

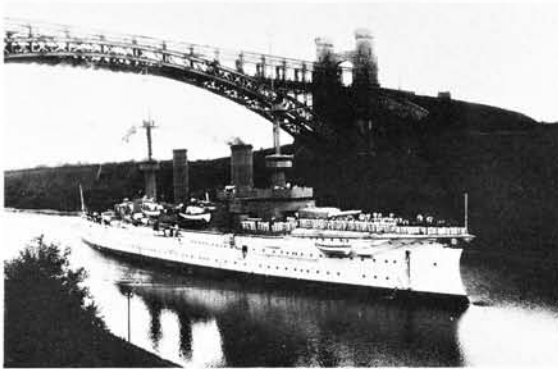
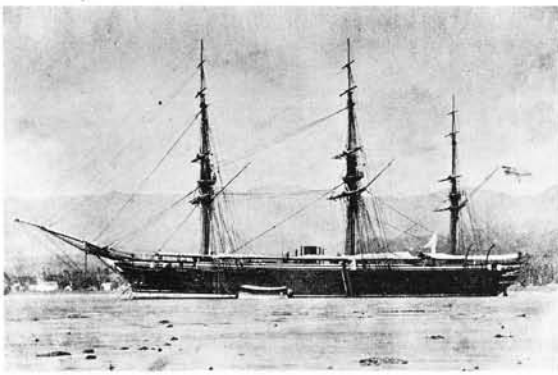
Profile Warship

18

KM Bismarck/Battleship

by Paul Schmalenbach
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Earlier 'Bismarcks'

- 1 1877 *BISMARCK*, steam frigate: 3386 tons,
16×15cm guns, 2×35cm bow torpedo tubes.
Used for protection of colonies.
Broken up 1922.
- 2 1897 *FÜRST BISMARCK*, armoured cruiser:
11,461 tons, 4×24cm guns, 12×15cm guns,
10×8.8cm guns, 6 torpedo tubes.
Far East, Boxer uprising.
1916 Baltic Patrol
1920 Broken up.

Bibliography

Siegfried Breyer—*Schlachtschiffe und
Schlachtskreuzer 1905-1970*
Jochen Brennecke—*Schlachtschiff Bismarck*

COVER PHOTO:

Midship section of Bismarck in Bergen Fjord, 1941—seen from Prinz Eugen
(Author)



Bismarck on commissioning

(Author)

Kriegsmarine Bismarck

by Paul Schmalenbach *Fregattenkapitän a.D.*

Historical Background to the German 35,000 ton Battleships

On 6 February 1922 the Washington Agreement was signed between the USA, Great Britain, France, Italy and Japan which limited naval armament. The definitions of types of ships, maximum displacement and maximum gun calibre laid down in the Agreement were one day to apply to the German Navy, a possibility no-one could foresee at the time of the signing of the Washington Agreement.

The Agreement limited future building of battleships to 35,000 tons (1016kg to the-ts.-ton), whereby the nature of the ship was for the first time exactly determined at the outset. The maximum calibre of gun was not to exceed 16in or 40.6cm—the Treaty of Versailles allowed Germany possession of only six ships of 10,000 tons having a maximum gun calibre of not more than 28cm. Two similar ships were allowed as an additional reserve.

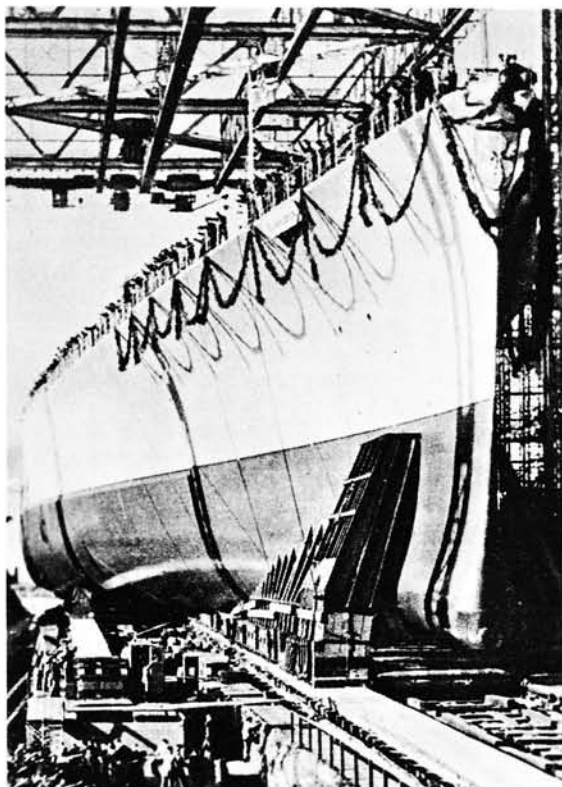
With a few exceptions favouring Great Britain, France and Italy, the Washington Treaty stipulated a pause in ship building which was to last until the end of 1930. In the final year of the stipulated period the pause in ship building was extended by Great Britain, the USA and Japan for a further six

years, i.e. until 31.12.36. Again, taking its name from the city where the conference was held, the 'London Agreement' on 30 June 1938 generally ratified, but amended in one very important point, the displacement of future battleships under standard (i.e. Washington Agreement) conditions was increased to 45,000 tons.

The negotiations and agreements of the great sea powers were now out of step with the endeavours of Germany and the German Navy to build up a minimum of modern naval armament within the limits of the conditions of the Versailles Peace Treaty. (See *Warship Profile* No. 6, pp. 121-122.)

The Three Panzerschiffe

The first results were the three Panzerschiffe *Deutschland*, *Admiral Scheer* and *Admiral Graf Spee* (see *Warship Profile* No. 4), proven in action and known universally as 'pocket battleships'. They were faster than all stronger, and stronger than all faster ships—the only exceptions to this being the British battle-cruisers. The situation changed overnight when France decided to build the two battleships permitted to her under the Washington Agreement. Both ships (the *Dunkerque* laid down in 1931, the *Strasbourg* in 1934) were, at 26,500 tons,



Launching day: the guard rails are manned as she slides down the ways. Note the mine boom at her forefoot
(Author)



Fitting-out

(Author)

to be the answer to the German pocket battleships. This shift in power in the Mediterranean in favour of France caused Italy to react by building the first battleships to make the most of the limitations of the Agreement. The Deutsche Reich acted with reserve in order not to destroy the negotiations already in progress with Great Britain over establishing a ratio of the relative strength of the two navies.

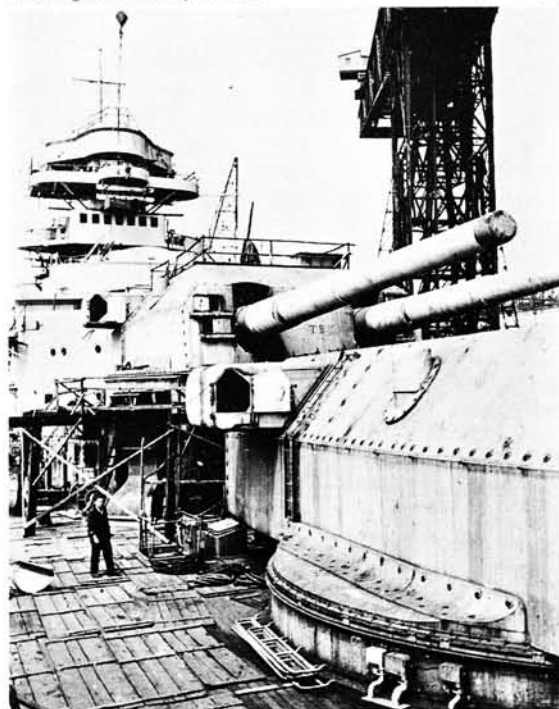
Gun Development

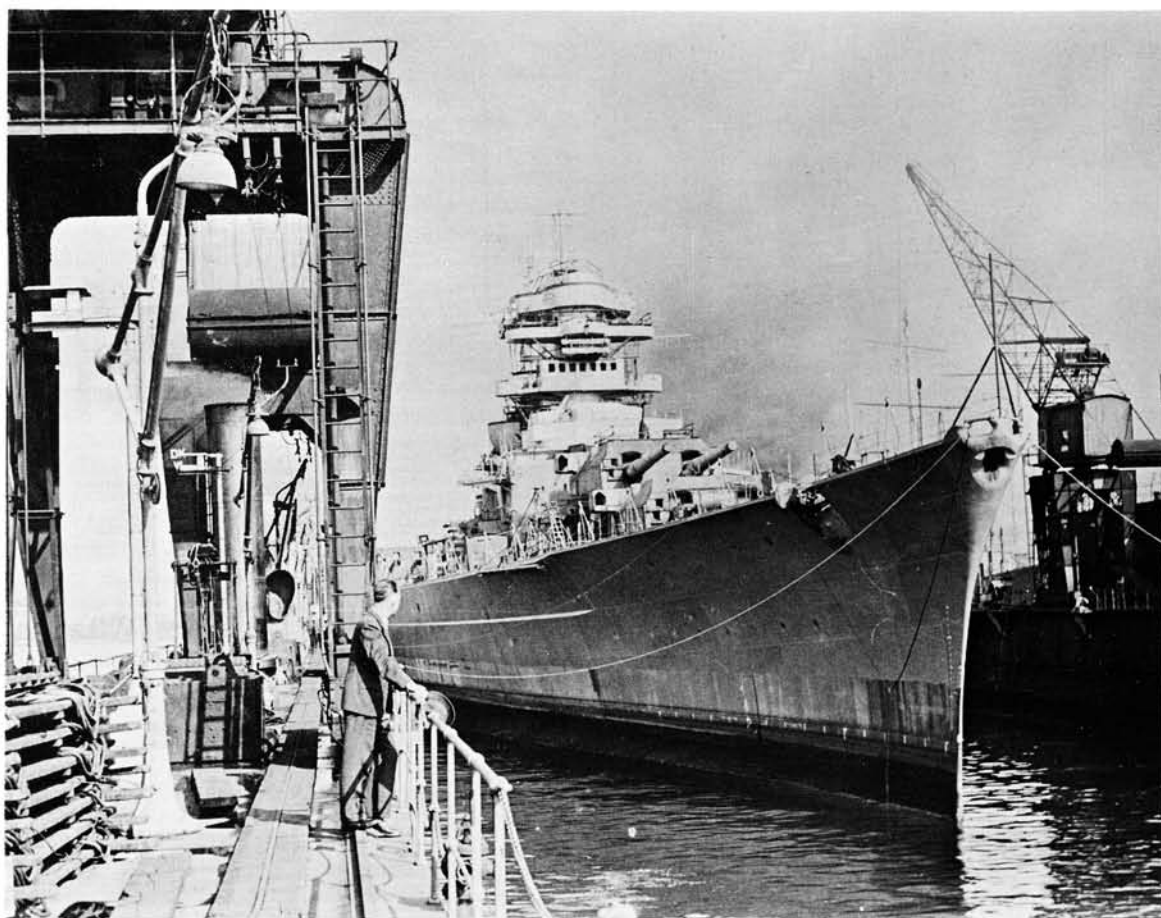
Only in 1934 was there talk of 'improved Panzerschiffe', with 28cm triple turrets, as before; these were the later, faster *Scharnhorst* and

Gneisenau with a planned displacement of 26,000 tons. However, this gun calibre still seemed inadequate when compared with the French ships, as these had 8×33cm guns in two four-gun turrets. So in that same year there began construction of a 38cm double turret at Krupp's in Essen. This double turret was one day to replace the 28cm triple turret of the *Scharnhorst* class, but it was not available for delivery until approximately 1938, whereas four 28cm triple turrets were in the process of being manufactured for the fourth and fifth pocket battleships. Because of this situation in the production of heavier guns, the guns for both the battleships *Scharnhorst* and *Gneisenau* remained 28cm calibre. The two ships respectively received the construction designation 'Battleship D' as the replacement for the ship of the line, the *Elsass*, dating from 1903; and 'E' for the replacement of the *Hessen* of the same year.

18 June 1935 saw the signing in London of the Anglo-German naval agreement which laid down that—excluding the U-boats—the German naval strength could be 35% of that of the Royal Navy. The standard displacement in accordance with the Washington and London Agreements served as the criterion. Thus qualitative limitation of ships came into operation for the Germany Navy. This gave the Deutsche Reich the facility of possessing battleship tonnage of up to 183,750 tons. After allowing for the pocket battleships (3×10,000 tons) and the new battleships (2×26,000 tons) totalling 82,000 tons, 101,750 tons remained as capacity for building. This figure would thus allow the construction of three ships each of a maximum of 35,000 tons. The German Government decided in the first

The fitting-out proceeds apace. The turret range-finder housings are clearly shown
(Author)





In the fitting-out basin. Note the armour belt

(Author)

instance to build two ships, each of 35,000 tons. They were to incorporate findings of certain theoretical studies which had started in 1933, but most important of all they were to be suitable to take the 38cm double turret, already under construction.

The two new ships were respectively designated 'F' to replace the ship of the line *Hannover* dating from 1905, and 'G' to replace the ship of the line *Schleswig-Holstein* dating from 1906. These two vessels later became the battleships *Bismarck* and *Tirpitz*.

It was more difficult to distribute the remaining weight allowance on the defence equipment (armour plating, watertight compartments) and the superstructure with the manifold demands of the weapon command, ship's command and the ship's aircraft. Several plans were drawn up leaving the two shipyards freedom to adopt their own solutions for relatively minor sections. This was particularly the case amidships with regard to the arrangement of aircraft hangars, catapults and the large cranes. The 1936/37 plan showed two overlapping catapults, one behind the other, between the funnel and the after mast, an arrangement similar to that found in the *Scharnhorst* Class and in Heavy Cruisers (see *Warship Profile* No. 6, p. 135).

One aircraft hangar was, however, excluded. Both of

the stabilised anti-aircraft command positions aft stood on either side and to the rear of the funnel. The total superstructure forward with the command position, ship's command position and fighting mast was longer, but flatter therefore, and ended as shown in the final plans—very narrow at the second 38cm turret. The funnel cap appeared for the first time in the 1938/39 plans which differed even less from the final ones.

