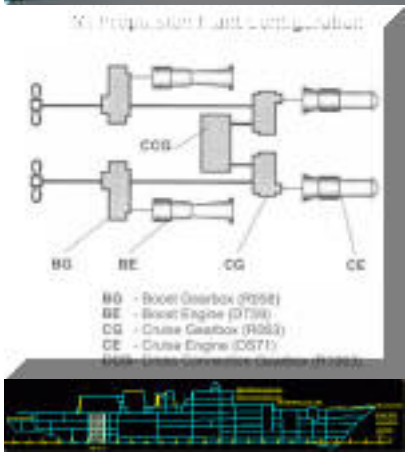
CCG
BG
BE
CG
CE
BG - Boost Gearbox (P258)
BE - Boost Engine (DT59)
CG - Cruise Gearbox (R253)
CE - Cruise Engine (DS71)


Vessel Type**:** Guided Missile Frigate, Type 1135.6

Names & Pennant Numbers with commission dates**:**
INS *Talwar* F40; Laid Down - 10 March 1999, Launched - 12 May 2000, Commissioned - 18 June 2003.
INS *Trishul* F43; Laid Down - 24 Sept 1999, Launched - 24 Nov 2000,

Commissioned - 25 June 2003.
INS *Tabar* F44; Laid Down - 26 May 2000, Launched - 25 May 2001, Commissioned - 19 April 2004.

Structure**:** The Severnoye (Northern) Design Bureau developed the Project 1135.6 vessel using an earlier Project 1135.1 design, which dated back to the early 1980s. The extensive scope of redesign and re-engineering for these vessels has realised a multipurpose surface combatant of about 4,000 ton displacement (this increase being attributed to additional weapon systems and the replacement of light alloys with steel), tailored to meet the Indian Navy's specific mission and performance requirements.

The ship's redesigned topside & hull has considerably reduced radar cross-section and this feature alone, clearly separates the Project 1135.6 from its predecessors. While the superstructure sides are sloped and relatively clean, the very cluttered topside of the ship cannot be remotely described as having any signature reducing features. However, these frigates will be the first Indian Navy warships to incorporate some stealth features and a vertical launch missile system. The ship's hull is characterised by outward flare and tumblehome, while the superstructure (which forms a continuous junction with the hull) has a large fixed tumblehome angle.

Displacement**:** 3620 tons - standard.
.....4035 tons - full load.

Dimensions**:** Length - 124.8 metres.

.....Beam - 15.2 metres.
.....Draught - 4.5 metres.

Main Machinery**:** Features the Zorya/Mashproekt M7N.1E gas turbine plant which comprises of 2 x DS-71 cruise turbines and 2 x DT-59 boost turbines in two engine rooms.

• The cruising component consists of two DS-71 gas-turbine engines (each rated at 9000 hp, forward running, and 1.500 hp in reverse), two cruising RO63 two-speed gearboxes and one cruising R1063 auxiliary (cross-connected) gearbox which makes it possible to use any of the cruising engines to drive both propeller shafts. Ratings at ISA + 15 air temperature.

• A boost component with two DT-59.1 gas-turbine engines (each rated at 19,500 hp, forward running, and 4500 hp in reverse) and two RO58 single-speed reduction gearboxes. Ratings at ISA + 15 air temperature.

All the engines & gearboxes are referred to as L (Levyy) and P (Pravyy) sets except for the R1063 auxiliary (cross connection) gearbox. In Russian, Levyy means Left and Pravyy means Right. So, there would be a DS71L, RO63L, and DS71P, RO63P and so on. Mashproekt Scientific & Production

Enterprise of Ukraine manufactures the Zorya-designed gas turbines and reduction gears. The basic specifications of marine gas turbine units (GTU) are;

- GTU (Gas Turbine) starting time: 120-180 seconds.
- Time to accelerate from idle running mode to rated power mode : 300 seconds.
- Time to decelerate from rated power mode to idle running mode : 40-70 seconds.
- Full reverse time: 70-120 seconds.
- MTBO (Mean Time Between Overhauls) for engines: 20,000 to 30,000 hours.
- MTBO (Mean Time Between Overhauls) for reduction gears: 50,000 to 60,000 hours.

urbines fo

Type

Power (hp)

Efficiency (%)

Output (RPM)

