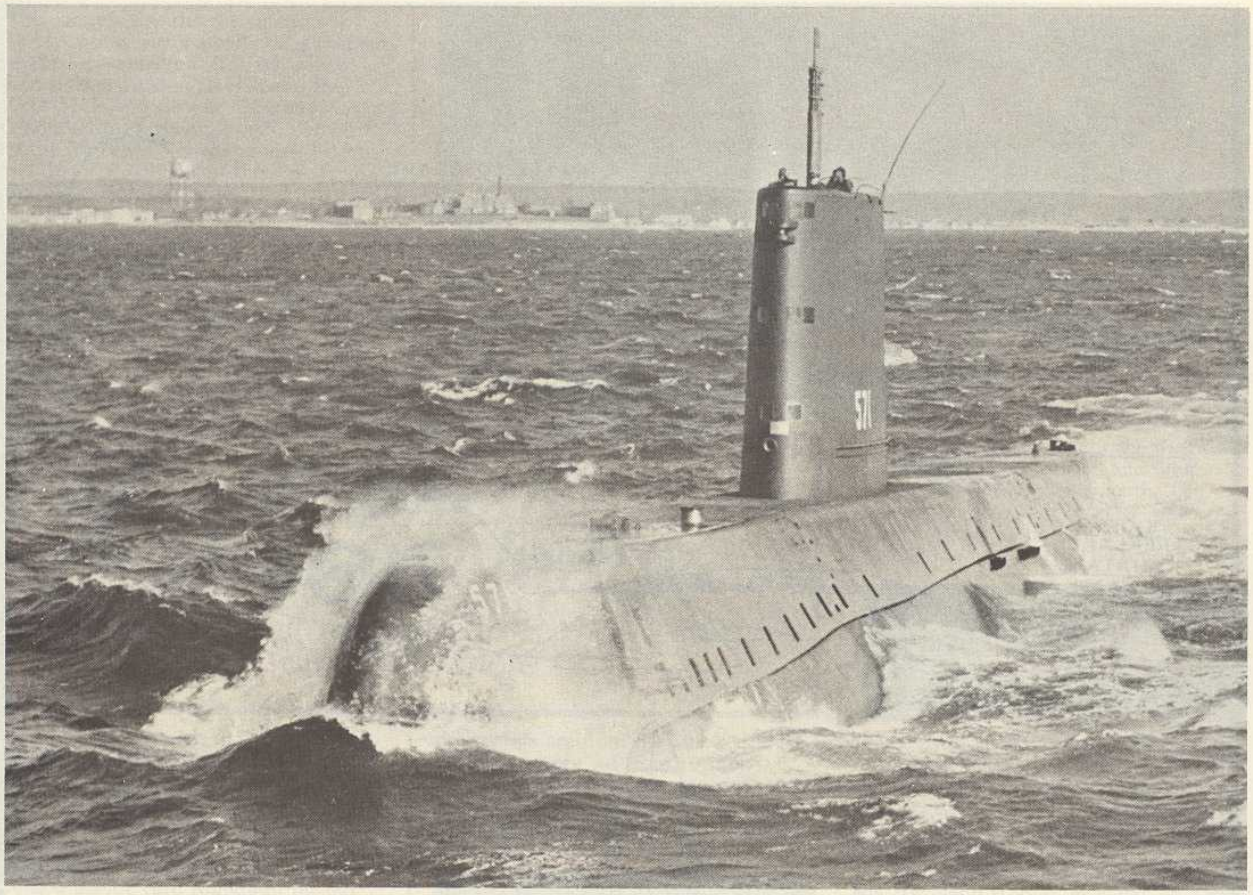


The USS Nautilus (SSN 571), the US Navy's first atomic powered submarine, on its initial sea trials (Photo US Navy).

The Modern Submarine Service

by Andrew Ambrose

Introduction

For those modern naval wargamers, and 1:600 scale ship modellers, this month's *Airfix Magazine*, heralds the start of a short series on the modern Submarine Service of the Royal Navy.

With the submarine playing such an important part in naval warfare now, it is unfortunate that Airfix's product range does not yet include this sleek black animal, as it is indeed an important part of any modern naval wargame strategy. In this series, I will take a close look at today's Submarines, and follow in part two with a complete set of construction drawings, to enable the modeller to quickly set about building his own fleet utilising plastic-card and one or two spare parts from Airfix models.