Notable features here were the first appearance of a catapult fixture athwartships, operational on both sides; and the arrangement of the two forward anti-aircraft command posts adjacent to one another, whereas these posts were later installed one abaft the other. Because of many uniform constructional concepts it is not surprising that the ships of this time, the heavy cruisers and battleships from the *Scharnhorst* to the *Tirpitz*, should resemble one another so strongly. On 24 May 1941, this similarity led to the *Hood* firing on the *Prinz Eugen* under the impression that she was the *Bismarck*.

The Building of the Battleship 'F'

At the beginning of 1936, the plans were sufficiently advanced for the contracts for battleships 'F' and 'G' to be allocated: 'F' went to the Blohm & Voss yard, Hamburg, and 'G' to the Naval Yard at Wilhelmshaven. Construction in Hamburg began on 1 July 1936



Adolf Hitler on board Bismarck. Admiral Lütjens gives the naval salute. Cdr. Düwell, second in command, stands immediately at right. (Author)



Bismarck leaves the basin (Drüppel)

with the laying of the keel. But in Wilhelmshaven it was not possible to start until the end of October, as the one slipway that was suitable was only vacated, on 3 October, by the launching of the *Scharnhorst*. For Blohm & Voss the new ship was the 509th to be laid down there.

Each day, in two shifts, about 5 to 6000 workers streamed to the dockyards. Work proceeded according to plan until it came to welding together medium thickness armour plating with the usual shipbuilding steel. Test pieces did not hold. Only a welding rod developed by the Friedrich Krupp AG for gun turret armour plating fulfilled all the requirements. The heavy side armour and the longitudinal torpedo bulkheads were not welded, however, but joined and riveted in the usual way.

The Launching

The launching took place on 14 February 1939. The ceremony was declared a state occasion by the German Government. The fact that Hitler was not only present for the occasion but also personally delivered the christening speech stressed the political importance of this first modern battleship. Everyone who had any pretension to name and rank at that time put in an appearance: beside the highest Admirals stood Reichsmarschall Göring, Hitler's deputy, Hess, the Chief of the Armed Forces Supreme Command, Generaloberst Keitel and, on the platform of honour, the Federal Ministers Ribbentrop, Goebbels, Frank and Rust, as well as the various heads of other organisations like Himmler, Rosenberg, Borman and v. Schirach.

In his speech, Hitler expounded the importance of maritime armament for the Deutsche Reich, and charged the future crew that they should perform their duty in the spirit of the 'Iron Chancellor', in peacetime as in war. Hitler concluded his oration with the wish of the German people that Bismarck's spirit would uplift the crew in the most difficult hours of fulfilment of their duty.

The Naval Commander-in-Chief, Admiral Dr h. c. Raeder (who was promoted to Admiral of the Fleet on 1 April on the occasion of the launching of the *Tirpitz*) thanked the German Government for the energy with which they had pressed forward naval armament and this new ship, and promised that no effort would be spared to make the ship ready for action, a powerful weapon to secure peace. Frau Dorothea von Loewenfeld, née Countess of Bismarck (widow of Vice-Admiral a.D. von Loewenfeld, Leader of the Volunteer Corps in the post-war period and co-founder of the German Navy) gave the new ship the name of *Bismarck*; the name could be seen on either side of the bow while the Bismarck family coat of arms was revealed on the stem. The launching went off without a hitch.

Fitting out began the next day. Naturally at the outbreak of war at the beginning of September, it was necessary to gauge whether and, if appropriate, how urgently construction should continue. Great Britain's entry into the war considerably affected the crucial issues, and the U-boat had come strongly to the forefront of all plans. The German Government decided that both the battleships should be completed as well as the heavy cruiser, *Prinz Eugen*, and the aircraft carrier *Graf Zeppelin*. The work that then remained to complete *Bismarck* still amounted to 5.6 million working hours and the toil continued without interruption. In the full flush of enthusiasm during the first years of the war, the ship was even finished earlier than intended, enabling her to be commissioned as early as 24 August 1940. Kapitän zur See Ernst Lindemann commanded the vessel throughout her life.

Dimensions and Water Displacement

The shallow water in German river mouths and in the North Sea, as well as in the Kaiser-Wilhelm Canal (nowadays officially designated the Kiel Canal) limited the draught of projected battleships from the planning stage. The previously tested and established ratios of length, beam and draught resulted in an extraordinarily wide beam of 36m. This was welcome information for it enabled the intermediate space between the outer shell and the longitudinal torpedo bulkheads to be made both larger than was usual and also greater than adopted by other Navies. This had the effect of considerably reducing the adverse effect of underwater explosions.

The *draught* of the ship was 9.33m at standard displacement, the *length* at the designed waterline was 241.50m, the overall length being 251m. The *freeboard* was a notable 15.00m. These dimensions stemmed from the fulfilment of many staff requirements, which had now gradually forced an infringement of the then still valid standard displacement of 35,000 tons up to 41,700 tons. As mentioned earlier, this limit was increased in 1938

to 45,000 tons. This point should be stressed as, after the war, the admirals responsible at the time were reproached for failure to keep to the Agreement. The 41,700 tons standard (1016kg to the ton) corresponds approximately to the frequently quoted 42,343.5 tons at 1000kg to the ton. As these two units of measurement are also confused in official circles, there have occasionally been previous contradictory statements about the battleship's displacement.

Weights

A precise classification of the weights and division of weight are shown in the following tables in the then current standard of the Kriegsmarine.

WEIGHT SHEET (EXTRACT) FOR THE BATTLESHIP 'BISMARCK' Date of calculation 16.3.1940

		1000kg to the ton	1016kg to the ton
S	Hull	11,691.0	=11,507.0
	Armour plating, excl. revolving turret armour	17,540.0	
MI	Main engines	2,800.0	
MII	Auxiliary engines	1,428.0	
A	Gunnery armament and armour	5,973.0	
T	Torpedo armament		
F	Aircraft equipment	83.0	
Spr	Barrage weapons	8.0	
I	General equipment etc	369.4	
N	Nautical instruments	8.6	
Ta	Rigging	30.0	
	Empty ship with instruments with oil and water in MI, MII etc	39,931.2	=39,302.0
A	Gunnery ammunition	1,501.4	
Spr	Barrage weapon ammunition	2.5	
	Consumables	155.4	
	Crew	243.6	
	Supplies	194.2	
	Drinking water	139.2	
	Washing water	167.0	
	Type displacement	42,343.5	=41,676.0
	Feed water (combat cells)	187.5	
	Oil	3,226.0	
	Fuel oil	96.5	
	Lubricating oil	80.0	
	Aircraft—working reserve 1 filling	17.0	
	Designed displacement	45,950.5	=45,226.0
	Feed water	187.5	
	Oil	3,226.0	
	Fuel oil	96.5	
	Lubricating oil	80.0	
	Aircraft—working reserve 1 filling	17.0	
	Freshwater—reserve	389.2	
	Ship fully equipped	49,946.7	=49,160.0
	Useful oil load	1,009.0	
	Ship with useful load	50,995.7	=50,153.0

PROPORTIONAL WEIGHTS (SITUATION ON 19.10.40 IN ROUND FIGURES)

		tons	% of weight
Hull weight	SI-IV	12,700	27.0
Engine installations	MI	3,000	6.4
Auxiliary engines	MII	1,400	3.0
Armour	P	18,700	40.0
Gunnery	A	5,550	11.8
Armaments	Au	920	2.0
Fuel	Br	4,000	8.4
Water	W	530	1.0
Barrage weapon installations	—	100	0.2
Aircraft installations	—	100	0.2
Designed displacement		about 47,000	100

It is interesting to compare the preceding data with the results of the weighing carried out by the Blohm & Voss yard as each item was taken on board.

		1000kg to the ton
SI	Steelwork	10,150
SII	Fitters' work, pipelines	960
SIII	Sheetmetal work	335
SIV	Paint	220
		11,665
HoP	Horizontal armour, deck and torpedo bulkhead	8,910
S	Side armour	5,019
Z	Armoured transverse bulkheads	363
Ba	Barbettes	2,285
KoT	Fire command posts	466
		17,043
MI	Engines: turbines, auxiliary engines	3,370
MII	Engines: apparatus and auxiliary engines	1,430
		4,800

Guns	Total gunnery	6,180
TO	Torpedo tubes	40
		6,220
	TOTAL	39,728

In addition there was the water in the boilers and pipelines; the gunnery ammunition, all the aircraft and barrage weapon installations as well as the navigational instruments; the signalling and broadcasting apparatus; the weapon control instruments including range-finding equipment and the radar apparatus, not to mention the weight of the crew and their belongings, both professional and private. Finally there was drinking and washing water and the consumables as, for example, lubricants, cleansers and anti-freezing agents.

There were, however, some notable differences:

Group	calculated by designers tons	weighed at the yard (see above) tons
SI-IV	11,691	11,665
MI	3,370	2,800
MII	1,430	1,428
Armour (without gunnery)	17,540	17,043
Total gunnery	5,973	6,180
Torpedo weapons	—	40

Admiral Lütjens inspects Prinz Eugen's company 11.00 at Gdynia, 18 May 1941. Note the Swastika aircraft recognition marking on the quarter-deck. (Author)



Just how fluid the limits were is shown by the last entry, for example, for *Bismarck* never had any torpedo weapons. Nevertheless, equipment, which on other ships was classed with torpedo weapons, were attributable as, for example, pneumatic pumps and the ship's anti-mine devices such as the extendible spar for the paravane.

The following summary gives some indication of the weights included in what was termed the 'useful load'.

	1000kg to the ton
Gunnery ammunition	1,510.4
Barrage ammunition (primer cartridges for high explosive shells etc)	2.5
Consumables (cleansing, maintenance etc)	155.4
Crew	234.6
Supplies	194.2
Drinking water	139.2
Washing water	167.0
Total Useful Load	2,412.3

The Hull

The hull was a transverse and longitudinally framed steel structure, of which more than 90% was welded. The double bottom extended over 83% of the ship's length. 17 bulkheads divided the ship into 18 watertight compartments. The ship had a bow blister which housed the hydrophone. From the ship's foremost lower section, extended the previously mentioned spar for the paravane. When docking, the ship could be set down on four keels. The outershell was perforated in many places for the intake of seawater or the discharge of sea- or waste-water. Biggest of these openings were the outlets for the cooling water used in the condensers. The upper deck ran through from the bow to the after deck. Under it lay the battery deck, the armoured deck and the upper and middle platform decks. The lower platform deck ran parallel with the stowage almost everywhere i.e. with the upper boundary of the double bottom. The space on the sloping surfaces or 'pockets' of the armoured deck are included as armoured deck.

The material used was the newly developed shipbuilding steel St 52 which had an elastic limit of 36kg/mm² and a fatigue limit of 26kg/mm². This was superior to the St II material previously used, particularly with respect to its elastic strength. Considerable weight savings were made by the exclusive use of St 52.

The Armour Protection

The upper deck had armour of 50mm thickness, extending from approximately 4m forward of the foremost 38cm gun turret (turret A) to about 6m abaft the after turret D. At each of these positions an armoured bulkhead was installed. These bulkheads were of different thicknesses in the various decks: 145mm in the battery deck, 220mm in the armoured deck forward and 110mm aft. This 180mm transverse bulkhead forward descended to the upper platform deck and formed the boundary of the turtle-shaped section of the armoured deck, which ran from this bulkhead a further 16m forward and indeed formed a horizontal surface (30mm). The foremost nine metres of the forecastle,

approximately, were without an armoured deck. Similarly the aft transverse bulkhead formed the after boundary of that armoured deck with a thickness of 145, 110 or 220mm. The armoured deck continued aft from here as a horizontal surface for about 10m and there rose obliquely about 50cm to protect the steering gear. Immediately abaft it, a third armoured transverse bulkhead closed off the armoured deck. Where it began under the battery deck, this bulkhead had a thickness of 45mm, which became 150mm thick around the armoured deck and 45mm thick underneath it. The armoured deck ran between both the previously mentioned main armoured transverse bulkheads and had a thickness of 80mm, increasing to 100 or 120mm in the area of the 38cm turrets.

The side armour was attached to the sides of those same main armoured transverse bulkheads. It was extremely thick, considered from top to bottom, being 145mm thick in the battery deck region and, under this in the region of the armoured deck, it increased from 270 to 320mm and then decreased again to 170mm. This was its thickness on the slopes of the armoured deck. 50mm teak provided the foundation for all the side armour.

The maximum thickness of the two-storey fire command posts (in the upper floor of which was housed the gunnery control post) was 350mm, on the front face and 220mm on the top. The revolving dome on top of it, which held the range finders, was reinforced to a thickness of 200 or 100mm. The aft command post was less thick (150 or 30mm) as was the revolving dome aft (100 or 50mm). Both posts were linked to the corresponding room under the armoured deck (control room and reserve control room in the middle engine room) by circular shafts (forward 220mm, aft 50mm armoured material). The main gunnery control post in the foretop had a protection of 60mm (20mm on the top) and a revolving dome (30 or 20mm). The command post stood on a two-deck high cylinder with 60mm armour thickness. This cylinder and the command post on top of it afforded protection for the combat communication control room.

As these ships were essentially gun platforms, it was natural for considerable weight to be allocated for protection of the guns. The turrets revolved within barbettes which had 220mm thick armour. The front faces were 360mm thick; the top, made up of three parts, 180, 130 and 180mm thick respectively; the back 320mm; the turret side walls 220mm and those connecting side and top 150mm.

The 15cm double turrets had 100mm thick barbettes, which also stood on the armoured deck. The forward face of the turntable was 100mm thick; the roof for'd was 35mm thick, and aft 20mm. The back and the side walls were 40mm thick.

For the rest, the vital connections outside the armour protection were laid in splinter-proof trunking in the *Bismarck* and the *Tirpitz*, similar to the arrangement in the heavy cruisers. The armoured material used was—as previously in the *Scharnhorst* and the *Gneisenau*—the material just developed in that year, which went under the name of 'Wotan'. There was 'Wotan-hard' (Wh) and 'Wotan-soft' (Ww) with the following characteristic properties:

tensile strength Wh 85 to 95kg/mm²; Ww 65 to 75kg/mm². Elongation Wh 20%, Ww 25%; elastic limit: Wh 50 to 55kg/mm²; Ww 38 to 40kg/mm². According to the particular problem to be solved, the more suitable material was used: Wh for the upperdeck and armoured deck, Ww for the torpedo bulkhead. Both sorts of material could be worked with the Krupp's special electrode Nichrotherm (Nickel-Chromium-Therm), though not the side armour or the armour used for the control posts or gunnery which was KC-material (=Krupp cemented). This was a modernised (chrome-nickel-molybdenum alloy) material, of which the resistance to shells exceeded material of usual manufacture by about 50%.

