opens fire.
- 09:02 *Bismarck* hit for the first time in the exchange, and starts to receive hits from all sides. Her foretop range-finder is disabled.
- 09:04 *Dorsetshire* opens fire. Gun turrets Anton and Bruno out of action.
- 09:12 *Bismarck*'s forward command post out of action.
- 09:13 *Bismarck*'s after command post out of action.
- 09:21 Gun turret Dora out of action.
- 09:31 Gun turret Cäsar out of action. Secondary guns continue to fire sporadically. British ships close distance to between 2,500m and 4,000m and continue to fire.
- 10:00 All weapons silent on *Bismarck*, and order given to scuttle. Demolition charges are set to explode in engineering spaces. Ship is a flaming wreck.
- 10:16 *Rodney* and *King George V* cease fire, and leave the battle scene.
- 10:20 *Bismarck* hit on the starboard side by two torpedoes fired by *Dorsetshire*. Scuttling charges detonate.
- 10:36 *Bismarck* hit on the port side by a third torpedo fired by *Dorsetshire*.
- 10:39 *Bismarck* sinks at 48° 10' north, 16° 12' west. During the battle 2,876 shells were fired at *Bismarck*.³ When she sank there were over 700 men in the water. Only 116 were rescued: 86 by *Dorsetshire* (one of the survivors later died on board); 25 by the destroyer *Maori*; three by U74, and two others were picked up by the German weather ship *Sachsenwald* on 28 May.
- 8 June 1989 The wreck of *Bismarck* is discovered.

THE WRECK

Dr Robert Ballard of the Woods Hole Oceanographic Institution had been attempting to discover the wreck of *Bismarck* since reading *Battleship Bismarck – A Survivor's Story* by Baron Burkard von Müllenheim-Rechberg. After meeting the author, Ballard mounted an initial expedition in June 1988 but failed to find the wreck site. One year later, Ballard's second exploration was successful, the wreck being discovered on 8 June 1989. For the following three days Ballard and his team aboard the *Star Hercules* used underwater camera sled Argo to photograph the wreck and record data of the site.

Bismarck lies 4,790m down in an area about 960km west of France. As she sank by the stern, she capsized to port. While the ship was upside down, the four main turrets that were held in place by their sheer weight, fell away from the ship. Sometime during the fall to the bottom the stern broke away cleanly at frame 10.5, and the ship righted herself. The main mast, signal platform, rangefinders, funnel, aircraft hangars 2 & 3, and the complete foretop from the Lower Mast Deck was carried away. Both cranes, the shields of the 10.5cm Flak battery and various ventilation covers were also detached during *Bismarck's* plunge to the seabed. The portside crane lies over the open barrette of the gun turret Cäsar. When *Bismarck* reached the sea floor upright, she hit the side of a submarine seamount and slid approximately 1000m down.

Despite the pounding *Bismarck* endured, she is in remarkable condition. Both bow and stern teak deck planking is preserved. The Swastikas on the bow and stern are still visible, although part of the stern insignia was lost when the stern broke off. The Forward Fire-control Position and Night Control Position, which were the main target of British gunners, are severely damaged on the port side. There is also a very large hole in the upper deck, where the port side crane would have been. A later expedition by film director James Cameron, in May–June 2002, discovered that forty per cent of the outer hull below the armour belt and between frames 32.0 and 202.7 is missing.⁴ James Cameron believes that large sections of the outer hull broke off the ship when the ship hit bottom. The missing outer hull was part of the torpedo defense system designed to protect *Bismarck* by exploding the torpedo before it reached the 45mm longitudinal torpedo bulkhead. This bulkhead is still intact. There were also only four penetration holes in the ship's armour belt: two on the starboard side in the main 320mm-thick belt and two in the upper 145mm belt.

Following the discovery of the wreck there have been a number of subsequent expeditions to the site. In June 2001 an expedition led by Michael McDowell with Deep Ocean Expeditions (DOE) aboard the Russian scientific research vessel *Akademik Keldysh* dived on the wreck using *Keldysh's* two MIR submersibles. Eight dives with both subs were made. In July 2001 David Mearns of Blue Water Recoveries led an expedition to find and film the wreck of HMS *Hood*. Sailing aboard the vessel *Northern Horizon*, Mearns used the remotely operated vehicle (ROV) *Magellan 725* to film the wreck of *Bismarck* from 9 to 13 July, before continuing to search for *Hood*. James Cameron's expedition in 2002 also used the *Keldysh*, from which six dives were made to examine and photograph the wreck. DOE made another visit to the site in July 2002 and embarked on a further expedition on 31 May 2005.

DESIGN AND SPECIFICATION

Preliminary discussions for a new German vessel *Schlachtschiff F Ersatz Hannover* date back to the spring of 1934, before the Anglo-German Agreement was signed and while Germany was still bound by the Treaty of Versailles. This design was apparently referred to from the outset as *Schlachtschiff* (Battleship) because Hitler was already considering unilateral abrogation of the Treaty of Versailles – which he did on 16 March 1935. Only armoured ships (*Panzerschiffe*) with a displacement of 10,000 tons and a maximum gun calibre of 28cm could be built under Versailles, but 'F' was a design for a 35,000-ton battleship initially with 33cm guns, and these characteristics were based on the assumption that following the abrogation of Versailles Germany would be bound by the Washington Treaty, which permitted 'battleships' with these characteristics. Subsequently *Scharnhorst* and *Gneisenau*, initially classified as *Panzerschiffe*, would also be re-designated *Schlachtschiffe*, and the 10,000-ton *Panzerschiffe* of the *Deutschland* class would be reclassified as *Schwere Kreuzer* (Heavy Cruisers) again in line with the Washington system of classification. *Schlachtschiff F* was intended to be a replacement for the pre-dreadnought *Hannover* laid down in 1904. Following German tradition, the ship's name was not known until launch; all ships were identified by type and an individual letter followed by the name of the ship it was intended to replace. Initial requirements were for a 35,000-ton ship armed with eight 33cm, twelve 15cm guns and sixteen 10.5cm guns. It must be noted that the Construction Office was at this time working with total disregard to treaties in place. The main belt was to be 350mm thick with a horizontal

armoured deck of 100mm, but it became evident that it would be impossible to stay within the 35,000-ton displacement, so the main belt armour was scaled back to 320mm. The type of propulsion plant had still not been decided at this point, with several options under consideration.

During a design conference on 2 November 1934 it was determined that the vessels would need to be superior to the French ships *Dunkerque* and *Strasbourg*, with a cruising speed of 21 knots and a maximum speed of 33 knots. Vice Admiral Guse, the head of the General Office, disagreed and reduced the design speeds to 21 and 29 knots respectively. Several design sketches were discussed, but in each the estimated displacement exceeded 35,000 tons. On November 10th, Gross Admiral Erich Raeder, the Chief of the German Navy, had instructed that under no circumstances should the design exceed 35,000 tons, and that the dimensions must be within the current limitations of docks, locks and harbour facilities. Further amendments were made to the designs, but it seemed impossible to keep the displacement under 37,200 tons. On 21 December 1934, after examining the updated proposals put forth by the General Office, Weapons and Construction Offices, Admiral Raeder agreed that:

1. The type displacement could be exceeded provided that a considerable increase in fighting power was obtained.
2. Turbo-electric propulsion should be investigated.
3. That separate designs should be prepared for four twin 33cm turrets with turbo-electric drive and four twin 35cm turrets with steam turbine propulsion.

The Construction office made calculations on the two separate designs requested by Admiral Raeder, and determined that specific type displacement would be seriously exceeded. The increase in displacement and size would determine which yards could be approached to build this vessel. A further design conference held on 17 January 1935, decided that available slip lengths would not determine the overall hull dimensions. The conference discussed that the main armament could be of 33cm or 35cm, and the maximum speed 28 knots. Admiral Raeder misinterpreted the maximum speed as continuous speed, which led to disagreements in the design requirements.⁵

On 19 January, Admiral Raeder decided that the armament should be 350mm and that geared turbines with a maximum continuous speed of 28 knots should be developed. The dimensions for armour protection were also given⁶:

Main belt	320mm
Bow and Stern	150mm
Armoured deck (horizontal)	100mm
Armoured deck (sloped)	120mm
Upper deck	50mm
38cm Barbettes	350mm above upper deck 320mm below upper deck
15cm Barbettes	150mm
Face of conning tower	400mm
Longitudinal torpedo bulkhead	60mm
Side splinter protection	60mm

This design would displace more than the 35,000-ton limit set by Admiral Raeder. It was estimated that the new design would displace over 39,000 tons, but it was always to be referred to as 35,000 tons. This was common practice in other navies under the Washington Treaty. The 'official' displacements declared under the Treaty – which had to be formally released – had to be within the prescribed limits or the ships were 'illegal'. By the 1930s most of the Washington powers were having serious problems designing ships within these limits. The hull dimensions were to be limited to 242m length, 36m beam and 10m draught if the ship was to use Kiel Canal.

In March 1935, after the abrogation of the Treaty of Versailles, the idea of using 38cm guns was discussed. The larger calibre would add approximately 1,500 tons, bringing the displacement up to 42,000 tons. This would put the design 7,000 tons over the Washington limits. As Germany was negotiating with Great Britain at this time on the Anglo-German Agreement, the General Office decided against a calibre larger than 35cm so that the displacement would be only 41,000 tons. A ship of this size would have a maximum draught of 9.25m and could use the largest lock at Wilhelmshaven, which had a maximum depth of 10m, while a ship with 38cm guns would have a draught of 9.40m, too large for the lock. Armour could be reduced, but this would put the design at a disadvantage against the French *Strasbourg*. Nine 38cm guns in triple turrets were also considered, but this would also have meant a further increase over the desired displacement. On 1 April 1935, Raeder confirmed that the displacement would be 41,000 tons, with a main armament of eight 35cm guns in four twin turrets.

In early 1935 Germany was still negotiating with Great Britain on the Anglo-German Agreement, and hoped to be allowed to mount 38cm guns. The adoption of the 38cm calibre was duly sanctioned by Raeder on 9 May 1935, just prior to the bilateral discussions, despite a warning from the Weapons Office that any change in calibre at this stage would result in a delay of six months in the completion of the ship.

The main propulsion was still to be decided, and the Construction Office investigated four alternative arrangements:

1. High-pressure steam geared turbines, twelve boilers in six boiler rooms forward of the turbine rooms.
2. As with (a) but with only three boiler rooms forward of the turbine rooms.
3. As with (b) but with only one boiler room between the turbine rooms.
4. Turbo-Electric drive.

The Construction Office considered the second option to be the best, while the last was ruled out because of the increase in weight requirements. Four sketches were developed, known as A3–A6, on the arrangement and options of the secondary armament. Casemates were considered, but the obvious obsolescence of this design feature created considerable discussion. It was decided that 150mm armour would be used above the main belt to the upper deck to provide a closed citadel, and the secondary armament would be mounted in turrets. Several designs were put forth on the length of the citadel. In one, the length of the citadel was extended to encompass all four turrets plus their magazines. In others, the citadel was only between A and D turrets, while another shorter citadel covered B and C turrets.

Another conference was held on 7 June 1935 to address the various designs for the secondary armament as well as options for the main propulsion. The passenger liner *Scharnhorst* (1934) had very successfully operated with turbo-electric drive, and so this was still considered despite the extra 600-ton weight over the geared turbines. Admiral Raeder remained determined that the current design displacement of 41,000 tons should not be exceeded, which meant that if turbo-electric drive were used, weight would have to be saved elsewhere without affecting protection.

On 23 August 1935, the Construction Office presented Admiral Raeder with a three-shaft turbo-electric design sketch, A13, which he approved. The overall layout of the ship, bridge shape, command and control stations and

aircraft installation were still to be finalized. Anti-aircraft guns were increased from eight to sixteen 3.7cm guns in eight twin mountings. In order to increase habitability, by increasing the number of scuttles, the citadel length was reduced to between B and C turrets. Late in 1935, re-examinations showed that it would be possible to position living spaces outside the armoured areas, and so the citadel length was restored. It was hoped that the new vessel, *Schlachtschiff F*, would be laid down on 1 July 1936 at the latest and in service by 1 October 1939.

The size of the vessel limited the choice of construction companies. Many of Germany's shipyards had full order books in 1935, which meant that only two yards could be considered. The order for *Schlachtschiff F* (not yet known as *Bismarck*) was placed with the Hamburg shipbuilding firm Blohm & Voss on 16 November 1935.⁷ Blohm & Voss was founded in April 1877 and produced its first warship SMS *Condor* in 1892. In 1906, they signed a license agreement to manufacture Parsons turbines. Prior to the First World War, the yard was successful in winning tenders for the construction of a number of battlecruisers: *Von der Tann*, *Moltke*, *Goben*, *Seydlitz* and *Derfflinger*. They also began, but never completed, a further three: *Mackensen*, *Prinz Eitel Friedrich* and *Ersatz Scharnhorst*. At one time, Blohm & Voss was the world's largest self-contained shipyard at 560,000m² and with a water frontage of 3km.

On 23 January 1936, in line with Admiral Raeder's directive that the displacement should remain 41,000 tons despite the propulsion choice, amendments were made to reduce the overall weight. The barbette thickness beneath the upper deck was reduced from 320mm to 220mm, while the armoured deck above the machinery was reduced from 100mm to 80mm. Armour above the main magazines was increased from 90mm to 95mm. The armoured bulkheads at frames 32.0 and 202.7 were extended to the upper deck (see drawing A3/1).

Turbo-electric drive was subsequently rejected in favour of geared turbines, which would reduce the weight considerably. On 6 June 1936 Admiral Raeder agreed this propulsion change, which necessitated completely new design work and drawings on the layout of machinery. The weight saved by adopting geared turbines was taken up by additional armour. The main armour belt was increased to 320mm, with welded armour adding further increases. By December 1936, many of the plates were either rolled or formed so no further changes in the armour thickness were possible.

TABLE 1: Final Design Details for Bismarck (1936)

Displacement:	
Official displacement	35,000 tons
Actual displacement	
Light load	39,517 tonnes
Designed	45,451 tonnes
Full load	49,406 tonnes
Battle load	50,405 tonnes
Dimensions:	
Length (overall)	250.50m
Length (water line)	241.55m
Beam	36.0m
Draught at full load	10.2m
Draught at	
designed displacement	9.3m
Depth (amidships)	15.0m
Freeboard, bow	
(designed displacement)	8.8m
Freeboard, amidships	
(designed displ.)	5.7m
Machinery:	
Boilers	12 Wagner Höchstdruck
	58 kg/cm ² 450°C
Turbines	3 Blohm & Voss Parsons type
Shaft horsepower (design)	138,000shp
Shaft horsepower (maximum)	150,170shp
Speed designed	28.0kt
Speed maximum	30.1kt
Range	8,400nm at 15kt
	3,750nm at 30kt
Bunkers designed	3,200m ³
Bunkers maximum	7,400m ³
Generators	5 turbo-generators at
	690kW each
	1 turbo-generator at 460kW
	8 diesel generators
	at 500kW each
Power 220 volts DC designed	3,920kW
Power 220 volts DC maximum	7,920kW
Propellers	3 at 4.8m diameter
Rudders	2 at 24.2m ²
Armour:	
Belt	320mm KC tapering to 170mm below
Upper Citadel Belt	145mm KC with 60mm teak base
Deck	80mm to 95mm Wh

Main Turrets	130mm to 360mm KC
Main Barbettes	340mm KC
Secondary Turrets	40mm to 100mm KC

Armament:	
38.0cm SKC/34	8 in four twin Drh LC/34 turrets
15.0cm SKC/28	12 in six twin Drh LC/34 turrets
10.5cm SKC/33	8 in four twin Dopp LC/31 mounts
	8 in four twin Dopp LC/37 mounts
3.7cm SKC/30	16 in eight twin Dopp LC/30 mounts
2.0cm MG C/38	12 in twelve single LC/30 mounts

After April 1941

	10 in ten single LC/30 mounts
	8 in two L38 vierling mounts
Aircraft	4 Arado 196 floatplanes
(See Table 4 for abbreviations)	

TABLE 2: Contemporary Foreign Battleships

Class	Laid Down	Disp (f/l)	Dimensions	Armament
Iowa	27.06.1940	57,540t	270.43x32.96x11.02m	9-406.4, 20-127, 80-40mm
South Dakota	05.07.1939	44,519t	207.26x32.96x10.69m	9-406.4, 20-127, 12-25.4mm
Nelson	28.12.1922	41,250t	216.40x32.31x10.21m	9-406.0, 12-152.0, 6-120.0mm
King George V	01.01.1937	42,076t	227.07x31.39x9.93m	10-356.0, 16-133.0, 32-2pdr
Vanguard	02.10.1941	51,420t	248.20x32.92x10.62m	8-381.0, 16-133.0, 73-40mm
Richelieu	22.10.1935	43,293t	247.85x33.00x9.63m	8-380.0, 9-152.4, 12-100.0mm
Dunkerque	24.12.1932	30,750t	214.50x31.08x8.70m	8-330.0, 16-130.0, 8-37.0mm
Littorio	28.10.1934	45,236t	237.76x32.82x9.60m	9-381.0, 12-152.0, 4-120mm
Yamato	04.11.1937	69,990t	263.0x36.9x10.4m	9-460.0, 12-155.0, 12-127.0mm

HULL STRUCTURE

The construction of *Bismarck*, which was still known as *Schlachtschiff F* up to point of launching, followed practices established in the preceding classes of German warships. With an overall length of 250.50m and a waterline length of 241.55m, frame numbers began at the stern waterline and increased towards the bow. There was a centreline keel that ran between frames 47.6 to 154.6 and then from frame 224.0 to the bow. Between frame 154.6 and 224.0, and from frame 47.6 aft, a centreline longitudinal bulkhead replaced the keel. Transverse bulkheads divided the hull into twenty-two watertight compartments.

The double bottom began at frame 46.157 where it increased in depth to 1200mm at frame 50.514. Between frames 50.514 and 72.3, the depth remained 1200mm. At frame 72.3 the depth again increased to 1700mm at frame 77.3. Between frames 77.3 and 154.6 the depth remained 1700mm. From frame 154.6 to the bow stem at frame 239.0 the depth was 1500mm. The 100-per-cent welded double bottom was oil- and watertight where required.

The hull was longitudinally framed with nine longitudinal frames on each side of the keel. Longitudinal VIII (see drawing A4/16) was continuous with the torpedo bulkhead between frames 32.0 to 202.7, and extended from hull plates to 1400mm above the armoured deck. In the area of Port III and Starboard III 15cm turrets (see drawing A3/2), this bulkhead extended 2400mm above the armoured deck. A bilge keel ran from frame 88.8 to 141.1 with a depth amidships of 1000mm. Hull plating thickness varied between 16mm and 26mm.

Transverse bulkheads at frames 41.8, 50.514, 60.0, and 68.714, supported turrets Dora and Cäsar respectively, while frames 169.986, 178.7, 188.886 and 196.9 supported turrets Bruno and Anton respectively. These bulkheads were continuous inboard of the torpedo bulkhead, and extended from the bottom hull plate to the underside of the armour deck. No. 2 and No. 3 turbine rooms were separated by a centreline bulkhead that ran between frames 98.3 and 112.3 and extended vertically from the inner double bottom to the underside of the armoured deck.

Above the armour deck, there were thirty-four transverse bulkheads, their height depending on their position within the hull. The torpedo bulkhead extended to the underside of the upper deck and acted as splinter protection formed around PII, PIII, SII and SIII 15cm turrets. Two longitudinal bulkheads about 4,800mm from the centreline ran between Bruno and Cäsar and extended from the armour deck to the underside of the main deck.

TABLE 3: Coefficients of Form at a Displacement of 45,951 tonnes

Ratio length cwl/beam	6.71
Ratio beam/draught	3.85
Longitudinal prismatic coefficient (δ) ¹	0.55
Coefficient, fineness of waterplane(α) ²	0.66
Ratio δ/α	0.83
Midship section coefficient (β) ³	0.97
Ratio δ/β	0.57

PROTECTION

Bismarck's protection followed the general layout of the *Scharnhorst* class. It has been stated many times that *Bismarck* was just a rework of the *Scharnhorst* class, and differed little in principle from that of the *Bayern* class laid down in December 1913. Although the *Bismarck* class and *Bayern* class shared some similarities, such as size and layout of main armament, experience gained with

Bayern led to several improvements in *Bismarck*. *Bismarck* was a larger, faster vessel with up-to-date guns. *Bayern* displaced 32,200 full load tonnes, while *Bismarck* displaced 49,406 full load tonnes. *Bismarck*'s power plant generated 150,150shp at 30.8kts while *Bayern*'s generated 52,000shp at 25kts.

Bismarck was designed to fight in the North Sea and the North Atlantic. In these waters poor visibility (especially during the winter) meant relatively short ranges of engagement, typically 10–15,000m, so the emphasis was on close-in protection. The main upper and lower belt, which extended from frames 32.0 to 202.7, was fabricated from face-hardened KC n/A steel (see Table 5, page 18). The 145mm-thick upper citadel belt extended from the upper deck down to the upper edge of the lower belt, approximately 100mm below the Battery Deck. The edge was notched and chamfered where the lower belt joined to the upper belt. The lower belt was 320mm thick from its top edge to approximately 9.3m above the keel, where it tapered to 170mm thick 7.8m above the keel. The main belt, with a 60mm teak backing, was secured to the hull plating by armoured bolts 50 and 70mm in diameter. The main belt extended forward and aft, but was not as thick or deep as the upper citadel belt. From 32.0 aft to frame 10.5 the belt was 80mm thick, 2.1m deep, and reached 1.5m below the designed waterline. Forward of frame 203.0 to the bow the belt was 60mm thick and 3.895m deep. The fore and aft belts formed part of the ship's outer plating, being connected to the outer plates by rebate and riveting.

Transverse bulkheads at frames 32.0 and 202.7 closed off each end of the armoured citadel. The upper armoured bulkhead from the armoured deck to the underside of the upper deck was 145mm thick inboard of the torpedo bulkhead, tapering to 100mm thick inside the citadel belt. The lower armoured bulkhead at frame 202.7 extended down to the Upper Platform Deck and was 220mm thick inboard of the torpedo bulkhead, tapering to 100mm thick inside the main belt. Below this and extending to Middle Platform Deck was an armoured bulkhead 180mm thick inboard of the torpedo bulkhead tapering to 100mm thick inside the main belt. At frame 32.0, the lower armoured bulkhead extended down to the upper side of the 110mm deck plate protecting the steering equipment rooms. Another armoured transverse bulkhead was positioned at frame 10.5. This bulkhead from the top of the Armour Deck to the underside of the Battery Deck was 45mm thick inside the hull plates. The lower bulkhead from Upper Platform Deck to the underside of the Armour Deck was 150mm thick.

An inner torpedo bulkhead inboard of the main belt ran between frames 32.0 and 202.7 along longitudinal IX (see drawing A4/16). This 45mm-thick bulkhead was fabricated from Wh steel (see Table 5) and extended from inside the bottom hull plates to just above the main Armour Deck. A 16mm-thick longitudinal splinter plate overlapped the inner torpedo bulkhead by 200mm and extended to the underside of the upper deck. Two longitudinal bulkheads divided the space between the inner torpedo bulkhead and outer hull plating, forming three longitudinal spaces, two outer and one inner, which were separated by transverse bulkheads to form tanks. The outside tanks were generally kept empty, but could be used for counter flooding, while the inside tanks were used for fuel- and water-storage bunkers. The total weight of vertical protection was 8,136 tonnes.

The upper deck and main armoured deck were fabricated from Wh material. The upper deck weighed some 2,248 tonnes and extended from frame 10.5 to frame 224.0. It was 50mm thick, except from turrets Cäsar to Bruno and around the openings for the 15cm turrets, where the thickness was increased to 80mm. All joints were welded. The main armoured deck extended between frames 32.0 and 202.7 and inboard of the torpedo bulkheads. This deck was 80mm thick over machinery spaces and 100mm thick over magazines. Outside of the torpedo bulkhead, the main armoured deck was 110mm thick (120mm outboard of the magazines) and sloped downward towards the belt at twenty-two degrees. The deck extended aft of frame 32.0 to frame 10.5. This 110mm-thick deck was lower than the main deck and protected the steering gear. The main armour belt weighed a total of 4,293 tonnes.

Command and control stations were also protected with face-hardened (FH) armoured steel plates rabbeted and bolted together. The foretop control station was lightly armoured with 50mm side due to its height above the water line, while the forward and after control stations were more heavily armoured with 200mm- and 150mm-thick sides respectively. An armoured communications tube extended from the bottom of the stations to the main armour deck. The forward communications tube was 1000mm in diameter and protected by 220mm-thick plate, while the after tube was 800mm in diameter and protected by 50mm-thick plate.

Barbettes for the main 38cm guns were constructed with an upper and lower ring. The upper ring was made of 340mm face-hardened armoured plate above the upper deck, while below the upper deck to the topside of the

main armour deck 220mm face-hardened armour was used. The barbettes had an internal diameter of 10.0m at the top and 10.2m at the bottom. The 15cm barbettes were constructed from 80mm face-hardened armoured plate. The turrets, which were made from face-hardened armoured plate, used sloping armour to reduce weight. The main 38cm turrets had 360mm-thick front plate, with 220mm sides, 150mm sloping sides, 180mm front and rear sloping plates, 320mm rear plate and 130mm roof plate. The 15cm turrets had 100mm thick face plate, while the sides back and roof plates were 40mm.

TABLE 4: Armour

Belt Armour Lower	320mm KC reducing to 170mm
Belt Armour Upper Citadel	145mm KC
Belt Armour Forward	60mm Wh
Belt Armour Aft	80mm Wh
Armoured transverse bulkhead beneath upper deck between torpedo bulkhead and outer skin	100mm Wh
Armoured transverse bulkhead beneath upper deck between torpedo bulkheads	145mm Wh
Armoured transverse bulkhead beneath platform deck between torpedo bulkhead and outer skin	180mm Wh
Armoured transverse bulkhead beneath platform deck between torpedo bulkheads	220mm Wh
Longitudinal splinter bulkhead upper	25mm Wh
Longitudinal torpedo bulkhead	45mm Wh
Upper deck	50mm Wh
Upper deck near control tower	80mm Wh
Upper deck above machinery centre	50mm Wh
Upper deck above magazines centre	80mm Wh
Armour deck	80mm Ww
Armour deck above powder storage rooms	95mm Wh
Armour deck forward of citadel	30mm Wh
Armour deck aft	80mm Wh
Armour deck above steering gear	100mm Wh
Armour deck above machinery, centre	80mm Wh
Slope from torpedo bulkhead to armour belt above machinery	110mm Wh
Slope from torpedo bulkhead to armour belt above magazines	120mm Wh
Barbettes for 38cm turrets	340mm KC upper, 220mm KC lower

Barbettes for 15cm turrets	80mm KC
38cm turret	360mm KC face; 220mm KC sides; 320mm KC rear 180mm KC roof, forward & rear; 150mm KC roof, sides; 130mm roof
15cm turrets	100mm KC face; 40mm KC sides; 40mm KC rear; 40mm KC roof
10.5cm shields	20mm
Forward control tower	350mm KC sides/slope; 200mm KC roof; 70mm KC deck; 220mm KC communications shaft
After control tower	150mm KC sides/slope; 50mm KC roof; 50mm KC deck; 50mm KC communications shaft
Forward control tower rangefinder	200mm KC sides; 100mm KC top
After control tower rangefinder	150mm KC sides; 50mm KC top
Foretop control tower rangefinder	50mm KC sides; 20mm KC top

TABLE 5: Armour material

KC n/a	Krupp cemented: Face-hardened armour steel containing 0.34% carbon, 3.78% nickel, 0.31% manganese, 0.2% molybdenum, and 2.06% chrome
Wh	Wotan hart: (Hard Steel) High tensile steel 85–95 kg/mm ² and 20% expansion with a yield point of 50–55 kg/mm ²
Ww	Wotan weich (Pliable steel): Armour steel with a tensile strength of 65–75 kg/mm ² and 25% expansion with a yield point of 38–40 kg/mm ²

MACHINERY

Germany had begun testing high-pressure steam plants in 1929, in the hope of developing a high-efficiency, low-weight power plant. After trials in 1936 aboard the gunnery training ship *Brummer*, high-pressure steam plants were installed in four Type-34 destroyers commissioned between January and May 1937. These boilers operated at 70kg/cm² with a steam temperature of 480°C. *Bismarck's* machinery comprised twelve high-pressure Wagner water tube boilers in six compartments, three each abreast in compartments XI and XIII. Manufactured by Blohm & Voss the boilers, which could be brought up to service pressures in twenty minutes, were fired by two Saacke burners with an evaporation rate of 50,000kg/hr, operating at pressures of 58kg/cm² and

450°C. An auxiliary boiler was located in compartment XIV just forward of centre No. 2 boiler room.

The three shafts were driven by Curtis turbines manufactured by Blohm & Voss. Each set comprised high-pressure (HP), intermediate-pressure (IP), low-pressure (LP), high-pressure astern and low-pressure astern turbines each connected to a single reduction gearbox. The HP turbine comprised a Curtis wheel with forty reaction stages; the IP comprised fifteen stages in a double flow arrangement; the LP comprised nine reaction stages and supported the main condenser, which was slung underneath. The HP astern turbine was of the single Curtis wheel type, and was contained within the IP ahead drum at its forward end before the gearbox. The LP astern turbine was a double-flow reaction stage in the centre of the LP ahead turbine casing. The normal full-power rating for each turbine was 38,000hp and the maximum 46,000hp. Each turbine set drove a 4.8m-diameter three-bladed propeller at a maximum of 270 rpm. The port and centre propeller turned anti-clockwise, while the starboard propeller turned clockwise, when looking toward the bow. The maximum speed attained during trials was 30.1kt at 150,170shp.

Electrical power was supplied by four main generator rooms on the lower platform deck with a total output of 7,910kW. No. 1 starboard and No. 2 port generator rooms were located adjacent to center turbine room No. 1 in compartment VIII. These spaces were equipped with four 500kW DC diesel generators. No. 3 starboard generator room was equipped with three 690kW DC turbo generators, while No. 4 port generator room was equipped with two 690kW DC and one 460kW AC turbo generator. No. 3 and No. 4 generator rooms were located in compartment XIV adjacent to the auxiliary boiler room. An additional diesel motor room located on the starboard side of compartment VII housed a 550kV AC diesel generator.

TABLE 6: Machinery

Boilers:	
Evaporation heating surface	380m ²
Superheater heating surface	120m ²
Air pre-heat surface	685m ²
Feedwater pre-heated temp	160°C
Operating pressure	55 atmospheres forced
Intervention pressure (safety)	58 atmospheres forced
	63 atmospheres maximum
Authorized pressure	68 atmospheres forced
Steaming weight	50 tonnes/hour dry

Efficiency	80%
Steam temperatures:	
Saturated	287°C
Superheated	450°C
Heat generated	31.8kcal/kg
Evaporation figure	11.8 at 9,300kcal/kg
Steam production	132kg per m ² of surface
Gas resistance	220mm
Capacity	144m ²
Weight with water	52.8 tonnes
Weight of warm water	4.85 tonnes
Pre-heated temperature (air)	335°C
Furnace load	2kcal/m ² /hr

Safety valves:

Boiler drum, intervention pressure,	
steam collector	68.0 - 69.5 atmospheres forced
Superheat intervention pressure:	66.5 - 68.0 atmospheres forced

Turbines:

	turbine rpm/shaft rpm
High-pressure (HP) turbine	2,880/270
Intermediate-pressure (IP) turbine	2,880/270
Low-pressure (IP) turbine	2,430/190
High-pressure astern turbine	2,025/180
Low-pressure astern turbine	1,715/190

Liquids:

Main fuel inc. supplementary	8,294 tonnes
	7,400 tonnes usable
Diesel fuel oil	193 tonnes
Aviation spirit	34 tonnes
Reserve feedwater	375 tonnes
Fresh water	306 tonnes
Reserve fresh water	389 tonnes
Lubricating oil	160 tonnes

Range:

8,600nm @ 15kts
8,525nm @ 19kts
8,150nm @ 21kts
6,640nm @ 24kts
5,200nm @ 27kts
4,500nm @ 28kts
3,750nm @ 30kts

ARMAMENT

Main Armament

Bismarck mounted eight 38cm SKC/34 guns in four twin centerline Drh LC/34 turrets, designed and manufactured by the Krupp Company. SKC designated *Schiffskanone* (ships cannon) and DrhLC *Dreh scheiben-Lafette* (turntable

mounting). Following a long tradition, the main turrets were given names rather than alpha or numerical designation. Turrets Anton and Bruno were mounted forward at centreline frames 192.55 and 174.343 respectively, while the aft turrets Cäsar and Dora were mounted at centreline frames 64.357 and 46.157 respectively. The 38cm SKC gun fired an 800kg shell at a muzzle velocity of 820m/sec using a two-charge system. The main 112kg charge was encased within a brass cartridge, while the 99.5kg secondary charge was within a silk bag. Each gun carried 125 rounds comprising three types of shells: 38cm Psgr L/4,4(m Hb) Armour Piercing (AP) shell with base fuse; 38cm Spgr L/4,5 Bdz (m Hb) High Explosive (HE) shell with base fuse; 38cm Spgr L/4,6 Kz (m Hb)^s HE with nose fuse. The gun differed from the 38cm/45 SK L/45 mounted in the *Bayern* class of First World War battleship, with a higher muzzle velocity, heavier shell, greater elevation and longer range. The 38cm/45 mounted in *Bayern* fired a 750kg shell with a muzzle velocity of 800 m/s to a maximum range of 20,400m at 20-degree elevation.

The turrets were originally fitted with 10.5m rangefinders, but Anton's was removed during the winter of 1940/1941 after it became unusable due to water being shipped over the bows at high speeds. Two electric-powered pumps provided hydraulics for most turret functions, with the exception of electric-powered training, auxiliary elevation, auxiliary hoists and reserve power. Turrets Anton and Dora were of six working levels: gun house, training, machinery and intermediate platforms all rotating, and the magazine and shell-loading stations located below the armoured deck. Turrets Bruno and Cäsar had an additional intermediate platform. Shells were transferred onto a tray in the shell room before being pushed through a flash tight door into the shell handling room and onto the revolving shell ring. The ring with the shell would rotate to match the orientation of the turret. The shell would then be pulled into the shell cage. The procedure for the fore and main charge was similar. The shell, and the fore and main charge were hoisted together in cages between the guns. During hoisting, the lower shell cage would be raised to the underside of the charge cage, where they would be hoisted together up to the gun platform. Rammers transferred the shell and charges from their respective cage on to loading trays. The lower tray would pivot and place the shell behind the gun, while the tray holding the charges would lower and allow the charges to roll down to the ready position. A telescopic chain-operated rammer would load the shell in to the gun and retract, allowing the charges to roll from the ready

position to the lower tray and then be rammed into the gun. An auxiliary hoist transported shells and charges separately in the vertical position to the rear of the gun deck, where a tilting table would transfer them to the loading position for ramming. There was also a hand-operated auxiliary loading rammer. Each turret was also equipped with left- and right-side sights, two C/6 periscopes and electric fans fitted to the rear of the turrets to extract gases and smoke.

TABLE 7: 38.0cm SKC/34 – Drh LC/34

Gun:	
Bore	38.0cm
Barrel and Breech Weight	111,000kg
Length Barrel OA (overall)	19,630mm
Length Bore	18,405mm
Length Chamber	2,423mm
Volume Chamber	3.19dm ³
Length Rifling	15982mm
Grooves	(90) 4.5mm deep x 7.76, 5.5m
Lands	5.5mm
Twists	Increasing 1 in 36 to 1 in 30
Weight Projectile	800kg
Weight Charge	211.5kg
Muzzle Velocity	820m/sec
Working Pressure	3200kg/cm ²
Barrel Life	250 rounds
Range	18,000m @ 10.4° 28,000m @ 20.0° 35,550m @ 30.0° max
Mounting:	
Revolving Weight	1,056t w/o rangefinder 1,048t
Distance between guns	3750mm
Elevation Range	- 5.5°, +30.0°
Elevation Rate	6°/sec
Loading Angle	2.5°
Training Range	215° - 145° Anton, Bruno 35° - 325° Căsar, Dora
Training Rate	5.4°/sec
Rate of Fire	26 sec @ 4.0° elevation per round

Secondary Armament

The vessel's secondary armament comprised twelve 15cm SKC/28 guns in six twin Drh LC/34 turrets, mounted three port (PI, PII, PIII) and three starboard (SI, SII, SIII) at frames 150.1, 131.4 and 97.85 respectively. The 15cm SKC/28 fired a 45.3kg shell at a muzzle velocity of 875m/s, using a single 23.5 charge encased within a brass cartridge. Each gun carried 130

rounds: 15cm Spgr L/4,5 Bdz (m Hb) High Explosive (HE) shell with base fuse; 15cm Spgr L/4,6(m Hb) HE with nose fuse; 15cm Lg L/4,6 starshell.

The layout of turrets PI and SI followed that of Anton and Dora, with five working levels: gun house, training and engine intermediate platforms all rotating, with shell- and cartridge-loading platforms below the armoured deck. On port and starboard turrets II and III there was no engine intermediate platform and the shell-loading platform was located inside barbette. Both main and auxiliary training motors were electric. Elevation was hydraulic with emergency hand operation. Both shell and cartridge were hand loaded. A double hoist between and to the rear of the guns delivered two shells and two charges simultaneously. Turrets PII and SII were equipped with a 6.5m rangefinder.

TABLE 8: 38.0cm SKC/34 – Drh LC/34

Gun:	
Bore	149.1mm
Barrel and Breech Weight	9,080kg
Length Barrel AO	8200mm
Length Bore	7816mm
Length Chamber	1152mm
Volume Chamber	21.7dm ³
Length Rifling	6588mm
Grooves	(44) 1.75mm deep x 6.14
Lands	4.5mm
Twists	Increasing 1 in 50 to 1 in 30
Weight Projectile	45.3kg
Weight Charge	23.5kg
Muzzle Velocity	875m/sec
Working Pressure	3000kg/cm ²
Barrel Life	1100 rounds
Range	23,000m @ 40.0° elevation
Mounting:	
Revolving Weight	150.3t Turrets I, 131.6t Turrets II, 97.7t Turrets III
Distance between guns	1750mm
Elevation Range	- 10.0°, +40.0°
Elevation Rate	9.0°/sec
Training Rate	8.0°/sec
Rate of Fire	7.5 sec per round

Heavy Flak Armament

Sixteen 10.5cm SKC/33 guns were mounted in four twin Dopp LC/31 mounts on the forward superstructure port and starboard, combined with four twin Dopp LC/37 mounts on the aft superstructure port and starboard. The

forward guns were installed before *Bismarck* was commissioned in August 1940, but the after guns were not installed until October/November of that year while *Bismarck* was in Gotenhafen. The 10.5cm SKC/33 gun fired a 15.1kg shell in a fixed round with charge weighing 27.35kg at muzzle velocity of 900m/s. Each gun carried 425 rounds. Both the LC/31 and LC/37 were tri-axial stabilized mounts, and were electrically trained and elevated with emergency hand wheels for back up. Ammunition was supplied to the mounts by way of ammunition hoists located in gun crew ready rooms and transferred to the guns by hand. A fuse-setting machine was located on both sides of the mount. The LC/37 mount could be distinguished from the LC/31 by its larger shield, which extended above the guns.

TABLE 9: 10.5cm SKC/33

Gun:	
Bore	105.0mm
Barrel and Breech Weight	4,560kg
Length Barrel AO	6840mm
Length Bore	6348mm
Length Chamber	698mm
Volume Chamber	7.31dm ³
Length Rifling	5531mm
Grooves	(36) 1.3mm deep x 5.5
Lands	3.66mm
Twists	Increasing 1 in 55 to 1 in 35
Weight Projectile	15.1kg
Muzzle Velocity	900m/sec
Working Pressure	2850kg/cm ²
Barrel Life	2950 rounds
Range	17,700m horizontal 12,500 vertical @ 80.0° maximum elevation
Mounting: LC/31	
Total Weight	27,805kg
Distance between guns	680mm
Elevation Range	-8.0°, +80.0°
Elevation Rate	10.0°/sec
Training Rate	8.0°/sec
Rate of Fire	3.6 sec per round
Mounting: LC/37	
Total Weight	27,055kg
Distance between guns	660mm
Elevation Range	-9.0°, +80.0°
Elevation Rate	12.0°/sec
Training Rate	8.5°/sec
Rate of Fire	3.6 sec per round

Medium Flak Armament

This comprised sixteen 3.7cm SKC/30 guns in eight twin LC30 mounts. Four mounts were located port and starboard on the forward superstructure – two aft of Bruno on First Deck and two on the Upper Mast Deck – while four were located port and starboard on the after superstructure – two forward of Cäsar on First Deck and two on Lower Bridge Deck. The 3.7cm SKC/30 was mounted on most Kriegsmarine ships, and was only replaced on some ships once the 4cm FLAK 28 (Bofors) became available in late 1944 or early 1945. The 3.7cm SKC/30 was a manually loaded gun with direct gyro cross-levelling. It fired a 0.748kg shell at a muzzle velocity of 1000m/s and each gun carried 2000 rounds. Training and elevation were by hand wheel.

TABLE 10: 3.7cm SKC/30 – Dopp LC/30

Gun:	
Bore	37.0mm
Barrel and Breech Weight	243kg
Length Barrel AO	3074mm
Length Bore	2960mm
Length Chamber	357mm
Volume Chamber	0.5dm ³
Length Rifling	2554mm
Grooves	(16) 0.55mm deep x 4.76
Lands	2.5mm
Twists	Increasing 1 in 50 to 1 in 35
Weight Projectile	0.748kg
Muzzle Velocity	1000m/sec
Working Pressure	2950kg/cm ²
Barrel Life	7500 rounds
Range	8,500m horizontal @ 35.7° 6,800m vertical @ 85.0°
Mounting:	
Total Weight	3,670kg
Distance between guns	400mm
Elevation Range	- 9.0°, +85.0°
Elevation Rate	3.0°/revolution of hand wheel
Training Rate	4.0°/revolution of hand wheel
Rate of Fire	0.75 sec per round

Light Flak Armament

Ten 2cm C/30 in single Pedestal L30 mounts were combined with eight 2cm C/38s in two 2cm FLAK 35 Vierling L38 mounts to create *Bismarck*'s light flak armament. The single mountings were located port and starboard – four

on the upper deck fore and aft, two forward on Lower Mast Deck, two aft on Lower Bridge Deck, and two on the Funnel Platform. The two 2cm Vierling were mounted on the Search Light Deck. When commissioned, *Bismarck* mounted twelve 2cm C/30 in single mounts, but two of these from the Search Light Deck were replaced by Vierling mounts in late April 1941. Both versions of the 2cm gun fired a 0.134kg shell at a muzzle velocity of 835m/s. A major drawback of this gun was the weight of shell, which was not heavy enough to bring down an aircraft with a single hit. The 2cm C/38 guns were lighter and had an improved rate of fire.

TABLE 11: 2.0cm C/30 – and 2.0cm C/38

Gun:	
Bore	20.0mm
Barrel and Breech Weight	64kg C/30, 57.5kg C/38
Length Barrel AO	2252.5mm
Length Bore	1300mm
Length Chamber	121.5mm
Volume Chamber	0.048dm ³
Length Rifling	1159.4mm
Grooves	(8) 0.325mm deep x 5.2
Lands	2.65mm
Twists	Uniform 1 in 36
Weight Projectile	0.134kg
Muzzle Velocity	825m/sec
Working Pressure	2800kg/cm ²
Barrel Life	22,000 rounds
Range	4,900m horizontal @ 45.0° 3,700m vertical @ 85.0°
Mounting: Pedestal L30	
Total Weight	420kg
Elevation Range	– 11.0°, +85.0°
Rate of Fire	0.5 sec per round practical, 0.21 sec per round cyclical
Mounting: Vierling L38	
Total Weight	2,150kg
Distance between guns	674mm Horizontal, 280mm Vertical
Elevation Range	– 10.0°, +90.0°
Rate of Fire	0.27 sec per round practical, 0.125 sec per round cyclical

FIRE CONTROL

The fire-control system followed the standard layout established on the K-class cruisers *Köln*, *Königsberg* and *Karlsruhe* commissioned in 1929/30, with three main fire-control positions: one forward in the conning tower, one in the

foretop and one in the after superstructure. A stereoscopic rangefinder in an armoured cupola and a FuMO 23 radar antennae were mounted on top of each fire-control station. The foretop fire-control station and the after fire-control station were each equipped with 10.5m rangefinders, while a 7m rangefinder was placed in the forward control station. Each of the four main turrets had 10.5m rangefinders, while secondary turrets PII and SII were each equipped with a 6.5m rangefinder. The rangefinder in A turret was removed during the winter of 1940/1941. Each of the forward stations was fitted with three ZG C/38S directors with periscope hoods projecting above the armoured roofs: one on centerline and one each at port and starboard. The after station was fitted with port and starboard directors.

Target data for range, bearing and inclination were relayed to the main gunnery target solution room (TS) on the middle platform deck compartment XV. A reserve position was located aft in compartment VII. The reserve was similar to the main position, but omitted the shore bombardment computer.

The flak fire-control system was an improvement over that used for the Scharnhorst class. The main control position was sited in the foretop gallery, with four *Zeilanzeigergerate*, or ZAG, (Target Information Sights). There were two reserve positions in the fore and aft night control stands. Range data was supplied by two triaxially stabilized SL8 high-angle 4m rangefinders located port and starboard of the bridge structure. Two reserve positions with 3m rangefinders were located aft. One located between the after fire control position and the main mast; and one was located on centreline between the after fire-control position and turret Cäsar. The after rangefinders were not fitted with the distinctive spherical top.

The main Flak TS room was located on the upper platform deck in compartment XV. A reserve position was situated aft on the middle platform deck, compartment IX. For night engagements, *Bismarck* was fitted with seven 160cm Siemens-Schuckert searchlights: one on the front face of the control tower; four on the funnel platform (the two forward lights were protected by a shield when not in use); two aft abreast flak tower C. Searchlights were controlled from the night control positions with Zeilsaule C38 directors. Two 3m night rangefinders were also fitted in the wings of the Admiral's bridge.

AIRCRAFT AND EQUIPMENT

Bismarck was equipped with a 32m double-ended catapult that could be extended over the side to port or starboard. The catapult used compressed air,

stored in cylinders located in the forward part of the after superstructure on the upper deck, to propel the aircraft to take-off speed. It was located amidships on First Deck between the funnel and main hangar No.1. Once the aircraft was launched and returned to land in the water beside the ship, the aircraft would be lifted aboard using the port or starboard main crane. The 12-ton cranes manufactured by Demag were also used to transfer the various ship's boats to the water. Two other Demag cranes located below the funnel searchlight platform were used to spot the aircraft back in their respective hangars. There were three aircraft hangars all located amidships on First Deck. The main hangar, located below the mainmast, could accommodate two aircraft with wings folded, while the hangars on either side of the funnel could each accommodate one aircraft with folded wings. The design of aircraft equipment would allow a further two aircraft to be stowed on the catapult, but *Bismarck* only carried four aircraft.

Aircraft

Bismarck had four Arado Ar 196 A-3 aircraft for spotting and reconnaissance: T3+IH, T3+AK, T3+DL and T3+MK. The aircraft and crew were part of the 1./Bordflg.Gr 196 reconnaissance group, 1st Squadron of the Luftwaffe.

The Arado 196 became the standard shipboard aircraft of the *Kriegsmarine*, replacing the Heinkel He 60 as it became available from August 1939. (*Admiral Graf Spee* became the first ship to begin operations with the Ar 196 A-1.) The Arado 196 was a single engine seaplane with twin interchangeable metal floats. The all-metal wings with two spars and thirty-two ribs could be folded back along the fuselage. All control surfaces were fabricated from light metal and covered in fabric. The fuselage was fabricated using steel tubing with a trapezoid cross-section. The forward fuselage was covered with metal, while the rear was covered in fabric. In all over 600 Ar 196 aircraft were produced, all with the BMW 132 nine-cylinder engine.

TABLE 12: Arado Ar 196 A-3

Type	Two seat catapult reconnaissance floatplane
Power plant	One 960hp BMW 132K
Performance	Max. speed 310km/hr @ 4,000m
Cruising speed	253km/hr
Ceiling	7,000m
Range	1,070km

Dimensions:

Span	12.4m
Length	11.0m
Height	4.45m

Weights:

Empty	2,990kg
Loaded	3,730kg
Armament	Two fixed MG FF 20mm cannon wing-mounted One fixed 7.9mm MG fuselage-mounted Two flexible 7.9mm MG in rear cockpit

BOATS

Bismarck was equipped with a total of sixteen boats. Two 11m Admiral's gigs were located port and starboard on the hangars beside the funnel. Four 11m launches were on the main aircraft hangar. One 9m Captain's gig was located just inboard of the starboard Admiral's gig. Two 8m long boats were at port side inboard of the port Admiral's gig. One 6m long boat was mounted on top of the outside 8m long boat. Four 8m cutters were in davits on upper deck: two forward of PII and SII 15cm guns and two forward of PIII and SIII 15cm guns. Finally, two 4m dinghies were mounted above the after 8m cutters. All cutters and dinghies on the upper deck were removed before *Bismarck* left Norway on 19 May 1941.

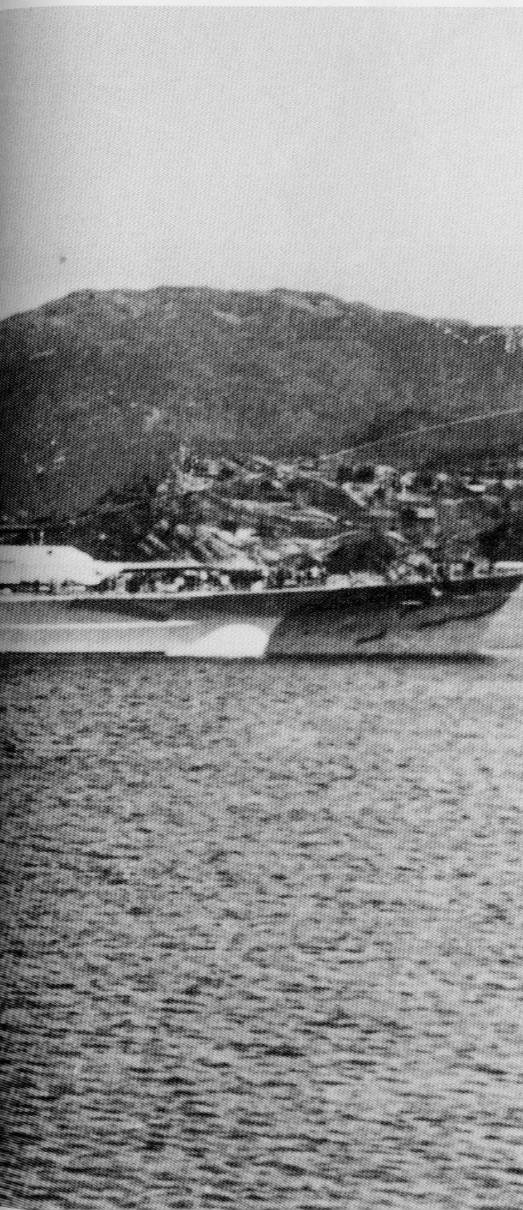
NOTES

- 1 Further details of the various design proposals can be found in *German Capital Ships of World War Two* by M. J. Whitley.
- 2 See *A Survivor's Story* by Baron von Mullenheim-Rechberg.
- 3 See Robert Ballard's book *The Discovery of Bismarck*, and *The Battleship Bismarck the Complete History of a Legendary Ship*, by José Rico.
- 4 From conversation with Bill Jurins of Winnipeg, Manitoba, who has confirmed this with James Cameron.
- 5 See Whitley, op. cit.
- 6 Ibid.
- 7 By this time in 1935, discussions had already begun for a sister ship to *Bismarck*, which was to be a replacement for *Schleswig-Holstein*, sister ship of *Hannover*. On 14 June 1936 the Wilhelmshaven shipbuilding firm of Kriegsmarine Werft was awarded the contract for the sister ship, which became *Tirpitz*.
- 8 Psgr (*Panzersprenggranate*): Armour piercing shell.
Spgr (*Sprenggranate*): High Explosive shell.



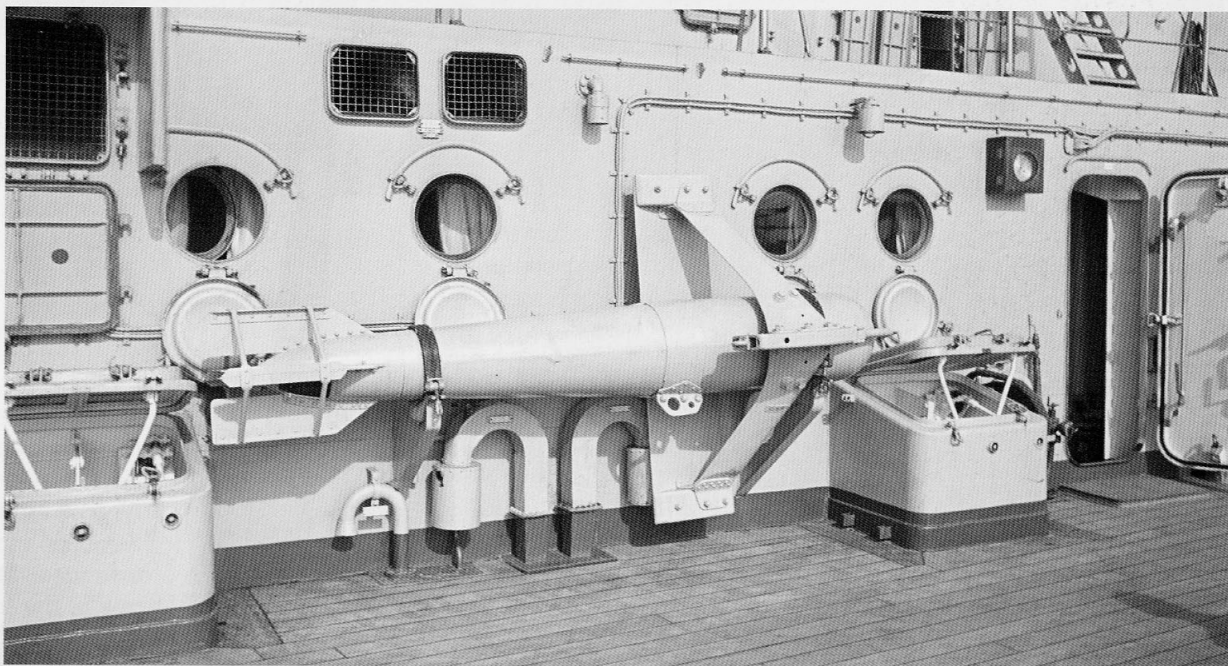
Starboard view of *Bismarck* taken from the deck of *Prinz Eugen* at Grimstadfjord, 21 May 1941.

(Chrysalis Picture Library)



Bismarck August/September 1940: Starboard side looking aft. Visible to the right is 38cm turret Bruno, while just aft of Bruno on First Deck is one of the 3.7cm SKC/30 guns. Located just above the breakwater is a paravane minesweeping device stored on the superstructure. On the right are the SI and SII starboard 15cm turrets, with one of the 10.5cm SKC/33 guns just behind the SI turret.

(Ref. B193-5-3-39, Bundesarchiv)

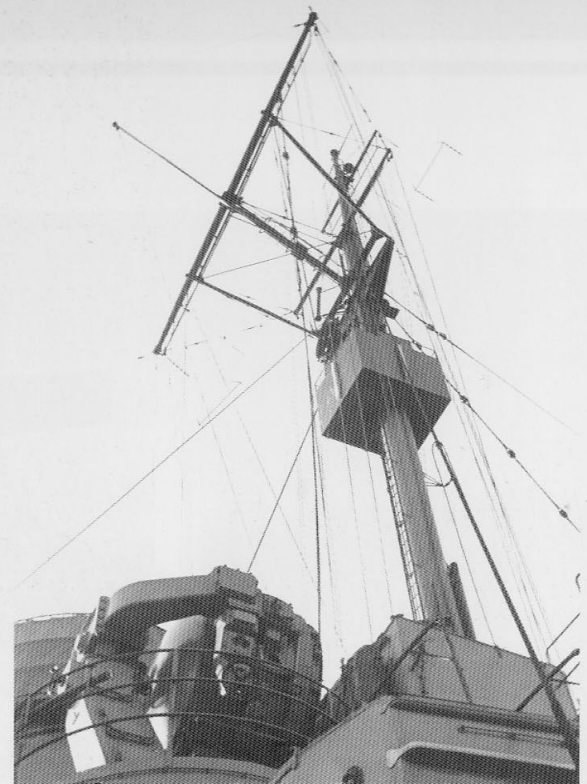


Bismarck August/September 1940: Detail of a paravane stowed against starboard after superstructure.

(Ref. B193-2-4-39, Bundesarchiv)



Bismarck August/September 1940: Portside view looking aft on Lower Mast Deck, showing 2cm gun (covered) and 4m SL8 rangefinder. (Ref. B193-18-6-25, Bundesarchiv)



Bismarck August/September 1940:
Portside view of the mainmast.
The square structure on the mast is
the rudder indicator. The arm on the
side is centred, indicating that the
rudder is in the ahead position.

(Ref. B193-7-6-9, Bundesarchiv)



Bismarck August/September 1940: Portside
view of after superstructure showing Main
Aircraft Hangar with three of the four 11m
launches stowed on top. The catapult is
extended. At bottom centre is a 4m dinghy
and one of the four 8m cutters, lashed
down on their stocks. Both the cutter
and dinghy were removed when
Bismarck left Norway on
Operation Rheinübung.

(Ref. B193-3-1-10, Bundesarchiv)

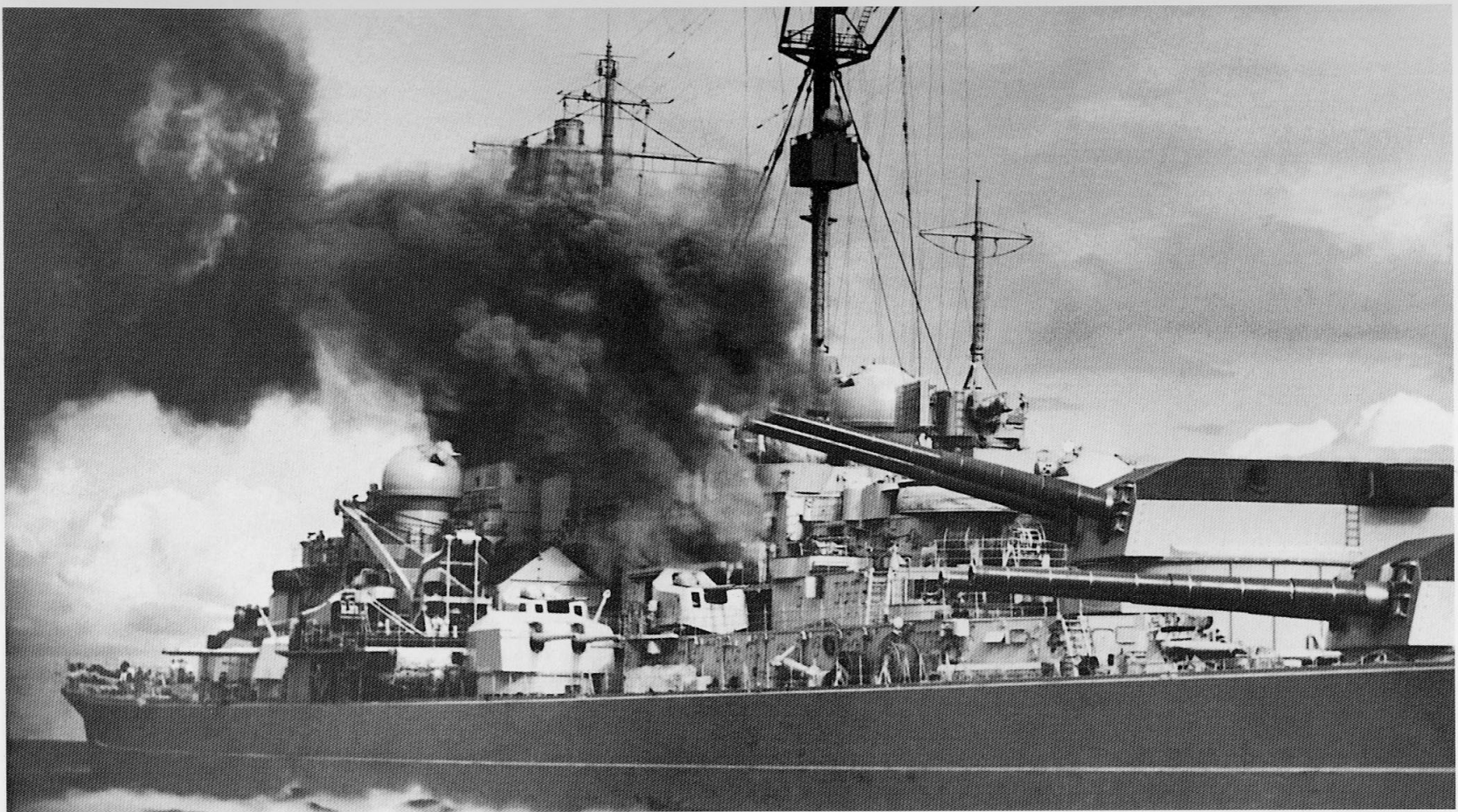


Bismarck August/September 1940: Portside view of the funnel and searchlight platform. The forward searchlight is covered. The port side Aircraft Hangar No. 2 can also be seen, with the 8m and 6m longboats lashed down on their stocks.

(Ref. B193-3-1-6, Bundesarchiv)

Bismarck August/September 1940:
A detailed view of the foremast.

(Ref. B193-8-1-35A, Bundesarchiv)



Bismarck's sister ship Tirpitz: Three-quarter port view showing the after guns. (CPL)

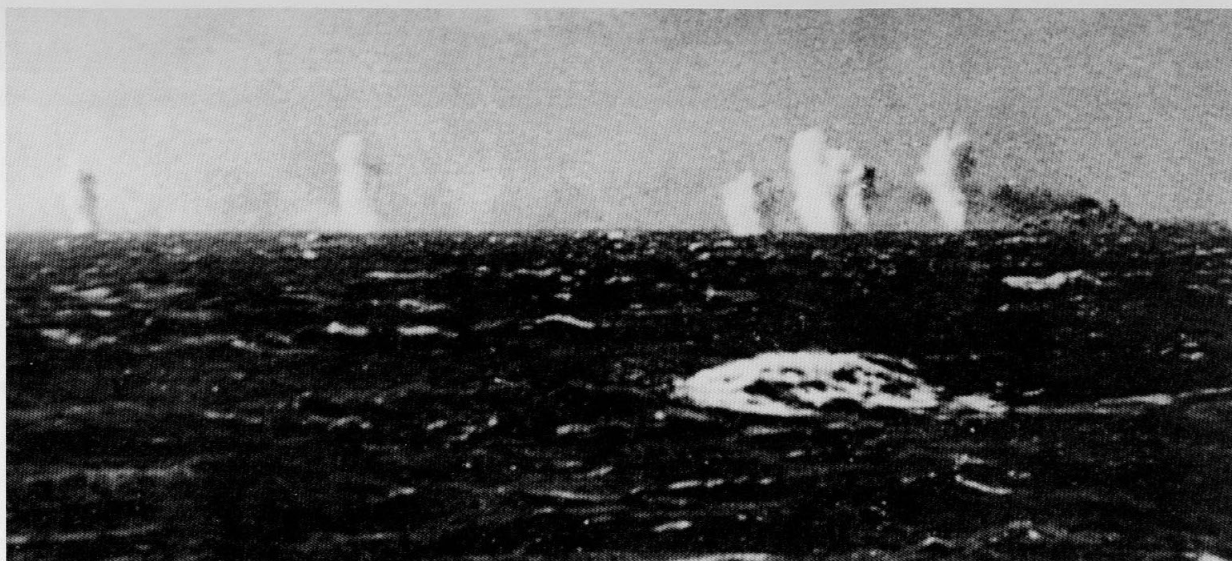


Bismarck viewed from Prinz Eugen: The ship is firing at the Prince of Wales shortly after the sinking of the Hood.

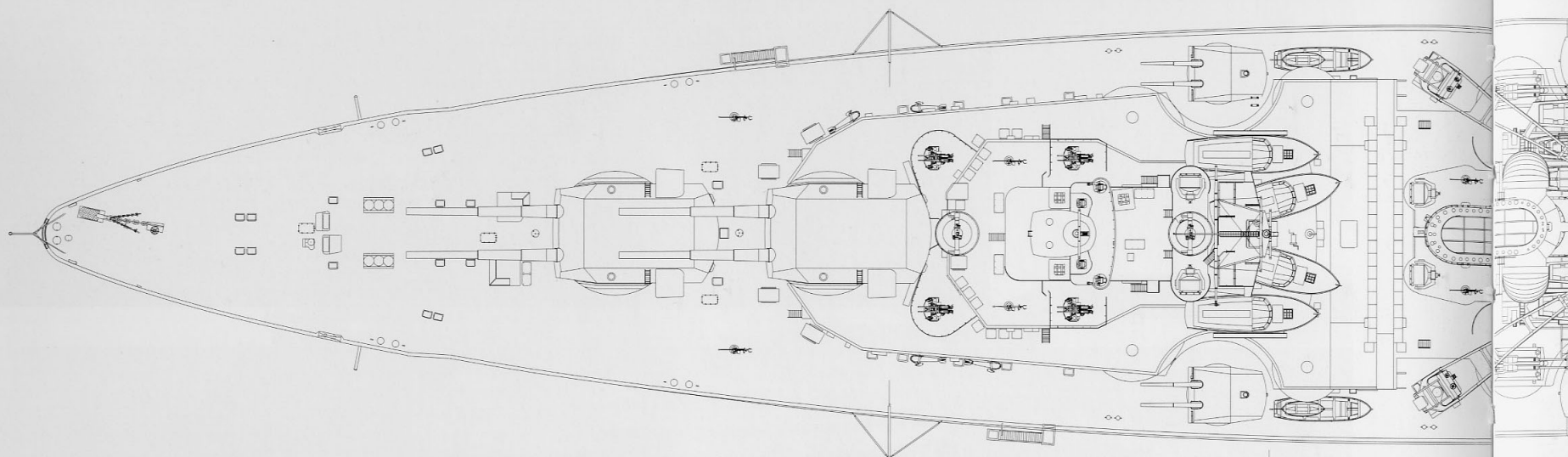
(CPL)

A number of 16" shells
from *Rodney* falling
astern of *Bismarck*,
27 May 1941.

