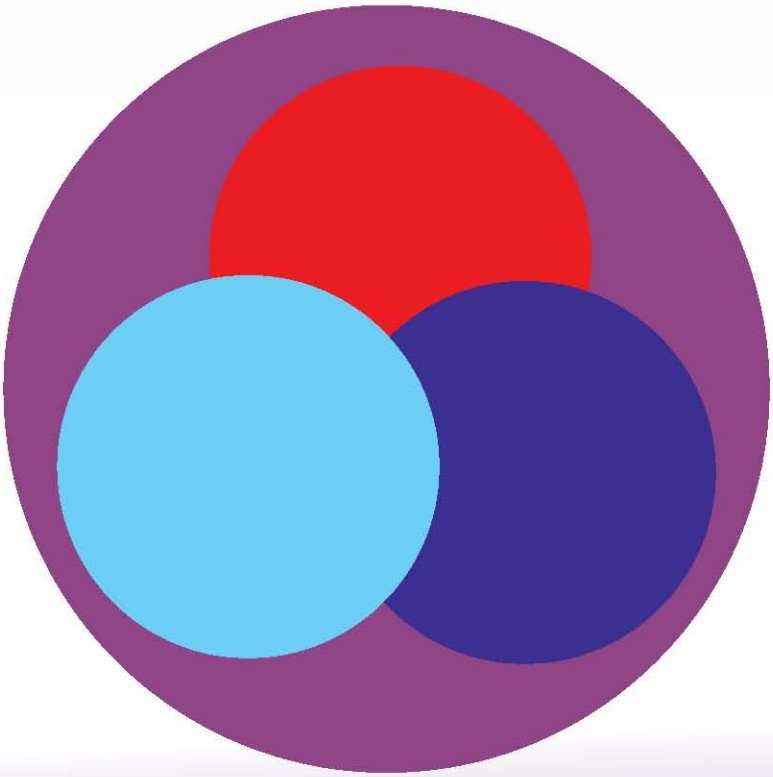
SYNERGY

Journal of the Centre for Joint Warfare Studies

Volume 2 Issue 1 ISSN : 2583-536X February 2023



CIVIL-MILITARY FUSION IN DEFENCE : THE WAY FORWARD

ANANTH TECHNOLOGIES PVT LTD

An AS-9100D & ISO 9001:2015 certified company

Committed Partner for Indian Aerospace & Defence Programs

OVERVIEW

- Complete satellite manufacturing facilities under one roof
- Design and manufacture of space and defence equipment
- Class 100K, 10K Clean Room with SMT production lines
- Contributed to 92 Satellites and 71 Launch vehicles so far
- India's premier private defense and space player
- In-house environmental test facilities

PRODUCT RANGE

- Digital & Embedded systems
- EW systems & Simulators
- Laser & Optical Systems
- Sights for weapons
- Telemetry & Tracking systems
- RF and Microwave systems
- Sensor Systems
- Navigation & Controls systems

Meeting Quality & Reliability Standards for Space & Defence programs

Dr. SUBBA RAO PAVULURI

CHAIRMAN & MANAGING DIRECTOR

Ananth Technologies Ltd., Ananth Info Park, Plot No: 39, Hitec City,
Phase-II, Madhapur, HYDERABAD – 500 081

Phone: 040 – 6615 6615 | **Fax:** +91-40-6615 6531
E-mail: subbarao@ananthtech.com; mail@ananthtech.com | **Website:** www.ananthtech.com

SYNERGY

JOURNAL OF THE CENTRE FOR JOINT WARFARE STUDIES

Volume 2 Issue 1 ISSN : 2583-536X February 2023

CENJOWS
(Established : 2007)
Room No 301, B-2 Wing, 3rd Floor
Pt Deendayal Antyodaya Bhawan
CGO Complex, Lodhi Road,
New Delhi - 110003 (INDIA)
Telephone Nos : 011-24364881, 24366485
Fax : 011-24366484
Website : www.cenjows.in
E-mail : cenjows@cenjows.in, cenjows@yahoo.com

ABOUT US

CENJOWS was raised in 2007 as an independent think tank, registered under the Societies Registration Act, 1860. This aims to promote Jointness as a synergistic enabler for the growth of Comprehensive National Power and provide alternatives in all dimensions of its applications through focused research and debate.