New Technology

The welding properties of the Wh and the Ww material allowed its use in places where previously only shipbuilding material could be used, for example in parts of the outer shell and the upperdeck. After consideration of the available materials, it was decided to use Ww material for the longitudinal bulkhead. This bulkhead was to protect, at a distance of about 6m from the hull, the vital parts from underwater hits. This torpedo bulkhead was extended upwards to the upper deck by a splinter-proof wall and downwards to the outershell by a strengthened longitudinal rib. The design of this bulkhead relative to the rest of the ship was selected because of the possibility of heavy stress on the torpedo bulkhead through an underwater hit.

For the same reason, this bulkhead was not welded, but riveted with foil and one-sided coverplates.

The Superstructure

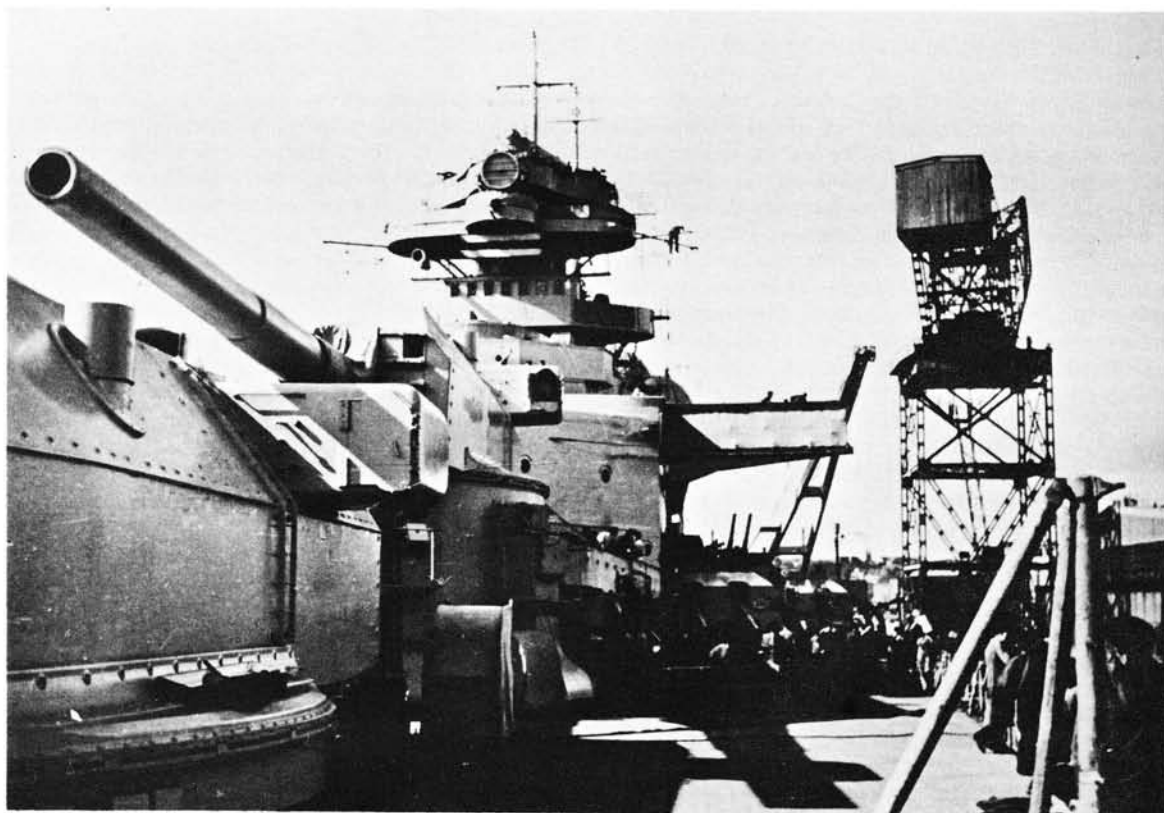
The original plan strongly resembled the *Scharnhorst* in the distribution of the superstructure; the final arrangement resembled that of the heavy cruisers, especially after the experiences of the *Admiral Hipper* had been evaluated for the two cruisers *Blücher* and *Prinz Eugen*. The forward bridge superstructure was four decks high, the after, three decks. The fighting mast stood on the forward superstructure with five sealed rooms, one on top of the other; on top came the open main anti-aircraft operational post, the main fire control tower and the foretop rotating cupola. The rooms were in essence divided and used as in *Prinz Eugen* (See *Warship Profile* No. 6, p. 136): the anchors, booms and accessories, masts and rigging, the radio and reconnaissance equipment, aircraft information centre, the bridges, the forward superstructure, the sick bay, accommodation, magnetic mine protection (de-gaussing), gyro compass, flag deck and smoke apparatus were all similarly sited.

The Propulsion Installation

The installation in the *Bismarck* consisted of three sets of geared turbines supplied by the shipyard (in the *Tirpitz* by Brown, Boveri & Co); these were three groups of boilers, each group being made up of four boilers of the Wagner type, as well as the necessary auxiliary engines. Each group of boilers

The after-superstructure, showing the sliding hangar door, the boat stowage and the signalling projector on the mast. Early 1940 (Author)



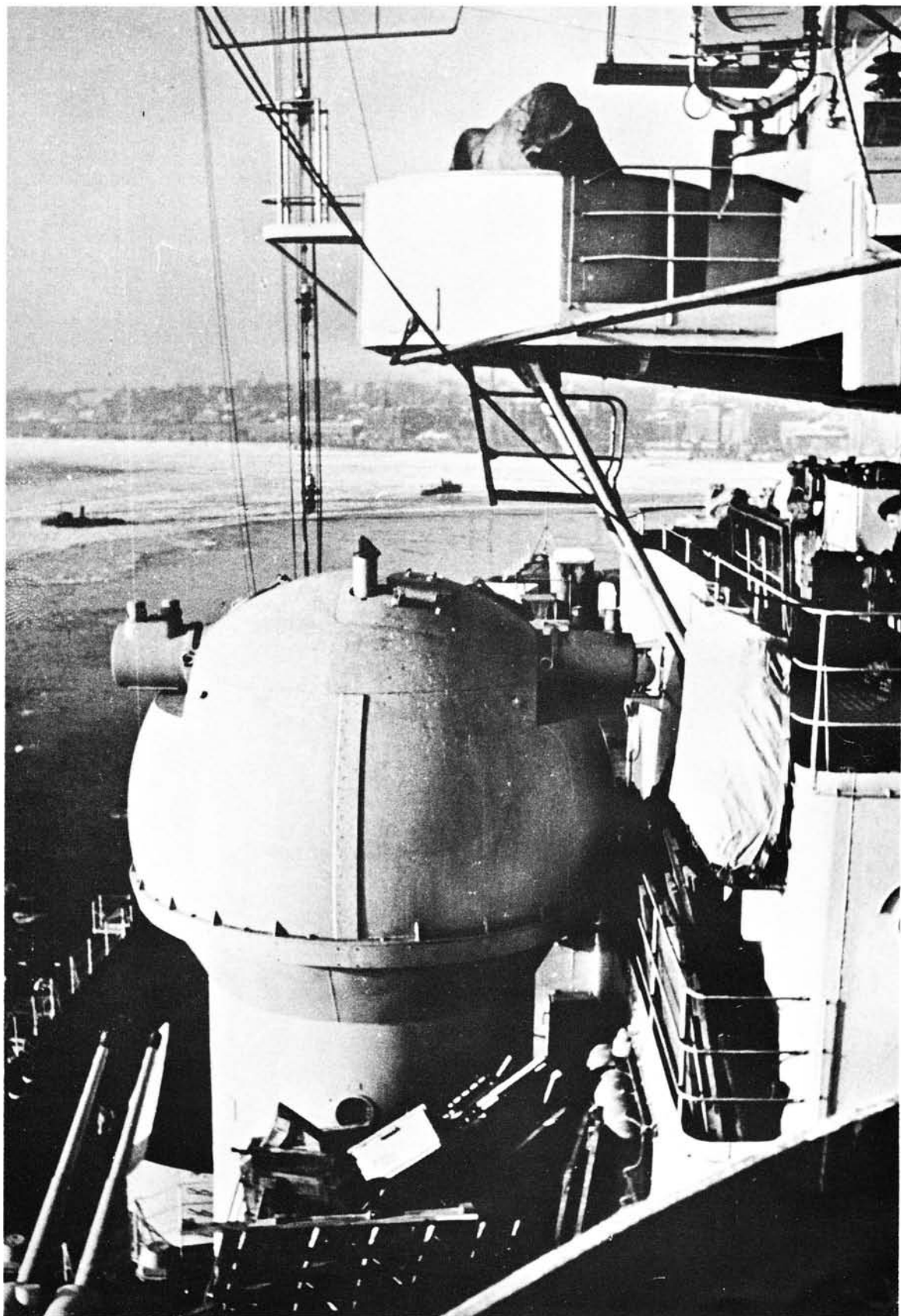


A and B turrets, the bridge and fighting top, port side: Hamburg 1940

(Author)

Fo'c'sle with command tower from outside the admiral's bridge. In addition, wings of bridges are visible. Note the assembly hatch for the instruments in the roof of the command tower and also armoured access door





Port night action range-finder sponson with access from below via climbing rungs. Above can be seen the port for'd anti-aircraft director enclosed by bullet-proof shield. Below left are the twin barrels of the 10.5cm anti-aircraft gun (Author)

consisted of two boilers each in the fore and aft compartment (IX and XI). Both these compartments were divided twice by longitudinal bulkheads so that only two boilers were in one room. Each set of turbines comprised a high, medium and low pressure, as well as a cruising turbine, which had differing speeds of rotation (at max. load 2825 for high and medium pressure, 2390 for low pressure and 4130 for cruising turbines) which were reduced by a gearing to 265 rpm.

The installation of the four turbines was arranged around the gearing which allowed a considerable shortening in the length of the engines. The three propellers were three-bladed and had a diameter of 4.85m. The 12 boilers delivered steam of 58 atmospheres at 450°C. The steam used at full speed amounted to 20.5kg for each HP per hour. The engine installation weighed 20.5kg for each HP. Initially the projected efficiency amounted to $3 \times 46,000 \text{HP} = 138,000 \text{HP}$, but in practice, thanks to a very careful approach by the builders to the measurement of efficiency and a stronger method of construction, amounted to 150,170HP, with a speed of 30.1 knots. The fuel used in various stages is given in the following chart:

Calculation of the total efficiency of the three shaft turbine installation with 12 boilers based on a test run displacement of 43,000 tons:

SHP	No. of boilers	Revs	Knots	Fuel used
3×46,000	12	265	29	325g/hp
3×38,350	12	250	—	320g/hp
3×23,300	9	214	—	335g/hp
Ahead				
3×13,000	6	176	—	370g/hp
3× 8,300	3	151	—	415g/hp
3× 5,000	3	128	—	500g/hp
Astern				
3×12,000	12	—	—	—

Fuel Supply The oil fuel carried amounted at designed waterline displacement to 3300cu.m, the max. supply 7900cu.m.

Operational Range The maximum fuel reserve allowed the ship an operational range of 8900 nautical miles at a speed of 17 knots or 9280 nautical miles at 16 knots.

Steering gear The steering gear comprised two balanced rudders connected in parallel, each with a surface of 24m², the steering gear being electrically driven. On the mainmast at the level of the foretop was a black, box-shaped rudder indicator which extended to the side and the back.

Mine protection MES (autoprotection-against-mines) equipment decreased the electro-magnetic field of the ship to such an extent that magnetic detonators would not explode when the ship came near. The cables for this ran along the outside of the hull and were protected from both the ravages of the sea and mechanical damage by semi-circular covers. These cableways lay supposedly on the underside of the side armour, and consequently under water.

Electrical supply Because of the need for high gunnery performance in battle, great demands were imposed for a constant and reliable supply of electrical energy. Accordingly, four electrical plants,

each with two 500kW diesel generators, were variously sited about the ship. In addition, there were 5×690kW turbo-generators and one 460kW turbo-generator with a 400kVA AC generator attached, specifically for the radio and fire control installations. This generator was supported by a 550kVA AC diesel generator. The total output in electrical energy amounted to 7910kW at 220V. An extensive supply provided both fresh and sea water, heating and ventilation as well as all the crew's requirements.

Building costs: *Bismarck*, 196.8 million Reichsmark; *Tirpitz*, 181.6 million Reichsmark.

