

# Keeping hold of the critical mass

*Russia's naval design bureaux are attempting to maintain their core capabilities in an era of domestic austerity. Richard Scott reports on their strategies to stay afloat.*

For five days in late July, as part of celebrations for the navy's tercentenary, the top floor of St. Petersburg's Central Naval Museum hosted the exhibition "The Russian Navy: a driving force for science and technology". It brought together the naval design bureaux, shipbuilders, research institutes and production enterprises which constitute the core of Russia's naval industrial base.

But while proud to display and discuss their present achievements, many senior officials were increasingly concerned for the long-term future of the military industrial complex which supports the navy. Massive cuts in domestic naval procurement have already resulted in widespread rationalization and often hurried attempts to diversify into commercial markets.

A major export drive – led by Rosvoorouzhenie, the state defence import and export group – is attempting to fill excess capacity and bring in much-needed revenue. However, this cannot compensate for the loss of orders from the Russian Navy, nor does it provide the level of research and development funding required for new ships and systems.

There are undoubtedly parallels with the post-Cold War downsizing and rationalization seen in the West. The major difference is that Russian industry has also had to adjust to the harsh realities of an immature market economy while operating amid a somewhat chaotic political transition.

Nowhere is this problem more apparent than with Russia's major warship design bureaux. Having worked to capacity during the 1980s, they have witnessed the almost overnight termination of new building programmes and seen funding for new projects reduced to a trickle. Indeed, with the exception of the first *Severodvinsk* class nuclear-attack submarine, laid down at the Northern Machine Building Enterprise in late 1993, no new major warship construction has begun since 1992.

Although there is still a backlog of vessels awaiting funding for completion, the design bureaux are anxious to press ahead with work on a new generation of ships and submarines. However, officials acknowledge that there are no firm indications as to when funding will become available.

Naval procurement in Russia comes under the budgetary authority of the Ministry of Defence's Main Shipbuilding Department. Requirements definition, concept formulation and procurement support are the responsibility

of the ministry's First Central Naval Construction Research Institute. This in turn works with various state-owned naval design bureaux (mostly based in St. Petersburg) to develop ship and submarine designs which meet the Russian Navy's operational requirements.

Additional technical and scientific support is provided by the Krylov Shipbuilding Research Institute. Its site in St. Petersburg houses over 100 buildings with laboratories and associated facilities for hydrodynamic testing, structures and materials research, signature management, machinery testing, development of computer-

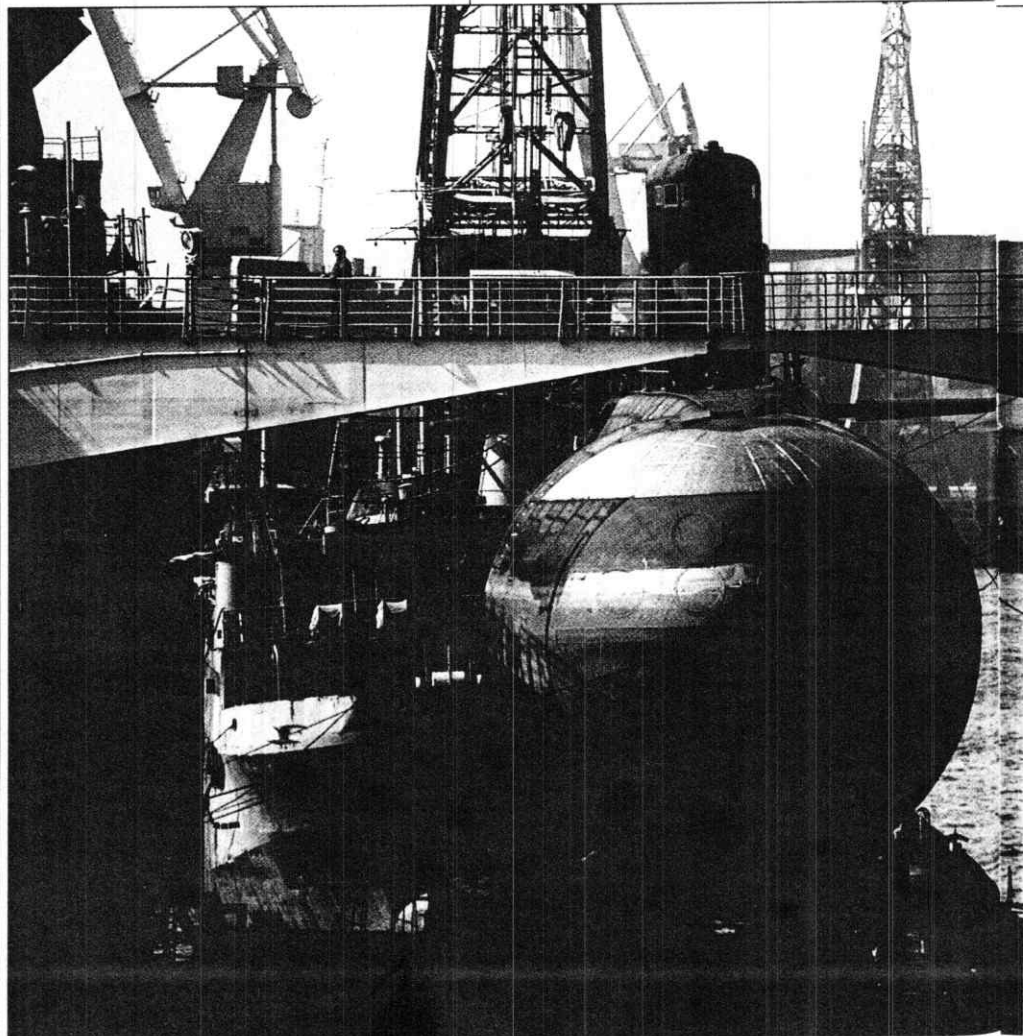
aided design (CAD) packages, stability analysis, risk assessment and cost/benefit analyses.

