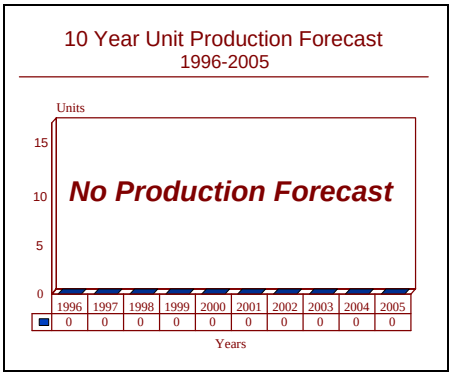
Project 1143.5 Kuznetsov Class - Archived 10/97

Outlook

- *RFK Kuznetsov* in operational service
- *RFK Varyag* being broken up
- No possibility of future construction
- Successor class may be designed in far term



Orientation

Description. TAKR (Tyazholiy Avianosny Kreyser or heavy aircraft carrying cruiser).

Sponsor
Ministry of Defense
Moscow
Russia

Contractors
Nikolayev South Shipyard
Nikolayev
Ukrainian Republic

Licensee. No production licenses have been granted.

Status. Production and service.

Total Produced. Two ships have been ordered, one of which has been canceled.

Platform

Ship	Builder	Laid down	In Service
Admiral Kuznetsov	Nikolayev South Shipyard	1983	1992
Varyag	Nikolayev South Shipyard	1985	Canceled 1995

Application. As indicated by the TAKR designation, these ships were intended to serve as the flagships for Pro-Submarine Warfare (PSW) groups containing surface ships, submarines and aircraft, operating in support of the ballistic missile submarines of the Russian Navy.

Price Range. According to statements made during Chinese attempts to purchase the *Varyag*, these ships cost US$2.4 billion each.

Technical Data

Characteristics

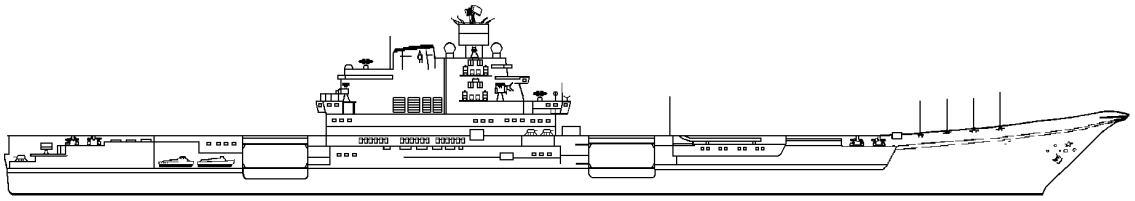
Crew:	200 officers, 600 Mishmanyyii, 1300 enlisted
Speed:	32+ knots
Range:	4,500 nm/32 kts; 15,000 nm/18 kts

Dimensions	**Metric**	**US**
Length:	304.5 meters	1007.8 feet
Beam (hull):	38.0 meters	125.8 feet
Beam (flight deck):	72.0 meters	238.3 feet
Draft:	10.5 meters	34.1 feet
Displacement standard:		55,000 tons
Displacement full load:		67,500 tons

Armament	**Type**	**Quantity**
Air group:	Maximum capacity	52
Interceptors:	Su-27K	18
ASW helicopters:	Ka-27PL	16
Command helicopters:	Ka-27RLD	3
Utility helicopters:	Ka-27PS	2
Guns:	AK-630 30 mm Gatling	6
Missiles:		
Surface-to-surface:	P-700 Granit	16
Surface-to-air:	Kinzhal (9M330)	256
CIWS:	Kortika Gun/launcher	8
	each has 2A38 30 mm guns	2
	and 9M311 SAM	8
ASW:	RBU-12000	2