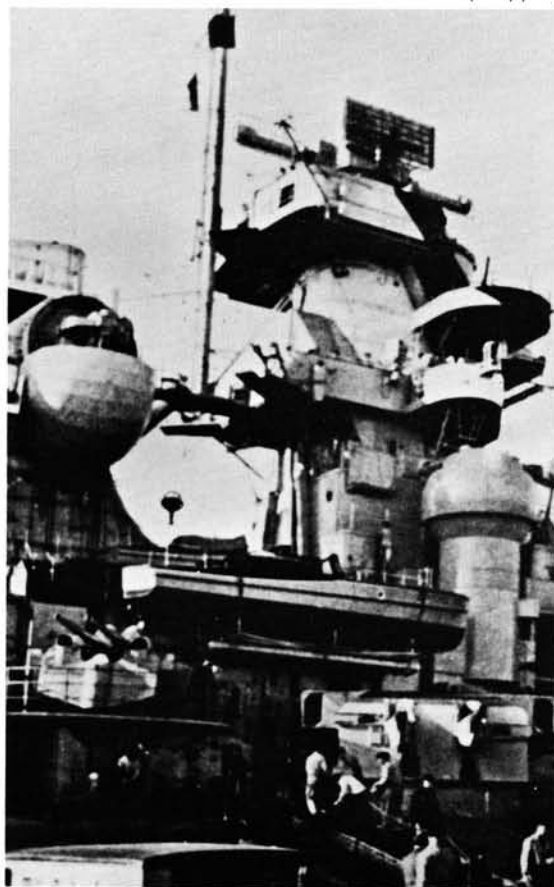
ARMAMENT

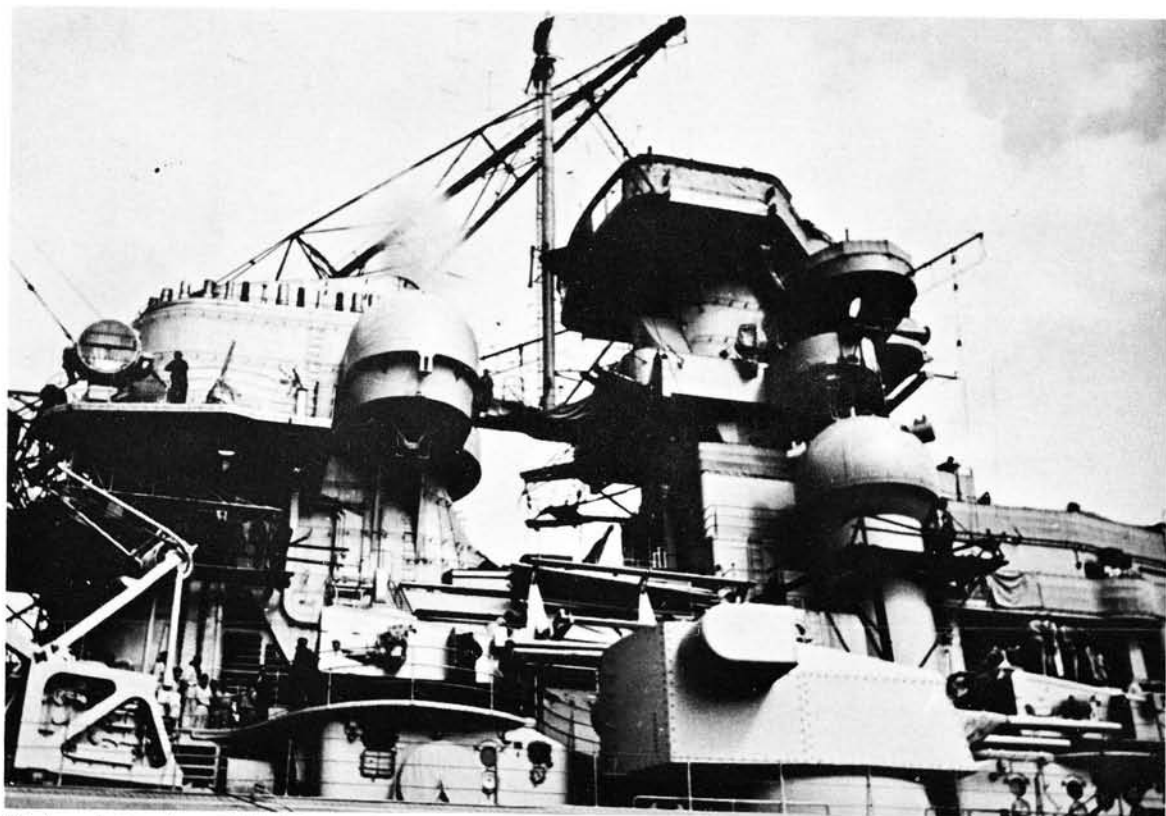
The following data applies to the *Bismarck*. Any differences are denoted in brackets, with *BS* for *Bismarck* and *TP* for *Tirpitz*.

Main Armament

Eight 38cm quick-firing guns, calibre L/47, C/1934 in turn-table mountings C/34. Maximum elevation 35°, maximum depression 8°. Maximum range 362hm. 840 normal, 960 maximum rounds, thus allowing 105 or 120 per barrel, consisting of shell primers and cordite charges. Because of the considerable weight of the shells, only a mechanical hoist could convey them from the magazines to the turret substructure. The magazines were situated

Midship section showing control tower with mattress radar aerial and range-finder trained on starboard beam (Drüppel)





Starboard side: the midship 15cm twin turret and boat crane. Numbers 1 and 2 10.5cm twin anti-aircraft guns. By the mast heel are the searchlight supports and anti-aircraft director platform (Author)

around the actual turret, the shells being on the middle and the charges on the upper platform deck. **Secondary Armament** Twelve 15cm quick-firing guns, calibre L/55, C/1928 in turntable mountings C/1934. Maximum elevation 35°, maximum depression 10°. Maximum range 230hm. Ammunition supply, 1800 rounds, thus 150 to each gun. The ammunition was stored on the upper platform deck in magazines, and, for the forward double turrets, forward of the for'd boiler room; for the middle turrets, between the two boiler rooms; and for the after turrets it was stored between the two engine rooms (Section VII).

Heavy anti-aircraft guns Sixteen 10.5cm quick-firing guns, calibre L/65 in twin mountings (*BS* forward four mountings C/31, aft four mountings C/33; *TP*: all mountings C/33. There were minor differences in the data transfer and remote control systems, so that in *BS* certain difficulties arose in the co-ordination of several mountings as one battery). Maximum elevation 80°, maximum depression 10°. Maximum range 180hm.

Ammunition supply: 6720 shells, equal to 420 each barrel. The ammunition was stored diagonally under the guns near the 15cm magazines and was brought up to the guns by vertical lifts and hoists. Ready-use lockers served immediate needs in the event of any alarm. The eight twin mountings were sited on the boat deck.

Medium anti-aircraft guns Sixteen 3.7cm quick-firing guns, calibre L/83, C/1930 in twin mountings in three axes C/30. Supply of ammunition was

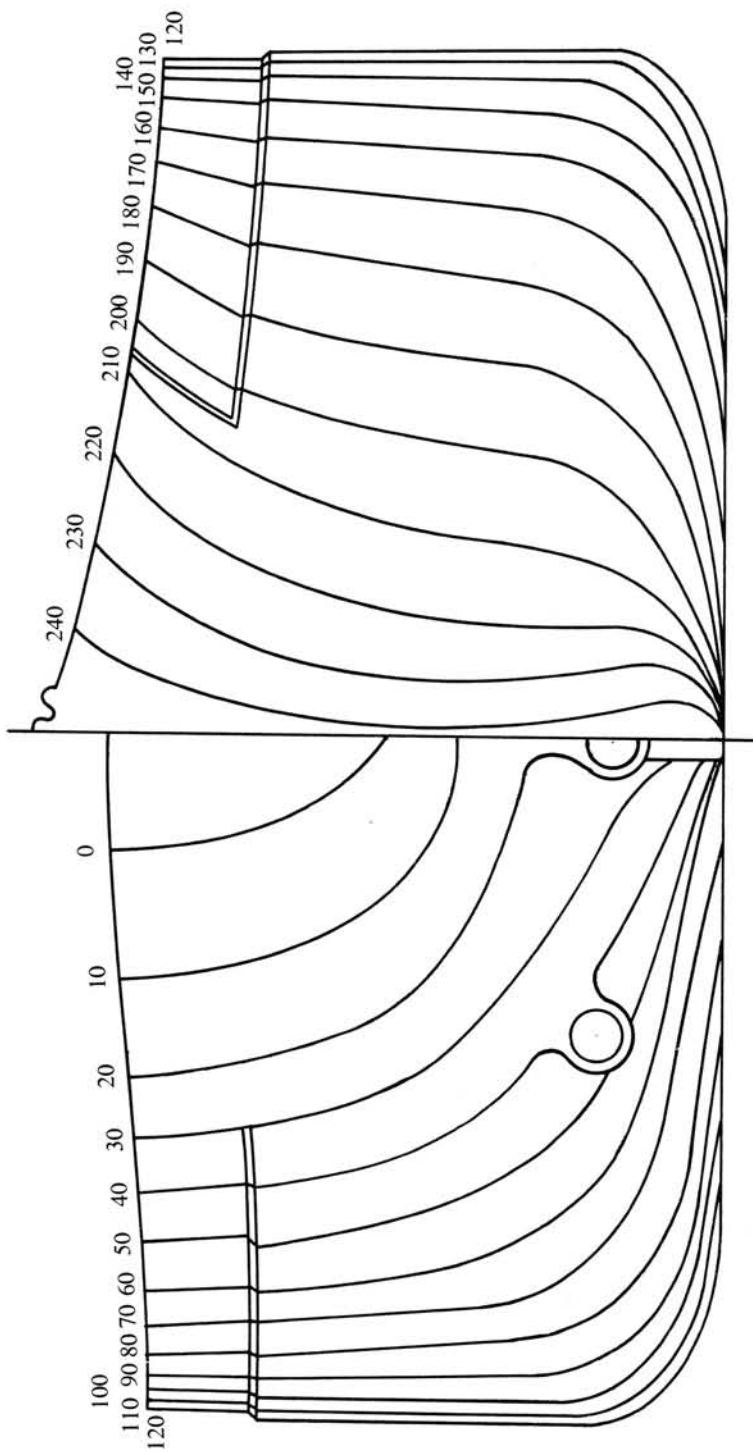
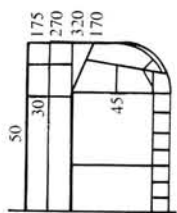
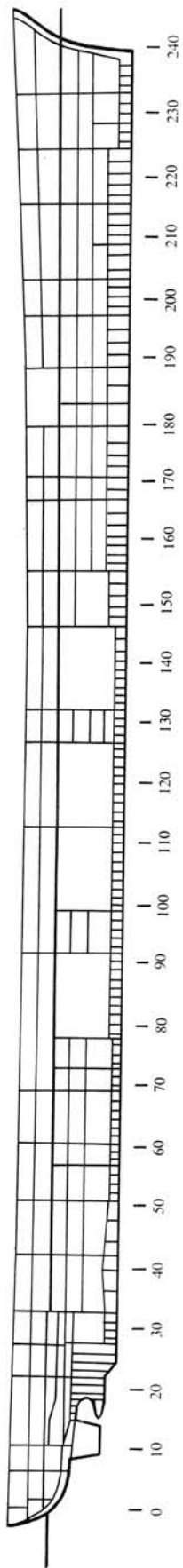
32,000, equal to 2000 for each gun. The mountings were sited on the superstructure deck and the bridge superstructure, as far as the foretop.

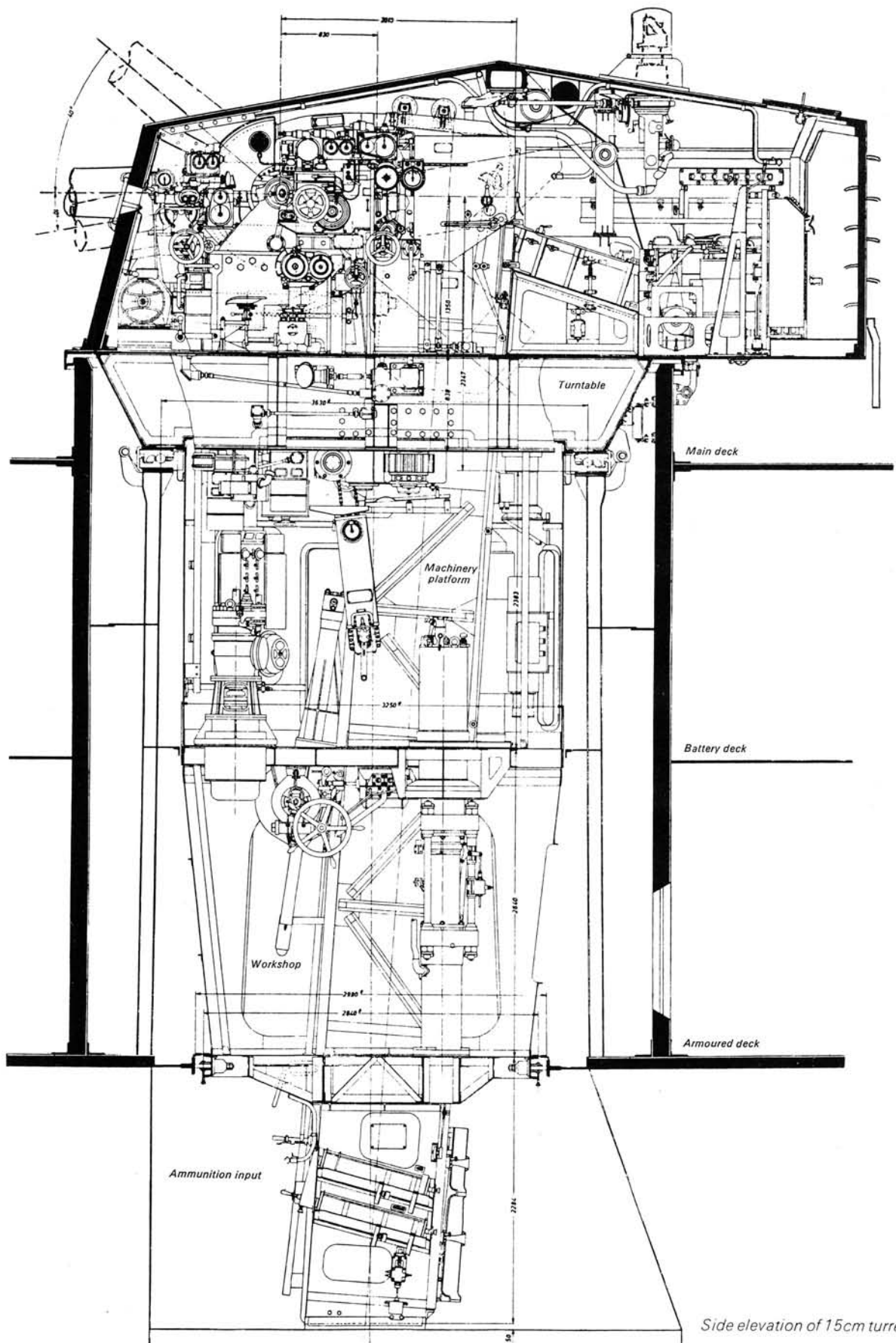
Light anti-aircraft guns Twelve 2cm machine-guns (MG C/30) singly mounted C/30 with 24,000 rounds, being 2000 per gun, mounted on the funnel and the superstructure. (*TP*: from 1942 constant increase from 16 to 58 guns in twin and quadruple turrets and an ammunition supply of 90,000 rounds; also quadruple units instead of searchlights with protective shutters on the funnel, the superimposed turrets and the forward bridge.)

Torpedo armament The *Bismarck* had no torpedo armament. (*TP*: from 1942, eight quadruple sets of deck mounted torpedo tubes, calibre 53.3cm with a total of 24 torpedoes. There was no torpedo control on the bridge, only a target director on the tube mountings.)