A design bureau will initially be contracted to perform a series of feasibility studies, examine cost/capability trade-offs and produce design options. These are refined and an outline specification produced with the First Central Naval Construction Research Institute.

Detailed engineering specifications and full design documentation are produced and transferred (under contract) to the nominated shipyard. All long-lead material for the first-of-class is normally procured by the design bureau, with responsibility passed to the shipbuilder for follow-on series production. Design bureaux also provide shipyard overseers to supervise construction, and take responsibility for post-design services and refit planning.

Unlike the aerospace industry, where design competitions and fly-offs have become increasingly common, each of Russia's warship design bureaux still tends to specialize along the following lines:

- Nevskoye Planning and Design Bureau (aircraft carriers and air-capable ships);
- Severnoye Project Design Bureau (cruisers, destroyers and large frigates);
- Zelendolsk Design Bureau (small frigates and corvettes);



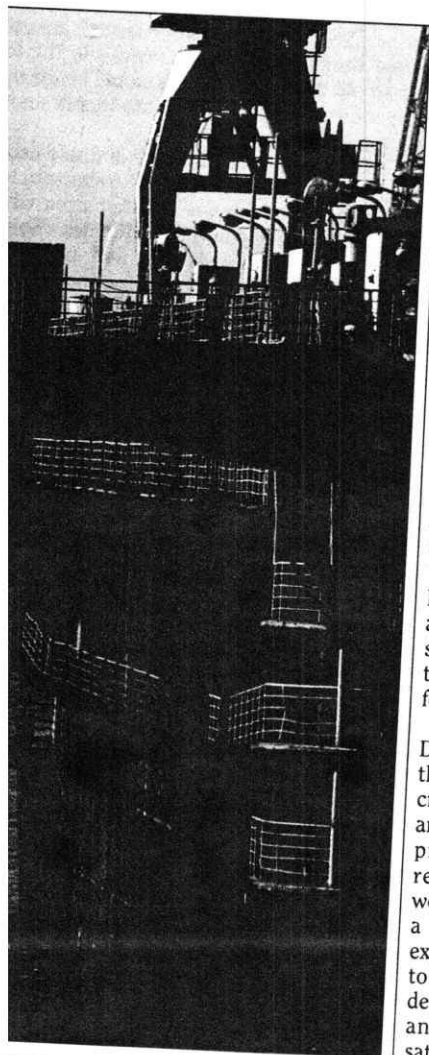
## INDUSTRY UPDATE

- Zapadnoye Design Bureau (mine-countermeasures vessels);
- Rubin Central Design Bureau for Marine Engineering (nuclear-powered ballistic-missile and cruise-missile submarines, and diesel-electric patrol submarines);
- Malachite St. Petersburg Marine Engineering Bureau (nuclear-powered attack submarines, midget submarines); and
- Almaz Central Marine Design Bureau (fast strike combatants, air-cushion vehicles and patrol craft).

