

Startling revelations on Soviet subs

According to Jane's Fighting Ships, they are electromagnetically propelled!
Charles B. Stevens reports.

The foreword to 1985-86 edition of *Jane's Fighting Ships*, which is the bible of all inveterate sea salts, makes the most startling revelation concerning advanced Soviet submarines: They could be propelled electromagnetically and not with propellers. If true—and *Jane's* presents convincing facts in this regard—then Gorshkov's Soviet navy has achieved one of history's most astounding technological breakouts and leaped decades ahead of its Western counterparts. And the specific technology involved also gives a measure of the rate that the Soviets are running ahead in the race to deploy anti-missile beam weapons.

'Shooting oneself in the foot'

In general, the *Jane's* foreword focuses on naval matters per se. It does note that while "The American Strategic Defense Initiative (SDI) . . . has not been received with any acclamation in Moscow and has been severely criticized as a source of destabilization. . . . In the suburbs of Moscow the Galosh ABM defences are being steadily modernized, the huge phased array radar at Krasnoyarsk is operational . . . [and] research and development of laser and particle beam technology continues at a brisk pace. The customary Western exercise of shooting oneself in the foot is well under way."

The rest of the foreword is rather routine, reviewing the various issues faced by the chief naval powers of the world. The section on the Soviet Navy is not routine, and takes up more than one-third of the foreword. This section focuses on one subject, electromagnetic propulsion of ships, and outstanding mysteries of the Soviet Navy.

Mysteries? Take the titanium-hulled nuclear attack submarine Alfa. The first member of this class was launched in 1970 and turned out to be a failure. But, by 1976, a second of the class appeared, followed by a further five. According to the best knowledge in the West, the Alfa class has neither the size nor volume needed for an oversized nuclear power reactor essential for a propeller driven submarine to achieve a submerged speed of 42 knots. But as *Jane's* emphasizes: "Unfortunately, despite all the theories, the damned thing was capable of 42 knots."

And then there are the "pods." "By 1984 . . . the first Sierra appeared . . . carrying a pod on the after fin similar to

that in Victor III. Then the Akula, also with the pod. If this is a housing for some form of towed array sonar it is strange that Mike is not so equipped. If, on the other hand, this nine-metre pod contains a form of auxiliary silent propulsion of the MHD variety, Mike becomes a separate development."

Mike, the largest nuclear attack sub yet constructed, but with only a single propeller, has "a volume capable of housing power generation greater than one would expect a single screw could transmit.

And then there's Typhoon. This 29,000-ton gargantuan ballistic missile nuclear submarine, which dwarf's anything in the West, has been a mystery since it was first seen coming out of the drydock some five years ago. Why such a monster? Do the Soviets bloat their subs with bortsch to simply imitate their marshals?

'Colossal output'

In 1975, Admiral of the Fleet of the Soviet Union Sergei Gorshkov, Commander-in-Chief of the Soviet Navy, over which he has ruled for the past 30 years, published his "bible," "The Sea Power of the State." As background *Jane's* quotes Gorshkov: " 'In 20 or 25 fast moving years one thing is certain—ships will be quite dissimilar from present craft. . . . We have no doubt that, for ships of the future, electric power units of colossal output will be needed.' " *Jane's* goes on to note that, while no weapon or radar needing "colossal power" has been observed, nor has the speed of surface warships dramatically increased, "there is one area where this increase in power may be evident and that is in submarine propulsion."

Jane's then puts forth the thesis that the Soviets have developed a wide range of advanced systems ranging from super cold, absolute-zero cryogenic electric superconducting motors to propellerless propulsion based on electromagnetic and MHD drive. The foreword emphasizes that this conclusion "is based on [a] hypothesis which is, in turn, based on freely available literature published over the last 25 years. It will, inevitably, be described as muddled thinking with little, if any, basis in fact. But the truth of the matter is that there is a possibility of some of it being right."

