



PRECISION TARGETS: ACCELERATING THE U.S.-INDIA DEFENSE INDUSTRIAL PARTNERSHIP

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INTRODUCTION

The inauguration of the U.S.-India initiative on Critical and Emerging Technologies (iCET) in early 2023 has created greater momentum for bilateral defense industrial cooperation.¹ The India-U.S. defense partnership has progressed by leaps and bounds since the year 2000, when President Bill Clinton's visit signaled a resumption of normal ties following India's 1998 nuclear tests. In the years since, the two countries have expanded the range and sophistication of their military exercises, which now involves all services and several partner countries. They have concluded negotiations over enabling agreements covering logistics, secure communications, and other protocols. The two countries' security cooperation has been given a political and bureaucratic structure, including through the 2+2 Dialogue, Defense Policy Group (DPG), and various bilateral and Quad working groups. Defense trade has also taken off, with the Indian armed services now using at least eight major U.S.-designed or -produced platforms. Yet defense coproduction and research and development (R&D) have not grown as significantly, despite some marginal successes. The Defense Trade & Technology Initiative (DTTI), despite some modest success with air-launched unmanned aerial systems, has not produced the results that were once envisioned.

But recent developments have created new openings. Many old impediments, including stifling export controls, insufficient enabling agreements, and lack of political engagement, have largely been addressed. On the Indian side, elements of an industrial policy that involve the private sector have begun to take shape, creating more attractive conditions for private investment and supply chain integration. Geopolitical factors are also more conducive, given the growth in India-U.S. coordination on the Indo-Pacific and the declining relevance of U.S.-Pakistan security cooperation. Meanwhile, wartime attrition, supply chain disruptions, and secondary sanctions will create challenges for Russia's 1,300 defense companies – which account for 20% of the world's weapons sales – resulting in a partial vacuum in the global arms market.² Other actors are already seeking to fill some of that gap.³

Taken together, these circumstances present an unprecedented opportunity for India-U.S. defense coproduction. But this will require translating the tremendous political progress at the government-to-government level into concrete outcomes at the business-to-business level. Priority areas discussed in iCET include jet engines and munition related technologies, but coproduction could extend to anti-tank and anti-air missile systems, fixed-wing and rotary aircraft, armored vehicles, artillery, small arms, maritime surveillance systems, drones and counter-unmanned aerial systems (C-UAS), and maintenance, repair, and overhaul (MRO) facilities and services. In addition to creating a viable commercial basis for defense coproduction, the two governments could take several discrete policy steps to facilitate and accelerate such cooperation. This would include: (a) translating political agreement into outcomes such as approvals and procurement requests, (b) ensuring a greater predictability for demand on the Indian side to accelerate investment and technology transfers, and (c) on the U.S. side, improving public-private cooperation to ensure timely responses to proposals.

FRIENDSHORING MEETS MAKE IN INDIA

To benefit from immediate opportunities, companies from the United States would have to explore manufacturing partnerships with high-potential counterparts in India for commercial reasons. Such commercial partnerships could serve two benefits. First, they can help U.S. companies grow their value addition in India and demonstrate their commitment to New Delhi's "Make in India" policies. Second, relocating certain parts of the weapons value chain to India could help increase cost effectiveness, which is important for competing against alternative offerings from other countries. Many companies in the

¹ "Fact Sheet: United States and India Elevate Strategic Partnership with the initiative on Critical and Emerging Technologies (iCET)," White House, January 31, 2023, <https://www.whitehouse.gov/briefing-room/statements-releases/2023/01/31/fact-sheet-united-states-and-india-elevate-strategic-partnership-with-the-initiative-on-critical-and-emerging-technology-icet/>.

² Andrew S. Bowen, "Russian Arms Sales and Defense Industry," Congressional Research Service, October 14, 2021, <https://crsreports.congress.gov/product/pdf/R/R46937>; Stockholm International Peace Research Institute (SIPRI), "Trade Registers," https://armstrade.sipri.org/armstrade/page/trade_register.php.

³ Vasabjit Banerjee and Benjamin Tkach, "The Coming Chinese Weapons Boom," Foreign Affairs, October 11, 2022, <https://www.foreignaffairs.com/china/coming-chinese-weapons-boom>.