The final instalment will cover a detailed yet simple to operate set of instructions, on the use and operation of submarines in naval wargames, and describes the rules and methods for the realistic re-enactment of a limited game, using the submarines, and one or two other Airfix 1:600 model ships, in a cat and mouse game of ASW Warfare.

Part One

At the beginning of World War Two, the capital ship of the Royal Navy was the Battleship. During the years following the war however, it became increasingly apparent that the aircraft carrier was replacing the Battleship in its importance as a major fleet unit.

Nowadays, with the retirement of HMS *Ark Royal*, the last of the Royal Navy's capital ships has disappeared, and the submarine has moved forward to become the most powerful unit of the fleet.

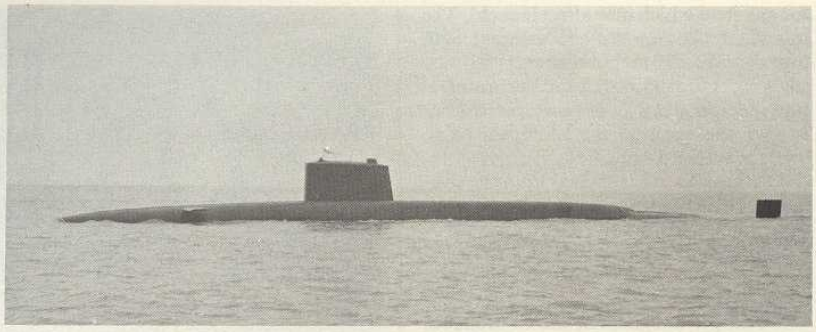
The Submarine Service of today, is divided into three basic sections. The first section comprises the strategic deterrent, consisting of the four Nuclear powered, Ballistic missile armed submarines, (known as SSBN's) namely HM Submarines *Resolution* (S22), *Renown* (S26), *Repulse* (S23), and *Revenge* (S27). These are the 'big boys', each armed with sixteen Polaris A3 missiles. The second section consists of the nuclear powered, and (at the present moment) conventionally armed submarines (known as SSN's) comprising the 'Valiant', 'Swiftsure', 'Dreadnought' and 'Trafalgar' classes. These are termed 'fleet' nuclear submarines as, unlike the SSBNs, they often operate with other units of the fleet, whereas the SSBNs deploy independently, (although sometimes they have an SSN attached as escort).

The third section consists of the conventionally armed submarines (known as SS's). These boats of the 'Porpoise' and 'Oberon' classes, operate both within the fleet, and as surveillance vessels operating independently. Their advantages are many, including their ability to remain undetected, and their incredible cheapness when compared to the SSN or SSBN. However, their endurance underwater is somewhat limited, as they are forced to surface frequently, in order to charge their batteries.

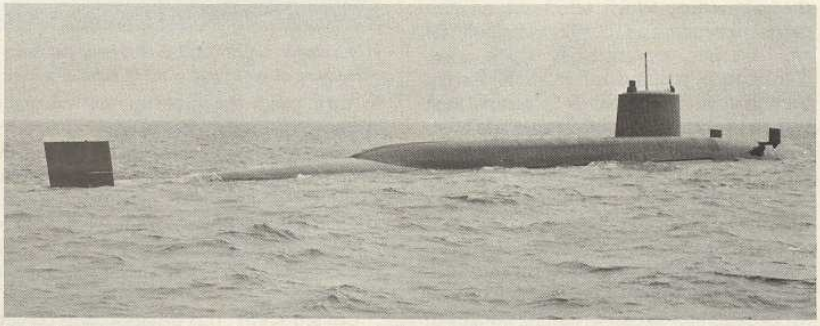
To maintain a balanced fleet, a navy must possess all three types, for to concentrate on one without the other, would inevitably lead to its downfall. In addition, a navy operating such submarines must also provide an adequate back up service, to replenish submarines at sea, because during times of war, submarines would be extre-

mely vulnerable should they need to return to port for constant stocking up. Consider, for example, the fact that submarines are only vulnerable to action when their location is known, consequently, the only periods of a submarines patrol which would be unhealthy are: a) when in actual contact with the enemy, b) when travelling on the surface and c) when alongside in harbour. Therefore, should an enemy be aware that vessels are in fact in port, he would be able to launch a nuclear strike at the known co-ordinates of the harbour, and stand a reasonable chance of destroying any vessels therein. On the other hand, replenishment at sea provides the enemy with no known co-ordinates as it could take place anywhere in the ocean, and in order for the enemy to make a strike he must first locate the surface fleet so engaged. He must then ascertain the presence of a submarine, and finally, to launch a strike with any degree of success, he must penetrate the defensive screen of the auxiliaries and their escorts. It can therefore be seen that replenishment on the high seas must play an important part in any of the fleets submarine operations.