Electronics	**Type**	**Quantity**
Radar:		
Air/surface search:	MR-760 Fregat-MR	1
	MR-302 Rubka-M	2
Air search:	Mars-Passat (*Kuznetsov*)	1
	MR-600 Voshkod (*Varyag*)	2
Navigation:	MR-212 Volga	3
Fire Control:	Podberezovik	8
	Positiv-E	8
Aircraft control:	Fly Trap	1
Electronic warfare:		
ESM:	Wine Glass	8
	Bell Bash	4
	Bell Thump	4
	Bell Push	2
ECM:	Wine Flask	8
	Flat Track	2
Decoy launchers:	RK-2	2
	RK-10	10
Sonar:		
LF Bow mounted:	Platina	1
VDS	Orion	1
Communications:		
TACAN	Cake Stand	1
SATNAV	Low Ball	2
OTHT Datalink	Tsunami	2
E/O:		
Laser/IR surveillance	Tin Man	3
Laser warning system	Spektr-F	12
IR launch warner	LO-82	12

Propulsion	**Type**	**Quantity**
Main engines:	Turbo-pressurized boilers	8
	TV-12 steam turbines	4x50,000 shp
Propellers:	Fixed pitch	4



Project 1143.6 Varyag

Source: Forecast International

Design Features. The Project 1143.5 class represents a simple extension of the earlier Project 1143 Kiev class, retaining the same basic hull lines but with an extra 30 m parallel hull section inserted amidships. The hull has been blistered (increasing the beam by 7 m) to improve stability and to raise the freeboard from 13.5 m on the Project 1143 class to 16 m on the Project 1143.5. These two modifications were also to have been used to correct the trim problems experienced on the Project 1143 class. The extra internal hull volume is used to enhance the command control facilities that are the primary purpose of these ships. The space within the blisters is used to carry additional fuel oil.

The Project 1143.5 design has 27 decks from the keel up and has more than 3,000 compartments. Many of the watertight doors have not been installed and "others" are

made of wood. The hangar deck is 150 m long but is very narrow and accommodation is limited. Propulsion is the standard Russian large-ship plant using eight vertical turbo-pressurized boilers linked to four geared steam turbines. The engineering plant generates 200,000 shp and can provide a speed of 32 knots.

Replacing the P-500 (SSN-12 Sandbox) missiles in elevatable launch tubes with the P-700 Granit (SSN-19 Shipwreck) in fixed, internal tubes has permitted the flight deck to be extended to the bow. This bow area was originally intended to carry two steam catapults, reportedly based on those designed for the French aircraft carrier *Charles de Gaulle*. As with the French system, the Russian catapults failed to meet specifications. They were deleted and have been replaced by a 12-degree ski jump flight deck to assist in V/STOL (Vertical/Short Take-Off and Landing) aircraft operation. This results in the ship's most notable visual feature, the extreme rake and sheer of the bow section.

The flight deck arrangement reflects US design practice in that the island is sponsoned out on the starboard side and is outside the hull form. The landing-on deck is sponsoned to port and has four arresting wires with a bull's-eye at wire number two. The ship has two aircraft elevators located on the starboard side, one forward and one aft of the island. Numerous ammunition lifts lead up to the flight deck which is not fitted with tie-down points for aircraft. No deck park can therefore be carried.

The extreme rake of the bow (exaggerated by the ski-jump) and the provision of a stem anchor indicated that design provision has been included for a large, low-frequency bow-mounted sonar dome. This system is designated Platina and acts as a defensive sonar array for platform self-protection. Similar systems are carried onboard the Project 1164 Slava class and Project 1144 Admiral Ushakov class heavy cruisers. The VDS is Orion, the standard Russian Navy low-frequency active towed sonar.

The shape and configuration of the island are dominated by the four planar phased-array Mars Passat (Sky Watch) antennas. These are dummies made out of concrete paving slabs. The island structure is topped by the large, cylindrical Cake Stand TACAN antenna. Internally, little of the intended electronics fit has been installed so the relationships between the systems cannot be established with any degree of certainty. It appears that the ship was intended to have a large and sophisticated command system based around a fully distributed network of computers and administered from the Battle Information Post in the superstructure. This compartment is empty.