United States and India have already successfully partnered to leverage the latter's low-cost production capabilities to increase the former's global competitiveness. In non-military industries, Caterpillar is a prominent example of a U.S. company growing its manufacturing footprint in India to boost its exports across the Global South and, more recently, to Europe.⁴ In defense and aerospace industries, General Electric (GE), for instance, has entered into agreements with Indian partners to manufacture aero-engine components that are then exported to GE's production facilities, thereby helping to increase commercial appeal of the company's engines.⁵ Boeing and Raytheon have similarly partnered with Tata to produce components of Apache combat helicopters and the Stinger missile system, respectively, in India.⁶

These partnerships have rapidly enhanced the India's capabilities in defense innovation and production, as seen in the cases of the Akash surface-to-air missile (SAM) system and a range of artillery equipment including the Dhanush gun system.⁷ Other areas of recent progress for India's defense industry include armored vehicles and naval vessels.⁸ India has leveraged these successes in domestic production to make progress towards its target of \$5 billion in annual defense exports by 2025. Defense companies signed a growing number of deals between 2014 and 2022 to increase exports from around \$145 million (₹900 crore) to more than \$1.7 billion (₹14,000 crore) in this period.⁹ Recent and high-profile export deals include agreements to export high-speed patrol boats to Vietnam, and missiles, rockets, and ammunition, including Pinaka multi-barrel rocket launchers, to Armenia.¹⁰

As in any commercial partnership, tie-ups between U.S. and Indian defense companies will need to involve suitable market carve-outs and end-user agreements, keeping in mind commercial interests as well as relevant national security and foreign policy concerns. These terms may be challenging to define, particularly for more advanced weapons systems from the United States. A realistic and step-by-step approach would give priority to certain categories of defense technologies in which India could offer co-development opportunities given its own capabilities. Attracting critical elements of the supply chains for platforms that are in high demand both for the Indian armed services and for global export markets would position India well to codevelop the next generation of weapon systems with the original equipment manufacturers (OEMs).

PRIORITY WEAPONS SYSTEMS

There are many specific and high potential opportunities for U.S. and Indian companies to coproduce systems or components to increase supply to India and third countries. These will depend not just on

⁴ Caterpillar Exports from India to the United Kingdom," Volza, 2020, <https://www.volza.com/p/caterpillar/export/export-from-india/cod-united-kingdom/>.

⁵ "Indian supply chain of GE Aerospace grows, focus on Make in India," Financial Express, October 17, 2022, <https://www.financialexpress.com/defence/indian-supply-chain-of-ge-aerospace-grows-focus-on-make-in-india/2717252/>.

⁶ "Tata Boeing Aerospace delivers first fuselage for AH-64 Apaches for Army," Economic Times, January 19, 2023, https://economictimes.indiatimes.com/news/defence/tata-boeing-aerospace-delivers-first-fuselage-of-indian-army-helicopters/articleshow/97141281.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst; Megha Mandavia, "Raytheon Company signs MOU with Tata Advanced Systems to jointly make Stinger air defence missiles," Economic Times, July 14, 2018, https://economictimes.indiatimes.com/news/defence/raytheon-company-signs-mou-with-tata-advanced-systems-to-jointly-make-stinger-air-defence-missiles/articleshow/57203089.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst.

⁷ "DRDO hands over Authority Holding Sealed Particulars of Akash missile," The Indian Express, December 4, 2022, <https://indianexpress.com/article/india/drdo-hands-over-authority-holding-sealed-particulars-akash-missile-8305558/>; Dinakar Peri, "Army expects to boost fire power with induction of artillery guns," The Hindu, October 2, 2022, <https://www.thehindu.com/news/national/army-looking-at-major-accretion-of-indigenous-artillery-guns-in-inventory/article65959031.ece>.

⁸ Dinakar Peri, "India's indigenous aircraft carrier and largest warship INS Vikrant joins Navy," The Hindu, September 3, 2022, <https://www.thehindu.com/news/national/pm-modi-commissions-ins-vikrant-indias-indigenous-aircraft-carrier/article65839748.ece>; Sandip Digne, "Army gets 16 Made-in-India armoured vehicles for UN peacekeeping deployment," The Times of India, October 10, 2022, http://timesofindia.indiatimes.com/articleshow/94766938.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst.

⁹ Saurav Anand, "India's defence exports hit INR 14,000 crore, highest ever," Mint, December 10, 2022, <https://www.livemint.com/news/india/indias-defence-exports-hit-14-000-crore-highest-ever-11670661555303.html>.