Year of Publication	:	2023
Frequency	:	Bi-Annual
Language	:	English
Publisher	:	Lt Gen Sunil Srivastava Director CENJOWS 301, B-2 Wing, 3rd Floor Pt. Deendayal Antyodaya Bhawan CGO Complex, Lodhi Road New Delhi-110003
RNI Number	:	DELENG/2022/82424
Editor	:	Lt Gen Sunil Srivastava (director@cenjows.in) 301, B-2 Wing, 3rd Floor Pt. Deendayal Antyodaya Bhawan CGO Complex, Lodhi Road New Delhi-110003

All correspondence may be addressed to:
Editor

Centre for Joint Warfare Studies (CENJOWS)
301, B-2 Wing, 3rd Floor, Pt Deendayal Antyodaya Bhawan
CGO Complex, Lodhi Road, New Delhi-110003
Telephone: (91-11) 24366485/Telefax: (91-11) 24366484
e-mail: cenjows@cenjows.in / cenjows@yahoo.com
Website: http://cenjows.in

Price : Rs 300/- INR or US 15$

RNI No. : DELENG/2022/82424

Print ISSN: 2583-5378
Online ISSN: 2583-536X

CIVIL-MILITARY FUSION IN DEFENCE : THE WAY FORWARD

INDEX

CIVIL-MILITARY FUSION IN DEFENCE : THE WAY FORWARD

Notes:-

- Views expressed in articles are individual opinions of the writers, and not of CENJOWS.
- Contributors to Synergy Journal are requested to visit the website for the theme of the next issue and guidelines.

MESSAGE

1. National Security is an ever evolving field and National Security architectures continue to evolve, to stay ahead of myriad challenges. India, too, has witnessed major reforms in its national security architecture since the end of the last century, after nearly half a century of stasis. We are now adopting a whole of the Government approach as is evident from the reforms ushered in recent times like the formulation of a Strategic Policy Group, and a Defence Planning Committee, creation of the Chief of Defence Staff and a new Department of Military Affairs (DMA), within the Defence Ministry. Formulation of Security Strategies and Defence Policies calls for an inclusive and multi-agency, collaborative approach.

2. All instruments of power of State-Diplomatic, Economic, Information, Military and Technology, need to function in unison and harmony and reinforce each other to ensure coherent and effective responses to competition, crisis and conflicts. Our robust response to the ongoing stand-off in Ladakh or galvanisation of resources to fight COVID pandemics are an example of this synergy.

3. New domains of warfare, including cyber, space and information, as evinced in Ukraine, entail not only integration within the Services, but within the Ministry of Defence, intelligence agencies, DRDO, and critical capabilities in departments like Space, Road, Railway, Shipping, Energy, Communication and IT, just to name a few. Effective responses also pre-suppose support from partner nations.

4. Developing and sustaining Military capabilities is a very challenging enterprise, which calls for a long term vision and roadmap for leveraging raw material, technological, financial and human resources. Technological and import dependence is the biggest hurdle in achieving strategic autonomy. Atmanirbharta is the clarion call and it necessitates intensive civil-military integration and collaboration in R&D, innovation and manufacturing. A slew of initiatives to boost "Make in India" in Defence have been taken by the Government by liberalizing licensing, FDI, transfer of patents, Defence Industry Corridors, positive indigenization list, "make" procedures, sharing testing facilities and iDEX/DISC challenges for startups and MSMEs. R&D facilities and institutions must harness talent from India, as well as abroad, for joint design and development. Diplomats, military and civil, must promote defence exports from both public and private enterprises.

5. Besides, defense initiatives must be aligned with Government initiatives like Gati Shakti, for multi-modal connectivity, the National Logistics Policy, Vibrant border villages and aviation. Road infrastructure in border areas must be aligned with plans of MoRTH. Space capabilities are inherently dual use and navigation, reconnaissance and communication needs of Armed Forces need to be factored in the joint roadmap.

6. I am sanguine that this comprehensive issue of Synergy will trigger innovative ideas for bolstering civil-military fusion in its many, and growing dimensions.

Jai Hind!

(Anil Chauhan)
General
Chief of Defence Staff

Air Marshal BR Krishna
PVSM, AVSM, SC, ADC
Chief of Integrated Defence Staff to the
Chairman, Chiefs of Staff Committee
& Chairman CENJOWS

FOREWORD

As national challenges become increasingly amorphous and complex, each resource and institution of Nation is needed to protect, preserve and promote our National interests and security. Development and Security are two sides of the same coin and both civil and military are principal constituents of a Nation's power. These have been historically integrated and any seggregation creates dysfunctionality in national security strategies. Harmony between the two elements leads to coherent threat assessment, articulation of National Security Strategies, identification of desired multi-agency and multi-domain capabilities, crafting pragmatic policies and strategies for time bound achievement of goals.

