CHAPTER 11 - NEW ROLES FOR SUBMARINES

The marketing of submarines is a difficult business because few sales are made on commercial grounds for the true price. There is overcapacity in submarine yards and technology transfer deals would seem likely to close some markets to traditional builders in favour of emergent nations such as South Korea. Western builders are now being challenged by the Russians who have an urgent need to generate foreign currency and who have seem to have been able to retain an advanced system for the design of the boats.

Submarine builders have also not felt able to re-examine the raison d'être of their designs until recently. During the cold war years the main thrust of submarine design centred upon the manoeuvring of missile carriers in the deep oceans. Design effort centred on large submarines powered by nuclear heated steam plant. The idea was that non-nuclear submarines could only have a small role to play on a greater stage.

Several happenings have begun to change this thought, and not least of these is a hastening of political change. The cold war as we understood it for most of our lives has now changed into some other type of competition. Projection of power by the United States and Russia is lessened. In particular, the centres of naval conflict are not so likely to be in the deep ocean now. It seems more probable that we will go through a period where something akin to piracy might become more prevalent. Nations unfriendly to the democratic principle may seize the opportunity to enlarge their immediate sphere of influence by making it more difficult to keep open important shipping lanes. Such restrictions might not even be aimed globally, but be the result of local struggles for influence.

A few good quality submarines near the Gulf of Hormuz would seem to pose a problem in the matter of the control of local seaways. The South China Sea appears to be coming more of a centre for potential dispute, especially with the increasing possibility that it might become an oil producing centre. One already sees strange things happening such as the Chinese building watch towers on a group of rocks hardly justifying a name like the Spratley Islands. China is becoming stronger and wanting to mention its own ideas more than before.

It need not be thought that non-nuclear submarines are an irrelevance, not even those without Air Independent Propulsion and not even operating in a deep sea. In 1982 during the South Atlantic War, the Argentine submarine *San Luis* (a German built Type 209) was manoeuvred by Commander Azcueta past a vast and highly active British anti-submarine screen and into position to fire three warshots at the British fleet. That no hits were scored seems to have been just bad luck. Ref (2) If a submarine force can think to operate within say three weeks submerged travel of a base, and if it can operate in waters that are interrupted with shallows, islands and with acoustic properties that make sonar relatively difficult then some of the advantages pass to the submarine fleet. "Shallows" means water less than say 350 metres deep, in which a submarine can hug the bottom. Remember that 300 m is near enough 1000 feet and so there is still plenty of manoeuvring room.

In these conditions, which are lumped together as "brown water" for purposes of nomenclature, nuclear submarines find it relatively difficult to keep themselves safe from attack. Their size makes navigation more tricky than for a smaller submarine, and the detectability of a submarine

is increased if you are close to an unfriendly shore where an enemy can dispose quite a large number of units to search. The officers of a 5000 te submarine certainly do not want to be taking evasive action in restricted waters where there might be a dozen or so ASW trawlers backing up fleet warships and aircraft. So, I think that one role of the AIP submarine is going to lie in strengthening local influence.

I mentioned in the chapter on Integration that control of carbon dioxide inside the submarine was an unsolved problem for a small (non-nuclear) submarine. Suppose now that someone found a solution to this problem and that a submarine could then lie stationary in the water or on the bottom for a notable time interval like 10 days. Then, you have the possibility of ambush of superior forces. You would put your boat on the bottom of the sea hard up against some existing wrecked ship and simply sit there. Put a wreck in the right strategic position if you need to. If the enemy appears, he's not going to detect you, he'll just see a wreck. Attack from behind.

You don't need an AIP submarine for this; you just need a bit better industrial chemistry to go in your existing boats.

I think a second role might lie in a strengthened role as an offensive warship. Of course, the submarine has always been an offensive warship, but it has mostly had a precarious position : either it was in a very successful role or it was in a disastrous losing situation.

In the second world war, the U-boat fleet's most successful tactic was to attack shipping at night while surfaced, and to dive either to escape or to keep out of the way during daylight hours. Initially this was a wonderful tactic. Ships would blow up without warning in the middle of the night, torpedoes would be seen running in from several directions, fires would illuminate other targets and not much could be done by the defenders.

Later, ways were found of "seeing" the submarine in various of its roles. Better radar enabled the surface attack to be thwarted, because the boats were driven beyond torpedo range. Better sonar either enabled direct attacks to be made on submerged boats, or (which was nearly as good) kept the submarines under the water until their submerged capacity became exhausted. Then they were sunk when they surfaced. Other inventions like the flux gate magnetometer enabled submerged boats to be detected from aircraft so that their rest areas ceased to be safe. And so on.

Once the submarine had been detected it became increasingly difficult for it to escape because although one might think of the submarine as having a good chance against a single surface warship, it certainly could not manage to confront a pair of ships working together.