During her recent operational deployment to the Mediterranean, the *Kuznetsov* was noted to be taking on considerable volumes of fresh water at frequent intervals. This lead to speculation that the ship was having serious problems with her evaporators. Russian Navy sources deny this and state that the problem is that the installed evaporator work but their capacity is inadequate to meet the demands of the crew. This does not reflect technical problems but the difference in living standards between those demanded of Soviet sailors and those expected by their Russian successors.

Operational Characteristics. The primary function of these ships as fleet command ships dictates the provision of a comprehensive integrated command system. The key part of this is a strategic-level system called the Second Admiral. This receives generalized directives from the shore and integrates those with information received from the ships own sensors and those of the task group to produce a series of prioritized tactical recommendations. The task group commander is then able to select from these and the Second Admiral then brings subordinate command systems, the Second Captains, on line as appropriate to the tactical situation.

These Second Captains may either be on the Project 1143.5 class, covering specific warfare areas (ASW, AAW or ASuW), or be the primary command Second Captains on other warships, aircraft or submarines in the task group. Threats to the task group are countered in rotation according to the tactical priorities established by the Second Admiral. Where threats are equal in priority, one is assigned to a subordinate unit of the task group while the flagship accommodates another.

The Su-27K fighters and Sky Watch radar would have formed an integrated outer ring of air defenses effectively substituting for long-range surface-to-air missiles. The Sky Watch radar is often described as "a Russian Aegis" but the relationship between the two systems is superficial only. Sky Watch was never intended to have a missile control capability. The Second Admiral would have received a threat alert from the shore control stations and the direction of the probable threat axis. This information would have been used to deploy aircraft to cover that threat axis. The aircraft were to have been datalinked to each other and to the Sky Watch radar so that over-the-horizon radar data would have been made available to the Project 1143.5. Thus the Su-27K aircraft would have combined the roles of the F-14 and some of the capabilities of the E-2C. Once the airborne threats had been identified and the Su-27Ks had engaged their fire control radar, the aircraft's missiles could have been fired either by the pilots or (preferred option) by the Project 1143.5. It is possible that land-based MiG-31 Foxhound interceptors could also have been controlled using this system.

Inbound threats leaking through this system would then have been handed over to the close-in defense systems of

the Project 1143.5. The damage control center on the ship would be automatically brought to the highest state of readiness at this point. The close-in defenses of the Project 1143.5 are extremely heavy, equivalent to 24 Phalanx Mk.15 and 12 NATO Sea Sparrow launchers.

The primary point defense system is the Kinzhal (NATO codename SAN-9) vertical launch missile system. Four batteries, each consisting of eight rotary-launch silos are provided, each containing eight missiles for a total of 256 rounds. A complete set of magazine reloads is carried, bringing the total loadout of Kinzhal missiles to 512. Rate of fire is one missile per silo every three seconds and the guidance complex can direct a maximum of 32 missiles divided between a total of 16 targets. Maximum engagement range is 12,000 m with a minimum range of 1,500 m. The missiles have a speed of 3,050 kph and can engage targets at altitudes between 10 m and 6,000 m in altitude and traveling at speeds of up to 2,520 kph. The guidance computers automatically hand over any targets leaking through the Kinzhal screen to the Kortika CIWS.

The CIWS system fitted is the Kortika (NATO codename CADS-1) combined gun/missile system. Eight of these mounts are installed, two on each of four sponsons covering the quadrants of the ship. Each is armed with a pair of 2A38 30 mm multi-barreled cannon and racks for eight 9M311 (NATO codename SAN-11) missiles. A total of 384 9M311 missiles are carried for the eight systems. The four 2A38 guns have an aggregate rate of fire of 5,000 rounds per minute and an effective range of up to 3,000 m. The 9M311 missile has command-to-line-of sight guidance and a maximum range of 8,000 m. Two radar antennas are provided, codename Hot Flash by NATO. One scans vertically to determine altitude, the other horizontally to give range and bearing. This arrangement, very common with Russian AAW radar, provides target tracking at 12,000 m. The system operates in the L-band. There is no on-mount target acquisition radar, this function being provided by the Positiv-E radar.

