

# Growing pains: India's drive for modernisation makes slow progress

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**Declining budgets, procurement bureaucracy, and internal organisational shortcomings are delaying the Indian military's much-needed modernisation and degrading its ability to operate effectively in a turbulent and nuclearised neighbourhood, as *Rahul Bedi* reports**

India's efforts to modernise its armed forces are being hampered internally by extended delays by the Ministry of Defence (MoD) in confirming tenders, alleged wrongdoing in acquisitions, frequently changing procurement priorities, and ambiguity by the services in formulating their qualitative requirements (QRs) for equipment.

The inability of the government-managed Defence Research and Development Organisation (DRDO) to design efficient weapon systems and the incapacity of the 41 state-owned Ordnance Factory Board (OFB) units and nine public-sector defence units to manufacture DRDO-developed equipment and licence-build other kit are also stunting India's military advancement.



*Three IA T-90 Bishma tanks participate in India's Republic Day parade in New Delhi on 26 January 2016. Modernisation of the IA has been the slowest of the three services during the past two decades. (Roberto Schmidt/AFP/Getty Images)*

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Procedural inadequacies in advancing the recent 'Make in India' initiative have also exacerbated matters. India fulfils about 60% of its military requirements from France, Israel, Russia, and the

United States with attempts to reverse this trend through private-sector involvement having so far failed.

Senior officers have declared that battling equipment obsolescence, shortages, low serviceability of major platforms, and the “casual approach” of the Indian government to augmenting military capability have “progressively eroded” operational competence.

The officers have noted that, since the government of Prime Minister Narendra Modi’s Hindu nationalist Bharatiya Janata Party assumed office in May 2014, there have been three different defence ministers, with one of those serving twice.

To many service personnel this has exemplified the administration’s lack of commitment to the armed forces, which are deployed almost permanently on counter-insurgency (COIN) operations, manning restive frontiers with nuclear rivals China and Pakistan, and readying for a possible two-front war with both of those countries.

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Analysts contend that the prevailing practice of service-specific doctrines, operational planning, and equipping priorities, as well as a lack of jointness between the three armed forces, is proving “organisationally counter-productive” to military efficiency. The analysts also suggest that inter-service turf wars over resources and delays in appointing a chief of defence staff or a permanent chairman of the chiefs of staff committee, which was recommended by two successive administrations, is also compromising capability.

“Important changes that should have occurred in the Indian armed forces years ago continue to be blocked, stonewalled, or delayed due to closed mind sets, or vested interests, or sheer professional incompetence,” said Lieutenant General Balraj Nagal (ret), who heads the MoD-funded Centre for Land Warfare Studies (CLAWS) in New Delhi. The decision makers, he added, do understand the urgent requirement for change, but appear unable to drive that change.

The primary obstacles to India’s military modernisation continue to be diminishing finances, jumbled procurement processes, and the MoD’s indecision.

In fiscal year (FY) 2017/18 the MoD was allocated an INR274.11 billion (USD42.79 billion), which amounts to just 1.56% of India’s GDP, leading military officials to state that this is the lowest amount in 55 years. By comparison, China and Pakistan committed nearly 2% and about 3.4% respectively of their GDPs to military spending during the same period.

India’s Parliamentary Standing Committee on Defence reiterated its “deep anguish and disappointment” in December 2017 over the military’s greatly decreased procurement and modernisation budget, which has been steadily decreasing since FY 2012/13.

In its report the committee revealed that the MoD had allocated the Indian Army (IA), Indian Navy (IN), and the Indian Air Force (IAF) just 60%, 67%, and 54% respectively of what each service had sought. Collectively this amounted to INR864.88 billion, about 90% of which was already committed to previous buys, leaving meagre amounts for badly needed acquisitions.

The committee reprimanded the MoD over its “consistent failure” to make use of allocated funds within the prescribed duration. This continuing indecisiveness, it declared, was largely responsible for the government lowering consecutive defence budgets.

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During FY 2008–16 the MoD surrendered more than INR538.64 billion of unspent funds to the federal government after frequently issuing, withdrawing, and re-issuing tenders, and then scrapping many of them following years of costly trials and discussions over technology transfers and delivery schedules.