The Severnoye Project Design Bureau (which this year celebrates the 50th anniversary of its establishment as bureau TsKB-53) illustrates the problems found throughout the military industrial complex. Responsible for designing most of the Russian Navy's third-generation surface combatants (notably 'Krivak' and *Udaloy* class frigates, *Sovremenny* class destroyers, and *Slava* and *Kirov* class cruisers), its payroll today stands at 700 (of which 500 are designers or engineers) down from a staff of 100 in 1990.

According to Vladimir Yukhnin, bureau head and chief designer, the cuts have mainly hit

the Project 877EKM 'Kilo' class submarine has been Russia's most notable naval export in recent years. (Photo: R. Scott/Jane's)



construction managers. "The reduction in ship construction means that we no longer need so many overseers seconded to shipyards." He added that the same era has also seen a marked shift in the balance of naval and commercial work. "Up until 1990 we were at a 100 per cent load for the navy. Today around half our work is in the naval sector, the rest in merchant shipping."

In fact, the bureau made a strategic decision to diversify into the commercial sector back in 1988. "Since then we have developed designs for container ships, bulk and chemical carriers and fishing boats," said Yukhnin. "We're now starting work on passenger ships and a second generation of bulk ships and container vessels."

Exports are also a major focus. "We have active ties with India, having worked with that country on the construction of five Project 61ME [*Rajput* class] destroyers," said Yukhnin. "We are currently providing design assistance for specific areas of the new Project 15 destroyer, notably weapon engineering."

Yukhnin confirmed that Severnoye is also working with Vietnam. Details remain sparse, but the deal is believed to cover both a corvette design and a smaller 500t fast strike craft.

As part of its reorganization, the bureau has invested in a new CAD system and is rebuilding its design drawing office. "These facilities are essential if we are to remain capable and efficient in the longer term," said Yukhnin.

One major hope for the bureau is that full-scale development funding will soon be made available for the Russian Navy's planned new fourth-generation "multipurpose escort". Severnoye has in fact received limited funding to conduct option studies into two or possibly three new surface combatant types.

"We are looking at a frigate, a destroyer and — at a much lower level of priority — an even larger [cruiser-sized] vessel," said Yukhnin. "These feasibility studies are ongoing and will be assessed with the First Institute on completion."

Although Russian Commander-in-Chief Adm Felix Gromov has spoken of plans to lay down a new escort in 1997, Yukhnin remains understandably cautious on the subject. "It's all down to money. We must see first whether this is forthcoming."

Senior officials at the Almaz Central Marine Design Bureau (CMDB), responsible for most of the Russian Navy's small combatants, patrol craft and air-cushion vehicles, believe there is an emerging trend towards non-developmental procurement on the back of independent research and development. "In the past we would receive money from the navy to develop a design which could then be modified for export," explained general designer and director Alexander Shliakhtenko. "Now we must develop the design first for the export market, and then see if the same product can later satisfy domestic needs."

This is very much the case with Almaz's latest 'Scorpion' fast strike craft design, an early computer-animated design iteration of which was seen by *JNI*. Featuring a new A-190 100mm dual-purpose gun, eight Kh-25 Uran surface-to-surface missiles and a navalized version of the Pantsyr-S1 air-defence system, 'Scorpion' is being developed as a next-generation small

combatant to succeed the long-running Project 1241 'Tarantul' series.

Design support for 'Scorpion' is being provided by the Krylov Institute and the TsAGI Central Aerodynamic Institute in Moscow. However, there is no funding from the Russian Navy at the present time. Instead, Almaz is forced to rely on money from export sales and hope that the Ministry of Defence may contribute funds at a later date.

To maintain a viable

workload for its 520 staff, Almaz is turning its attention to overseas markets. The bureau has already achieved considerable export success, selling over 430 warships to a total of 28 countries since 1965.

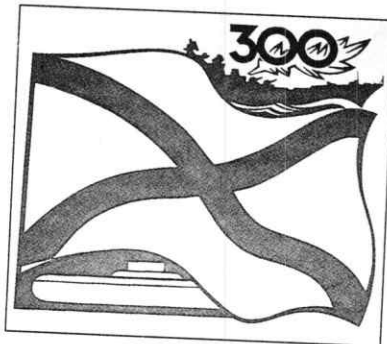
In conjunction with Rosvoorouzhnie and the Vypel shipyard in Rybinsk, Almaz is beginning series production of the 'Mirage' type patrol craft and 'Mongoose' high-speed interceptor for export. The latter is planned to make its international debut at IDEX '97 in Abu Dhabi next March.