The latest real warship sinking was the sinking of Hector Bonzo's *Admiral Belgrano* by the British nuclear submarine *Conqueror* in 1982. This was effected with free running WW2 torpedoes, the direction of firing being determined by geometry. We are told that the captain of the submarine selected the seemingly old fashioned torpedo because it had a larger warhead. However, in the future you can't expect the submarines of a quarrelsome country to be fitted with out of date gear like Mk VIII torpedoes. They will have wire guided or by-other-means-homing torpedoes and sea to surface missiles and doubtless we the West will foolishly have supplied some of this weaponry with the eye on a short term gain.

My ideas about naval warfare revolve around the idea that a surface ship is a target. Your typical frigate is big and slow moving. It is made of puny 15 mm steel plate, its design hasn't evolved much in fifty years, and its weapon systems are rarely in 100% working order. A dinosaur that deserves to be sunk. The trick is to find some way of exposing its limitations.

Certainly the isolated warship, or even a fleet, is highly vulnerable to air attack. The straightforward torpedo or bomb attack that sank the *Prince of Wales* in 1944 was very nearly paralleled in the South Atlantic War of 1982 even where the enemy were flying out of date aeroplanes at the edge of their range against a fortified fleet anchorage. Worse than this, the enemy were in the possession of a small number of French *Exocet* anti-ship missiles, which if they could have been delivered, would have seriously discomforted the expeditionary fleet.

What the strategist tries to do is to concentrate his warships round a carrier so that a synergistic system is created. The carrier's planes protect the surface ships from air attack. The surface ships drive away any submarines with ambitious captains, and the whole fleet trundles forward until it reaches a target area where it will start to use the attack systems which it has carried along with it. The designer tries to keep his fleet safe by keeping ahead of any opposition's air technology. He looks to have better fighters, and better surface to air missiles. Notice that he thinks about "air" and not "better ships" or "water".

If I were the President for Life of the North East Africa Religious Republic in receipt of oil money from a fraternal neighbour, and I were set upon lessening the visibility of the American and Western hegemony, I should be commissioning a new missile from the French. I would choose the French because they are particularly good at missiles, they don't belong to NATO and, if they are not especially anti-American, they are most definitely pro-French. I would be looking for something along the lines of the Exocet 13 which can be fired from a submerged submarine against a target at least 50 km distant.

{ I favour "missiles" rather than "torpedoes"; by missile I mean something that flies through the air. Thousands of missiles, guided and unguided, have been fired in anger in the last thirty years, whereas only a minimum number of torpedos (only a few tens) have been fired. Missiles are designed by commercial aircraft companies. Torpedoes are grudgingly developed by naval research departments.)

I should want this missile to be fireable from a submerged submarine and from the surface. I should want it to be able to fire, and then to lock on to an illuminated target, and thereafter to be left to its own devices. There is an existing missile that does some of this; the American *Harpoon* missile. However I am not aware of the detailed behaviour of the missile, and in any case the Americans aren't going to sell any to a frisky fellow like myself. The missile should have a range of at least twenty nautical miles and have a warhead of about 150 Kg. Further more it should be the minimum size for its job. It should be integrated with the submarine in such a way that the submarine can fire missiles one after the other without unnecessary delay. I would want to get twenty units in a 2000 te submarine.

I should then order some submarines, probably from the Russians. The Russians are more flexible than the Germans, and they do not have to worry about what to tell their NATO partners when they have sold hardware to an enemy. (You could say the same thing about the French, of course). I would be looking for a flotilla of at least five submarines, of between about 2000 and 2500 tes submerged displacement. They would be fitted with an AIP system capable of

generating at least 400kW and thus would be using closed cycle diesels or MESMA. My submarines would not be fitted with torpedoes but with my new *Super-France* missile. The submarines would be fitted with submarine to submarine acoustic telephony, such as it may be, in order to help underwater communication.

I should provide some means of re-fuelling the submarines at sea even in the limited patrol area around the horn of Africa. To do this I shall have a number of converted cargo carrying vessels. These will also be fitted with equipment for communicating covertly with submarines. They will carry large LOX tanks, enough to fill up at least a couple of submarines.

The submarine group is intended to more or less openly attack an incoming surface fleet. Submarines in the flotilla will deploy over a restricted area like a few square kilometres approximately 15 miles distant. They will then fire missiles at the fleet from a submerged position a few metres from the surface. The fleet will then send escort vessels in the range 3000 to 6000 te to attack the submarines; they will also send ASW helicopters which have the role of dipping sonar transponders into the water and may be able to release a guided torpedo. The surface ships will be attacked by further missiles and it ought to be easy to dispose of them. The incoming ships have nothing to fire at until they come within range, whereas the submarines can select their targets with ease and fire missiles at them. There are no suitable anti-missile missiles at the present time. When helicopters are seen, the flotilla will break off the attack, and go deeper using its powerful AIP (and possibly batteries) to move to a new position, travelling at say 12 kts. (You have to avoid these helicopters because they can drop a homing torpedo near to a distant target.) Then the submarines will fire more missiles and so on.

The object of the submarine manoeuvring is not to prevent ASW detection, but to prevent the ships being fired upon by any of the missile systems the fleet would use against a surface opponent. The fleet is to be left with a good fraction of its weapons useless. The submarines are to keep distant from forces that might be able to detect and attack them, by attacking themselves in force. You have to remember that ASW procedures are relatively slow and ponderous and are most effective if several units are working together. Determined manoeuvring ought to enable detached frigates to be isolated and confronted.