Considering the role the Submarine Service of the Royal Navy has to play in modern operations, it can be seen that the present fleet, although numerically not as strong as it would like, is on the other hand, a highly effective and well balanced fleet, capable of carrying out the tasks required of them efficiently and effectively.

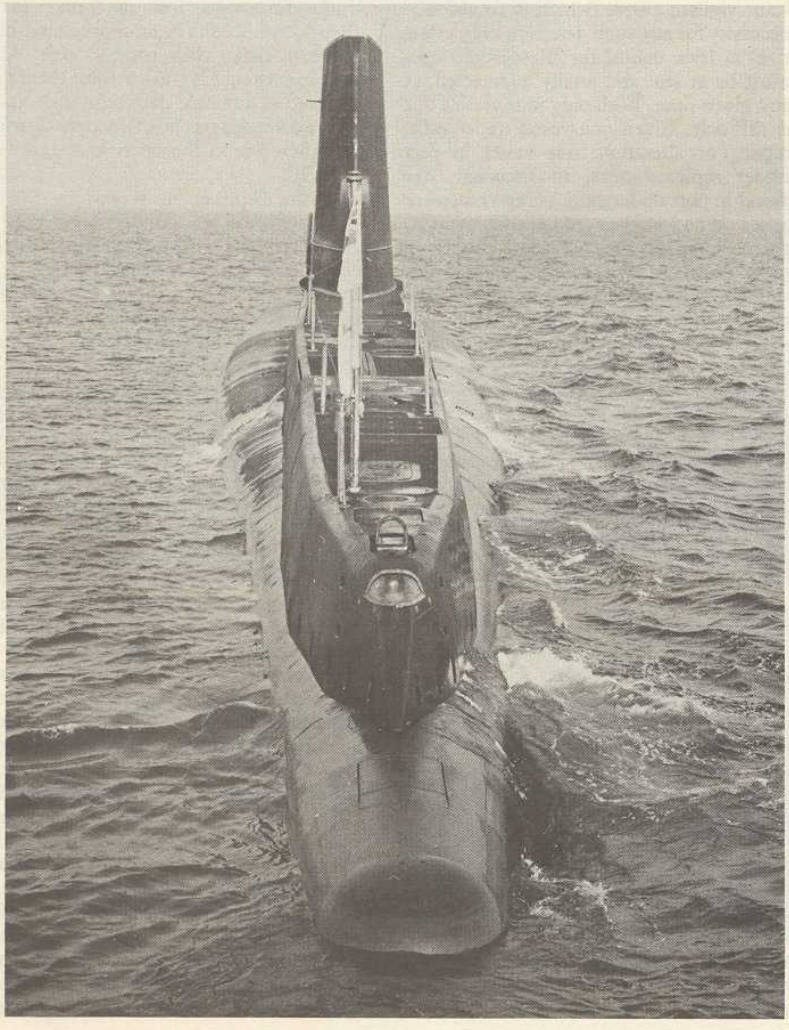


HM Submarine Renown *(S26) part of the British nuclear powered ballistic missile armed submarines which differ from the US Navy's Polaris subs, notably, in having six torpedo tubes instead of four.*



This photo shows the Resolution, *(S22) Britain's first Polaris submarine at sea in 1969. It is interesting to know that the cost of building such a craft was £39,950,000.*

Photos from MoD (N) unless otherwise credited



A splendid view of HM Submarine Onyx, part of the 'Oberon' Class. Plastic was used in the superstructure for the first time, with before and abaft the bridge made of glass fibre laminate.

Big, Bad, Black and Powerful

The massive proportions of Britain's four SSBN Polaris submarines, are an impressive sight, when seen on the surface. Their displacement when surfaced being 7,500 tons, (8,400 tons when dived). Measuring 425 feet in length overall, with a 33' beam, they certainly are massive when compared to the 500/1500 tons of a conventional 1945 submarine. Naturally enough their cost was enormous too.