Compressor Type

Dimensions (LxWxH) in meters

**Weight (Tons)**

DS-71

9000 fwd
1500 rev

29-31

5130

Axial flow, 2 spool, 8 + 9 stages. Comp Ratio = 16.6:1

3.4 x 1.7 x 2.4

3.7

DT-59

19,500 fwd 4500 rev

28

3500

Axial flow, 2 spool, 7 + 9 stages. Comp Ratio = 12.7:1

6.6 x 2.5 x 3.1

14

-

## Gearbox Data

| Type |
|---|

| Power (hp) |
|---|

| Reduction Ratio |
|---|

| Output (RPM) |
|---|

Dimensions (LxWxH) in meters

| **Weight (Tons)** | |
|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| RO58 | 19500 | 12.76 | 300 | 3.24 x 2.8 x 2.6 | 19 | |
| RO63 (2 speed) | 8500 | 20.88/13.95 | 220/300 | 3.3 x 2.3 x 2.8 | 16 | |
| R1063 | 4250 | Cross Connection | | 1.0 x 1.92 x 1.05 | 3 | |

Electrical Power**:** Provided by four 1 MW Wartsila WCM-1000 generator sets with Cummins KTA50G3 engines and Kirloskar 1MV AC generators. These are not mounted in acoustic enclosures like the Project 17 Class frigates. The contract for the generators was signed with Wartsila Denmark. An integrated platform control system, developed by the Aurora Research and Production Association, monitors and manages propulsion machinery, auxiliary machinery, steering and stabilisation, and electrical power distribution. Based on a local-area network (LAN), its distributed system architecture uses standardised VME modules.

Maximum Speed**:** 30 knots.

Maximum Range**:** 4850 miles at 14 knots.
.....1600 miles at 30 knots.

Maximum Sea Endurance**:** 30 days.

Complement**:** 180 (incl. 18 officers)

Radar**:** *Surface Search;* One 3Ts-25E Garpun-B radar at I-band frequency, using both active and passive channels, provides long-range surface target designation. One MR-212/201-1 radar at I-band frequency is used for navigation and a separate Kelvin Hughes Nucleus-2 6000A radar set is used for short-range navigation and surface surveillance. Also fitted with a Ladoga-ME-11356 inertial navigation and stabilisation suite supplied by Elektropribor.

*Air/Surface Search;* One Fregat M2EM (NATO: Top Plate) 3D circular scan radar at E-band frequency, provides target indication to the Shtil-1 missile system. Featuring continuous electronically scanned arrays, the radar rotates at 12 or 6 rpm and has an instrumented range to 300 km.

*Fire Control;* Features a Ratep JSC 5P-10E Puma fire control system, comprising of a phased array and target tracking radar along with laser and TV devices. The system - fitted above the bridge deck - features in-flight course correction updates via data links, has a maximum detection range of 60 km, operates autonomously and is capable of automatically locking on to four targets and tracking them.

Sonar**:** Some reports indicate that the BEL APSOH (Advanced Panoramic Sonar Hull) hull-mounted sonar is fitted on the vessels. The APSOH sonar performs active ranging, passive listening, auto tracking of targets and classification. Other reports indicate that the BEL HUMSA (Hull Mounted Sonar Array) sonar is fitted. The HUMSA is a panoramic medium-range active/passive sonar system developed by the Naval Physical and Oceanographic Laboratory (NPOL).

Information released from the Severnoye Design Bureau (SDB) indicate that French towed array sonars (TAS) are also fitted. This is very plausible given that many Indian Navy ships now use French TAS, however INS Talwar shows no signs of such a system. The vessel may also

have a SSN-137 VDS (Variable Depth Sonar), providing active search with medium frequency.

Weapons**:** In the main strike role, an eight-cell KBSM 3S14E vertical missile launcher is fitted, which accommodates the Klub-N ASCM. The Agat Research and Production Enterprise has supplied the 3R14N-11356 shipborne fire-control system associated with Klub-N. Jane's Defence Weekly reported in April 2004, that IN sources indicated that INS Tabar would be the first vessel in the Talwar series to be armed with the supersonic BrahMos (PJ-10) ASCM, which DRDO of India and NPO Mashinostroyeniya of Russia, have co-developed. The other two vessels (Talwar and Trishul) will also subsequently be equipped with the BrahMos ASCM.

In the air defence role, a single 3S-90 missile launcher is fitted forward of the bridge and is armed with the Shtil-1 SAM system. The system comprises of the 9M317 ( SA-N-11, navalised

SA-17
) missile and
24 such missiles are carried in a below-decks magazine. Guidance and target illumination for these missiles is provided by four MR-90 Orekh (NATO: Front Dome) radars, which are connected to a command and control post.