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The services have also impeded their own modernisation by framing unrealistic and poorly drafted QRs for equipment. In 2015 former defence minister Manohar Parrikar publicly declared that some of the military's QRs appeared to be "out of Marvel comic books" because the technologies and capabilities they specified were "absurd and unrealistic". The April 2012 report tabled by the Defence Parliamentary Committee revealed that 41 of the IA's tenders were scrapped because the capabilities it demanded did not exist.

Since 2014 the MoD has terminated tenders worth nearly USD30 billion that were in advanced stages of negotiation following differences over prices, technology transfers, or both – or in some cases on grounds of alleged corruption.

The latest tender to flounder, in December 2017, was for 12 mine countermeasures vessels (MCMVs) for the IN, which was cancelled nearly 13 years after the contract was initiated in 2004. Terminating the MCMV contract will leave the IN without minesweepers after 2021 because six of its Soviet-era licence-built Karwar-class vessels would have been retired by then.

In 2012 former IA Chief of Staff General V K Singh declared that military procurements in India were a "version of snakes and ladders, where there is no ladder, but only snakes". Gen Singh warned, "If the snakes bite you somewhere, the whole thing comes back to zero."

Six years later little has changed and equipment shortages are continuing across all three services.

However, despite the barriers faced by the armed forces in acquiring equipment a number of acquisitions have been successfully concluded since 2015. These procurements have taken between five and 12 years to complete and have a value of USD15 billion. The largest of these is the EUR7.9 billion (USD9.84 billion) deal to import 36 French Dassault Rafale fighters in flyaway condition. The Rafales were acquired in a surprise buy announced by Modi in Paris in April 2015 (the fighter had been shortlisted in January 2012 in the Medium Multirole Combat Aircraft (MMRCA) tender, which was subsequently scrapped over licence-building issues).

The government has also signed deals for 28 Boeing Apache AH-64E attack helicopters and 15 Chinook CH-47E heavylift helicopters for the IAF, as well as a Lockheed Martin C-130J-30 transport aircraft to supplement existing platforms.

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Meanwhile, since 2002 the MoD has attempted to streamline acquisitions via eight successive editions of the Defence Procurement Procedure (DPP), but has only further complicated matters each time.

"Not a single major acquisition has been effected under any of the DPPs," according to former major general Mrinal Suman: the IA's foremost authority on procurements and offsets. He noted that the DPP has expanded from about 40 pages in 2002 to 429 pages and is so dense in parts that it is almost incomprehensible.

The latest iteration, DPP 2016, aimed to fast track acquisitions and boost the government's 'Make in India' enterprise. However, it fails to streamline the laborious 12-stage acquisition procedure. According to senior MoD officials, each of these dozen steps has the potential to derail the entire procurement process because mandated approvals from multiple MoD, military, and related agencies are interminably delayed or annulled.

Therefore procurements that the DPP stipulated should be completed in a timeframe of 86–126 weeks have taken multiple years to conclude, by which time some of the eventually inducted equipment has become dated.

“There is little in DPP 2016 that improves upon previous decision-making measures, which remain the bane of defence procurement and military modernisation,” said Amit Cowshish, former MoD financial advisor for acquisitions. The MoD, he added, does not need additional guidelines to conduct military commerce, but stronger and swifter implementation of existing ones.

Adding to the complexity of DPP 2016 is the confusingly drafted Indigenously Designed, Developed, and Manufactured (IDDM) initiative and the multilayered but imprecise strategic partnership policy that was unveiled in June 2017, 15 months after the original DPP document was released.

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## **Land forces**

Enduring shortages continue to afflict the 1.2 million-strong IA as it strives to respond to threats from China and Pakistan, with which it has had periodic standoffs over unresolved territorial disputes.

During the past two decades modernisation of the IA has been the slowest of the three services, with its INR251.75 billion capital outlay for FY 2017/18 plummeting to less than a fifth of its INR1.2 trillion revenue allocation for salaries, stores, and force maintenance.

IA equipment shortages are possibly the worst of all the three services and include various 155 mm/45 calibre howitzers, armoured recovery vehicles, attack and light multirole helicopters, modern infantry combat vehicles (ICVs), a mix of small arms, and modern air defence systems.