The 'Mirage' design also forms the basis for a luxury motor cruiser aimed at the overseas leisure market. "Although it will be largely outfitted with Russian-made systems, there is flexibility for the design to take Western equivalents, such as MTU diesels or Racal-Decca navigation equipment," said Shliakhtenko.

Despite the economic hardships of recent years, Almaz has been able to invest in a new CAD suite, and has acquired software packages from both Russian and Western sources. "Of course, modernizing the design process means it has not been necessary to keep so many people on in the company," said Shliakhtenko.

In terms of its commercial footing, the CMDB is keen to maintain its position as an independent design house, having split in 1990 from a joint venture grouping with the St. Petersburg shipyard and joint stock company which shares its name. Although initially attracted by the perceived benefits of vertical integration, Shliakhtenko admitted that the joint venture arrangement was not successful. "We prefer to work as a separate organization with state enterprise status, working with individual shipyards on a case by case basis."

The Rubin Central Design Bureau for Marine Engineering takes a different view. Earlier this year it established a joint export team with the Admiralty Shipyard and Inkombank to boost its competitiveness in the submarine export market. "We know that our competitors have such resources. By establishing an industrial/financial group, we want to demonstrate our flexibility



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and long-term commitment to the customer," Igor Spassky, bureau head and director general, told *JNI*.

Spassky, who celebrated his 70th birthday in August, has guided Rubin through Russia's recent political and economic upheavals. "The last five years have witnessed a revolution," he said. "Our staff has been cut by a half [to slightly below 2,000] in that time, not just because of the reduction in defence orders, but also as a result of increased automation and improved productivity."

Over the same period Rubin has embarked on a large-scale diversification programme, becoming active in the fields of oil and gas, high-speed rolling stock, power generation and marine ecology, as well as acquiring interests in over a dozen other joint ventures and production enterprises. One example of the latter is the Neptune business centre, a hotel and office complex which currently lets space to around 25 foreign firms.

"Our life today is much more complicated, but it has also become much more interesting," said Spassky. "Previously, the richest vein of technical expertise was applied to defence rather than the civil field. This is changing."

century. With the design now essentially complete, the bureau is awaiting the government's go-ahead for the first construction order.

Although Project 935 has overwhelming strategic significance, the new *Amur* class diesel-electric submarine (SSK) is seen as the key to Rubin's future in the submarine export market. Design work on the Russian Navy's variant — which will incorporate a fuel-cell air-independent propulsion system — is well advanced and tooling up for production is under way.

Rubin later intends to develop a range of *Amur* export variants to succeed the best-selling Project 877EKM and Project 636 'Kilo' class boats. In the meantime, Spassky has high hopes of securing further 'Kilo' customers to add to the existing list of Algeria, China, India, Iran, Poland and Romania.

Alongside Rubin, the Malachite St. Petersburg Marine Engineering Bureau is the only other Russian bureau actively involved in submarine design (the Lazurit JSC having now effectively withdrawn from the field for lack of new work). Initially spun-off from Rubin as an experimental bureau, Malachite pioneered the development of Russia's nuclear-powered submarine fleet in the 1950s.

Vladimir Barantsev, the bureau's chief designer, expresses widely held concerns over defence funding and Russia's financial system as a whole. "We rely on state orders for the bulk of our work," he said. "But we find that we are not paid on time, forcing us to get bank credits for which we must pay interest charges. It is an increasingly difficult situation for us."

Barantsev would also like to see procurement reform enabling design bureaux to be given full responsibility for whole ship procurement. "Today, when it comes to actual construction, the shipyard signs a contract with us to draw up plans, technical documentation and working drawings. We complete this work and the shipyard forgets to pay," he said. "It would be better if the design bureau was contracted for the whole ship and then placed a subcontract on the shipyard for building."

Malachite has had some success in commercial markets, developing deep submergence vehicles for both industry and the Department of Geology. There have also been technology spin-offs applied to areas such as offshore drilling, fire suppression and crop processing. Even so, commercial activities account for no more than 15 per cent of turnover.

The bureau's most ambitious commercial scheme is to develop an underwater oil transport system using 30,000t submarines to transport crude oil beneath the polar ice cap. "The initial outlay would be very large," acknowledged Barantsev, "but the savings in the long run would be enormous. This would be the most efficient way to transport oil into Russia's northern regions."

