Will Submarine Superdreadnaughts of the Future Sweep the Seas with 12-Inch Guns?

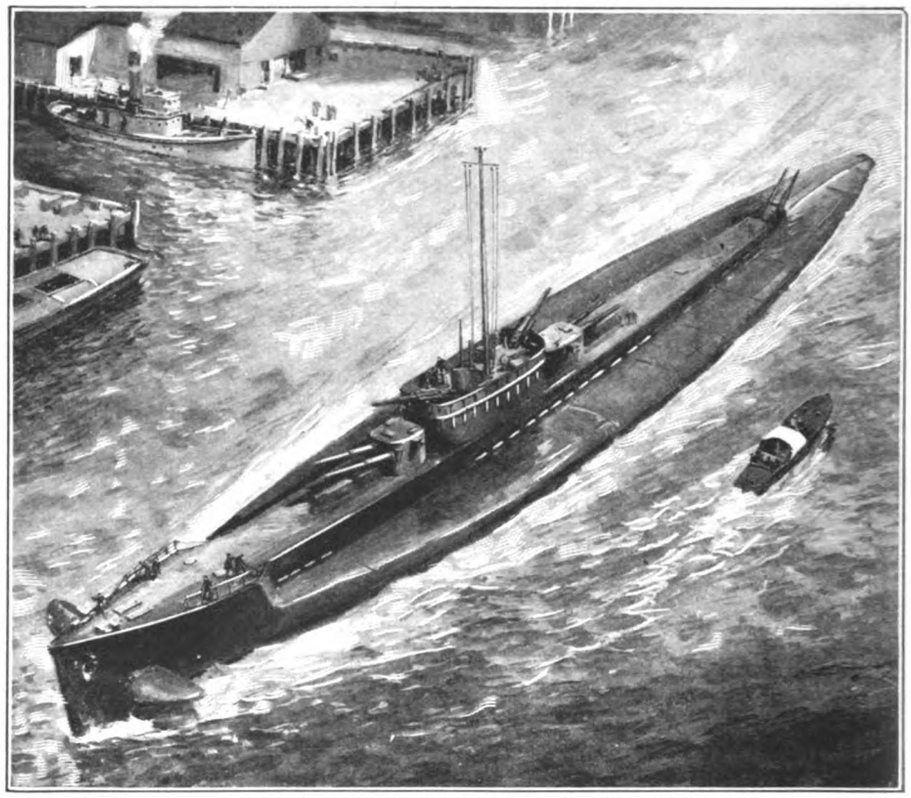
Newest Undersea Battleships to Speed at 21 Knots

By Graser Schornstheimer

ONE of the most interesting discussions growing out of the Washington Conference on Arms Limitation concerns the future of the submarine.

Will the great powers compete—unless prevented by an amicable agreement—in the building of submersible superdreadnaughts capable of blowing all present surface navies out of the ocean?

The following article, from one of of the best-informed naval writers in America, is part of a series which Popular Science Monthly has been publishing to help readers actually visualize the amazing armament developments that will be inevitable if the Washington conference is a failure.—*The Editor.*



The undersea superdreadnaught is in its first stages of development. Japan is constructing a number of submarines of 7500 tons displacement, equipped with four 7.5-inch and 5.5-inch guns. Diesel engines will drive these fighting ships at a speed of twenty-one knots

IS the heavily armed sub-surface cruiser to be the battleship of the future?

The submarine was the only naval arm to undergo radical change as the result of the lessons learned during the war, and at least one of these lessons suggests forcibly the reply to the above question.

The lesson learned was that the efficiency of the torpedo is still an uncertainty. Too late and to her sorrow Germany made this discovery. Three or more torpedoes were fired for every hit made during the war. While the periscope and the conditions under which the torpedo is aimed are partly responsible for this, the real reason is the inherent delicacy of the torpedo's gyroscope steering apparatus, superheaters, and detonating fuse.

Torpedo Has Disadvantages

Another disadvantage of the torpedo is found in the very conditions under which it must be discharged. Thus, when a submarine comes to the surface, vision through the periscope is obscured by the tiny drops of water falling from its case, and by a light mist that sometimes blankets the high seas. Suppose, despite this, the officer on watch manages to locate an enemy ship. He makes it out indistinctly, no matter how fine his optical equipment. But finally the enemy ship is properly ranged and the torpedo is discharged. Even then the chances of a hit are only one out of three. If it is not a hit, the target will in a moment be maneuvering to such an extent as to render useless the discharge of a second torpedo.

A third drawback to the use of torpedoes is the protective structure of the modern capital ship. Should a hit be made on a battleship, battle cruiser, or large cruiser, comparatively little damage is done, although indeed, the damage will exceed that of an aircraft bomb exploding alongside the ship. In fact, it is claimed that the British *Hood* can withstand ten torpedoes; and with her triple hull our new battleship *Maryland* should be able to withstand six or seven torpedo hits.