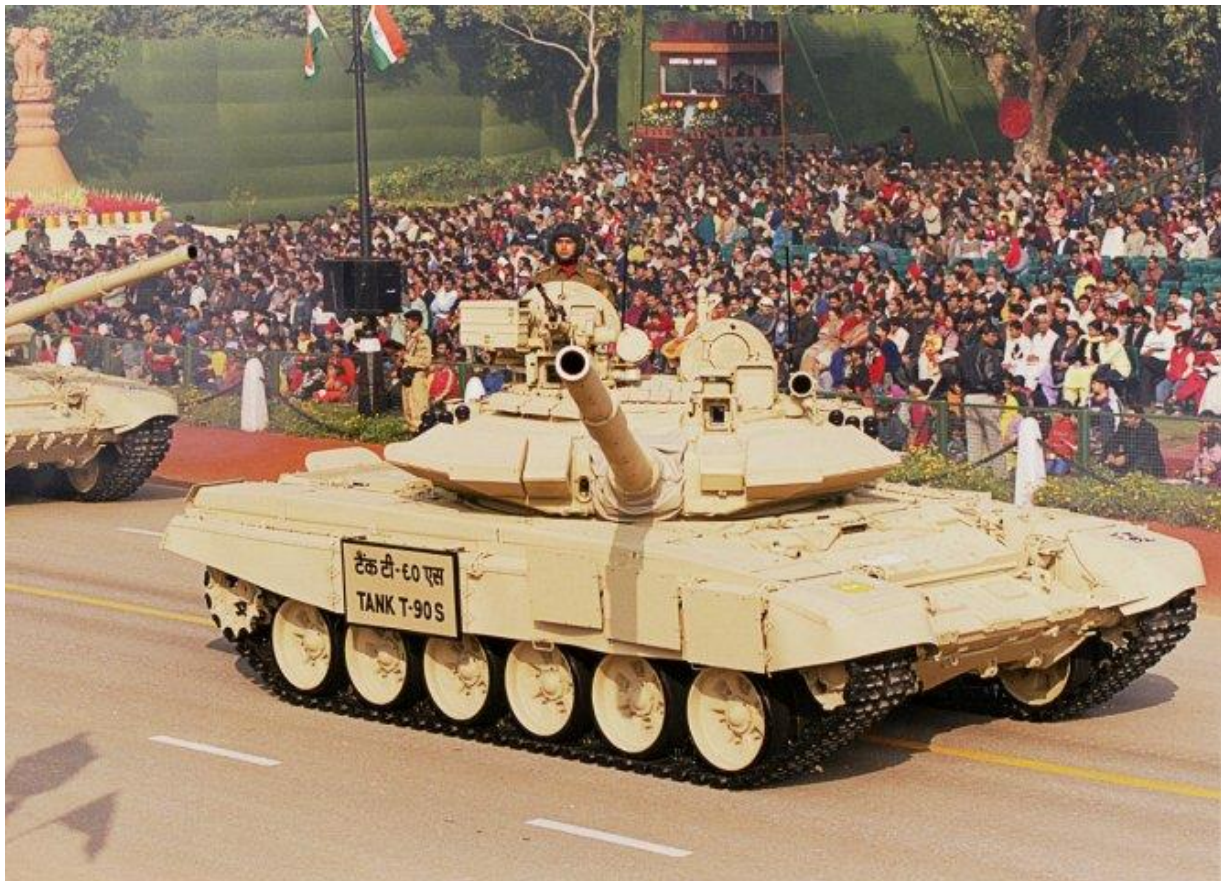
The service also lacks anti-tank guided missiles (ATGMs), tank and artillery ammunition, bulletproof jackets, lightweight ballistic helmets, multi-calibre assault rifles, 5.56 mm close-quarter-battle (CQB) carbines, 7.62 mm light machine guns, and short-range surface-to-air missiles. According to the 2015 parliamentary defence committee report the force is even short of rudimentary gear like boots, mosquito nets, balaclavas, and sleeping mats.

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Despite these shortages the IA is responsible for conducting a COIN mission in the disputed northern Kashmir province as well as operations in the northeast of the country to ensure territorial defence and to sustain conventional deterrence with respect to China and Pakistan.