Anti-ship and land attack firepower is provided by a battery of 12 P-700 Granit (SSN-19 Shipwreck) missiles carried in inclined tubes buried in the forward section of the flight deck. These missiles can have nuclear warheads of either 200 or 350 kilotons, a 1,000 kg unitary high explosive shaped charge warhead or a cluster bomb dispenser with 750 1 kg bomblets. These can be high explosive, armor piercing or incendiary. Guidance of the P-700 can be by inverse synthetic aperture imaging radar, active radar or passive radar/home-on/jam.

Variants/Upgrades

The next ship of the class, the *Varyag* had a redesigned superstructure which eliminates provision for the Sky Watch phased-array antennas. The radar fit was modified to reflect the loss of capabilities intended to be provided by the Sky Watch radar. Two MR-600 Voshkod (Top Sail) radar were provided, mounted for and aft on the island. There are some suggestions that the battery of P-700 missiles may have been deleted in order to increase airgroup capacity.

Project 1143.7 was to have been the *RFK Ul'yanovsk*, a further expansion of the basic Project 1143 design. This ship would have featured full aircraft operating features, including catapults and arrester wires as well as being nuclear-powered. The ship was an estimated 40-percent complete in 1992 when construction was halted. The incomplete hull was broken up in order to clear the slipway for merchant ship construction. This process was completed by late 1993. The material assembled for a second ship of this class was also scrapped during this period.

Project 1153 Russian histories of warship designs also mention a true carrier program involving two designs. One of these is designated Project 1153. No details of this design are available but the number suggests that it was a development of the basic Project 1143 Kiev class. This, in turn, suggests that Project 1143.7 may have been a simplified version of Project 1153.

Project 1160 The same Russian design histories also refer to a Project 1160 class aircraft carrier. The institution of a new Project Number series could be taken to suggest that this was a new design, possibly competitive with Project 1153. Another possibility is that Project 1153 was intended for the Red Banner Northern Fleet while Project 1160 was intended for the Pacific Fleet. To some extent, this is an academic question since neither ship advanced beyond the early design stages.

Project 1133 One German-published history of Russian warship design refers to a Project 1133 class TAKR as being an intermediate between Project 1123 and Project 1143. The reliability of this reference is impossible to determine. Project 1133 may be a guess based on a hole in the Project Number sequence, it may refer to the pre-flagship design for the Kiev class or it may be fog and mist.

Program Review

Background. The Project 1143.5 design can trace its ancestry back to the Okean '70 exercise. This, the Soviet Union's first blue water worldwide fleet maneuvers, was intended to demonstrate the capability of the new Soviet fleet. Although regarded as a major success by Western observers, the Russian assessment of the operation was that it was a disastrous failure. The concept of controlling far-flung naval operations from shore fleet command posts was shown to be deeply flawed since the command loops involved could not respond quickly enough to cope with the naval environment.

The result was an urgent program to introduce at-sea flagships for the Soviet Navy PSW and RKR (Raketny Kreyser or Rocket Cruiser) forces. Fortuitously, a successor to the Project 1123 Moskva class anti-submarine cruisers was being built (these may have been designated Project 1133). The new ships became the Project 1143 Kiev class and featured a much larger hull than the Project 1123. This provided the volume required for the elaborate command facilities demanded of a fleet flagship. The Project 1143 class were therefore redesignated from PKR (Protivolodochny Kreyser or Anti-Submarine Cruiser) to TAKR (Taktischeskoye Avianosny Kreyser or tactical aircraft-carrying cruiser). In Russian Navy terminology the cruiser designation denotes, as it does with the Royal Navy, provision for controlling groups of warships.