[CPL]



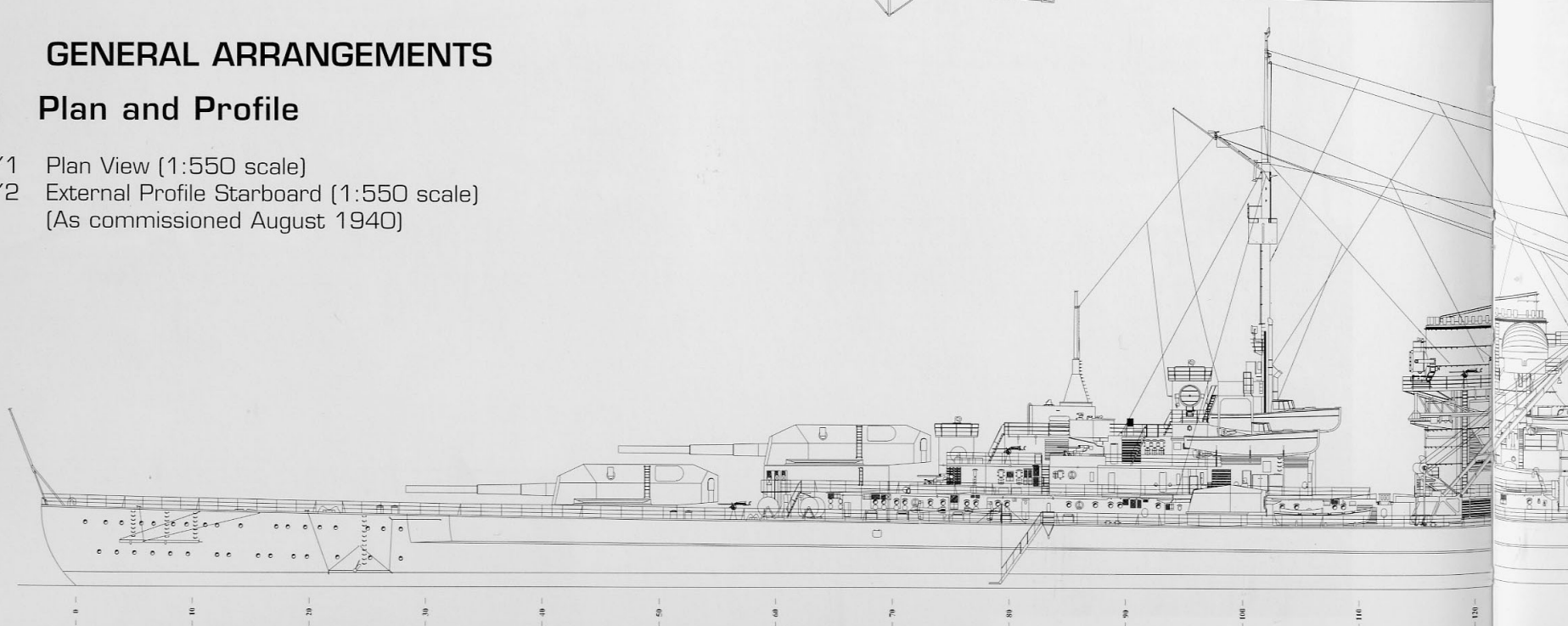
The Fleet Air Arm Striking Force on the flight deck of the carrier *Victorious*. Nine Swordfish (825 Squadron) and two Fulmars (800Z Flight) await the order to attack on 24 May 1941. [CPL]

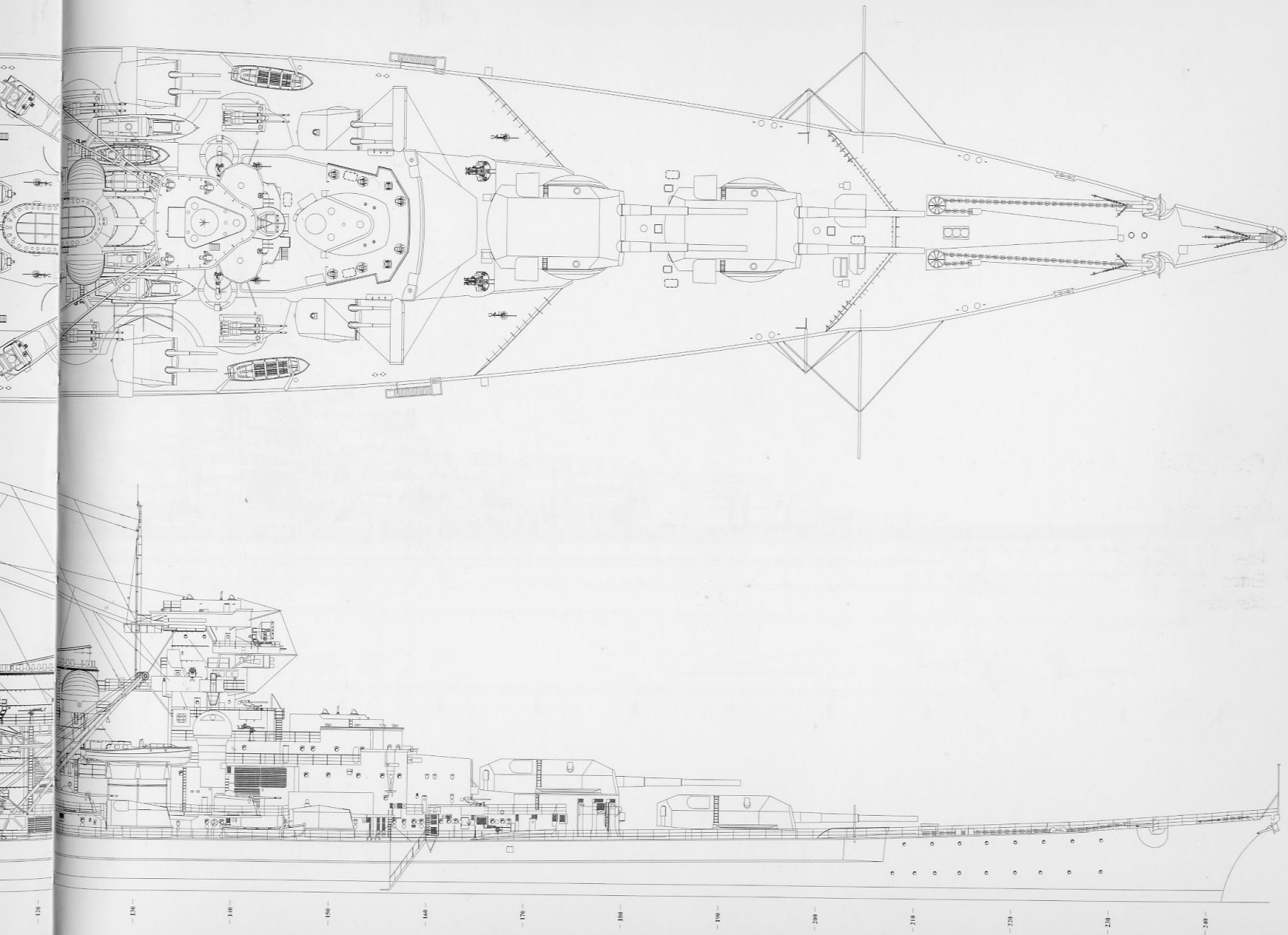


A GENERAL ARRANGEMENTS

A1 Plan and Profile

- A1/1 Plan View (1:550 scale)
 A1/2 External Profile Starboard (1:550 scale)
 (As commissioned August 1940)

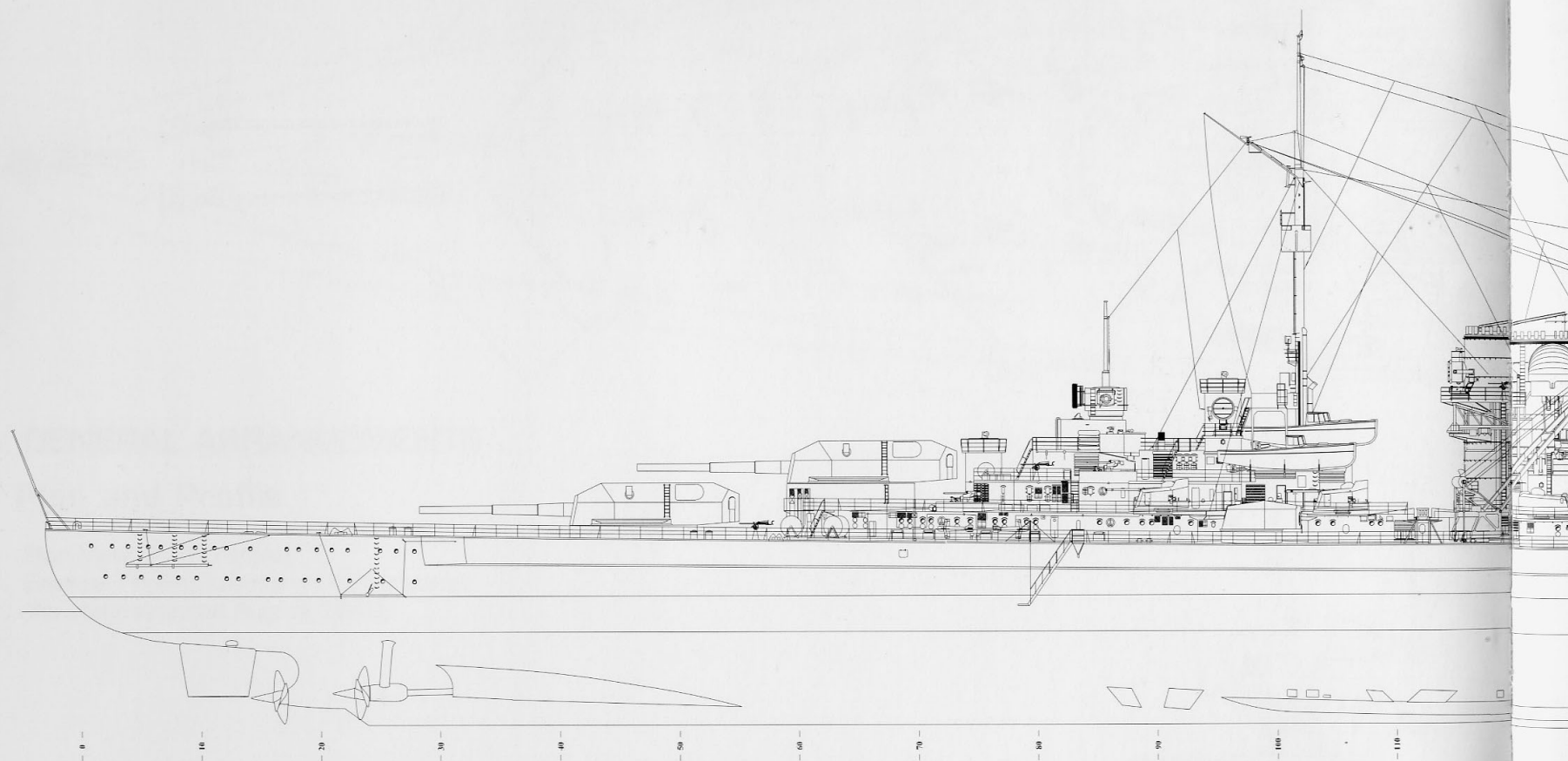


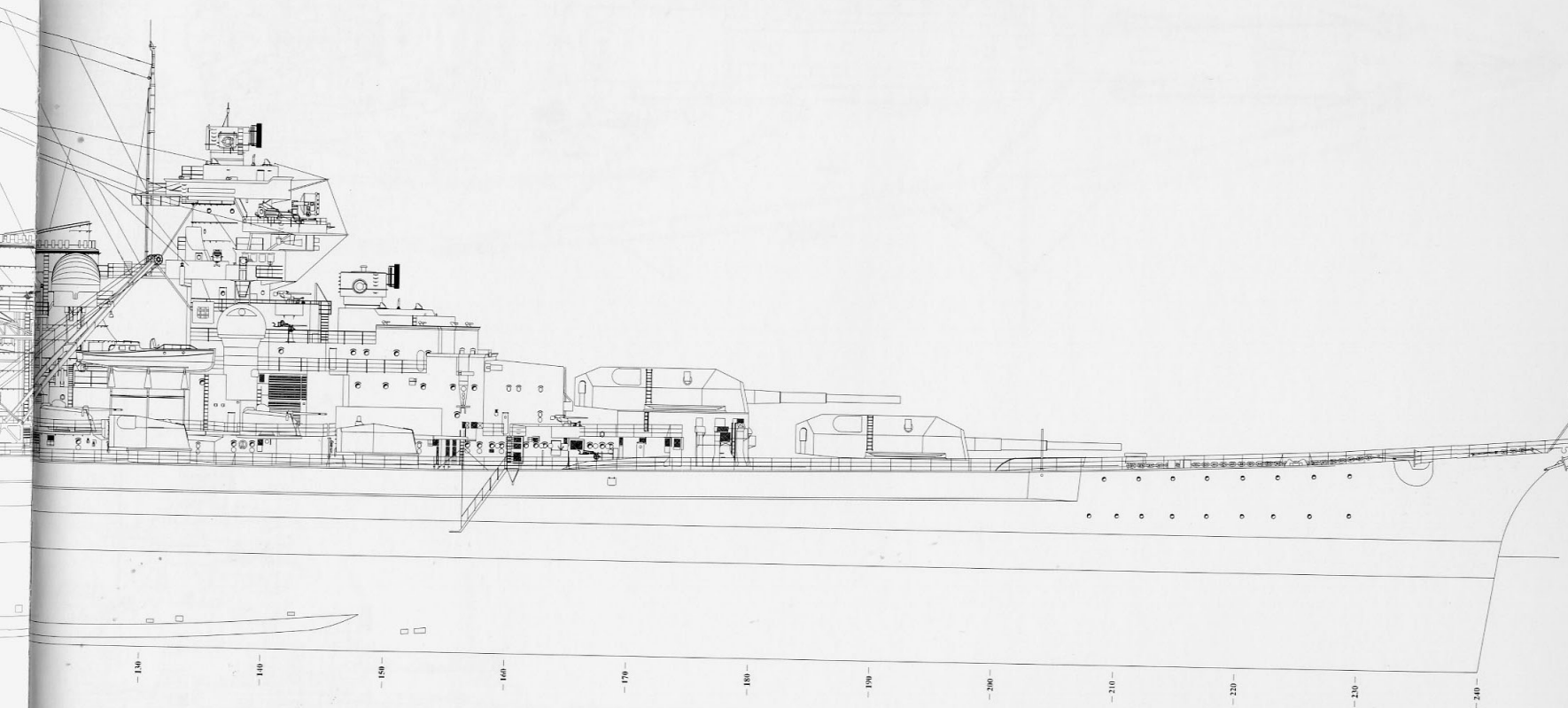


A GENERAL ARRANGEMENTS

A2 External Views (As of March 1941)

A2/1 External Profile Starboard (1:550 scale)

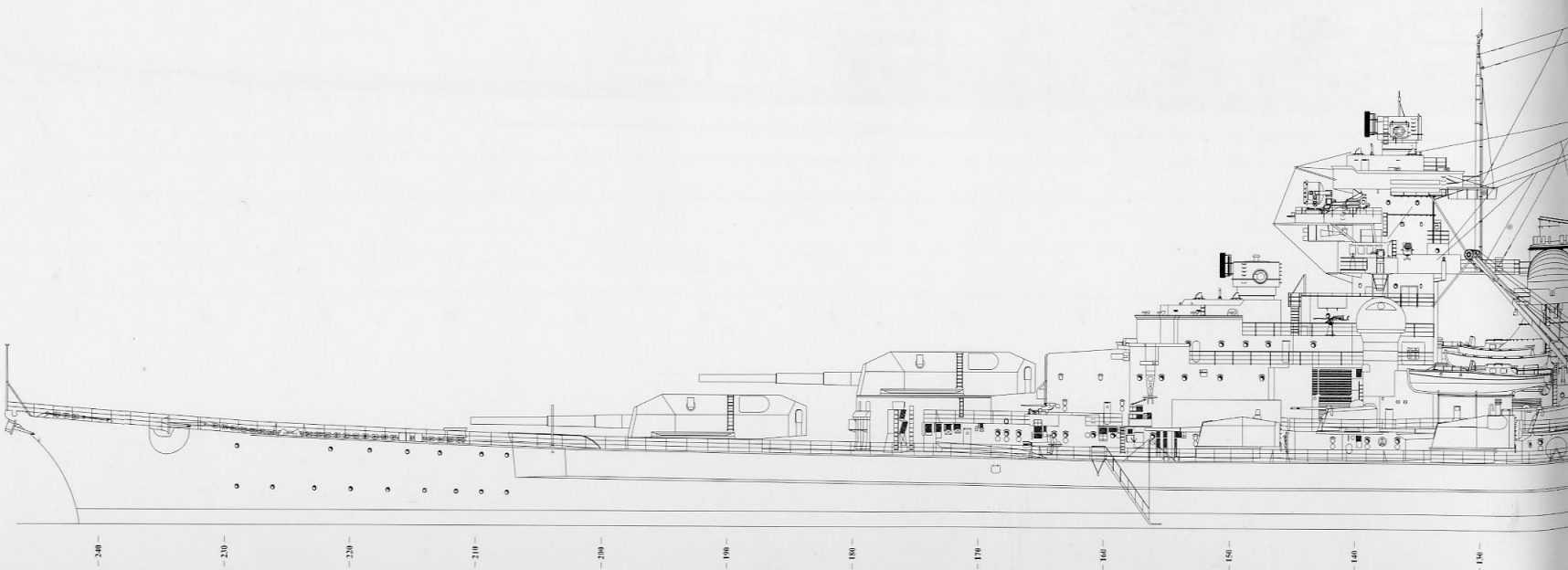
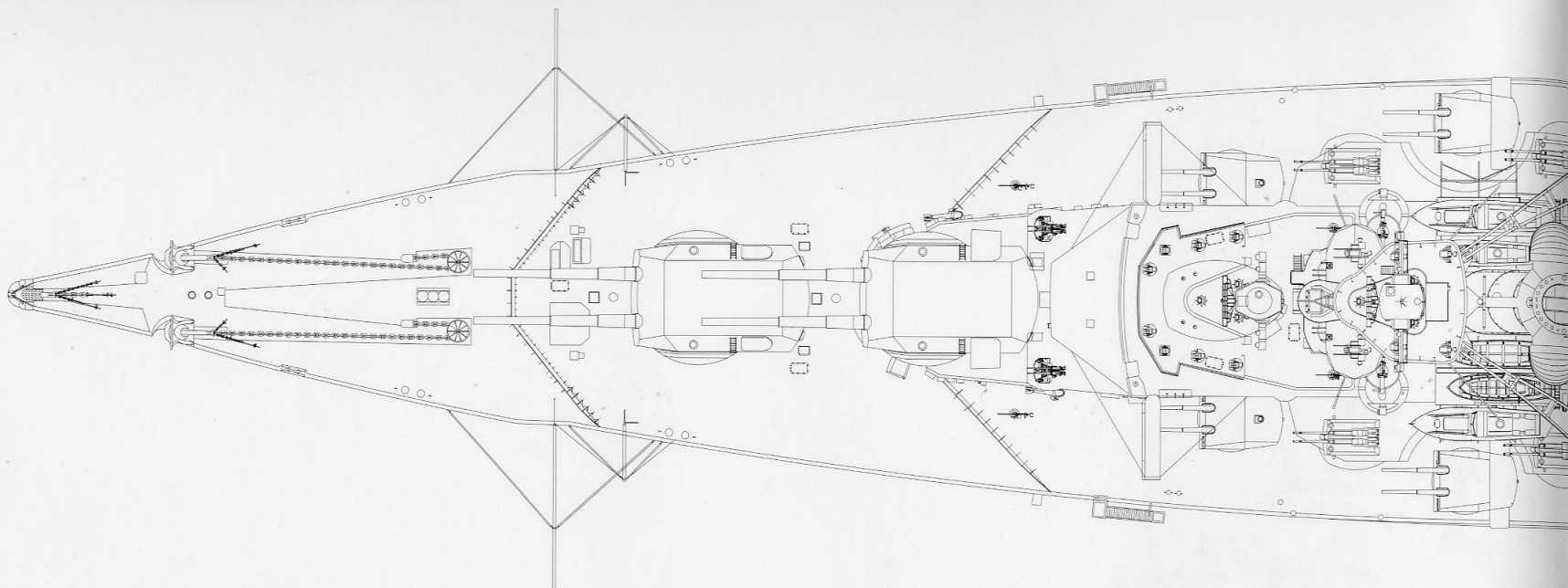


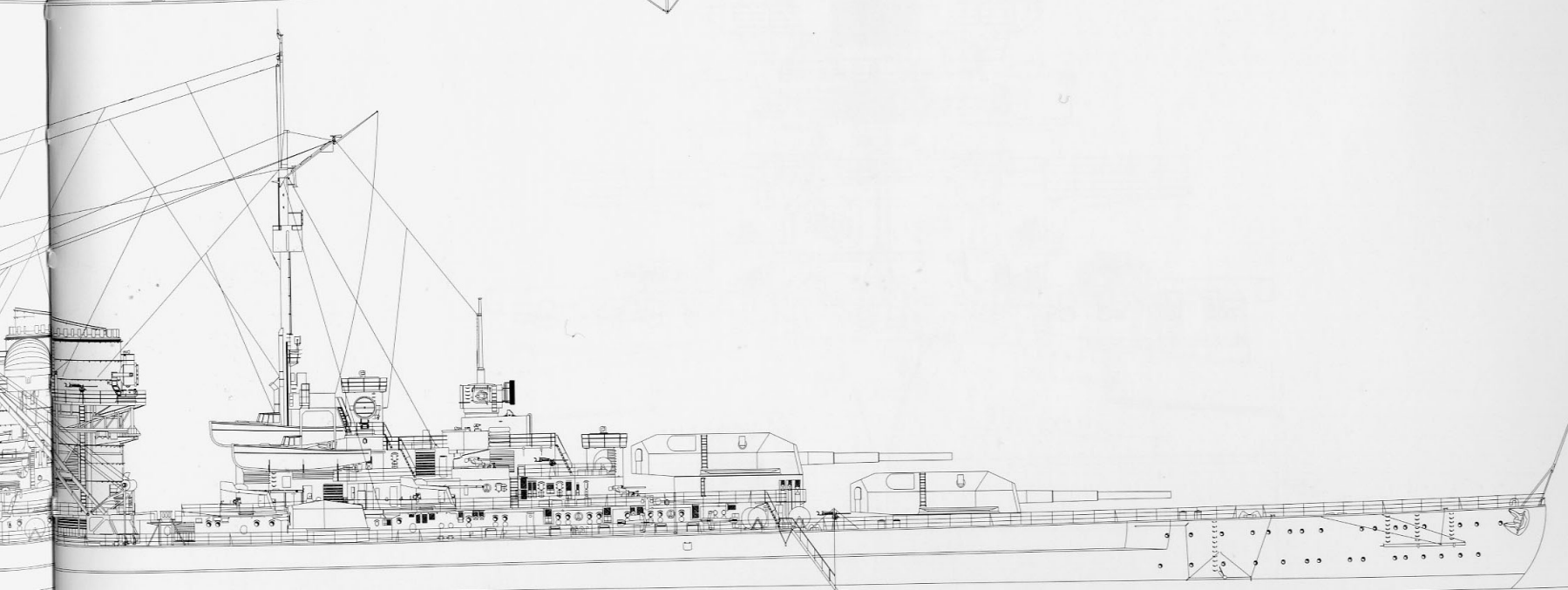
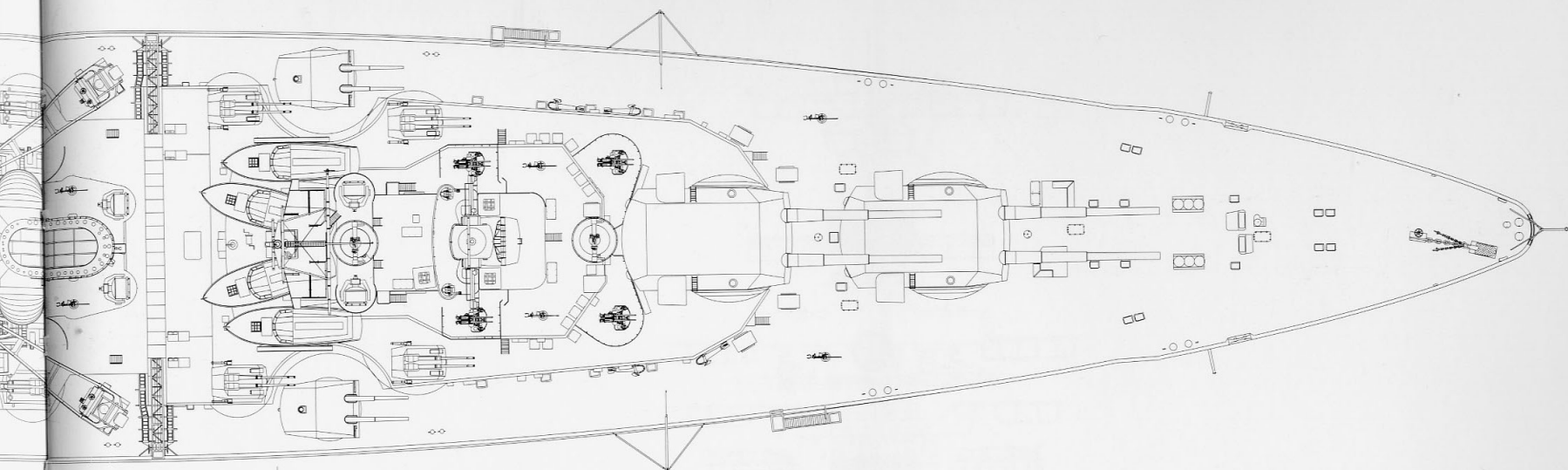


A GENERAL ARRANGEMENTS

A2/2 Plan View

A2/3 External Profile Port

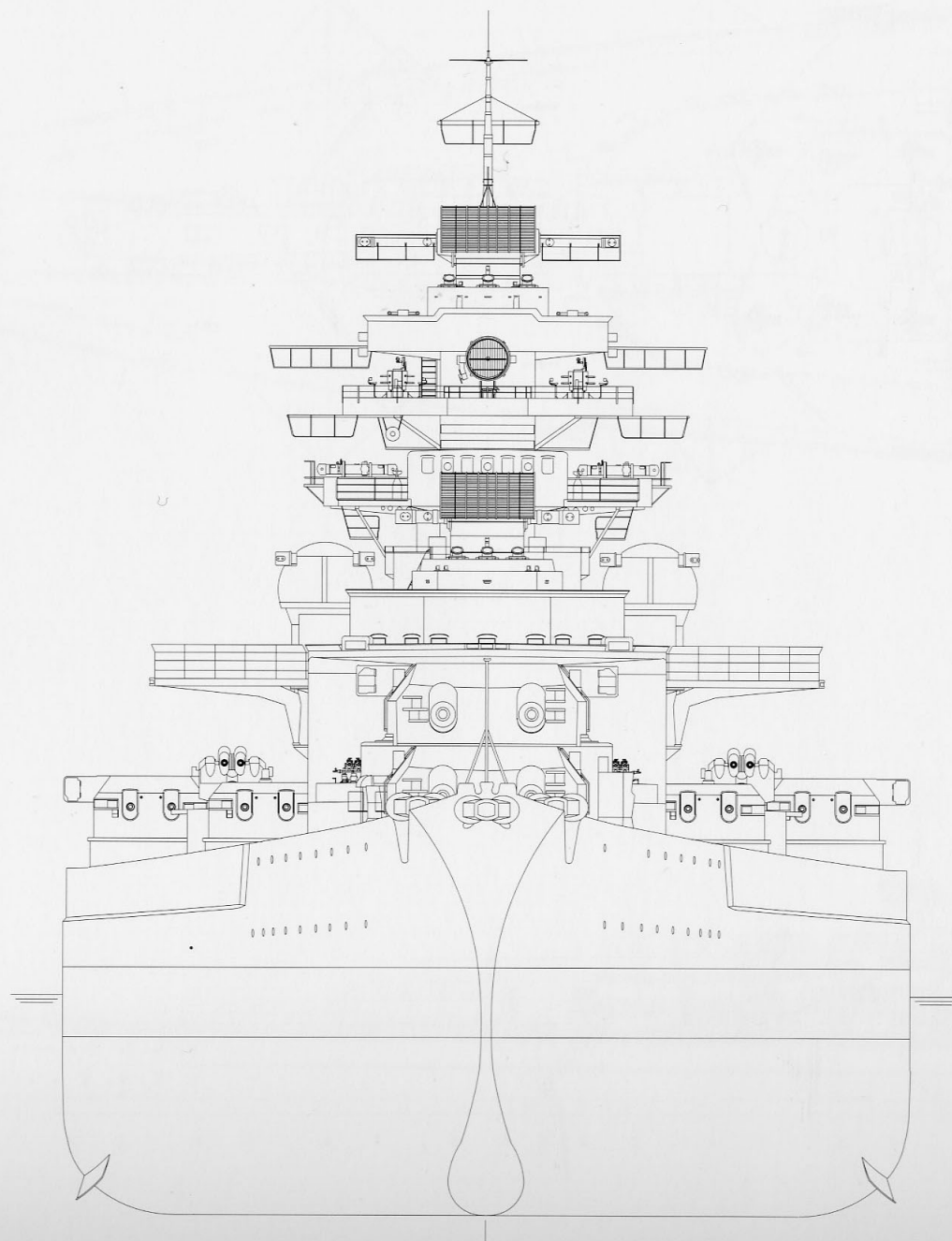




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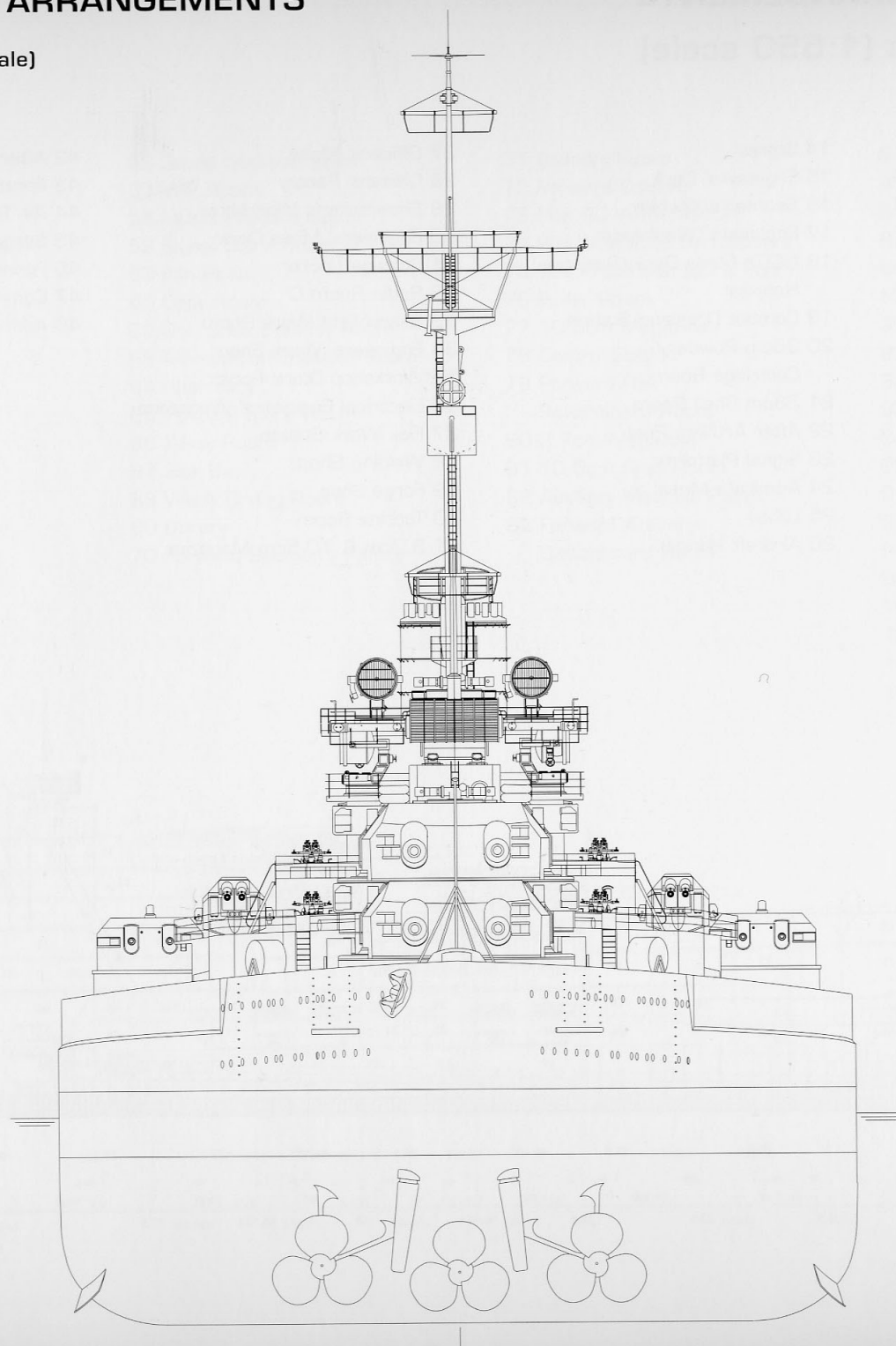
A GENERAL ARRANGEMENTS

A2/4 Bow (1:300 scale)



A GENERAL ARRANGEMENTS

A2/5 Stern (1:300 scale)

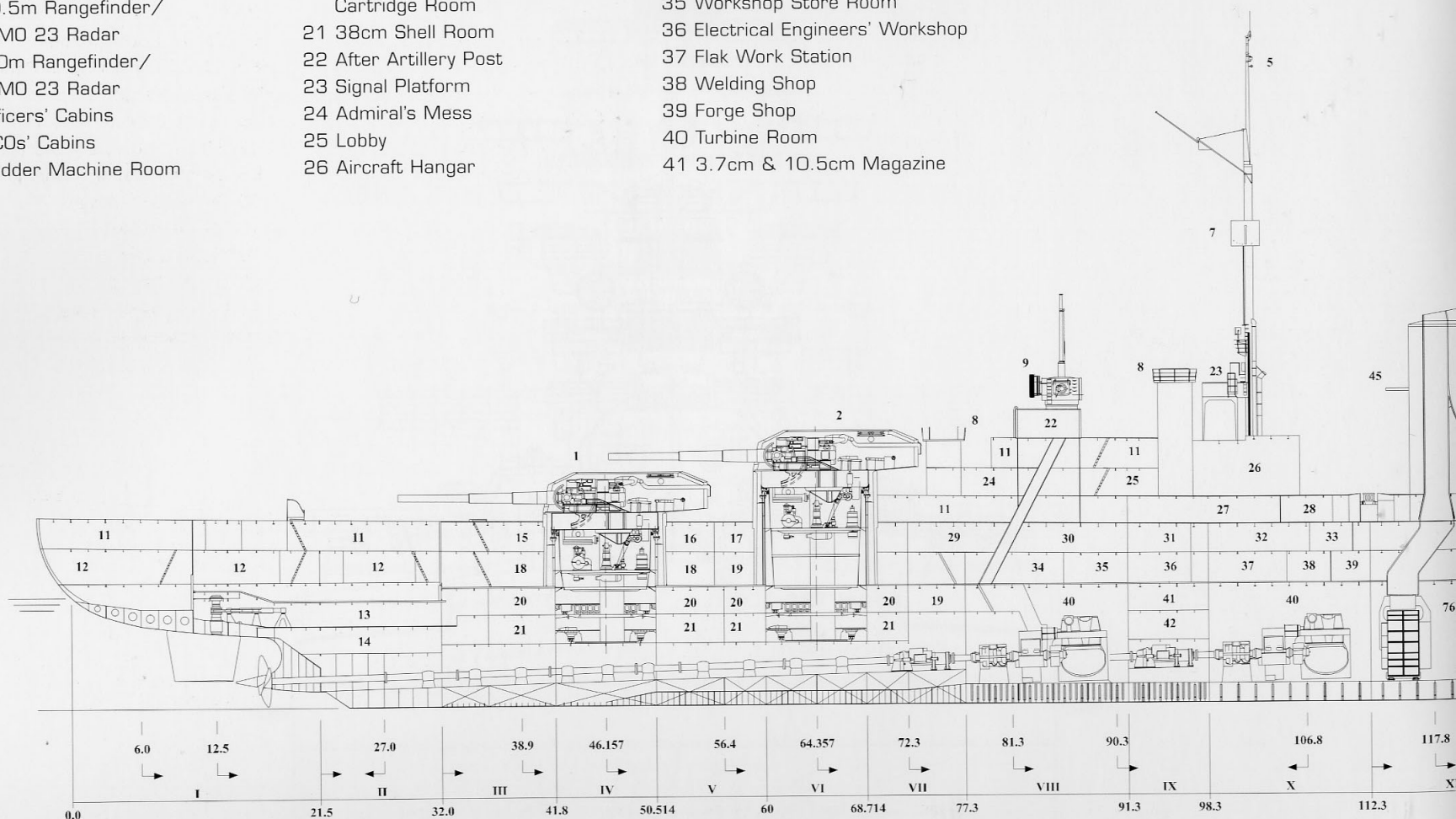


A GENERAL ARRANGEMENTS

A3 Deck Profiles (1:550 scale)

A3/1 Internal Profile

- | | | | |
|--------------------------------|----------------------------|-----------------------------------|-------------------------------|
| 1 Barbette 38cm turret "Dora" | 14 Stores | 27 Officers' Mess | 42 After Flak Plotting Office |
| 2 Barbette 38cm turret "Cäsar" | 15 Engineers' Deck | 28 Officers' Pantry | 43 Foretop Artillery Post |
| 3 Barbette 38cm turret "Bruno" | 16 Seamen's Kitchen | 29 Shoemaker's Workshop | 44 Air Tracking Station |
| 4 Barbette 38cm turret "Anton" | 17 Engineers' Washroom | 30 Engineers' Mess Deck | 45 Searchlight Platform |
| 5 Mainmast | 18 NCO's Mess Deck/Reserve | 31 Storage Locker | 46 Funnel |
| 6 Foremast | Hospital | 32 Radio Room C | 47 Communications Centre |
| 7 Rudder Indicator | 19 Combat Dressing Station | 33 Searchlight Work Room | 48 Admiral's Bridge |
| 8 HA Rangefinder | 20 38cm Powder/ | 34 Engineers' Work Shop | |
| 9 10.5m Rangefinder/ | Cartridge Room | 35 Workshop Store Room | |
| FuMO 23 Radar | 21 38cm Shell Room | 36 Electrical Engineers' Workshop | |
| 10 7.0m Rangefinder/ | 22 After Artillery Post | 37 Flak Work Station | |
| FuMO 23 Radar | 23 Signal Platform | 38 Welding Shop | |
| 11 Officers' Cabins | 24 Admiral's Mess | 39 Forge Shop | |
| 12 NCOs' Cabins | 25 Lobby | 40 Turbine Room | |
| 13 Rudder Machine Room | 26 Aircraft Hangar | 41 3.7cm & 10.5cm Magazine | |

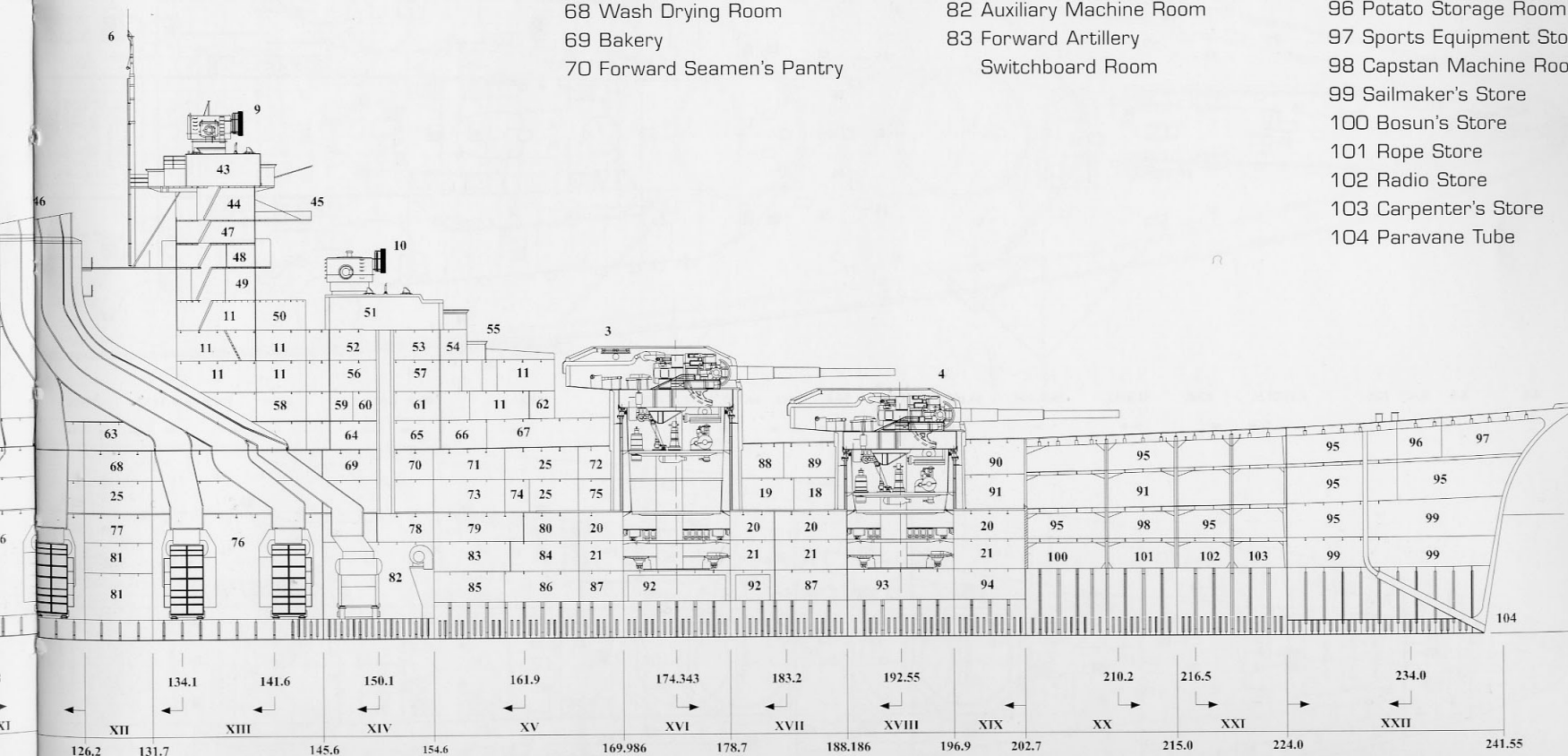


49 Weather Radio Room
 50 Admiral's Sea Cabin
 51 Forward Artillery Post
 52 Combat Message Center
 53 Chart House
 54 Bridge Shelter
 55 Bridge

56 Sound Location Room
 57 VHF Room
 58 Music Practice Room
 59 Signal Store Room
 60 Fan Room
 61 Copy Room
 62 Gun Crew Standby Room
 63 Ammunition Transfer Room
 64 Pharmacy
 65 Hospital Store Room
 66 X-Ray Room
 67 Sick Bay
 68 Wash Drying Room
 69 Bakery
 70 Forward Seamen's Pantry

71 Laundry Room
 72 Forward Canteen
 73 Flak BU Work Station
 74 Flak Telephone Switchboard
 75 Gas Protection Store Room
 76 Boiler Room
 77 10.5cm Magazine
 78 Control Station
 79 Forward Flak
 Switchboard Room
 80 3.7cm Magazine
 81 10.5cm Shell Room
 82 Auxiliary Machine Room
 83 Forward Artillery
 Switchboard Room

84 Forward Artillery Plotting Office
 85 Forward DC Switchboard Room
 86 Forward Gyro Compass Room
 87 Cooling Compressor Room
 88 NCOs' Washroom
 89 Forward Seamen's Washroom
 90 NCOs' Pantry
 91 NCOs' Mess Deck
 92 Cool Room
 93 Canteen Store Room
 94 Administration Store Room
 95 Seamen's Mess Deck
 96 Potato Storage Room
 97 Sports Equipment Storage
 98 Capstan Machine Room
 99 Sailmaker's Store
 100 Bosun's Store
 101 Rope Store
 102 Radio Store
 103 Carpenter's Store
 104 Paravane Tube



A GENERAL ARRANGEMENTS

A3/2 Upper Deck (Oberdeck)

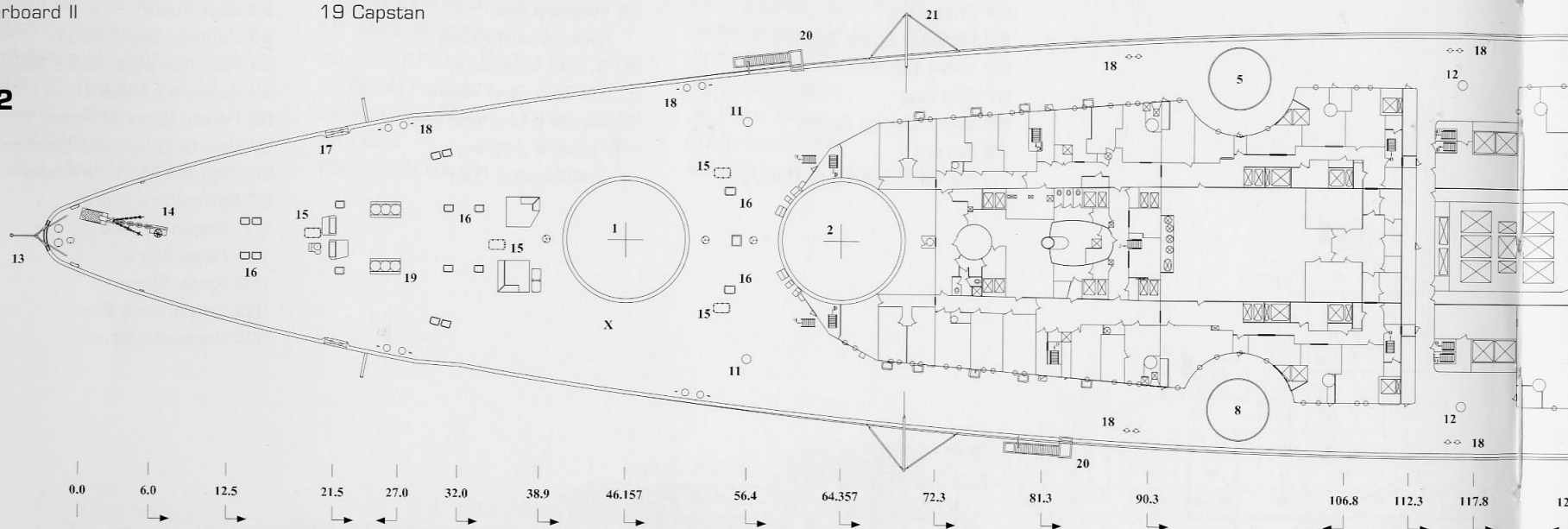
- | | |
|--------------------------------------|-------------------------------------|
| 1 Barbette 38cm turret "Dora" | 10 Barbette 15cm turret Starboard I |
| 2 Barbette 38cm turret "Cäsar" | 11 2cm Gun Base |
| 3 Barbette 38cm turret "Bruno" | 12 Crane Base |
| 4 Barbette 38cm turret "Anton" | 13 Flagstaff |
| 5 Barbette 15cm turret Port III | 14 Stern Anchor Hawse |
| 6 Barbette 15cm turret Port II | 15 Deck Hatch |
| 7 Barbette 15cm turret Port I | 16 Skylight |
| 8 Barbette 15cm turret Starboard III | 17 Fairlead |
| 9 Barbette 15cm turret Starboard II | 18 Bollards |
| | 19 Capstan |

- | |
|---------------------------------|
| 20 After Accommodation Ladder |
| 21 Swing Boom |
| 22 Forward Accommodation Ladder |
| 23 Breakwater |
| 24 Boat Boom |
| 25 Bow Anchor Hawse |
| 26 Jack Staff |

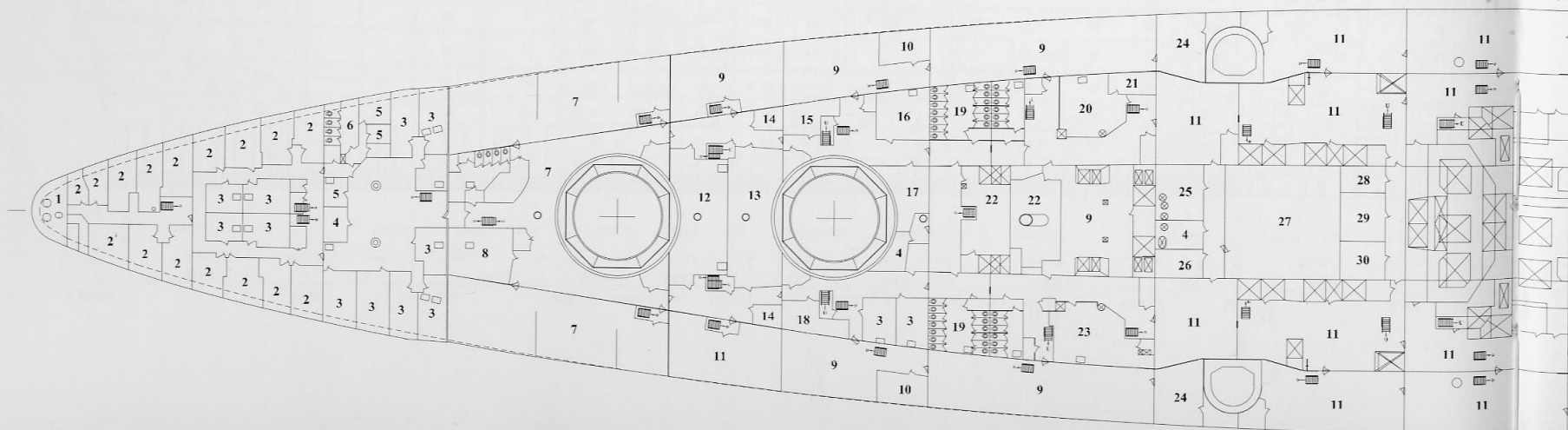
A3/3 Battery Deck (Batterie deck)

- | |
|------------------------|
| 1 Smoke Generator Room |
| 2 Officers' Cabin |
| 3 Cabin for 2 NCOs |
| 4 Storage Locker |
| 5 NCOs' Washroom |
| 6 NCOs' Head |
| 7 Engineers' Deck |
| 8 Engineers' Pantry |
| 9 Engineers' Mess Deck |

A3/2



A3/3



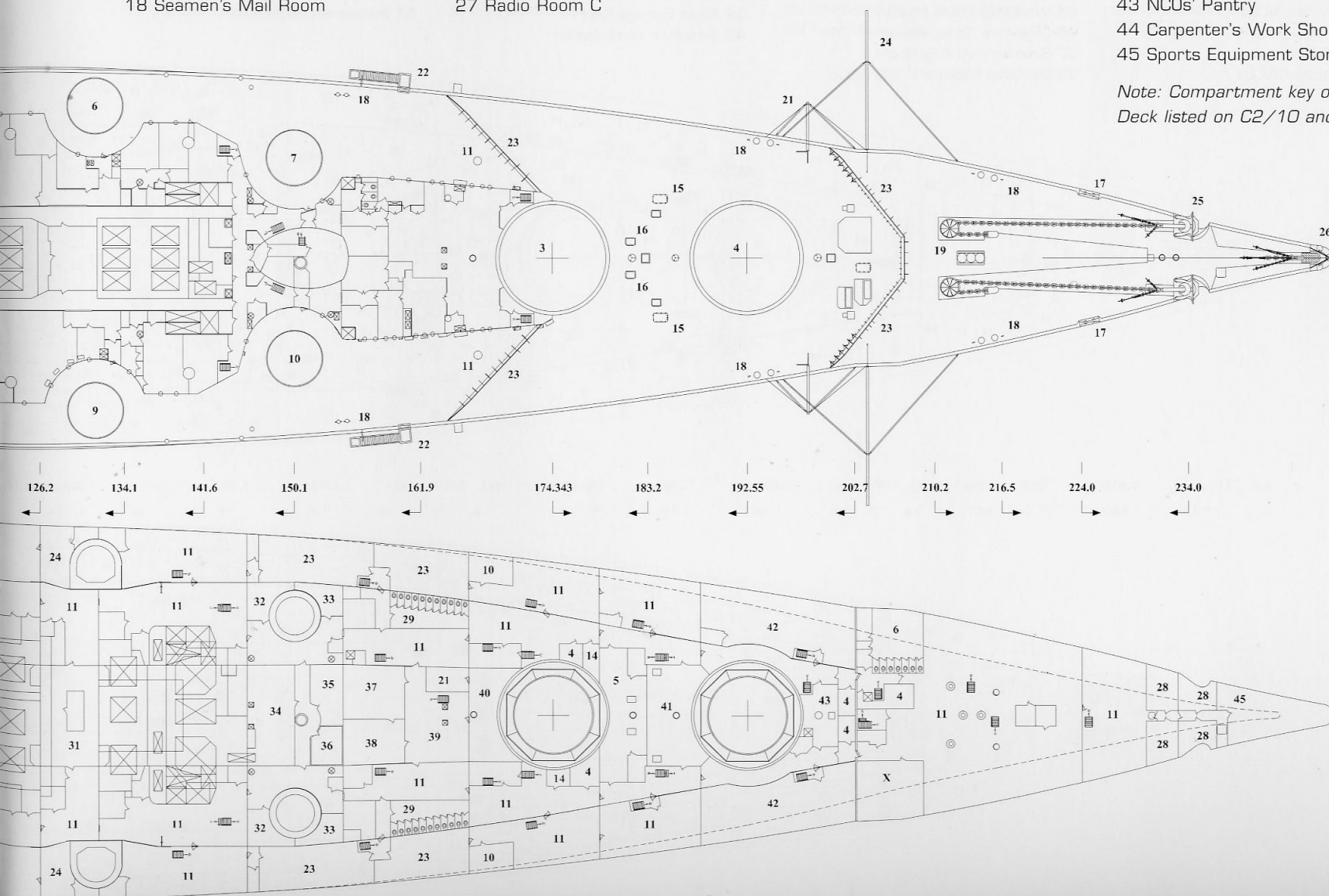
10 Fuel Oil Control Station
11 Seamen's Mess Deck
12 Seamen's Kitchen
13 Engineers' Washroom
14 Hammock Store
15 After Seamen's Pantry
16 NCO's Kitchen
17 Watch Officers' Mail Room
18 Seamen's Mail Room

19 Seamen's Head
20 Aft Canteen
21 Mineral Water Storage Room
22 Shoemaker's Workshop
23 Seamen's Washroom
24 Cooks' and Waiters' Cabin
25 Deck Storage Room
26 Artillery Office
27 Radio Room C

28 Potato Storage Room
29 Searchlight Work Room
30 Potato Prep Room
31 Wash Drying Room
32 Gun Storage Locker
33 Boom Defence Store Room
34 Bakery

35 Forward Seamen's Pantry
36 Bakery Cold Storage
37 Laundry Room
38 Dishwashers
39 Lobby
40 Forward Canteen
41 Forward Seamen's Kitchen
42 NCOs' Mess Deck
43 NCOs' Pantry
44 Carpenter's Work Shop
45 Sports Equipment Storage

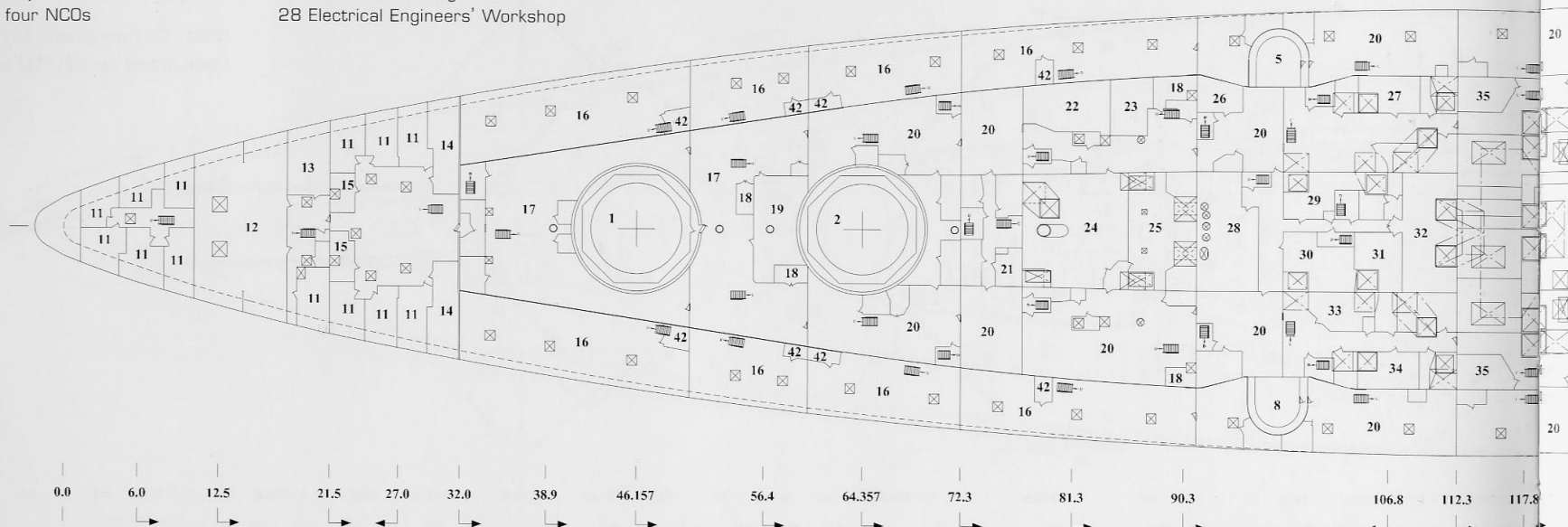
Note: Compartment key on Upper Deck listed on C2/10 and C7/4



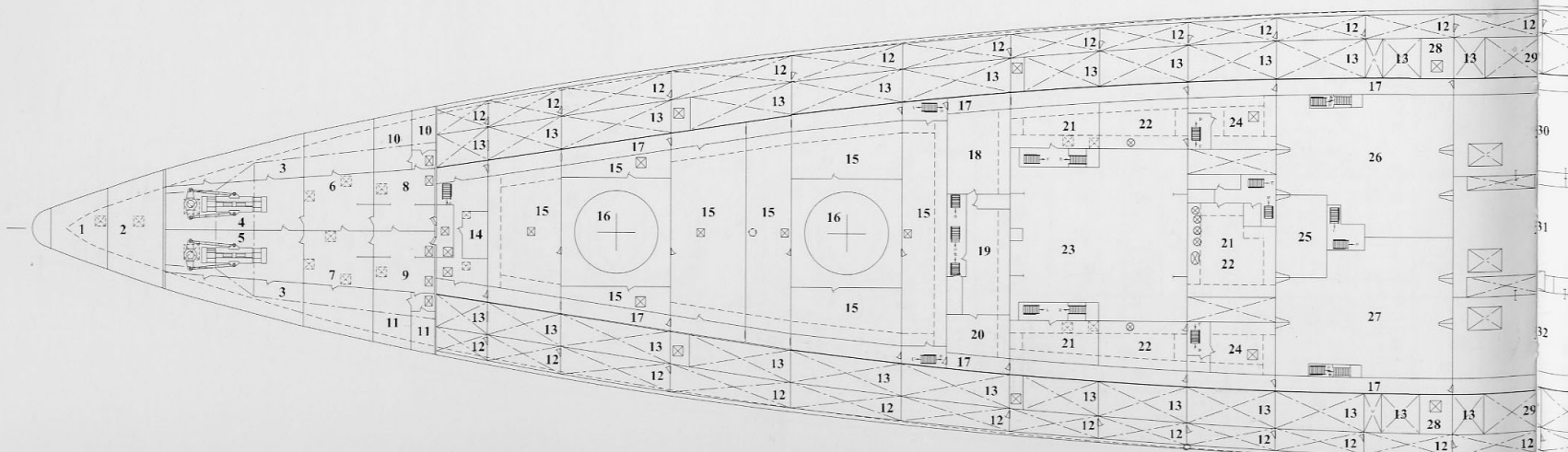
A3/4 Main Armour Deck (Zwischendeck)

- | | | | |
|--------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| 1 Barbette 38cm turret "Dora" | 15 NCOs' Cabin | 29 Electrical Engineers' Store Room | 41 Musical Instrument Store Room |
| 2 Barbette 38cm turret "Casar" | 16 Engineers' Mess Deck | 30 Flak Work Station | 42 Hammock Store |
| 3 Barbette 38cm turret "Bruno" | 17 NCOs' Mess Deck/Reserve Hospital | 31 Welding Shop | 43 SVF Room |
| 4 Barbette 38cm turret "Anton" | 18 Storage Locker | 32 Forge Shop | 44 Flak BU Work Station |
| 5 Barbette 15cm turret Port III | 19 Combat Dressing Station | 33 BU Work Station | 45 Flak Telephone Switchboard |
| 6 Barbette 15cm turret Port II | 20 Seamen's Mess Deck | 34 Hot Water Supply Room | 46 Artillery BU Work Station |
| 7 Barbette 15cm turret Port I | 21 Central Control | 35 Pumpmaster's Store Room | 47 Artillery Telephone Switchboard |
| 8 Barbette 15cm turret Starboard III | 22 Artillery Workshop | 36 Air Compressor Room | 48 Administration Office Store Room |
| 9 Barbette 15cm turret Starboard II | 23 Artillery Store Room | 37 Printing Room | 49 Chart Room |
| 10 Barbette 15cm turret Starboard I | 24 Engineers' Workshop | 38 Optical Device Storage Room | 50 Gas Protection Store Room |
| 11 Cabin for two NCOs | 25 Workshop Store Room | 39 Sport Storage Room | 51 Instrument Store Room |
| 12 NCOs' Mess Deck | 26 Engineers' Store Room | 40 Ventilator Work Station | |
| 13 NCOs' Pantry | 27 Seamen's Writing Room | | |
| 14 Cabin for four NCOs | 28 Electrical Engineers' Workshop | | |

A3/4

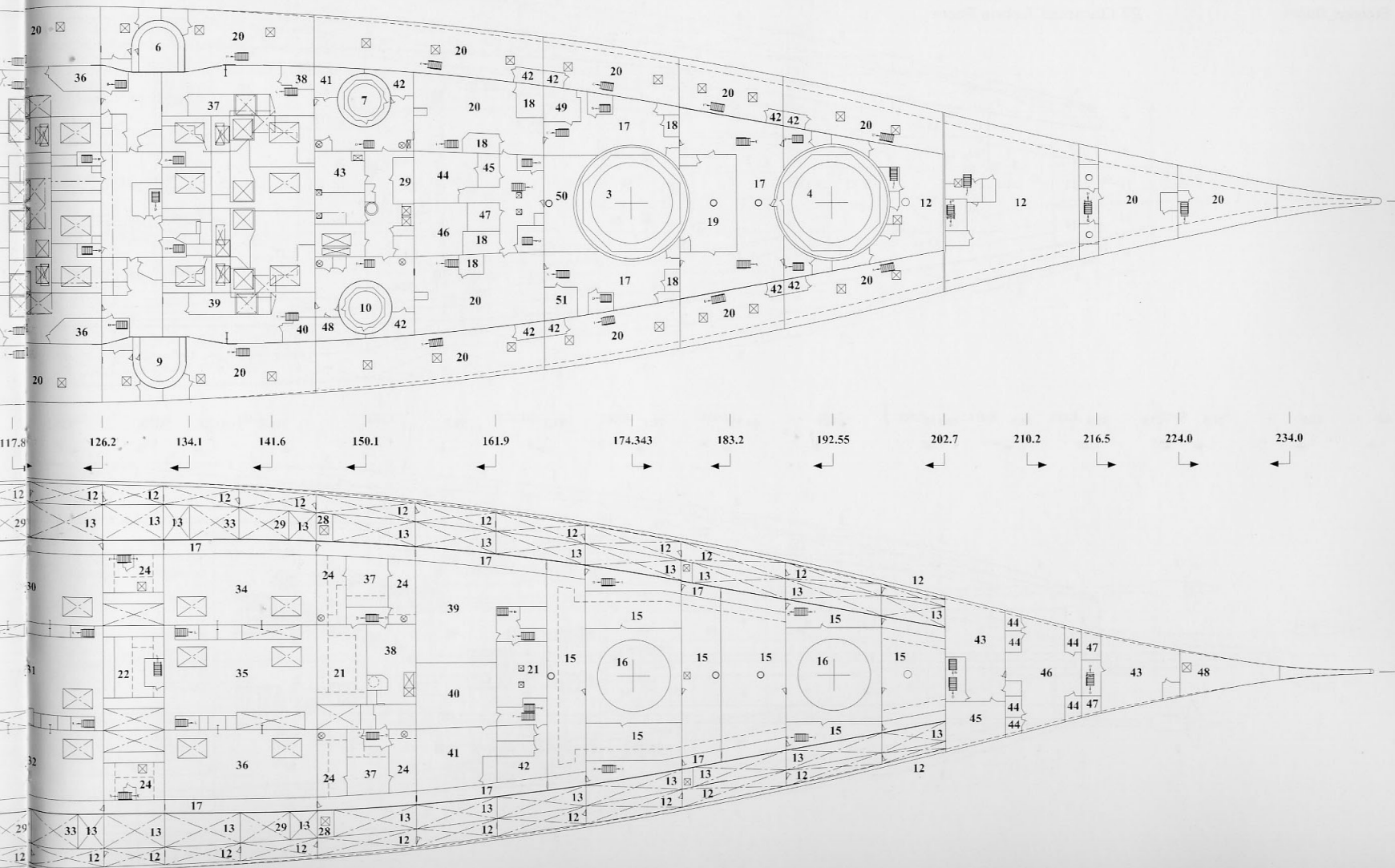


A3/5



A3/5 Upper Platform Deck (Oberes Plattformdeck)