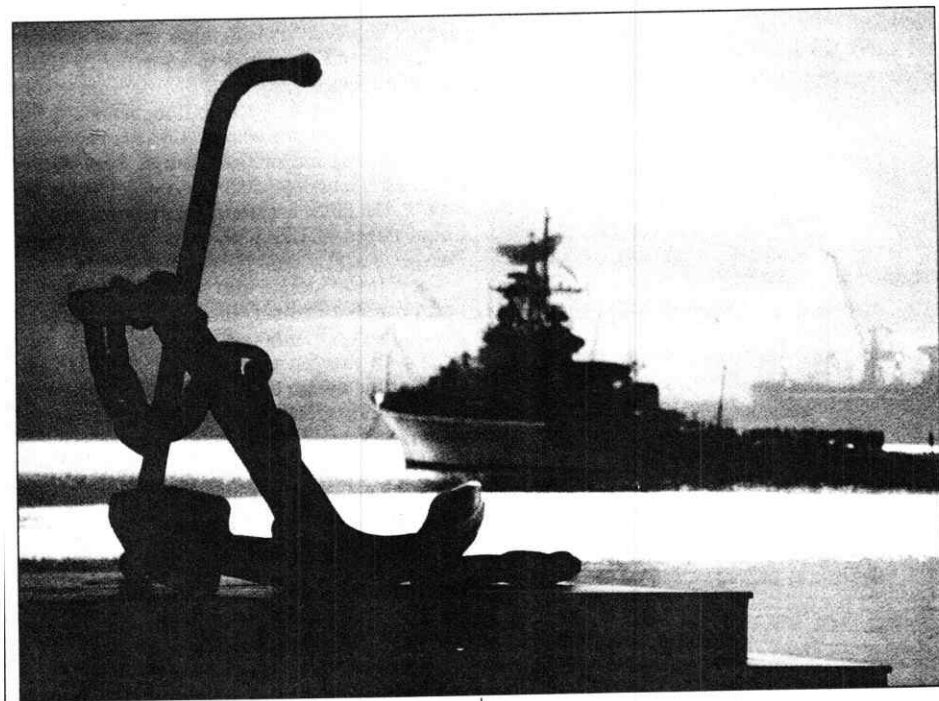
The development of a secure and safe decommissioning programme for Russian nuclear-powered submarines is another area where Malachite is seeking new opportunities. "Solving this problem will be difficult and expensive," said Barantsev. "Russia today does not have the resources. We need international co-operation to overcome the problem."

But Malachite's principal aim is to retain those core capabilities required for the design and development of nuclear-powered submarines. "We are doing our best to conserve the design skills and technical disciplines necessary to enable submarine construction," said Barantsev. "The head of the bureau is trying to maintain salary levels, but younger graduate engineers who see our situation are not so keen to work with us."

"As a result, we've seen a reduction in the number of graduates in our core disciplines. Given that it takes around 12 years to have a designer or technician fully trained, the consequences of this skills drain are likely to linger for many years."

Barantsev sees the loss of skills in the shipyards as a worrying portent. "For example, production of titanium submarine hulls has stopped. You need years of experience to weld titanium for use in high pressure structures. Those specialists will leave the shipyards and will be very difficult to replace."

"Construction is being damaged first. We are desperately trying to retain our core design skills and technical competencies, but we are on our last forces. Firm decisions on the navy's future course are vital for us." ■



However, Spassky is clear as to his top priority. "The main reason for these commercial ventures is to help us to survive. There is a major responsibility for the company to preserve its intellectual potential and capability for the design and development of submarines," he explained. Even with its commercial interests, defence work still accounts for around 60-65 per cent of Rubin's turnover.

Submarine design work for the Russian Navy is continuing, albeit at a slower pace and reduced volume. Rubin's most important project is the development of a fourth-generation nuclear-powered strategic-missile submarine (SSBN) — believed to be designated Project 935 — which will enter service early in the next

Having designed almost all of the Russian Navy's third-generation surface combatants — such as this Project 1135 'Krivak' class frigate — the Severnoye Project Design Bureau is now working on concepts for fourth-generation "multipurpose escort" ships. (photo: R. Scott/Jane's)

More recently, the bureau has designed a series of third-generation nuclear-attack submarines (notably the Project 971 *Bars* class) which has narrowed the acoustic gap between NATO and Russian SSNs to a situation of near parity. Malachite is now working with the Northern Machine Building Enterprise on the construction of the fourth-generation Project 885 submarine *Severodvinsk*.