The first pair of Project 1143 class ships (*Kiev* and *Minsk*) were already well-advanced and, therefore, retained many of their PKR design features. Initial trials did, however, reveal that they were successful in providing the required at-sea command capability. These trials, and the Okean '75 exercise, also demonstrated the crucial importance of the fleet flagships and that they could expect to be subjected to intense attack. Enhancing their defenses was essential while a campaign of disinformation as to their true role was mounted.

The third ship of the class, the Project 1143M *Novorossiysk*, reflected the lessons learned with the first two ships. It mounted a much-enhanced self-defense missile battery at the expense of a portion of its air group (a very revealing design trade-off), while the fourth ship of the class became the Project 1143.4 *Gorschkov*. This ship was radically redesigned and carried the new Sky Watch radar together with a further-enhanced missile load-out. This ship was the testbed for the systems and equipment to be carried onboard the definitive PSW flagships, the Project 1143.5 Kuznetsov class.

The Project 1143.5 design represented, as its Project Number indicates, a lineal development of the earlier TAKR design. Replacing the P-500 (SSN-12 Sandbox) missiles with the P-700 (SSN-19 Shipwreck) permitted the flight deck to be run from bow to stern. In its original form, a 30-meter hull stretch allowed for the installation of two bow catapults and stern arrester wires, thus permitting the operation of conventional fixed-wing aircraft. When preparation for construction of the first ship was discovered by Western intelligence experts in 1979 they immediately jumped to the conclusion that it was the Soviets' first attempt at the construction of a Western-style aircraft carrier. This was incorrect; although the Project 1143 program was paralleled by a true aircraft carrier program built around two designs, Project 1153 and Project 1160. No details of these have been released although the numbers might suggest that Project 1153 was a development of Project 1143 while Project 1160 was a new design. At the moment, this is pure speculation.

On Project 1143.5, the fixed-wing aircraft represented the addition of yet another ring of defenses to the flagships. It was then obvious that the US Navy intended to come north with its own carriers and that the PSW forces would be subject to intense air attack. The older Project 1143 and 1143M ships could only carry the Yak-38, a low-performance VTOL light fighter, intended to interrogate dubious contacts and harass NATO ASW aircraft. It was quite incapable of facing the US carrier air wings. Once the provision of fixed-wing fighters had been accepted, control of a very complicated air battle had to be instituted, hence the development of Sky Watch. The *Kuznetsov's* air group remained subsidiary to, and a support for, the ship's primary role as fleet command flagship.

It is now known that the Russian Navy never envisaged a power projection role for these ships. This function was devolved to the RKR forces which would have used their long-range missiles for the role. The Russian Navy believed that cruise missiles were a more effective solution to the power projection requirement than manned aircraft - an assessment which the US Navy appears to have adopted in Iraq and proposed as an option in other, similar, circumstances.

Construction commenced on the first Project 1143.5 TAKR, then called the *Leonid Brezhnev*, in 1982. The keel for the ship was officially laid in January 1983. The ship has had three names since construction commenced. The original name was *Leonid Brezhnev*, but this was changed to *Tbilisi* when the ship's namesake fell from grace with the Communist Party. When the Russian Republic started declaring their independence, the Supreme Soviet decided that ships would not be named after the breakaway republics or any city in these republics. The ship was then renamed the *RFK Admiral Flota Sovetskogo Soyuza Kuznetsov*. The ship was launched December 5, 1988 at Nikolayev South Shipyard. At the same time, the keel for the second ship of the class, then named *Riga*, was laid. The second ship was later renamed *RFK Varyag*.