- | | | | |
|------------------------------|--|--------------------------------|----------------------------------|
| 1 Store Room | 12 Trim Tank | 22 10.5cm Magazine | 34 Port Boiler Room No. 2 |
| 2 NCOs' Store Room | 13 Oil Fuel Tank | 23 Centre Turbine Room | 35 Centre Boiler Room No. 2 |
| 3 Empty Room | 14 Dry Store | 24 15.0cm Cartridge Room | 36 Starboard Boiler Room No. 2 |
| 4 Rudder Gear Room No. 2 | 15 38cm Powder/Cartridge Room | 25 Machinery Platform | 37 15cm Cartridge Handling Room |
| 5 Rudder Gear Room No. 1 | 16 38cm Powder/Cartridge Handling Room | 26 Port Turbine Room | 38 Control Station |
| 6 Rudder Machine Room No. 2 | 17 Passageway | 27 Starboard Turbine Room | 39 Radio Room B |
| 7 Rudder Machine Room No. 1 | 18 Aft Artillery Plotting Office | 28 Access Compartment | 40 Forward Flak Switchboard Room |
| 8 Manual Steering Room No. 2 | 19 Artillery Reserve Switchboard Room | 29 High Cell | 41 Forward Flak Control Center |
| 9 Manual Steering Room No. 1 | 20 Aft Artillery Amplification Room | 30 Port Boiler Room No. 1 | 42 Transformer Room |
| 10 Admiral's Store Room | 21 3.7cm Magazine | 31 Centre Boiler Room No. 1 | 43 Seamen's Mess Deck |
| 11 Captain's Store Room | | 32 Starboard Boiler Room No. 1 | 44 Detention Cell |
| | | 33 Feed Water Tank | 45 Storage Room |



A GENERAL ARRANGEMENTS

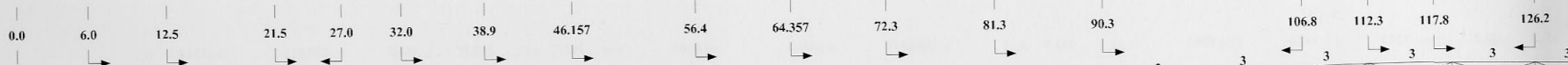
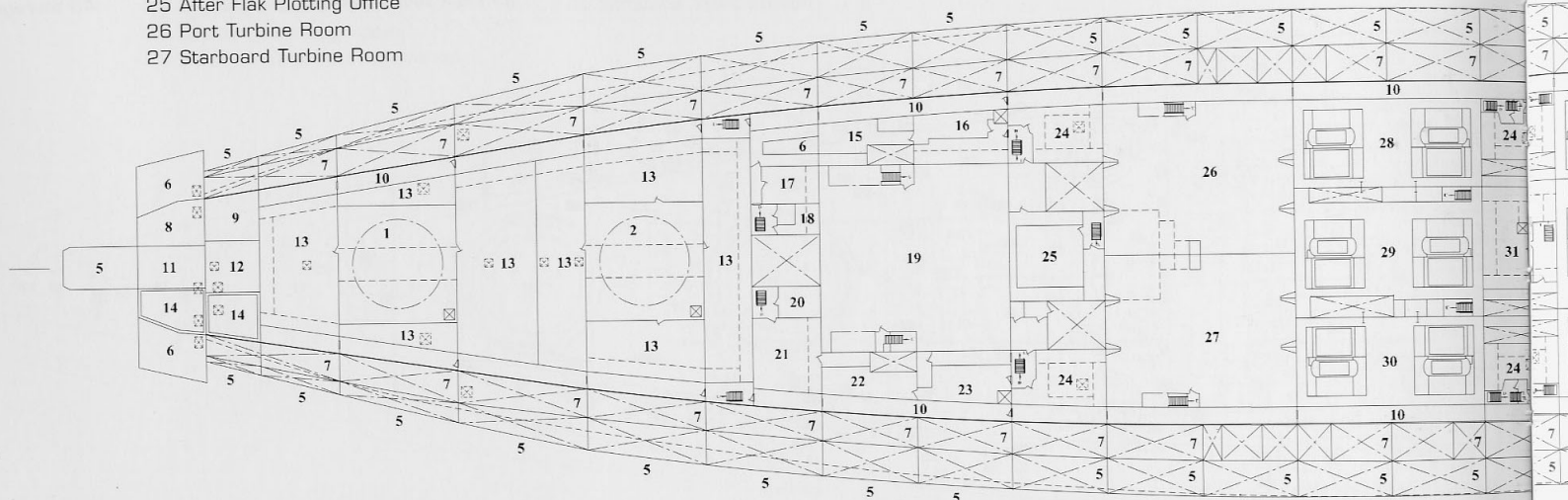
A3/6 Middle Platform Deck (Mittleres Plattformdeck)

- 1 38cm Shell Handling Room "Dora"
- 2 38cm Shell Handling Room "Casar"
- 3 38cm Shell Handling Room "Bruno"
- 4 38cm Shell Handling Room "Anton"
- 5 Trim Tank
- 6 Officers' Store Room
- 7 Oil Fuel Tank
- 8 Paint Store
- 9 Meat Storage Room
- 10 Passageway
- 11 Spirit Store
- 12 Pump Room
- 13 38cm Shell Room
- 14 Canteen Storage Room
- 15 Flak Switchboard Room
- 16 Aft Regulator Room
- 17 Aft Artillery Reserve Switchboard Room
- 18 Air Conditioning Room
- 19 Centre Turbine Room
- 20 Dry Store
- 21 Gyro Compass Room
- 22 Aft DC Switchboard Room
- 23 Aft Central Gun Training Room
- 24 15cm Shell Room
- 25 After Flak Plotting Office
- 26 Port Turbine Room
- 27 Starboard Turbine Room

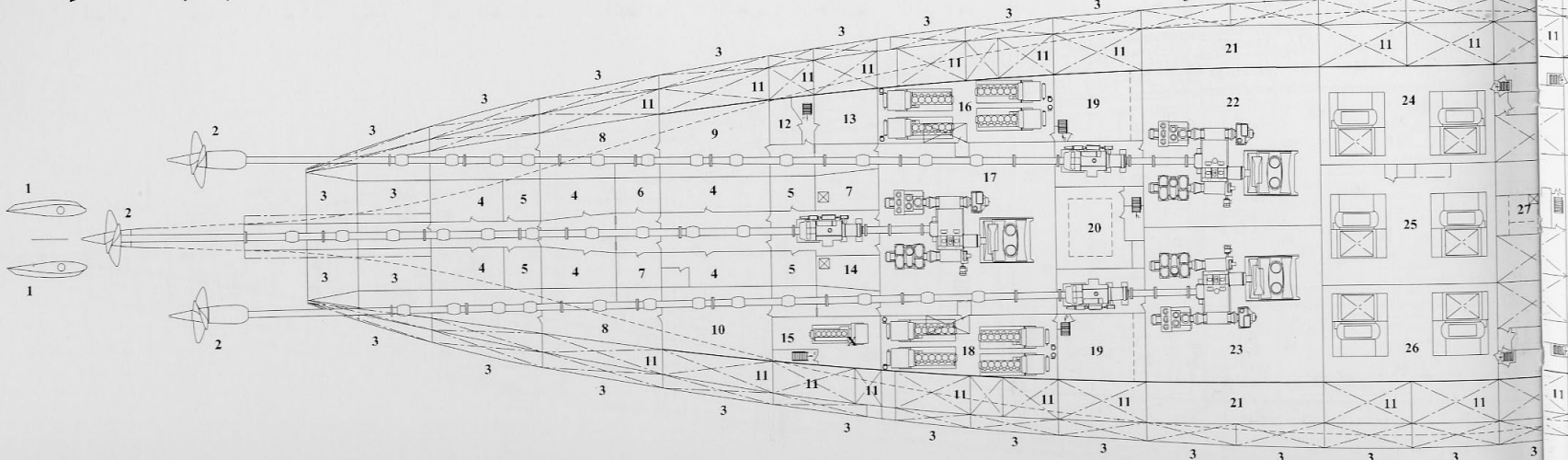
- 28 Port Boiler Room No. 1
- 29 Centre Boiler Room No. 1
- 30 Starboard Boiler Room No. 1
- 31 10.5cm Shell Room
- 32 Port Boiler Room No. 2
- 33 Centre Boiler Room No. 2
- 34 Starboard Boiler Room No. 2
- 35 Auxiliary Machine Room
- 36 Forward Artillery Reserve Switchboard
- 37 Bread Storage Room
- 38 Forward Artillery Switchboard Room

- 39 Forward Artillery Plotting Office
- 40 Forward Artillery Amplification Room
- 41 Radio Room A
- 42 Paint Store
- 43 Pyrotechnic Store
- 44 Chain Box
- 45 Bosun's Store
- 46 Rope Storage
- 47 Radio Store
- 48 Carpenter's Store
- 49 Sailmaker's Store

A3/6



A3/7



A GENERAL ARRANGEMENTS

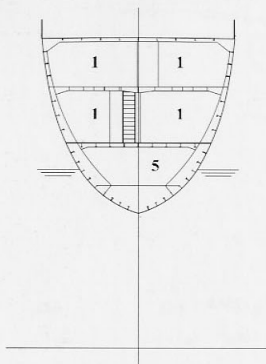
A4 Transverse Sections (scale 1:400)

A4/1 Frame 6.0 Looking Forward

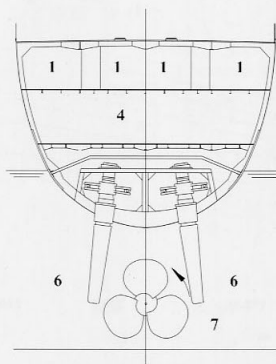
A4/2 Frame 12.5 Looking Forward

A4/3 Frame 21.5 Looking Forward

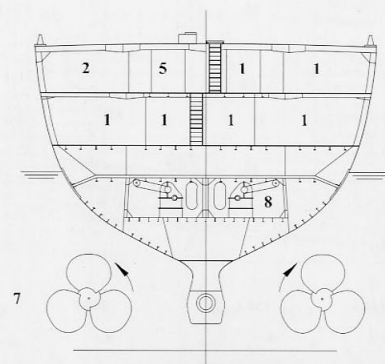
- 1 Officers' Cabin
- 2 NCOs' Head
- 3 NCOs' Washroom
- 4 NCOs' Mesh Deck
- 5 NCOs' Store Room
- 6 Rudder
- 7 Propeller
- 8 Rudder Machine Room



A4/1



A4/2



A4/3

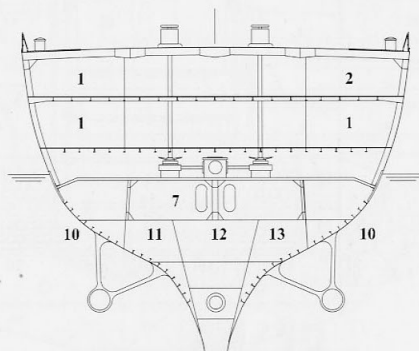
A GENERAL ARRANGEMENTS

A4/4 Frame 27.0 Looking Aft

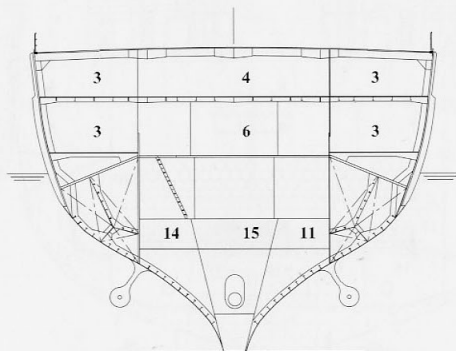
A4/5 Frame 32.0 Looking Forward

A4/6 Frame 38.9 Looking Forward

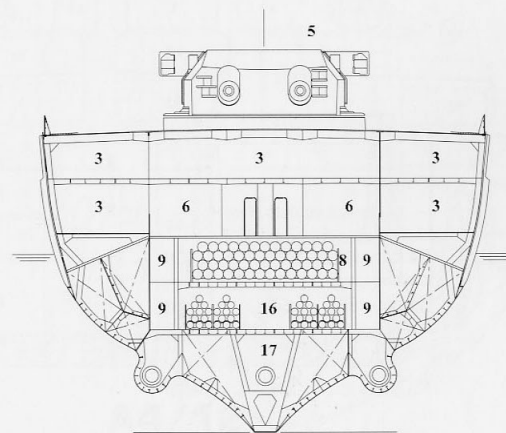
- | | |
|--|-------------------------|
| 1 Cabin for two NCOs | 9 Passageway |
| 2 NCOs' Washroom | 10 Officers' Dry Store |
| 3 Engineers' Mess Deck | 11 Canteen Storage Room |
| 4 Engineers' Pantry | 12 Spirit Store |
| 5 38cm Turret "Dora" | 13 Paint Store |
| 6 NCOs' Mess Deck/
Reserve Hospital | 14 Meat Store Room |
| 7 Rudder Machine Room | 15 Pump Room |
| 8 38cm Powder/
Cartridge Room | 16 38cm Shell Room |
| | 17 Shaft Tunnel |



A4/4



A4/5



A4/6

A GENERAL ARRANGEMENTS

A4/7 Frame 46.157 Looking Forward

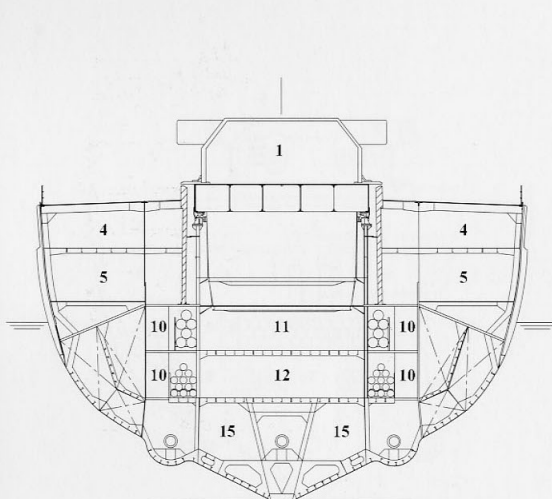
A4/8 Frame 56.4 Looking Forward

A4/9 Frame 64.357 Looking Forward

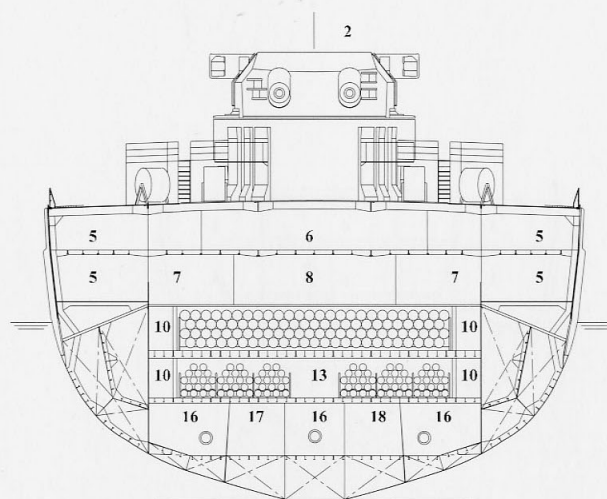
- 1 38cm Turret "Dora"
- 2 38cm Turret "Casar"
- 3 Officers' Cabin
- 4 Engineers' Deck
- 5 Engineers' Mess Deck
- 6 Engineers' Washroom
- 7 JNCOs' Mess Deck/
Reserve Hospital
- 8 Combat Dressing Station

- 9 Seamen's Mess Deck
- 10 Passageway
- 11 38cm Powder/
Cartridge Handling Room
- 12 38cm Shell Handling
Room "Dora"
- 13 38cm Shell Room
- 14 38cm Shell Handling
Room "Casar"

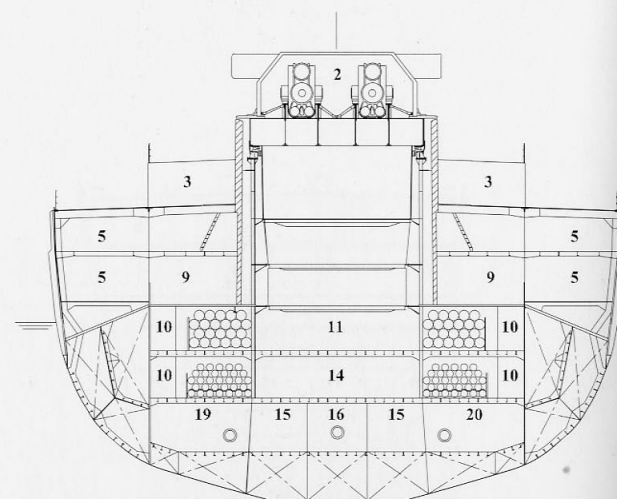
- 15 Machinery Store Room
- 16 Shaft Tunnel
- 17 Fresh and Wash Water
Pump Room
- 18 Fuel Store
- 19 Cooling Machinery Room
- 20 Fuel Pump Room



A4/7



A4/8



A4/9

A GENERAL ARRANGEMENTS

A4/10 Frame 72.3 Looking Forward

A4/11 Frame 81.3 Looking Forward

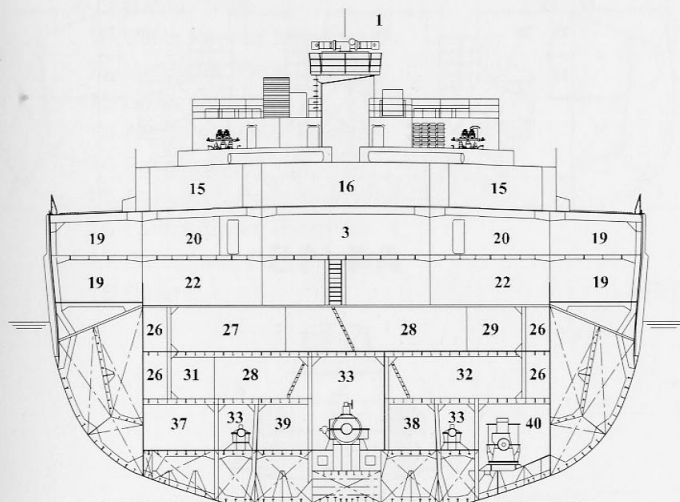
A4/12 Frame 90.3 Looking Forward

- 1 HA Rangefinder
- 2 160cm Searchlight
- 3 Lobby
- 4 10.5cm SKC/
- 33 Dopp LC37 Flak Gun

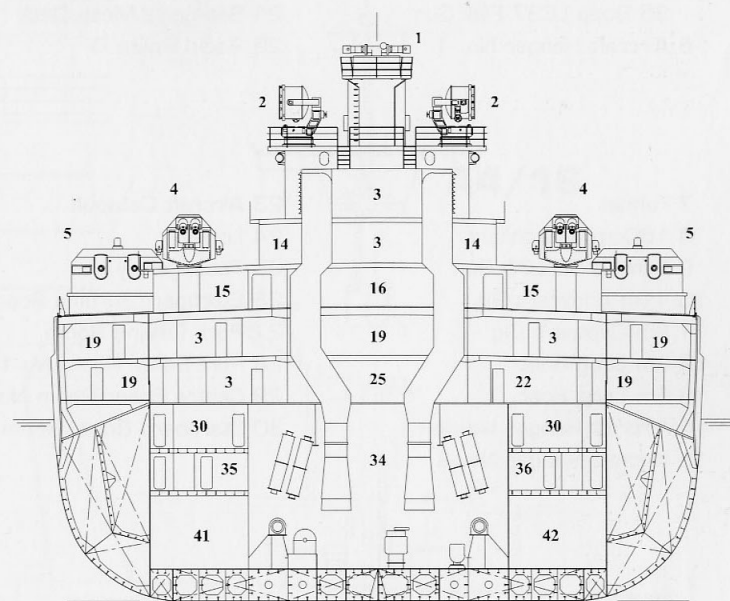
- 18 Astro Workshop
- 19 Engineers' Mess Deck
- 20 Seamen's Head
- 21 Shoemaker's Workshop
- 22 Seamen's Mess Deck
- 23 Artillery Workshop
- 24 Engineers' Workshop
- 25 Workshop Store Room

- 26 Passageway
- 27 Aft Artillery Plotting Office
- 28 Artillery Reserve Switchboard Room

- 29 Aft Artillery Amplification Room
- 30 10.5cm Magazine
- 31 Officers' Store Room

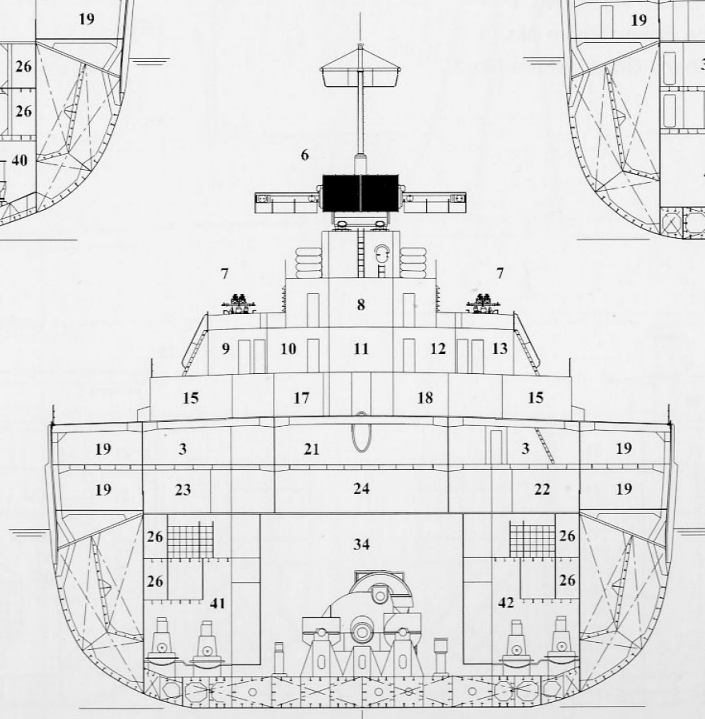


A4/10



A4/12

- 5 15cm SKC/28 Drh LC/
- 34 Gun
- 6 10.5m Rangefinder/
- FuMO 23 Radar
- 7 3.7cm SKC/30 Dopp LC/
- 30 Gun
- 8 Flak Work Station
- 9 Captain's Sleeping Cabin
- 10 Captain's Bathroom
- 11 Admiral's & Captain's Pantry
- 12 Admiral's Bathroom
- 13 Admiral's Sleeping Cabin
- 14 Gun Crew Standby Room
- 15 Officers' Cabin
- 16 Officers' Wardroom
- 17 Teleprinter Room



A4/11

- 32 Gyro Compass Room
- 33 Shaft Tunnel
- 34 Centre Turbine Room
- 35 Aft Regulator Room
- 36 Aft Central Gen Training Room
- 37 Electrical Store
- 38 Fuel Store
- 39 Artillery Store
- 40 Diesel Motor Room
- 41 Electrical Generator Room
- No.1
- 42 Electrical Generator Room
- No.2

A GENERAL ARRANGEMENTS

A4/13 Frame 106.8 Looking Aft

A4/14 Frame 112.3 Looking Forward

A4/15 Frame 117.8 Looking Forward

1 Rudder Indicator

2 Main Mast

3 Signal Platform

4 11m Tender

5 10.5cm SKC/

33 Dopp LC37 Flak Gun

6 Aircraft Hangar No. 1

16 Office

17 Officers' Conference Room

18 Officers' Pantry

19 Officers' Kitchen

20 Midshipmen's Work Room

21 Seamen's Mess Deck

22 Radio Room C

7 Funnel

8 160cm Searchlight

9 2cm C/30 L30 Gun

10 11m Admiral's Gig

11 9m Captain's Gig

12 8m Long Boat

13 6m Long Boat

14 Aircraft Hangar No. 2

15 Aircraft Hangar No. 3

23 Aircraft Catapult

24 Lobby

25 Passageway

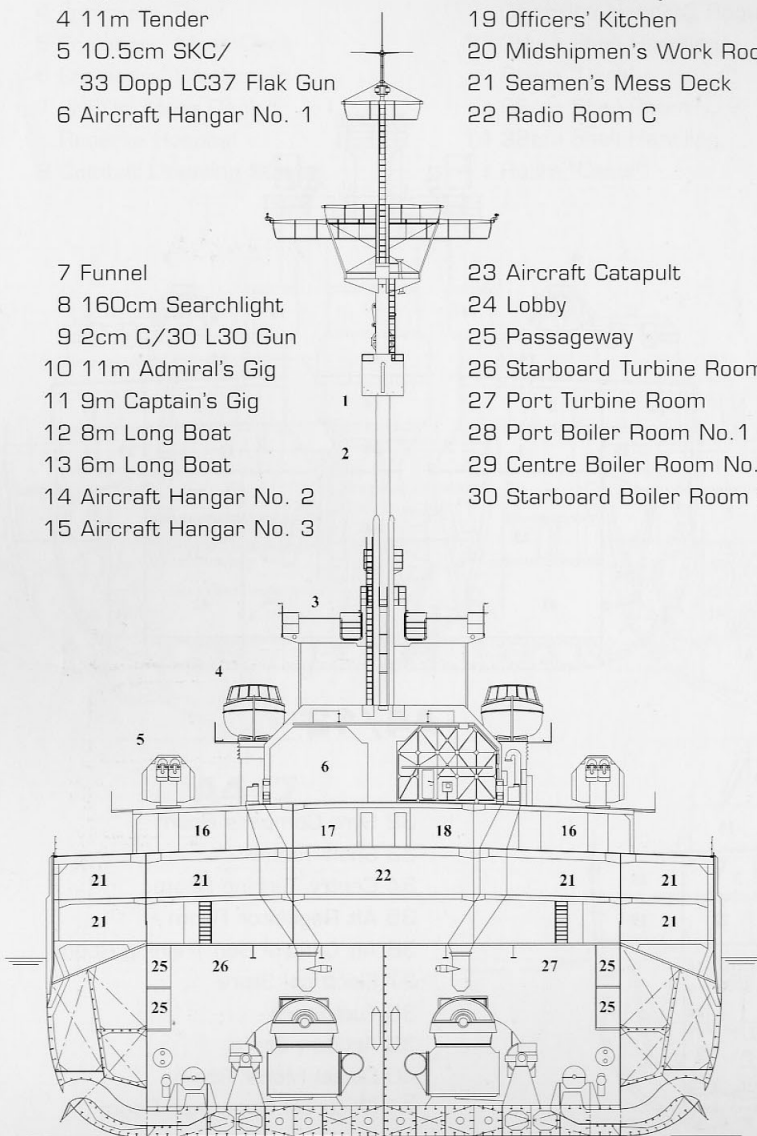
26 Starboard Turbine Room

27 Port Turbine Room

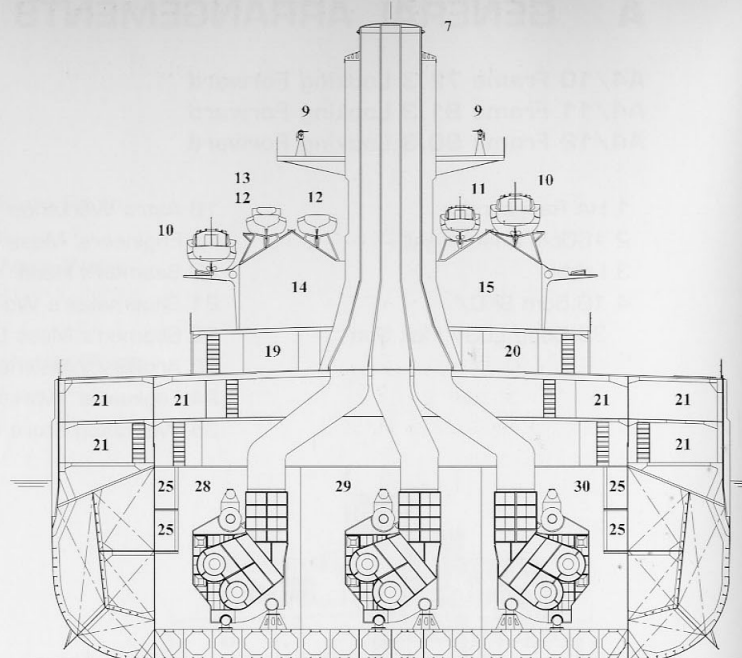
28 Port Boiler Room No. 1

29 Centre Boiler Room No. 1

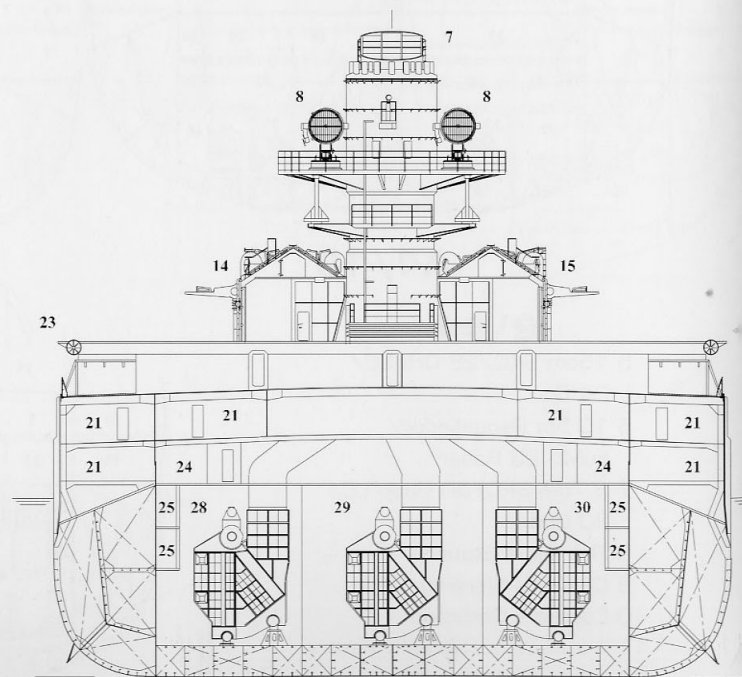
30 Starboard Boiler Room No. 1



A4/13



A4/15



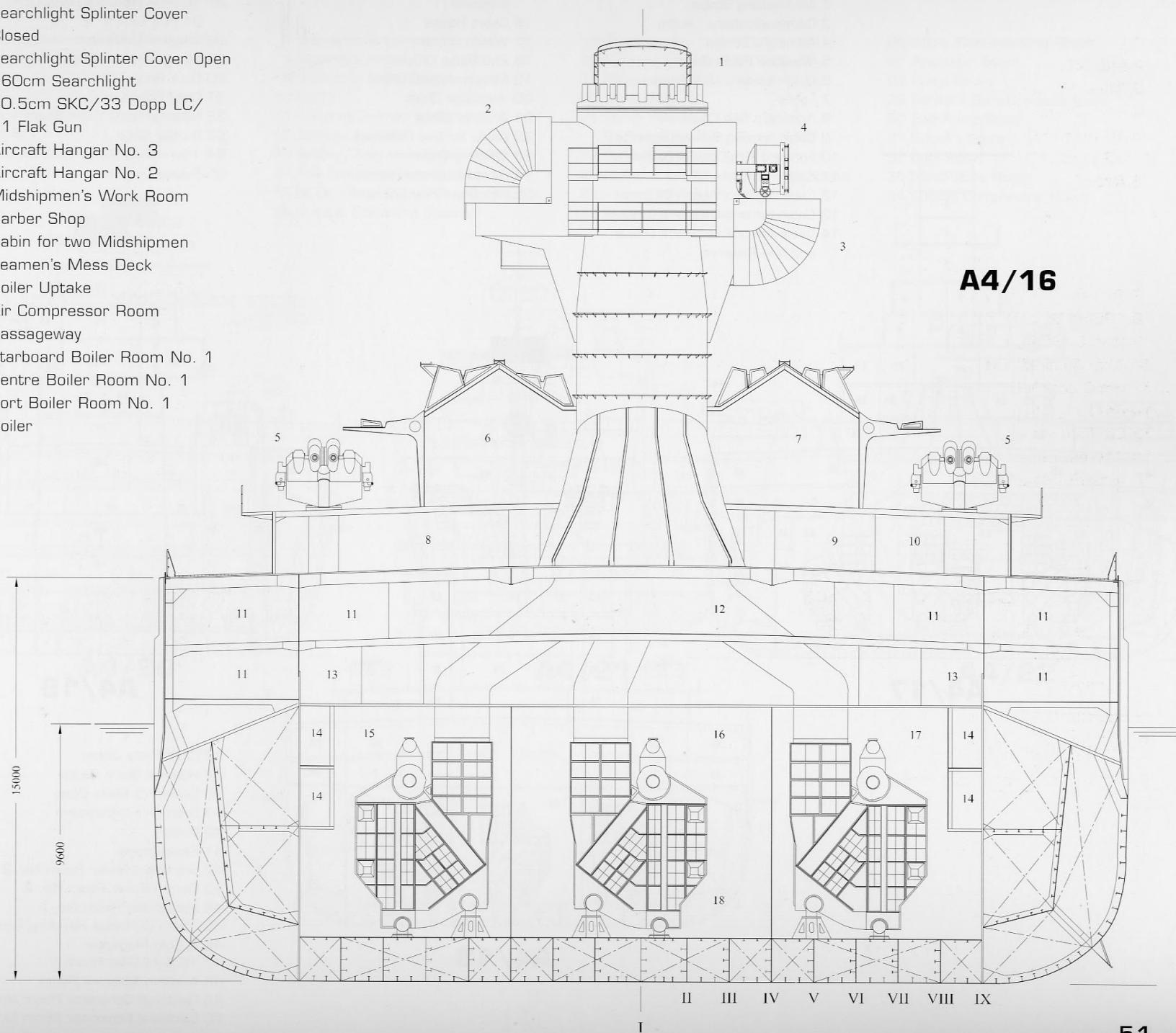
A4/14

A GENERAL ARRANGEMENTS

A4/16 Frame 126.2 Looking Aft (Scale 1:200)

- 1 Funnel
- 2 Searchlight Splinter Cover
Closed
- 3 Searchlight Splinter Cover Open
- 4 160cm Searchlight
- 5 10.5cm SKC/33 Dopp LC/
31 Flak Gun
- 6 Aircraft Hangar No. 3
- 7 Aircraft Hangar No. 2
- 8 Midshipmen's Work Room
- 9 Barber Shop
- 10 Cabin for two Midshipmen
- 11 Seamen's Mess Deck
- 12 Boiler Uptake
- 13 Air Compressor Room
- 14 Passageway
- 15 Starboard Boiler Room No. 1
- 16 Centre Boiler Room No. 1
- 17 Port Boiler Room No. 1
- 18 Boiler

A4/16



A GENERAL ARRANGEMENTS

A4/17 Frame 134.1 Looking Aft

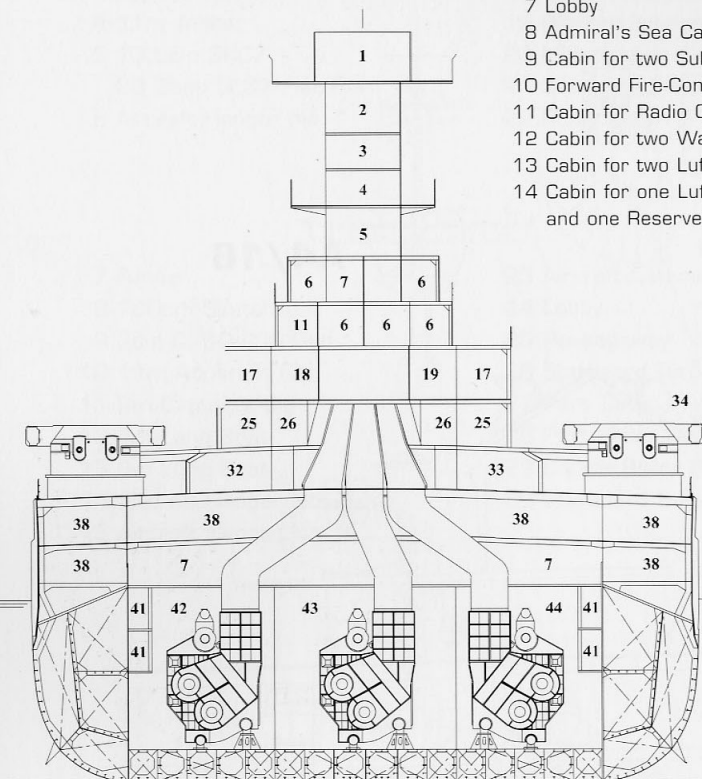
A4/18 Frame 141.6 Looking Aft

A4/19 Frame 150.1 Looking Aft

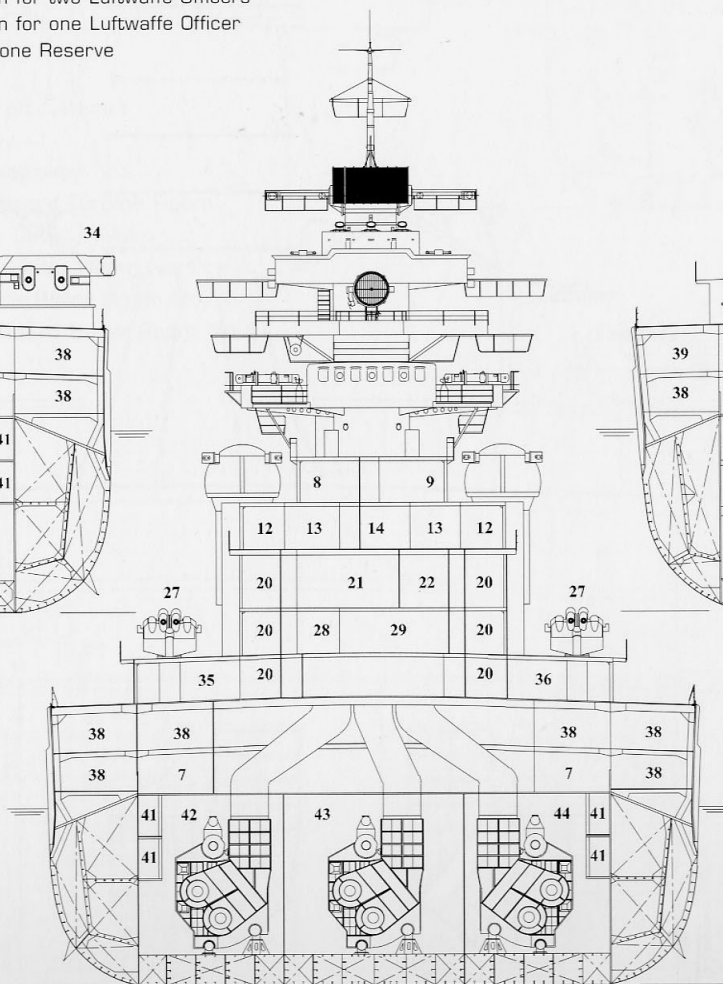
- 1 Foretop Fire-Control Station
- 2 Air Tracking Station
- 3 Communications Centre
- 4 Admiral's Bridge
- 5 Weather Radio Room
- 6 Cabin for two Midshipman
- 7 Lobby
- 8 Admiral's Sea Cabin
- 9 Cabin for two Sub-Lieutenants
- 10 Forward Fire-Control Station
- 11 Cabin for Radio Officer and Reserve
- 12 Cabin for two Watch Officers
- 13 Cabin for two Luftwaffe Officers
- 14 Cabin for one Luftwaffe Officer and one Reserve

- 15 Shelter for Night Com. Post. Personal
- 16 Chart House
- 17 Watch Officer
- 18 2nd Radio Officer
- 19 Meteorological Office
- 20 Ventilator Shaft
- 21 Artillery Office
- 22 Cabin for two Reserves
- 23 Officers' Cabin
- 24 Sound Location Room
- 25 Flak Gun Crew Shelter

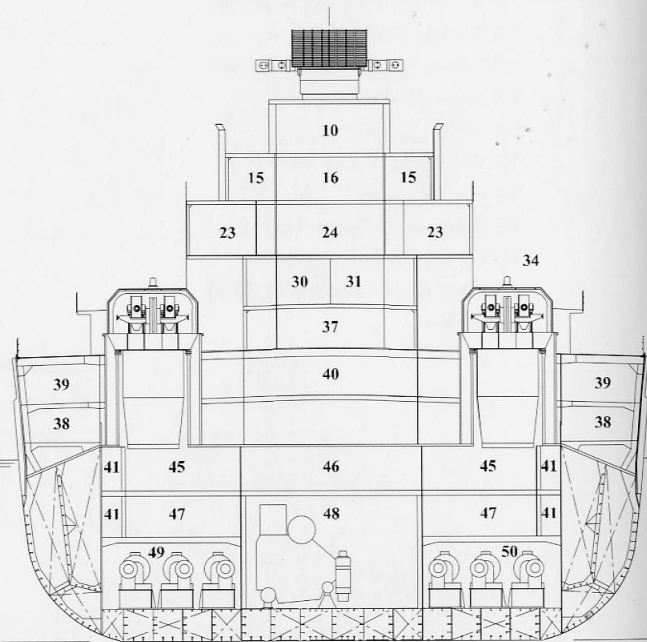
- 26 Switchboard Room
- 27 10.5cm SKC/33 Doop LC/31 Flak Gun
- 28 Officers' Bathroom
- 29 Music Practice Room
- 30 Dark Room
- 31 Copy Room
- 32 Midshipmen's Work Room
- 33 Barber Shop
- 34 15cm SKC/28 Drh LC/34 Gun
- 35 Potato Locker



A4/17



A4/18



A4/19

- 36 Chief Petty Officer
- 37 Hospital Store Room
- 38 Seamen's Mess Deck
- 39 Seamen's Washroom
- 40 Bakery
- 41 Passageway
- 42 Starboard Boiler Room No. 2
- 43 Centre Boiler Room No. 2
- 44 Port Boiler Room No. 2
- 45 15cm Cartridge Handling Room
- 46 3.7cm Magazine
- 47 10.5cm Shell Room
- 48 Auxiliary Machine Room
- 49 Electrical Generator Room No. 3
- 50 Electrical Generator Room No. 4

A GENERAL ARRANGEMENTS

A4/20 Frame 161.9 Looking Aft

A4/21 Frame 174.343 Looking Forward

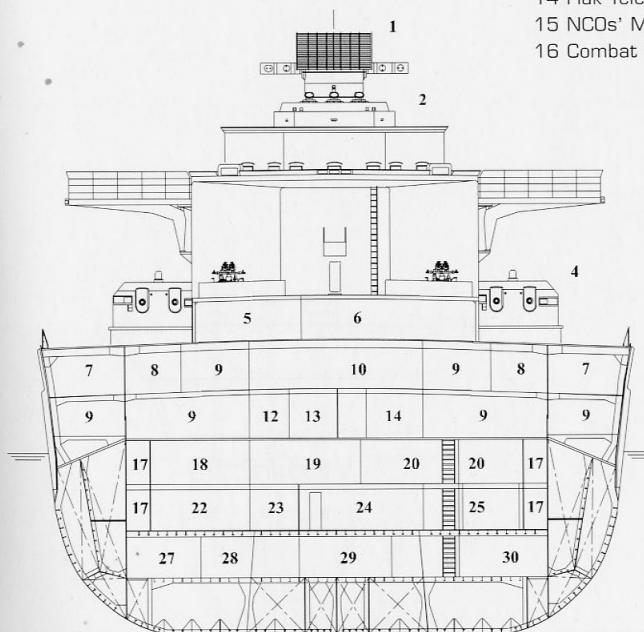
A4/22 Frame 183.2 Looking Aft

- 1 7m Rangefinder/FuMO 23 Radar
- 2 Forward Fire-Control Station
- 3 38cm Turret "Bruno"
- 4 15cm SKC/28 Drh LC/34 Gun
- 5 Operating Room
- 6 Sick Bay

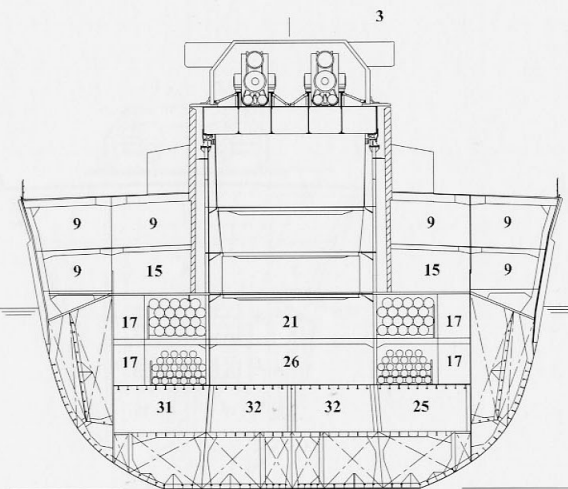
- 7 Seamen's Washroom
- 8 Seamen's Head
- 9 Seamen's Mesh Deck
- 10 Lobby
- 11 Forward Seamen's Kitchen
- 12 Storage Locker
- 13 Artillery Telephone Switchboard
- 14 Flak Telephone Switchboard
- 15 NCOs' Mess Deck/Reserve Hospital
- 16 Combat Dressing Station

- 17 Passageway
- 18 Forward Flak Control Center
- 19 Forward Flak Switchboard Room
- 20 Radio Room B
- 21 38cm Powder/
Cartridge Handling Room
- 22 Radio Room A
- 23 Forward Artillery Amplification Room
- 24 Forward Artillery Plotting Office
- 25 Bread Storage Room

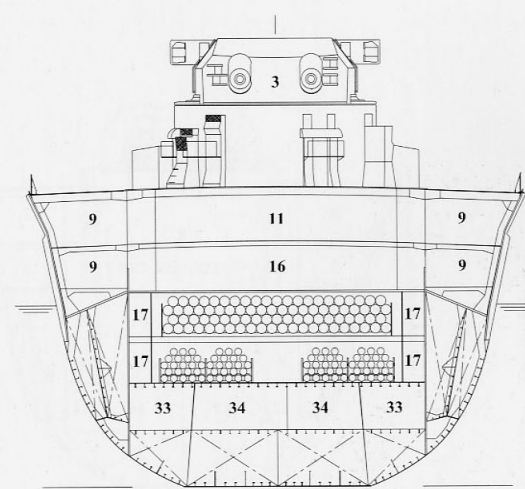
- 26 38cm Shell Handling Room
- 27 Regulator Room
- 28 Pump Room
- 29 Forward Gyro Compass Room
- 30 Fuel Pump Room
- 31 Bosun's Store
- 32 Cool Room
- 33 Meat Store Room
- 34 Cooling Compressor Room



A4/20



A4/21



A4/22

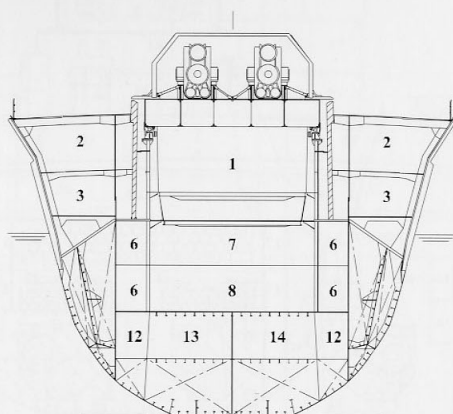
A GENERAL ARRANGEMENTS

A4/23 Frame 192.5 Looking Aft

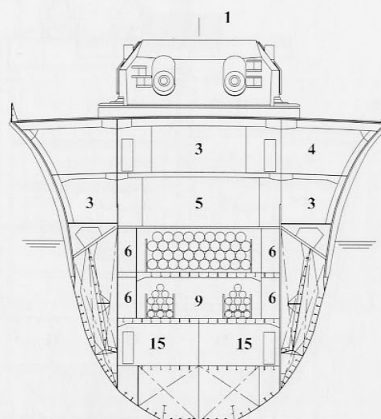
A4/24 Frame 202.7 Looking Aft

A4/25 Frame 210.2 Looking Forward

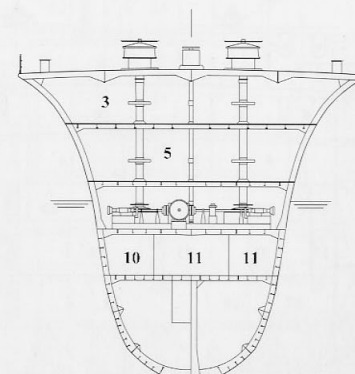
- | | |
|---|------------------------------|
| 1 38.0cm Turret "Anton" | 8 38cm Shell Handling Room |
| 2 NCOs' Mess Deck | 9 38cm Shell Room |
| 3 Seamen's Mess Deck | 10 Pyrotechnic Store |
| 4 NCOs' Head | 11 Rope Store |
| 5 NCOs' Mess Deck | 12 Lobby |
| 6 Passageway | 13 Clothing Store Room |
| 7 38cm Powder/
Cartridge Handling Room | 14 Canteen Store Room |
| | 15 Administration Store Room |



A4/23



A4/24



A4/25

A GENERAL ARRANGEMENTS

A4/26 Frame 215.5 Looking Forward

A4/27 Frame 224.0 Looking Forward

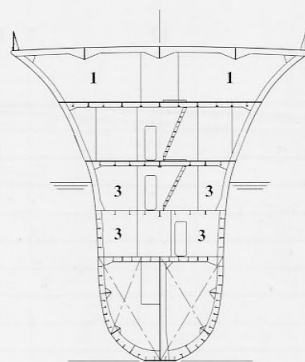
A4/28 Frame 234.0 Looking Aft

1 Seamen's Mess Deck

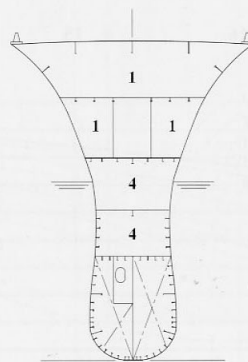
2 Potato Storage Room

3 Chain Locker

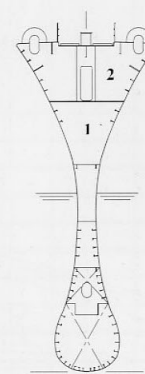
4 Sailmaker's Store



A4/26



A4/27



A4/28

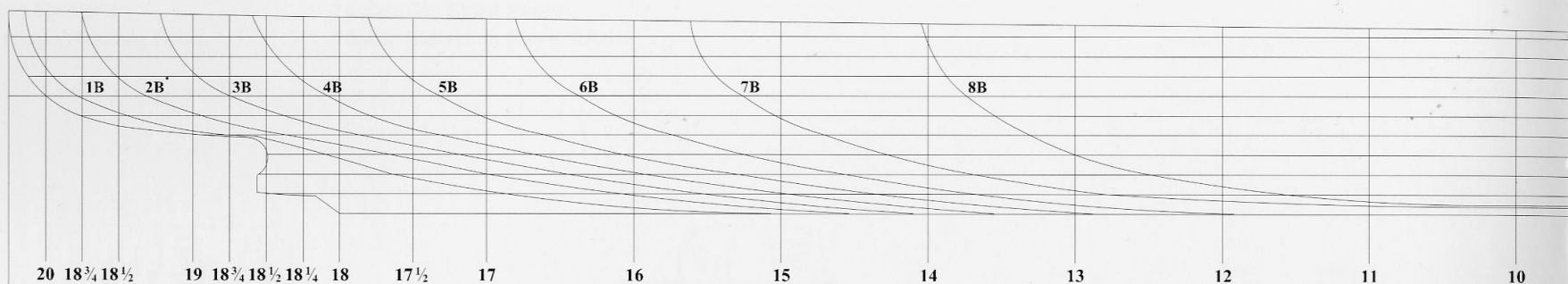
B HULL STRUCTURE

B1 Lines and Body Plans

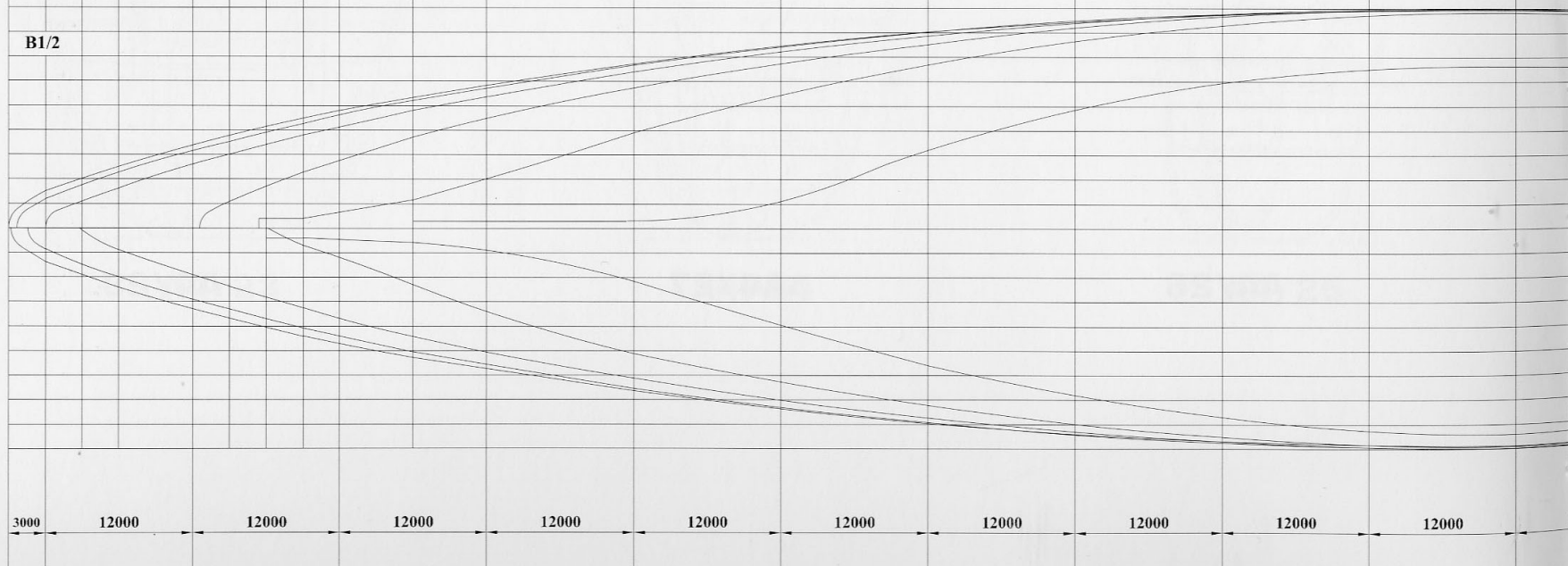
B1/1 Sheer Elevation (1:550 scale)

B1/2 Waterline Plan (1:550 scale)

B1/1

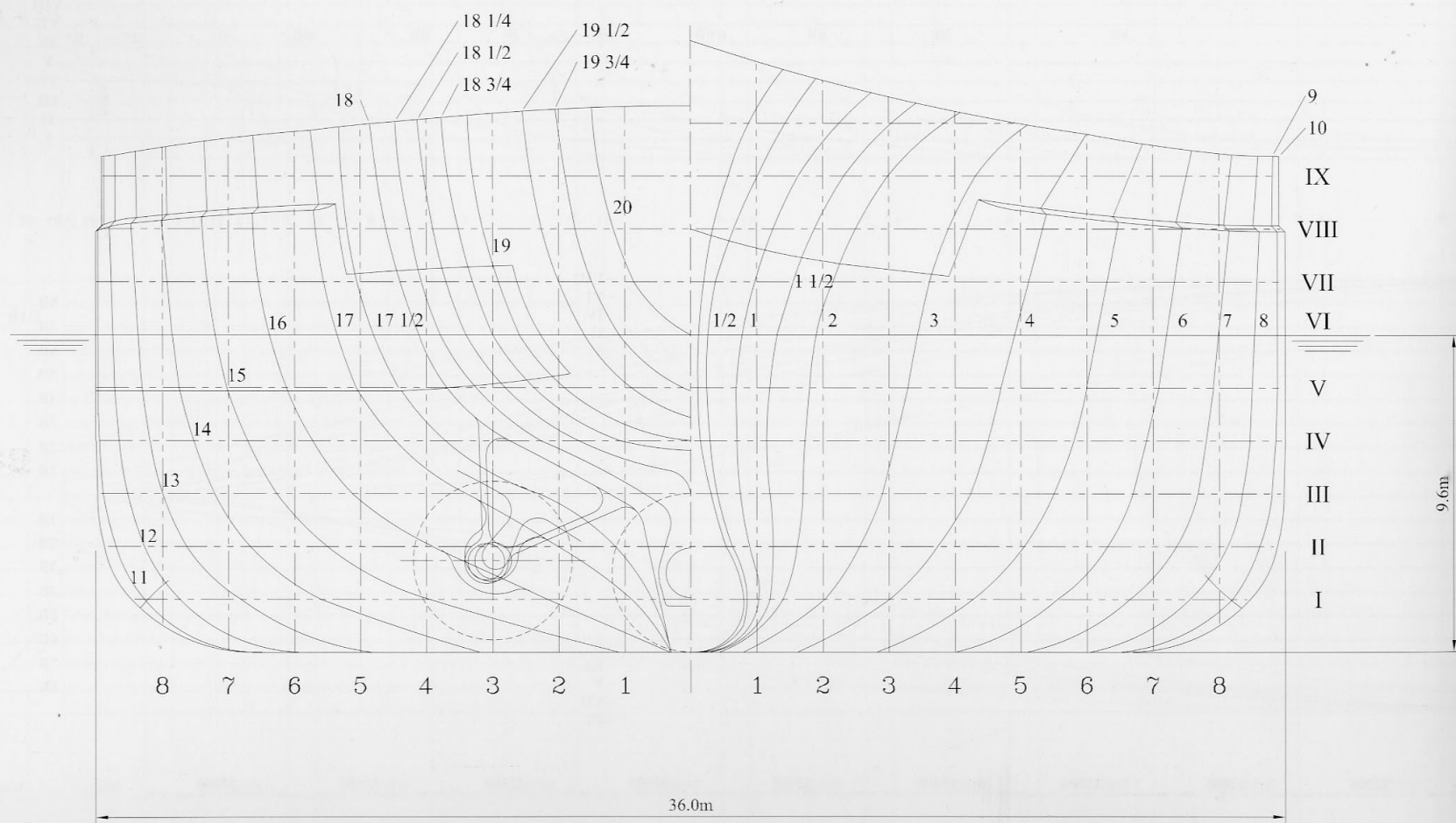


B1/2



B HULL

B1/3 Body Plans (1:200 scale)



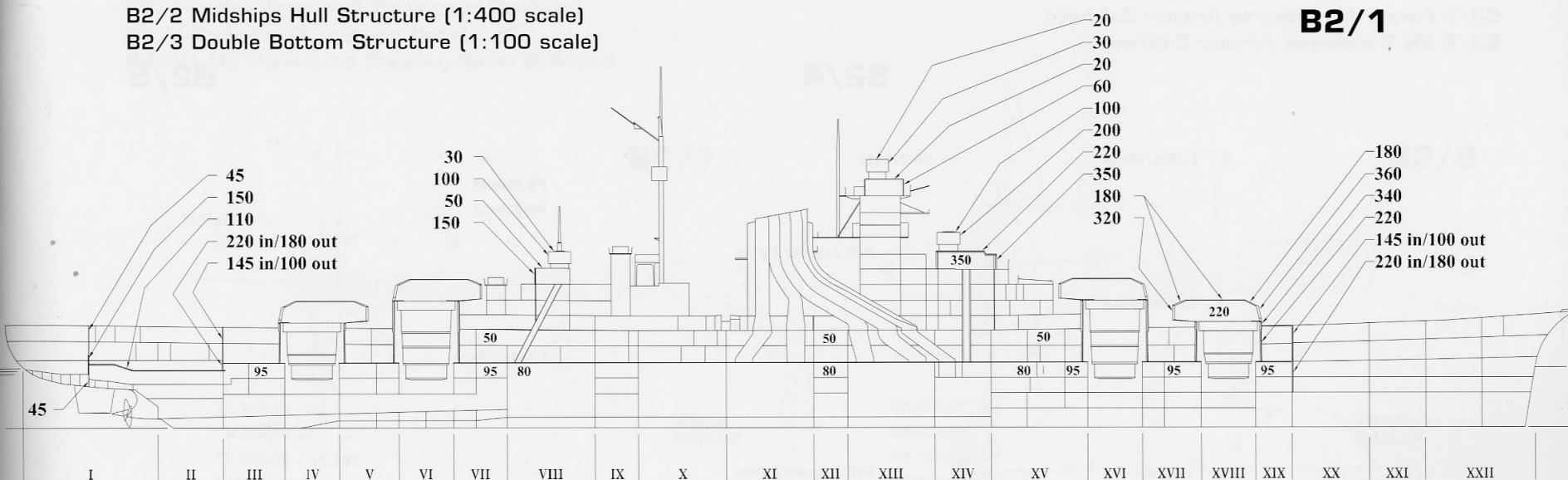
B HULL

B2 Armour and Protective Plating

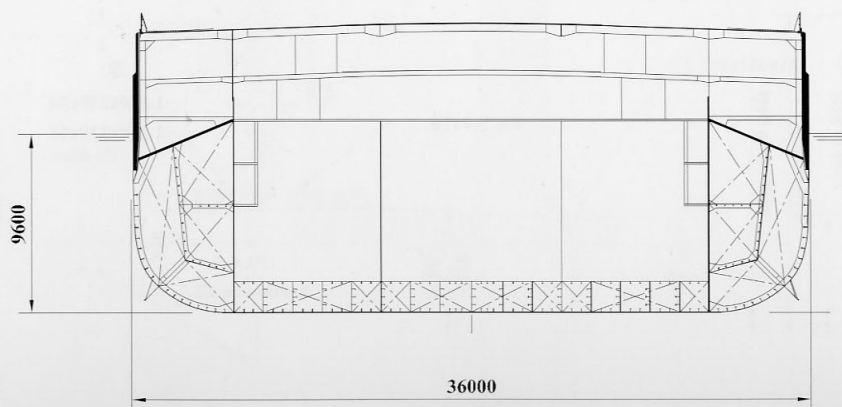
B2/1 Inboard Profile (1:1000 scale)

B2/2 Midships Hull Structure (1:400 scale)

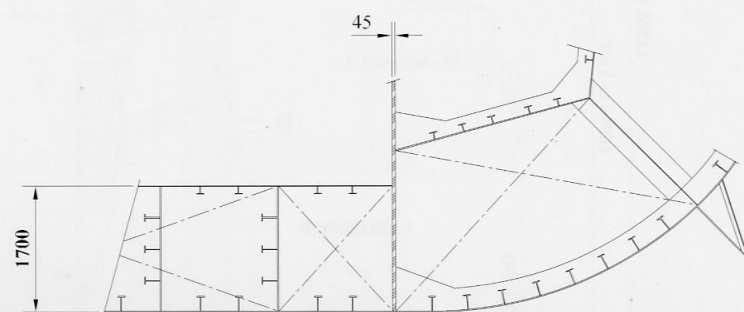
B2/3 Double Bottom Structure (1:100 scale)



B2/2



B2/3



B HULL

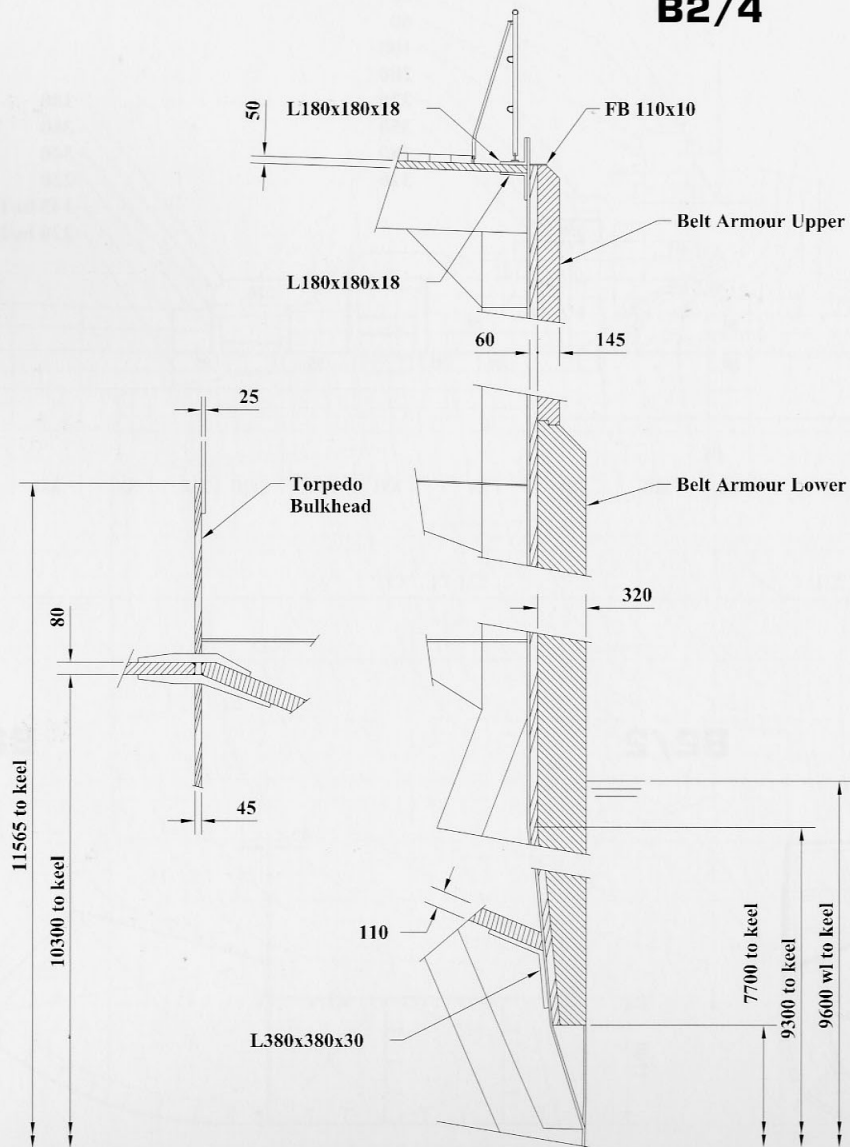
B2 Armour and Protective Plating (1:50 scale)