Each of the four boats has provision for sixteen Polaris A3 Intermediate Range Ballastic Missiles (IRBMs) and six 21' torpedo tubes. The Polaris missiles carried by these submarines were purchased from the United States of America, as all the British systems were cancelled by the government of the day. However, the warheads, re-entry bodies, fusing and arming devices are all developed and built in the UK. These missiles have a range of two thousand eight hundred and eighty statute miles dependent on payload (with maximum payload this range may be reduced by up to 23%), and have an MRV Warhead, (Multiple Re-entry Vehicles), consisting of three, two hundred kiloton devices. Guidance is by an inertial system, fed, prior to launch, with the target co-ordinates and the latest update from the launcher platforms SINS and ULCER systems. (SINS=Ships Inertial Navigation Systems. ULCER=A system used to determine water currents, temperature layers, and general sea conditions, so that compensation can be made

for any item which may affect launch). The missiles dimensions are 9.550 metres length overall and 1.370 metres diameter; the missile weighs in at 13,600kg and the manufacture incorporates a lot of fibreglass in order to give the warhead the additional range over the earlier A2 missiles.

The missiles are launched from the submarine by compressed air, or gas/steam generators, and are controlled by a computorised system, which needs only to be fed with the exact launch position and target co-ordinates.

For target designation, the co-ordinates are fed to the computer from a set of pre-recorded magnetic tapes carried on board the submarine, which select the missiles target, dependent on the prevailing political and strategic contingencies which arise. The launch position information, having been fed in by the SINS (a complicated system of computers, gyroscopes and accelerometers which relate movements of all types to the first known position of the vessel), and various other navigation systems are used to check the SINS readings. These include optical and electronic devices which give running verification updates every so often, to enable the central SINS computer to pass a running up-date to each missile every fraction of a second. In addition, it is believed that the OMEGA and Satellite Navigation systems are often used for navigational updates, as the OMEGA system works in a section of the Radio Spectrum, which can be received by a submarine even if travelling below periscope depth.

Unbelievably (but certainly a fact), submarines of today, do not need to surface, to transmit and receive radio messages. Radio communication for submerged submarines utilizes the VLF (Very Low Frequency) Band, which makes it possible for the vessel to maintain contact even when cruising quite deep, and at quite long range. However, due to the very nature of the SSBN it is highly unlikely that the Strategic submarine would ever use its radio to transmit while engaged on an active patrol, as to do so would almost certainly give away its position.

Should the position of the SSBN be known, the deterrent threat is lost, because an enemy, having once located it, can remain in such a way, that should missile launch be imminent, the destruction of the SSBN can be carried out beforehand. This

HM Submarine Churchill *(S104) being put through its paces. Part of the 'Valiant' Class, its hull is very much of the same design as that of the* Dreanought *but it is a little larger.*

in turn poses the problem that once the strategic deterrence has been destroyed by the enemy, they can immediately launch all their ballistic and nuclear cruise missiles at the UK with absolutely no threat of retaliation at all, and obviously the whole idea of nuclear deterrents in the first place is to prevent one's enemy from starting, in the first place.

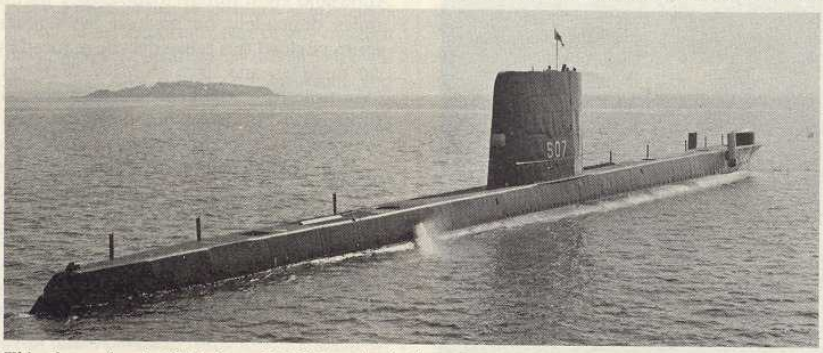
Consequently, this brings to light certain problems in the UK SSBN fleet, namely the quantity of launch platforms or submarines available, for in order to maintain a constant vigilant patrol (which is an absolute necessity for any such deterrent to be effective) at least one of the 'Resolution' class must be at sea, and totally undetected, at any given time. With only four vessels this is difficult. Given one vessel under refit, repair, or alteration; one vessel in port under replenishment, re-armament; one vessel in port undergoing a crew change, or at sea on its way to or from its deployment/patrol area, leaves only one vessel in position to act as a deterrent. Should this singular platform ever be located by the enemy, then I suggest that it would be a good time for one to visit the local church, and offer up a prayer that the concept of the North Atlantic Treaty Organization, actually works. Perhaps more importantly, that the enemy actually believes it too!