¹⁰ "India hands over 12 high-speed guard boats to Vietnam," Hindustan Times, June 9, 2022, <https://www.hindustantimes.com/india-news/india-hands-over-12-high-speed-guard-boats-to-vietnam-101654761522776.html>; Manu Pubby, "Arming Armenia: India to export missiles, rockets and ammunition," Economic Times, October 6, 2022, https://economictimes.indiatimes.com/news/defence/arming-armenia-india-to-export-missiles-rockets-and-ammunition/articleshow/94518414.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst.

demand in India or other potential export markets but also the likelihood of U.S. approvals and the competencies of Indian joint venture partners. Yet the commercial opportunities for all these systems are sizeable. They include catering to future demand both in India and in third country markets. They offer important alternatives to other actors in strategically important countries. And in some cases, they can help in replacing depleted global stockpiles.

From a value proposition perspective, the major categories of potential U.S.-India joint ventures would include **anti-tank and anti-air missile systems**. Anti-tank missiles, such as the AGM-114 Hellfire and Javelin shoulder-fired anti-armor systems, have substantial global commercial value. Portable, shoulder-fired SAMs such as the Stinger, with an air-to-air option, are also attractive. The Stinger is already utilized with the Indian military's Apache helicopters.¹¹ All these U.S. systems are likely to be in greater demand in the global arms market, including among countries whose stockpiles have been depleted due to the war in Ukraine.¹²

In addition to missile systems, **aircraft, aircraft engines, and marine turbines** represent the most lucrative opportunities in the global arms market. Engines such as the GE F414 and aircraft components for transport and combat helicopters such as the AH-64 Apache, CH-47 Chinook, and the Indian Multi Role Helicopter (IMRH) represent promising possibilities, particularly given that the former two systems are already partly manufactured in India. Marine turbines offer additional possibilities, with the GE LM2500, for example, powering many of the Indian Navy's destroyers and frigates and used by over 30 navies worldwide.

Armored vehicles, artillery, small arms, and munitions are other high potential products for U.S.-India partnerships. The Stryker family of armored vehicles offers an example of vehicles that might be of relevance in future conflicts, and in demand in third countries. Small arms, such as SIG Sauer rifles and light machine guns, and munitions, such as the M982 Excalibur guided artillery shell and a variety of 155mm shells, also have substantial demand in the global market.

Among emerging systems, there is considerable interest in both **drones, counter-unmanned aerial systems (C-UAS), and maritime surveillance systems**. C-UAS are of growing interest for the security of both civilian and military assets in India and many other countries. Drones are in increasing demand globally, with growing data security concerns over Chinese models likely to create new openings for other exporters.¹³ U.S. companies might not be permitted to manufacture their most cutting-edge systems overseas. However, there may be opportunities to partner with the fast-developing Indian drone industry on both legacy systems and next generation platforms.

A final and highly promising area of partnership is **maintenance, repair, and overhaul (MRO)**. U.S.-India partnerships on MRO could service demand in India as well as more broadly, including South Asia, Southeast Asia, the Middle East, and East Africa. U.S.-supported MRO facilities in India could also have strategic importance given the high and increasing number of joint military exercises and coordination by the U.S., India, Quad partners, and other countries in the Indo-Pacific. The repairs and allied services of the USNS Charles Drew in India in August could be the start of a wide suite of operations to support the military assets of India, the United States, and their partners.¹⁴

¹¹ "With air-to-air missile capabilities, these Apaches are potent force in air," Business Standard, September 3, 2019, https://www.business-standard.com/article/pti-stories/with-air-to-air-missile-capabilities-these-apaches-are-potent-force-in-air-119090301168_1.html.

¹² Craig Hooper, "Ukraine's Use of Stinger And Javelin Missiles Is Outstripping U.S. Production," Forbes, March 8, 2022, <https://www.forbes.com/sites/craighooper/2022/03/08/ukraines-use-of-stinger-and-javelin-missiles-is-outstripping-us-production/?sh=43cdaf42409e>.

¹³ Gen Nakamura, Risa Kawaba, and Kui Sugano, "Japanese companies ditch Chinese drones over security concerns," Nikkei Asia, May 4, 2021, <https://asia.nikkei.com/Business/Technology/Japanese-companies-ditch-Chinese-drones-over-security-concerns>.

¹⁴ "US Navy Ship repair in India for first time: Charles Drew arrives at L&T Kattupalli shipyard," Economic Times, August 8, 2022, <https://government.economicstimes.indiatimes.com/news/technology/us-navy-ship-repair-in-india-for-first-time-charles-drew-arrives-at-lt-kattupalli-shipyard/93419662>.