B2/4 Midships Armour Belt Detail

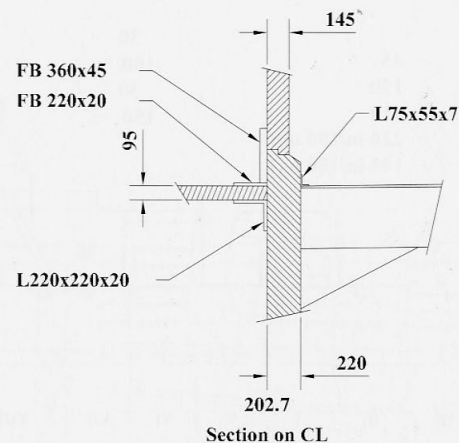
B2/5 Forward Transverse Armour Bulkhead

B2/6 Aft Transverse Armour Bulkhead

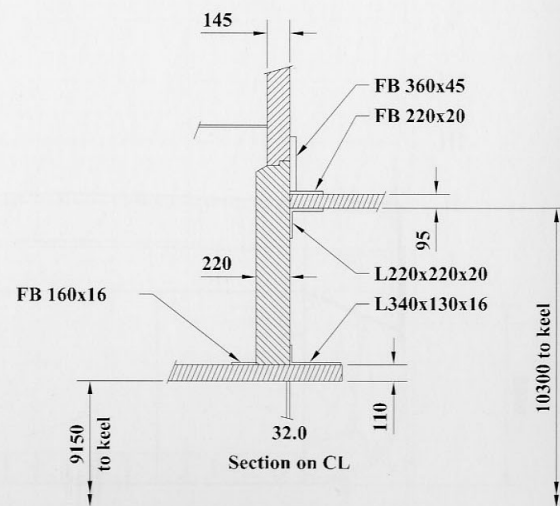
B2/4



B2/5



B2/6



B HULL

B2 Armour and Protective Plating (1:25 scale)

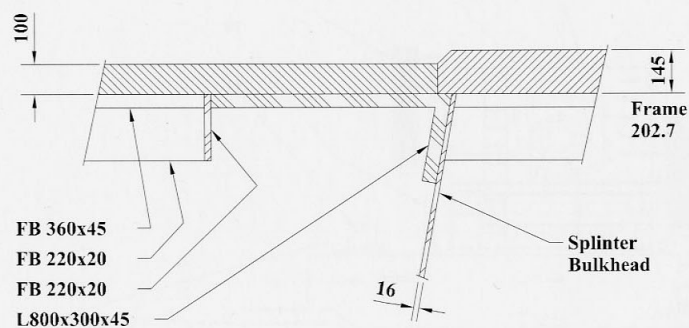
B2/7 Upper Armoured Transverse Bulkhead

B2/8 Lower Armoured Transverse Bulkhead

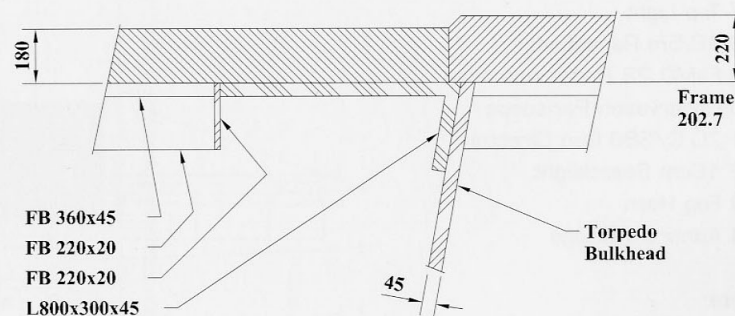
B2/9 Barbette Connection Detail

B2/10 Aft Transverse Steering Room Bulkhead

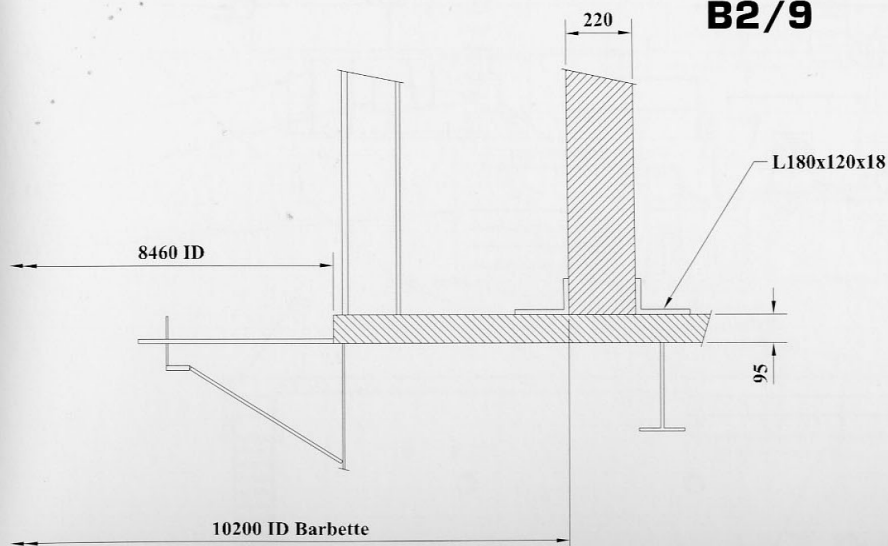
B2/7



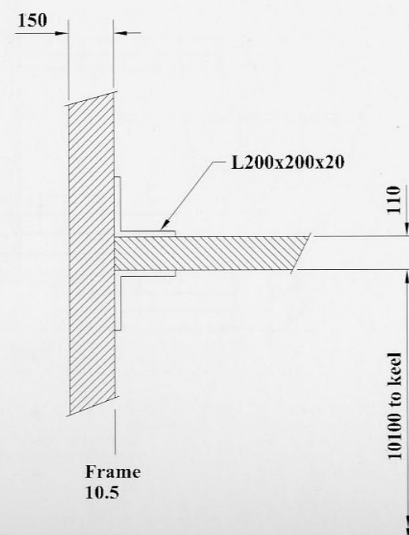
B2/8



B2/9



B2/10

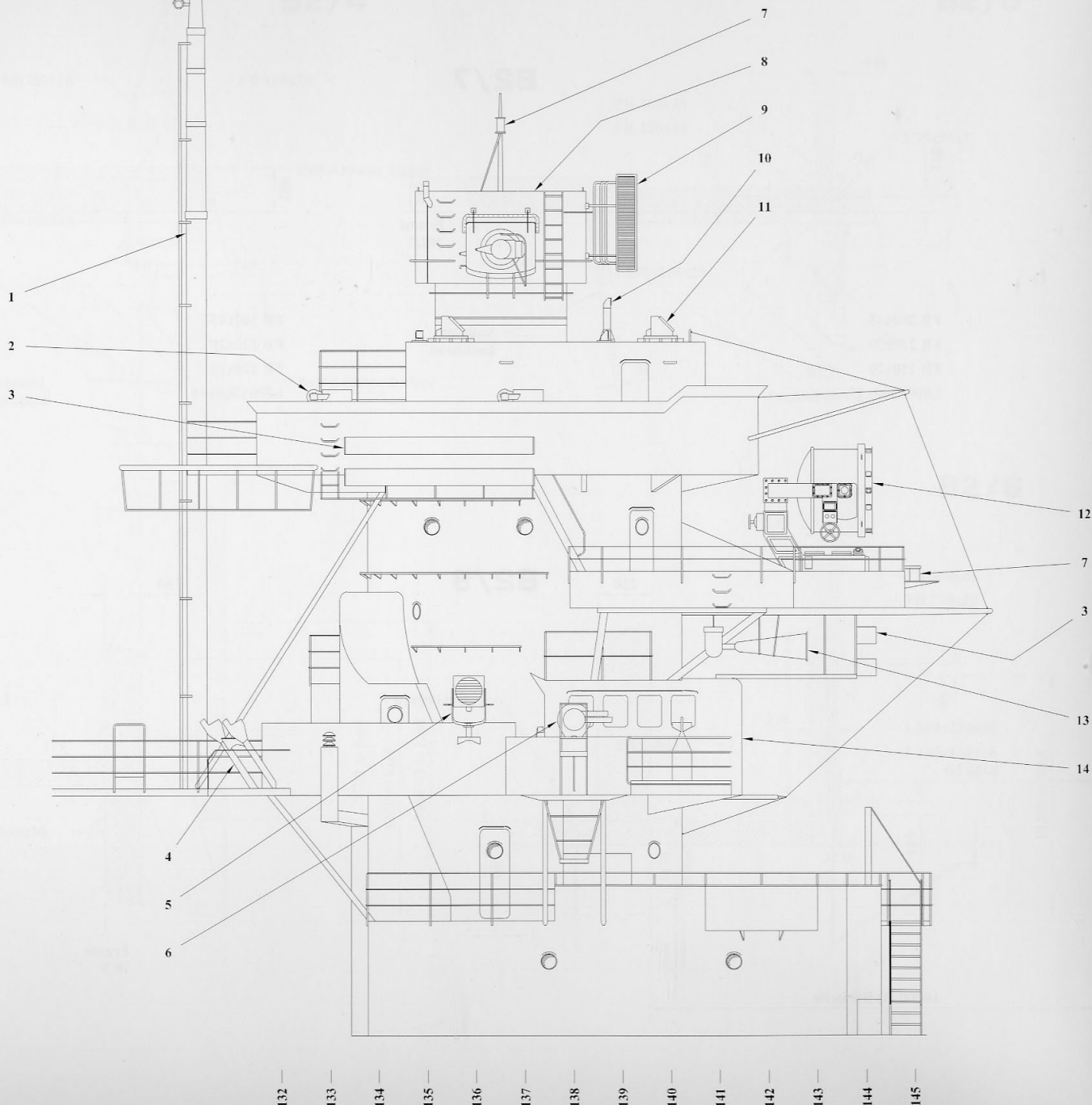


C1 Bridge and Foretop (1:125 scale)

C1/1 Foretop Starboard Elevation

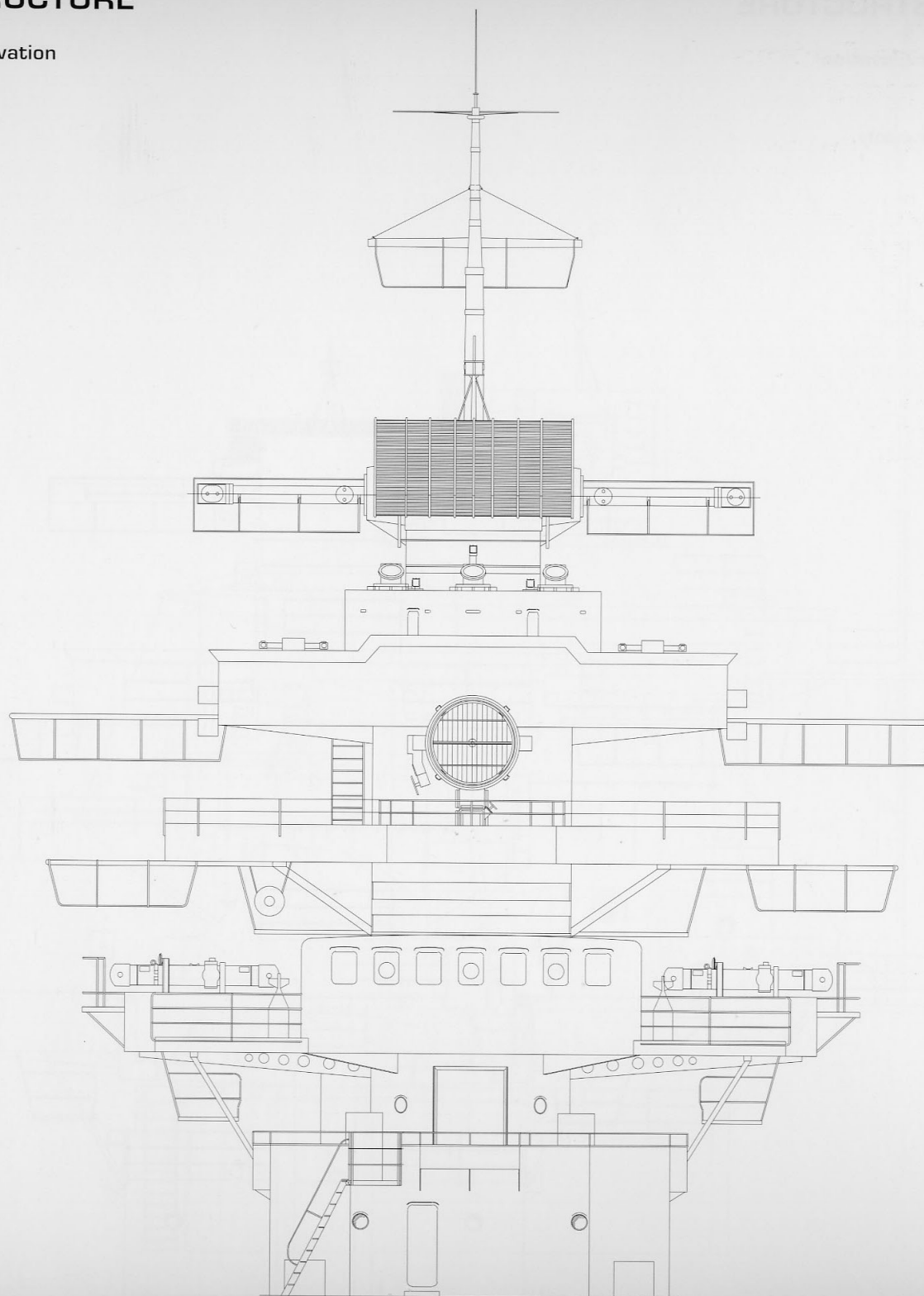
- 1 Foremast
- 2 Zag (Target Information Sights)
- 3 FuMO 21 Radar (Possible)
- 4 Crane Storage Brackets
- 5 Signal Lamp
- 6 3m Night Rangefinder
- 7 Top Light
- 8 10.5m Rangefinder
- 9 FuMO 23 Radar Antennae
- 10 Observation Periscope
- 11 ZC C/38S Gun Director
- 12 16cm Searchlight
- 13 Fog Horn
- 14 Admiral's Bridge

Note:
2cm Flak Vierling and 3cm
SKC/30 not shown for clarity



C SUPERSTRUCTURE

C1/2 Foretop Front Elevation

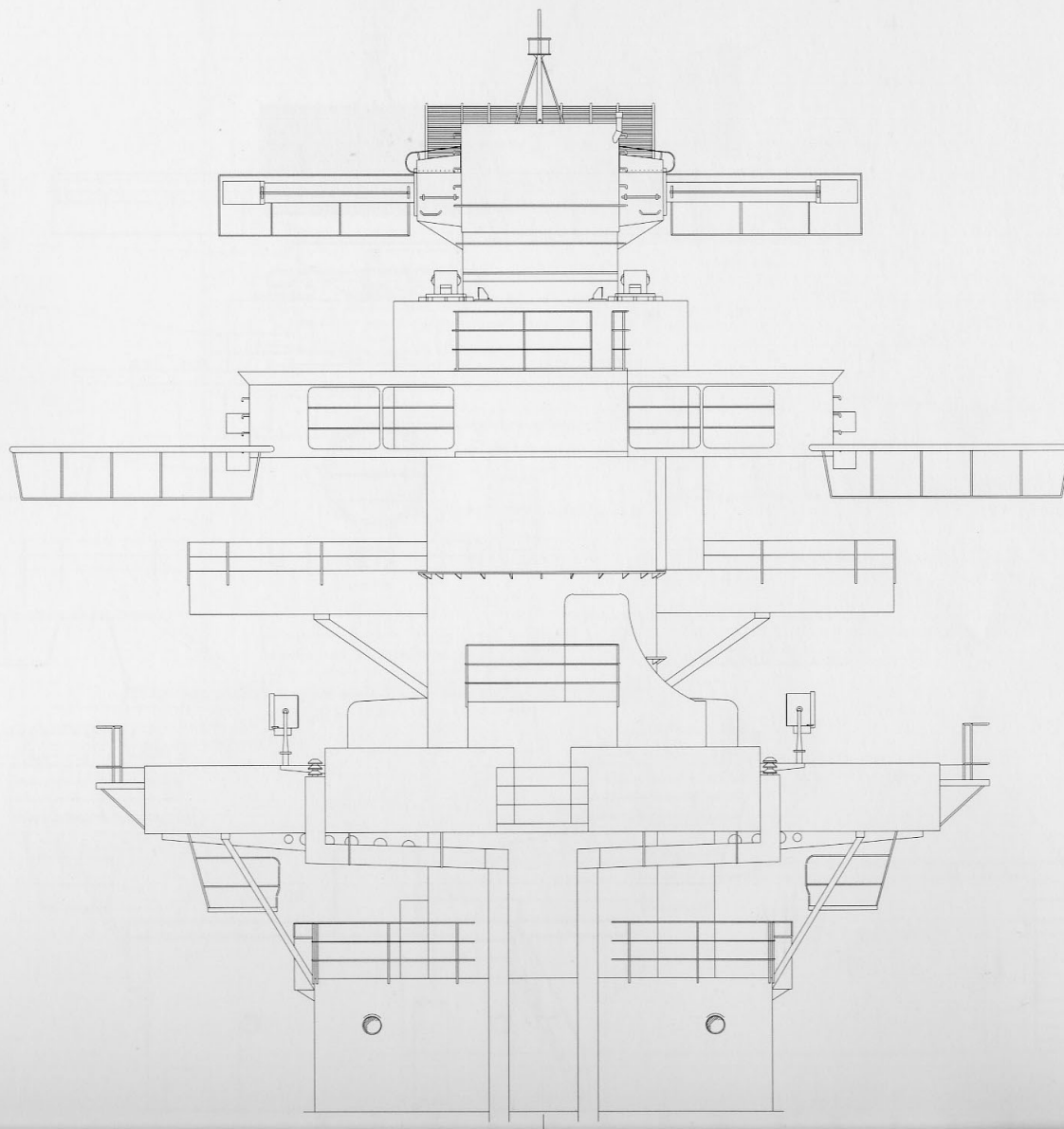


C SUPERSTRUCTURE

C1/3 Foretop Rear Elevation

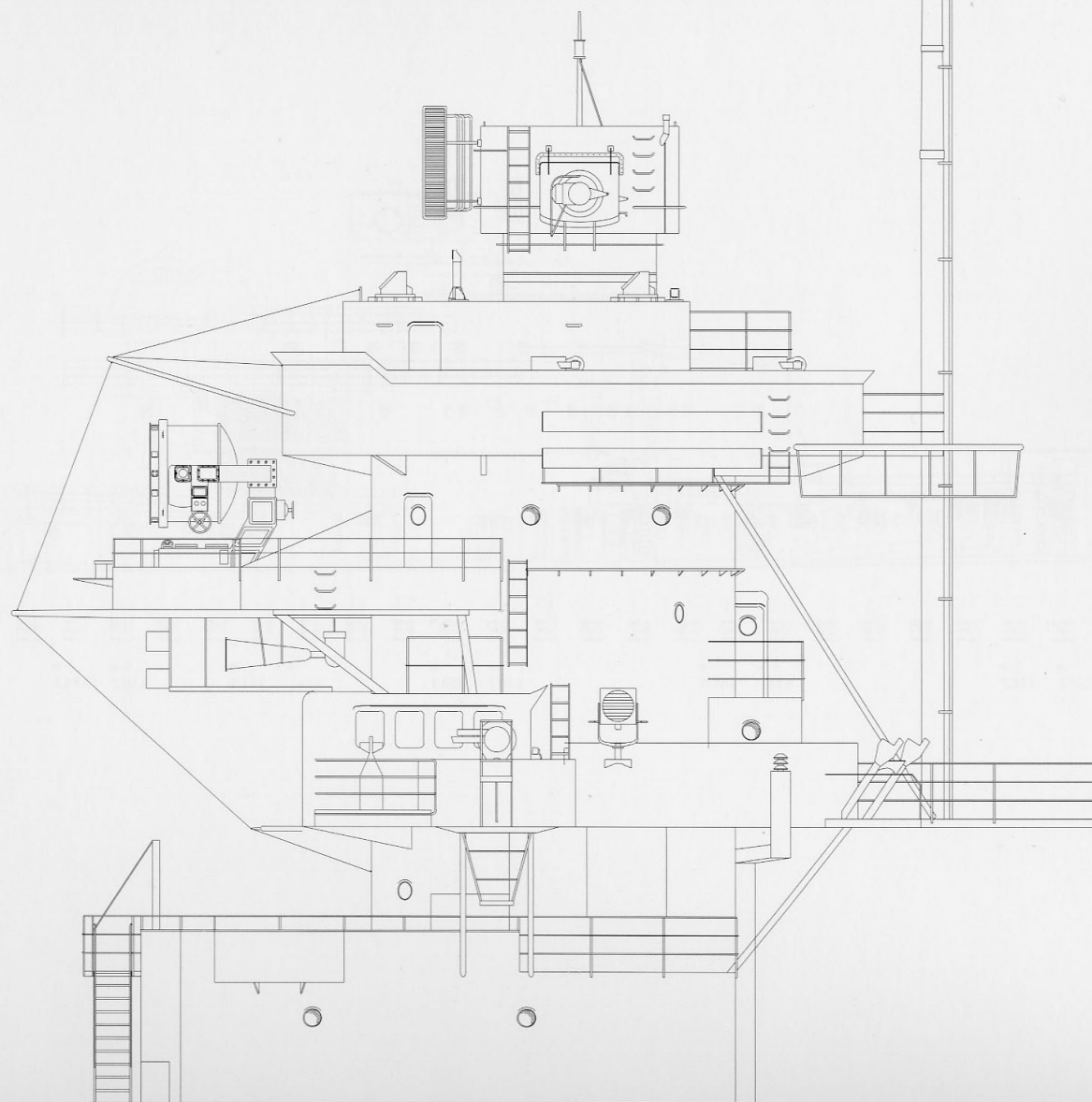
Note:

Formast not shown for clarity



C SUPERSTRUCTURE

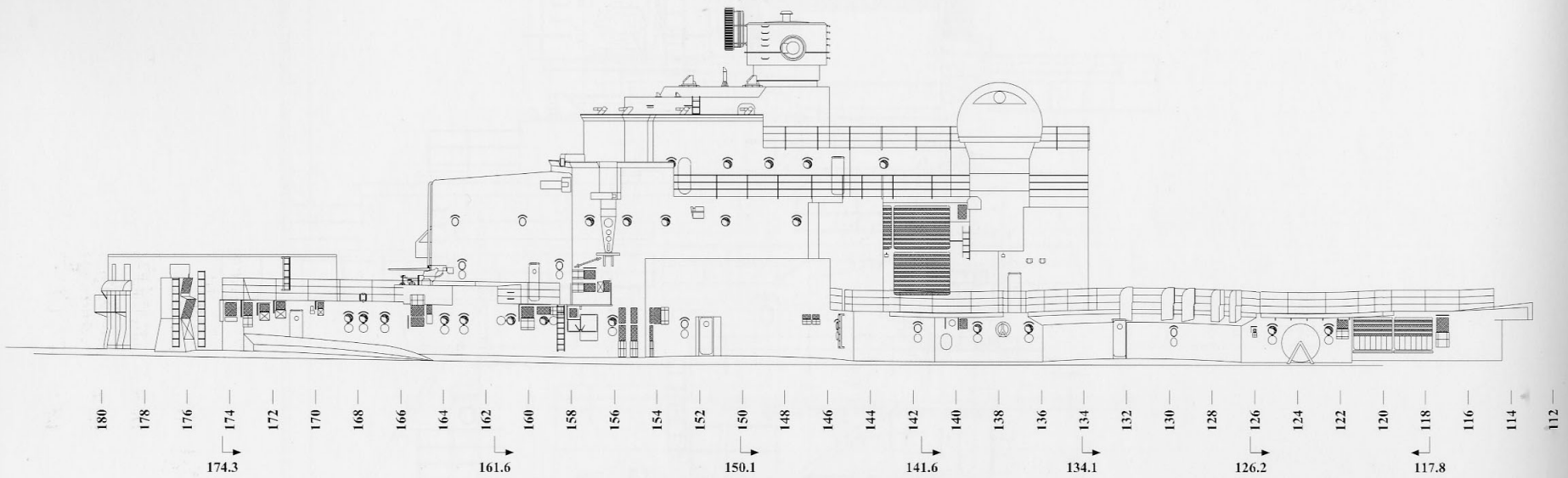
C1/4 Foretop Port Elevation



15 —
14 —
13 —
12 —
11 —
10 —
9 —
8 —
7 —
6 —
5 —
4 —
3 —
2 —

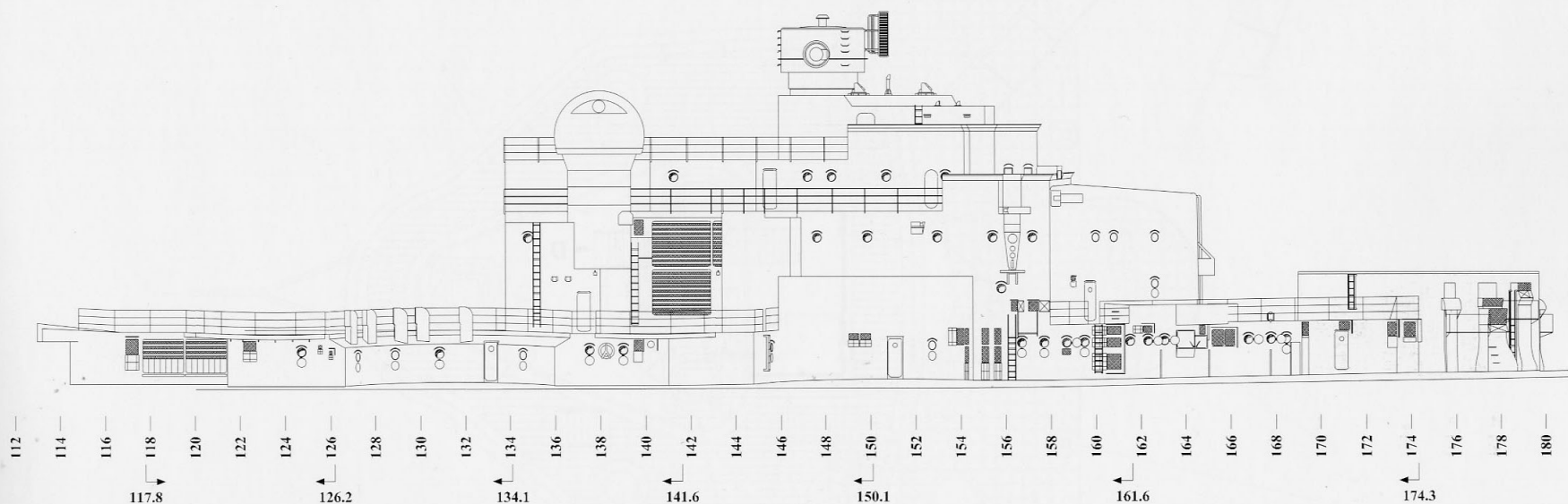
C SUPERSTRUCTURE

C1/5 Bridge Elevation Port (1:300 scale)



C SUPERSTRUCTURE

C1/6 Bridge Elevation Starboard (1:300 scale)

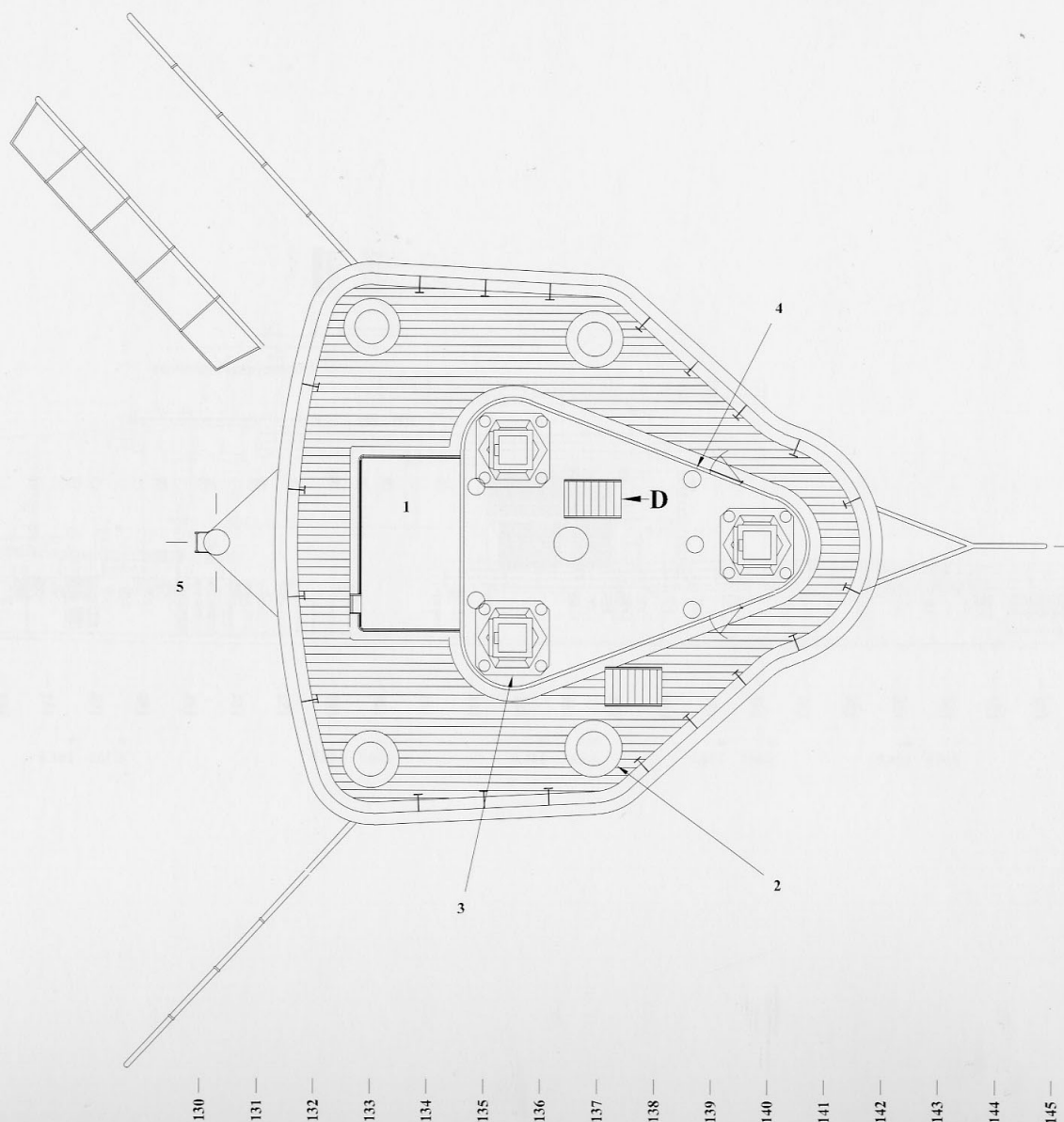


C SUPERSTRUCTURE

C2 Bridge and Foretop Deck Plans (1:125 scale)

C2/1 Control Stand

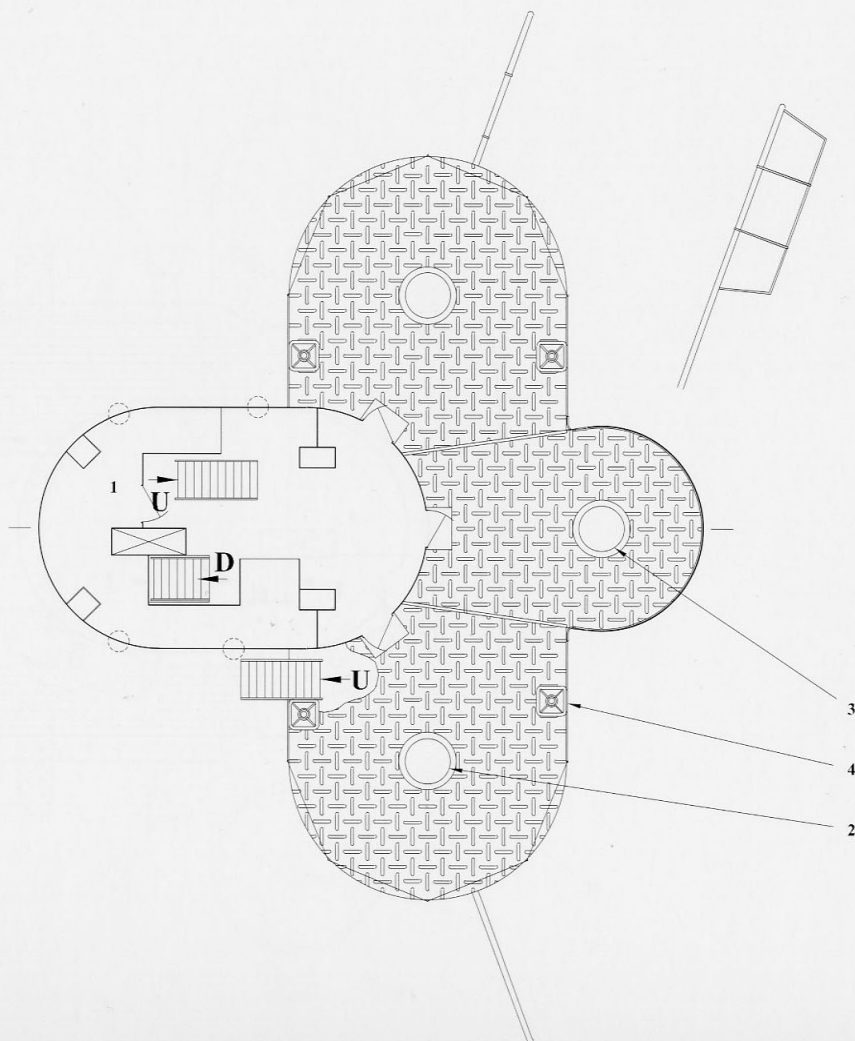
- 1 Standby Room
- 2 Zag (Target Information Sights)
- 3 ZG C/38S Gun Director
- 4 Observation Periscope
- 5 Foremast



C SUPERSTRUCTURE

C2/2 Searchlight Deck (Scheinwerferdeck)

- 1 Air Tracking Station
- 2 2cm Vierling Base
- 3 16cm Searchlight Base
- 4 Ready Use Ammunition Box

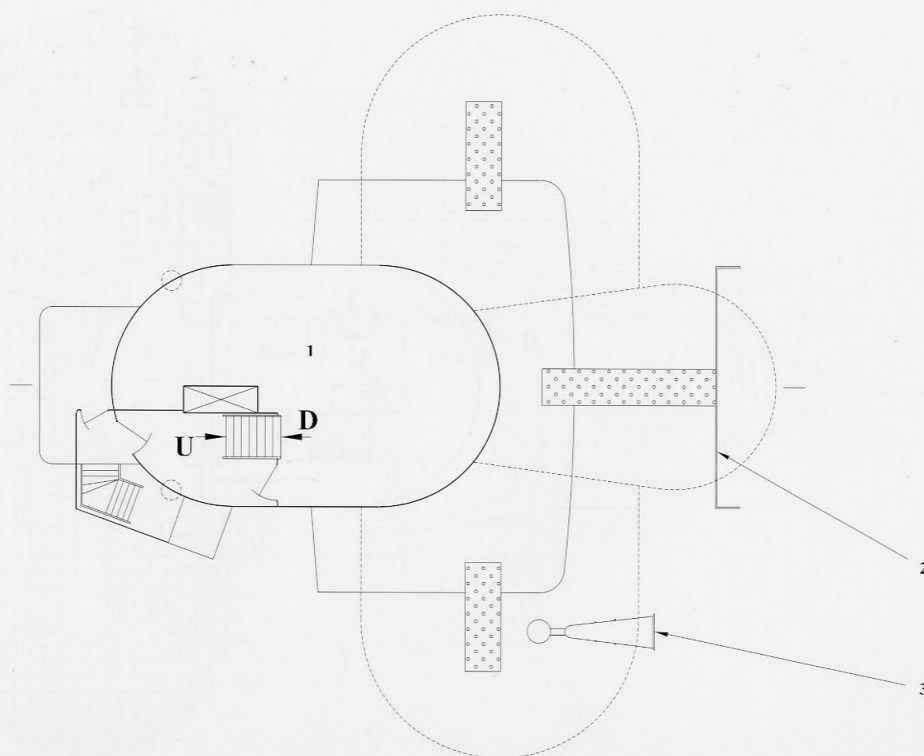


133 —
134 —
135 —
136 —
137 —
138 —
139 —
140 —
141 —
142 —
143 —
144 —
145 —

C SUPERSTRUCTURE

C2/3 Lower Searchlight Deck (Unt Scheinwerferdeck)

- 1 Communications Centre
- 2 FuMO 21 Radar (Possible)
- 3 Fog Horn

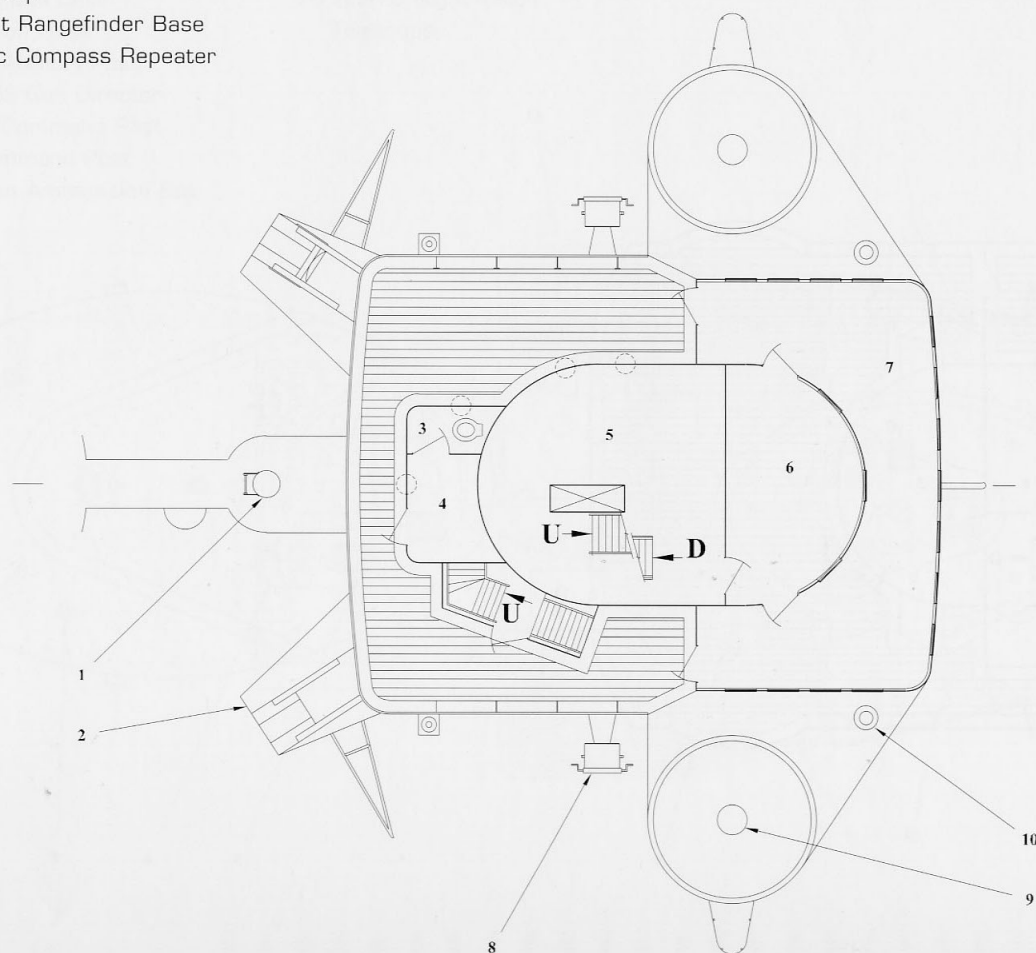


133 —
134 —
135 —
136 —
137 —
138 —
139 —
140 —
141 —
142 —
143 —
144 —
145 —

C SUPERSTRUCTURE

C2/4 Admiral's Bridge (Admiralbrücke)

- 1 Foremast
- 2 Crane Storage Brackets
- 3 Head
- 4 Signalman's Standby Room
- 5 Chart House
- 6 Admiral's Bridge Shelter
- 7 Admiral's Bridge
- 8 Signal Lamp
- 9 3m Night Rangefinder Base
- 10 Magnetic Compass Repeater

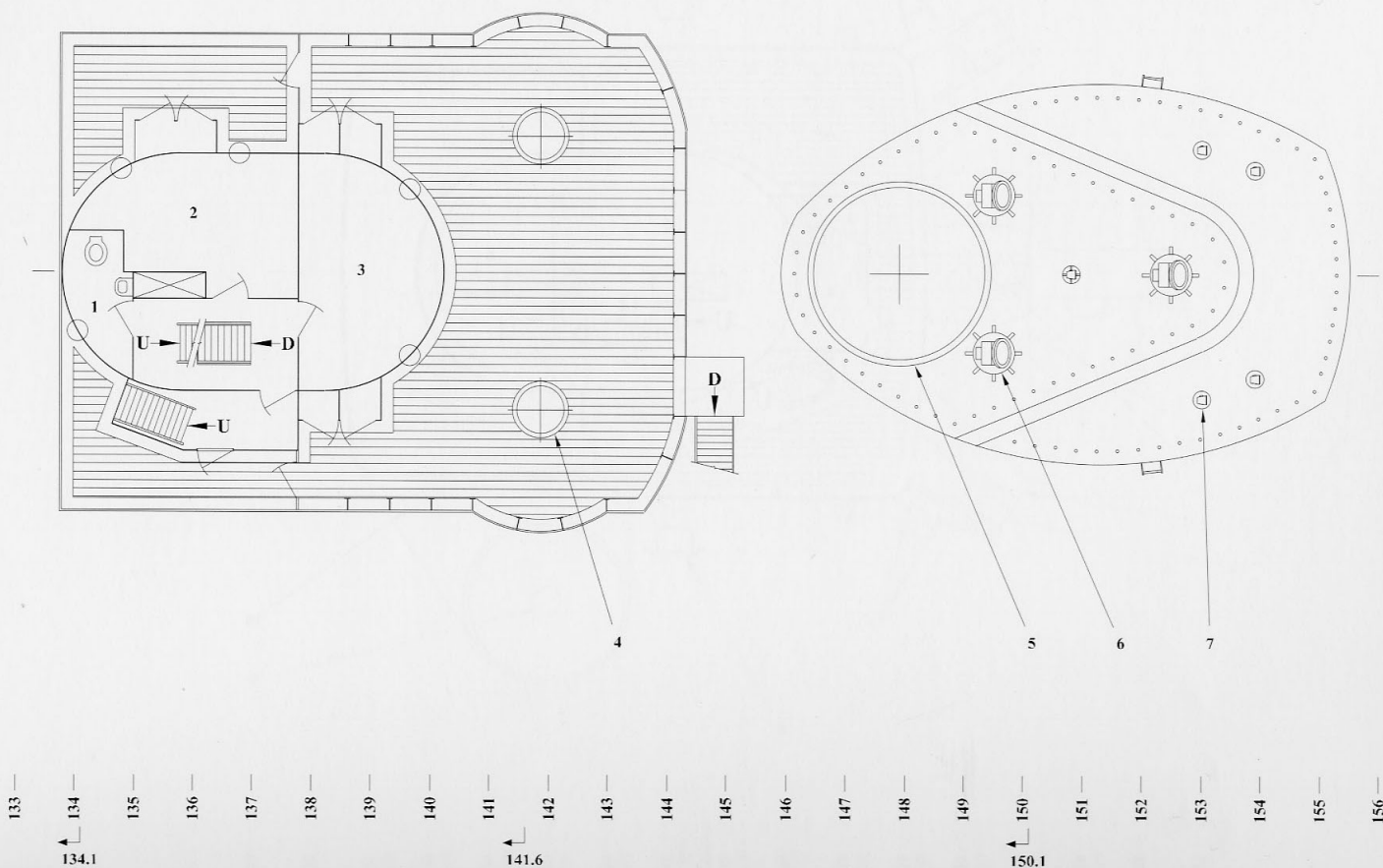


127 —
128 —
129 —
130 —
131 —
132 —
133 —
134 —
135 —
136 —
137 —
138 —
139 —
140 —
141 —
142 —
143 —

C SUPERSTRUCTURE

C2/5 Upper Mast Deck (Oberes Mastdeck)

- 1 Admiral's Head
- 2 Meteorological Office
- 3 Weather Radio Room
- 4 3.7cm Gun Base
- 5 7m Rangefinder Base
- 6 ZC C/38S Gun Director
- 7 Observation Periscope



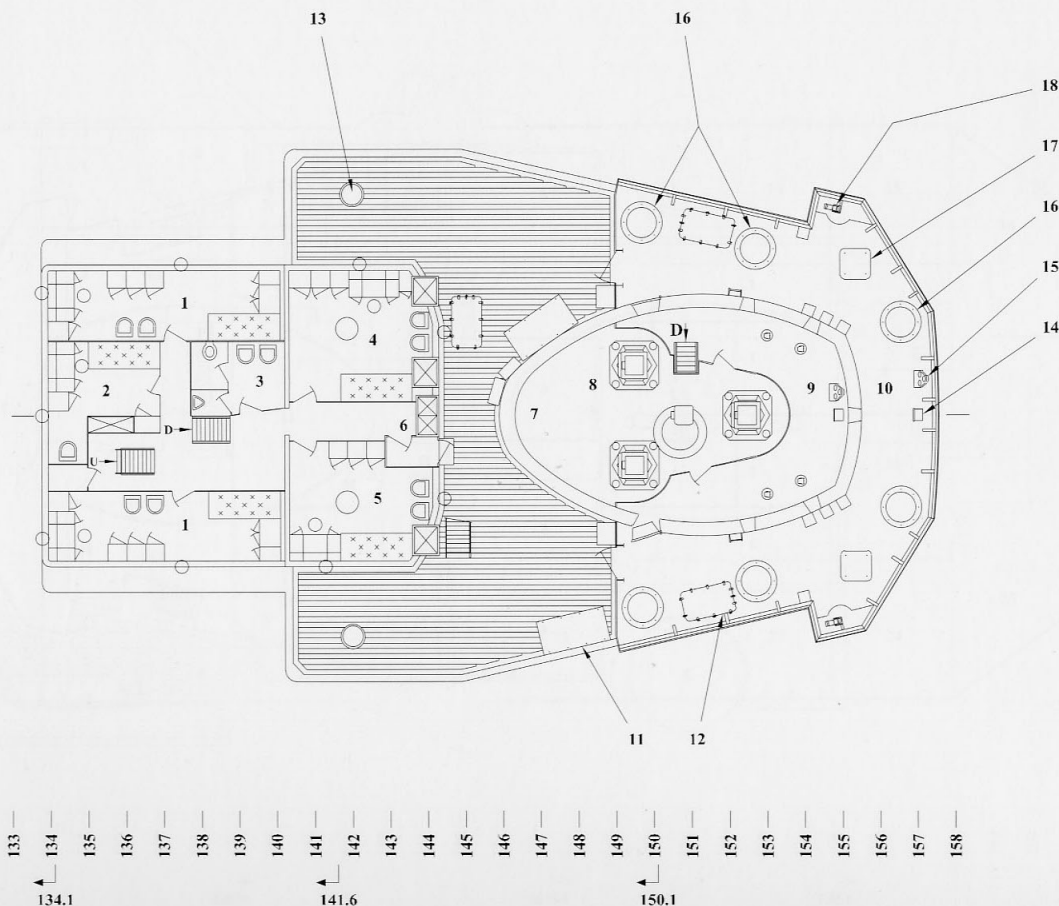
C SUPERSTRUCTURE

C2/6 Lower Mast Deck (Unteres Mastdeck) (1:200 scale)

- | | |
|--|---|
| 1 Cabin for two Midshipman
(<i>Leutnant zur See</i>) | 12 Deck Hatch |
| 2 Cabin for one Lieutenant
(<i>Kapitanleutnant</i>) | 13 2cm Gun Base |
| 3 Bathroom | 14 Helm |
| 4 Cabin for two Sub-Lieutenants
(<i>Oberleutnant zur See</i>) | 15 Rudder Indicator |
| 5 Admiral's Sea Cabin | 16 Target Giver Position |
| 6 Ammunition Hoist | 17 Zeilsaule C38 Night
Director Position |
| 7 Forward Artillery Post | 18 Infared Night Vision
Telescope |
| 8 ZC C/38S Gun Director | |
| 9 Forward Command Post | |
| 10 Night Command Post | |
| 11 Ready Use Ammunition Box | |

Note:

Typical Cabin Layouts



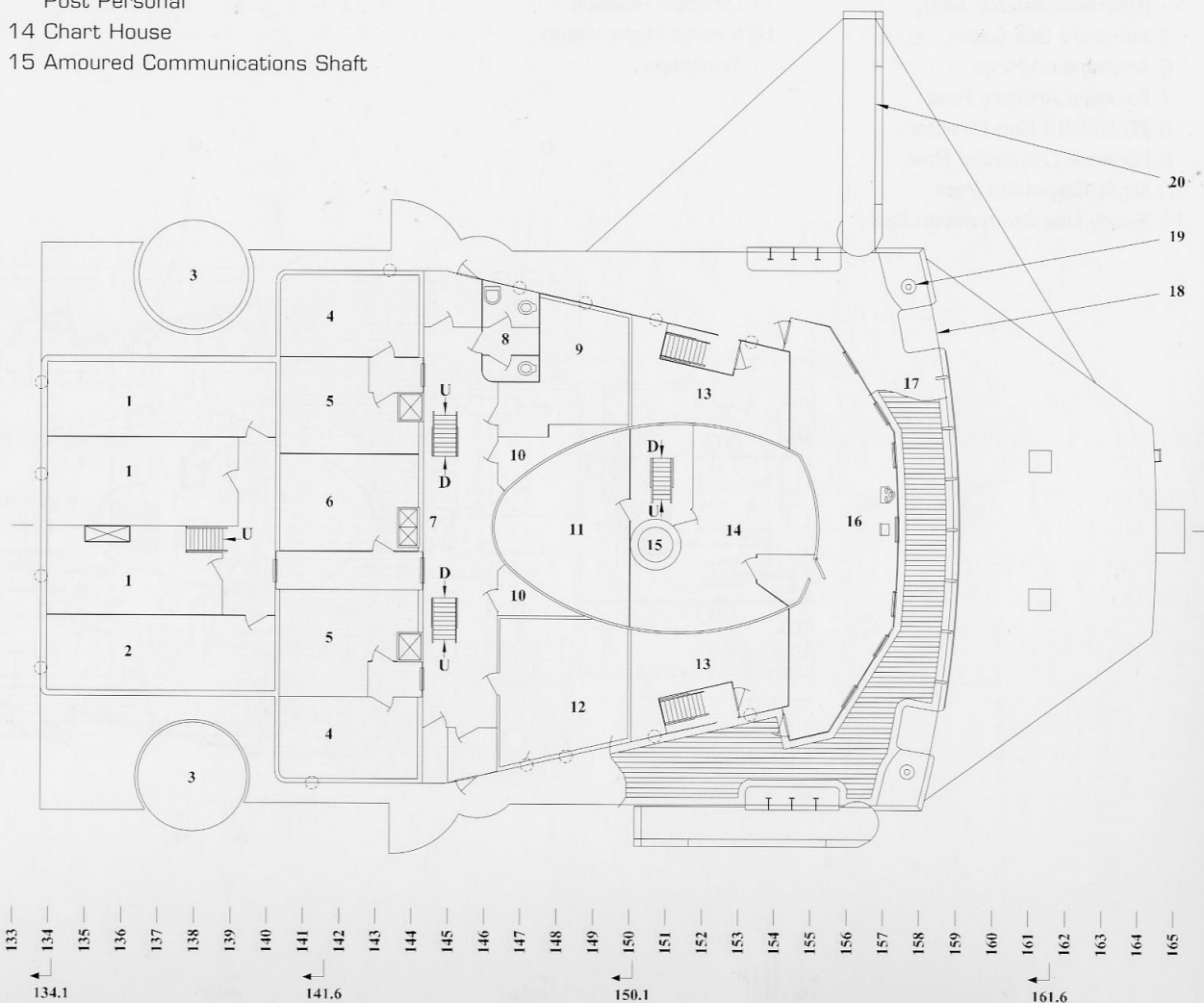
C SUPERSTRUCTURE

C2/7 Bridge Deck (Brückendeck)

- 1 Cabin for two Midshipmen
- 2 Cabin for Radio Officer and Reserve
- 3 SLB High Angle Rangefinder Base
- 4 Cabin for two Watch Officers
- 5 Cabin for two Luftwaffe Officers
- 6 Cabin for one Luftwaffe Officer and one Reserve
- 7 Ammunition Hoist

- 8 Bathroom
- 9 Navigation Office
- 10 Storage Locker
- 11 Combat Message Centre
- 12 Captain's Sea Cabin
- 13 Shelter for Night Command Post Personal
- 14 Chart House
- 15 Armoured Communications Shaft

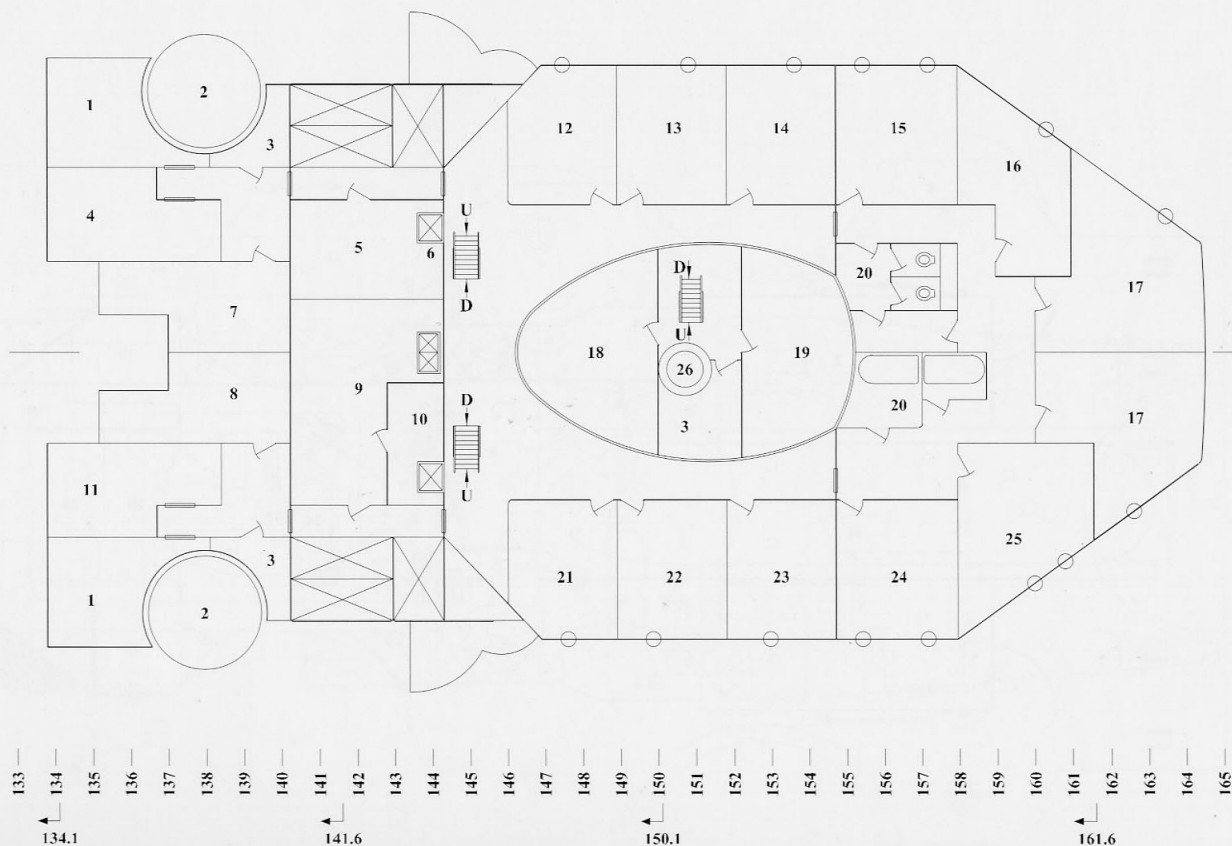
- 16 Bridge Shelter
- 17 Bridge
- 18 Bridge House
- 19 Magnetic Compass Repeater
- 20 Bridge Wing



C SUPERSTRUCTURE

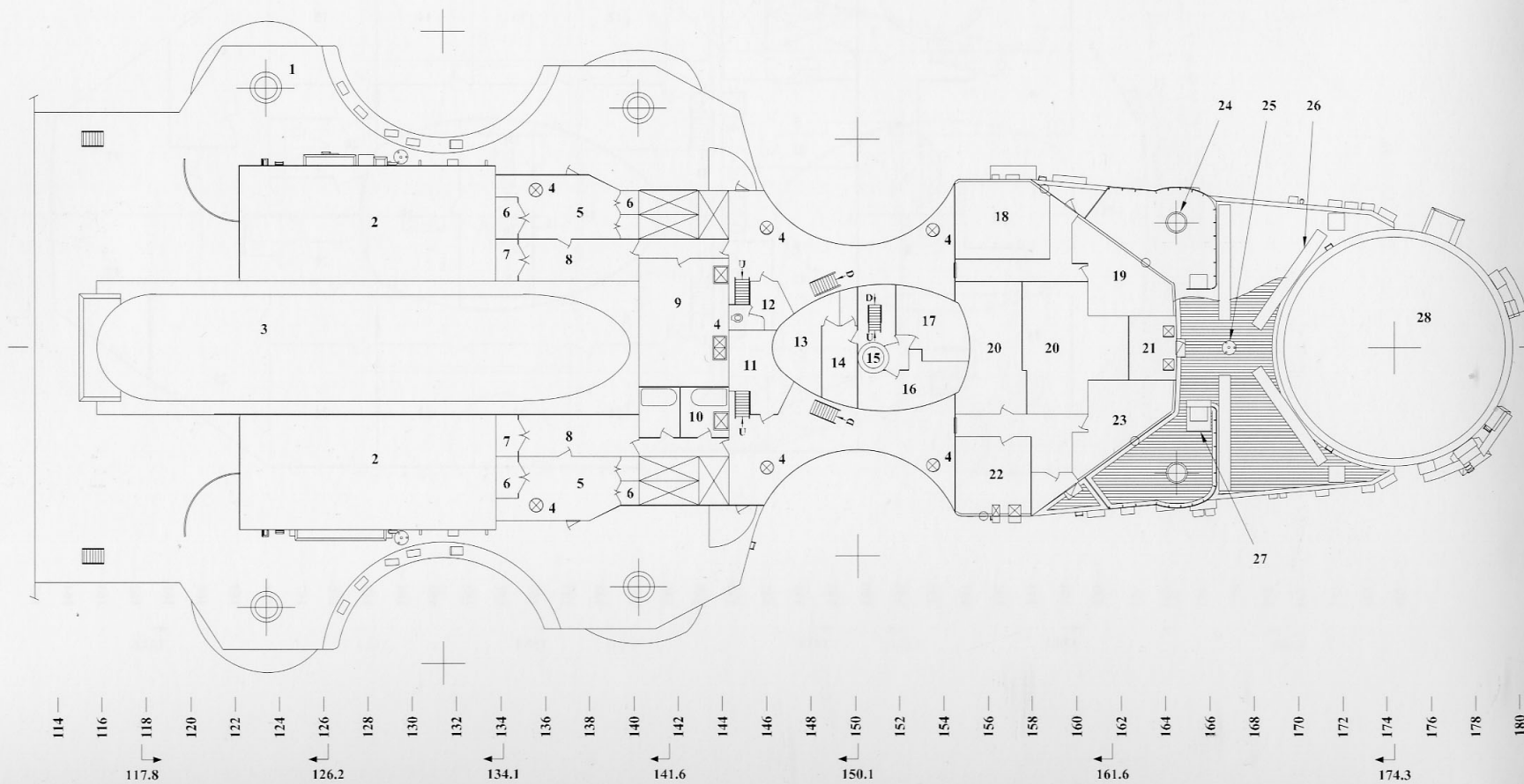
C2/8 Lower Bridge Deck (Unteres Brückendeck)

- | | | |
|---------------------------------------|------------------------------------|---------------------------------|
| 1 Watch Officer | 9 Artillery Office | 18 Sound Location Room |
| 2 SL8 High Angle Rangefinder Base | 10 Artillery Signal Room | 19 VHF Room |
| 3 Storage Locker | 11 2nd Radio Officer | 20 Officers Bathroom |
| 4 Meteorological Office | 12 2nd Artillery Technical Officer | 21 1st Radio Officer |
| 5 Cabin for two Reserves | 13 3rd Medical Officer | 22 4th Artillery Officer |
| 6 Ammunition Hoist | 14 2nd Medical Officer | 23 3rd Artillery Officer |
| 7 Cabin for two Midshipmen | 15 1st Navigation Officer | 24 1st Artillery Officer |
| 8 4th Medical Officer and one Reserve | 16 1st Artillery Technical Officer | 25 2nd Artillery Officer |
| | 17 Cabin for two Sub-Lieutenants | 26 Armoured Communication Shaft |



C2/9 First Deck (Aufbaudeck) (1:300 scale)

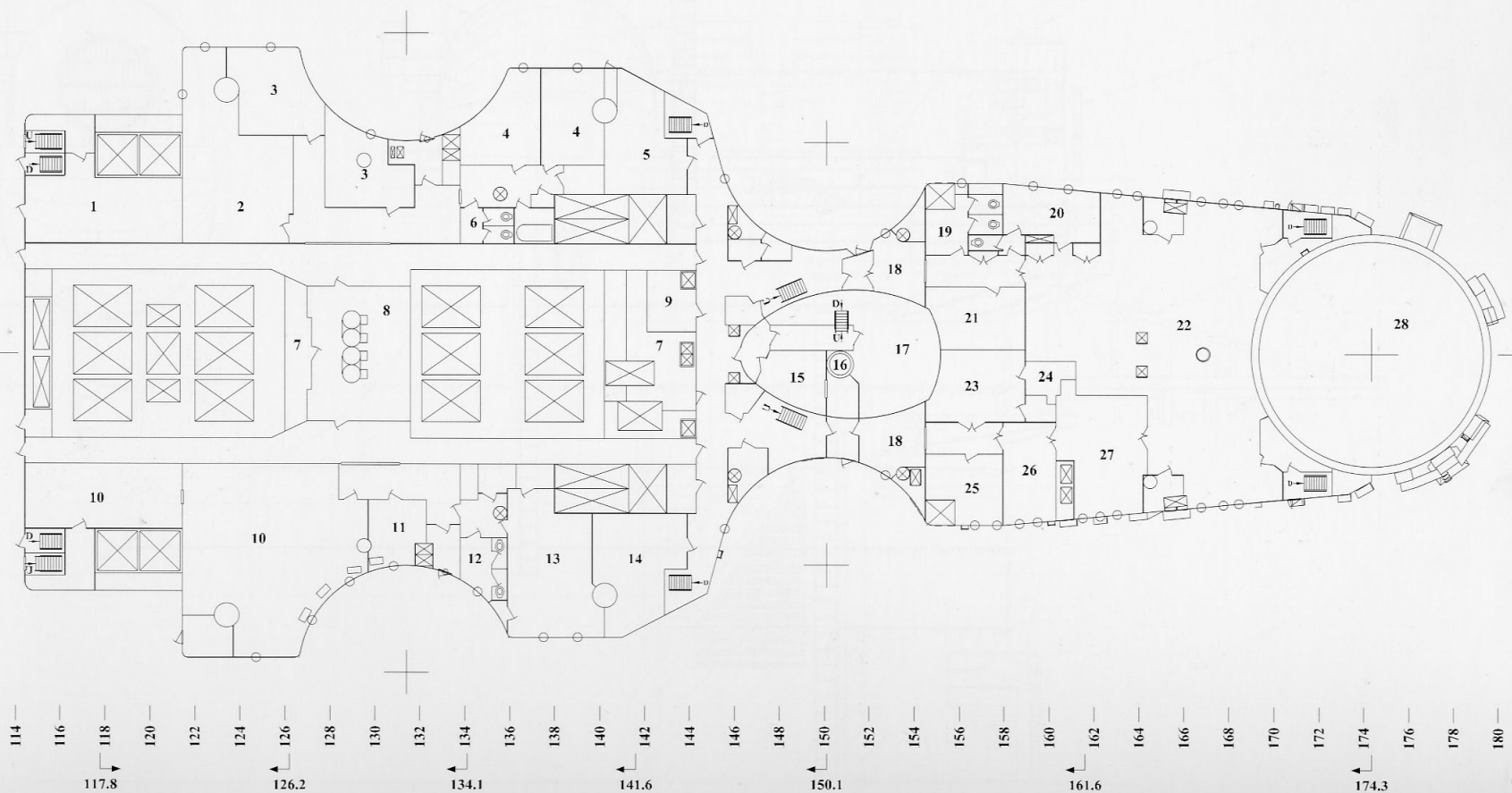
- | | | |
|--------------------------------|---------------------------------|----------------------------------|
| 1 10.5cm Gun Base | 11 Petty Officers Store Room | 21 Gun Crew Standby Room |
| 2 Aircraft Hangar | 12 Officers Head | 22 2nd Administration Officer |
| 3 Funnel | 13 Signal Store Room | 23 3rd Administration Officer |
| 4 Ammunition Hoist | 14 Fan Room | 24 3.7cm Gun Base |
| 5 Flak Gun Crew Shelter | 15 Armoured Communication Shaft | 25 Ammunition Loading Hatch |
| 6 Ready Use Ammunition Storage | 16 Dark Room | 26 Barrel-cleaning Tools Storage |
| 7 Storage Locker | 17 Copy Room | 27 Installation Opening |
| 8 Switchboard Room | 18 Music Master | 28 Turret Bruno Barbette |
| 9 Music Practice Room | 19 Watch Officer | |
| 10 Officers Bathroom | 20 Administration Office | |



C SUPERSTRUCTURE

C2/10 Upper Deck (Oberdeck)

- | | | |
|--|---------------------------------|---------------------------|
| 1 Officers' Kitchen | 11 Midshipmen's Pantry | 22 Sick Bay |
| 2 Barber Shop | 12 Midshipmen's Head | 23 X-Ray Room |
| 3 Cabin for two Midshipmen | 13 Midshipmen's Washroom | 24 X-Ray Development Room |
| 4 Watch Officer | 14 Potato Locker | 25 Hospital Admin Office |
| 5 Chief Petty Officer
(Oberfeldwebel) | 15 Pharmacy | 26 Dentist |
| 6 Officers' Bathroom | 16 Armoured Communication Shaft | 27 Operating Room |
| 7 Dry Wash Room | 17 Hospital Store Room | 28 Turret Bruno Barbette |
| 8 Ammunition Transfer Room | 18 Waiting Room | |
| 9 Duty Protection Room | 19 Head | |
| 10 Midshipmen's Work Room | 20 Isolation Room | |
| | 21 Hospital Washroom | |