Manufactured by the Dolgoprudny Research and Production Enterprise, the 9M317 missile uses a combination of inertial guidance and semi-active radar homing (the 70 kg blast fragmentation warhead is triggered by a radar proximity fuze) to its maximum range of 45 km. The missile can engage the following targets irrespective of the intensive jamming and minimal altitude; tactical ballistic missiles; aircraft manoeuvring at acceleration up to 12 g; cruise and antiradar missiles; helicopter gun ships; remotely piloted aircraft; anti-ship missiles; and radar-contrast water-borne and

ground targets. The missile's control system and warhead can be adjusted to a specific target (ballistic, aerodynamic, small-size, water-borne, ground, helicopter) following target recognition, which increases hit probability. Eight Igla-1E (SA-16) portable air defence missiles are also carried.

One 100mm A-190(E) gun, for use against ship and shore based targets, is fitted forward. The A-190(E) uses a lightweight gun mount with an automatic gun and fuze setter. The mounting is fed from separate port and starboard magazines and uses three different rounds: a high-explosive shell with an impact fuze; an anti-aircraft shell using an electronic fuze; and an inert practice round. An automatic control and monitoring system prepares the gun for firing, selects the appropriate ammunition,

conducts continuous diagnostics and computes firing corrections. Fire control is provided by the 5P-10E Puma FCS. The gun can fire 60 rounds a minute out to a range of 8.2n miles; 15 km. Weight of each shell is at 16 kg.

The A-190(E) gun is based on innovative technological and layout solutions, which features relatively low weight-size characteristics. The gun leads to a more than three-fold increase in the combat effectiveness of surface combatants, as compared to those fitted with the AK-176M (fitted in the Khukri Class), owing to: increase in the range of fire (roughly twofold); 1.8 times growth in the lethality of projectiles at a target; doubled accuracy of fire; and reduced reaction time as a result of

automated operations, such as preparation of the gun for firing, selection of ammunition, monitoring of mechanisms' operation during firing, and display of data on the operator's monitor.

The A-190(E) gun is also superior to the AK-100 gun (fitted in the Delhi Class) in terms of basic performance characteristics: the rate of fire (approximately 1.5 times); accuracy (about three times); weight; dimensions; and operating characteristics. The gun also features higher automation of fire preparation and control and employs advanced guided and rocket-assisted long-range and enhanced-lethality projectiles fitted with dual-mode impact /

proximity fuses set to operate over the target area. Together with the use of the muzzle velocity meter, it is designed to produce ever increased combat capability of the system in fire against sea- and shore-based point and area targets. In addition, the gun hull features stealth technology to minimize the radar signature of a ship.

For the CIWS (Close In Weapon System) role, two Kashtan Air Defence Gun/Missile Systems are used.

Features the RPK-8 system, which uses a 12 barrelled RBU-6000 ASW launcher to fire the 212mm 90R anti-submarine missile or RGB-60 depth charges. The firing range is from 600 to 4300 metres, and the depth of engagement is up to 1000 metres. Two twin 533mm DTA-53-11356 fixed torpedo tube launchers are fitted amidships and fire the SET-65E/53-65KE torpedoes. The Purga anti-submarine fire-control system - a product of the Granit Central Scientific Institute - provides control for both the RBU-6000 and DTA-53 launchers.

Combat Data System: The Trebovaniye-M combat information and control platform is a is a fully distributed combat management system produced by the Meridian Research and Production Enterprise JSC. The system is an advanced up-to-date information acquisition/processing and target designation data transmission facility. It controls all platforms of attack and defence weapons, independently generates combat missions based on situation analysis, determines optimal number of missile firings, displays information on the state of ship-borne weaponry and transmits data to protection systems. It is capable of

processing information coming simultaneously from 250 sources.

Interconnected via an Ethernet LAN, Trebovaniye-M features eight T-171 fu ll-colour
operator workstations (with 18-inch colour flat panel displays) and three central T-162 servers. Individual items of combat system equipment interface to Trebovaniye-M via T-119- and T-190-series bus interface units. Raw radar data is received through a T-181 data reception unit. According to the Meridian Research and Production Enterprise, the hardware is based on

ruggedised industry-standard processing boards supplied by Octagon Systems. Applications are coded in C++, running under the QNX real-time operating system.

Helicopter Capacity: One Ka-28 *Helix* -A ASW helicopter or one Ka-31 *Helix* -B AEW helicopter. The vessel can also embark the navalised variant of the indigenous HAL Dhruv

.