Construction of both ships was very badly delayed by problems with the new systems installed. First, foremost and above all, the Mars-Passat radar system was a complete failure and could not be made to work. Neither the radar installed on the *Gorschkov* nor those on the *Kuznetsov* have ever radiated and recent close-up photographs have revealed that the antenna arrays are dummies made out of concrete pavement slabs. Work on the system was abandoned in 1990 and the *Varyag* was modified with a redesigned bridge, very similar to that on the Project 1143M class. Russian sources informed us in early 1995 that this ship would be equipped with two MR-600 Voshkod (Top Sail) radar to replace the air surveillance capability lost by the failure of Mars-Passat. The MR-600 radar is relatively old and it is possible that they were removed from decommissioned Project 1134A (Kresta II) class BPKs.

The design of the catapults and arrester wire systems also presented serious problems. The former were only resolved by the deletion of the catapults and reprofiling the bows to include a ski-jump. This severely limited the ability of the ship to operate conventional (nonvectored-thrust) aircraft. The arrester wire system was installed aft when the first ship of the class commenced sea trials in late 1989. The *Kuznetsov* continued running sea trials in an attempt to get its aviation-related features operational until early 1995. These trials were suspended for most of 1991 and 1992 since the ship was unable to operate due to a lack of funds.

In January 1992, the Norwegian ship-broker Ole-Jacob Liebig was commissioned by the Ukrainian Government to find a buyer for the incomplete *Varyag*. At that time, the ship was structurally complete but only 60 percent of the powerplant had been installed and none of the electronics. Liebig was authorized to sell the ship either as a warship or for scrap. The asking price, at that time, was US$4 billion, far more than the ship was worth. India is reported to have made an offer via Liebig of US$800 million. The main interest, however, came from the Chinese Navy.

An offer was made for the purchase of the *Varyag* at a cost of US$2.4 billion, paid in three annual installments with the completion of the ship being undertaken in a Ukrainian shipyard. According to authoritative reports, the sales agreement between China and the Ukraine was actually signed in August 1992. Russia raised serious objections to the sale, ostensibly on the grounds that it did not wish to sell the ship, but actually because it wanted a bigger share of the US$2.4 billion. This ownership dispute, plus growing doubts in China over the wisdom of the proposed purchase, caused the deal to be formally abandoned in April 1993.

In February 1994, the Project 1143.4 TAKR *RFK Gorschkov* suffered a very serious boiler room explosion and fire which caused the ship to burn for more than twelve hours. The damage was reported to be so extensive that the ship is beyond economical repair. As a result, the Russian Navy attempted to have construction of the *RFK Varyag* restarted in order to replace the stricken *Gorschkov*. Funds to complete the *Varyag* were to have come from the sale of the *Gorschkov* to the Indian Navy. Eyewitnesses reported that work restarted on the *Varyag* but there were doubts as to whether this work is building the ship or scrapping it.

During early 1995, the Russian Navy provided Forecast International with accurate details of powerplants, dimensions and other ship characteristics. This information has now been incorporated in this report but contains no real surprises.

The Russian Navy also announced that the *RFK Kuznetsov* joined the active fleet during mid-1995. The *Kuznetsov* is now the only Russian TAKR left; the four earlier ships have been either sold for scrap or are awaiting that fate. In early 1996, the Russian Navy revealed that the reported activity on the second Kuznetsov class ship was the commencement of the process of scrapping the *Varyag*. The order to scrap the hulk had apparently been signed in late 1995 and the wreck should be substantially dismantled by early 1997.

In contrast, the *Kuznetsov* undertook her first major cruise during the opening months of 1996. This was officially in support of UN initiatives in Bosnia and involved participating in the carrier-based air operations. The ship did not integrate with the other forces in the area. The airgroup contained a mix of Sukhoi and MiG fighters with a reduced number of helicopters. Technical difficulties and a general lack of experience restricted the ship's availability and her role appears to have been more of a sales effort for the embarked aircraft than an operational deployment.

Funding

This program was funded by the Supreme Soviet for the Soviet Navy, but is no longer being supported.