Gunnery Fire Control

Control of the main armament (38cm) and the secondary armament (15cm) was basically the same as, and very much resembled, the fire control of the main armament in the heavy cruisers (see *Warship Profile* No. 6, p. 128/129). Because of the two calibres, it was necessary to have three target directors at the disposal of both the forward and the after command posts, and four target directors in the foretop command post in order to be able to control both batteries separately at all times. Correspondingly, the number of computer centres

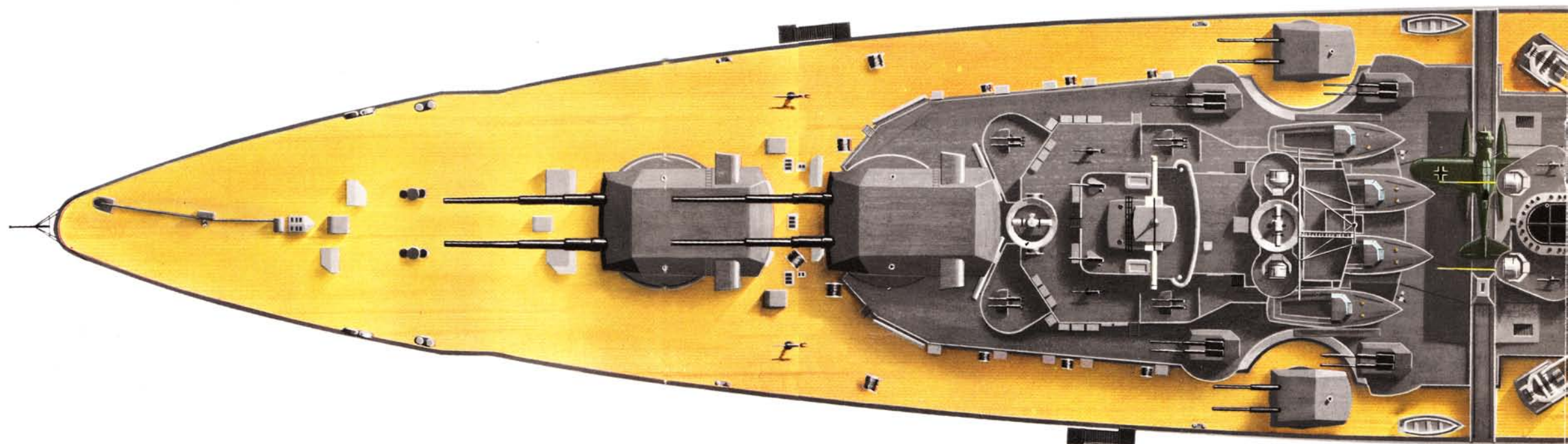
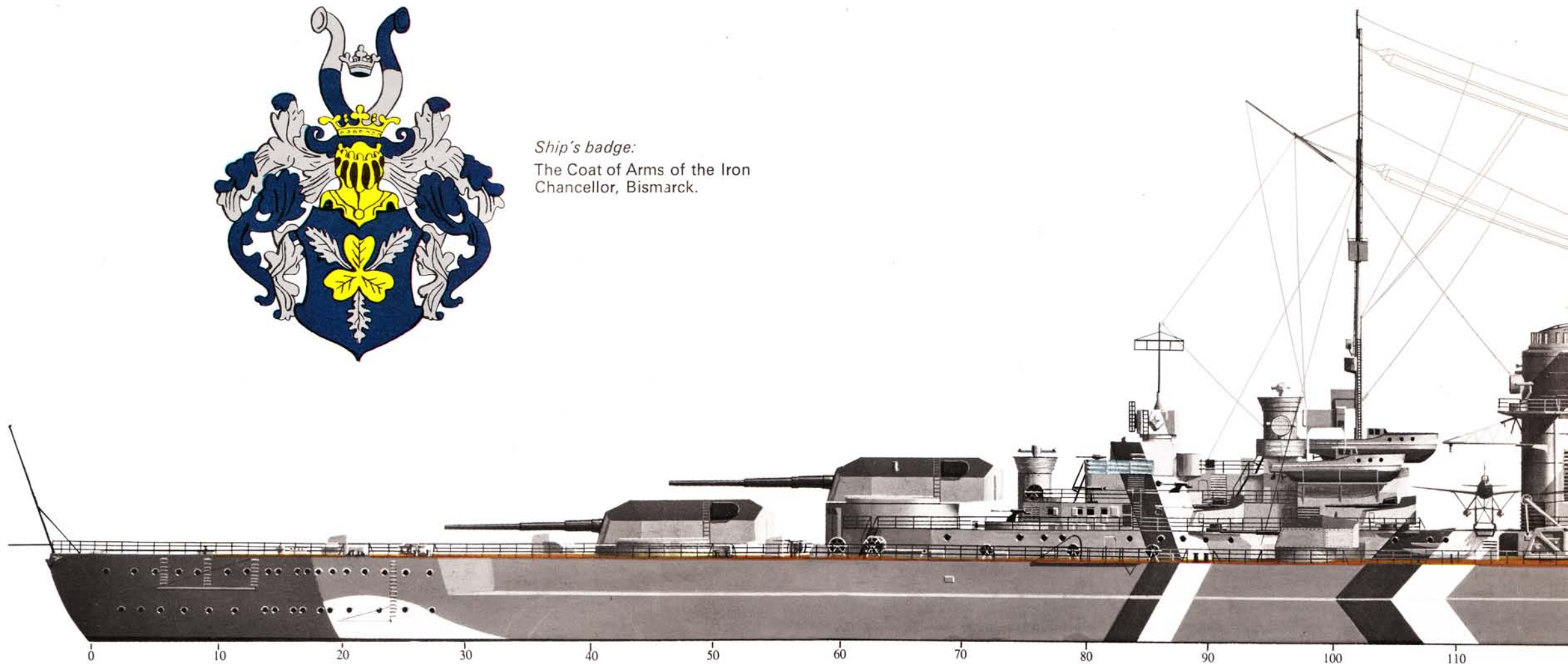




Side elevation of 15cm turret



Ship's badge:
The Coat of Arms of the Iron
Chancellor, Bismarck.



KM Bismarck, nucleus of the Third Reich's naval power during 1940/41, is shown in the camouflage she wore in early 1941.

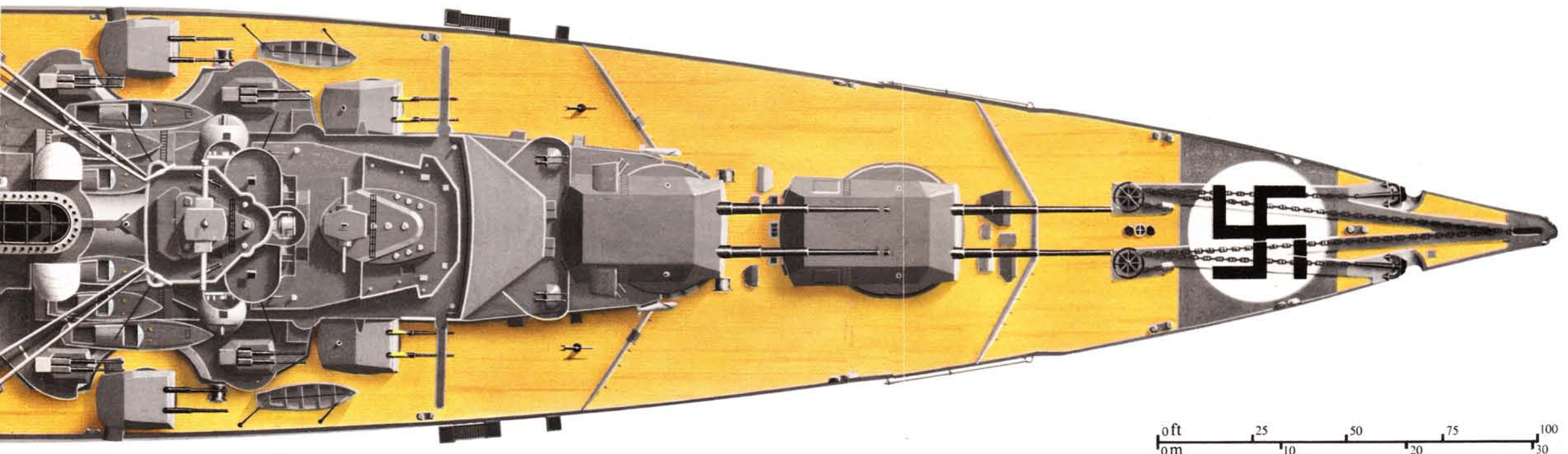
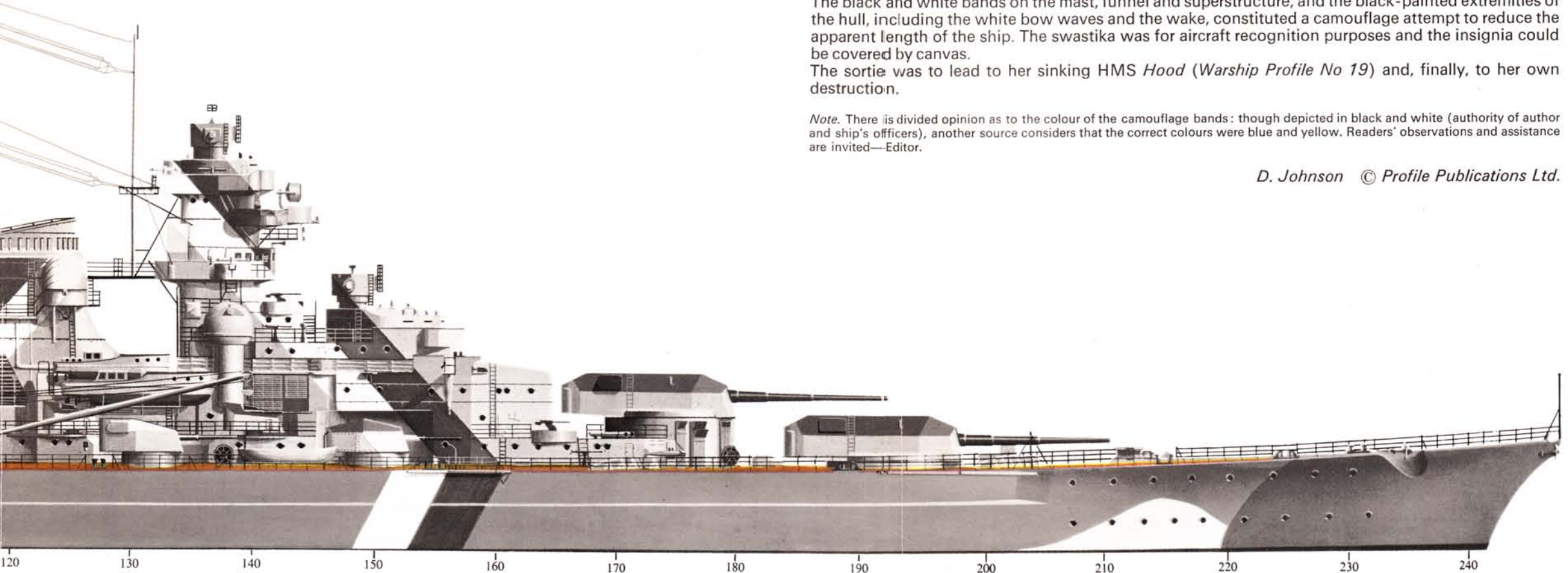
Immediately before putting to sea for the breakout with *Prinz Eugen* (*Warship Profile No 6*) into the Atlantic, she painted out her camouflage with the normal grey of German warships.

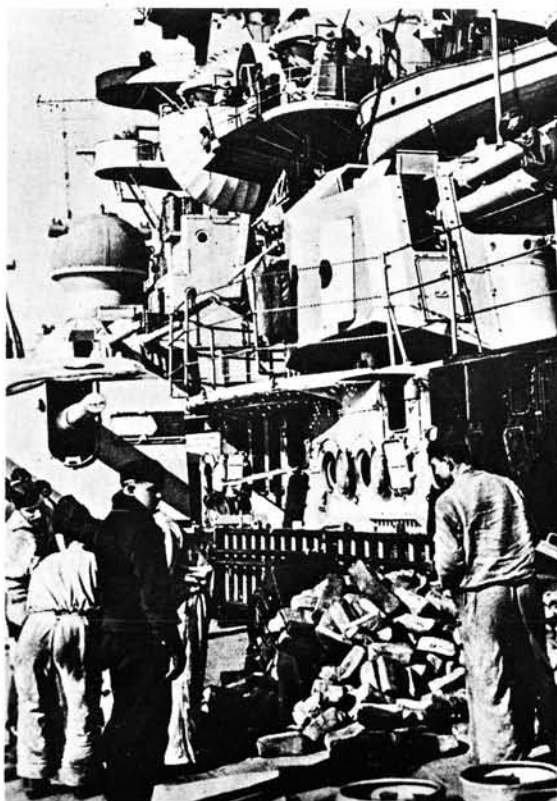
The black and white bands on the mast, funnel and superstructure, and the black-painted extremities of the hull, including the white bow waves and the wake, constituted a camouflage attempt to reduce the apparent length of the ship. The swastika was for aircraft recognition purposes and the insignia could be covered by canvas.

The sortie was to lead to her sinking HMS *Hood* (*Warship Profile No 19*) and, finally, to her own destruction.

Note. There is divided opinion as to the colour of the camouflage bands: though depicted in black and white (authority of author and ship's officers), another source considers that the correct colours were blue and yellow. Readers' observations and assistance are invited—Editor.

D. Johnson © Profile Publications Ltd.





The chores continue: the upper deck port-side amidships (Drüppel)

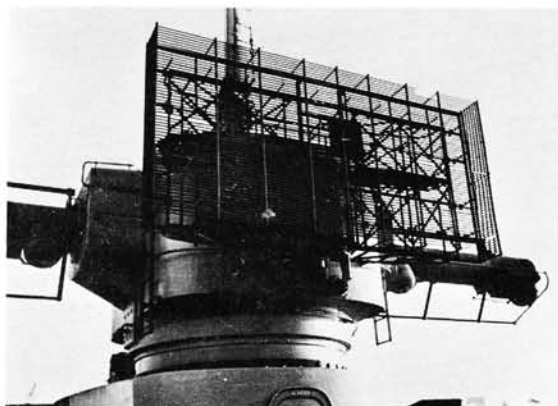
including computers C/38s was increased from two, as on the *Prinz Eugen*, to six. This made it possible to attack one target with each turret group.