The result of these conditions, as I see it, will be the development of regular battleship armament for the submarine, comprising both light and heavy guns. Already, indeed, it is known that Japan intends to build a number of very large submarines of the multigun carrying type. Contracts have been let in Europe for a number of 4000-horsepower Sulzer-Diesel engines. Three engines are to be the surface motors of single large submarines to have a displacement on the surface of around 7500 tons. The surface speed of these boats will be about twenty-one knots, and the surface cruising radius very great. They will be the ideal long-range scouts and commerce raiders.

The efficiency of the torpedo is still an uncertainty, as Germany learned. The smaller submarine is giving place to the heavily armed sub-surface battleship, of which the British "M" type is the first experimental example, designed to "mop up" disabled ships

The armament to be given these ships is a matter of great speculation. But it is known that in addition to the usual submerged tubes, probably of the twenty-one inch type, on the deck will be four 7.5-inch or six 5.5-inch guns, with two or four anti-aircraft guns. These guns will be sufficient to combat the lightly armed cruiser, armed merchantman, or destroyer and, therefore, will be all they will need. Light as these guns are, they forecast the coming of the submarine battleship.

The submarine battleship is, of course, yet to be practically developed, and the British submarines of the "M" type are simply the first uncertain applications of the principle to underwater craft. The first two of these boats, while not exactly failures, are not regarded as entirely successful and have not been ordered to sea duty. The third boat, the M-3, is regarded as successful enough to go to sea with the Atlantic fleet.

Britain's Undersea War-Ship

She is a large vessel, displacing 1600 tons on the surface and 1950 tons submerged. On the surface she is driven by 2400-horsepower Diesel engines, for a maximum speed of sixteen knots, which was actually obtained on the vessel's trial. Electric motors of 1600 horsepower, deriving their power from huge storage batteries, drive the ship when sub-

merged at a speed of 9.5 knots. For surface engines the M-3 carries a normal load of seventy-six tons of oil, insuring a very good cruising radius.

The M-3 will be driven, observe, by Diesel engines, and not by the once much-vaunted steam drive. During the war the steam-propelled submarine proved a failure. In speed it is superior to the Diesel-driven craft, but the British are now re-engining the K-18, K-19, and K-20 with Diesel equipment.

To return to the M-3. Her surface armament consists of one twelve-inch gun, firing a 520-pound shell. (The normal twelve-inch gun fires an 850-pound shell.) A single three-inch anti-aircraft gun is also carried. The vessel is 303 feet long, with a beam of 24.5 feet and a mean draft on the surface of 15¾ feet. She will be the first "submarine battleship" to form a part of a fleet.

Imagine the plight of a battleship that has been severely pounded and forced to draw out of action in sinking condition. Suddenly a speck appears on the surface six or seven miles away and a 520-pound shell comes tearing through her belt. This shell is followed by three or four unexpected torpedoes. Such will be the work of the submarine battleship.

In a certain way, of course, a submarine of this size would be able to take part in a real line-of-battle action. Suppose a fleet of modern battleships is peacefully steaming in column when an equal number of submarine battleships, carrying four sixteen-inch guns each, suddenly appears four or five miles away. They fire three or four tremendous broadsides and then disappear quickly beneath the waves, leaving nothing for the battleships to attack, even if they are able to withstand the big gun and torpedo hits made by the submarines.

All through the ages, "battleship" has simply been the term applied to the type dominant in naval warfare. Who can say that "battleship" will not mean to naval men of the next generation a heavily armed sub-surface cruiser of which the modern submarine is but the rudimentary progenitor?

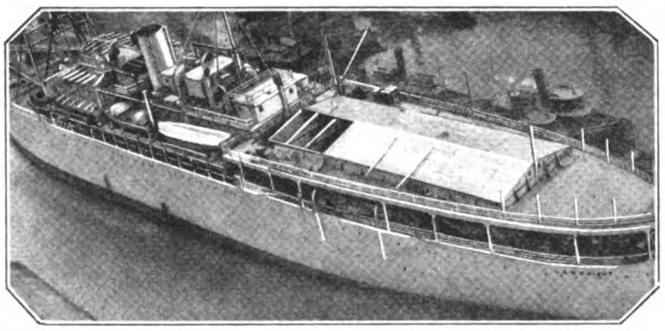
Floating Hangars to Cruise with Fighting Fleets

Masts Will Telescope and Elevators Will Carry Airplanes from Deck to Deck in Newest Mother Ship

THE mother ship of to-morrow will be a vast seagoing service station for aircraft—an intricate floating hangar, machine-shop, and flying-field, capable of maneuvering with any fleet of battleships. In the aircraft tender of the future spacious elevators will lift planes from deck to deck. Masts and pilot-house will telescope into the hull, transforming the top deck into a long unobstructed flying-field. Wind-breaking palisades will offer protection to the flyer from strong sea breezes.

Japan is building such a carrier, the *Hosho*, which will soon be ready to join its fleet of battleships. Other nations are constructing tenders as an essential part of their naval forces. England already has six; France and Italy have a few, while the United States is converting the former naval collier *Jupiter* into an airplane service ship.