A submarine can fire a missile big enough to disable anything up to cruiser size from a such a large distance that it cannot at once be detected. Furthermore a salvo of such missiles fired from a group of five submarines, say 12 missiles, would wreak a deadly havoc on a carrier group. The admiral commanding would find himself with precious few weapons with which to counter attack. Most of his aircraft would be useless without a surface fleet to go after. His anti-submarine screen could easily be eliminated if he persisted in approaching the attackers' position. An initial attack might not be followed up, the submarines merely stealing away to a relatively safe area, leaving the surface fleet with an inhibiting feeling of uncertainty.

I suspect that another major advantage of a submarine in this role of attacking warship submarines is that it is cheaper. A 4000 te frigate seems as though it costs between $300M and $700M and it is a considerable size. British Type 23 frigates are about 4000 tes displacement when fully loaded and have an overall length of 133 m. This is to compare with a Kilo submarine which has a dived displacement of about 2500 tes and a length of no more than 70 m. Bearing in

mind that the surface ship has to carry a considerable anti-aircraft battery, you would think that in real costs the submarine would be cheaper..

I'm sure the attack submarine, as described, is more cost effective. A warship of an emergent country cannot really confront a Western ship of the same size and a flotilla can't seriously discommode a carrier group. The disparity in weapons quality and training is just too great. Any opponent that can be seen is simply going to take a one way trip downwards in short order. With an overtly aggressive group of missile firing submarines you can expect damage even on a large carrier group and you can expect to retire without your force being totally destroyed. The attack submarines, intending to close a water way, can afford to patrol for two to three weeks only and they will each be using the services of 30 crew. The frigates on the other hand will have a crew probably six times as large.

Now let us turn to some other possible roles for AIP powered submarines. Firstly there is the special forces submarine to consider. I suspect that all AIP groups may have had the same experience as the Closed Cycle Diesel company CDSS Ltd in Kettering England, namely that numerous schemes appeared for putting the AIP unit into various small submarines. Often we were drawing 50 kW diesel engines fitted into something not a lot bigger than a torpedo. "Rats into drainpipe" jobs we called them. Taking the job by and large there are two types of special forces boat. One is a small submarine with a crew between two and six men which is intended to enter an enemy harbour and place explosives near a capital ship. The boat is therefore like a British X craft. A second type of special forces boat is the Squadron Assault Craft.

The X type special duty submarine has quite a long and quite distinguished pedigree. The Italians have taken a particular interest in, and have pioneered, this type of boat. (ref 1) Everyone recognises it for what it is and everyone seems to agree on what a new one might look like. Even, by a strange co-incidence, two of the proposed designs have the same name. Both Vickers Shipbuilding and Engineering and the Russian design bureau Malachit have called their submarine *"Piranha"* . What is required for a modern X-craft is much longer range and submerged endurance. Accounts of British operations with this type of boat make it clear that one thing the crew needed was time to overcome the various obstacles in their path. Not only did the boat have to travel a distance which was near to its maximum range, but it had to spend a long total time under the water while crew members left the boat to cut holes in nets, to spy out the defences or to disentangle the boat from some snag or other.

It's obvious that the boats will be better with an AIP system. The LOX tank which would be in the boat to give a suitably large range can supply oxygen for almost any imaginable endurance for crew support. Remember that you only need 1 kg of oxygen per man per day, which is going to be small compared with the engine consumption..

Sometimes the option to use HTP for the oxygen source comes up in discussion about small submarines. LOX tanks become progressively less efficient as the size goes down; there is more weight proportionally in the structure and less actual LOX. So HTP in bags seems as though it is a good option. However, I myself think that there is such uncertainty about how to handle HTP safely under operational conditions that the substance would only re-appear after some advance in chemistry had been made which could be used to convince sceptical naval personnel.

There is another type of special forces submarine that we call a Squadron Assault Craft. In a typical formulation of this idea a fibreglass craft containing ten marines approaches the shore at

60 kts. When in range of defences it slows down, submerges, and makes a one way trip to the shore at a moderate depth, not more than 50 metres as I understand it. The intention is to make the boats as cheap as possible and to order them a squadron at a time ten to twenty boats. For example, the boat was to be a “wet boat”, the crew being in some sort of underwater swimming gear. In this case the function of the AIP is to provide speed.

When this idea was first mooted we refused to make even preliminary drawings. The source was a private contractor, we thought we couldn't get the cost down and we thought it was pretty unlikely that anyone would order the system. However as time passed, we found out that several countries were seriously considering variations on this theme and so we reconsidered the matter more carefully. The overriding problem from our point of view was to get the cost down. The problem is to find a way to amortise the design costs properly. Even if you have, as we did, two

standard units giving 200 and 500 kW you still have to carry out considerable design work to make a unit to work well at 60 kW. But the smaller the unit the less money you can ask for it and you get into a position where you can’t do the job. So far as I know, no boats of this type have been ordered.

REFERENCES

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