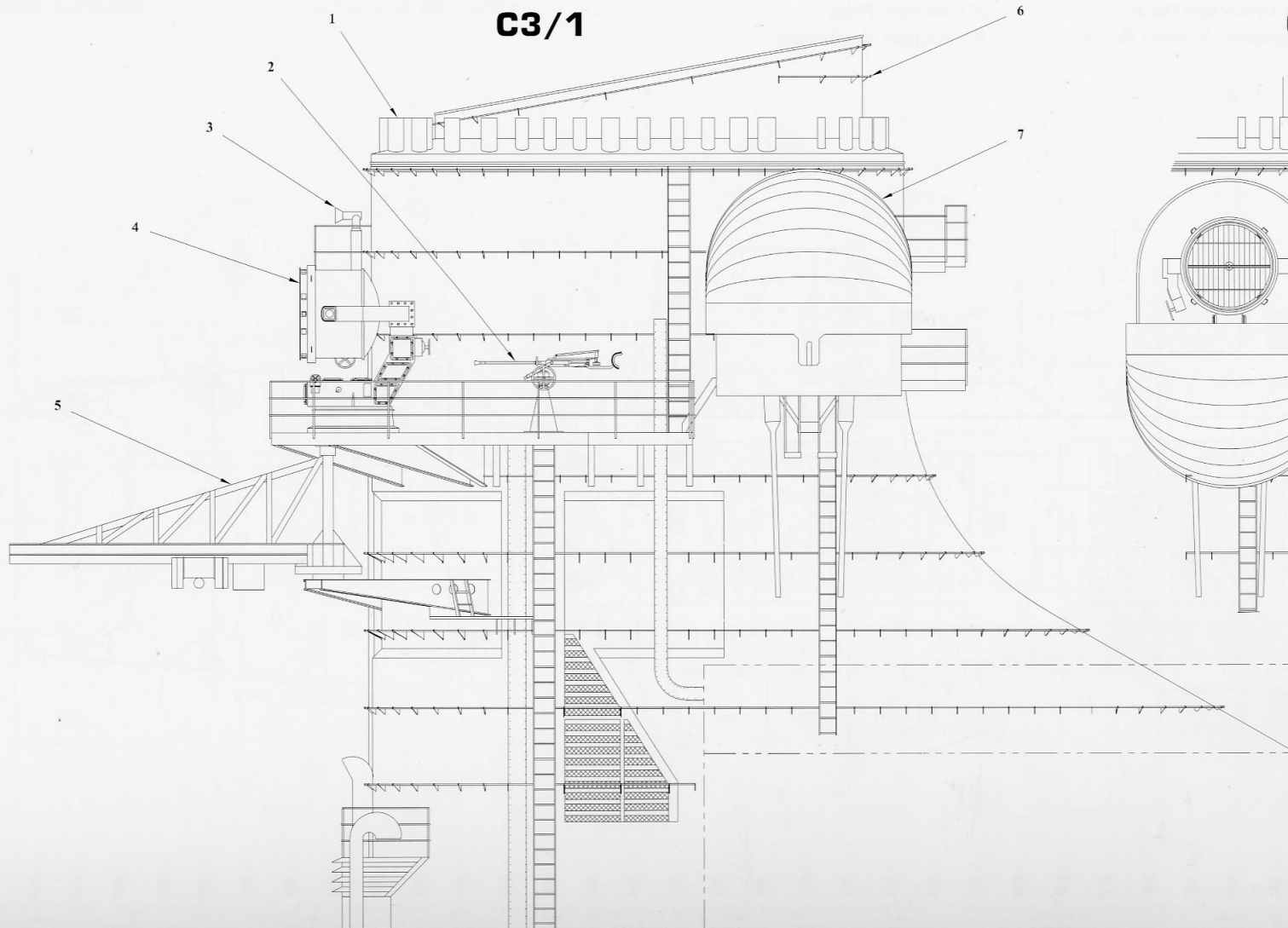


C SUPERSTRUCTURE

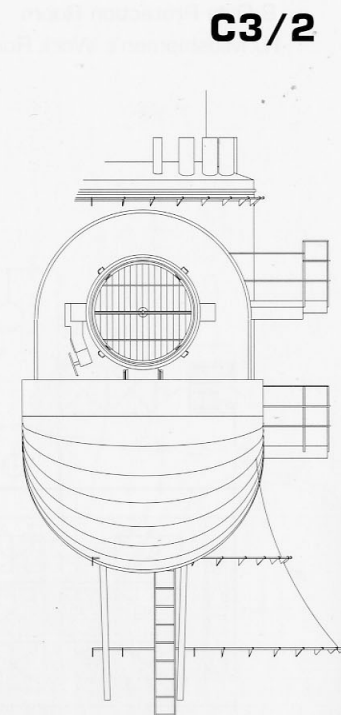
C3 Funnel (1:125 scale)

C3/1 Starboard Elevation

- 1 Exhaust Pipe
- 2 2cm C/30 L30 Gun
- 3 Horn
- 4 160cm Searchlight
- 5 Crane
- 6 Handrail
- 7 Searchlight Cover

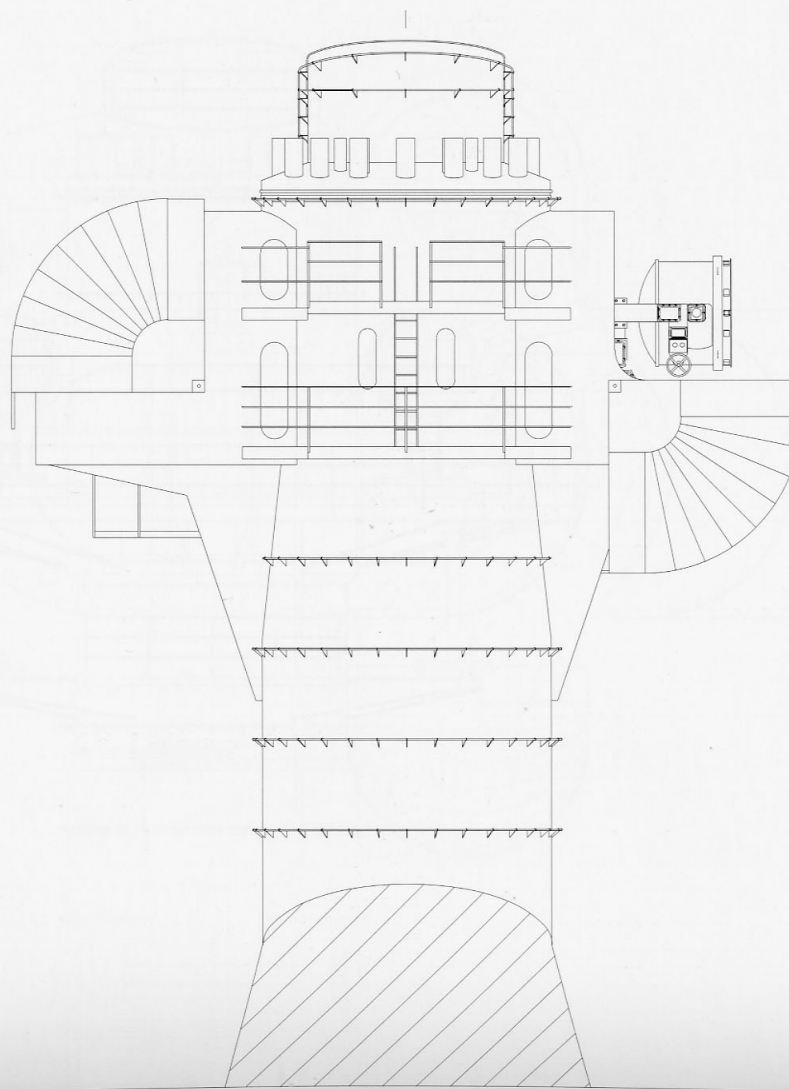


C3/2 Partial Starboard Elevation
Searchlight Cover in open position



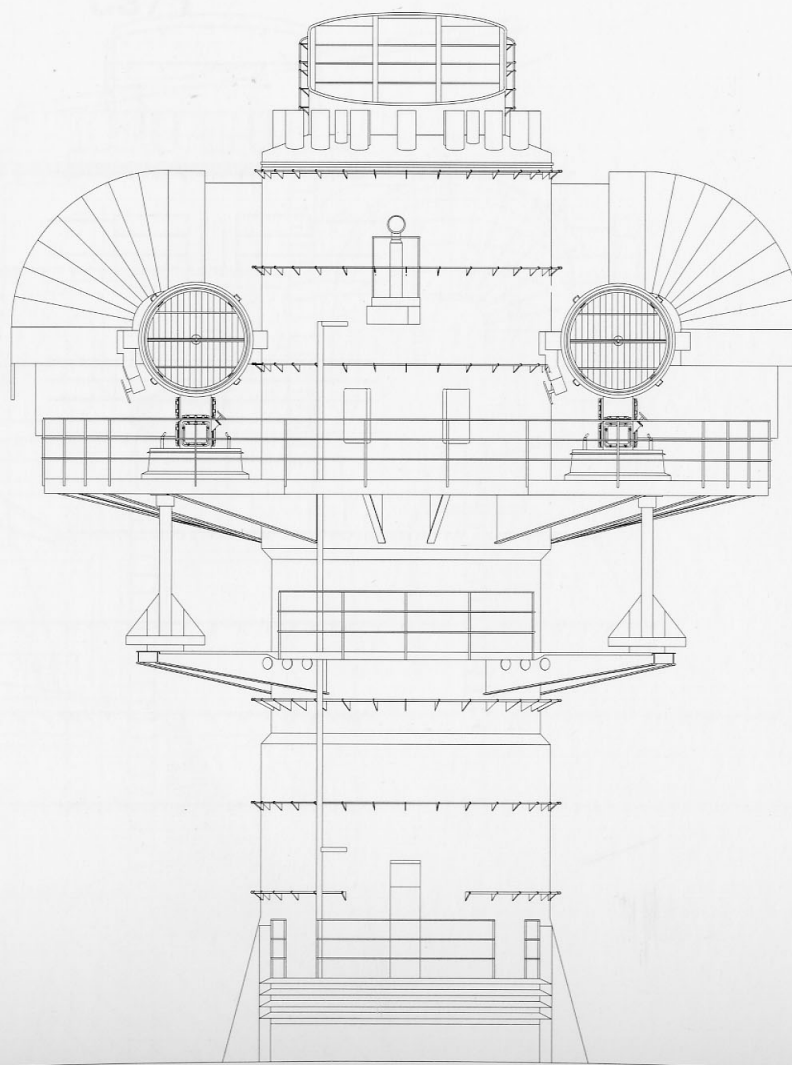
C SUPERSTRUCTURE

C3/3 Front Elevation



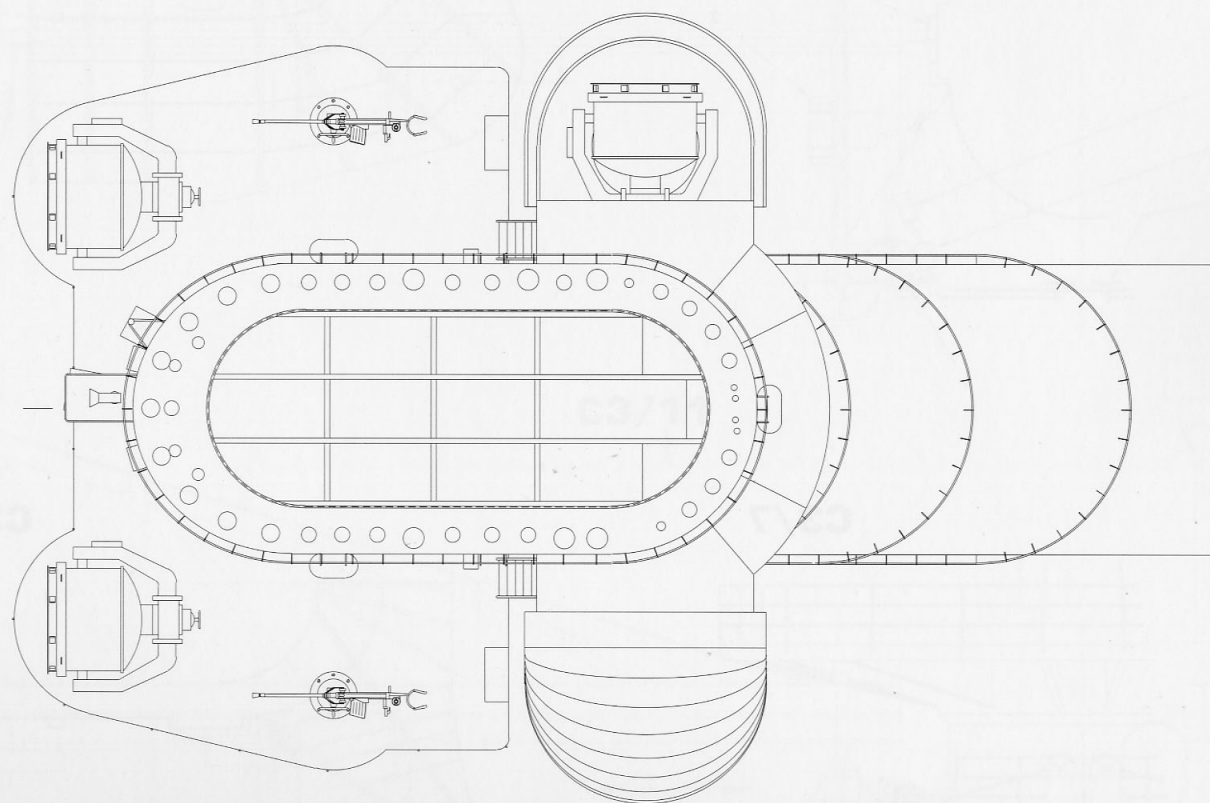
C SUPERSTRUCTURE

C3/4 Rear Elevation



C SUPERSTRUCTURE

C3/5 Plan



113 —
114 —
115 —
116 —
117 —
118 —
119 —
120 —
121 —
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130 —
131 —
132 —
133 —
134 —

C SUPERSTRUCTURE

C3/6 Crane Working Platform Plan

C3/7 Crane Working Platform Elevation

C3/8 Searchlight Platform Framing

C3/9 Crane Working Platform Framing

1 Ladder

2 Crane (Stowed)

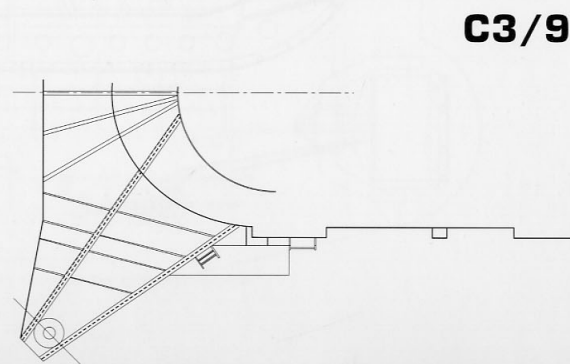
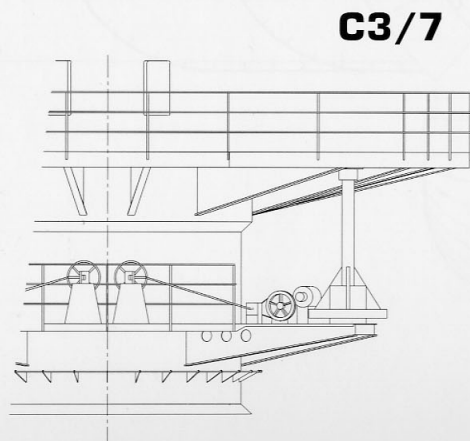
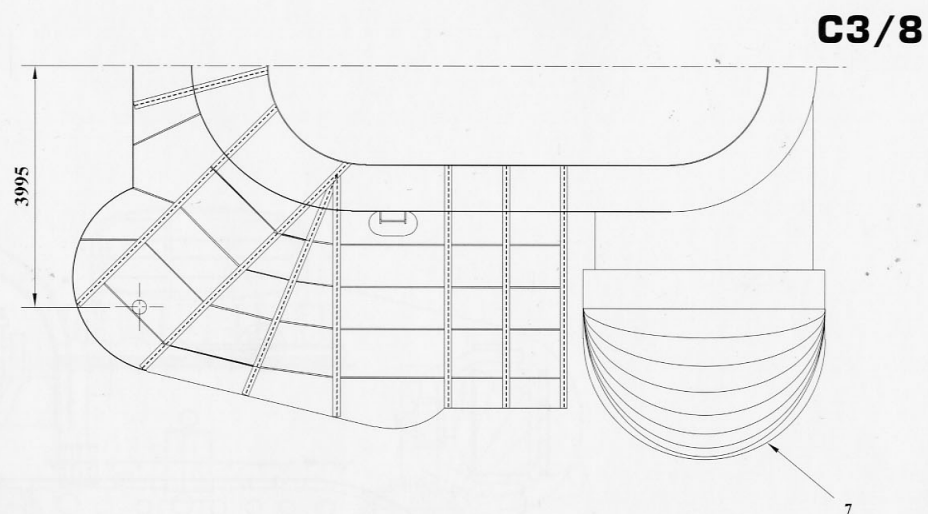
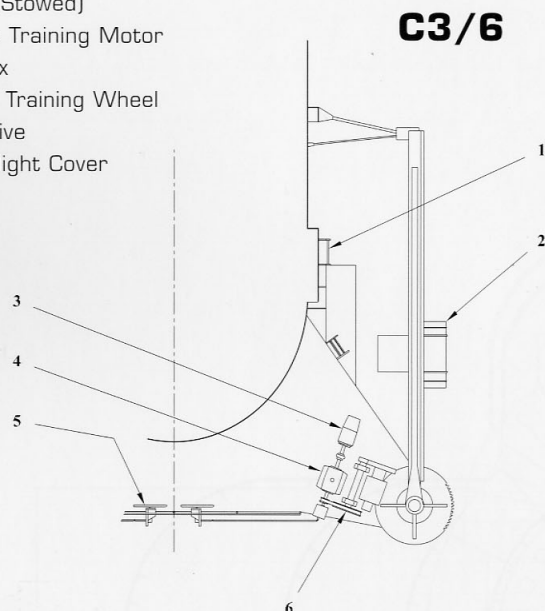
3 Electric Training Motor

4 Gearbox

5 Manual Training Wheel

6 Belt Drive

7 Searchlight Cover



C SUPERSTRUCTURE

C3/10 Work Crane Plan (1:50 scale)

C3/11 Work Crane Side Elevation

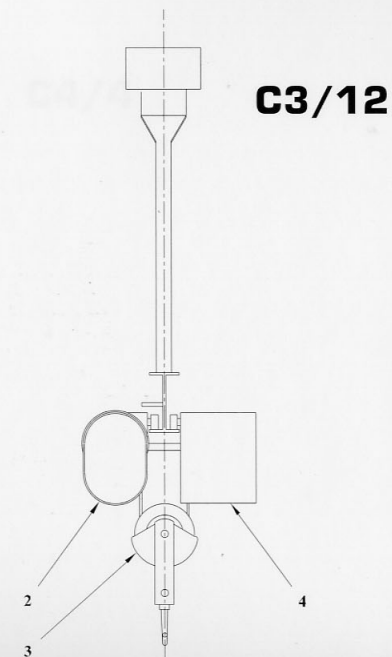
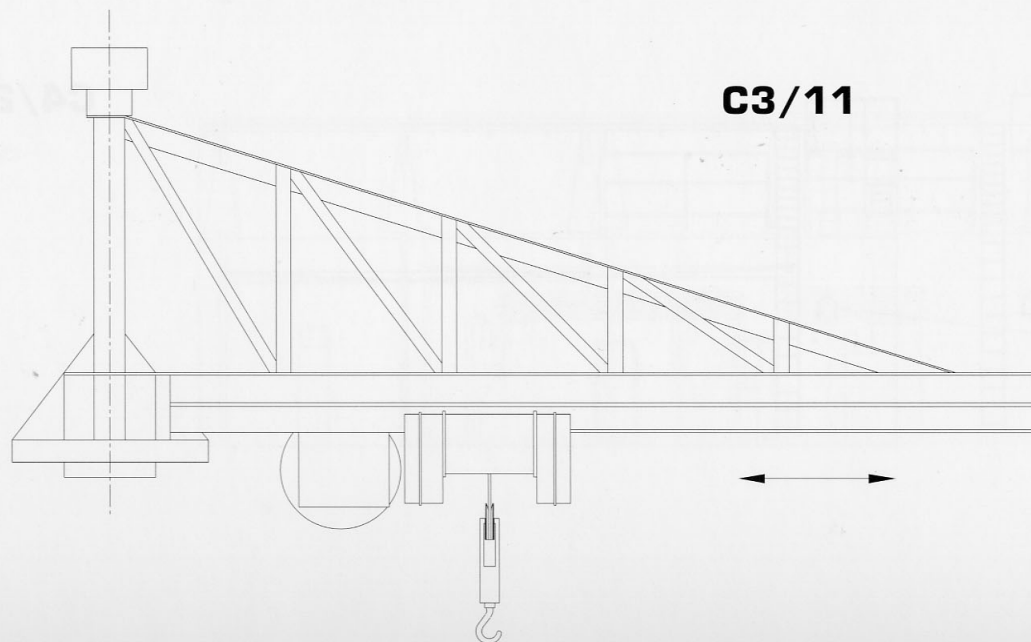
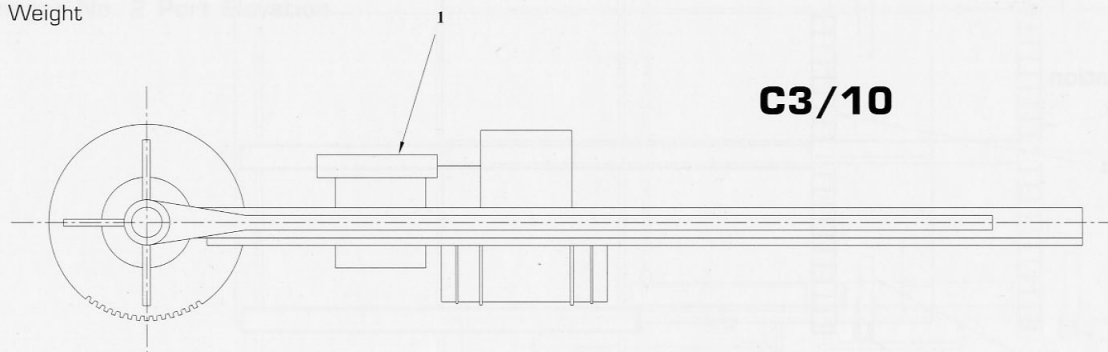
C3/12 Work Crane Front Elevation

1 Electric Cable Reel

2 Cable Drum and Gear Box

3 Crane Hook

4 Counter Weight

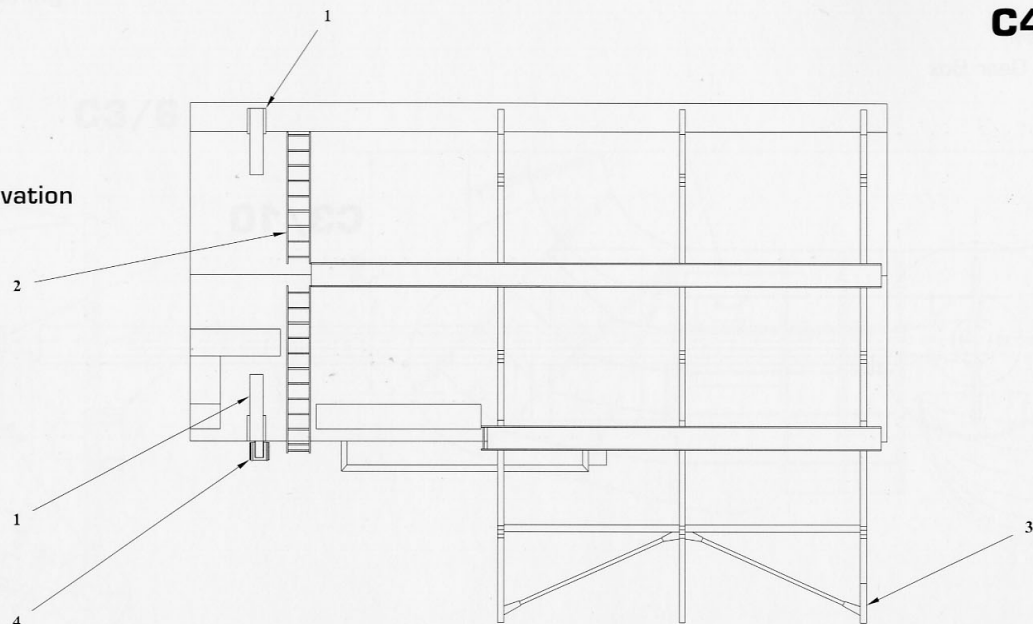


C SUPERSTRUCTURE

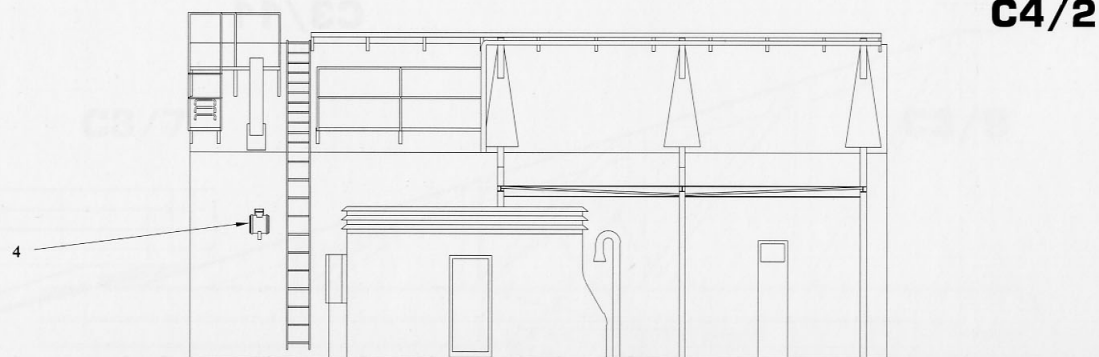
C4 Forward Aircraft Hangar (1:125 scale)

C4/1 Hangar No. 3 Plan

- 1 Ventilator Fan
- 2 Ladder
- 3 Boat Cradle
- 4 Loudspeaker



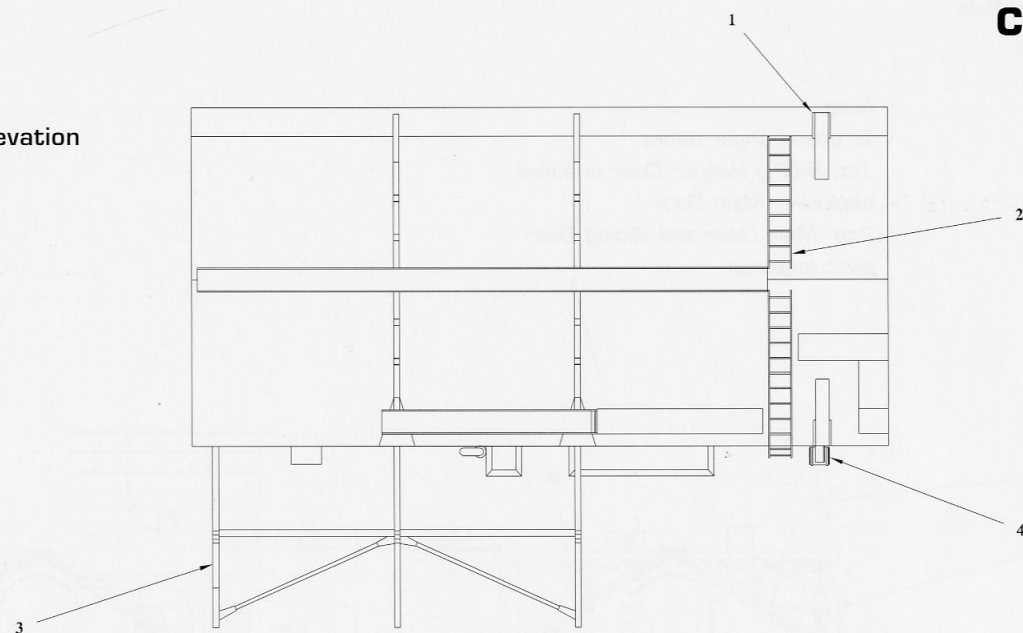
C4/2 Hangar No. 3 Starboard Elevation



C SUPERSTRUCTURE

C4/3 Hangar No. 2 Plan

- 1 Ventilator Fan
- 2 Ladder
- 3 Boat Cradle
- 4 Loudspeaker



C4/3

C4/4 Hangar No. 2 Port Elevation



C4/4

C SUPERSTRUCTURE

C4/5 Hangar Door Elevation

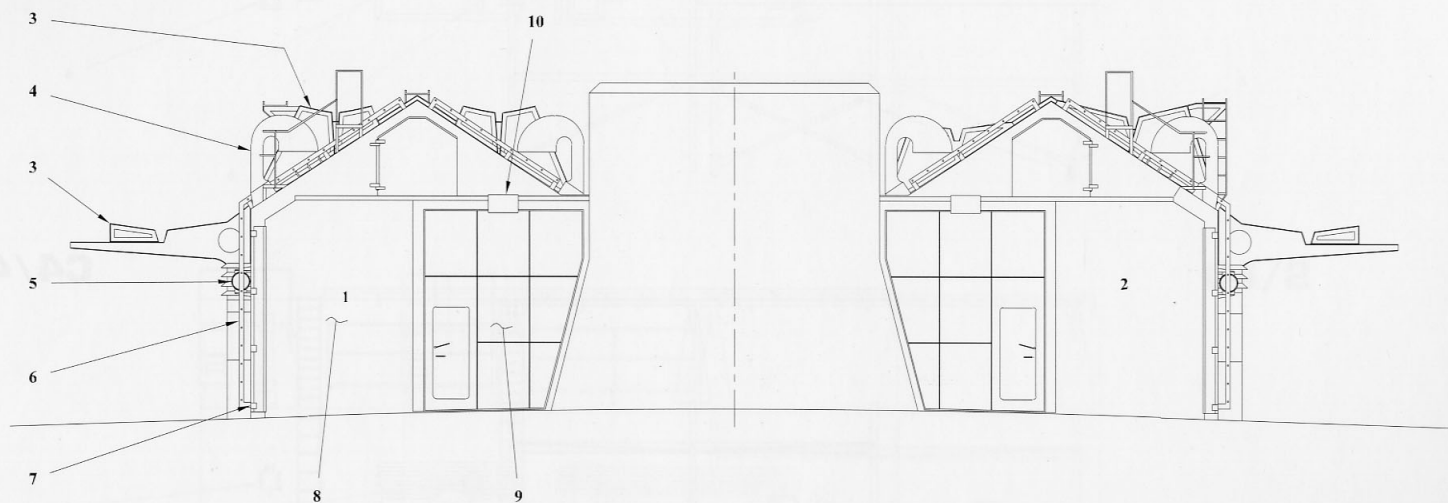
- 1 Hangar No. 2 Port Side
- 2 Hangar No. 3 Starboard Side
- 3 Boat Cradle
- 4 Ventilator Fan
- 5 Loudspeaker
- 6 Ladder
- 7 Hangar Door Hinges
- 8 Main Hangar Door
- 9 Sliding Hangar Door
- 10 Sliding Bracket

Note:

To open hangar doors:

1st. Sliding Hangar Door is pulled
back over Main Door

2nd. Main Door and Sliding Door
pivot together

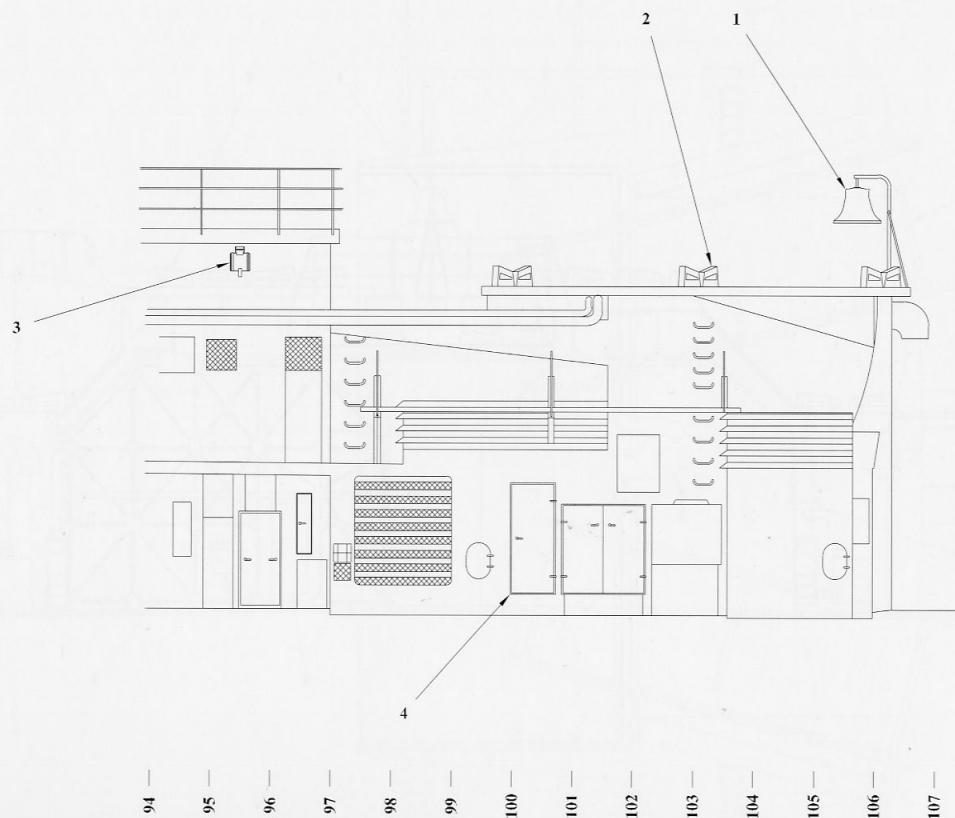


C SUPERSTRUCTURE

C5 Main Aircraft Hangar (1:125 scale)

C5/1 Port Elevation

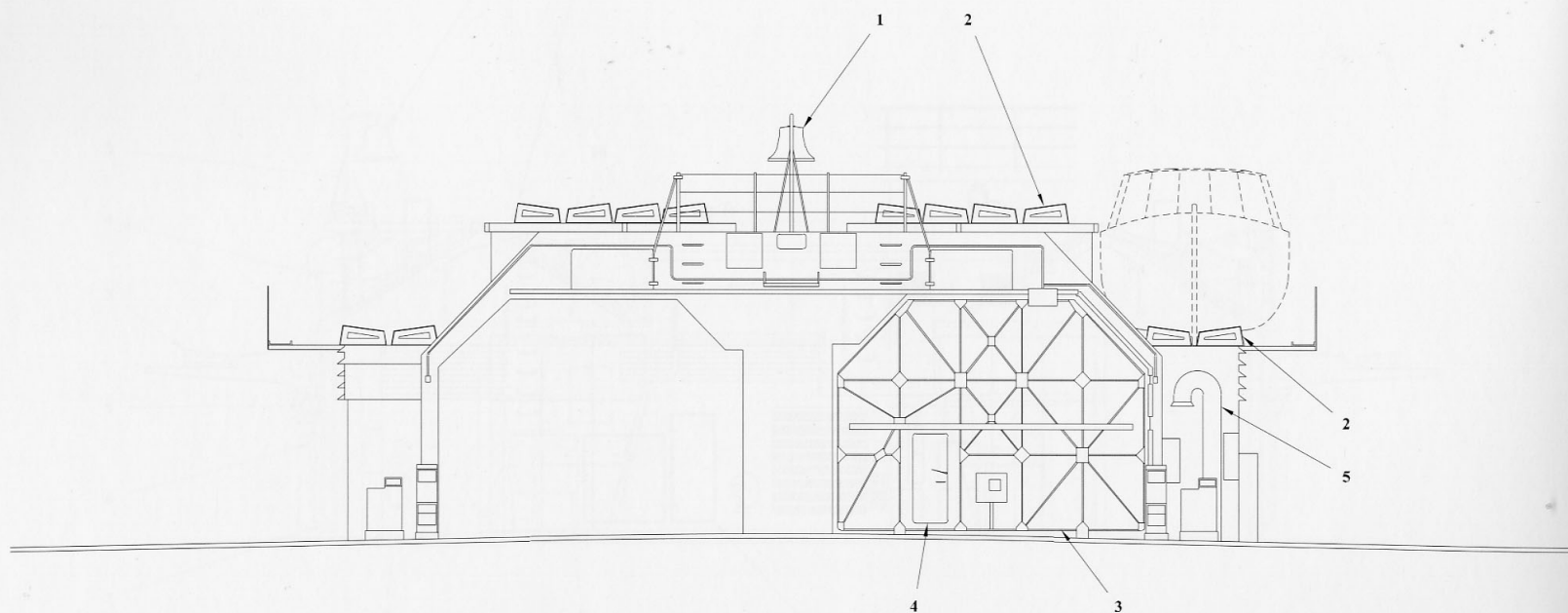
- 1 Ship's Bell
- 2 Boat Cradle
- 3 Loudspeaker
- 4 Deck Storage Locker



C SUPERSTRUCTURE

C5/2 Hangar Door Elevation

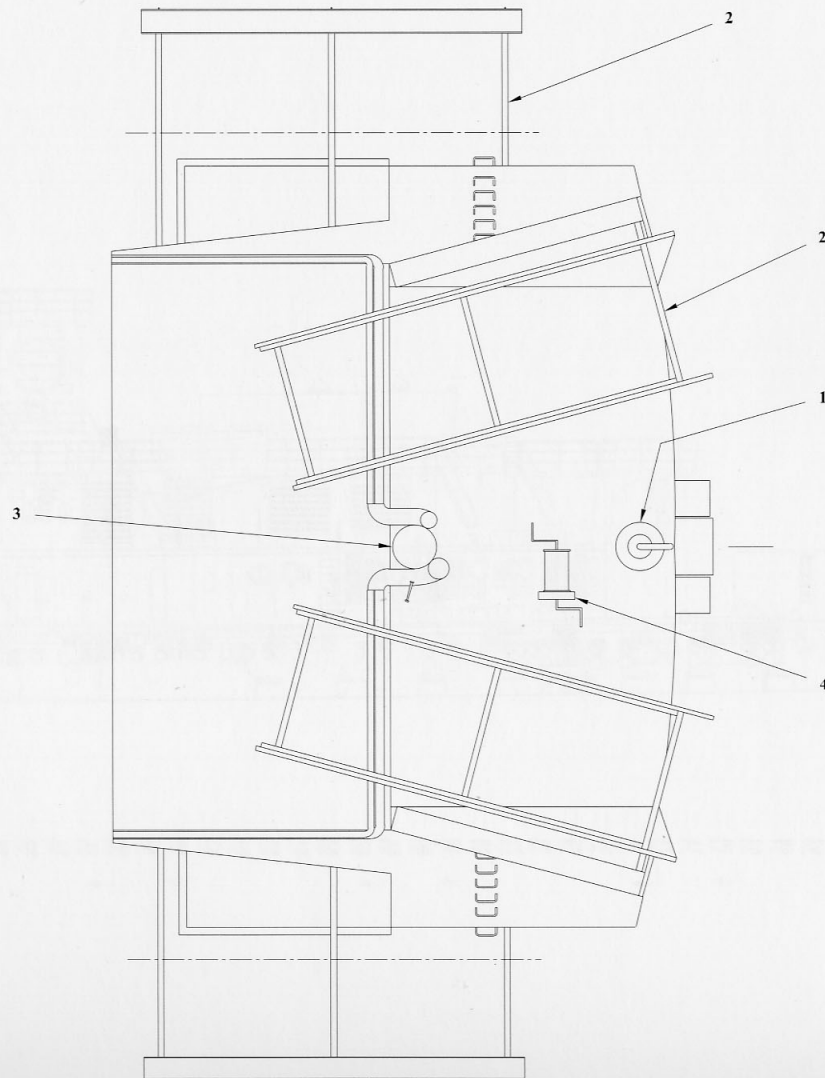
- 1 Ship's Bell
- 2 Boat Cradle
- 3 Hangar Door
- 4 Main Door
- 5 Ventilator



C SUPERSTRUCTURE

C5/3 Plan View

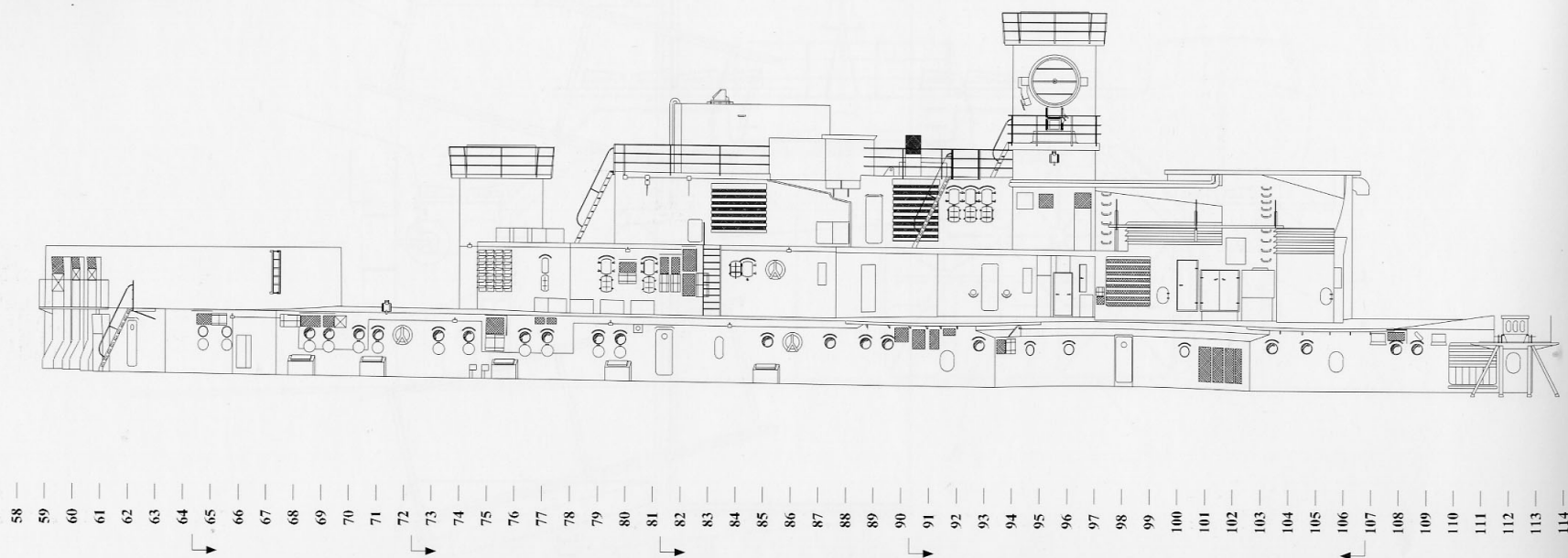
- 1 Ship's Bell
- 2 Boat Cradle
- 3 Mast
- 4 Hand Winch



C SUPERSTRUCTURE

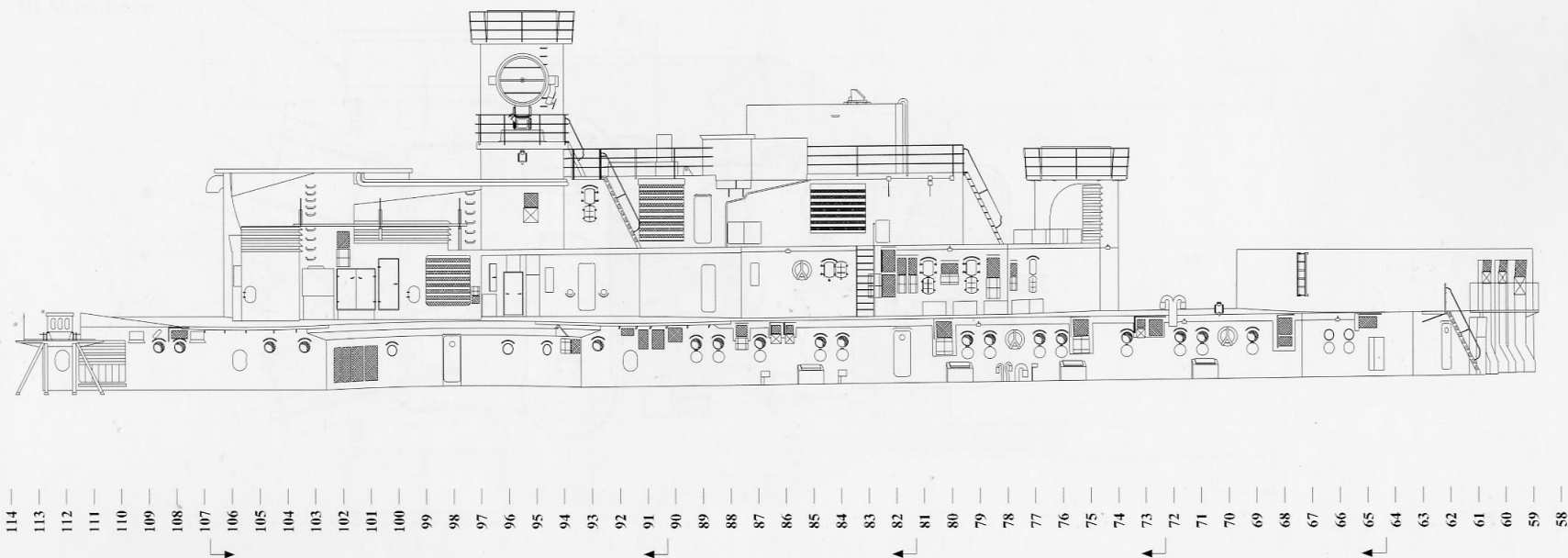
C6 After Superstructure (1:250 scale)

C6/1 Starboard Elevation



C SUPERSTRUCTURE

C6/2 Port Elevation

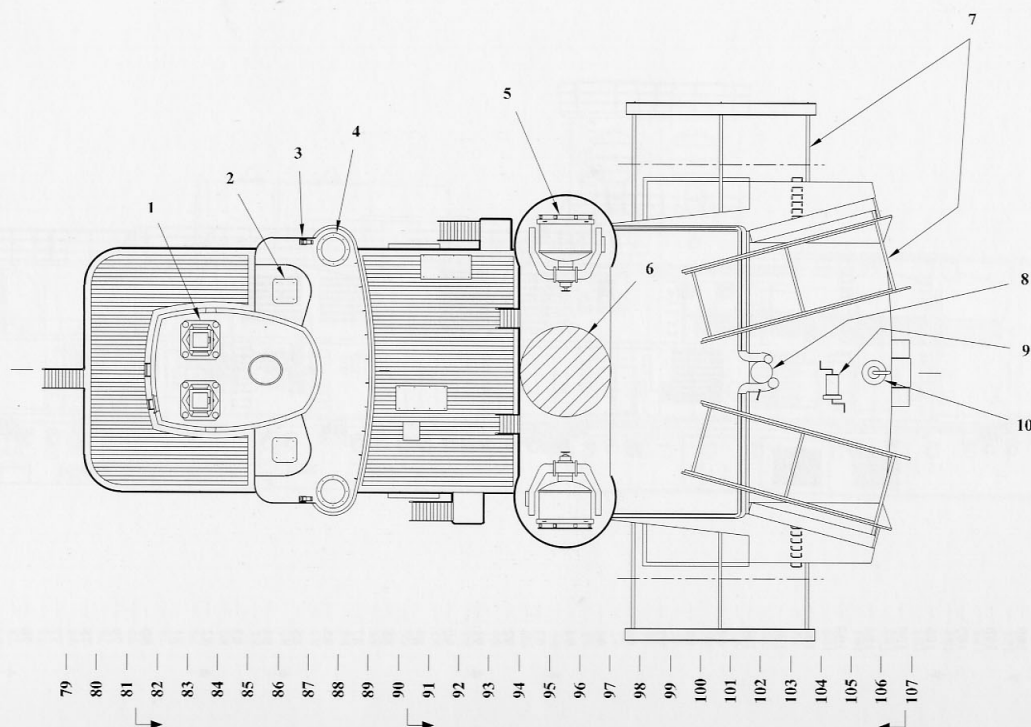


C SUPERSTRUCTURE

C7 After Superstructure Deck Plans

C7/1 After Fire-Control

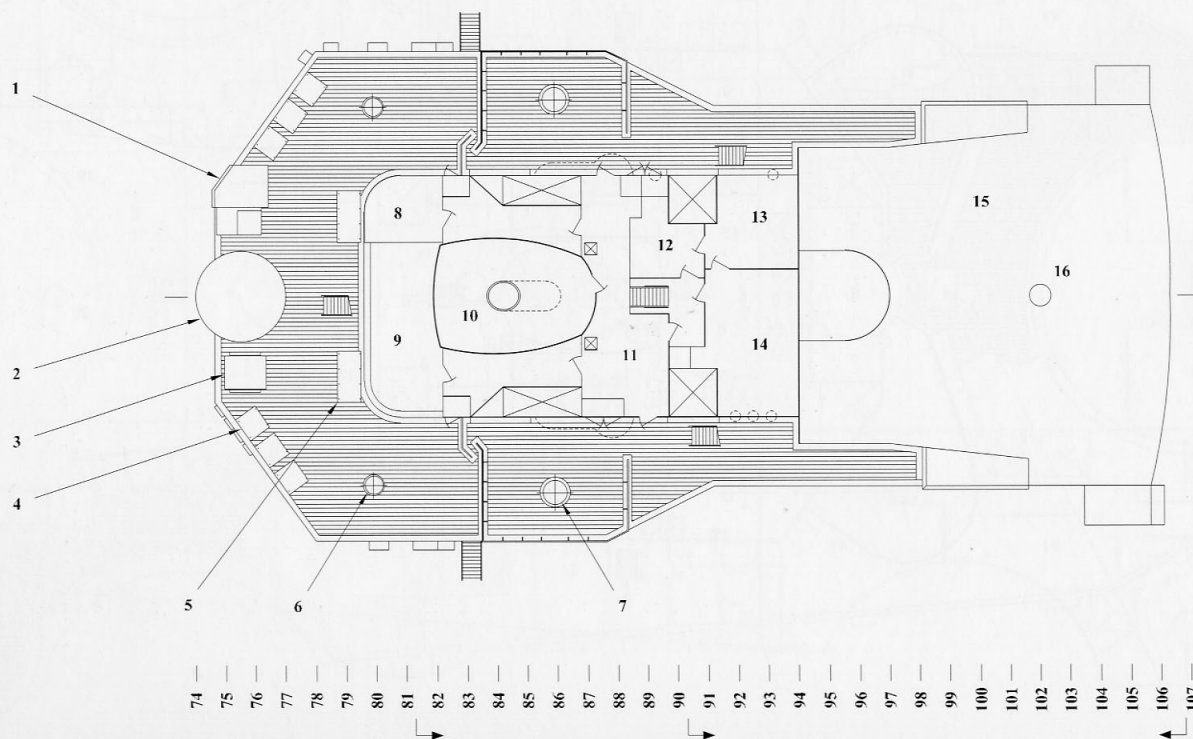
- 1 ZG C/38S Gun Director
- 2 Zeilsaule C38 Night Director Position
- 3 Infrared Night-Vision Telescope
- 4 Target Giver Position
- 5 160cm Search Light
- 6 HA Rangefinder Tower
- 7 Cradle for Ilm Tender
- 8 Mast
- 9 Hand Winch
- 10 Ship's Bell



C SUPERSTRUCTURE

C7/2 Lower Bridge Deck (Unteres Brückendeck)

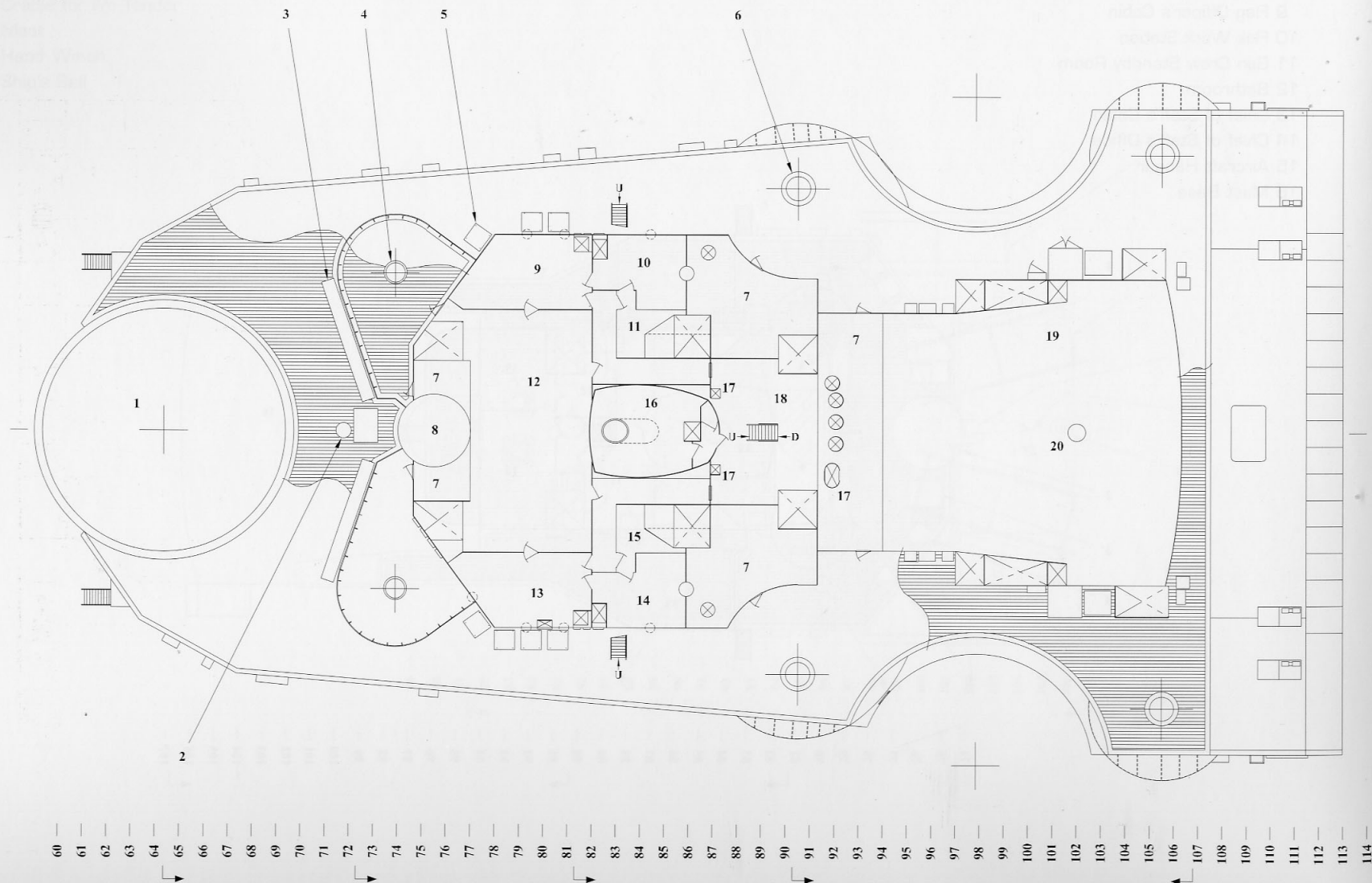
- 1 Ventilator Fan
- 2 HA Rangefinder Tower
- 3 Hose Reel
- 4 Ready Use Ammunition Box
- 5 Deck Storage Box
- 6 2cm Gun Base
- 7 3.7cm Gun Base
- 8 Storage Room
- 9 Flag Officer's Cabin
- 10 Flak Work Station
- 11 Gun Crew Standby Room
- 12 Bathroom
- 13 Chief of Staff's Cabin
- 14 Chief of Staff's Office
- 15 Aircraft Hangar
- 16 Mast Base



C SUPERSTRUCTURE

C7/3 First Deck (Aufbaudeck)

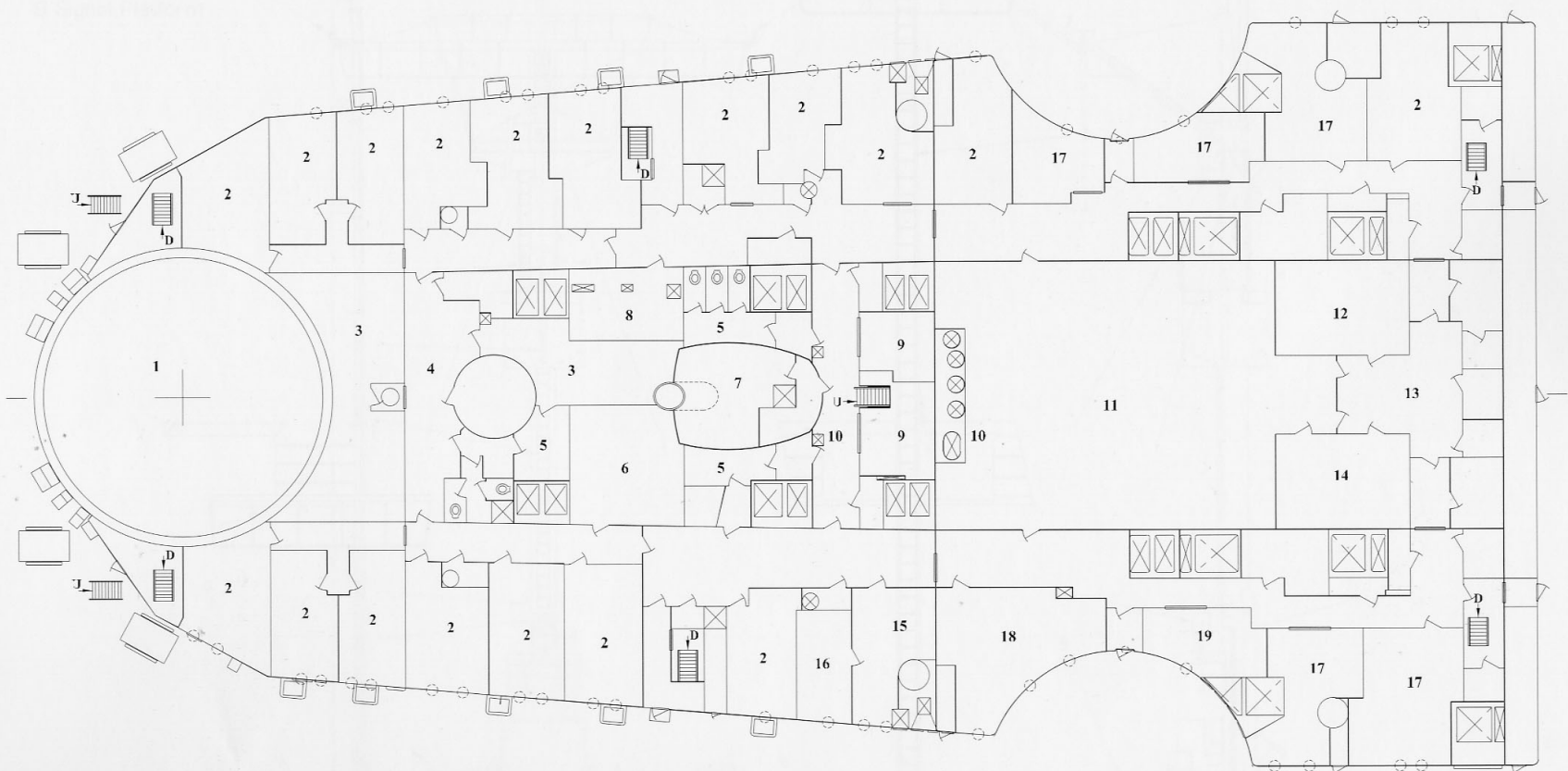
- | | | |
|---------------------------------|-----------------------------|-----------------------------------|
| 1 Turret César Barbette | 9 Captain's Day Cabin | 15 Admiral's Bathroom |
| 2 Ammunition Loading Hatch | 10 Captain's Sleeping Cabin | 16 Admiral's and Captain's Pantry |
| 3 Barrel-cleaning Tools Storage | 11 Captain's Bathroom | 17 Ammunition Hoist |
| 4 3.7cm Gun Base | 12 Admiral's Mess | 18 Lobby |
| 5 Ready Use Ammunition Box | 13 Admiral's Day Cabin | 19 Aircraft Hangar |
| 6 10.5cm Gun Base | 14 Admiral's Sleeping Cabin | 20 Mast Base |
| 7 Gun Crew Standby Room | | |
| 8 HA Rangefinder Tower | | |



C SUPERSTRUCTURE

C7/4 Upper Deck (Oberdeck)

- | | |
|-----------------------------------|-------------------------------|
| 1 Turret César Barbette | 11 Officers' Mess |
| 2 Officers' Cabin | 12 Officers' Pantry |
| 3 Officers' Wardroom | 13 Ante-room |
| 4 Officers' Washroom | 14 Officers' Conference Room |
| 5 Officers' Bathroom | 15 Executive Officers' Office |
| 6 Astro Workshop | 16 Executive Officers' Cabin |
| 7 Admiral's and Captain's Kitchen | 17 Office |
| 8 Teleprinter Room | 18 Chief Clerk's Office |
| 9 Wardroom | 19 Station Officer's Office |
| 10 Ammunition Hoist | |



60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114

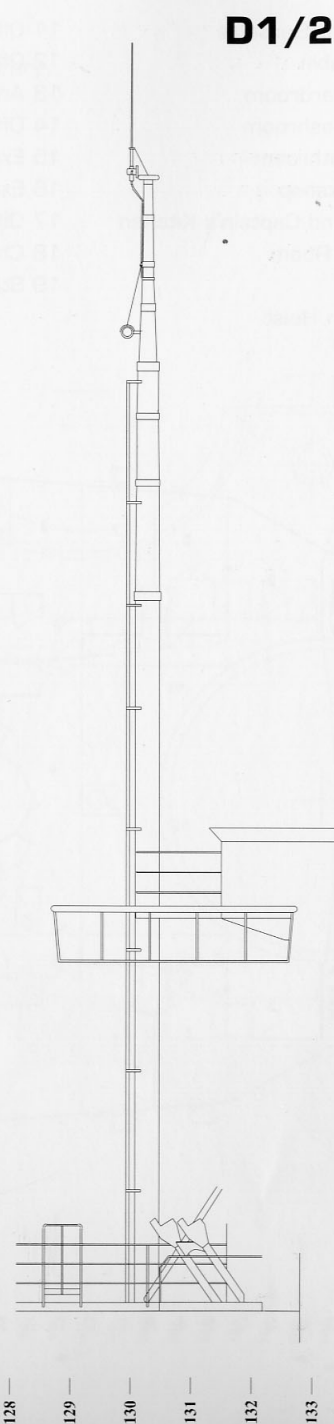
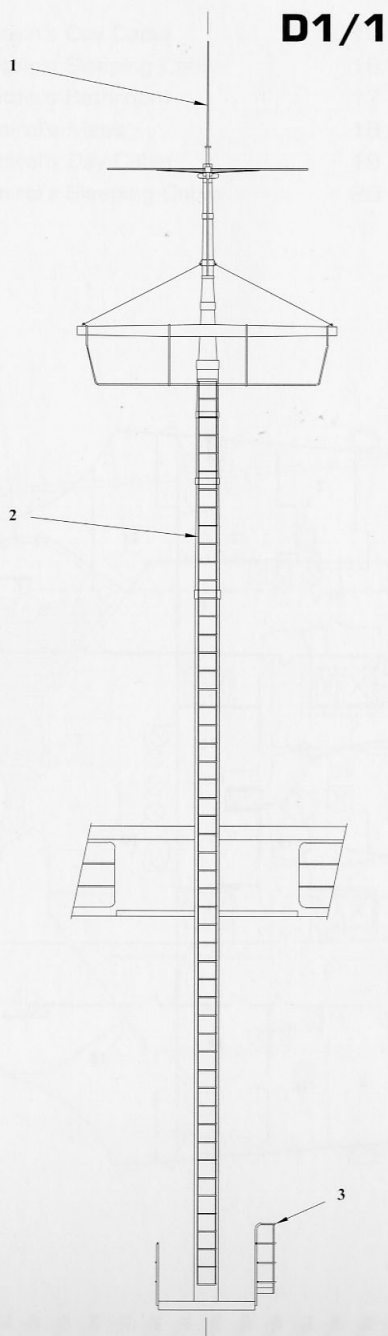
D RIGGING

D1 Foremast (1:125 scale)