The IA's efficiency is being further compromised by a shortfall of more than 9,000 officers: a deficiency that has not improved for two decades. This has resulted in many combat and support units functioning with about 40% less than their sanctioned officer complement.





*The T-90S is an upgrade of the T-72BM and is being licence produced in India by the Ordnance Factory Board. (Indian Ministry of Defence)*

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Additionally, there is tension between the government and serving personnel and more than 2.3 million retired staff over salaries, pensions, and allowances, as well as disagreements over promotions and appointments, which is damaging civil-military relations.

Despite these challenges IA Chief of Staff General Bipin Rawat recently declared that the army needed to be prepared for a simultaneous two-front war against China and Pakistan.

Speaking at a CLAWS seminar in Delhi in September 2017 he said that, despite all three countries possessing nuclear arms, “warfare lies within the realm of reality”. China, he said, had already started “flexing its muscles” by trying to “nibble away” at Indian territory in a “gradual manner” to test India’s limits.

Gen Rawat was referring to the 73-day standoff between the IA and China’s People’s Liberation Army (PLA) that ended on 28 August 2017. The two countries became locked in a two-month-long military standoff over disputed borders between China, India, and the Himalayan kingdom of Bhutan. Tensions escalated in the Doklam tri-junction when Bhutan sounded the alarm after spotting PLA personnel using equipment on 16 June 2017 to build a road to the Doklam Plateau near the tri-junction. The IA and the Royal Bhutan Army opposed this action on the grounds that ownership of the area remained unresolved.

Such showdowns have multiplied recently as India and China remain locked in one of the world's longest-running frontier disputes, which has been running since 1962, over their undefined 4,057 km Line of Actual Control (LoAC) in the Himalayas.

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Since 2015 the Indian and Pakistani armies have exchanged mortar, small arms, and occasionally artillery fire almost daily across their unresolved 740 km Line of Control (LoC) in Kashmir. Both countries claim the province in its entirety.

India accused Pakistan of violating the LoC's 2003 ceasefire agreement 860 times during 2017 – up from 221 times in 2016 – and of facilitating the infiltration of armed militants into Kashmir to boost the Muslim insurgency that has been raging there since 1989 and which has claimed more than 70,000 lives.

Pakistan denies fuelling the insurgency and claims a comparable number of IA ceasefire violations along the LoC. None of the violations can be independently verified; however, they have resulted in military and civilian fatalities on both sides.



*Indian Army soldiers fire a Bofors 155 mm FH-77B howitzer during Exercise 'Sarvatra Prahar' at the School of Artillery in Devlali in the Nasik district of western Maharashtra state. These guns were imported in 1987 but now India is planning to develop its own howitzers. (Indranil Mukherjee/AFP/Getty Images)*

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Meanwhile, shortages of equipment are a cause for concern regarding the overall war-waging capabilities of the IA, with the service lacking appropriate stocks of artillery, attack and utility helicopters, and modern ICVs.

In July 2017 India's watchdog Comptroller and Auditor General (CAG) declared that the IA's ammunition stocks were barely enough to enable it to fight a 10-day war. The CAG revealed that 121 of 152 types of ammunition – or about 80% of stocks – were below the level mandated by the MoD for 40 days of intensive fighting in keeping with authorised 'war wastage reserves'.



The report also stated that the availability of 61 types of ammunition was at “critically” low levels, while another 83 ammunition types were below the MoD’s stipulated minimum acceptable risk level to sustain 20 days of war.

“The availability of high-calibre ammunition relating to tanks and artillery are in a more alarming state,” the report added, pointing out that the deficiency of fuzes had rendered more than 83% of these high-calibre rounds “operationally unfit”.



*An Ordnance Factory Board 155 mm Dhanush gun, procurement of which has been delayed.  
(IHS Markit/Jayesh Dhingra)*

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“Despite its high numerical strength, the IA continues to be a hollow army,” according to former IA vice chief of staff Lieutenant General Vijay Oberoi. Consequently, its ability to undertake various types of military operations on the modern battlefield stands greatly reduced due to persisting equipment shortages, he added.

Most notably, much of the IA’s fleet of roughly 2,200 T-72-series MBTs and approximately 2,600 Soviet-era BMP-1 and BMP-2 Sarath ICVs have questionable night-fighting capabilities.