In all, six night command posts and starshell control mechanisms for the 15cm and the 10.5cm guns completed the installation. There were auxiliary instruments in all posts and turrets. The directors were stabilised by two master stabilising units, as were the range finders in the 38cm turrets (originally in all four turrets, based on the experience of *Sharnhorst* and *Gneisenau* in the Arctic: taken off in turret A (base 10m) in the Autumn of 1940 or beginning of 1941); in the forward post (7m) and in the foretop and aft post (10m). Two 4m instruments on either side of the admiral's bridge served specifically for light combat. In combat the first gunnery officer exercised control in the foretop, where he commanded the main armament. The second gunnery officer controlled the secondary armament. In poor visibility, when batteries were divided, or when fighting on both sides, other officers helped out. Gunnery rangefinding was supported by radar installed in the three rotating cupolas. The range measurements were passed on to gunnery control by telephone.

At night the target was lit up for the gunnery officers with searchlights. The five searchlights were similarly sited as in the heavy cruisers; one on the forward side of the mast, two either side of the funnel and one behind each of these further aft. The two middle searchlights were protected in the day time by quarter spherical splinterproof shutters.

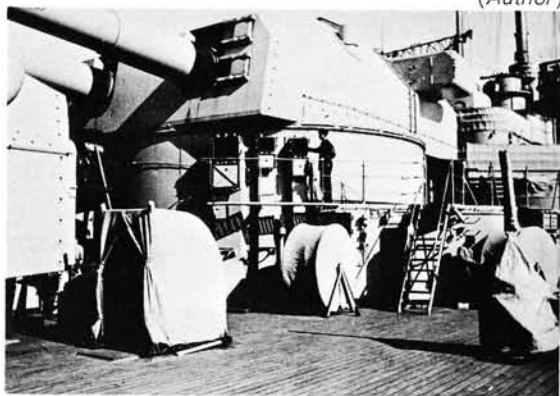
The after 15cm twin turret, after superstructure, searchlight and boat stowage. The recently installed 3.7cm guns are just visible on the sponson behind the group of men. Hamburg 1940 (Author)





Radar antennae mounted on the after-side of the revolving range-finder cupola. Hamburg 1940 (Author)

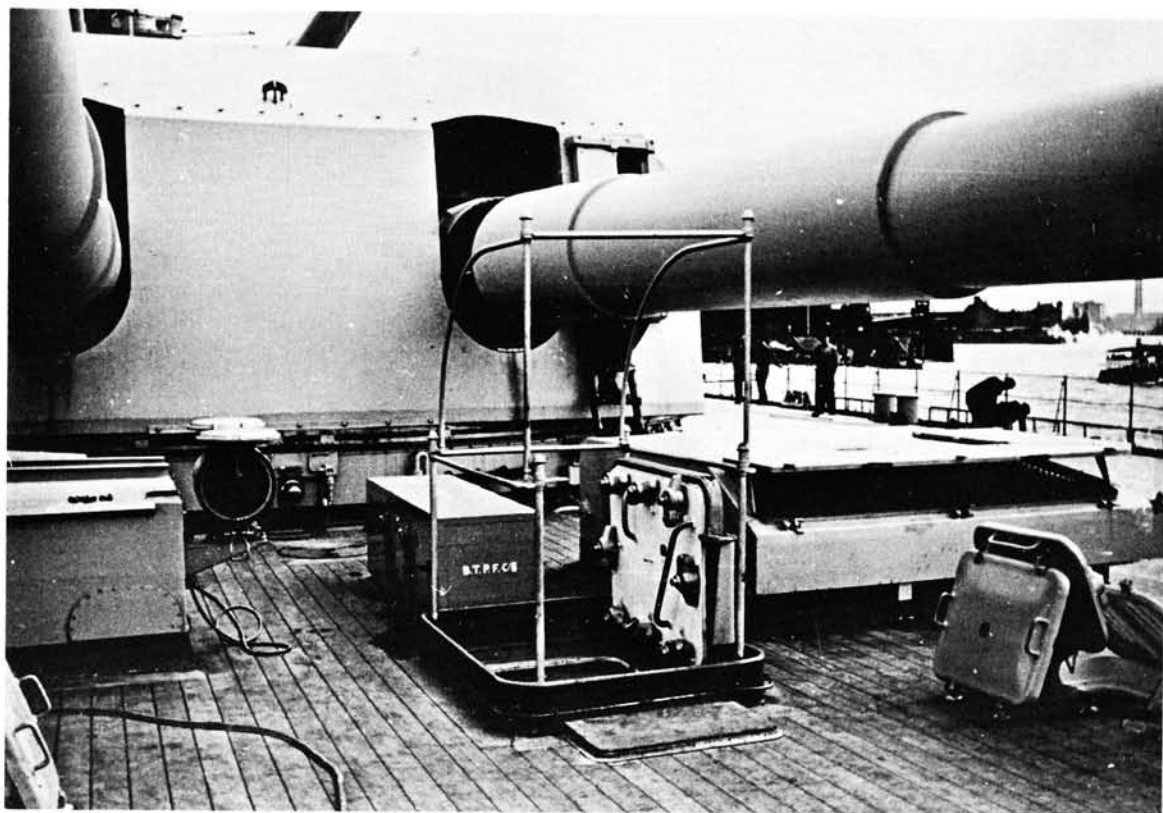
C turret: the covered hatchway to the battery deck is visible, as is also the 2cm machine gun. 1940, Hamburg (Author)

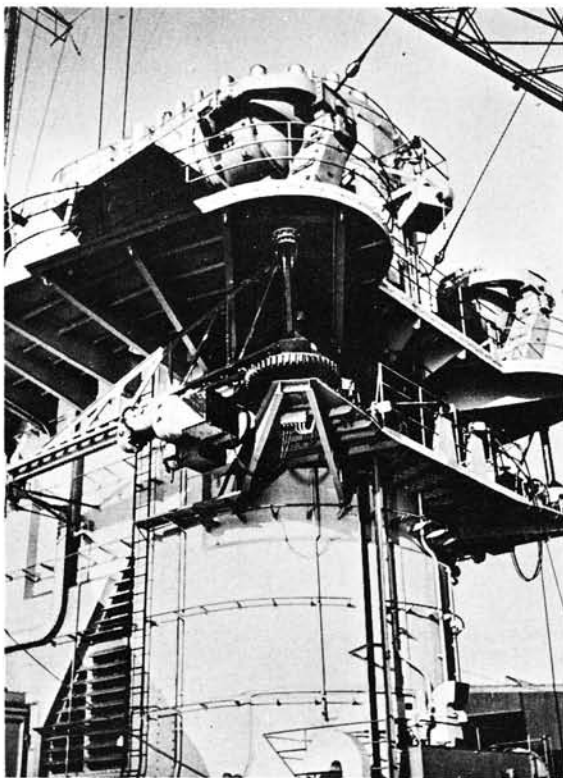


Anti-aircraft Gunnery and Fire Control

The anti-aircraft armament and instruments, as well as the whole combat organisation with target selection and co-ordination of the guns in the command posts, were the same as those in the *Prinz Eugen* (see *Warship Profile* No. 6, p. 130), as far as the major anti-aircraft operational control was concerned. The only difference was in that *Bismarck* and *Tirpitz* had 16, not 12, 10.5cm calibre guns. Similarly, in the *Prinz Eugen*, where both the forward spherical anti-aircraft command posts were missing, so in the *Bismarck* the two after command posts, plus the associated computer Reg VI were missing. The instruments were not installed so that the terms of delivery to the USSR could be kept at all costs, whereas in the *Prinz Eugen* the missing instruments (also including the equipment for the after target-directors for the 20.3cm guns) were installed immediately following the outbreak of war with the USSR: it was too late to carry out the corresponding measure for the *Bismarck*. The question must be asked today, whether the risk was justified in installing, in open control positions, the inferior replacement equipment which was stabilised only in height, in view of the fact that the aircraft torpedo hits so fateful to the *Bismarck* were scored by an attack from the stern. (TP was equipped in 1943 with radar on the third anti-aircraft control post, abaft, the mainmast.)

Below: D turret showing the uncovered hatchway between the guns, top of ventilator and loud-speaker on the turret barbette. Hamburg 1940 (Author)





Funnel with surrounding platform. Underneath is the drive to the gear-wheel of the boat crane and overhead gantry. Note the rear side of the searchlight, which is remotely controlled three dimensionally: elevation and depression—training and tilt. Hamburg 1940 (Author)

The Ship's Aircraft

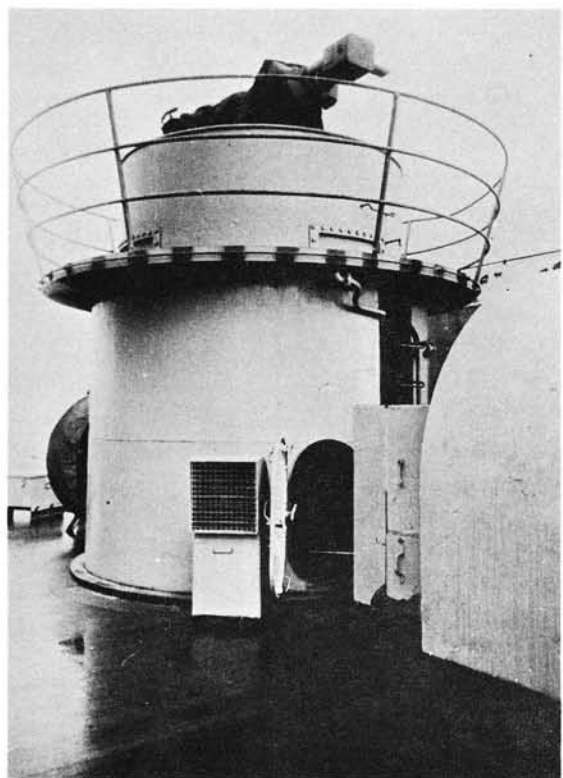
Changing views about the most favourable arrangement of the aircraft catapults were evidenced even in the plans. After originally relinquishing the aircraft hangars, whereby two catapults could have been installed with aircraft ready for take off, a decision was subsequently made in favour of a double catapult which could be used from both sides. In all, there were six aircraft of the Arado 196 type, of which one could be accommodated on either side of the funnel in one hangar, the other four in a hangar below the mainmast. As previously noted, there were differences between *Bismarck* and *Tirpitz*, namely in the details of the ships' cranes (balanced cranes and catheads) to lift the aircraft out of the water and to place them in the hangars or on the catapult. Because of this requirement, there were also slight differences in the siting of the two 10.5cm guns and the position of the boats.

The Ship's Boats

The *Bismarck* possessed three captain's gigs, four service boats, one motor launch, two motor pinnaces, two cutters, two dinghies and two lighters for outboard work. In addition there were the life-rafts.

Ship's Company

The crew totalled 1962 men of all ranks. The ship was fitted out for a further 27 men and was equipped to accommodate a Naval Staff of 103. The crew of



The after anti-aircraft emergency control position protected by bullet-proof shield. Hamburg 1940 (Author)

the *Tirpitz* increased during the course of the war to almost 2500 men because of the strengthened anti-aircraft defences.

Ship's Colouring

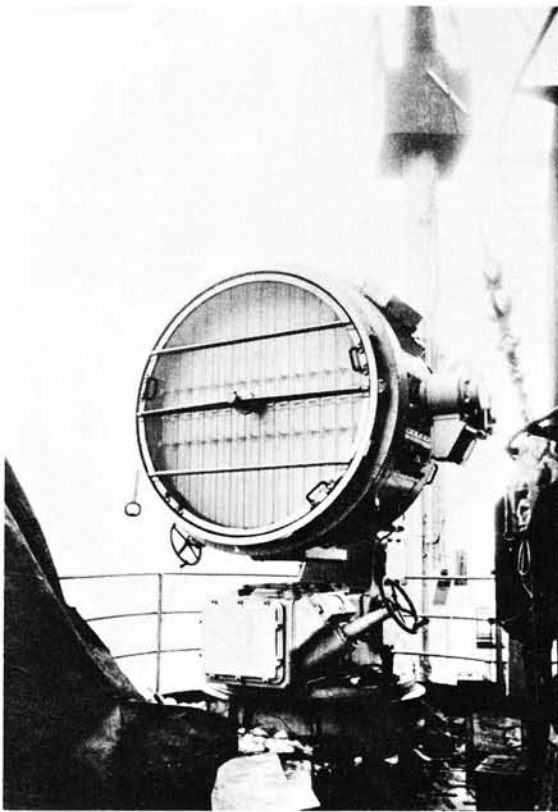
During the work-up period in the Baltic from April 1941 until leaving the Grimstad-Fjord on 22 May 1941, the *Bismarck* carried three black and white zig-zagged camouflage stripes designed to make it harder for the ship's position to be estimated but during the subsequent sortie the ship was again painted normally. The funnel top was always silver in colour, whereas in *Tirpitz* it was black initially, before adopting normal camouflage later in Norway.

Manoeuvrability

Both ships manoeuvred excellently and rode well, despite their beam. This was because of the damping effect of the weight (side armour) far removed from the rolling axis. Pitching movements were slight and the ship heeled very little when the rudder was hard over because of her great beam. Consequently both ships were ideal weapon platforms. During trials, the ships were very hard to steer with the propellers, which was not surprising as the lever arm of the external propellers was small relative to the ship's beam.

The Life of the Battleship 'Bismarck'

The ship's real life began when she was commissioned on 24 August 1940. The first months followed the usual course of events for all new ships. After a



Front view of the three axes searchlight. Note the box-like structure on the mainmast with the pointer of the rudder indicator showing hard-a-starboard (side sketch). Hamburg 1940 (Author)

Admiral Lütjens

(Author)



short training period, which principally served to accustom the crew with their new ship, there was a very extensive trials period; very extensive, because *BS* was the type-ship of a new Class.