The only deterrent to a nuclear strike on the United Kingdom, is the existence of the United States Naval and Air Force Ballastics Missiles which could be used to retaliate. The present line from the Pentagon however, (although not officially recorded anywhere) states that the US government would consider that a strike upon any nuclear missile submarine, or any nuclear armed aircraft, lawfully engaged about its business would be an expression of nuclear hostility, equal (almost) in importance, to a direct full scale attack on New York City or even the Pentagon itself. Consequently this would require retaliation of a type that very few people fully appreciate.

In strict contrast to the four SSBNs, come the Patrol Submarines (SS) of the 'Oberon' and 'Porpoise' classes. Their duties differ vastly from the former, in that they do not need to be on constant patrol, in order to make their presence felt. Their simple existence is sufficient for them to be counted as valuable deterrent units, in the conventional aspects of modern warfare, and therefore in the safety and security of the UK.

With a displacement of between 1500 and 2000 tons, and an underwater speed of about 17 knots, their armament consists of eight tubes for 21in torpedoes (six facing forward and two aft). Some have also been fitted with the submarine launched air missile known as SLAM, which is a small anti-aircraft missile system similar to the Army's 'Blowpipe' missile. Conceived primarily as a low cost self-contained, anti-aircraft missile, able to give surfaced submarines some measure of self protection from hostile aircraft, the SLAM system consists of a one man operated console, controlling a rotating launcher, mounted in the top of the boat's fin (or conning tower). The launcher is a multi-barrelled assembly which is remotely controlled by the operator from his position within the ship. The range of the missile is believed to be in the order of three nautical miles, and is controlled throughout its flight by the operator, through a closed circuit TV system, with a low light capability, allowing the operator a 'dark fire' capability.

Such a system as this, is extremely cost effective, as it gives the conventional submarine an efficient (although somewhat limited in range) method of self-defence when surfaced as, along with all conventional submarines, they do need to surface quite regularly in order to re-charge their batteries for submerged operation; hence the missiles lower their vulnerability to surprise surface attacks, from close range



This photo taken in 1965 shows HM Submarine Sealion *(S07) of the 'Porpoise' Class. The design of the superstructure and hull enables it to remain submerged for very long periods of time and also gives it great diving depth and a fast speed underwater.*

This photo demonstrates the underwater firing of the Polaris A-3 missile by an unidentified submarine (US Navy).

aircraft and small highly manoeuvreable patrol boats.

The main teeth of the conventional submarine however is still their torpedo tubes. These vessels can carry up to thirty torpedoes of one type or another, and it would appear to be rather nebulous to state which type is indeed used. However, it is highly likely that already, or in the not too distant future, these vessels will be fitted to carry the US submarine launched Harpoon tactical missile.

Basically the Harpoon system is a missile which is released from the torpedo tube encapsulated in a 21in cylinder, the capsule then rises to the surface, controlled by a set of fins at the rear. When surfaced, the end of the capsule is ejected, and the missile is launched. The harpoon missile itself is a high-subsonic anti-ship, tactical cruise missile, which is programmed before launch, thus allowing the launch vessel to make good its escape at the earliest possible moment. Initial guidance is by a ballastic pre-programmed trajectory, the missile then drops to low level and follows the contour operation until it gets into its terminal guidance area. It then gains height again rapidly and its active radar (ECM Immune) homing system, locks onto the target until final impact. In addition, the missile is highly manoeuvreable, enabling it to chase and destroy vessels taking high speed evasive action. The range of the missile is believed to be in the order of thirty nautical miles, but quite possibly an increase on this figure would be achieved, were some form of bridge guidance used, such as high flying MR or AEW aircraft or satellites.

In the face of strong international competition, the submarines of the 'Oberon' and 'Porpoise' classes have proved to be best sellers, as in addition to the 21 vessels operated by the Royal Navy, six have been sold to Australia, three to Canada, two to Brazil, and two to Chile.

Next time, we continue with the submarine theme, but giving full sets of plans and specifications etc to enable the modeller to complete any of the 'Resolution' class SSBNs, the 'Oberon' and 'Porpoise' class conventionals, and the 'Swiftsure' class Nuclear Fleet subs, in 1:600 scale.