Since the Kargil conflict, the National Security apparatus has been revamped and reformed to make it more responsive through greater civil-military and cross-cutting linkages at all levels. Transformative changes like appointment of CDS and creation of DMA are striking examples of ever increasing integration of military and the civil stake holders in higher defence decision making apparatus. There is a need to enhance efficiency in operational, administrative as well as functional domains through seamless multi-agency and multi-domain coordination and collaboration between all organs of the state. Every element can make immense contribution as part of the large security ecosystem, working as a team, pursuing joint and shared goals and visions. Jointness and integration of all departments within the

MoD is as important as the integration with other departments and ministries, to ensure that National resources, capabilities and wisdom are harnessed synergetically.

The inter-dependence between the industry and the Armed Forces has assumed unprecedented importance to shed import dependence, especially in view of the disruptions of defence supply chains witnessed during the Covid-19 pandemic and the ongoing year long Ukraine conflict. Atmanirbharta (self-reliance) through joint collaboration with friendly countries and partners is the need of the hour. Civil-Military Fusion will be a natural outcome of judicious resource allocation, enabling policies, fair and speedy procurement processes and disruptive R&D and innovations. Policies that incentivise investments, indigenisation and "Make in India" in defence, have already accelerated the desired outcomes, as exemplified by a spurt in defence exports and participation in Def Expo 2022 and Aero India 2023. The services and the Ministry are enthusiastically enabling the industry through hand-holding, provision of testing facilities, infrastructure and promoting startups through iDEX schemes and regional technology nodes. The buyer-seller relationship is turning into one of partnership. The outreach with IITs and academia has increased manifold through focused MoUs.

There is a need for all stake holders to accelerate the ongoing transmation through Civil-Military Fusion by adept adaptation. "Synergy" multiplies collaborative outcomes. I am sanguine that this issue of Synergy will boost the drive towards Civil-Military Fusion.

(BR Krishna)
Air Marshal
CISC & Chairman CENJOWS

Lt Gen Sunil Srivastava, AVSM, VSM (Retd)**
Director CENJOWS

FROM THE DIRECTOR'S DESK

This issue of Synergy on the theme 'Civil Military Fusion in Defence: The Way Forward', which is is very contemporary and topical, evoked an overwhelming response from our readers and contributors. To ensure that the issue enriches our readers on multiple facets of Civil-Military Fusion (CMF), we have endeavoured to include a wide variety of nuanced perspectives on the sub-themes deemed most germane, as we navigate the challenges of CMF to leverage immense opportunities, going forward.

We have curated evolutionary lessons in CMF since independence, offered new perspectives on strategic deterrence and ISR, explored lessons form the Chinese model, examined CMF in the US from a social science lens, and evaluated new CMF possibilities in diplomacy and leadership development. CMF is inherently a Whole of the Nation effort, and multiple domains, including the land borders, maritime security, space and cyber-space have been examined incisively. CMF in intelligence, logistics infrastructure and communications, which are key joint military functions, has been explored at length. Pathbreaking suggestions have been offered for CMF in emerging technologies, R&D, the defence ecosystem and knowledge absorption by the private industry, which are critical priority areas.

It was very heartening to have received numerous articles from young officers of the three Services. While we sincerely regret our inability to include them in this issue, many valuable perspectives from the grassroots will be published separately on our website.

Nuanced national security challenges demand a whole of the nation approach and we are sanguine that this edition of Synergy will ignite and accelerate several policy initiatives to bolster CMF in the Defence in India, going forward. Constructive feedback will be welcomed by Team CENJOWS.

Happy reading!

(Sunil Srivastava)
Lt Gen (Retd)
Director

CIVIL MILITARY FUSION IN INDIA- PROMISING PATHWAYS

Lt Gen Sunil Srivastava, AVSM, VSM** (Retd)*

Abstract

Civil-Military paradigm in India had a rich inheritance since millennia, the pre-independence imperialistic British model was deemed repugnant by the Nehruvian India, leading to progressive institutional detachment of the military and excessive civilian control. In the changed security paradigm of the 21st century, with blurred distinction between the civil and military, whole of the Nation strategies have gained salience. Drawing lessons from the past and incipient civil military fusion through recent pathbreaking reforms, this article evaluates three critical dimensions of the civil military paradigm in India- institutional frameworks, defence planning and capability development, and suggests promising pathways.