The ship trials command and the various trials commands for gunnery, torpedoes and the communications systems, put the ship through rigorous tests in order to determine the technical quality and fulfilment of all delivery conditions and to give instructions on the best tactical application of the ship and her equipment.

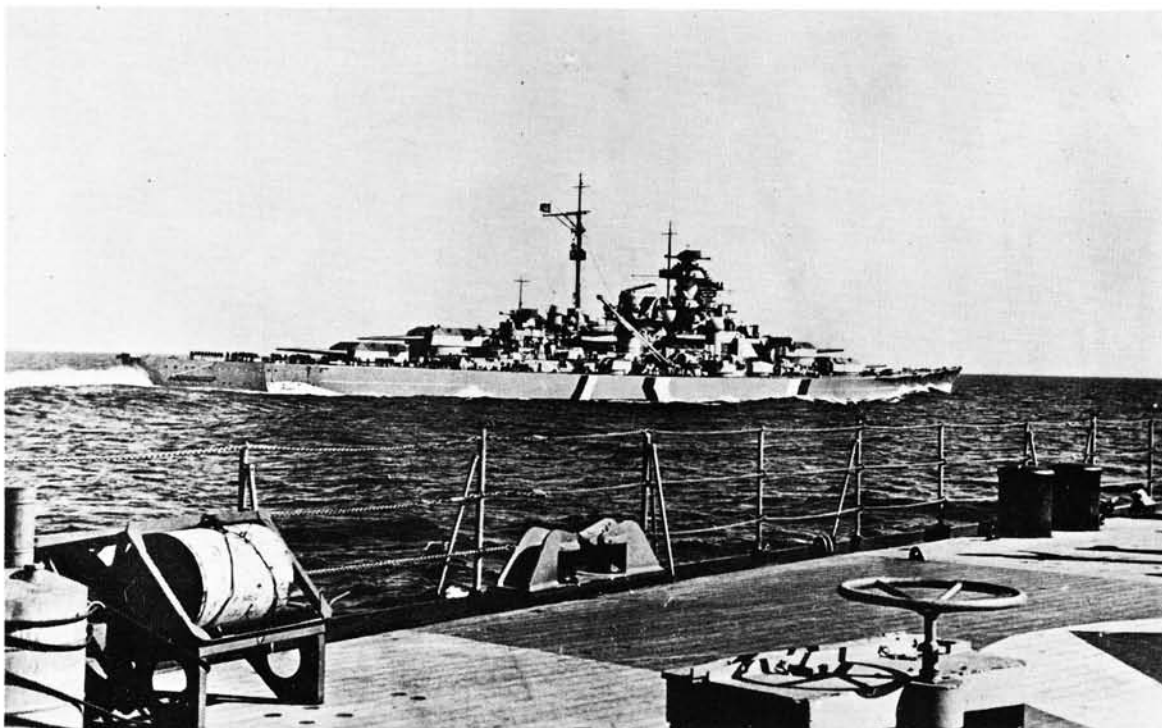
After this, from about the middle of March 1941, the real training started and continued, for some days in April, with the *Prinz Eugen*; the training was then stepped up from the beginning of May. The two ships went on joint training exercises for the commanders and officers of the watch, as well as for the W/T communications personnel. The ships took turns to represent the enemy in exercises and also practised towing and fuelling at sea.

Offensive Staff Planning

In the meantime, the Naval Command prepared the sortie, which was code-named '*Rheinübung*', and planned the offensive sweep of the battle group, comprising *Bismarck* and *Prinz Eugen*, into the Atlantic against the convoy routes to Great Britain. To this end, a network of supply ships and reconnaissance craft was set up in the North Atlantic and the European Arctic Sea. At a predetermined time, the battleship *Gneisenau* was to strike out from Brest to join the battle group but the ship was damaged by bombs. The sortie was deferred by magnetic mine damage to the *Prinz Eugen*. In May, the Naval Staff, under the leadership of the Commander-in-Chief of the Fleet, Admiral Lütjens, embarked on *BS* and joined in the last part of the battle training. On 16 May the C-in-C announced the future battle group ready for the '*Rheinübung*'.

Leaving Harbour

On Sunday 18 May, both ships left Gotenhafen, the Polish Gdynia, which in German times had earlier been called Gdingen, and had borne the German name Gotenhafen since 1939. The afternoon served once more as training for the ship's Command in station-keeping. *Prinz Eugen* then cruised to the west, while *BS* did not leave the waters of Gotenhafen until nightfall. Next day, off Cape Arkona, she was to rendezvous with three destroyers and her comrade-in-arms, so very similar and often to be referred to as *little brother*. The cruise continued to the west and north, led up the Great Belt and the Kattegat, and always covered during the day by barrier-breaking vessels and aircraft. At 1600 on 20 May, the gap in the minefield east of Cape Skagen was cleared, and in the night that of Kristiansand-Süd. Depending on the air situation and submarine danger, both watches were at action stations or else the anti-aircraft team were closed up. Early on Wednesday 21 May, the formation entered the Norwegian fjords and *BS* anchored in Grimstad fjord south of Bergen. There the aerial photographic reconnaissances taken in the morning over Scapa Flow were shown to the C-in-C. At 1315 a Spitfire flew over the whole Bergen area and photo-



Bismarck seen from Prinz Eugen during the training period, May 1941

(Author)

graphed the ships, without the aircraft itself being spotted. At 2000 the formation gathered outside Kalvenesbucht in order to leave the fjords to the north, while Bergen and the surrounding area was lit up by incendiaries and under attack from high explosive bombs.

Break Out

On the next day, the destroyers left the formation as planned while the two big ships steered a northerly course at high speed to rendezvous with a tanker. The C-in-C broke the monotony of the day with an air and submarine alarm practice. Because of the reconnaissance reports and the weather conditions, the C-in-C abandoned his intention to refuel and continually altered his course in the Denmark Straits, the straits between Greenland and Iceland which were half-closed by ice on the northern side. Visibility was at times very poor so that *Prinz Eugen* found it difficult not to lose her *big brother*. In the dusk of the short night *BS* showed a searchlight to help the following ship.

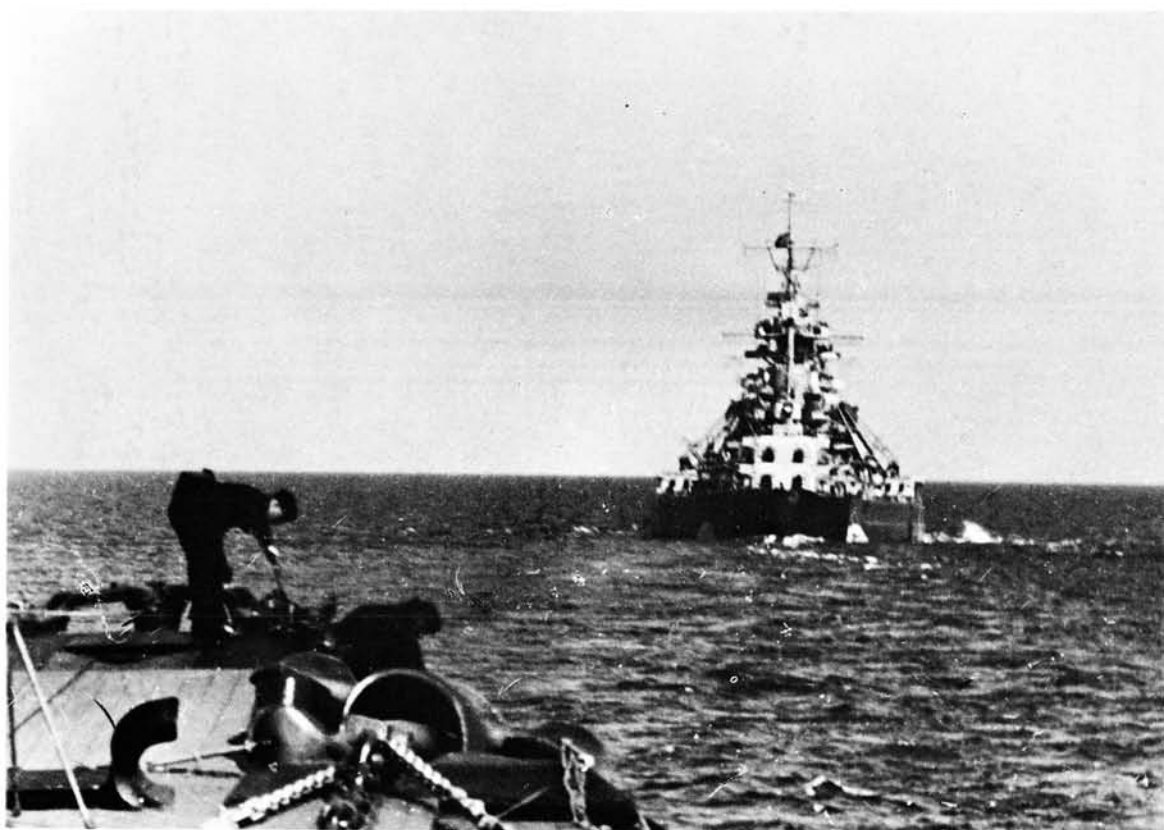
At midday, the battle group was about 75 nautical miles to the north of Iceland's northern coast which was invisible, not because of the distance but principally because of the thick mist hanging over the open water. The stretches of good visibility between pack ice and mist were only a few miles wide. In the mist to the south, the two heavy British cruisers which were to report on and follow the German formation were now on patrol; the first sighting was by HMS *Suffolk* at 1911. The *Suffolk* could be glimpsed only as a shadow but she was identified as a cruiser of the County class before she was again swallowed up by the mist.

At 2010 *BS* opened fire on a second heavy cruiser who could be identified with moderate certainty as HMS *Norfolk*. The five salvos were ineffectual though in *BS* the radar on the foretop broke down: *PE* was ordered to take the lead so as to be able to reconnoitre with her radar.

For a long time, each alteration of course of the German ships was clearly known by the two cruisers and reported home by radio. However, one can be sure that the British Admiralty did not receive the decoded messages before the German Commanders, for the German radio observation service operated almost perfectly. It was known also by the German Command that the cruisers had lost contact for over two hours, because during that time the contact signal stopped. When the radar contact was re-established, it caused no surprise on the German side because the course could not really be altered.

Bismarck, protected by a mine-sweeper, crossing the German mine barrage east of Skagen
(Author)





Bismarck from aft: preparing to fuel from Prinz Eugen

(Author)



Off Bismarck's port quarter. The Norwegian fjords loom up ahead

(Author)

Below : In foggy weather. The officer of the watch is in the background, while a merchant captain, as a possible prize captain, is looking out (Prinz Eugen)

(Author)



Making a landfall off Norway

(Author)





Off Bergen: Bismarck passes Prinz Eugen (Author)



Bismarck dips into the Atlantic swell (Author)

An Historic Day

At 0535 hours on that memorable day—24 May 1941—the listening post in the *PE* reported the 'sound of two fast running turbine ships', a report that was immediately passed on to *BS*—the first report of the newly appeared enemy, which later transpired to be HMS *Hood* and a ship of the *King George V* class. At 0553 *Hood* opened fire on *Prinz Eugen* under the mistaken impression that she was the German flagship that lay ahead. The *Prince of Wales* fired at *BS*, which action divided the German battleship's battery. The main armament fired at *Hood*, the port 15cm battery at *PoW*. *PE* scored the first hit on the *Hood*, who was also hit in the stern by the fifth salvo from the *BS*, and at 0601 the *Hood* exploded. With her bows high out of the water, she sank in a remarkably short time, taking with her all but three of the crew.

The *Prince of Wales* suffered heavily under the now concentrated fire of 8×38cm, 8×20.3cm, 6×15cm and at times 6×10.5cm guns. It was clear that the ship's Command no longer had control, and that the heavy guns were to a great extent out of action. Yet mindful of his orders, Admiral Lütjens did not pursue his stricken enemy, but continued his southerly course, though not without his own problems for the *Bismarck* had suffered three hits, all from the *Prince of Wales*.

Early Damage

One hit was far in the bows which rendered inaccessible approximately 1000 tons of fuel and later caused difficulties because of the bows cutting deeper into the water; another hit on the side armour against the torpedo bulkhead which sprang a leak and in the course of the day put a generator out of commission, with a corresponding loss of electrical power, in addition to flooding a boiler room which subsequently reduced her top speed by two knots. The third hit destroyed a boat. Under the pressure of this damage to his flagship, Lütjens decided to release *Prinz Eugen* to continue the war on the convoy routes, but he himself would proceed to St Nazaire for repairs.

This decision was preceded by the intention to shake off the pursuers by drawing them south-west over a line of U-boats, the codeword for this separation being 'Hood'. The oil slick left by the *Bismarck* was easy both to see and to smell. So it was evident

to those in *Bismarck* that it would be very difficult to shake off their pursuers. The Naval Staff was also obviously surprised at the British radar. So the sorely troubled *Bismarck* continued the cruise and attempted to disengage from the *Prinz Eugen* for the first time at about 1540. In doing so, *Bismarck* encountered a heavy cruiser. There was a short exchange, after which the first attempt was abandoned, to be repeated at about 1814.

Break-away

Prinz Eugen was in the meantime instructed, on receipt of the codeword, to maintain course and speed for at least three hours, in order to facilitate the *Bismarck's* separation. Whilst contact with *Prinz Eugen* was soon broken, *Norfolk*, *Suffolk* and *Prince of Wales* maintained contact with *Bismarck* almost uninterruptedly, and so brought up the aircraft-carrier *Victorious*, whose nine Swordfish torpedo aircraft, accompanied by six covering Fulmar aircraft, three times attacked the *Bismarck* and with 18 torpedoes scored one hit. This explosion did not however, have any serious repercussions.