D1/1 Elevation Looking Forward

D1/2 Starboard Elevation

- 1 Antenna
- 2 Ladder
- 3 Signal Platform



128 —
129 —
130 —
131 —
132 —
133 —

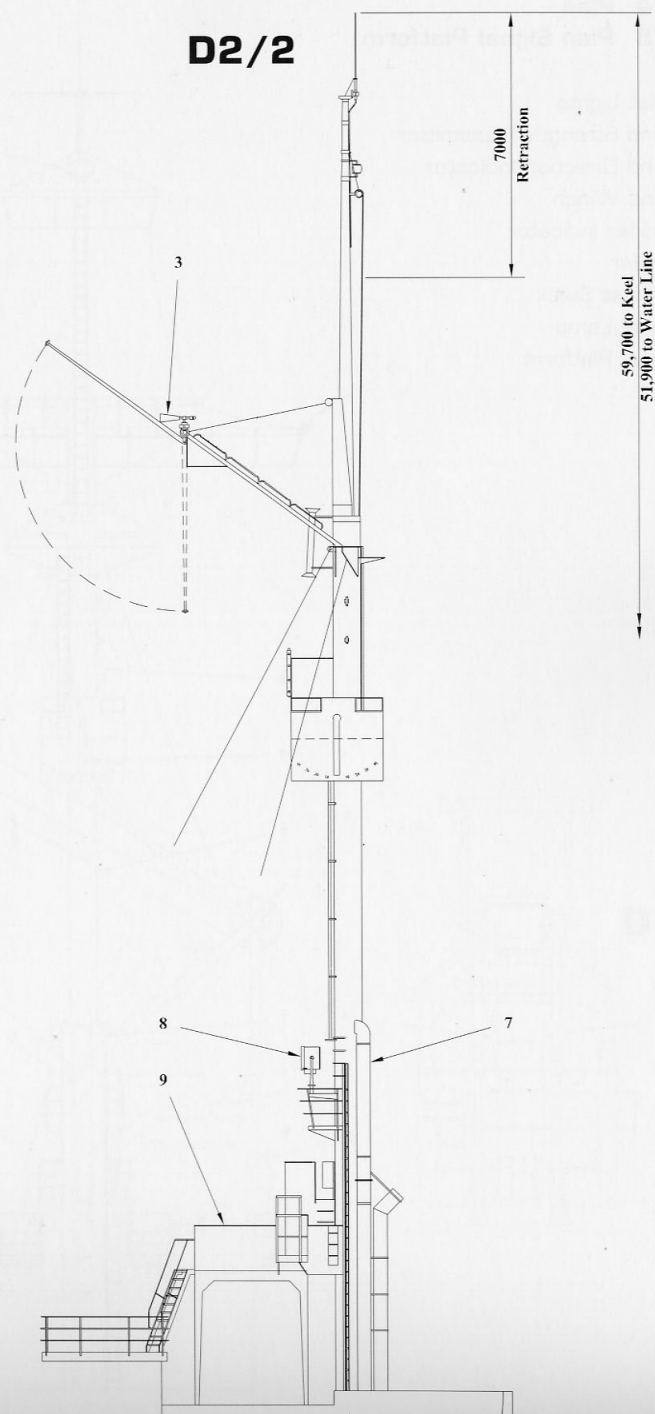
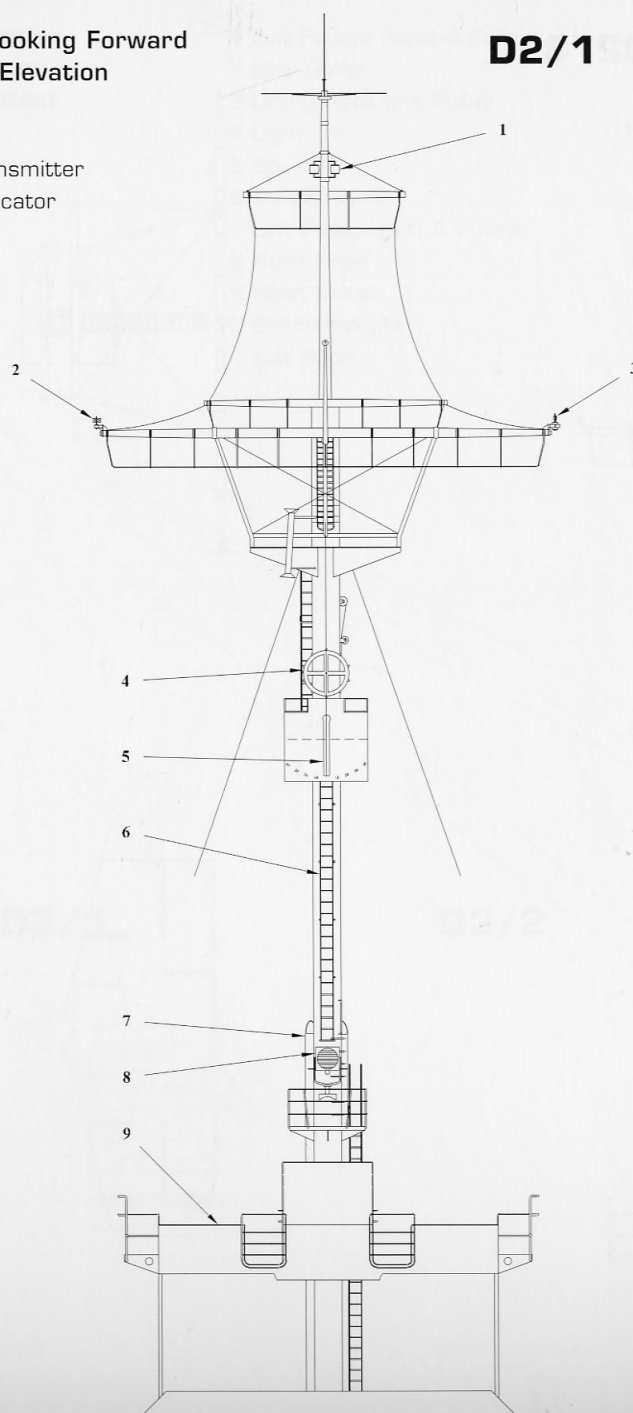
D RIGGING

D2 Mainmast & Signal Platform (1:200 scale)

D2/1 Elevation Looking Forward

D2/2 Starboard Elevation

- 1 Mast Lights
- 2 Wind Strength Transmitter
- 3 Wind Direction Indicator
- 4 Hand Winch
- 5 Rudder Indicator
- 6 Ladder
- 7 Exhaust Stack
- 8 Signal Lamp
- 9 Signal Platform



D RIGGING

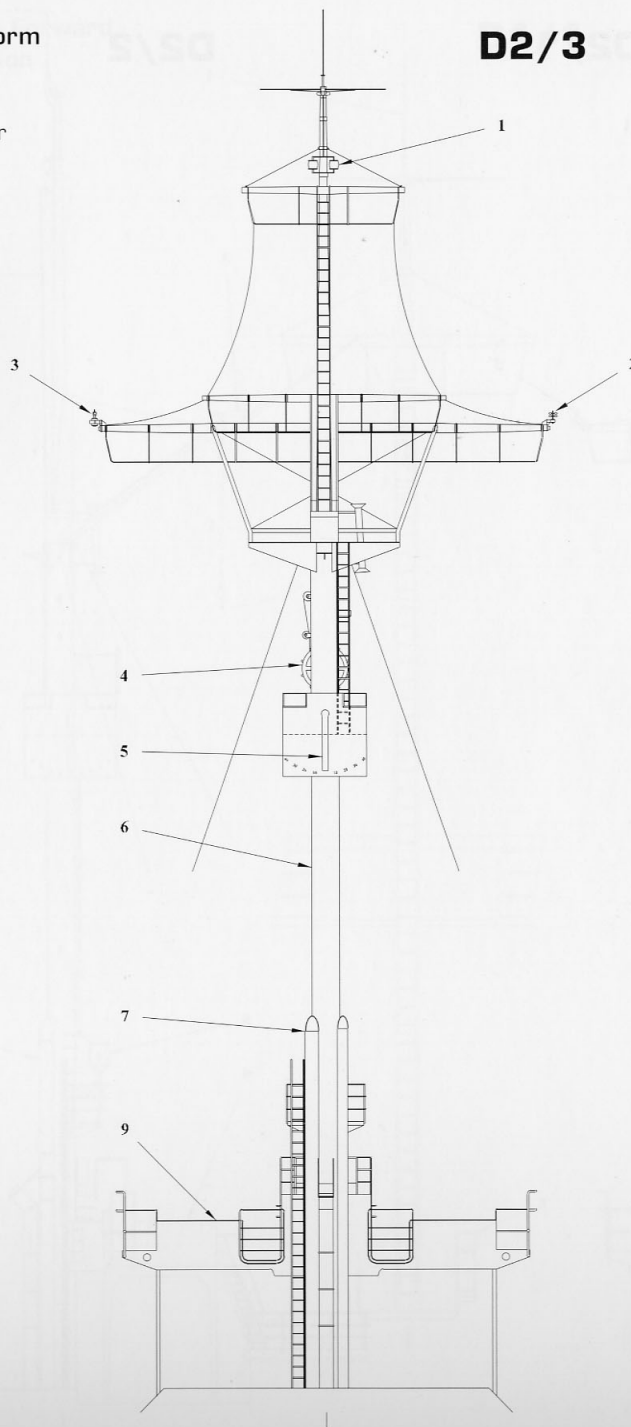
D2/3 Elevation Looking Aft

D2/4 Plan

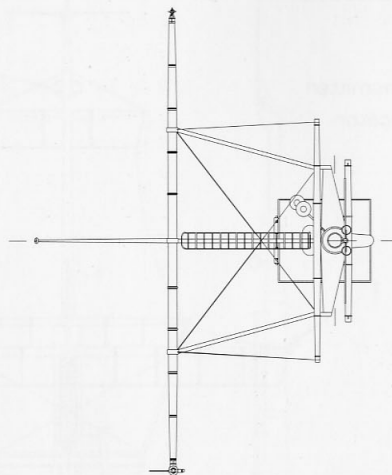
D2/5 Plan Signal Platform

- 1 Mast Lights
- 2 Wind Strength Transmitter
- 3 Wind Direction Indicator
- 4 Hand Winch
- 5 Rudder Indicator
- 6 Ladder
- 7 Exhaust Stack
- 8 Signal Lamp
- 9 Signal Platform

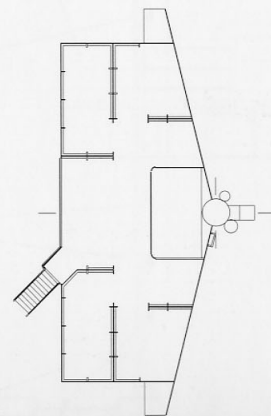
D2/3



D2/4



D2/5



D RIGGING

D3 Crane (1:125 scale)

D3/1 Front Elevation

D3/2 Side Elevation

D3/3 Rear Elevation

1 Luft Pulleys (fore) 4 Pulleys

2 Idler Roller

3 Lifting Hook and Pulley

4 Light

5 Boom

6 Tension Arm

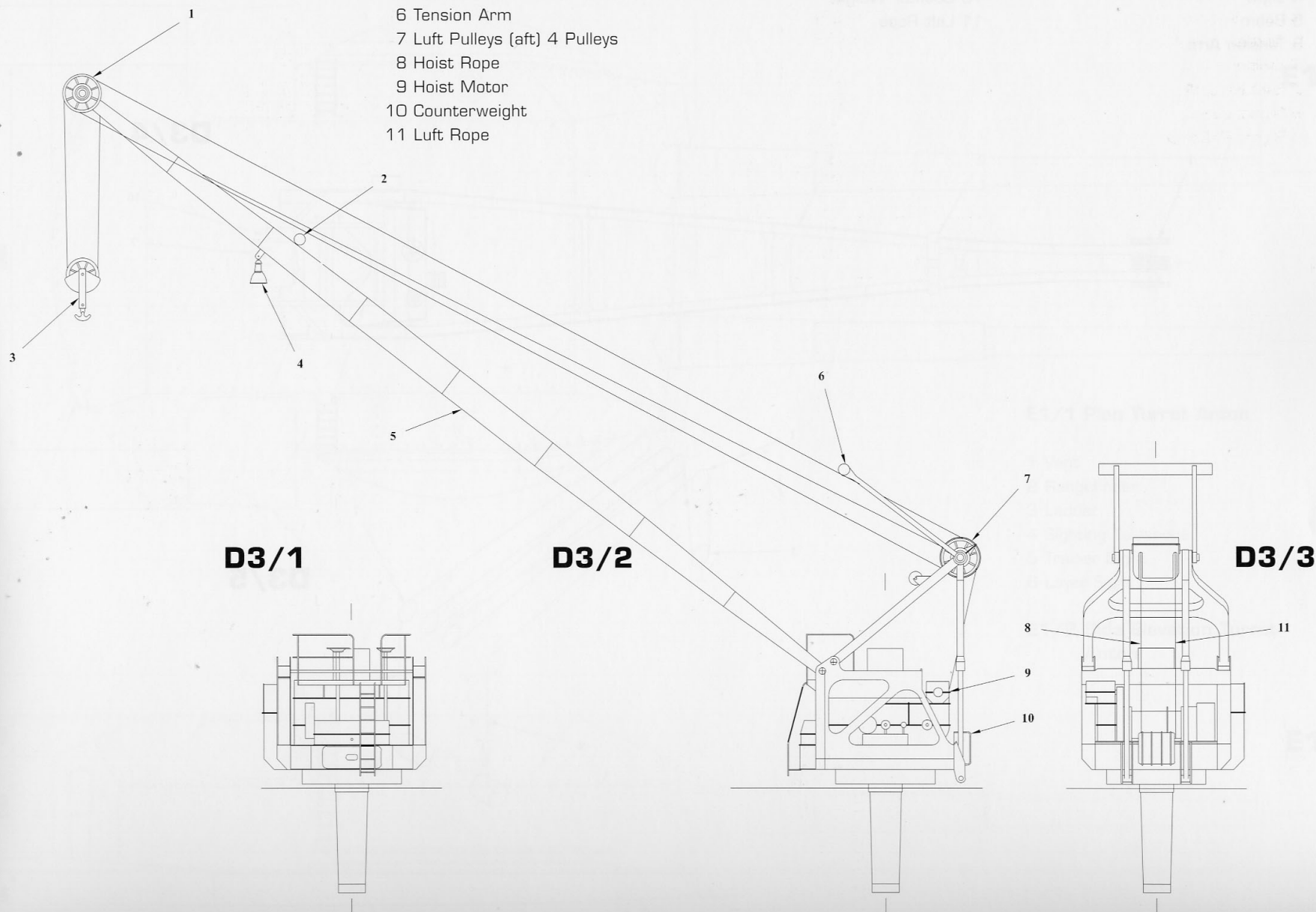
7 Luft Pulleys (aft) 4 Pulleys

8 Hoist Rope

9 Hoist Motor

10 Counterweight

11 Luft Rope



D RIGGING

D3/4 Plan

D3/5 Schematic of Crane Tackle

1 Luft Pulleys (fore) 4 Pulleys

2 Idler Roller

3 Lifting Hook and Pulley

4 Light

5 Boom

6 Tension Arm

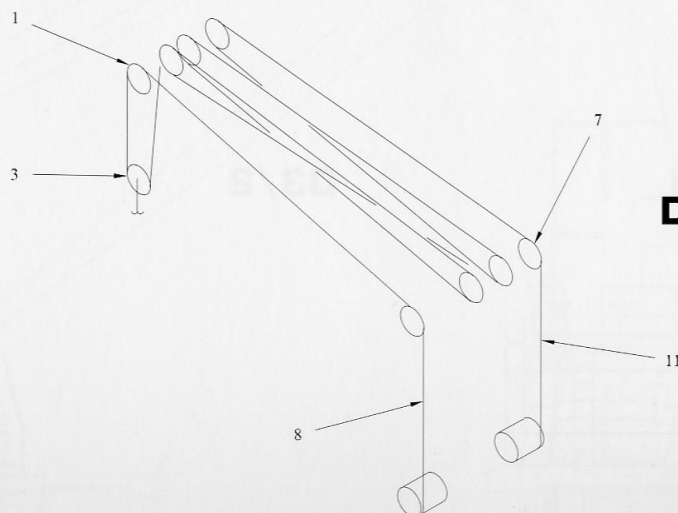
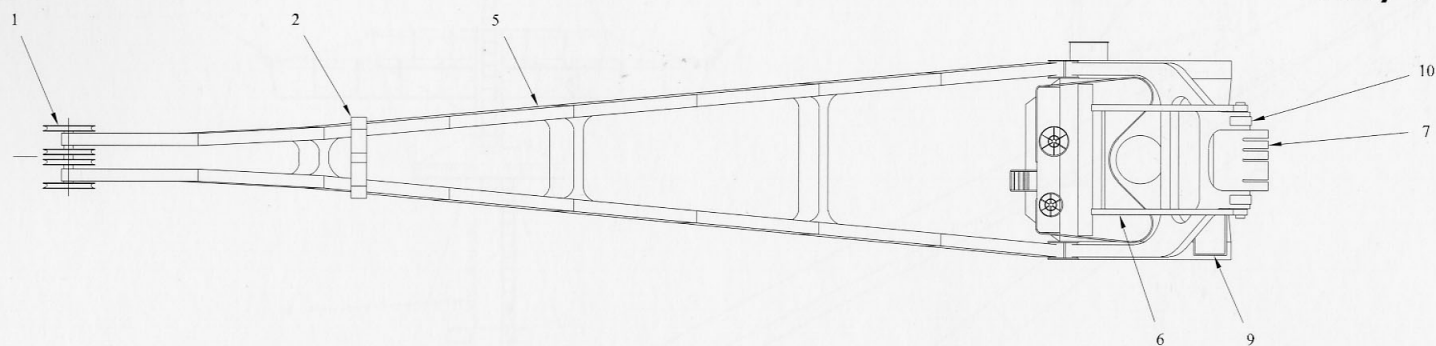
7 Luft Pulleys (aft) 4 Pulleys

8 Hoist Rope

9 Hoist Motor

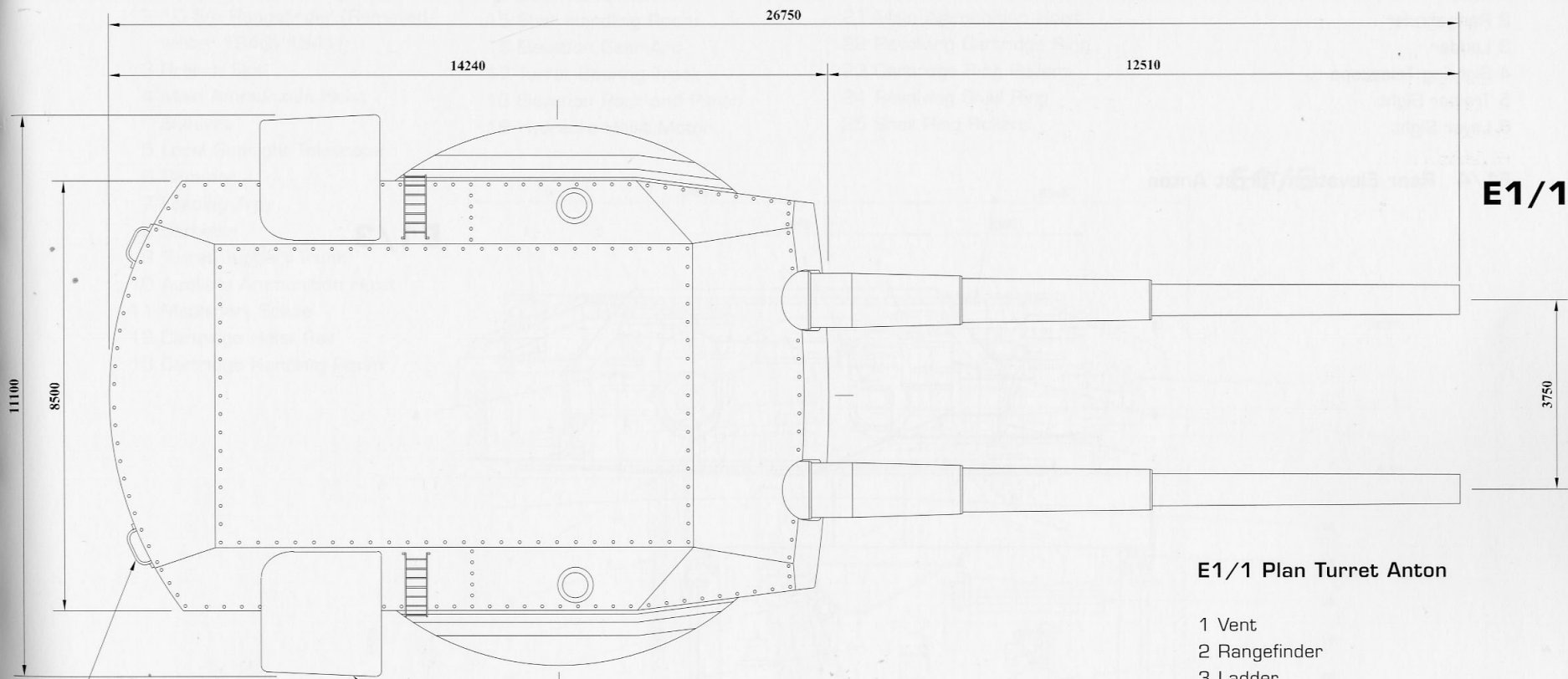
10 Counter Weight

11 Luft Rope



E ARMAMENT

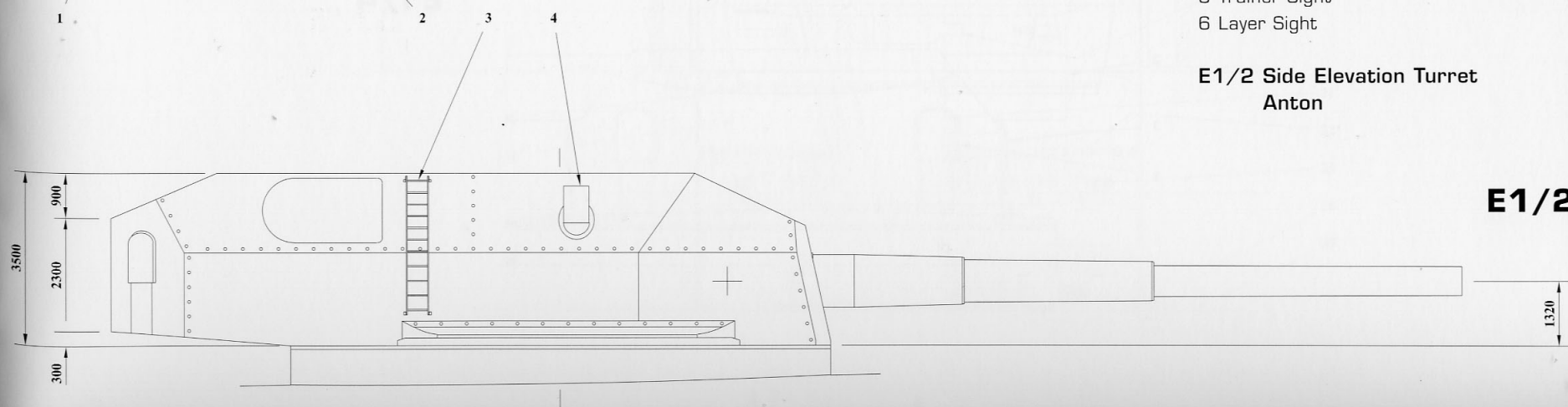
E1 38cm SKC/34 in Drh LC/34 mount (1:125 scale)



E1/1

E1/1 Plan Turret Anton

- 1 Vent
- 2 Rangefinder
- 3 Ladder
- 4 Sighting Telescope
- 5 Trainer Sight
- 6 Layer Sight



E1/2

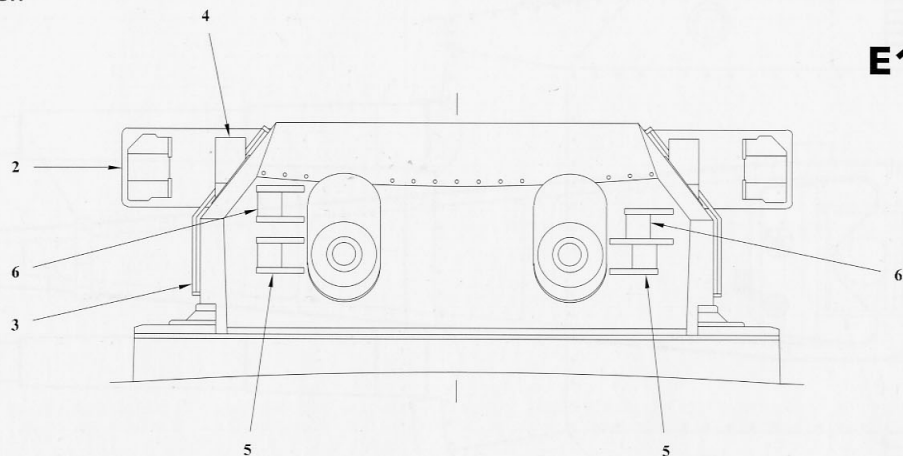
E1/2 Side Elevation Turret Anton

E ARMAMENT

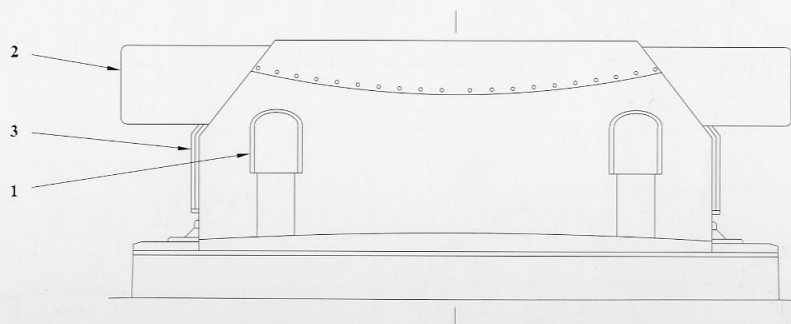
E1/3 Front Elevation Turret Anton

- 1 Vent
- 2 Rangefinder
- 3 Ladder
- 4 Sighting Telescope
- 5 Trainer Sight
- 6 Layer Sight

E1/4 Rear Elevation Turret Anton



E1/3



E1/4

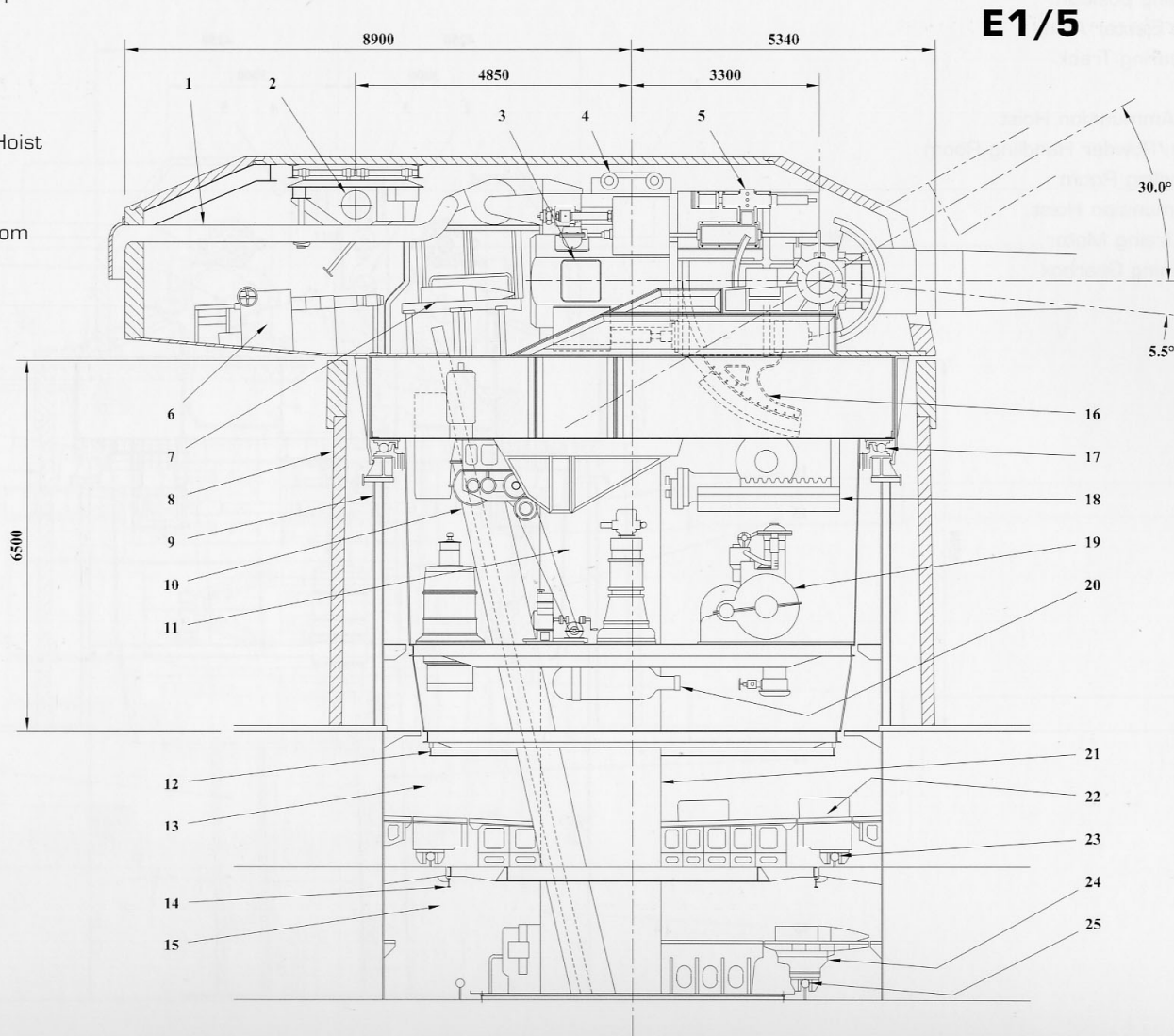
E ARMAMENT

E1/5 Section

- 1 Exhaust Fan Trunking
- 2 10.5m Rangefinder (Removed winter 1940/1941)
- 3 Breech Slot
- 4 Main Ammunition Hoist Sheaves
- 5 Local Gunsight Telescope
- 6 Rammer
- 7 Loading Tray
- 8 Barbette
- 9 Turret Support Trunk
- 10 Auxiliary Ammunition Hoist
- 11 Machinery Space
- 12 Cartridge Hoist Rail
- 13 Cartridge Handling Room

- 14 Shell Hoist Rail
- 15 Shell Handling Room
- 16 Elevation Gear Arc
- 17 Turret Bearing Track
- 18 Elevation Rack and Pinion
- 19 Hydraulic Hoist Motor

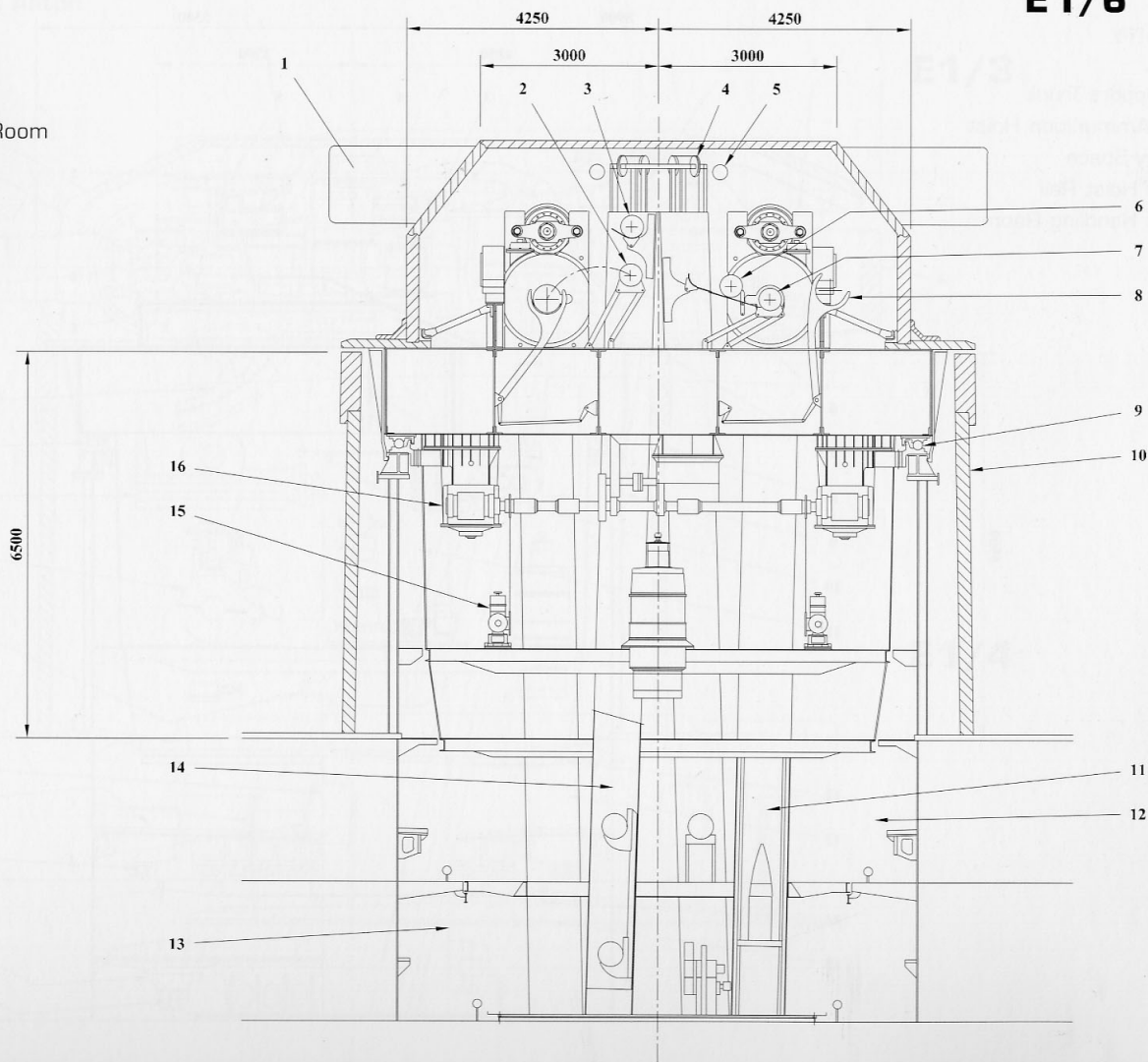
- 20 High-pressure Air Cylinder
- 21 Main Ammunition Hoist
- 22 Revolving Cartridge Ring
- 23 Cartridge Ring Rollers
- 24 Revolving Shell Ring
- 25 Shell Ring Rollers



E ARMAMENT

E1/6 Section

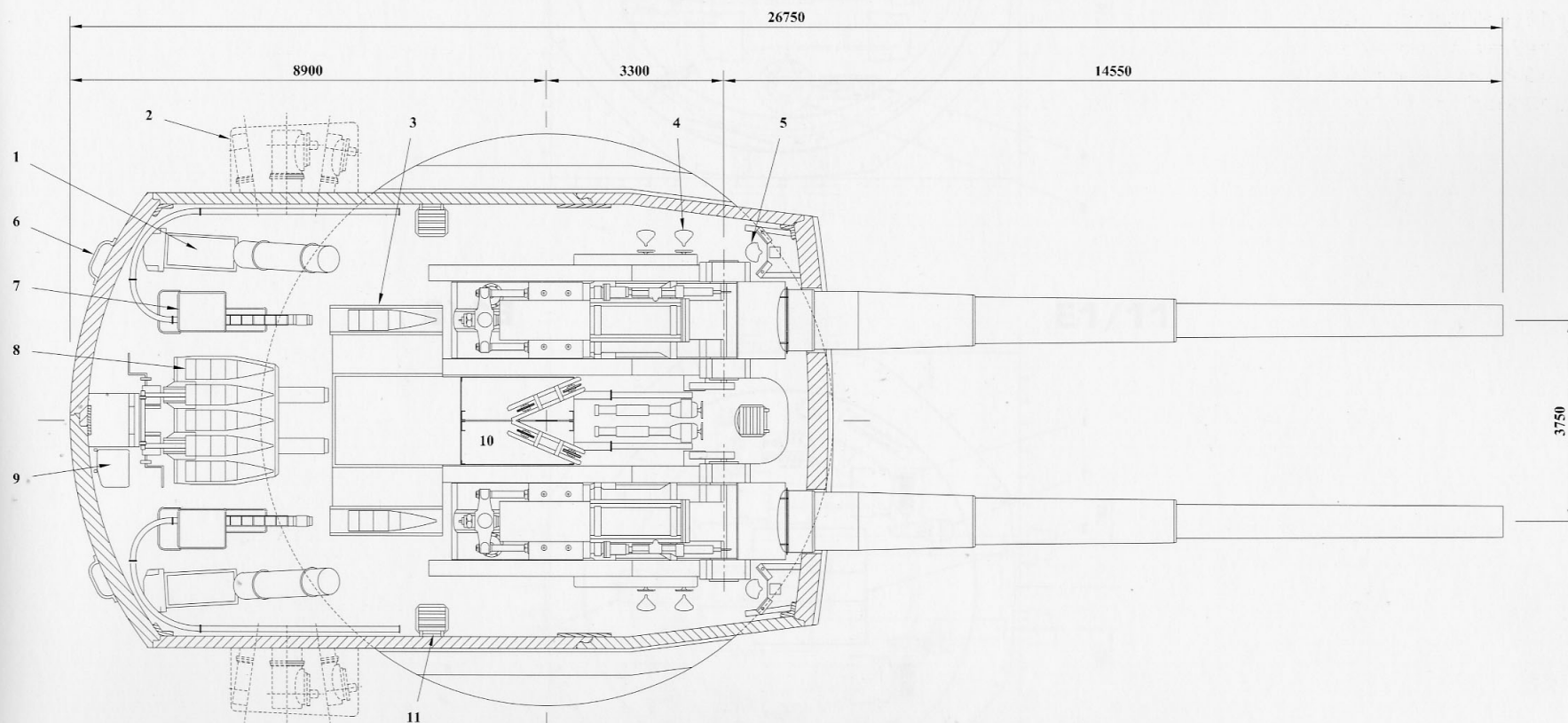
- 1 10.5m Rangefinder (Removed winter 1940/1941)
- 2 Shell offload position
- 3 Cartridge/Powder offload position
- 4 Main Ammunition Hoist Sheaves
- 5 Exhaust Fan Trunking
- 6 Cartridge/Powder ready position
- 7 Shell loading position
- 8 Cartridge Ejector Arm
- 9 Turret Bearing Track
- 10 Barbette
- 11 Auxiliary Ammunition Hoist
- 12 Cartridge/Powder Handling Room
- 13 Shell Handling Room
- 14 Main Ammunition Hoist
- 15 Auxiliary Traing Motor
- 16 Main Training Gearbox



E ARMAMENT

E1/7 Gun Platform

- | | |
|---|-------------------------------|
| 1 Cartridge Ejector | 6 Exhaust FanTrunking |
| 2 10.5m Rangefinder
(Removed winter 1940/1941) | 7 Rammer |
| 3 Loading Tray | 8 Fuse Setter |
| 4 Layer | 9 Hatch |
| 5 Trainer | 10 Main Ammunition Hoist |
| | 11 Hatch to Training Platform |



E1/7

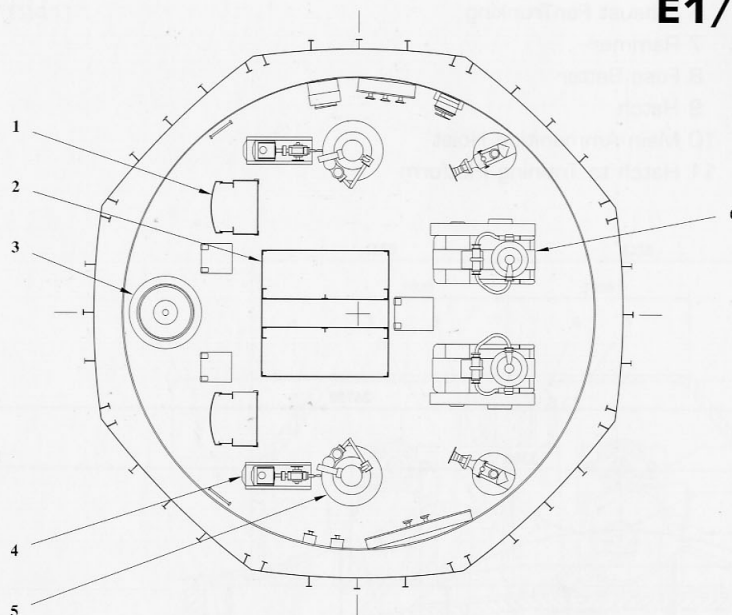
E ARMAMENT

E1/8 Machinery Platform

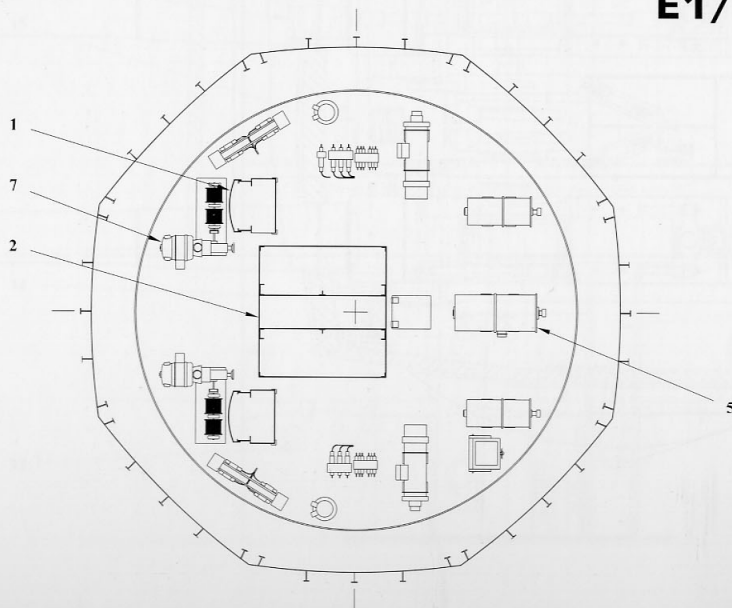
E1/9 Intermediate Platform

- 1 Auxiliary Ammunition Hoist
- 2 Main Ammunition Hoist
- 3 Main Training Motor
- 4 Auxiliary Training Drive
- 5 Hydraulic Pump
- 6 Hydraulic Hoist Motor
(Main Ammunition Hoist)
- 7 Cable Reel
(Auxiliary Ammunition Hoist)

E1/8



E1/9



E ARMAMENT

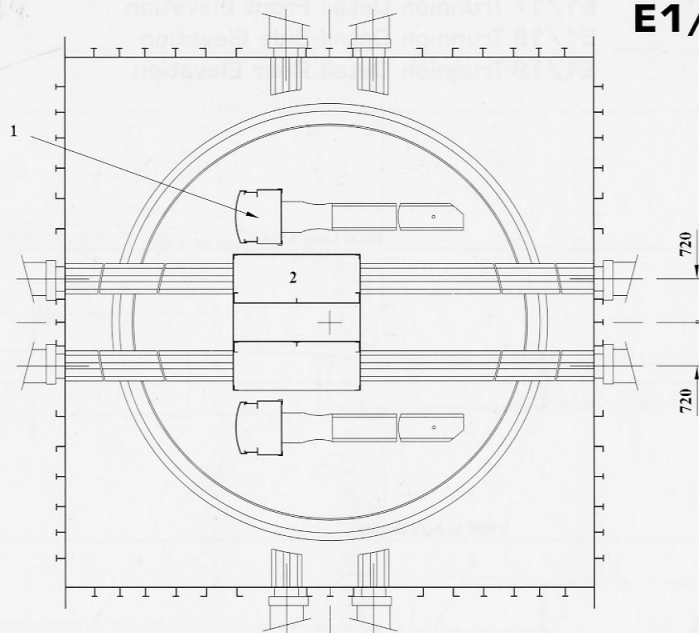
E1/10 Powder/Cartridge Handling Room

E1/11 Shell Handling Room

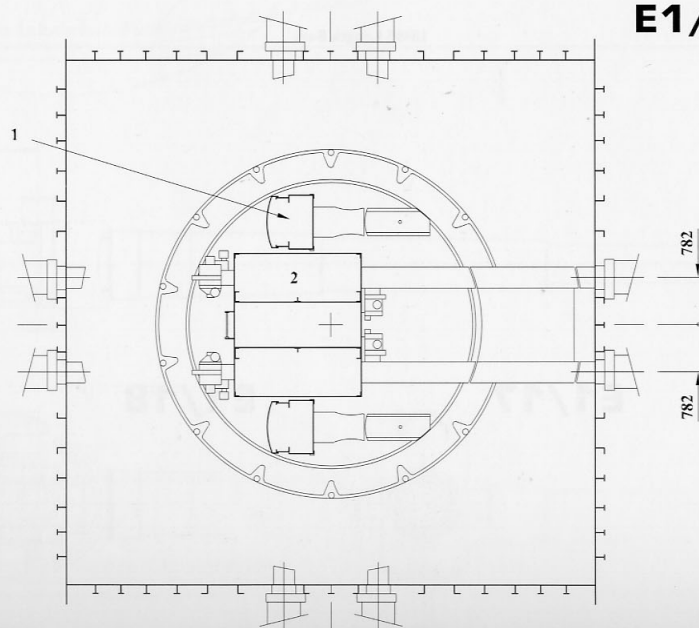
1 Auxiliary Ammunition Hoist

2 Main Ammunition Hoist

E1/10



E1/11

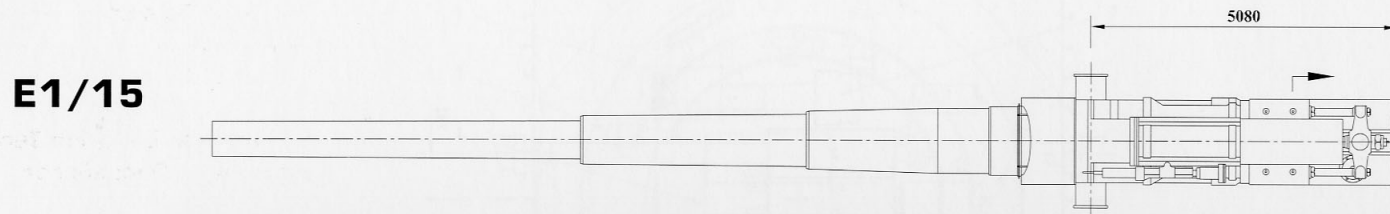
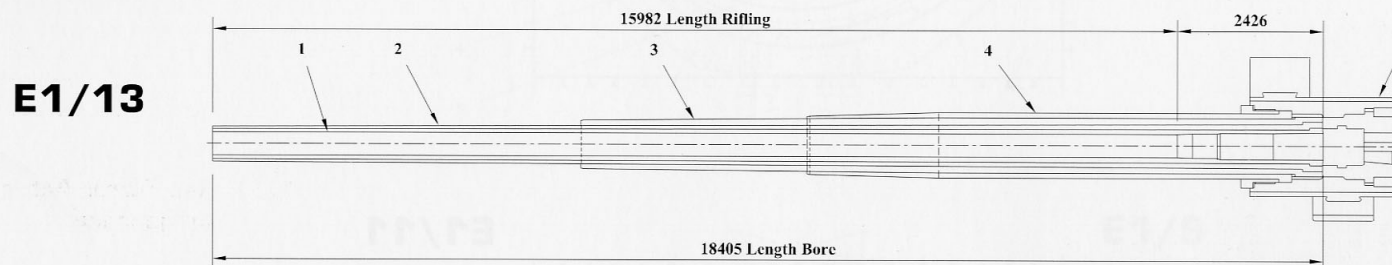
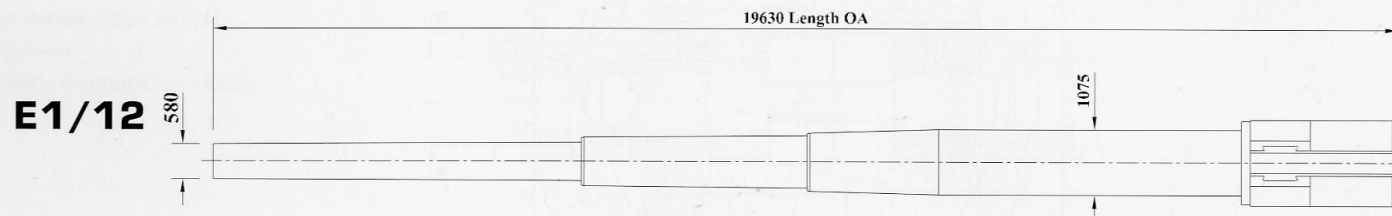


E ARMAMENT

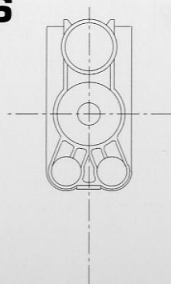
E1/12 Barrel Detail Plan
E1/13 Barrel Construction Detail
E1/14 Barrel Detail Rear Elevation
E1/15 Barrel and Trunnion Detail Plan

E1/16 Section
E1/17 Trunnion Detail Front Elevation
E1/18 Trunnion Detail Side Elevation
E1/19 Trunnion Detail Rear Elevation

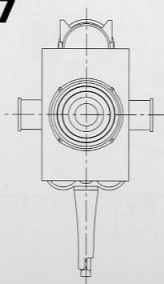
1 Liner (Loose)
2 A Tube
3 B Tube
4 Jacket
5 Breech Block



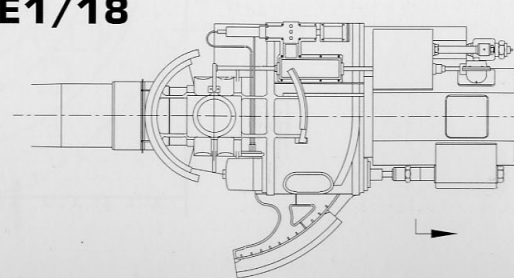
E1/16



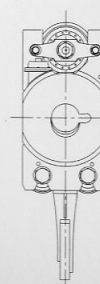
E1/17



E1/18



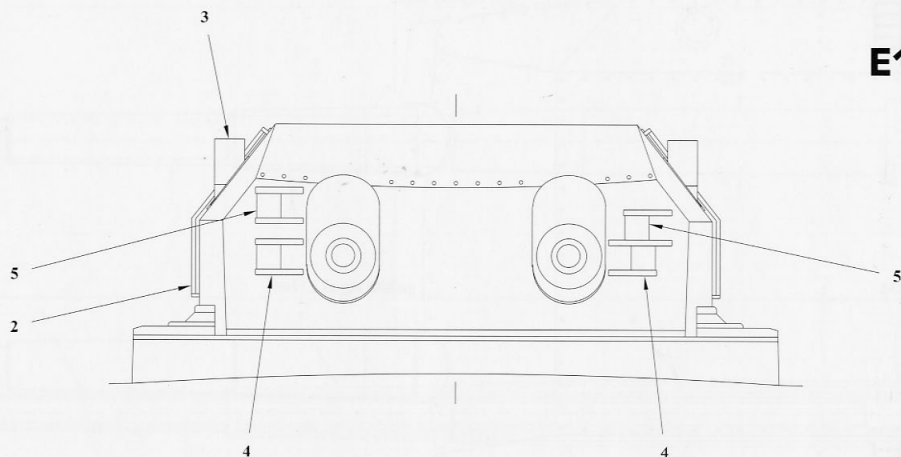
E1/19



E ARMAMENT

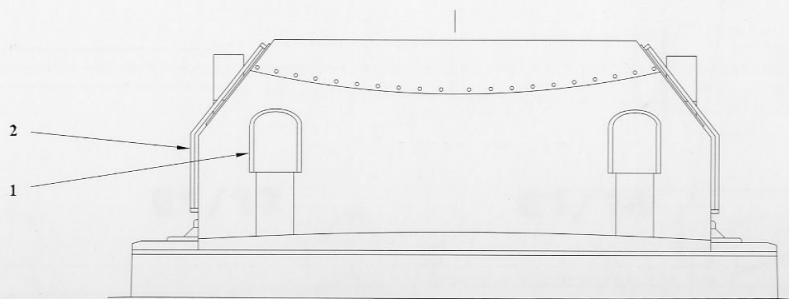
E1/22 Front Elevation Turret Anton w/o Rangefinder

- 1 Vent
- 2 Ladder
- 3 Sighting Telescope
- 4 Trainer Sight
- 5 Layer Sight



E1/22

E1/23 Rear Elevation Turret Anton w/o Rangefinder



E1/23

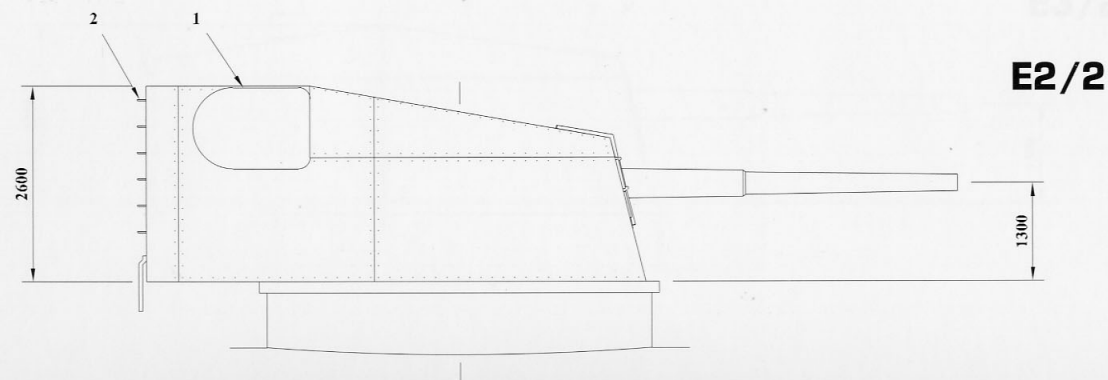
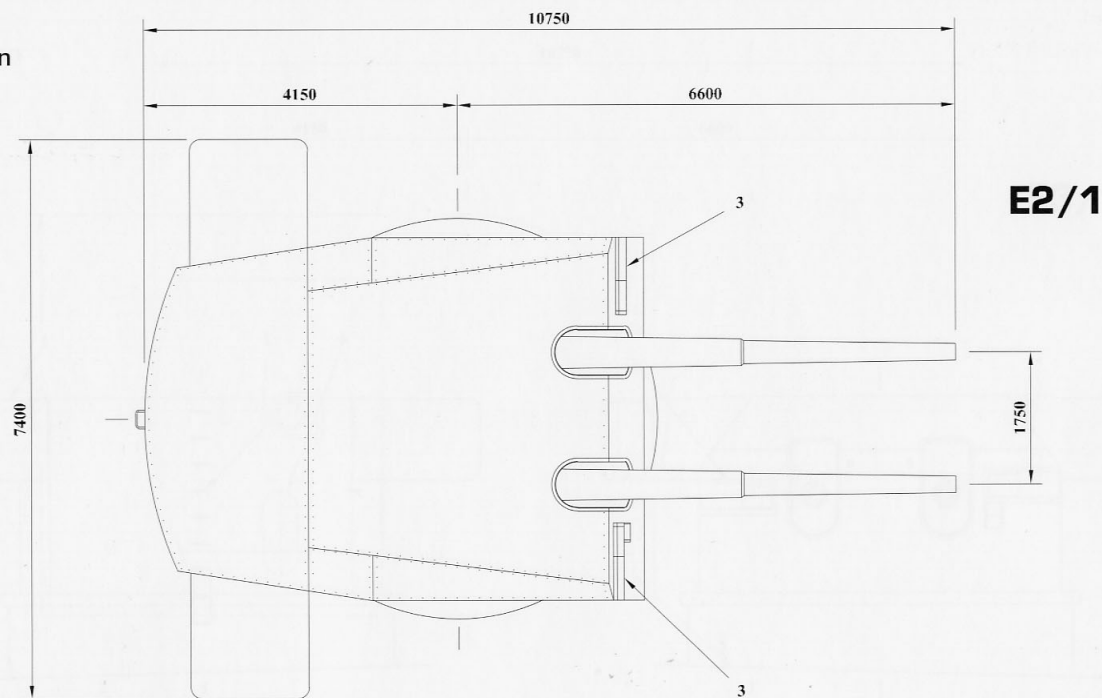
E ARMAMENT

E2 15cm SKC/34 in Drh LC/34 mount with Rangefinder (1:100 scale)

E2/1 Plan

- 1 Rangefinder
- 2 Ladder
- 3 Trainer/Layer Sight

E2/2 Side Elevation



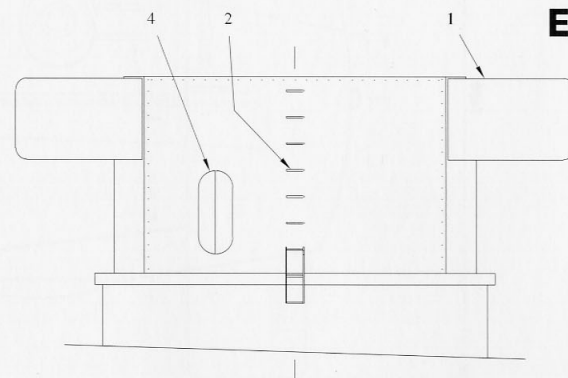
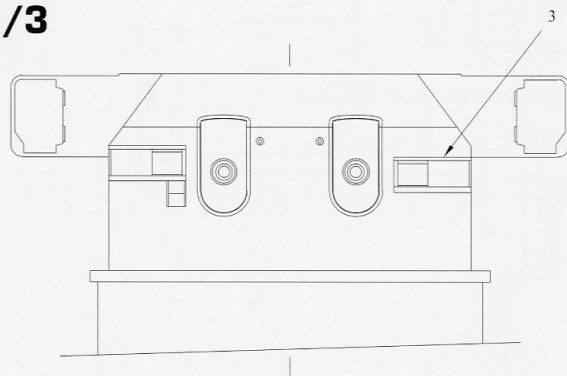
E ARMAMENT

E2/3 Front Elevation

- 1 Rangefinder
- 2 Ladder
- 3 Trainer/Layer Sight
- 4 Armoured Door

E2/4 Rear Elevation

E2/3



E2/4

E ARMAMENT

E3 15cm SKC/34 in Drh LC/34 mount (1:100 scale)

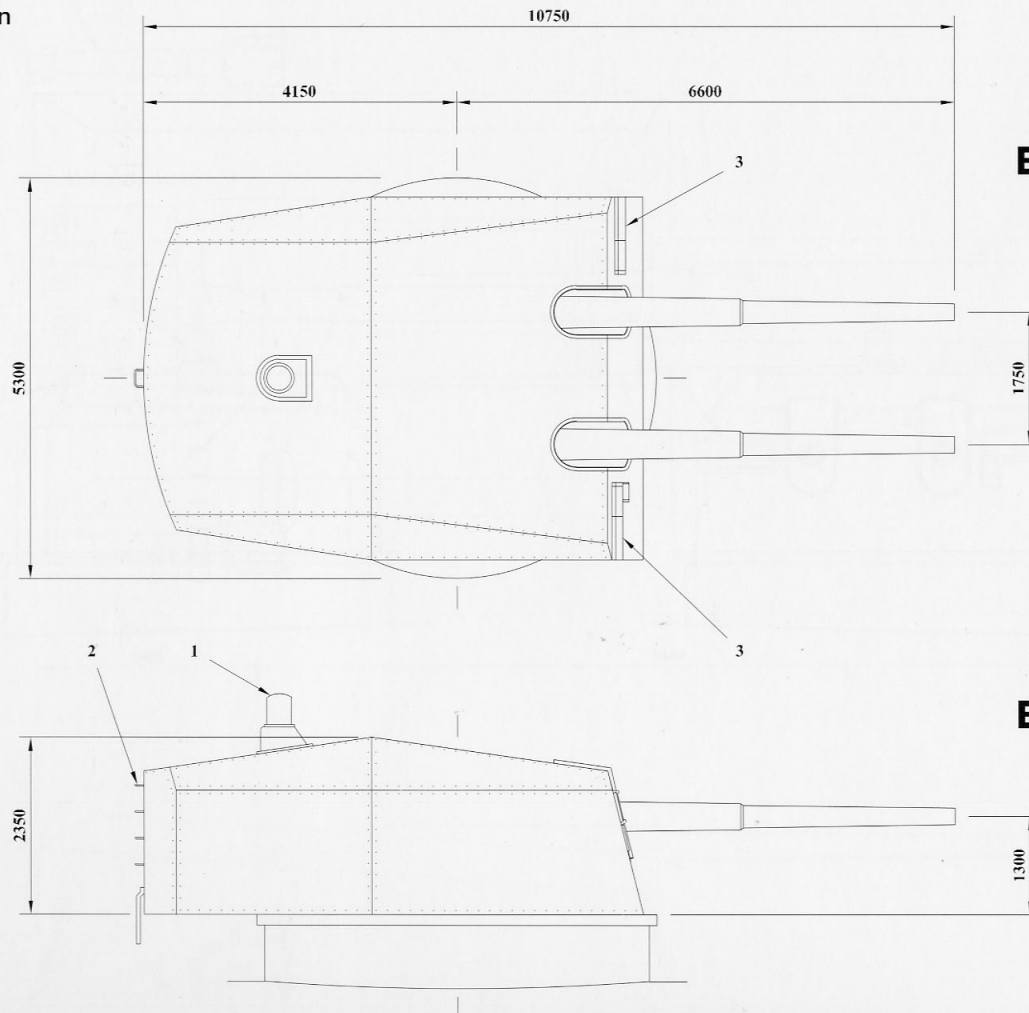
E3/1 Plan

1 Sighting Telescope

2 Ladder

3 Trainer/Layer Sight

E3/2 Side Elevation



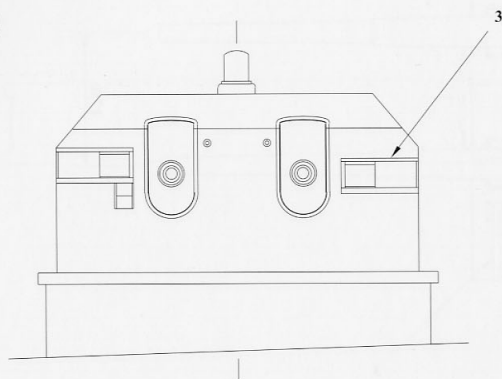
E ARMAMENT

E3/3 Front Elevation

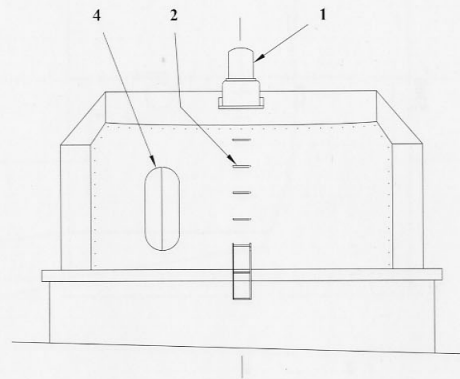
- 1 Sighting Telescope
- 2 Ladder
- 3 Trainer/Layer Sight
- 4 Armoured Door

E3/4 Rear Elevation

E3/3



E3/4



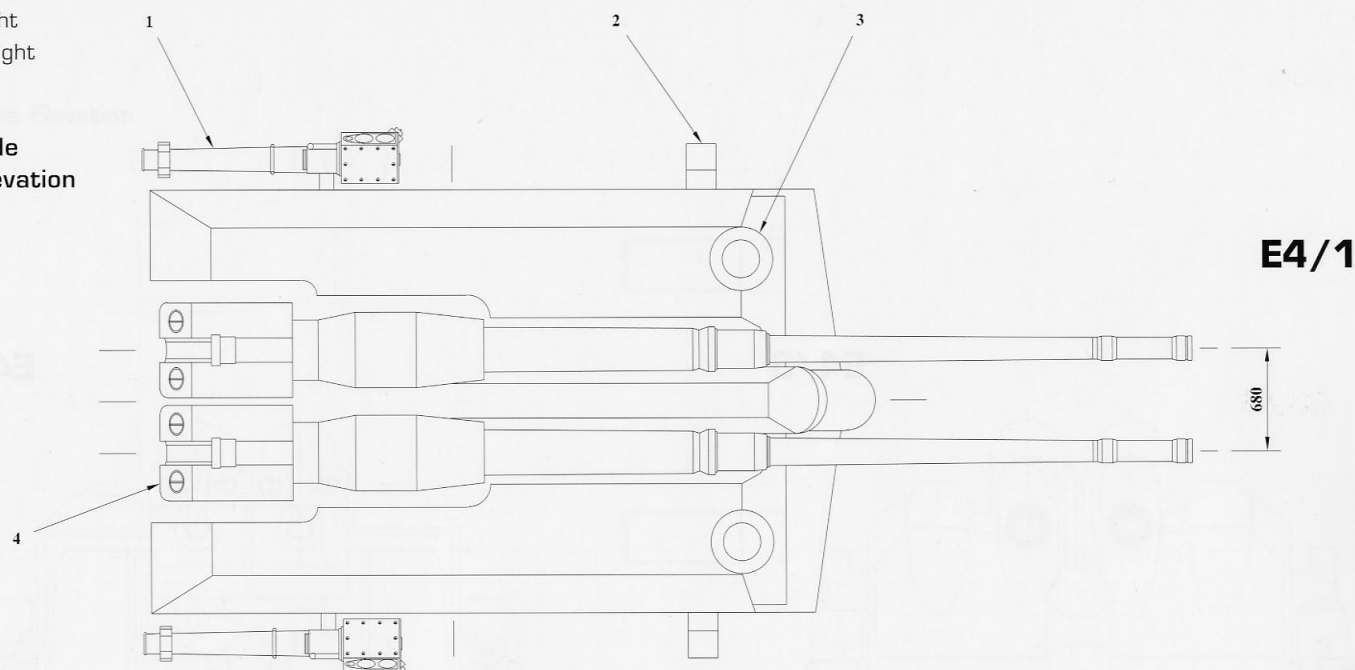
E ARMAMENT

E4 10.5cm SKC/33 in Dopp LC/31 mount (1:50 scale)