The IA’s severe howitzer shortage and obsolescence of its existing platforms are among the worst of its deficiencies. However, the service is attempting to fulfil its long-postponed 1999 Field Artillery Rationalisation Plan, under which it aims to import, licence build, and indigenously develop about 3,000 howitzers, including 1,580 towed and 814 truck-mounted 155-mm/52 calibre guns, which will equip about 220 artillery regiments for an estimated cost of USD9 billion.

The proposed artillery systems would replace about 200 of 410 Bofors FH-77B 155 mm/39 calibre howitzers that were imported in 1987, the rest having been cannibalised for spares, and 180 Soviet-

era 130 mm M-46 guns that were upgraded to 155 mm/45 calibre standard, as well as locally produced 105 mm field guns.

In November 2017, after nearly 10 years of negotiations, the MoD signed a USD737 million deal for 145 BAE Systems M777 155 mm/39 calibre LWHs and Selex Laser Inertial Artillery Pointing Systems under the US Foreign Military Sales (FMS) programme.

Under the agreement 25 M777s will be delivered in completed form and the remaining 120 guns will be built at the Assembly, Integration and Testing (AIT) facility that BAE Systems has established with India's Mahendra. The locally built guns are set to be supplied by mid-2021.

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Army officials told *Jane's* that the barrel of the gun was damaged after the projectile – the fifth in the series – exited in multiple pieces. The accident remains under joint investigation by the IA, BAE Systems, and the US government. IA sources have said the incident could delay deliveries.

In May 2017 the MoD signed a USD800 million deal with India's private-sector Larsen & Toubro for 100 modified South Korean Hanwha Techwin K-9 Vajra-T 155 mm/52 calibre SPHs in response to a 2011 tender.

Military sources said 10 of the 'shoot-and-scoot' K-9 Vajra (Thunderbolt) SPHs would be imported directly from South Korea and the remaining 90 manufactured at L&T's Telegaon plant near Pune, western India, with 50% indigenous content during the next five to seven years.

However, in July 2017 the IA's artillery prospects suffered yet another setback when six prototypes of the OFB-developed Dhanush 155 mm/45 calibre guns were withdrawn after three of them suffered muzzle brake damage during confirmatory trials in Pokhran.

The army planned to acquire 114 Dhanush guns – upgraded derivatives of India's FH-77B howitzers – plus another 300 from the OFB in a programme worth INR45 billion, but according to officials the procurement of these is also delayed.

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## **Air force**

The IAF faces a crisis of rapidly depleting combat assets following recurring delays in inducting fighters in large numbers at a time when military tensions with China and Pakistan are worsening.

IAF shortages include combat aircraft, transports, multirole tanker transports (MRTTs), airborne early warning and control (AEW&C) aircraft, light utility helicopters, and basic and intermediate trainers. In particular, MRTT shortages are now reaching crisis levels after a tender to acquire six of these was cancelled for a second time in July 2016.

At his annual press conference in October 2017 India's chief of the air staff, Air Chief Marshal B S Dhanoa, said the IAF needs its sanctioned strength of 42 fighter squadrons to conduct the full spectrum of operations in a 'two-front war' scenario with China and Pakistan. However, he explained, "It does not mean we are [presently] not capable of doing so [fighting on two fronts]", adding that, although the possibility of such an eventuality was low, the enemy's intentions could "change overnight".



Currently, the IAF operates 33 fighter squadrons: its lowest number in more than a decade and nine fewer than its mandated 42 squadrons.

However, according to the April 2015 Defence Parliamentary Committee these numbers will drop to 25 squadrons because 10 squadrons of upgraded legacy MiG-21M and MiG-27L variants are scheduled to be retired by 2024. By about 2020 the IAF will have 15 squadrons of licence-built Russian Sukhoi Su-30MKI multirole fighters; six squadrons of SEPECAT Jaguar strike aircraft, four of which are currently awaiting long-delayed engine, radar, and armament retrofits; and three squadrons each of Mirage 2000H and MiG-29M fighters, which are currently undergoing upgrades.