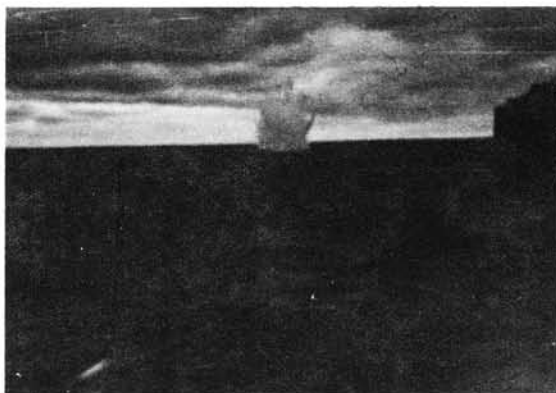
Fatal Errors

In the hours following and, to some extent, during Sunday 25 May, *Bismarck* succeeded in shaking off her followers. Presumably, because the ship described a great curve to the west and then continued north, she could cross the course of her pursuers, but *behind* them. Yet, for some inexplicable reason, *Bismarck* was not aware of her success: at 0942 *Bismarck* transmitted a long radio message about the action on the previous day. The bearings of this W/T transmission enabled the enemy to fix the *Bismarck's* position precisely. Yet the British Admiralty did not signal the bearings themselves, but the direction of the radio beams. Through an error in *King George V*, one of these radio beams was incorrectly evaluated. The false bearing thus obtained was given to all ships and served as a basis for the continuation of the hunt for the *Bismarck*.

The Hunt

In consequence, the majority of the ships steamed in the wrong direction, until the mistake was discovered in the afternoon and the courses corrected from 1810. In the meantime, further efforts were made in *Bismarck* to overcome the damage resulting from the hit in the bows.

On the next day, Monday 26 May, at about 1030, a Catalina seaplane which had started from Northern Ireland sighted *Bismarck* through a gap in the clouds. After this, from 1154, aircraft from the carrier *Ark Royal* maintained contact with the *Bismarck* until nightfall. It was thus an easy task



Hood's shell splashes on port-side, forward, of Prinz Eugen, as observed also by Prinz Eugen's Second Gunnery Officer, Kapitän leutnant Paul Schmalenbach (author of this Profile)
(Author)



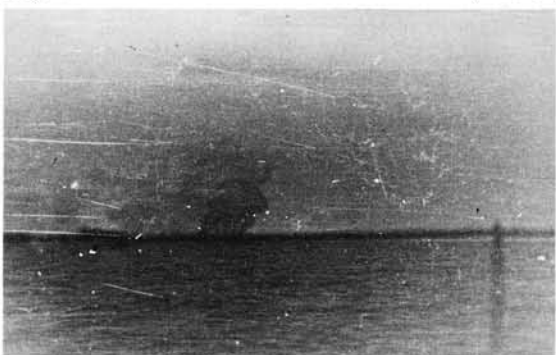
Another photograph taken from Prinz Eugen of Bismarck's broadside: her for'd turrets are trained well abaft the port beam
(Author)



Bismarck opens fire on Hood, as seen astern of Prinz Eugen
(Author)



Action photograph of Prince of Wales and Hood making smoke. Note the fall of shot at right
(Author)



Action photograph of the battle against HMS Hood and HMS Prince of Wales
(Author)

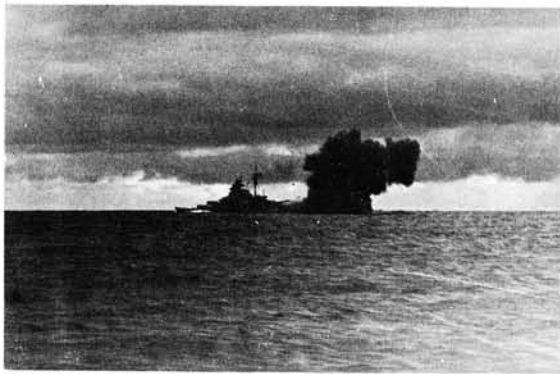
Bismarck opens fire, as seen from Prinz Eugen. Note Hood's shell splash at right of photograph
(Author)



Bismarck's broadside
(Author)

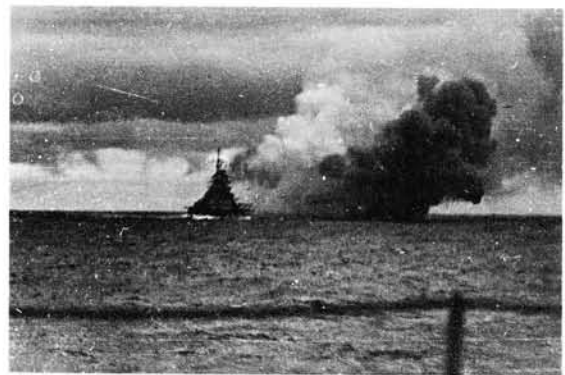
One of Prince of Wales' shells splashes between Bismarck and Prinz Eugen
(Author)





Another broadside from Bismarck

(Author)



Bismarck opens fire with her main armament. Photograph taken from Prinz Eugen

(Author)



HMS Hood and HMS Prince of Wales on the horizon

(Author)

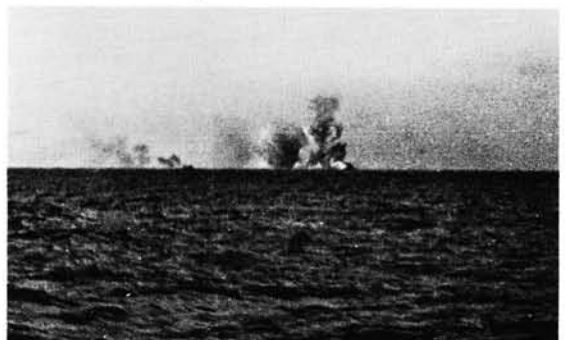
Another view of the enemy

(Author)



The flash from Bismarck's broadside

(Author)



HMS Hood blows up

for the British Commander-in-Chief, Admiral Tovey, to concentrate his forces but the heavy units could not reach the position until the next morning. There was therefore the danger that *Bismarck* could steam sufficiently near to the French west coast to come under the protection of the German Luftwaffe. It was therefore vital to slow down the *Bismarck*.

Last Chance of Escape

Two possibilities were open to the British and both were used to advantage: first, the torpedo bombers of the *Ark Royal*, and, second, the four British, and one Polish, destroyers force, under the command of Captain Vian in *Cossack* (see *Warship Profile* No. 2). The first attack by the *Swordfish* was a failure, for it was directed mistakenly at HMS *Sheffield* who was also fired on by the *Bismarck*. The second attack, when the aircraft were directed

by the *Sheffield*, had the desired effect, but in a manner hardly expected.

Lethal Damage

At 2103 a torpedo hit *Bismarck*'s stern and damaged her steering gear to such an extent that both rudders were jammed at 15° to port and could not be moved. Shortly afterwards, Admiral Lütjens reported in a radio message that the *Bismarck* was unmanoeuvrable. Despite the gale and the heavy seas, everything imaginable was done aboard *Bismarck* to restore the steering. Yet, more serious than any other factor was the weather that thwarted progress. The struggle was continued during the dusk and throughout the destroyer attacks, which produced no effect on the *Bismarck* and left the destroyers barely touched. What is noteworthy is that the *Bismarck*'s action against the destroyers was supported by radar, the first action of its kind.

The Trap Closes

Tuesday 27 May was to see the end of the hunt. At 0625 the *Bismarck* reported the situation unchanged and the wind strength eight to nine. At 0710 Lütjens requested a U-boat for the security of his war-diary. The German Naval Chief was therefore aware of the approaching end. For the sake of historical truth, he felt he had to preserve his decisions and their motivation for posterity: it was inevitable that the end of the hunt would come soon after.

At 0815 the *Norfolk* sighted *Bismarck* and led the *Rodney* and *King George V* to her, when they opened fire at 0847. *Bismarck* fired with the third salvo straddling the *Rodney*, but, because she was out of control, she could only occasionally co-ordinate her guns against one or other adversary.

Overwhelmed

One of the first hits on *Bismarck* destroyed her foretop. Thus the command of the main, secondary and anti-aircraft armament, as well as the most important officers, were wiped out. At about 0902 direct hits destroyed both the forward 38cm turrets, A and B. At 0912 the forward post was knocked out, at 0918 the after revolving cupola. At 0940, *Dorsetshire* joined in the action and *Norfolk* five minutes later.

A direct hit put the aftermost heavy turret out of action, so that now only C turret and some 15cm turrets returned the fire. Towards 1000 the main armament and, at about 1015, the secondary armament also petered out, all ammunition being used up. At the end, the range amounted to only about 6000 metres. Contrary to British public announcements, American reports told of severe damage to the *Rodney* who subsequently had to go to the shipyard in Boston, Mass.

The End

At about 1000, orders were given in *Bismarck* to prepare to scuttle the ship. A little later the command was given to lay the explosive charges (with a burning time of 9 minutes) and to open the

Kingston valves, as well as to abandon ship, orders, which despite the chaotic conditions on board, appeared to have been carried out in an exemplary fashion. At 1020 *Dorsetshire* fired two torpedoes and, at about 1030, another torpedo into the already sinking ship who at 1036 heeled over. The *Dorsetshire* saved 85 of the *Bismarck*'s crew, the destroyer, *Maori*, 25; the German U-boat, *U-74*, brought five survivors home and the weather ship, *Sachsenwald*, three.

British Adversaries

Active participants in *Bismarck*'s destruction were the battleships *Prince of Wales*, *King George V* and *Rodney*, in addition to the battle cruiser *Renown*, the aircraft-carriers *Victorious* and *Ark Royal*, the heavy cruisers *Suffolk*, *Norfolk* and *Dorsetshire*, the light cruiser *Sheffield*, as well as the destroyers *Maori*, *Cossack*, *Zulu*, *Sikh* and the Polish destroyer, *Piorun*. Three other battleships, five light cruisers and 14 destroyers also participated in the hunt.

The Effects of the Sinking of the Bismarck

When considering the effects that the sinking of the battleship produced on the German Naval Command, the consequences fall into two distinct groups:

- a first group with immediate consequences of a more tactical nature and
- a second group of strategic character.

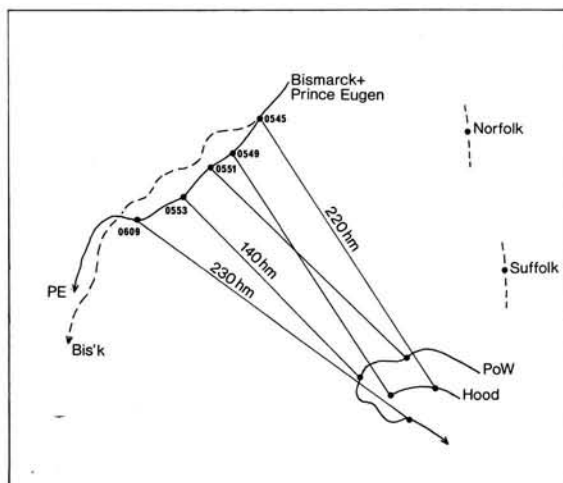
The immediate consequence for the Royal Navy was the clearing of the whole North Atlantic of German back-up and supply ships. Within a few days—partly aided by betrayal—the whole organisation, which had been set up with heavy ships for the trade war and which had been proved in collaboration with the *Scharnhorst*, *Gneisenau* and *Admiral Hipper*, was wiped out. However, as these supply ships were regarded by the British as the absolute pre-requisite for further German activity, they were destroyed by every possible means.

Thus the supplies for battleships and cruisers were eliminated, not just for a matter of weeks or months, but for the rest of the war. The German Naval Command took some time to recognise the basically changed position in the Atlantic. Further plans were still being made and more work was still being carried out to build up a similar supply organisation, in case it proved possible to send the battleships *Scharnhorst* and *Gneisenau* and the heavy cruiser *Prinz Eugen*, who were lying in Brest, into the Atlantic. There they would join up with the *Bismarck*'s sister ship *Tirpitz* and the pocket battleships *Admiral Scheer* and *Lützow* (ex *Deutschland*), circumstances permitting.

Catastrophic Effect on German Sea Power

Yet the German Naval Command could not resign itself to the bitter realisation that, with the increasing air-threat over all parts of the North and Middle Atlantic, attacks by surface forces against allied convoys could no longer be carried out with any hope of success. Logically, the conclusion was to move the ships from Brest to elsewhere where they could be better used. The removal to Norway was the result and this was the strategic conse-

Track diagram of the action between the *Bismarck* and *Hood* squadrons, 24 May 1941 (Author)



quence of the sinking of the *Bismarck*, a conclusion which should have been drawn a year earlier, before the loss of the *Bismarck*.

The Home Fleet, stationed in Scapa Flow, lay at the focus of a semi-circle along which every German ship from Southern Norway to Northern Iceland had to pass to reach the Atlantic. Consequently, each German ship had to steam about three times as far, if this semi-circle was compared with the radius determined by the distance from Scapa Flow to the position where the *Hood* sank.

In the last analysis, through the eventual tracking down of the German ships, the venture must end with the destruction of all German units. That the Royal Navy had to 'pay' first with the *Hood*, and that the cruiser *Prinz Eugen* survived, are circumstances which are not discussed further here. *Hood's* death throes only lasted perhaps as many minutes as the *Bismarck's* did hours. Both ships were the pride of their navies. Both ships fought bravely.

The battle on 24 May 1941 was the last battle between heavy units in which the Luftwaffe had not been directly involved. Yet the torpedo hits on *Bismarck*, scored by an aircraft, may have served as the indication that the character of naval warfare had changed and that the role of the omnipotent battleship was played out.

Fleet Staff

Commander-in-Chief of the Fleet
Admiral Günther Lütjens
Chief of Staff
Naval Captain Harald Netzbandt
1st Officer of the Naval Staff (Operation)
Naval Captain Paul Ascher
2nd Officer of the Naval Staff (Gunnery)
Naval Captain Emil Melms
(3rd Officer of the Naval Staff (Torpedoes)
Commander Gerhard Böhmig (did not take part in the sortie)
4th Officer of the Naval Staff (Communications)
Lieut. Comm. Hans Nitzschke
Fleet Engineer
Commander (Eng) Dipl. Ing Karl Thannemann
Fleet Medical Officer
Surgeon Admiral Dr Hans-Roloff Riege (med)
Fleet Judge
Naval Chief Justice Langer
Luftwaffe Liaison Officer
Major Grohé (entered navy 1927)

Staff of the battleship *Bismarck*

Commander
Naval Captain Ernst Lindemann
First Officer
Commander Hans Oels
Navigation Officer
Comm. Wolf Neuendorff
1st Gunnery Officer
Comm. Adalbert Schneider
1st AA Gunnery Officer
Captain Lieut. Karl Gellert
Chief Engineer
Comm. (Eng) DipEng Walter Lehmann

Warship Series Editor: John Wingate, DSC

Side elevation of 38cm turret