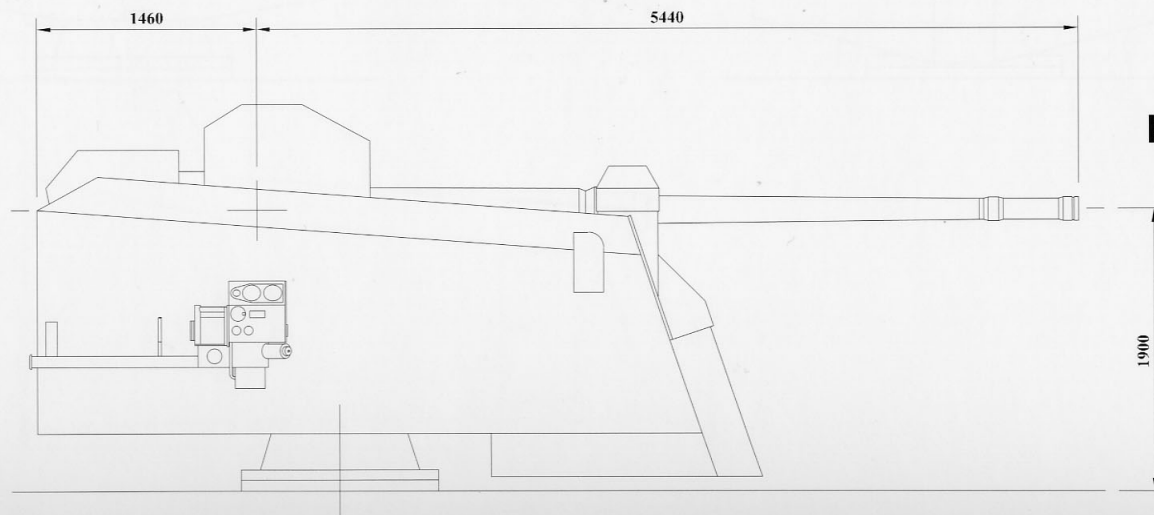
E4/1 Plan

- 1 Fuse Setter
- 2 Layer Sight
- 3 Trainer Sight
- 4 Breach

E4/2 Side Elevation



E4/1



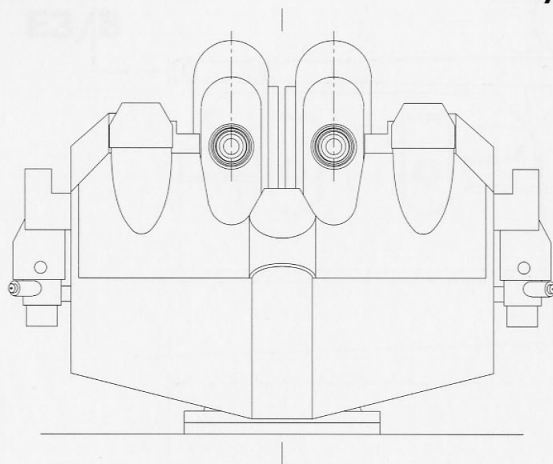
E4/2

E ARMAMENT

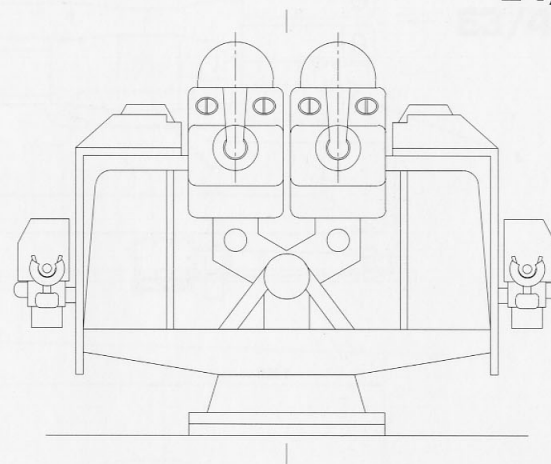
E4/3 Front Elevation

E4/4 Rear Elevation

E4/3



E4/4



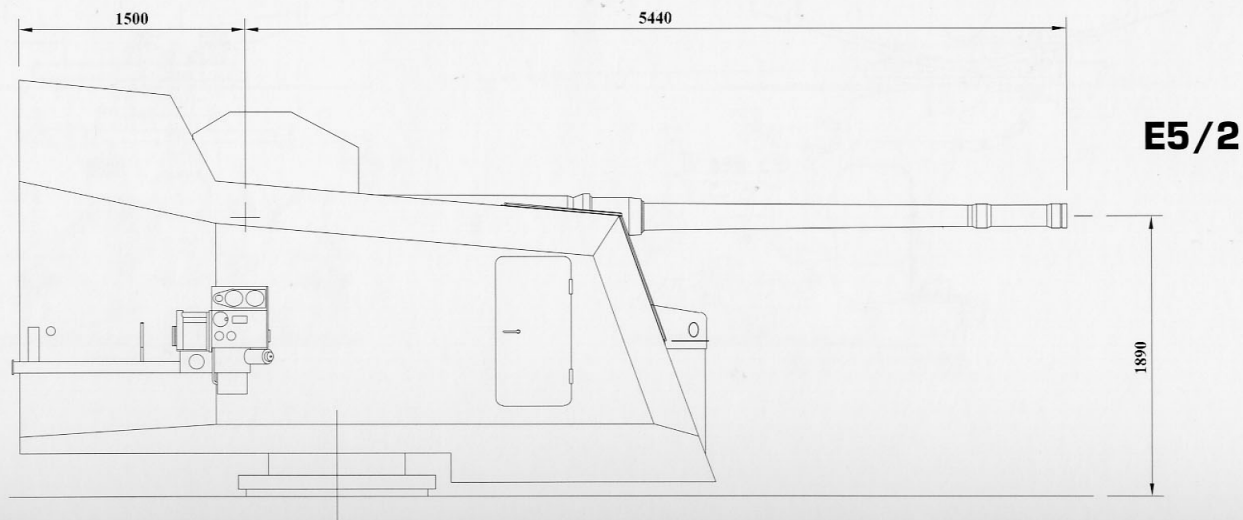
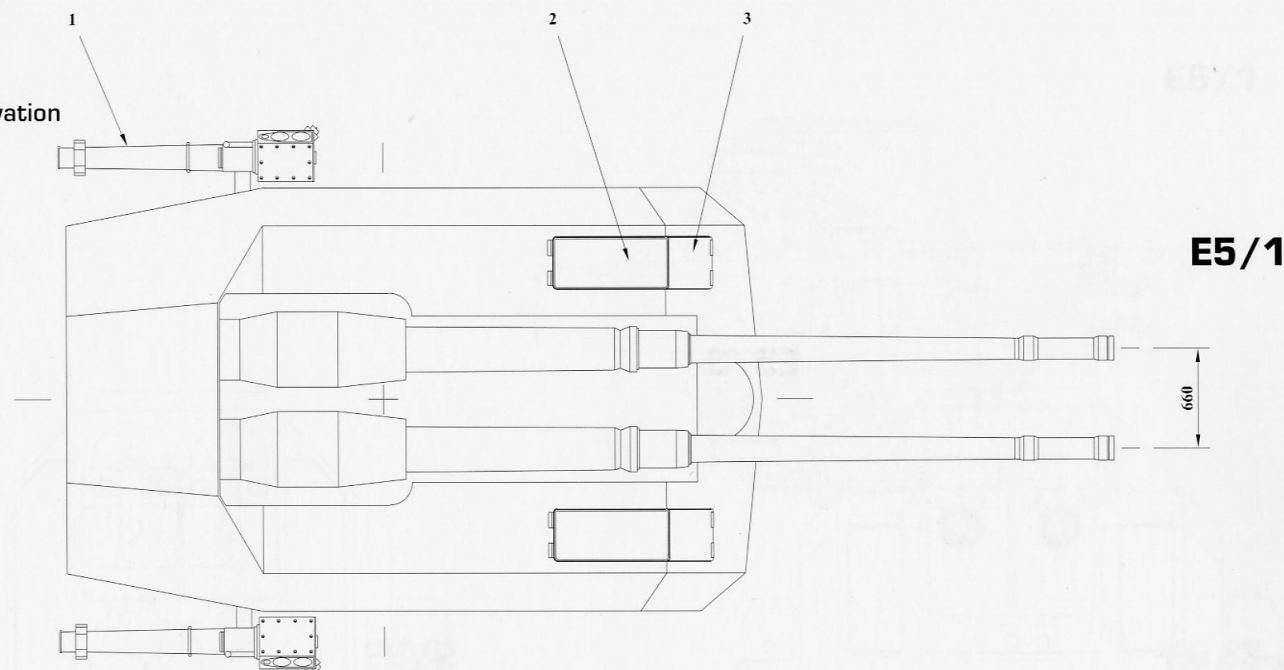
E ARMAMENT

E5 10.5cm SKC/33 in Dopp LC/37 mount (1:50 scale)

E5/1 Plan

- 1 Fuse Setter
- 2 Layer Sight
- 3 Trainer Sight

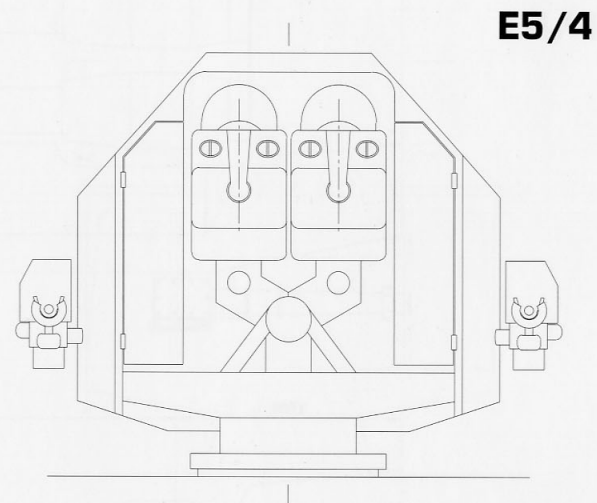
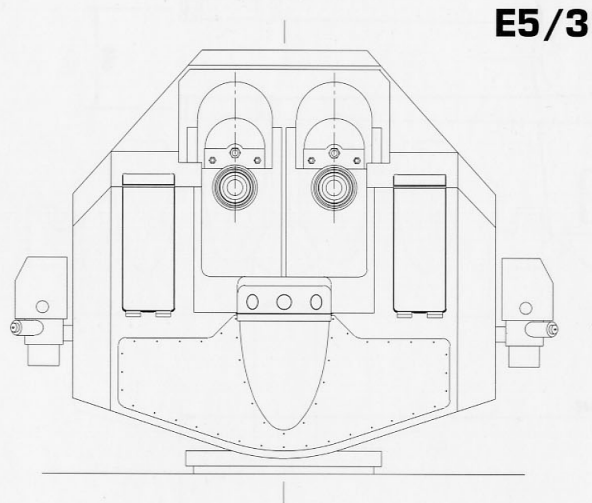
E5/2 Side Elevation



E **ARMAMENT**

E5/3 Front Elevation

E5/4 Rear Elevation

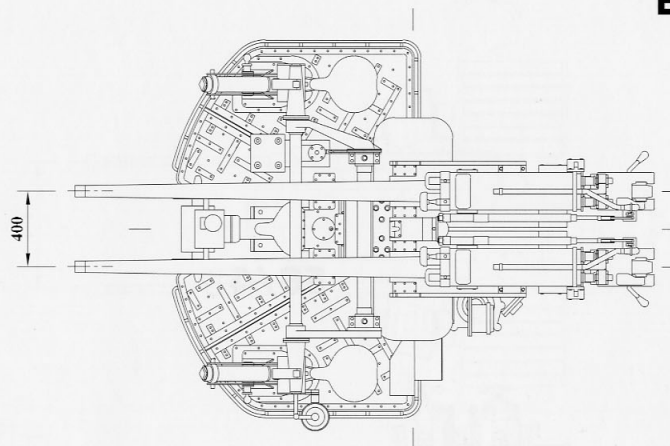


E ARMAMENT

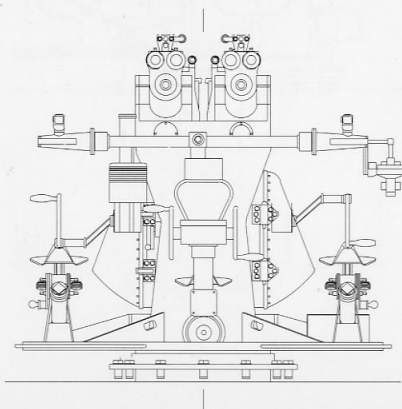
E6 37mm SKC/30 Dopp LC/37 (1:40 scale)

- E6/1 Plan
- E6/2 Front Elevation
- E6/3 Left Elevation

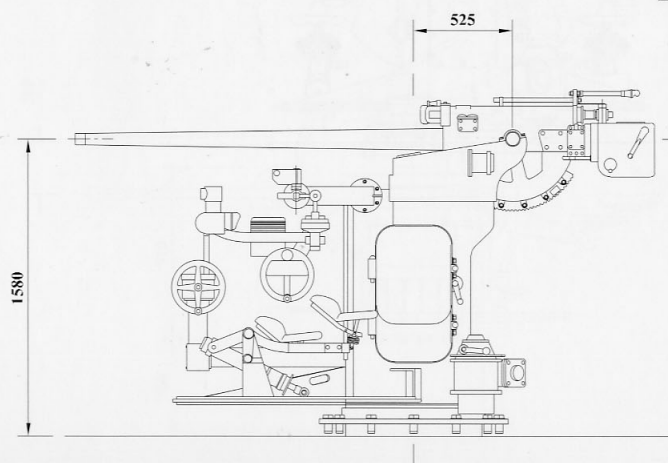
E6/1



E6/2



E6/3

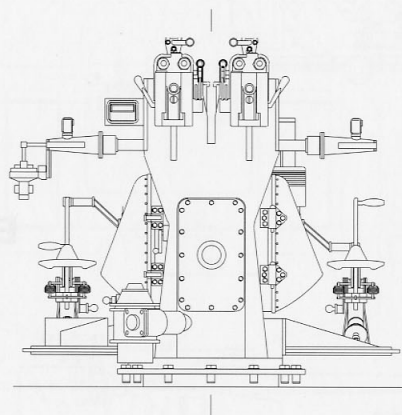


E ARMAMENT

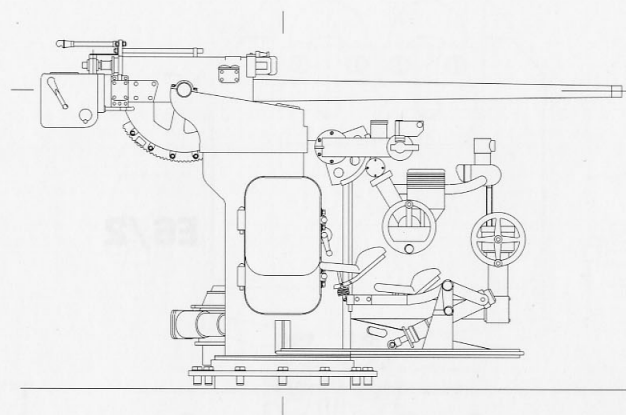
E6/4 Rear Elevation

E6/5 Right Elevation

E6/4



E6/5



E ARMAMENT

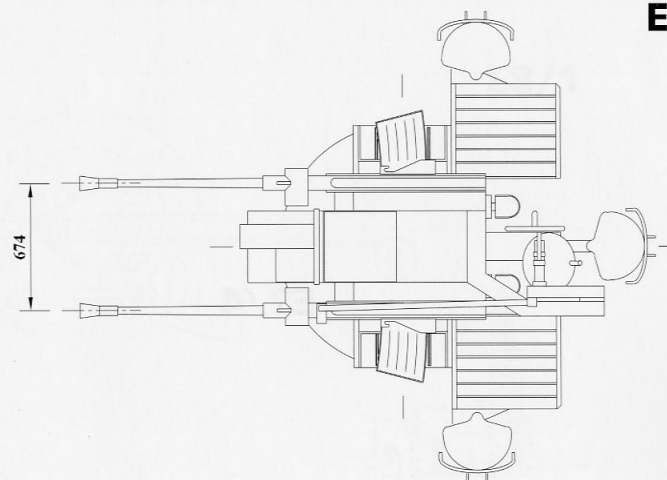
E7 20mm Flak Vierling (1:40 scale)

E7/1 Plan

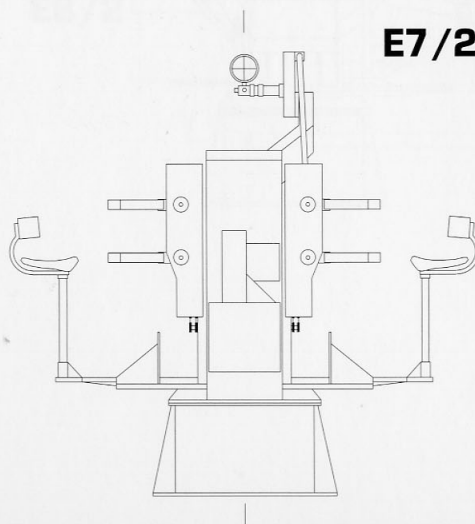
E7/2 Front Elevation

E7/3 Left Elevation

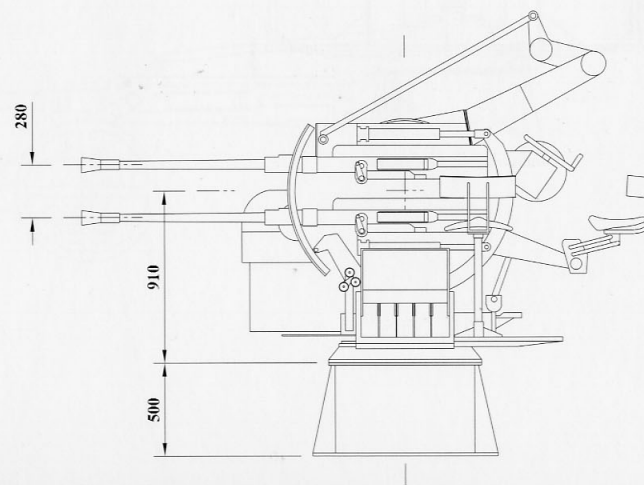
E7/1



E7/2



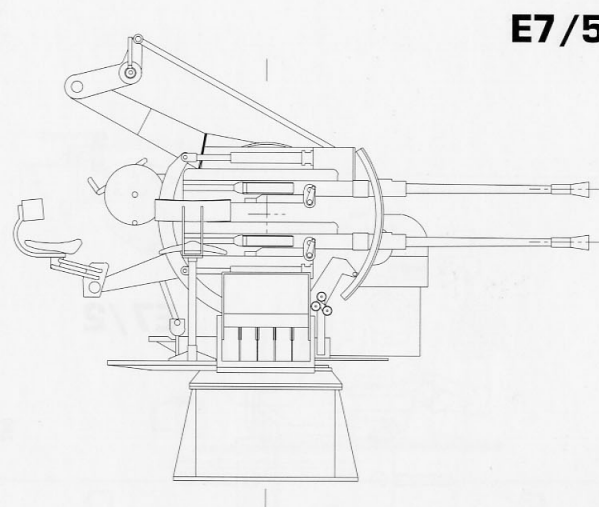
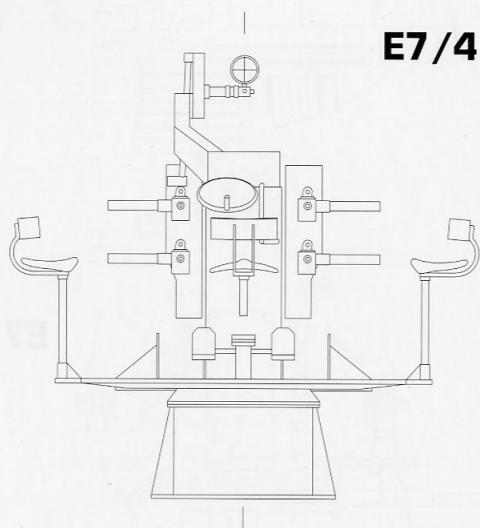
E7/3



E ARMAMENT

E7/4 Rear Elevation

E7/5 Right Elevation

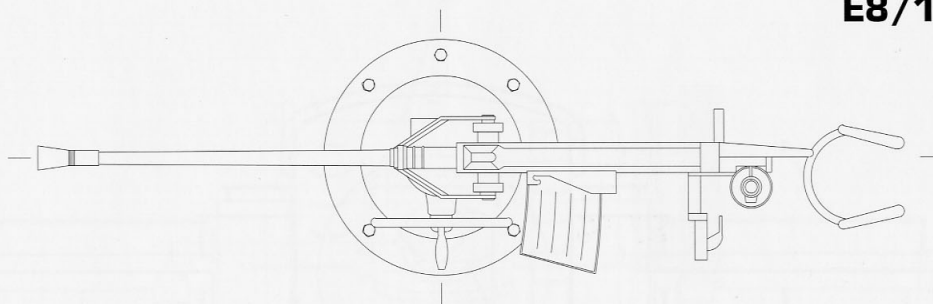


E ARMAMENT

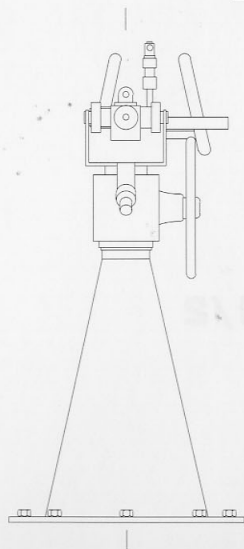
E8 20mm Flak 38 single (1:25 scale)

- E8/1 Plan
- E8/2 Front Elevation
- E8/3 Side Elevation
- E8/4 Rear Elevation

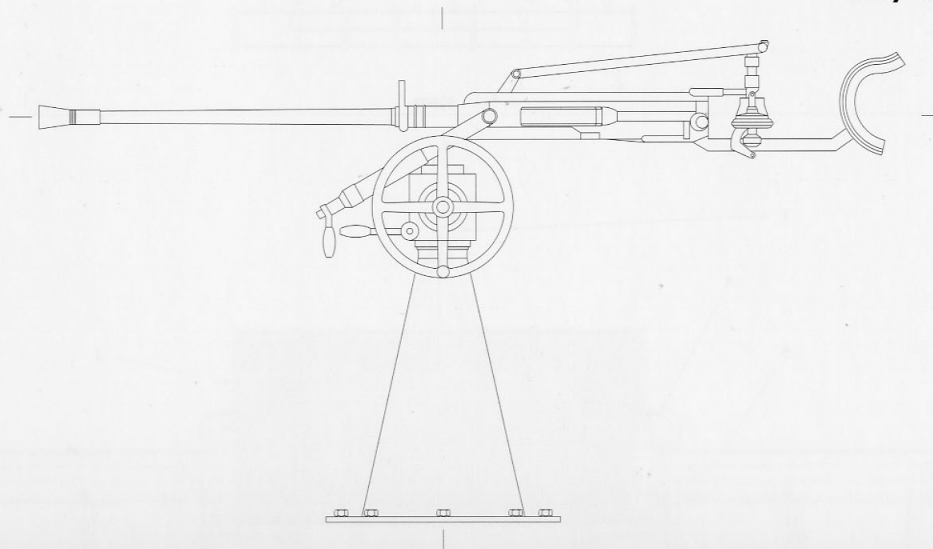
E8/1



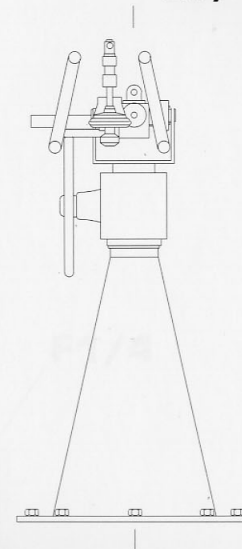
E8/2



E8/3



E8/4



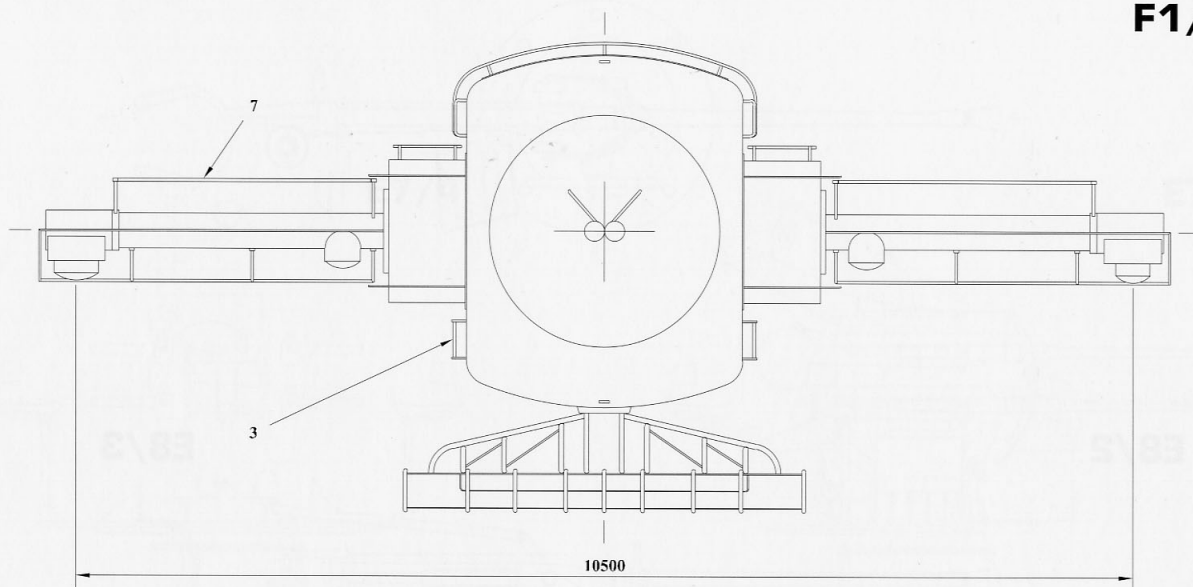
F FIRE CONTROL

F1 Foretop 10.5m Rangefinder (1:75 scale)

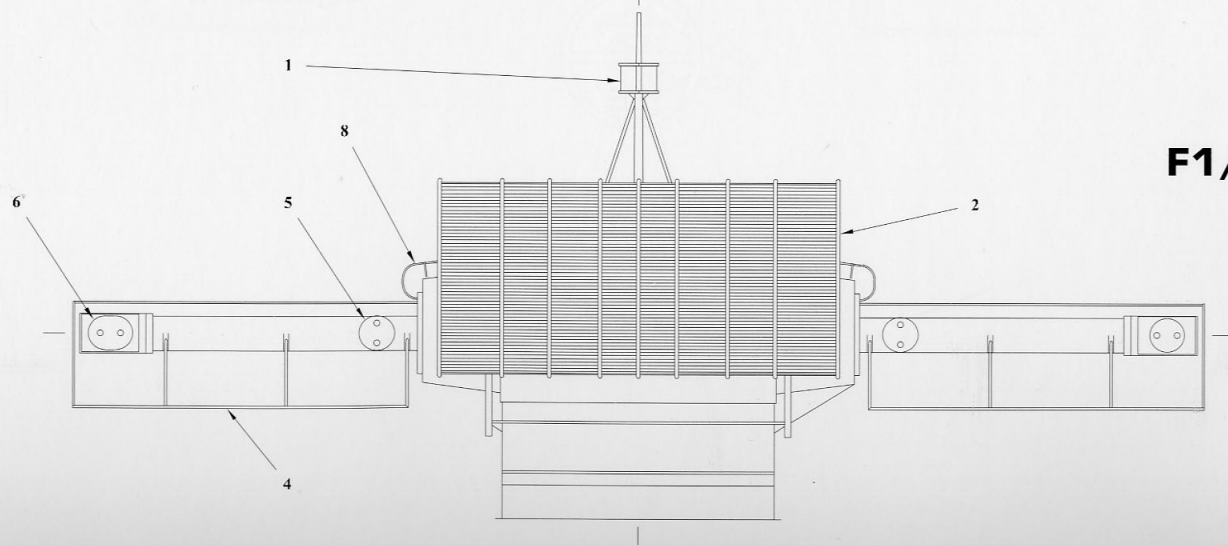
F1/1 Plan

- 1 Top Light
- 2 FuMO 23 Radar Antenna
- 3 Ladder
- 4 Foot Rail
- 5 Training Sight
- 6 Rangefinding Sight
- 7 Counter Weight
- 8 Hand Rail

F1/2 Front Elevation



F1/1



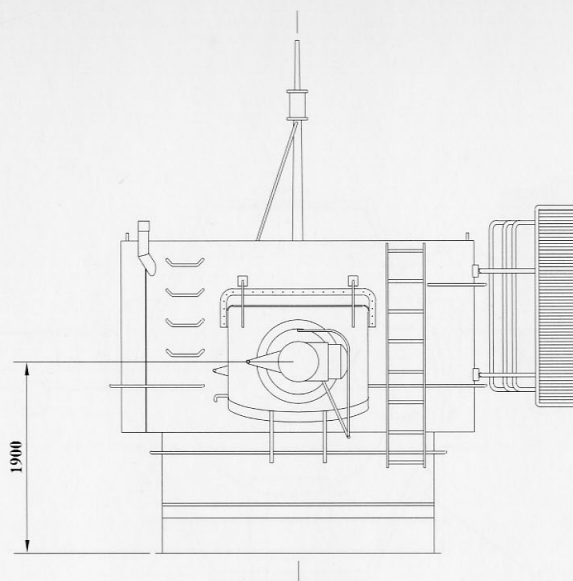
F1/2

F FIRE CONTROL

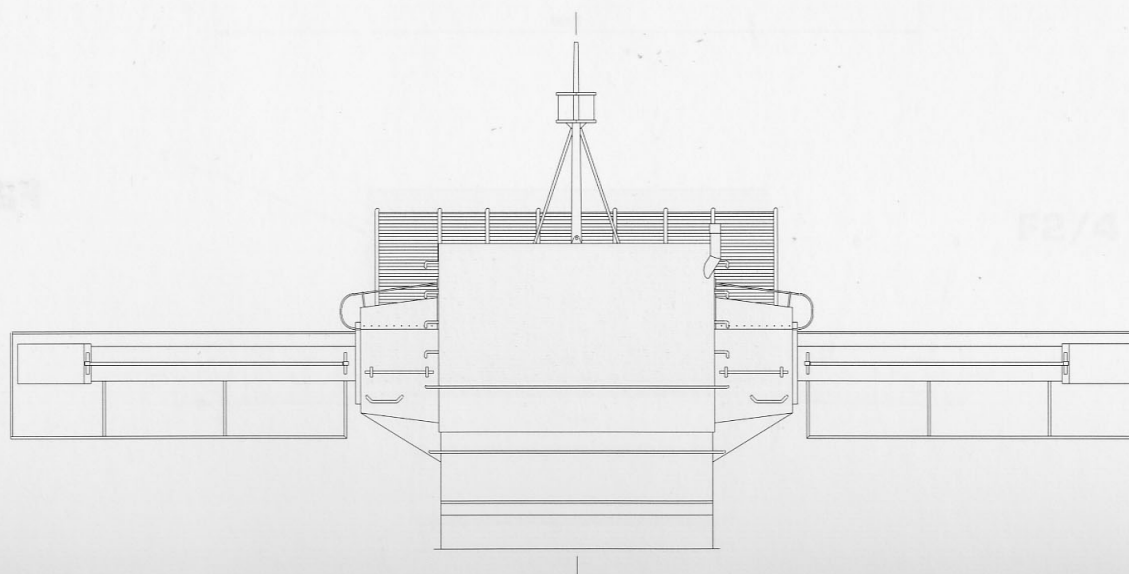
F1/3 Side Elevation

F1/4 Rear Elevation

F1/3



F1/4

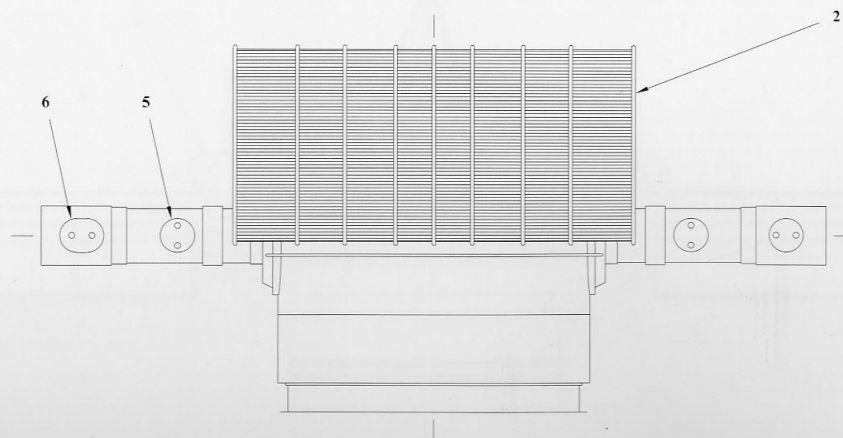
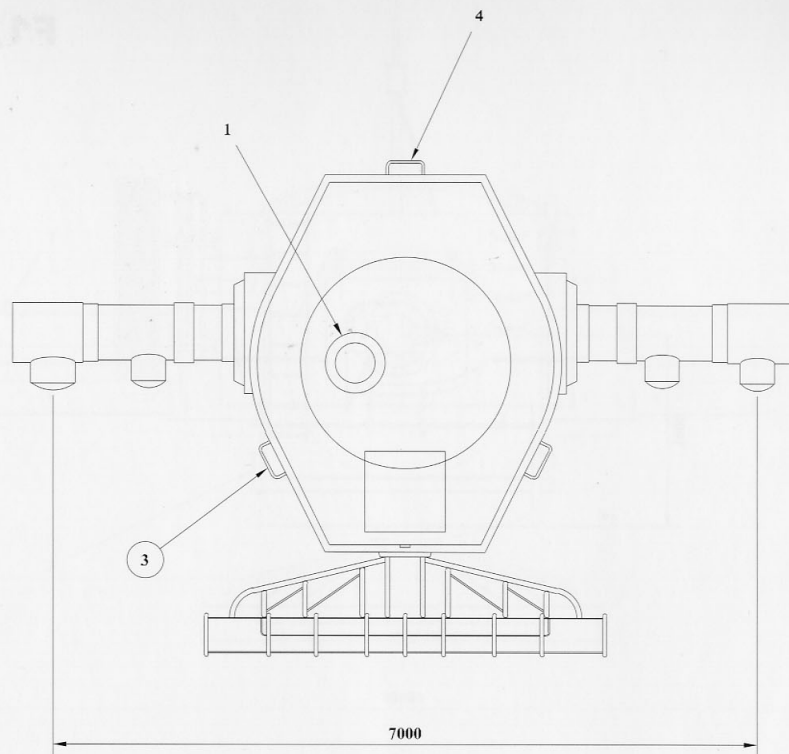


F2 Forward 7m Rangefinder (1:75 scale)

F2/1 Plan

- 1 Vent
- 2 FuMO 23 Radar Antenna
- 3 Ladder
- 4 Hand Rail
- 5 Training Sight
- 6 Rangefinding Sight

F1/2 Front Elevation

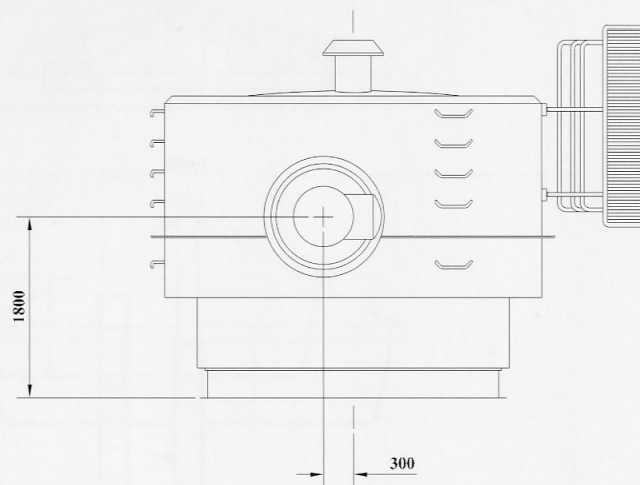


F FIRE CONTROL

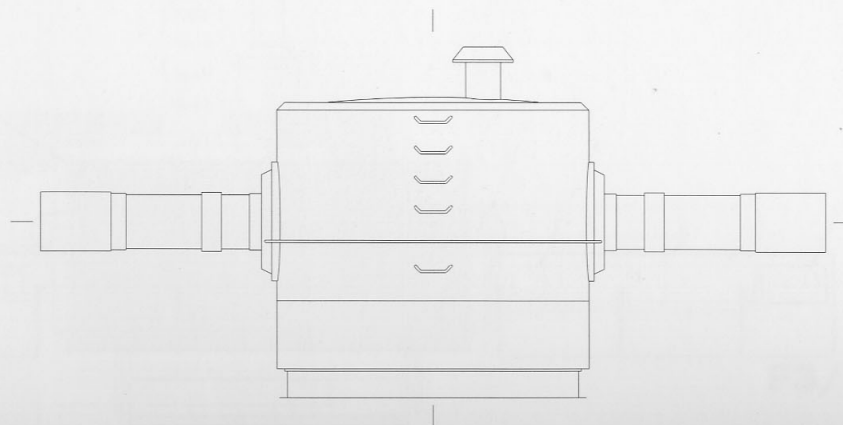
F2/3 Side Elevation

F2/4 Rear Elevation

F2/3



F2/4



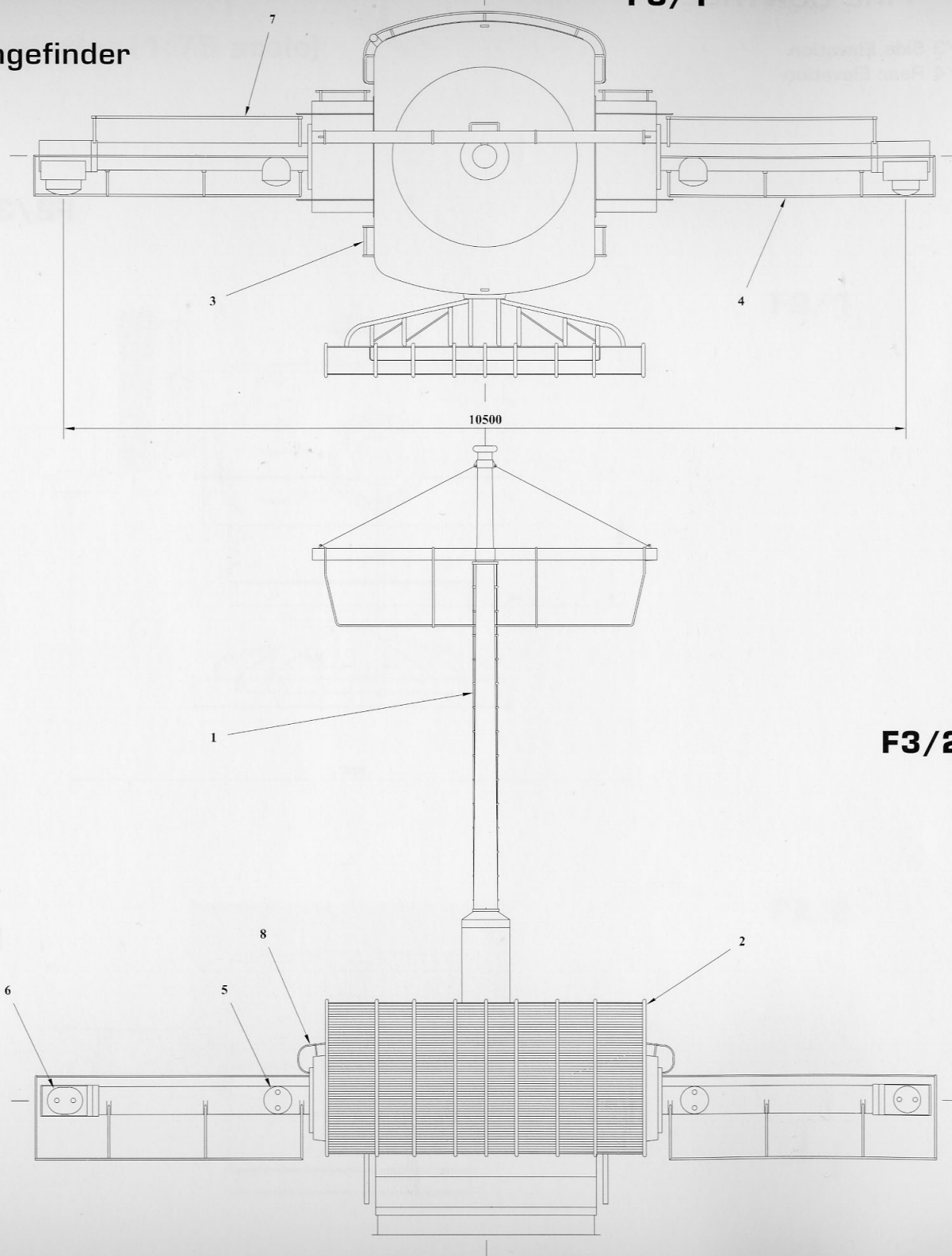
F FIRE CONTROL

F3 After 10.5m Rangefinder (1:75 scale)

F3/1 Plan

- 1 Mast
- 2 FuMO 23 Radar Antenna
- 3 Ladder
- 4 Foot Rail
- 5 Training Sight
- 6 Rangefinding Sight
- 7 Counter Weight
- 8 Hand Rail

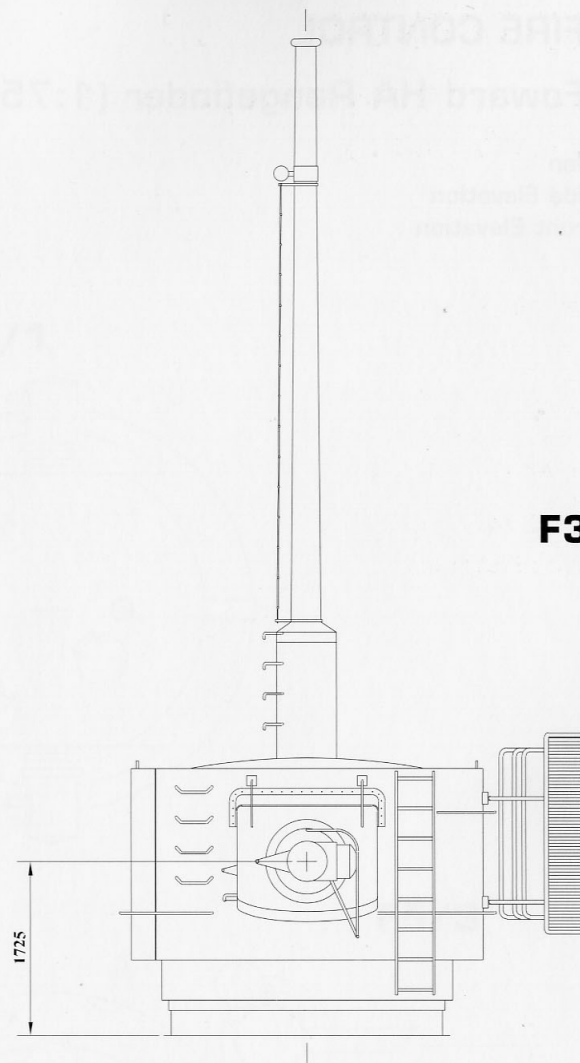
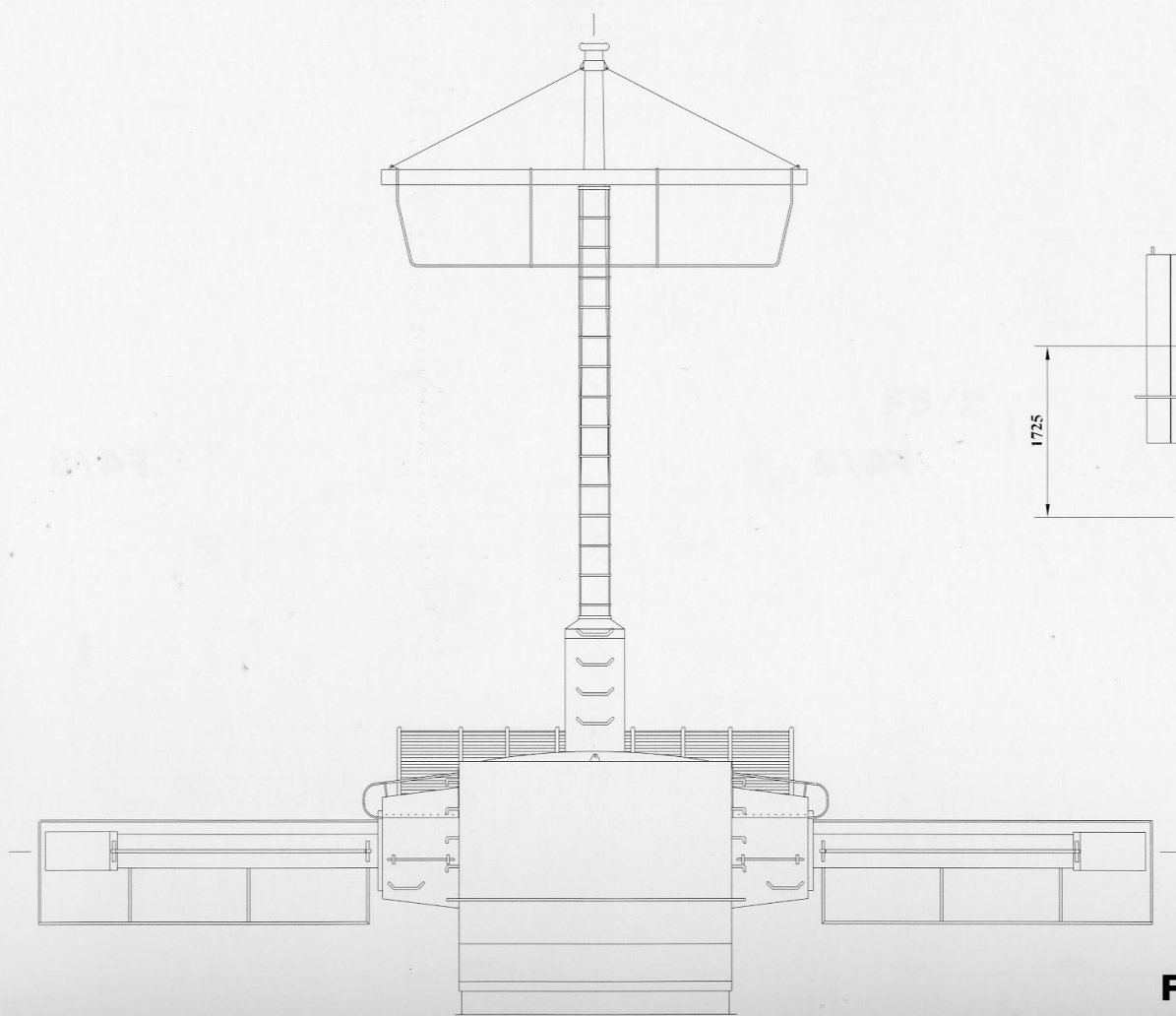
F3/2 Front Elevation



F FIRE CONTROL

F3/3 Side Elevation

F3/4 Rear Elevation



F3/3

F3/4

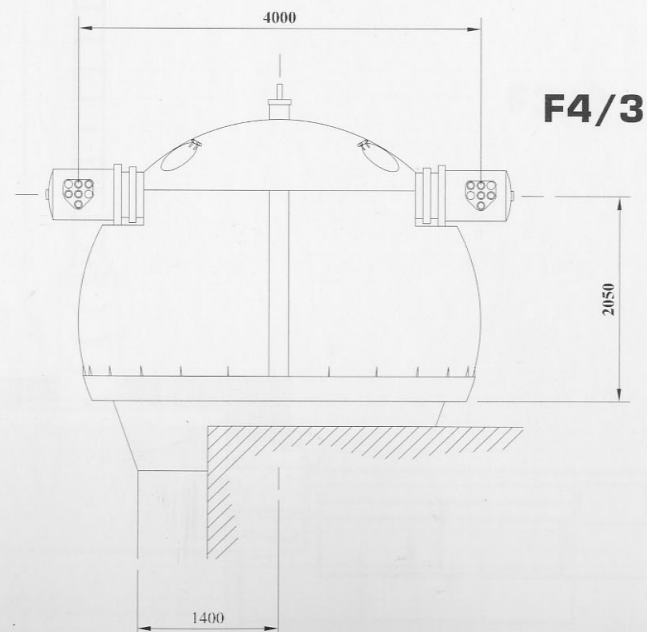
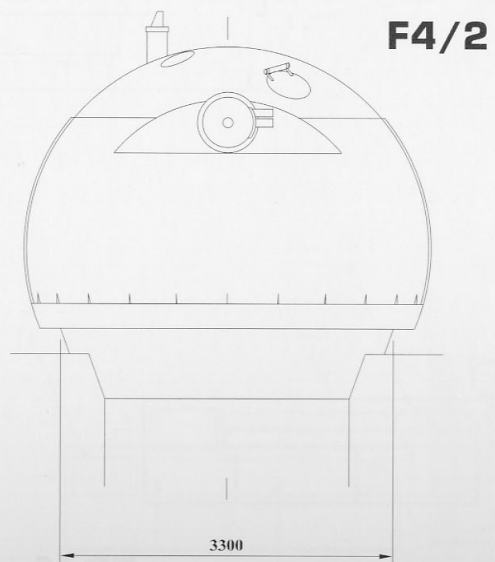
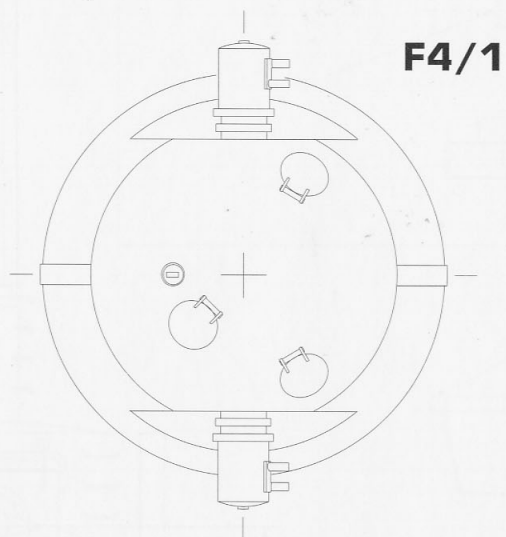
F FIRE CONTROL

F4 Foward HA Rangefinder (1:75 scale)

F4/1 Plan

F4/2 Side Elevation

F4/3 Front Elevation



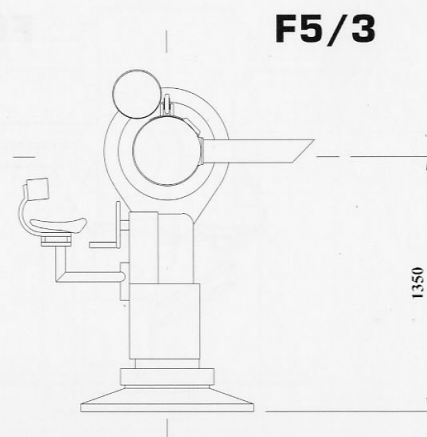
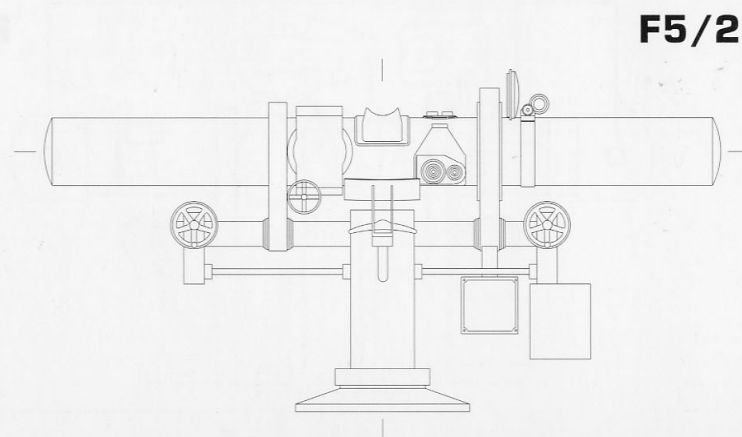
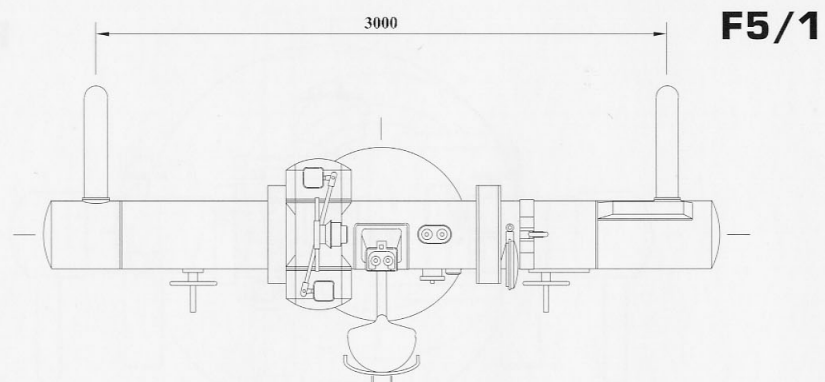
F FIRE CONTROL

F5 3m HA Rangefinder (1:40 scale)

F5/1 Plan

F5/2 Rear Elevation

F5/3 Side Elevation



F FIRE CONTROL

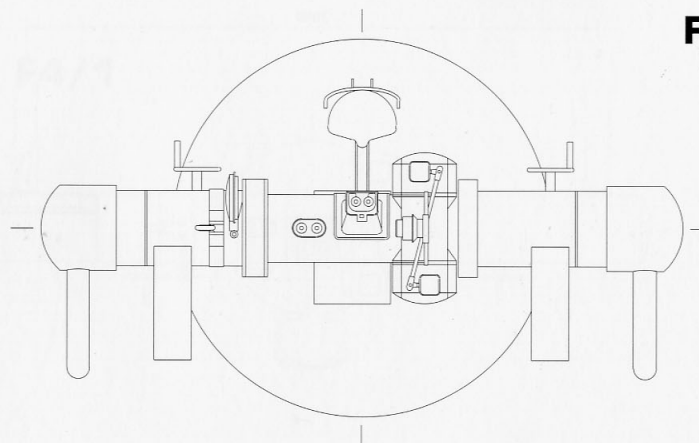
F6 3m Night Rangefinder (1:40 scale)

F6/1 Plan

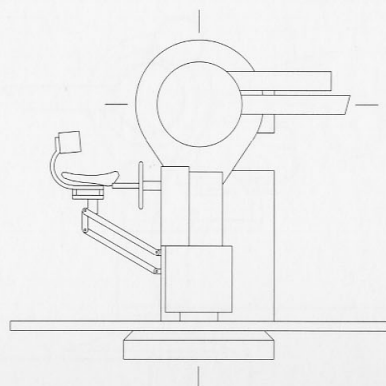
F6/2 Side Elevation

F6/3 Front Elevation

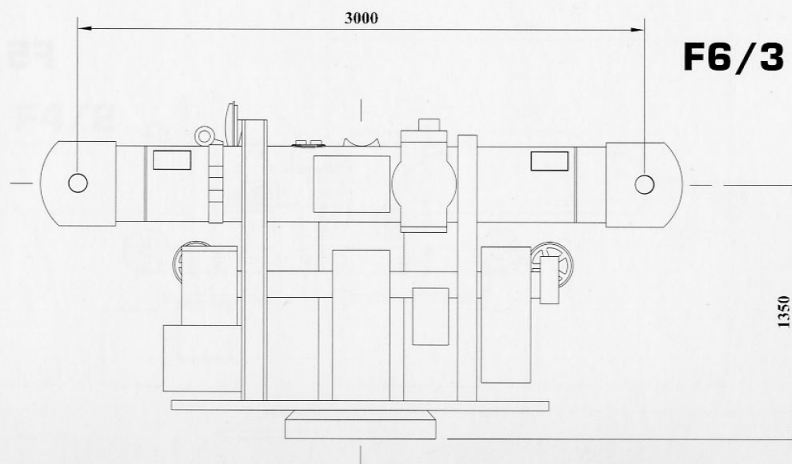
F6/1



F6/2



F6/3



F FIRE CONTROL

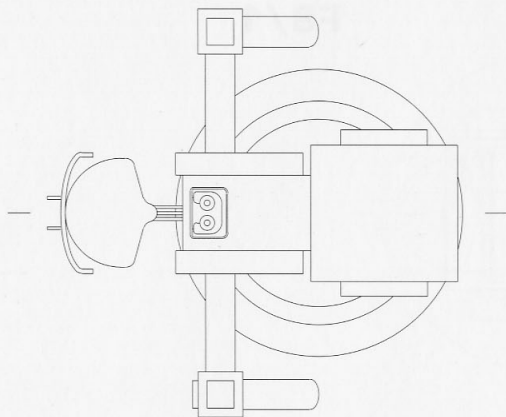
F7 Flak ZAG (1:25 scale)

F7/1 Plan

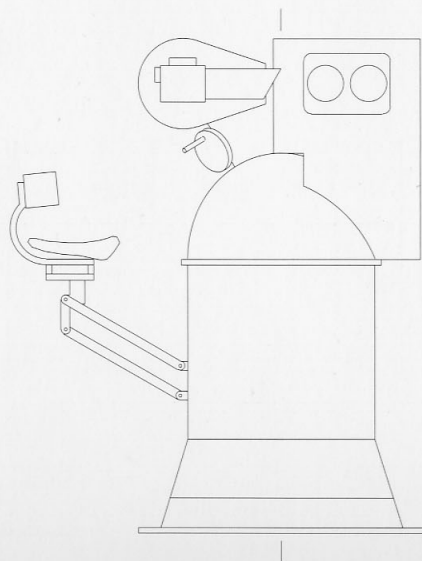
F7/2 Side Elevation

F7/3 Front Elevation

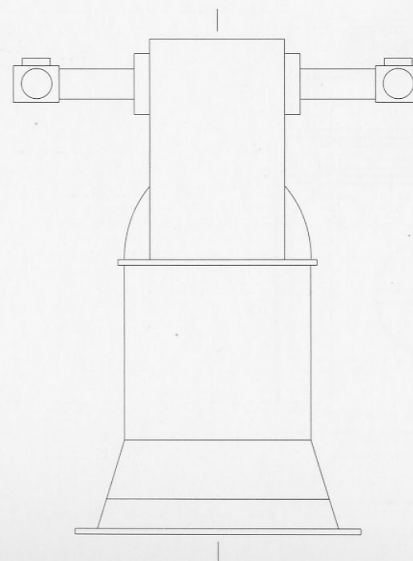
F7/1



F7/2



F7/3



F FIRE CONTROL

F8 Zeilsaule C38 Night Director (1:25 scale)

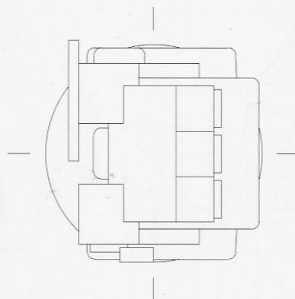
F8/1 Plan

F8/2 Rear Elevation

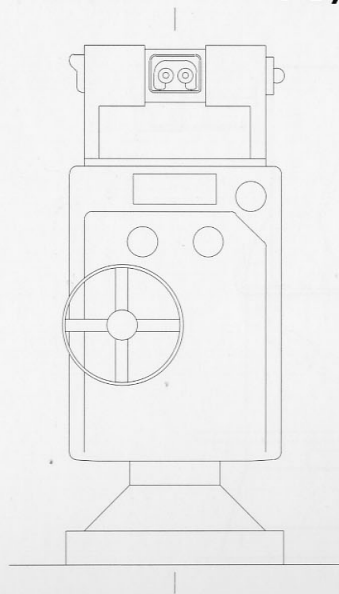
F8/3 Side Elevation

F8/4 Front Elevation

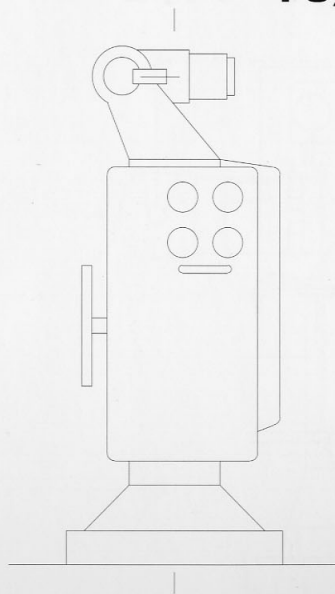
F8/1



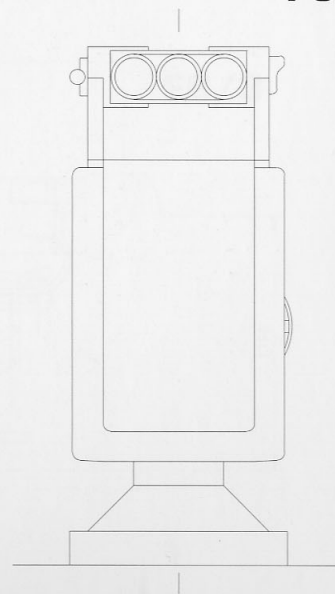
F8/2



F8/3



F8/4



F FIRE CONTROL

F9 Target Giver (1:25 scale)

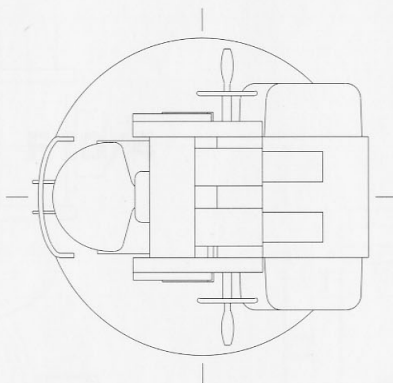
F9/1 Plan

F9/2 Rear Elevation

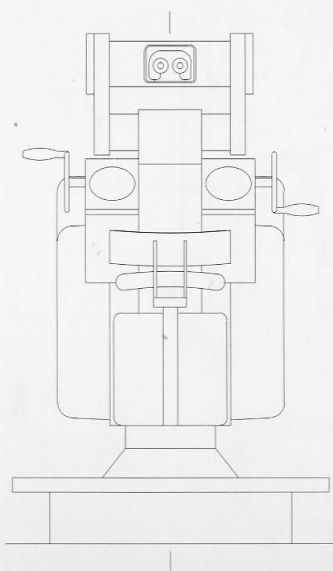
F9/3 Side Elevation

F9/4 Front Elevation

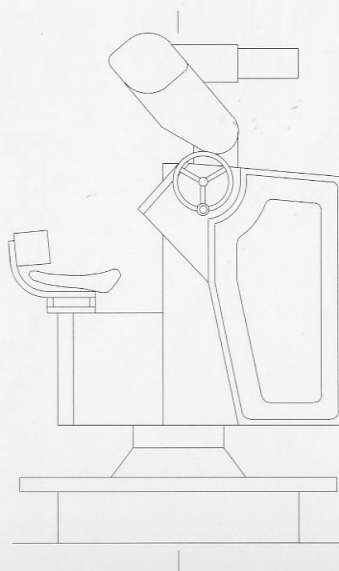
F9/1



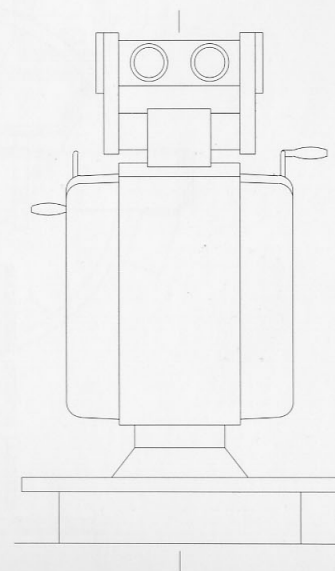
F9/2



F9/3



F9/4



F FIRE CONTROL

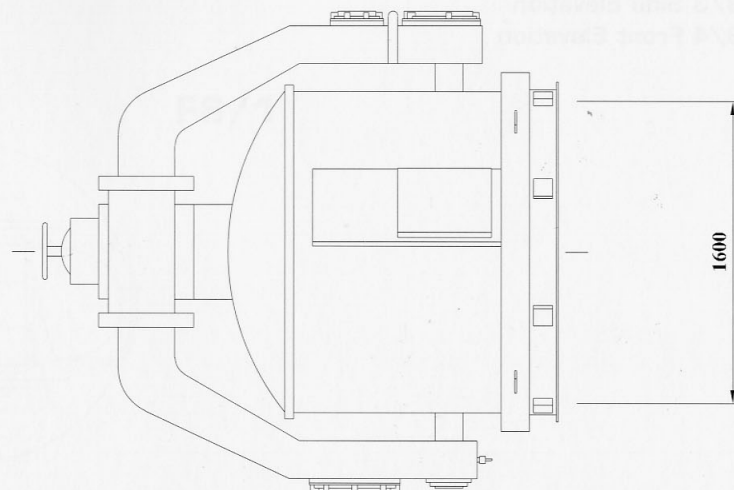
F10 160cm Searchlight (1:40 scale)