Recent Contracts

No contractual information has been made public.

Timetable

	1976	Soviet Navy initiated design study
	1979	Navy acknowledged design work
	1983	*Kuznetsov* laid down
Dec	1988	*Kuznetsov* launched
		Varyag laid down
	1989	*Kuznetsov* commenced sea trials
	1991	*Kuznetsov* delivered to Northern Fleet
	1992	Efforts to sell *Varyag* started
Jul	1995	*Kuznetsov* declared operational
Late		Orders to scrap *Varyag* signed
Feb	1996	*Kuznetsov* undertakes deployment to Mediterranean

Worldwide Distribution

Russia (1 ship in service)

Forecast Rationale

Previous Western analyses of the Project 1143.5 class TAKRs have all suffered from the perception that the ships are aircraft carriers and they were thus treated as mirror images of Western strike carriers. This is the reason Forecast International has explained the true background and role of these ships in some detail. Their aircraft carrying capability is a secondary support function to their primary role as fleet flagships. It is true that aviation features dominate their design; this is because aircraft operating features are inflexible and cannot be changed at will to accommodate ship design characteristics. This does not change the situation wherein the ability to operate aircraft is not the most important characteristic of these ships.

Viewed as flagships, there can be no doubt that they would have fulfilled their design role with great effectiveness. Their generous dimensions and sophisticated systems would have, had those systems worked, enabled them to coordinate anti-submarine operations over a very wide area, and thus provide excellent protection to the Russian Navy ballistic missile submarines in their bastions.

However, the necessary systems did not work and have never been installed. Apparently the datalinking between aircraft works well and that between the ships is a tried and tested system. In contrast, the air-to-surface links have been plagued with problems and, as already indicated, the vital Mars Passat radar was a total failure.

It is very difficult to conceive of a potential purchaser acquiring these ships for their original role. Few navies have requirements for ships in this class and the PSW function is one unique to the Russian Navy. These ships look like aircraft carriers and are regarded as such by potential buyers. Both the Indian and Chinese navies regarded them as potential increments to (or initiators of) their aircraft carrier force and made their bids on that basis. After the initiation of negotiations, both buyers withdrew, in the case of the Chinese when the arrangements for the sale were far advanced. It is probable that both navies dropped their bids when the error of their assessment of the ships as potential carriers was realized.

The problem is that the optimization of the Project 1143.5 to the flagship role means that their aircraft carrier characteristics are very much secondary ones and they are not cost-effective when considered in that role. Their hangar decks are restricted in length by the P-700 battery forward and in width by the magazine space needed for the awesome battery of point defense missiles. Deck parks cannot be carried due to the lack of tie-down points and the flame wash caused by firing the P-700 missiles. Thus the airgroup is very small for a 55,000-ton ship and is further restricted by the lack of catapults. It is therefore very unlikely that these ships will find buyers.

The situation is not completely hopeless. While the Project 1143.5 design is too heavily optimized to Russian requirements to be a viable export commodity, it has provided a very valuable fund of information on the design of aircraft-carrying ships. This can be exploited by developing a version of the design which enhances aircraft-carrying capability at the expense of the superfluous flagship characteristics and a substantial portion of the onboard weaponry. The nonavailability of the required sensors can be accommodated by building the ships with a databus so that the appropriate sensors as specified by the purchaser can be installed with little difficulty. Both China and India would find such a solution highly attractive — indeed both countries are reported to be involved in negotiations along just these lines.

The following forecast chart is based upon the completion of the existing Project 1143.5 program.

The very high level to which these ships have been optimized to their tactical role makes them unlikely to be sold to external users. They will either enter Russian service or be scrapped. It is possible that a true aircraft carrier derivative of this design will be prepared to meet the requirements of export customers, but this will have to wait until the relationship between Russia and the Ukraine stabilizes.

Ten-Year Outlook

No additional production is forecast.

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