*An Indian Air Force Sukhoi Su-30MKI fighter jet prepares to touch down on the Agra-Lucknow highway during an exercise by the Indian Air Force in the Unnao district of Uttar Pradesh on 24 October 2017. (Sanjay Kanojia/AFP/Getty Images)*

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From April 2022 these assets will be supplemented by two squadrons of 36 twin-engine French Dassault Rafale fighters, including eight twin-seat trainers, which were acquired in September 2016 for EUR7.9 billion (USD8.82 billion) in a surprise purchase to stem decreasing IAF fighter numbers.

Rafale deliveries are scheduled to begin from September 2019 onwards and the IAF has begun readying bases at Ambala in the north and Hashimara in the northeast to accommodate them at a cost of INR2.20 billion.

At the same time the IAF is set to acquire six squadrons of locally designed single-engine Tejas Light Combat Aircraft (LCAs): 40 Mk1s and 83 upgraded Mk1As that are still under development. Initiated in 1983, the LCA programme continues to be handicapped by technological challenges, cost overruns, and delays.

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The IAF's persistent misgivings over the questionable capabilities of the Tejas Mk1 were echoed by India's CAG, which revealed in May 2015 that LCA pilots were "vulnerable" to 7.62 mm rounds fired at the front end of the platform. It also disclosed that the persistent shortcomings of the aircraft

restricted its “operational efficiency and survivability, thereby limiting its employability when inducted into IAF squadrons”.

In a follow-up procurement the IAF issued a request for proposals to Hindustan Aeronautics Limited (HAL) in late 2017 for 73 upgraded LCA Mk1A fighters and 10 tandem-seat trainers. IAF officers said the Mk1A fighter would provide capability improvements, including an active electronically scanned array (AESA) radar, updated electronic warfare systems, and an air-to-air refuelling capability. Weighing 6,500 kg, the Mk1A will also be about 1,000 kg lighter than the Mk1 and its internal systems will be modified for easier maintenance.



*By about 2020 the IAF should have 15 squadrons of Su-30MKIs. (IHS Markit/Patrick Allen)*

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Delays by HAL in creating adequate facilities to series produce substantial LCA numbers has also eroded the IAF's confidence in the indigenous fighter. However, Minister of State for Defence Subhash Bhamre told parliament in late 2017 that INR13.81billion had been sanctioned to build a second Tejas manufacturing line to increase annual production of the fighters to 16.

“The LCA, especially its Mk1 version, remains a work in progress,” said AM Bhatia. Even the proposed Mk1A, he added, has limitations in its weapon payload and range that need supplementing by other fighters.

Furthermore, a mounting spares shortage and poor serviceability provided by HAL has led to a high number of IAF aircraft being left on the ground, with platform availability currently averaging about 60% for the entire fighter fleet. Eight Su-30MKIs have crashed since their induction in 1997 and 34 others have suffered engine failures that have forced them to land on just one engine.

According to the MoD, the IAF has lost 29 aircraft in accidents between April 2012 and July 2017, which other than the Su-30MKIs includes 12 MiG-21 variants, five Jaguars, and assorted other platforms.

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## **Navy**

Operationally and doctrinally the IN is the fastest evolving of India's three services, despite being the smallest and for years the most financially deprived.

The service currently has about 140 ships and submarines – including INS *Vikramaditya* (ex-*Admiral Gorshkov*), the Soviet-built, 44,750-tonne, Kiev-class aircraft carrier – and about 215 aerial platforms: 80 fixed-wing aircraft, 122 helicopters, and 14 unmanned aerial vehicles (UAVs).



*The Indian Navy's first indigenously built aircraft carrier, Vikrant , was floated out at Cochin shipyard in South India on 10 June 2015. (Indian Navy )*

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During the next decade the IN is aiming to field a 'balanced' force structure of about 212 surface ships and submarines (including two aircraft carriers), in addition to about 500 aircraft to support blue-water operations in the Indian Ocean Region and surrounding areas.

"The IN's expansion plans include a three-dimensional force of networked surface and sub-surface warships and aviation assets equipped with advanced weaponry and sensors for expanded maritime domain awareness," Chief of Naval Staff (CNS) Admiral Sunil Lanba told *Jane's* . Tankers, dock landing platforms, and other vessels, including minesweepers and offshore patrols vessels, would support these frontline assets, he added.