F10/1 Plan

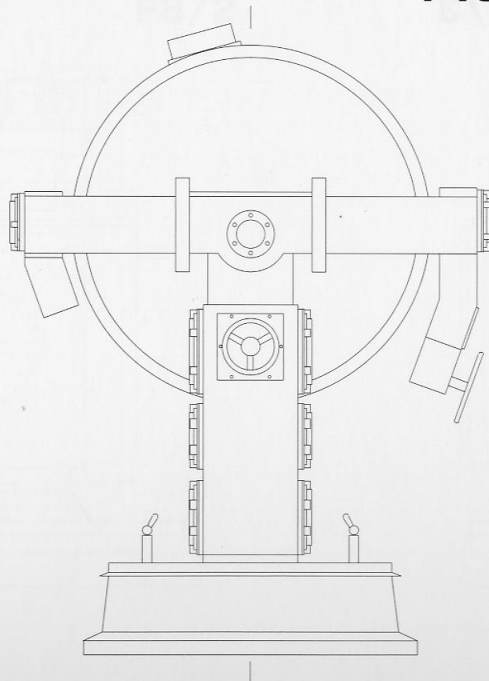
F10/2 Rear Elevation

F10/3 Right Elevation

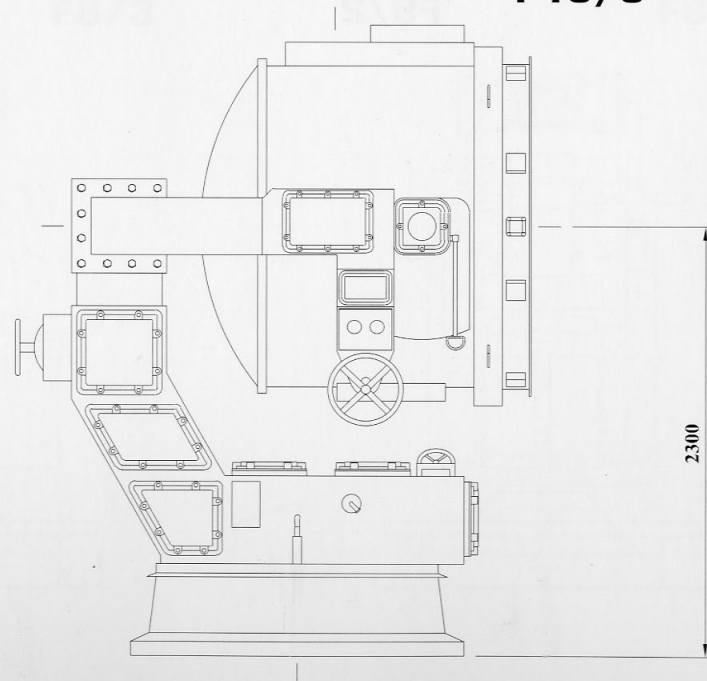
F10/1



F10/2



F10/3

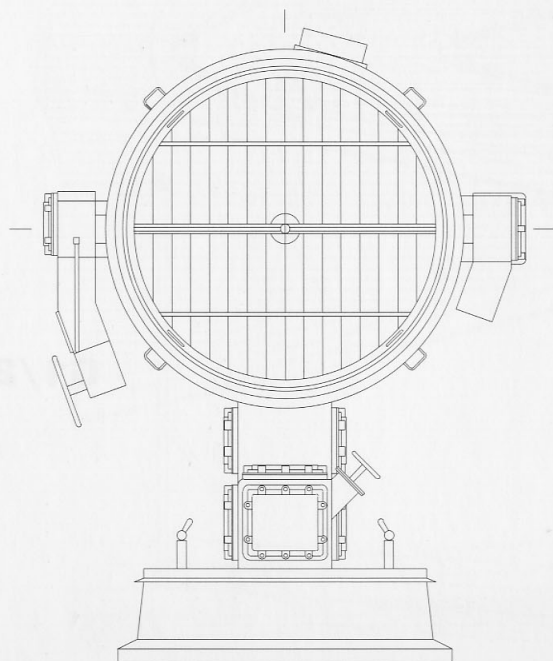


F FIRE CONTROL

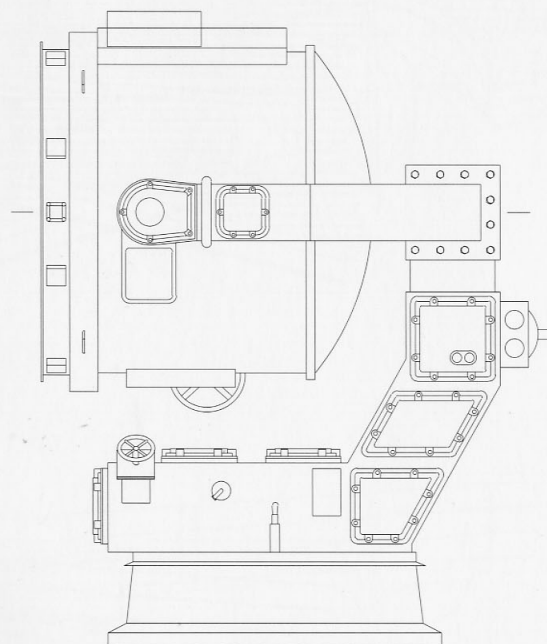
F10/4 Front Elevation

F10/5 Left Elevation

F10/4



F10/5



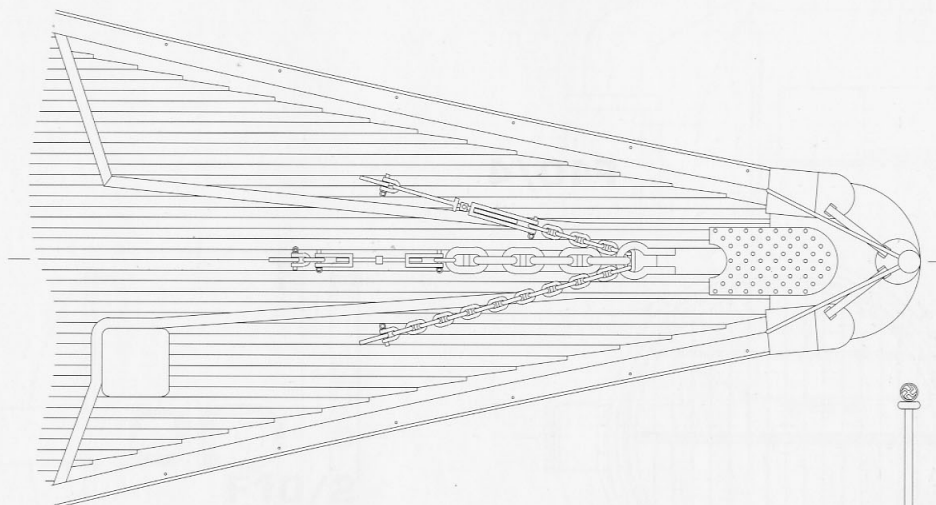
G GROUND TACKLE

G1 Bow Towing Fairlead and Jack Staff (1:100 scale)

G1/1 Plan

G1/2 Starboard Elevation

G1/1



G1/2



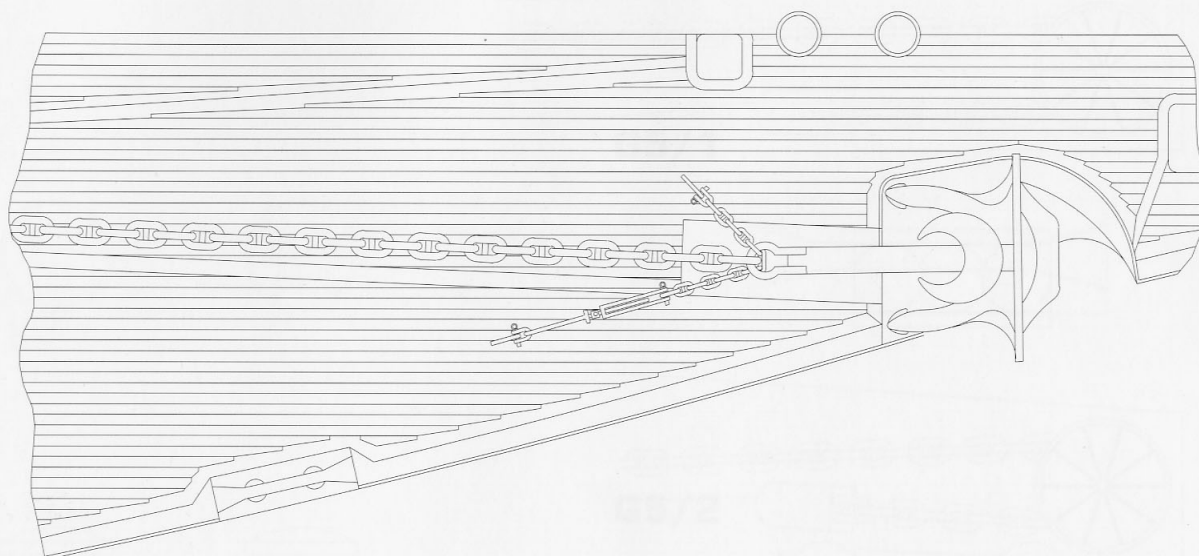
G GROUND TACKLE

G2 Anchor Stowage (1:100 scale)

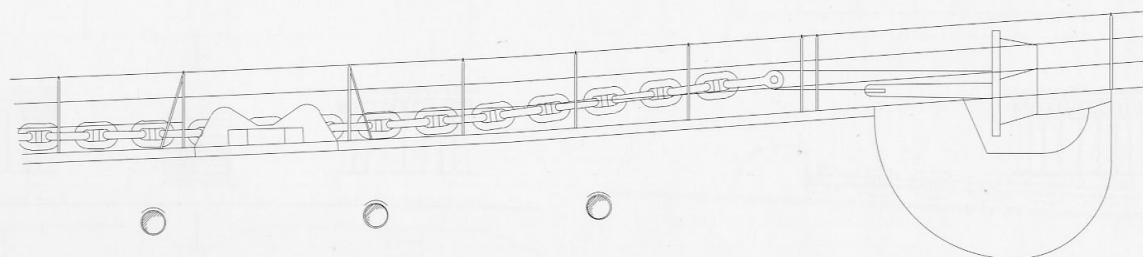
G2/1 Plan

G2/2 Starboard Elevation

G2/1



G2/2



225 —

230 —

235 —

G GROUND TACKLE

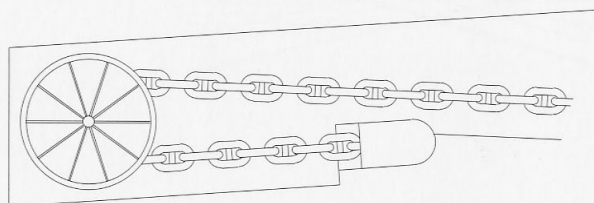
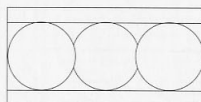
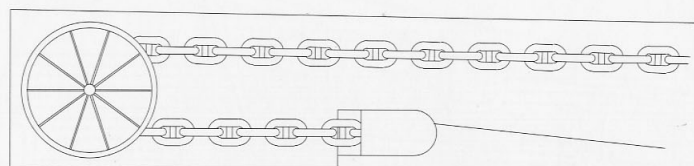
G3 Capstan (1:100 scale)

G3/1 Plan

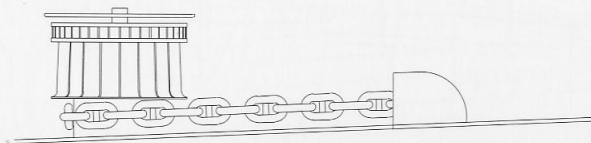
G3/2 Starboard Elevation

G3/3 Section

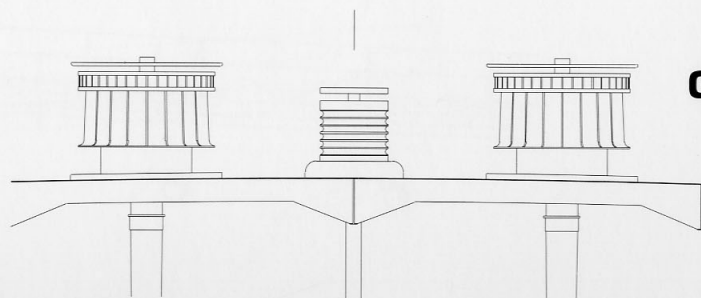
G3/1



G3/2



G3/3



G GROUND TACKLE

G4 Bollards (1:40 scale)

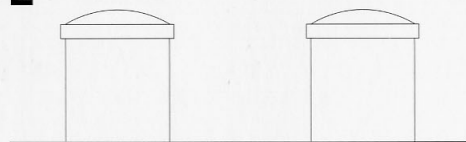
G4/1 Plan

G4/2 Side Elevation

G4/1



G4/2

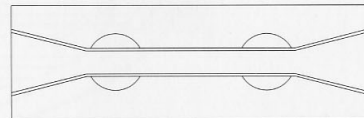


G5 Fairlead (1:40 scale)

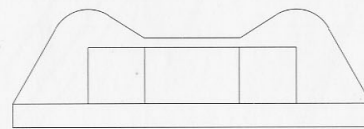
G5/1 Plan

G5/2 Side Elevation

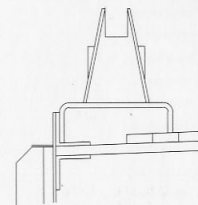
G5/1



G5/2



G5/3



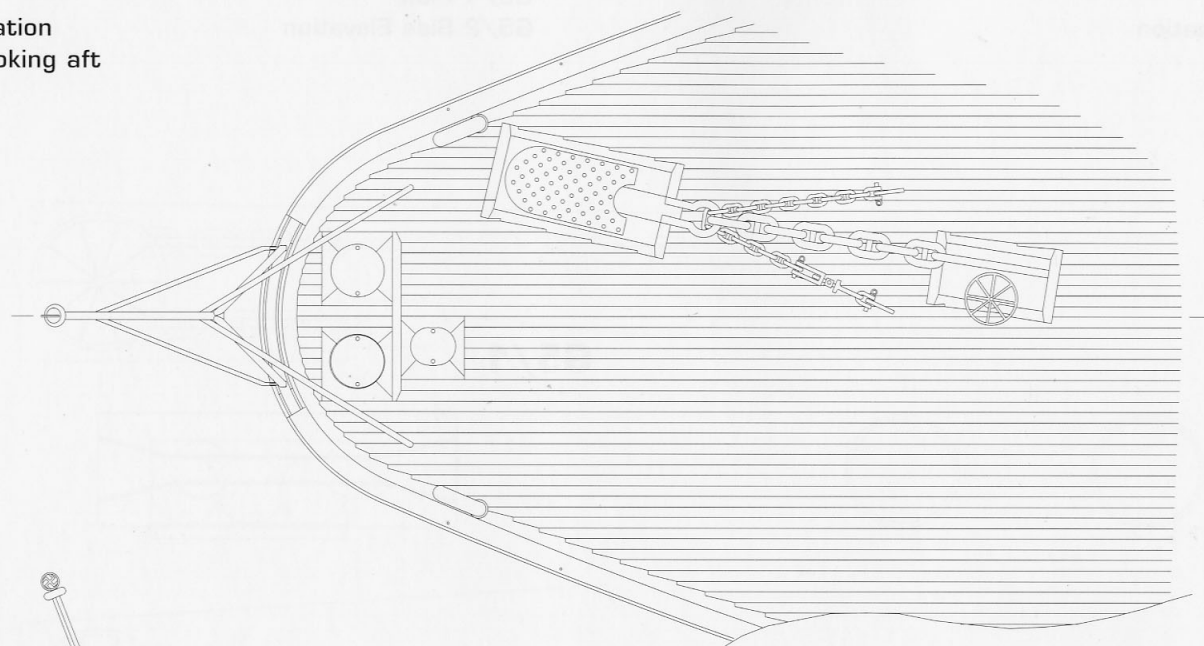
G GROUND TACKLE

G6 Towing Fairlead and Flag Staff (1:100 scale)

G6/1 Plan

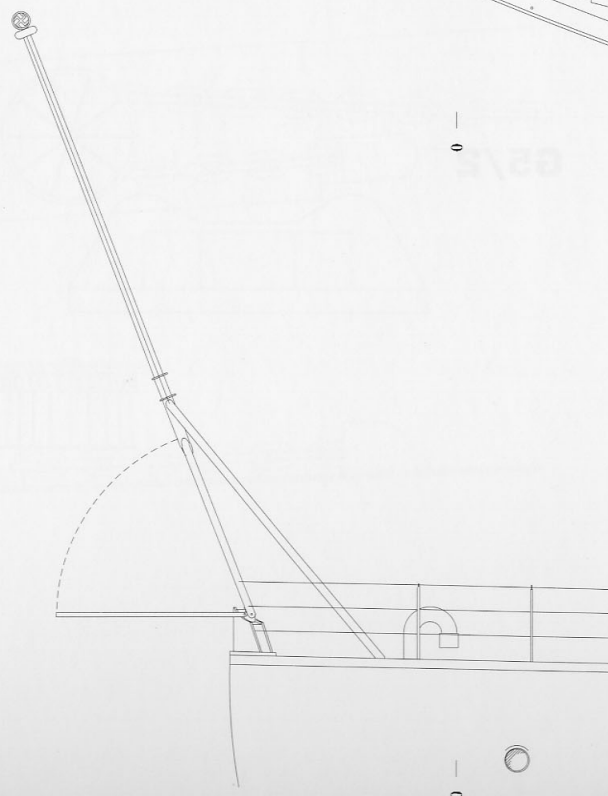
G6/2 Starboard Elevation

G6/3 Section at O looking aft

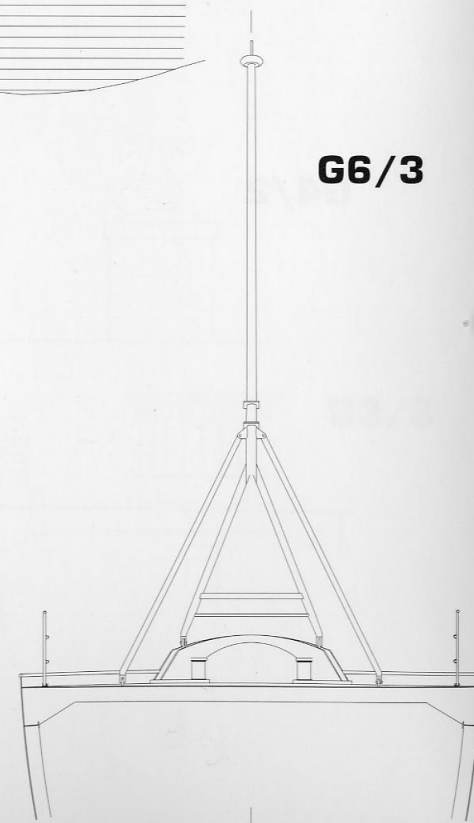


G6/1

G6/2



G6/3



H FITTINGS

H1 Accommodation Ladder (1:100 scale)

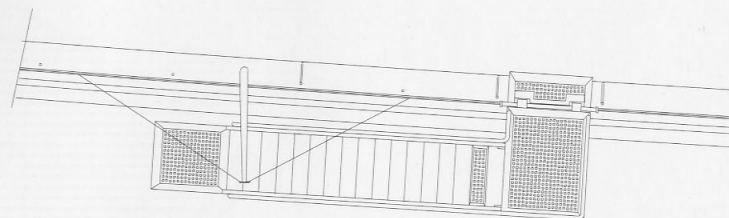
H1/1 Plan

H1/2 Ladder Davit

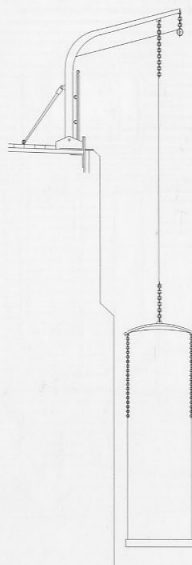
H1/3 Side Elevation

H1/4 Ladder

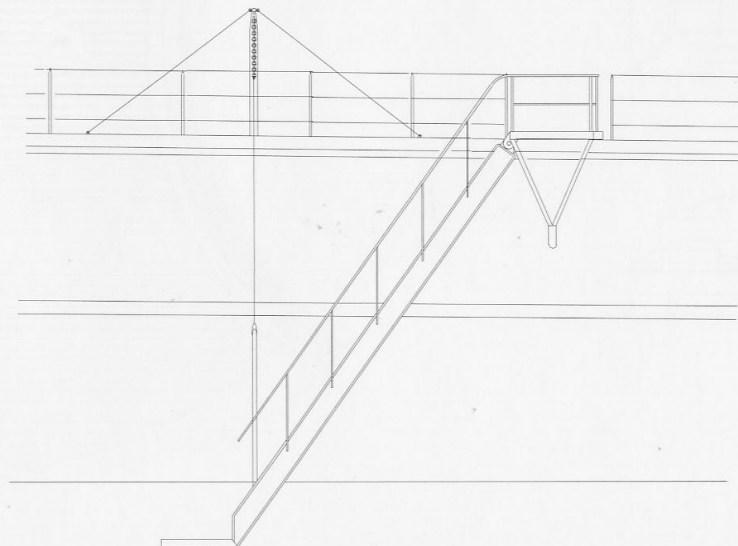
H1/1



H1/2



H1/3



H1/4

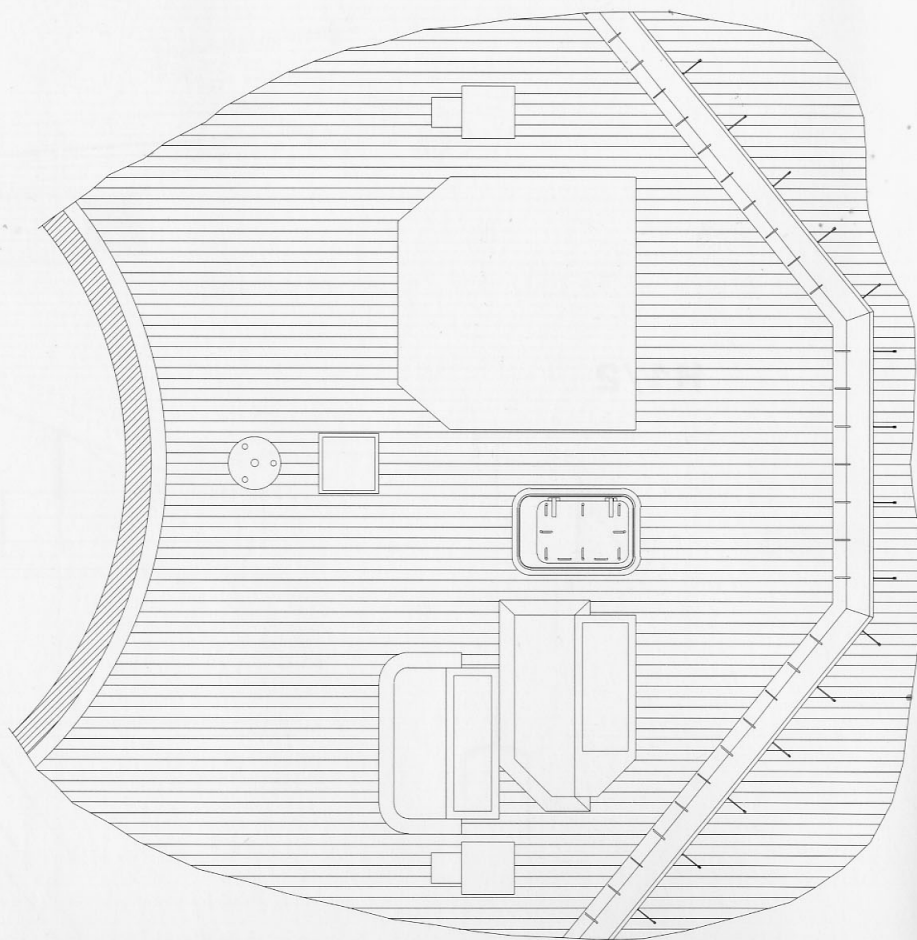
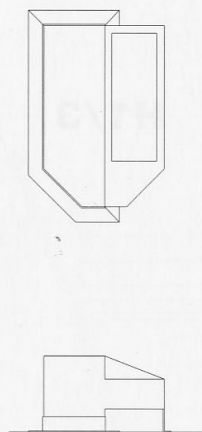


H FITTINGS

H2 Ventilators (1:100 scale)

H2/1 Bow Group

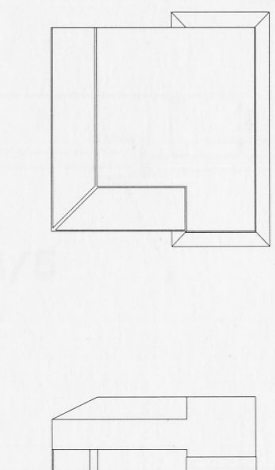
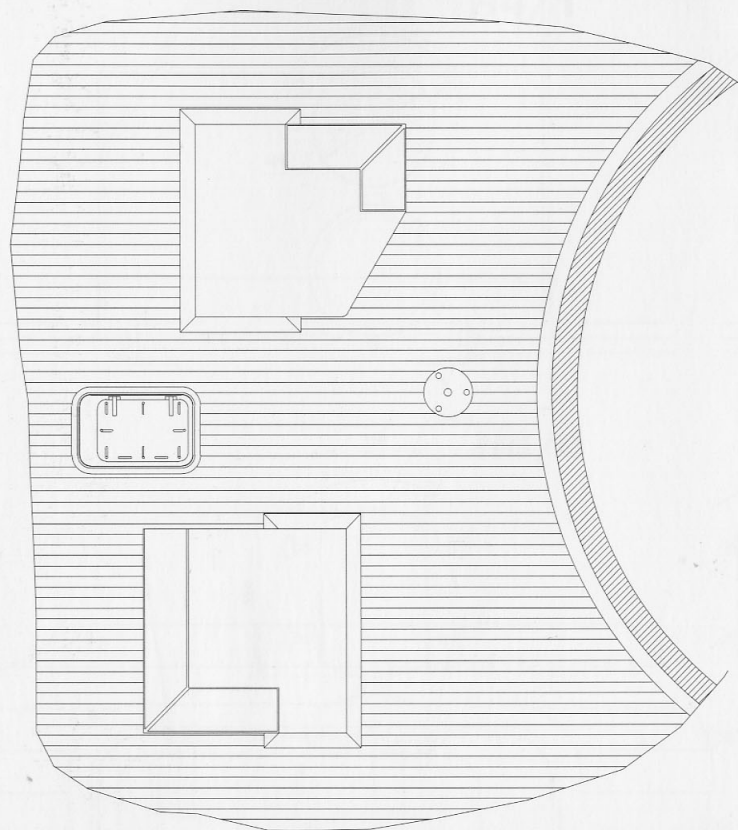
H2/1



H FITTINGS

H2/2 Stern Group

H2/2



H FITTINGS

H3 Watertight Doors (1:25 scale)

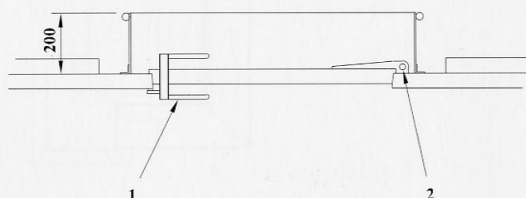
H3/1 Section

H3/2 Side View (Section)

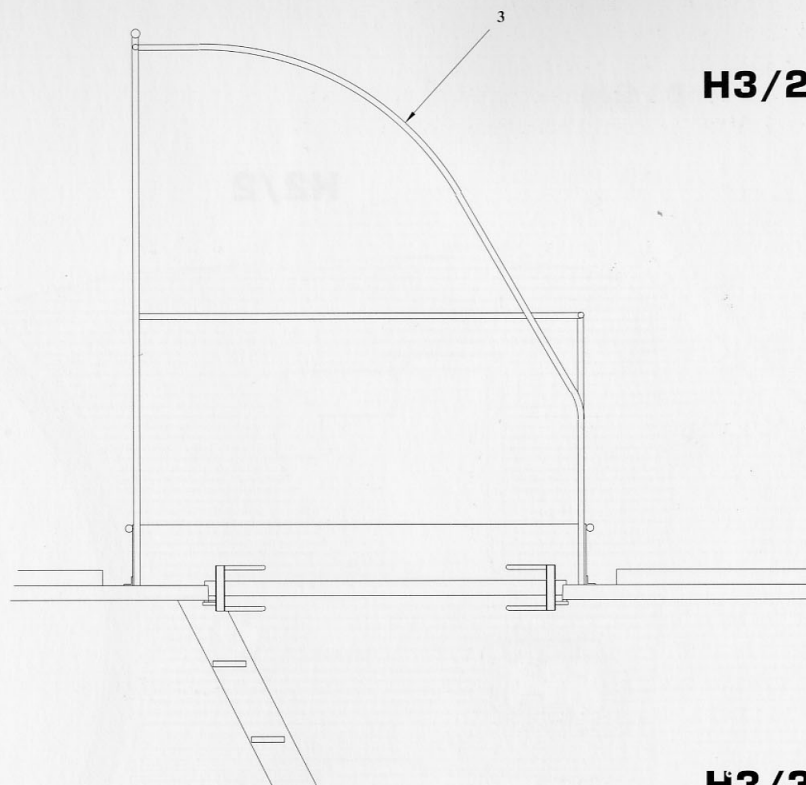
H3/3 Plan View

- 1 Clip
- 2 Hinge
- 3 Canvas Support
- 4 Handle

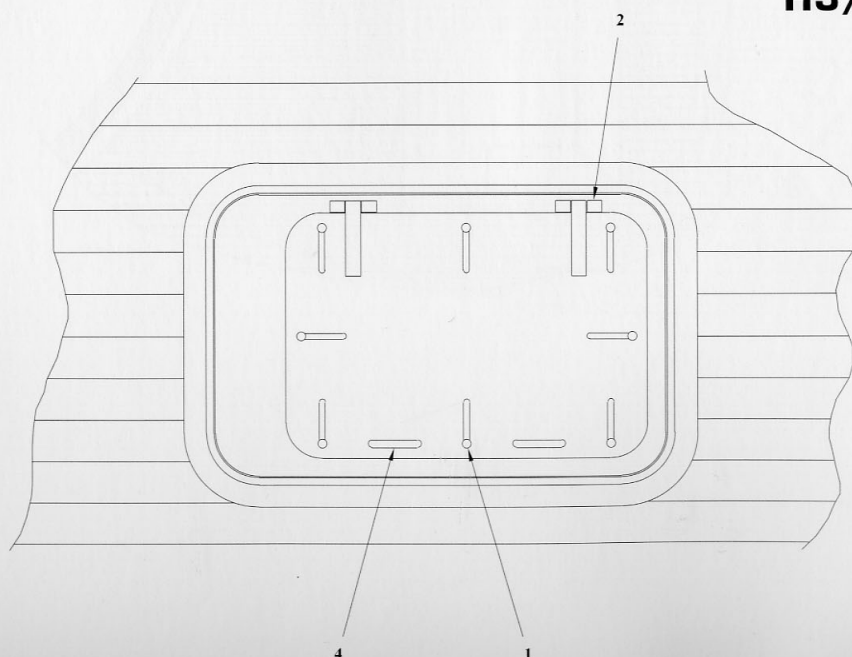
H3/1



H3/2



H3/3



H FITTINGS

H4 Side Scuttle (1:25 scale)

H4/1 Superstructure Scuttle (open)

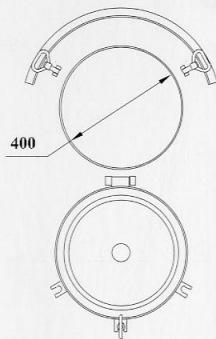
H4/2 Superstructure Scuttle (closed)

H4/3 Typical Hull Scuttle

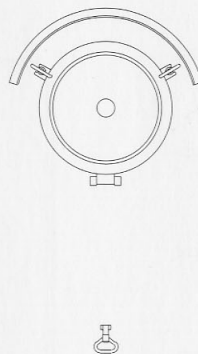
H4/4 After Superstructure Scuttle (open)

H4/5 After Superstructure Scuttle (closed)

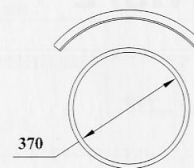
H4/1



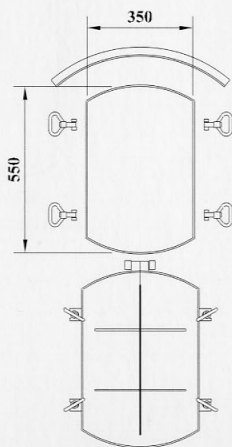
H4/2



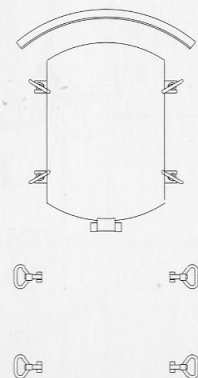
H4/3



H4/4



H4/5



H FITTINGS

H5 Guard Rail (1:25 scale)

H5/1 Superstructure Profile

H5/2 Superstructure Front View

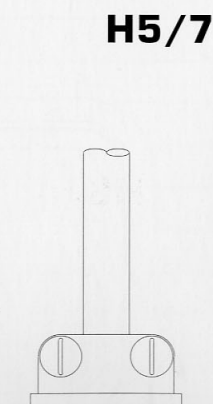
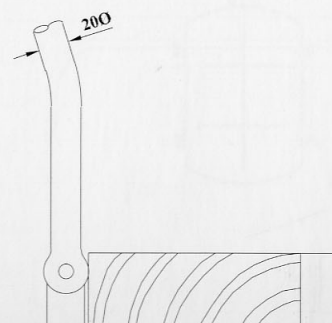
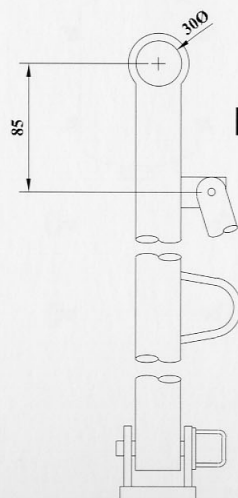
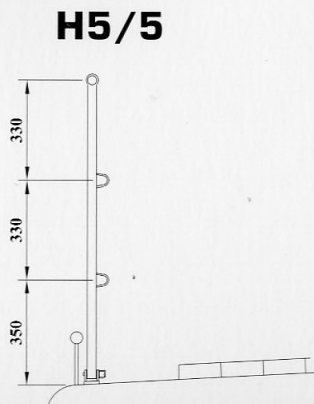
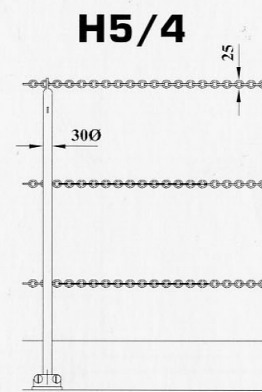
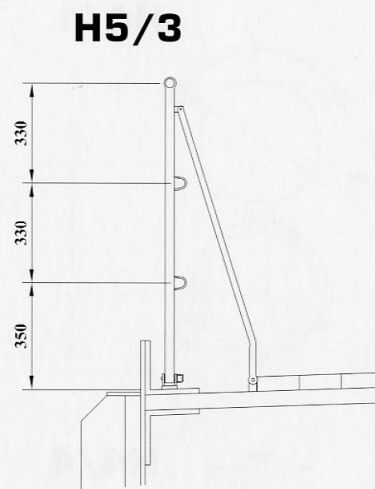
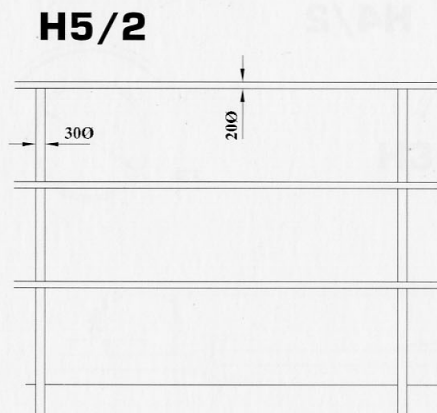
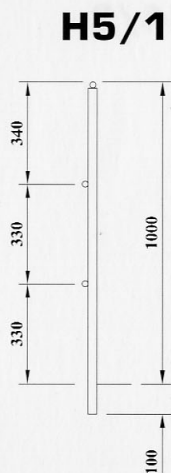
H5/3 Midships Upper Deck Profile

H5/4 Midships Upper Deck Front View

H5/5 Bow Upper Deck Profile

H5/6 Stanchion with Stay detail (1:5 scale)

H5/7 Stanchion Pivot



H FITTINGS

H6 Watertight Doors (1:25 scale)

H6/1 Watertight Door Closed (Outside view)

H6/2 Watertight Door Closed (Inside view)

H6/3 Watertight Door Open

H6/4 Door Section (1:5 scale)

1 Rigol

2 20cm Door Scuttle

3 Clip

4 Hinge

5 Door Frame Angle

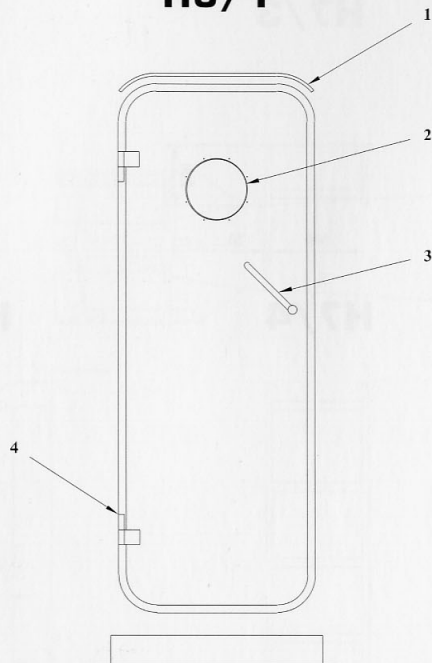
6 Door

7 Rubber Seal

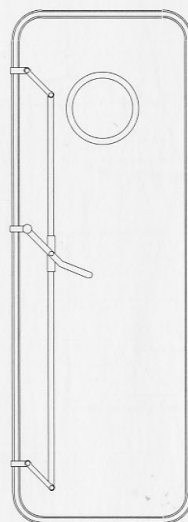
8 Door Wedge

9 Bulkhead

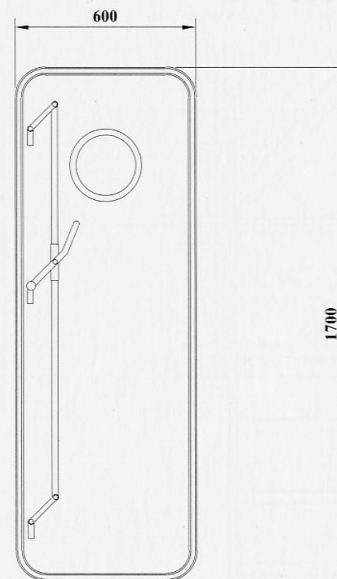
H6/1



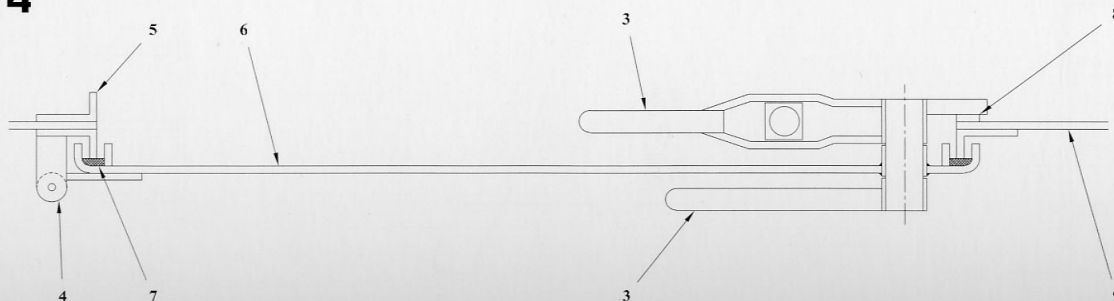
H6/2



H6/3



H6/4



H FITTINGS

H7 Typical Ladders (1:25 scale)

H7/1 Superstructure Ladder Front

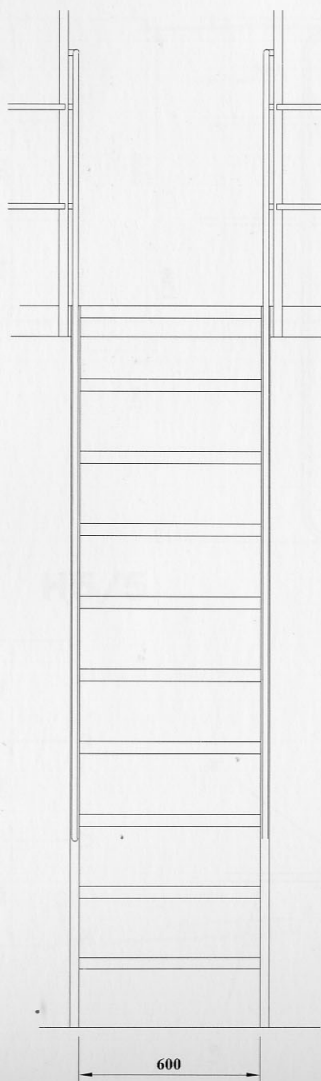
H7/2 Superstructure Ladder Section

H7/3 Superstructure Ladder Plan

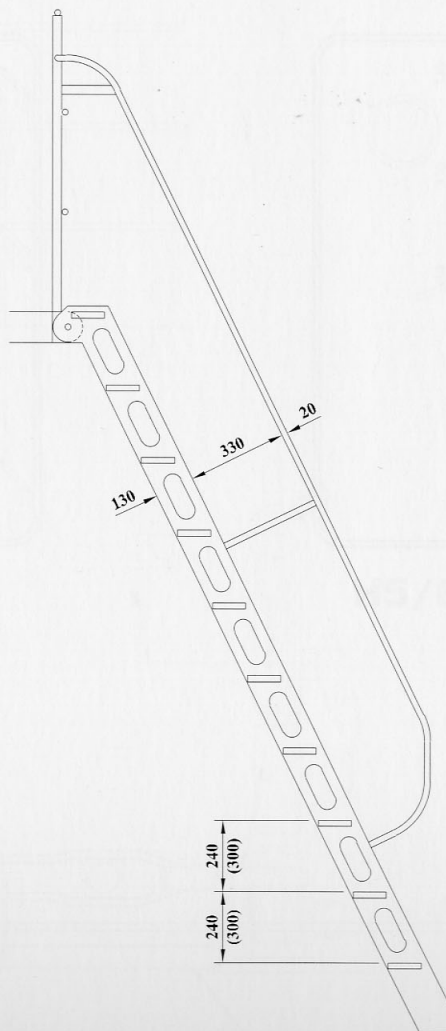
H7/4 Superstructure Ladder Front View

H7/5 Superstructure Ladder Section

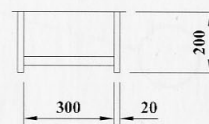
H7/1



H7/2



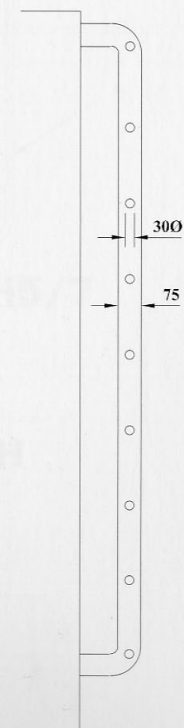
H7/3



H7/4



H7/5



H FITTINGS

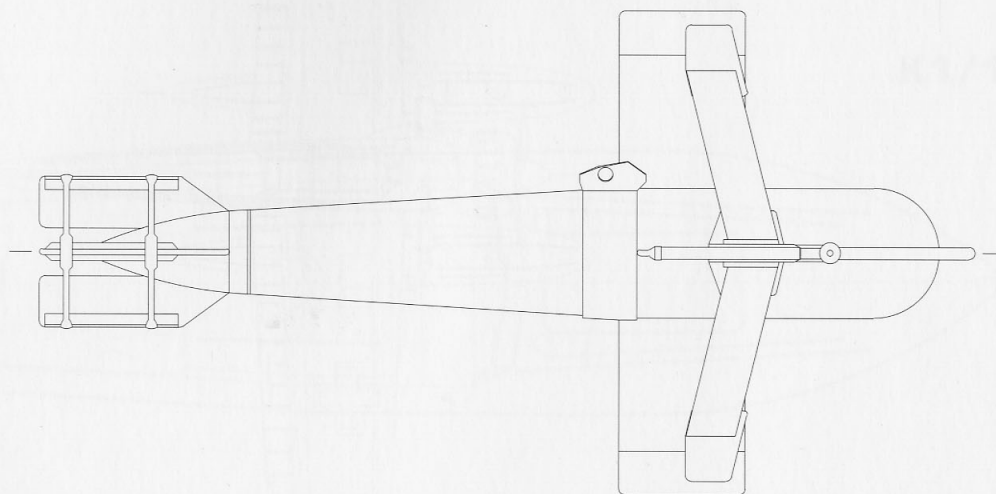
H8 Paravane (1:25 scale)

H8/1 Plan

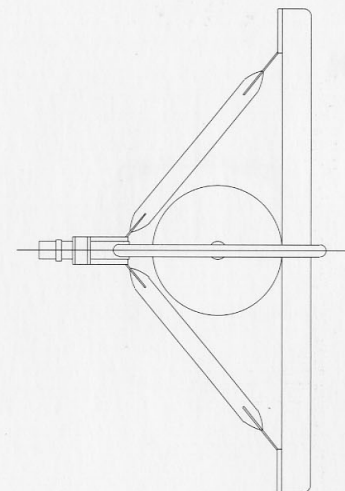
H8/2 Front Elevation

H8/3 Side Elevation

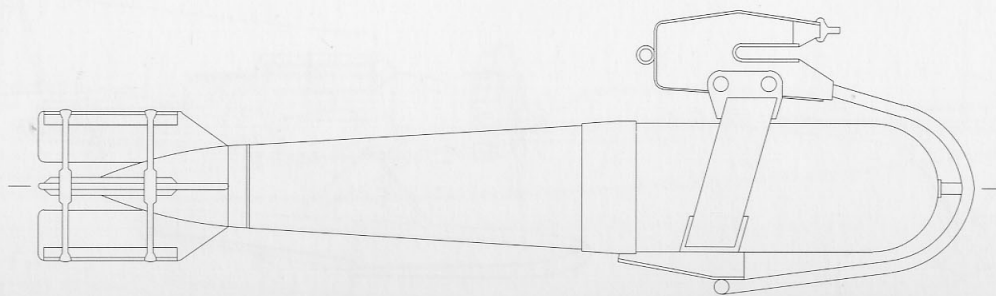
H8/1



H8/2



H8/3



J AIRCRAFT

J1 Arado 196A-3 (1:125 scale)

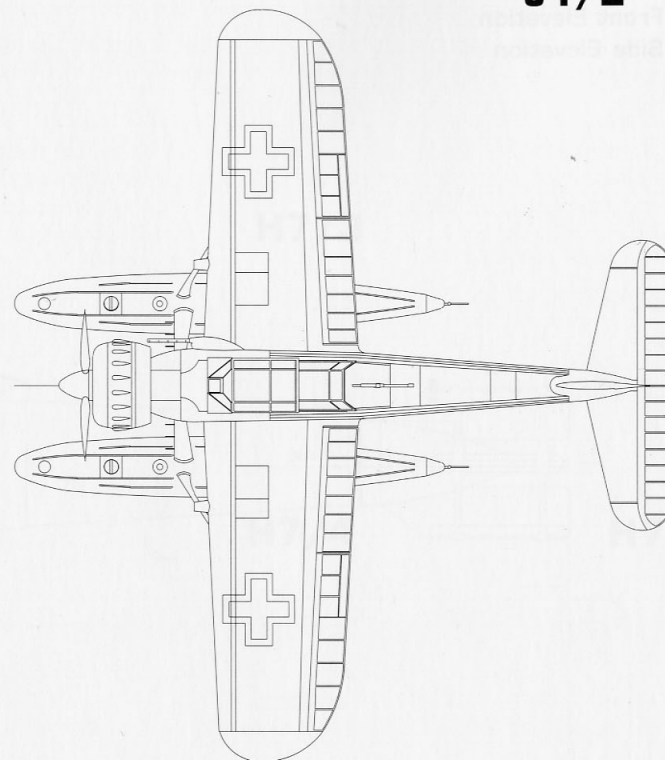
J1/1 Plan

J1/2 Front Elevation

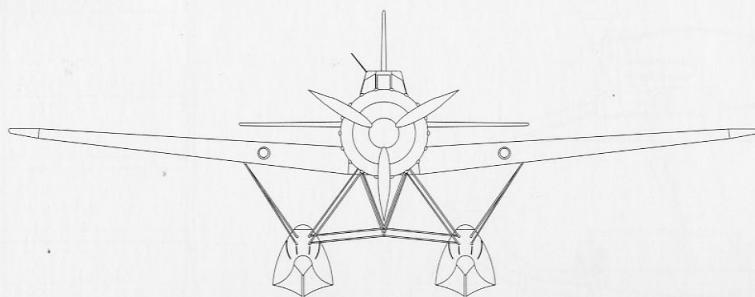
J1/3 Side Elevation

J1/4 Float Plan View

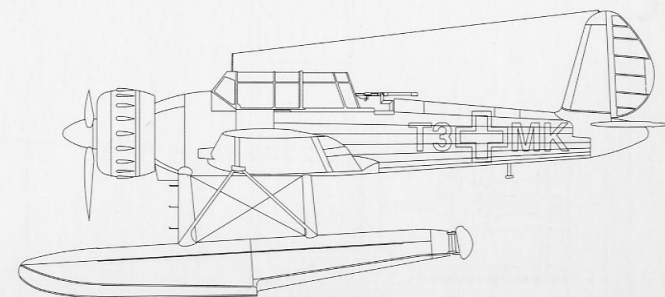
J1/2



J1/2



J1/3



J1/4



K BOATS

K1 11m Admiral's Gig (1:75 scale)

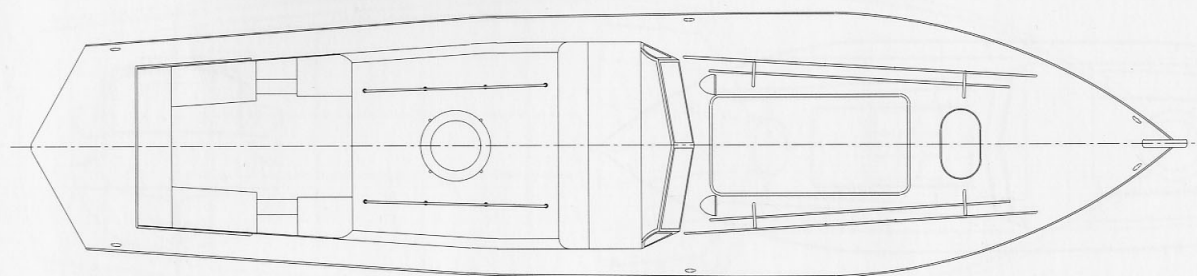
K1/1 Plan

K1/2 Stern Elevation

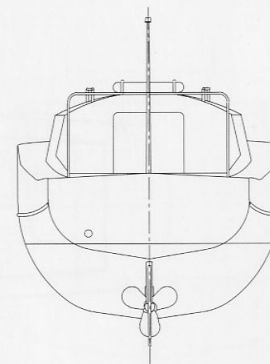
K1/3 Starboard Elevation

K1/4 Bow Elevation

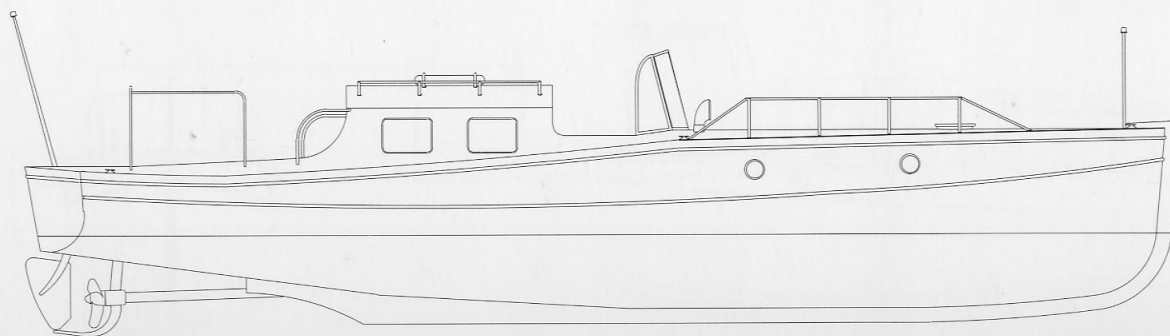
K1/1



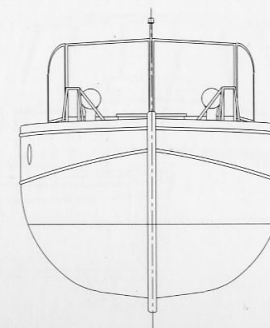
K1/2



K1/3



K1/4



K BOATS

K2 9m Captain's Gig (1:75 scale)

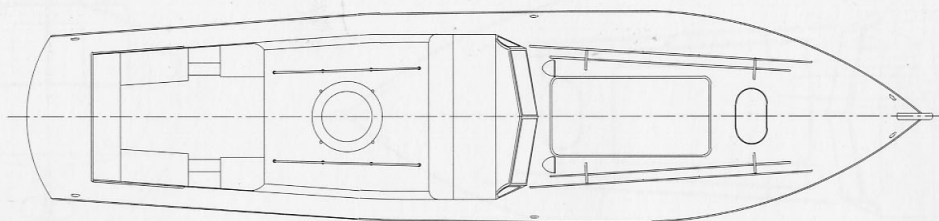
K2/1 Plan

K2/2 Stern Elevation

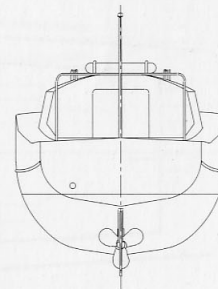
K2/3 Starboard Elevation

K2/4 Bow Elevation

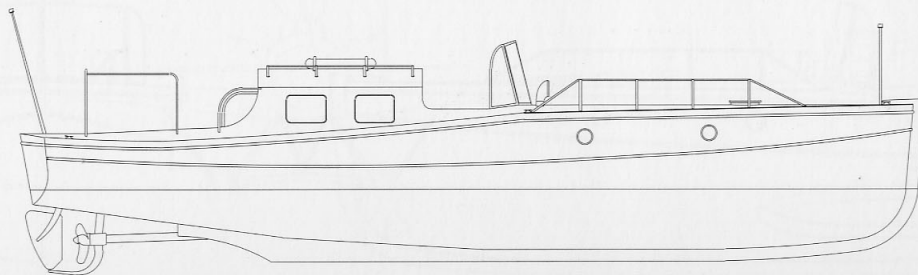
K2/1



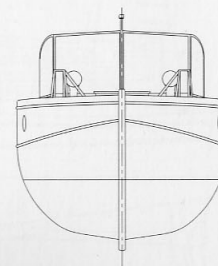
K2/2



K2/3



K2/4



K BOATS

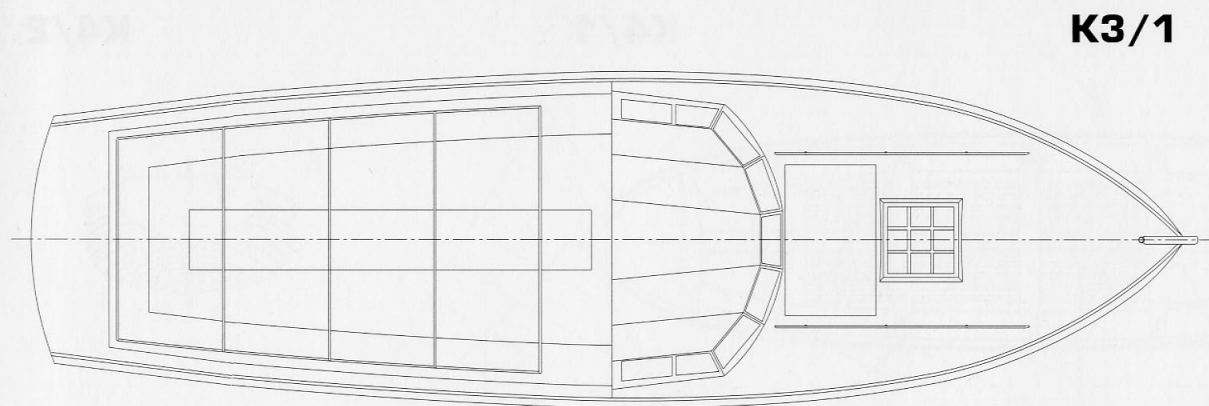
K3 11m Launch (1:75 scale)

K3/1 Plan

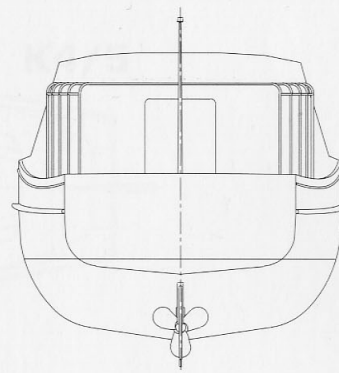
K3/2 Stern Elevation

K3/3 Starboard Elevation

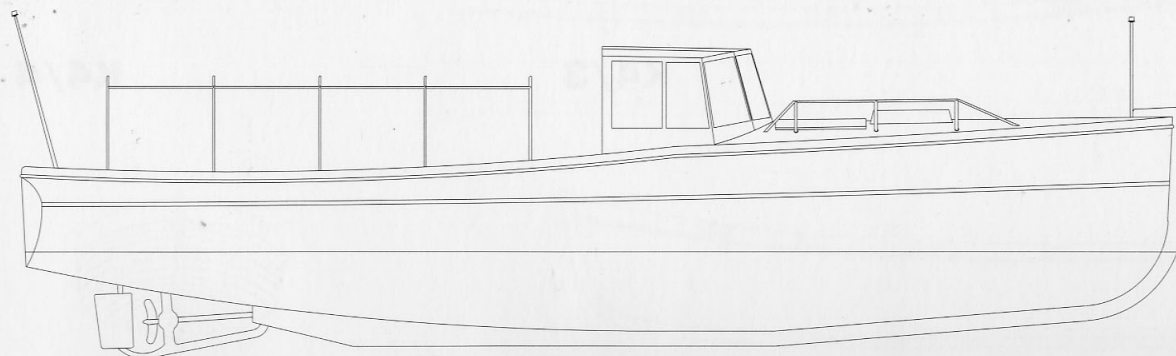
K3/4 Bow Elevation



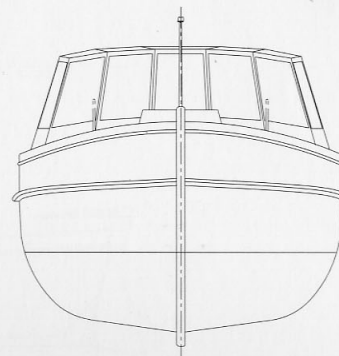
K3/1



K3/2



K3/3



K3/4

K BOATS

K4 8m Long Boat (1:75 scale)

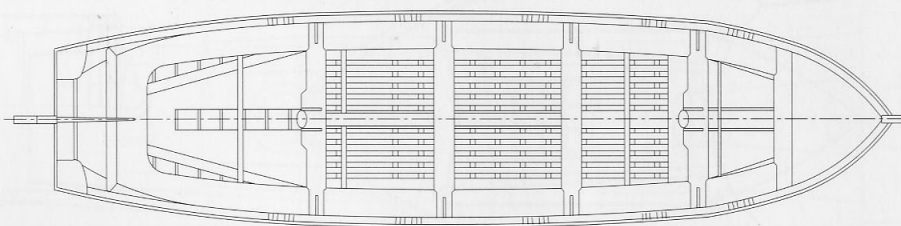
K4/1 Plan

K4/2 Stern Elevation

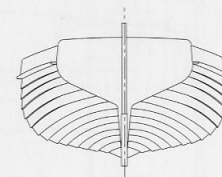
K4/3 Starboard Elevation

K4/4 Bow Elevation

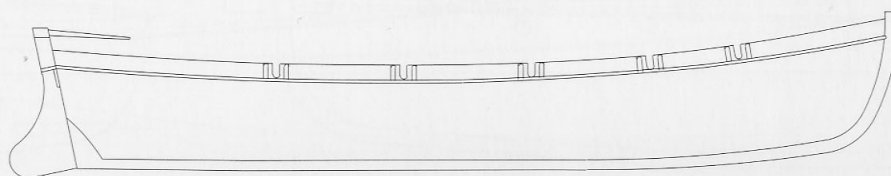
K4/1



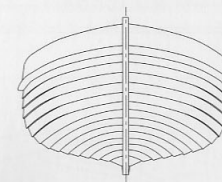
K4/2



K4/3

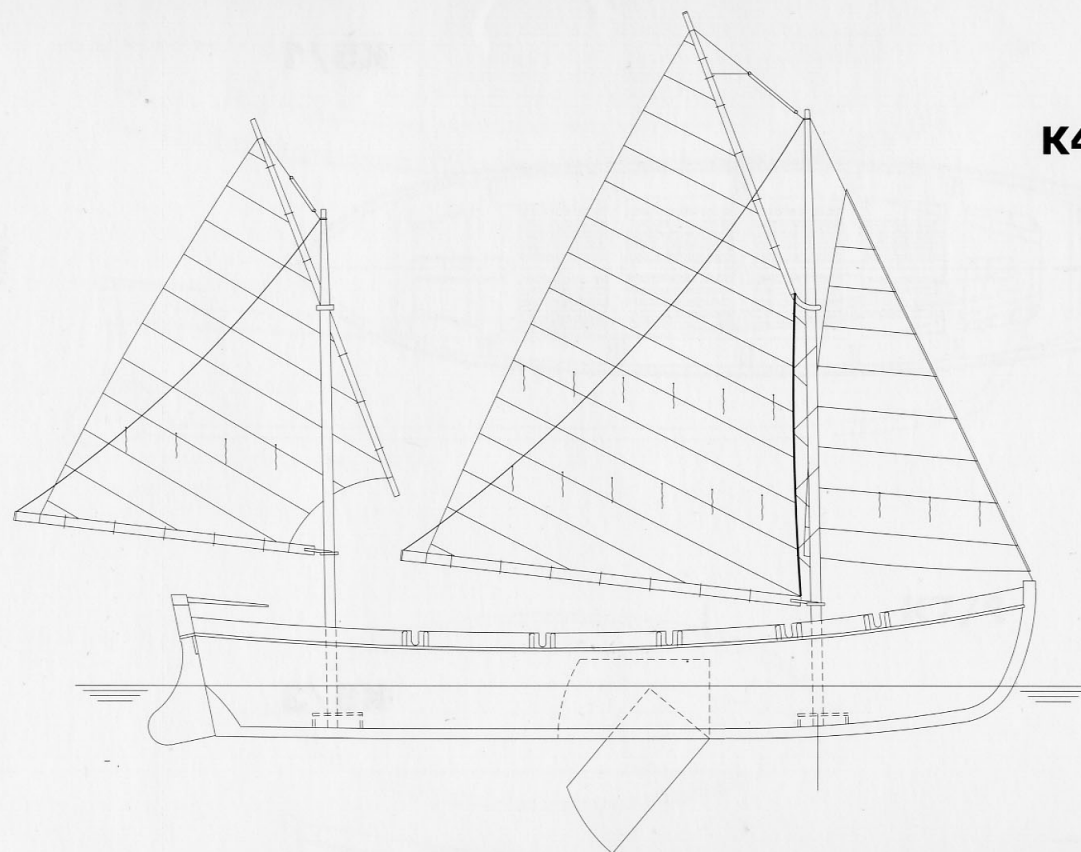


K4/4



K BOATS

K4/5 Starboard Elevation with Sail



K4/5

K5 8m Cutter (1:75 scale)

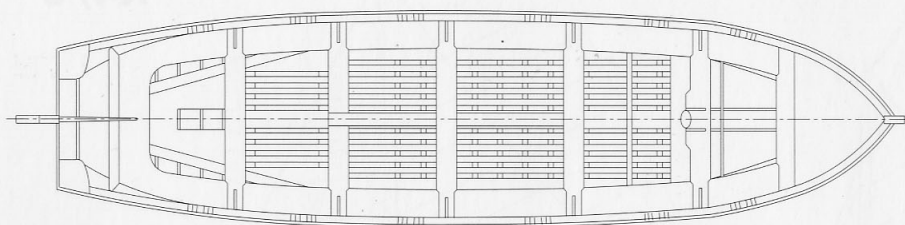
K5/1 Plan

K5/2 Stern Elevation

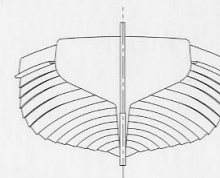
K5/3 Starboard Elevation

K5/4 Bow Elevation

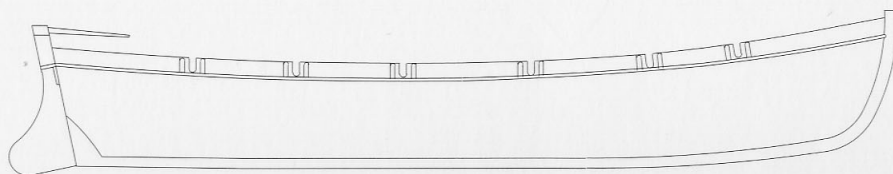
K5/1



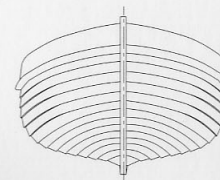
K5/2



K5/3



K5/4



K6 6m Long Boat (1:50 scale)

K6/1 Plan

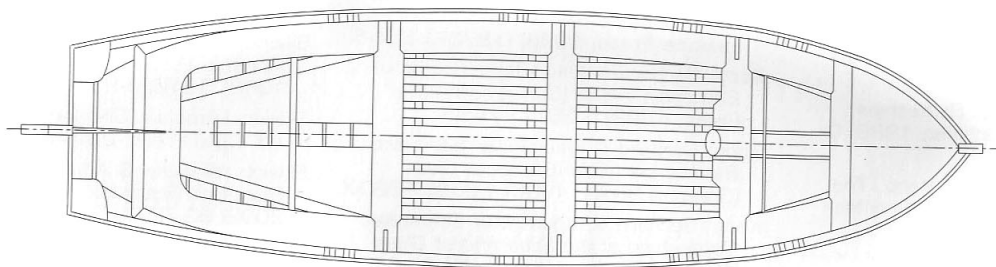
K6/2 Starboard Elevation

K7 4m Dinghy

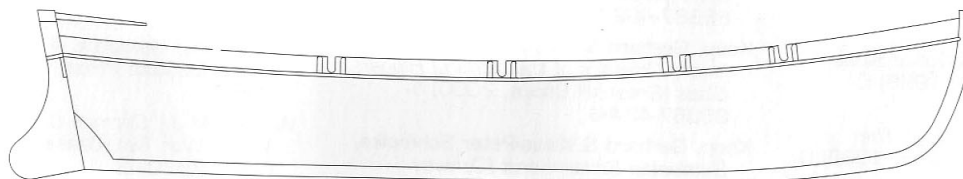
K7/1 Plan

K7/2 Starboard Elevation

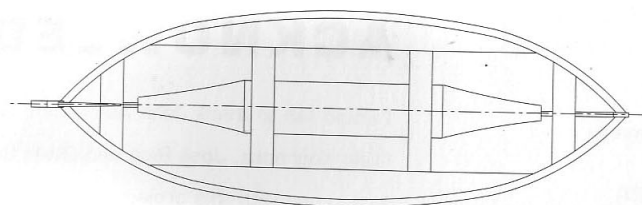
K6/1



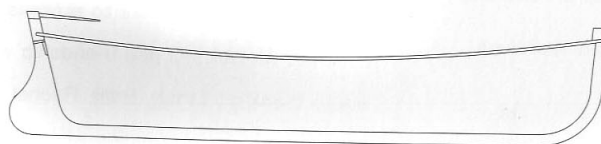
K6/2



K7/1



K7/2



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ANATOMY OF THE SHIP

Bismarck is arguably the most famous warship in the world. At 45,000 tonnes she and her sister ship *Tirpitz* were the largest and heaviest warships ever completed by any European nation. After trials in early 1941, *Bismarck* embarked on her first major role for the German Navy in Operation Rheinübung on 18 May. Less than a week later she sank the 'Mighty Hood', pride of the Royal Navy, during one of the most sensational naval encounters ever. After a dramatic chase around the North Atlantic involving many units of the Royal Navy, *Bismarck* was finally dispatched with gunfire and torpedoes on 27 May, less than five months after she was completed. The wreck of *Bismarck* still lies where she sank, 4,790m down and 960km off the west coast of France. This brand new addition to the well-established and highly popular 'Anatomy' series provides a unique documentation of *Bismarck*, with a complete set of superbly executed line drawings, accompanied by full technical specifications, ship history and detailed photographs.

THIS VOLUME FEATURES

- A full description of one of the most famous warships of all time.
- Pictorial section showing full-view and on-board photographs.
- Colour guide and action painting on the jacket.
- More than 250 perspective and 3-view drawings, with descriptive keys, of every detail of the ship – including general arrangements, hull structure, rigging, armament, fittings, aircraft and ship's boats.
- One large-scale plan on the reverse of the fold-out jacket.

A complete anatomy of the type in words, photographs and drawings.

Baltic Sea camouflage as of May 1941 [paint scheme: Black, Dark Grey RAL 7024, Mid Grey RAL 7000, Light Grey RAL 7001, Red-Brown RAL 8013].