Table 1: Priority Systems for U.S.-India Defense Industrial Partnership

Missiles	Anti-Tank Missiles (e.g., Hellfire / Javelin)
	Portable Surface to Air Missiles (SAM) (e.g., Stinger)
Aircraft	Transport Helicopter (e.g., Chinook / Blackhawk / Osprey)
	Combat Helicopter (e.g., Apache / Viper)
	Other Rotary and Fixed-wing Aircraft (e.g., Indian Multi Role Helicopter or IMRH)
Engines	Turbofan Engines (e.g., F414)
	Marine Turbines (e.g., LM2500)
Armored Vehicles	Light Tanks and Personnel Carriers (e.g., Stryker)
Artillery, Small Arms, and Munitions	Rifles and Light Machine Guns (e.g., X5 and XM250)
	Shells and Guided Shells (e.g., 155mm shells, Excalibur)
Unmanned Aerial Systems, Counter-Unmanned Aerial Systems, and Maritime Surveillance Systems	Drones (e.g., MQ-1 Predator / MQ-9 Reaper)
	C-UAS Systems
Maintenance, Repair, and Overhaul (MRO)	

INDIA'S EMERGING DEFENSE INDUSTRIAL SECTOR

Contrary to popular perception, India's defense industrial sector has changed significantly over the past twenty years. Indian defense industry has a long history dating back to before the country's independence, but was subsequently dominated by a handful of state-owned defense public sector undertakings (DPSUs), several labs under the government's Defence Research and Development Organisation, and ordnance factories.¹⁵ Many engaged in licensed production, but the lack of competition over the years resulted in inadequate technology absorption, a continuing dependence on imports, and a noticeable absence of Indian defense exports.¹⁶ Since about 2000, and particularly over the past few years, the Indian private sector has become much more competitive across many systems in terms of research and development capabilities, product quality and cost, and reliable fulfilment of orders. Private Indian companies have begun to cater to both the domestic and export markets, including through joint ventures with foreign vendors. Some public sector entities have also improved their capabilities. This has resulted in many new and compelling actors in the defense industrial ecosystem capable of manufacturing for the global arms market.

Some of the leading Indian companies include the Kalyani Group, whose Kalyani Strategic Systems Limited produces artillery systems, components for armored fighting vehicles (including gun barrels), tank tracks and wheels, precision ordnance, a range of light and armored personnel carriers, perimeter security systems, and strategic missile integration and testing support. Bharat Forge, another Kalyani subsidiary, manufactures aerospace and marine system components, including aero-engine fan blades,

¹⁵ "Defence Public Sector Undertakings," Department of Defence Production, Ministry of Defence, Government of India, <https://www.ddpmod.gov.in/defencepublicsectorundertakin/defence-public-sector-undertakings>.

¹⁶ Dinesh Kumar, "Defence PSUs, ordnance factories are in dire need of overhaul," Sunday Guardian, December 8, 2018, <https://www.sundayguardianlive.com/news/defence-psus-ordnance-factories-dire-need-overhaul>.

compressors and turbines, aircraft body components, landing gear structures, and engine crankshafts. Its core competencies include landing gear components, unmanned aerial systems, and fan blades. Meanwhile, Godrej and Boyce (G&B) manufactures precision and hi-tech aerospace components, including space engine and satellite thrusters and aerospace composites, and is in talks with global firms to develop and produce propulsion engines. G&B recently delivered the first airframe assembly for the air-launched version of the BrahMos missile and is building a defense production facility at Khalapur in Maharashtra. The company is also aiming to expand its R&D capabilities. Another market leader, Larsen and Toubro, currently holds a contract with the Ministry of Defence to supply indigenously produced Pinaka multi-barrel rocket launchers. It also contributes to guns and armored systems, submarine and underwater platforms, missiles and aerospace systems, radar systems, avionics, sensors, and unmanned systems.

Of the major Indian conglomerates, the Tata Group has subsidiary companies focused on manufacturing in aerospace and robotics; providing security technology for homeland security, border and infrastructure protection, transportation and aviation security, urban security, cyber security, and law enforcement; developing advanced composite materials for industrial sectors, including aircraft and space systems, personal armor, vehicle armor, and telecommunications equipment; advanced systems focusing on network-centric warfare, aerospace and avionics, missiles systems, unmanned aerial vehicles, radar systems, electronic warfare, communications equipment, and emergency response networks. Tata Advanced Systems has a joint venture with Boeing to coproduce several components including the AH-64 Apache combat helicopter fuselage. Tata has also developed partnerships with Lockheed Martin involving component manufacturing for the C-130J Super Hercules aircraft, MH-60 Romeo helicopter, and the S-92 helicopter.