According to the CNS the IN is the most advanced of the services at indigenising its requirements and has 38 platforms in various stages of construction at local shipyards. These include six French-designed Scorpène-class diesel-electric attack submarines (SSKs), which are being licence-built



under Project 75 by Mazagon Dock Shipbuilders Limited in Mumbai for INR236.52 billion, and INS *Vikrant*: the indigenously designed, 40,000-tonne, short take-off but arrested recovery (STOVAR) carrier that is under construction at Cochin Shipyard Limited (CSL).

In December 2017 the IN commissioned its first SSK, INS *Kalvari*, nearly six years behind schedule, making it the first submarine to be inducted into the service in 17 years.

However, *Kalvari* was inducted without its originally planned Black Shark heavyweight torpedoes after the 2012 deal to procure 98 of them for all six Scorpènes from Italy's Whitehead Alenia Sistemi Subacquei for USD300 million was scrapped in May 2016 following corruption allegations.



*India's MDL delivered Kalvari, the first of six licensed-built Scorpène-class diesel-electric submarines, to the IN on 21 September 2017. The boat is shown here during sea trials in 2016. (Indian Navy)*

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Consequently, the first two or three Scorpènes will initially be armed with the IN's older German-built SUT series torpedoes until the MoD succeeds in its efforts to acquire 150 new-generation heavyweight substitutes.

Meanwhile, *Khanderi*, the second Scorpène boat, has been undergoing sea trials since late September 2017 and is likely to be commissioned later this year, with induction of the remaining four boats to be completed by 2020–21, IN officials have said.

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Furthermore, most of the older 'Kilo' and HDW boats will be decommissioned by 2030, leaving the IN with serious problems in operating a credible submarine fleet for power projection and realising its goal of sea control and denial.

To make good on this shortfall the service is turning its attention to the INR500 billion Project 75I (P-75I), which has been delayed by more than a decade, to indigenously construct six SSKs with air-independence propulsion and a land-attack capability. The IN has plans to source these boats from an MoD-designated strategic partner, which will be required to form a collaborative venture with a foreign OEM to build the six boats.



*Khanderi* , the second of the six Scorpène-class submarines being built in India at MDL in collaboration with DCNS of France. (DCNS )

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Four contenders – Naval Group of France, ThyssenKrupp Marine Systems of Germany, Sweden's Kockums Naval Solutions, and Russia's Rubin Design Bureau – are under evaluation, especially with regard to their technology transfer potential.

The IN's underwater assets also include INS *Arihant* , the indigenously designed 6,000-tonne nuclear-powered ballistic missile submarine (SSBN), and INS *Chakra* , the 'Akula' (Shchuka-B)-class nuclear-powered attack submarine (SSN) leased from Russia in April 2012 under a 10-year deal worth USD962 million.

However, *Chakra* is currently inoperable after two of its titanium sonar dome panels were damaged in September 2017, although Adm Lanba said they are being replaced with Russian assistance.

In November 2017 India quietly launched *Arighat* , the second of its four indigenously planned SSBNs, at a low-key ceremony at the Ship Building Centre in Visakhapatnam, ahead of its commissioning in 2020–21.

Official sources said *Arighat* will be succeeded in the dry dock by two similar SSBNs that have been temporarily designated S4 and S4\*.

The four SSBNs will ultimately form the backbone of India's nuclear deterrence force.

Additionally, the DRDO along with the IN, Department of Atomic Energy, and private-sector companies, is at an advanced stage of designing SSNs, six of which the MoD approved for induction in early 2015, for an estimated INR600 billion.



*INS Chakra: the nuclear-powered 'Akula'-class attack submarine that was leased from Russia in April 2012 under a 10-year deal. (Indian Navy)*

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Meanwhile, in July 2017 the CAG revealed that the commissioning of aircraft carrier *Vikrant*, deferred by more six years to 2018, would be further delayed to 2023 following 'disagreements' between CSL and the IN over projected timelines. The cost of the carrier has multiplied almost six-fold from INR32.61 billion to INR193.41 billion.

IN sources, however, told *Jane's* that delays by Russia's Nevskoye Design Bureau in installing the carrier's 'aviation facility complex' were responsible for the delay.

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