The *Hosho* represents the latest advance in this type of naval construction, and is an indication of what may be expected in future development. Ever since the aircraft carrier was conceived, the tremendous advantage of the landplane over the seaplane has forced improvements to permit the landplane to alight on the tender's decks. In the mother ships *Hosho*, *Argus*, and *Hermes* this advantage has been achieved.



The United States balloon-tender "Wright," which will contain space for six kite balloons and complete apparatus for the generation and storage of hydrogen. Machine-shops for the repair of both airplanes and lighter-than-air craft will be included in her equipment. The "Wright's" armament will consist of four 5-inch guns and two machine guns, and the vessel will be manned with a complement of 49 officers and 522 men

The top deck of the *Hosho* is flush from bow to stern. Masts and chart-house telescope into the hull, and the funnels are back of the stern, leaving a flying-deck clear of obstructions.

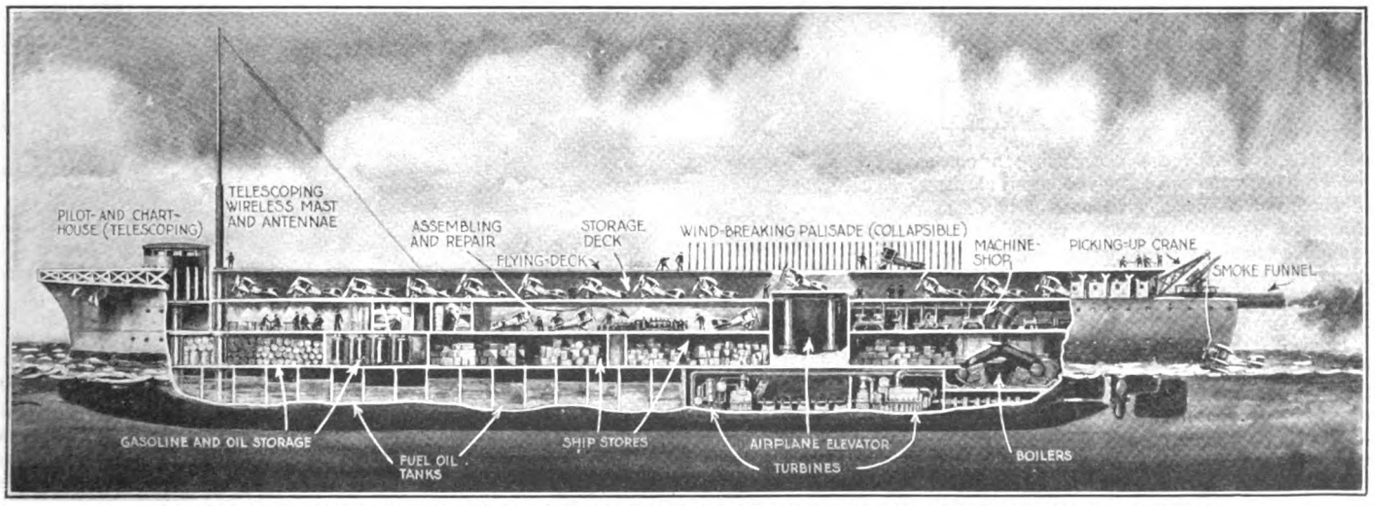
A large elevator, capable of carrying a fully assembled plane, connects the three decks on which the planes are handled. A plane can be rolled into the elevator, which rises flush with each deck, as easily as if it were being rolled from a hangar into a field. When the elevator reaches the top deck, the plane can start straight on its flight as smoothly as from the ground.

To keep the planes stationary on deck when the vessel is moving into a stiff breeze, blast screens have been provided. Without these screens, ready for instant use, a strong breeze or the sudden turn of the ship into the wind might force a plane up kite fashion.

The pilot-house is really a single-story elevator of great size, maneuvered hydraulically.

Planes of at least three types will be carried aboard the *Hosho*—fighting planes to drive off enemy aircraft, spotting planes to spot the big-gun fire of the large war-ships, and a squadron of torpedo planes to attack the enemy's capital ships.

The *Hosho* displaces 10,000 tons with her normal load aboard, and about 13,000 tons with her full load. She will be about 500 feet long, with a beam of fifty-five feet and a normal draft of eighteen feet. Her engines will be turbines and the steam will be supplied by oil-fired boilers. The speed will be around twenty-two knots. Her battery will consist of four 5.5-inch, 50-caliber 82-pounders; two 3-inch, 50-caliber anti-aircraft guns and possibly some deck torpedo tubes. She will be protected with the special anti-torpedo blisters on her hull and by covering armor enough to withstand the fire of smaller cruiser and destroyer guns.



An elevator to carry airplanes from deck to deck, and telescoping masts and pilot-house to permit an unobstructed top-deck flying-field, are part of the equipment of the newest aircraft tender, "Hosho"