The Tata Group is not the only legacy Indian industrial company expanding into the defense sector. Ashok Leyland Defence Systems, part of the Hinduja Group, now produces bulletproof light vehicles for the Indian Air Force, trucks, and rocket launchers. Mahindra Defence Systems specializes in armored vehicles, underwater warfare equipment, radars, and surveillance equipment, and was recently awarded a \$181 million contract to manufacture integrated anti-submarine warfare defense suites for modern warships for the Indian Navy. Reliance Naval and Engineering is involved in ship building and repair and in avionics. The Adani Group, which acquired Alpha Design Systems and PLR Systems, is interested in small arms and ammunition, anti-drone systems and maintenance, and aircraft repair.

Among state-owned enterprises, Bharat Electronics Limited (BEL) produces radars, sonar, C4I systems, electronic warfare capabilities, electro-optics, and tank electronics, and has joint ventures with Thales and GE to manufacture high voltage tanks and detector modules for computed tomography (CT) scan systems and advanced level X-ray tubes. Hindustan Aeronautics Limited (HAL), the largest state-owned aerospace and defense company in India, has produced 15 types of aircraft and has 11 dedicated R&D centers. Its core competencies include aircraft manufacturing and upgrades, turbine engines, avionics, and composites and materials.

There are also new entrants to the defense sector. For example, Paras Defence and Space Technologies is an emerging player whose products range from rocket and missile programs to infrared optics, including electromagnetic pulse protection solutions. The company is also venturing into the drone market and has tie-ups with global players to supply turnkey anti-drone systems for civilian airports in India.

Overall, India has significant potential for defense production, both to meet its immediate needs, but also export potential. An older set of primarily state-owned or -affiliated entities have been joined by a sizeable number of new private sector entrants, both traditional manufacturers and start-ups. But challenges include ensuring a level playing field, so as to facilitate healthy competition, and making a strong business case for investment and transfer of technology.

THE ROAD AHEAD

Operationalizing more defense industry partnerships between U.S. and Indian firms is contingent on commercial and regulatory factors, with the latter impacting the former. Commercial factors involve identifying weapons systems with sufficient profit potential, including not just use by the Indian armed services but critical export markets that offer both scale and strategic importance. It is also about structuring partnerships with suitable market carve-outs and end-user agreements. Policy or regulatory factors,

however, suffer from some important gaps: (i) in both India and the United States, between high-level political alignment and working-level policy outcomes, (ii) in India, between end user requirements and corporate incentives, and (iii) in the United States, between government and private sector in responses to Indian requests. Addressing these shortcomings will require:

- **Translating policy into implementation:** The U.S. government has declared India a Major Defense Partner and granted it Category-1 Strategic Trade Authorization-1 (STA-1) status, but that has not always translated into easier approvals process for U.S. firms' responses to Indian requests, at least for some types of weapons systems. For its part, India's Ministry of Defence could more closely align Requests for Information (RFIs) and Requests for Proposals (RFPs) for defense procurements – which can sometimes set unrealistic, short-term targets for domestic value addition and technology transfer – to its broader vision of gradually increasing tech transfers over a longer period.
- **Greater predictability:** The Indian government could increase the long-term predictability of its procurement specifications, including volumes, timelines, and budgets.¹⁷ Such long-term predictability is absolutely necessary to incentivize private firms – both foreign original equipment manufacturers (OEMs) and Indian private companies – to pursue long term partnerships, investments, and technology transfer arrangements.
- **Closer public-private coordination:** U.S. firms frequently miss opportunities in India as U.S. companies wait for U.S. government approvals for their responses to Indian requests, the U.S. government awaits confirmed interest from the Indian government before granting approval, and the Indian government waits on U.S. firms to share specific proposals, technical specifications, or classified briefings before confirming its interest in a particular defense system.

In sum, the U.S.-India defense industry partnership is ripe for acceleration given a range of factors, spanning supportive domestic policies and favorable geopolitics, including the urgent circumstances that have arisen due to the war in Ukraine. Capitalizing on these factors will require making a strong business case for long-term investments and technology transfers, ensuring predictable demand in India, improving public-private cooperation in both countries, and translating high-level political agreement into tangible outcomes.

¹⁷ Dhruva Jaishankar, "The Indigenisation of India's Defence Industry," Brookings India, August 2019, <https://www.brookings.edu/wp-content/uploads/2019/08/The-Indigenisation-of-India-Defence-Industry-without-cutmar-for-web.pdf>.

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