The *Jane's* thesis is intriguing: "In 1963 the U.S. Bureau

of Ships published Friauf's papers on magnetohydrodynamic propulsion. Nearly 30 years ago Dr. Stewart Way suggested the principle of electromagnetic thrust and, 10 years later, produced a working model. The principles of cryogenics have been available for a long period in the West . . . Contemporary to much of this work were the efforts of Soviet scientists and engineers. . . . In 1965 a volume entitled *New Sources of Electrical Energy* was published in Leningrad under the name of A.P. Baranov and it was then that it was forecast that magnetohydrodynamic (MHD) generators would be available for use by Soviet ships in the 1980s. About the time of publication of this book civilian applications of the MHD principle in 'Traveling Wave Pumps' had been investigated in the West and it had also been proposed as a means of torpedo propulsion. The energy required to push an object through the water is, in MHD, produced by a pulsating magnetic field causing sympathetic pulsations of ferro fluid surrounding a tube, open at both ends to the sea. Thus a traveling wave is set up in the enclosed fluid and the water is expelled at the rear, resulting in thrust. There are numerous advantages to such a system: no radiated noise from cavitation or moving mechanical parts, improved thrust for a given power and less wake turbulence. The last of these would probably mean a reduction in detectable magnetic flux variations."

"Another application of well-known laws of physics is the principle of electromagnetic thrust (EMT). magnetic field is set up by passing an electric current through banks of electrodes on either side of a ship. The interaction between this field and a second field set up by a line of electromagnets placed on the centre-line develops a forward thrust in the water. This option is currently being developed in Japan and has also received careful attention in the U.S.S.R."

". . . Thus the Gorshkov forecast of the need for colossal electric power output may well have been met by one means or another. . . . In some cases, those with MHD or EMT propulsion, there will be no need for propellers or pump jet, both of which are liable to damage, particularly under ice, and both of which emit radiated noise. As well as increased speed these developments would decrease the sonic signature and could have an effect on the magnetic signature. The second of these would also be reduced by the use of titanium alloys for the hull and fittings, an advantage to be added to the increased diving depth." The last being a development demonstrated by the Alpha.

". . . If the 20-year-old American theory that MHD could be applied to torpedos is sound . . . these targets might be menaced by a large torpedo of unusual speed attacking from astern. This, too, judging by Soviet writings, is by no means unlikely."

'Not invented here'

After reviewing the evidence from the building dates of various classes of subs and the patterns that form from what is known about them, *Jane's* brings up the Typhoon: "Ty-

phoon is a wholly separate design which is generally regarded as consisting of two parallel pressure hulls with the missile compartment set between them. . . . If, however, the concept were different and there were only one pressure hull which contained the missile compartment at the forward end abaft the torpedo tubes and was flanked on either side by an EMT or MHD unit the situation would be much changed. The dived displacement would fall to little more than that of the Ohio, the speed would be greatly increased over any current estimates, and the submarine would be notably quieter. Additional space would be available within the outer hull for additional defensive measures such as anti-ship missiles and even SAMs [surface-to-air missiles]."

The case *Jane's* presents, as they even emphasize, is quite speculative. But the problem is that intelligence resources are almost always devoted to only looking for what one believes in. *Jane's* points out that: "The habit of viewing the possible achievements of the Soviet Navy as a mirror image of Western advances has received many rude knocks but is still too prevalent. For some reason 'traditional wisdom' does not appear to apply in this case; innovation, forward thinking, the support of new ideas, and the cash to implement them mark the Soviet approach as an unusual one."

Ships and SDI

In this regard a little history could be illuminating. In his memoirs, Col. General Heinz Guderian, the World War II German grandmaster of the *blitzkrieg*, tells of an incident on the road to Minsk in July 1941, when the Germans were only just beginning to approach their high tide. The incident, though, according to Guderian, convinced him that "all was lost." What happened was that a single tank of the 52-ton Leningrad KV variety stopped cold an entire, three-division Panzer Corps—for more than two days. The tank remained impervious to every then-existing variety of German anti-tank gun. It was, after two days, detracked and immobilized by an infantry 155 millimeter howitzer firing at point blank range. (The tank did continue firing for some time afterwards until sappers moved in and blew it up.)

The moral is not that the Russians had developed a better tank model than the tank-wise Germans. The KV was a whole generation beyond that of the Soviet T-34 and the T-34 was a far better tank than anyone had in the world in 1941. The Russians were two generations ahead.

In the contemporary world of open skies, from space, it is well known that submarines have become the "ships-of-the-line" for any future nuclear war. But, while important, the oceans today are not the chief repositories of military power, outer space is. The question therefore arises: if *Jane's* is correct and the Russians have made such large financial, scientific, and technological investments to have their navy leap-frog the West into the 21st century, what have they done for their main-line offensive rocket and missile defense forces? What sort of lasers and electron-beams have they developed? Nuclear-explosive-driven directed energy?