Countermeasures: The Type 1135.6 frigate features the Russian-made TK-25E-5 integrated electronic warfare suite, which comprises of a wideband electronic support measures system that has antenna arrays mounted in the superstructure and a multimode jammer. Four KT-216 decoy launchers, forming part of the PK-10 system, are fitted for

soft-kill defence. A total of 120 120mm chaff and infrared decoy rounds are carried on board. A local ESM system featuring the BEL
Ajanta system could also be on board.

Comments: On 17 November 1997, Russia and India signed a USD $1 billion contract, for three Krivak III Class multi-purpose frigates. The

Indian Navy wanted to fill the gap created by the decommissioning of the Leander Class frigates and until the Project 17 Class frigates enter service. After the signing of the contract, Severnoye Design Bureau began a detail design layout and the shipbuilder, Baltisky Zavod of St. Petersburg began preparations for their construction. The project involved around 130 suppliers

from Russia, India, Britain, Germany, Denmark, Belarus, Ukraine and other countries including over 30 St. Petersburg-based naval design organizations and institutes. VT Halmatic of the UK has supplied a pair of Pacific 22 Mk.I rigid inflatable boats (RIBs), for use as general ship boats. These RIBs are designed primarily for ASW warfare and for the air defence of naval task forces. There are also a

considerable number of Indian component suppliers. According to the original contract schedule, the Talwar was intended for handover in May 2002, with the Trishul to follow in November that year and the Tabar being accepted in May 2003.

The Talwar commenced engine sea trials in November 2001 and immediately ran into

major problems with the machinery, hull, equipment integration and weapons systems. Media reports indicated that as of December 2002, the Shtil-1 SAM system had been unable to hit any airborne targets during trial firings. This was due to integration problems between the combat management and weapons systems. This resulted in the Indian Navy not taking delivery of the

vessel and the commissioning crew was flown back to India because of the extent of problems, and the time needed to fix them. This had set back the scheduled delivery dates very considerably - from May 2002 to mid-2003 for the Talwar. Th e first vessel was finally handed over to the Indian Navy in St. Petersburg in a formal commissioning ceremony on 18 June 2003,

after all problems were identified and remedied. INS *Talwar* arrived home at Mumbai's Naval DY on 12 August 2003, after a long journey from St. Petersburg. Her sister ships also charted a similar route home, with INS *Trishul* and INS *Tabar* arriving in Mumbai on 23 September 2003 and 31 July

2004 respectively. In December 2005, INS *Trishul* collided with a commercial ship, Ambuja Laxmi, outside the Mumbai harbour. In May 2006, INS *Talwar* accidentally dropped its anchor on its own sonar dome.

The crest of a ship, akin to the 'Coat of Arms' of the Army or an 'Insignia' of the Air Force, epitomises the spirit and ethos of the ship. Talwar was the most commonly used sword in Indian martial history. The blades varied in size, curvature and temper. According to Gatka - the Shastra from ancient Indian literature - Talwar is one of the Ten Weapons of the Gods. In lore, the Gods

(embodying all that is Good) used these weapons in their numerous fights with the demons or 'Asuras' (embodying all that is evil). Talwar proved to be the foremost of them all and has been held in great esteem ever since. Through the ages Talwar has been the pride of India's many warrior classes, notable among them being the Rajputs, Sikhs and Marathas. "They are as

careful of their swords and take as much pains to keep them in order as the Japanese do with their samurai," a British historian recorded. It is a common saying that a really objectionable act is as disgraceful as having a blunt sword. To the Indian Navy, the new Talwar represents the cutting edge of technology in stealth, reach and punch.

The word Trishul finds its origin from the Sanskrit word 'Tri' meaning three and 'Shul' meaning a spiked weapon. Consequently, this three-edged spiked weapon resembles a trident. Indian mythology has it that the Trishul was a powerful and all pervasive weapon of the Lord Shiva, that was effectively used by him to ward off evil. The Trishul as a weapon has been used ever since then to

symbolise the victory of truth and righteousness over evil. According to mythology, surviving the onslaught of the Trishul is impossible. The crest of the ship depicts a strong arm rising out from under the sea, holding the powerful Trident. The mythological truth of this feared weapon, when extended to the INS *Trishul* makes the ship powerful in all three dimensions - air,

surface and sub-surface. A warship that will be feared for her lethality and brutal power. The last vessel in the series is called Tabar - means Battle Axe in Sanskrit - and is aptly named for role, as she serves as an all-powerful weapon platform of the sea. The crest of the ship depicts a pair of battle axes, in a 'X' layout, rising out from under the sea.