Keywords- Civil Military Fusion, defence planning, defence industrial base, India

The Civil-Military Paradigm

The Civil (Government and People) and the military are *primordial pillars of state power.* The rise and fall of empires and powers since millennia is testimony to the critical *institutional relationship* between the political, economic and military organs of states. Kautilya's invaluable treatise "Arthashastra", written before the 2nd century BCE, postulates Saptanga (7 organs) of a State (King, Ministers, Territory & Population, Forts, Treasury, Army and Allies) using a unique term *Kosha-Danda*[1] to underscore *the symbiotic relationship between economic power (Kosha)*

and the military might (Danda) of a State. Sound *civil military integration or fusion (CMI or CMF),* driven by robust *civil-military relations (CMR),* remains the key to state survival. In recent times, disastrous world wars and the nuclear holocaust led to distaste *for the militarism evinced in pre-war Germany and Japan*. Several *CMR theories, which* spawned after Samuel Huntington propounded the "Objective Control Theory" in 1957, *emphasise "civilian control" and civil and military "separation"*. However, most theories fall short of sufficiently explaining the real world CMR. Unending proxy, post-colonial, civil wars and wars on terror, underscore the need for intense interplay and integration between the civil and military in any effective CMR framework. Moreover, dual-use information technology, digitisation and Fourth industrial revolution (4IR technologies) have revolutionised military affairs and democratised use of violence. The *traditional* air, sea and land domains of security have expanded to *include contestations in non-traditional security domains* like information, cyber-space, space, high-end technologies, trade, economic, human, migration, food, water, health, energy, environment and climate-change.

Wars of the 21st century have *blurred the distinction between war and peace, military and non-military*, state and non-state actors, combatants and non-combatants, borders and hinterland. Calibrated *hybrid competition and conflicts seek outcomes in the cognitive domain,* leveraging economic, diplomatic, information, technology, military and non-traditional instruments of power. This is exemplified by the *ongoing conflict in Ukraine*, which also presents *contrasting CMR paradigms for generation and application of national power*. *National security is manifestly multi-dimensional*, entailing multi-agency and multi-disciplinary collaboration. Effective CMR frameworks must *integrate the civil and military constituents, since security policy and military strategy feed and reinforce each other. Development and security have a positive-sum relationship*. While civilian oversight must ensure that *militaries do not pursue self-serving or wasteful goals,* justifiable military needs must be met. Kautilya's *arguments* for planning, development, employment, sustenance, *management and control of the military, critically aligning military with the growth of the State, are arguably canonical*.

Civil and military integration is manifest in many national security dimensions- defence policy and decision making institutions; internal security; border defence; public and private defence-technological-industrial ecosystems, commonly termed Defence Industrial Base (DIB); critical infrastructure; science and technology (S&T), research and development (R&D), learning and innovation. Ubiquitous dimensions of national security have driven States to institutionalise *Whole of Government (WoG) and Whole of Nation (WoN)* security strategies, to achieve national *security most economically, efficiently and at an accelerated pace*. ***The three pillars of national power*** *- development, security and external influence* are intricately inter-related (Table 1), with critical *civil and military inter-dependencies*.

Three Pillars of National Security & Multi-Disciplinary CMF

Development	Security	External Influence
Economy- Policies & Potential	Secure Territory & Borders	Diplomacy- Multilateralism
Industry & Services	Deterrence- Conventional and Strategic	Stability-Defence Relations & Trade
Science & Technology	Internal Stability	Strategic Autonomy
Social Equity	Intelligence & Information	Trade & Investments
Environment & Climate Change	Critical Resources & Technology	Culture & National Values

Table No 1 Source: Author

All nations design CMR and *evolve CMI/CMF strategies,* tailored for their nuanced challenges, resources and *politico-military systems*. Shaping appropriate CMR and CMI/CMF frameworks is critical for India, especially since the collusive nexus of her adversaries is growing stronger, triggering border crises episodically, given their proclivity to use multi-domain hybrid threats with a coercive and revisionist intent. India's defence budget has grown to nearly $75 Bn, and manufacturing in aerospace and defence is proposed to exceed Rs 175000 Cr, including Rs 35000 Cr exports by 2027. *Substantial reforms to break the civil military stasis*, including, but not limited to the creation of a Chief

of Defence Staff (CDS) and Department of Military Affairs (DMA) and corporatisation of Ordnance Factories (OF), have been ushered post 2020. The salience of *CMI and CMF has been flagged by political and military hierarchy* repeatedly-enhancing CMI in infrastructure and R&D[2]; the adopting a WoG and a WoN approach[3,] and policies to infuse CMF in logistics[4]; convergence between defence programs and government initiatives like Gati-Shakti[5]. *There is a need to examine the ongoing CMI/CMF endeavours*. This essay examines India's *institutional CMR frameworks, CMR in defence planning and CMI/CMF in defence capability development*, and suggests promising pathways.

India's CMR Framework. Independent India had to contend with formidable security and foreign policy challenges at its birth- partition driven communal violence and war initiated by Pakistan; political uncertainty in newly born neighbours; turbulence and economic aftershocks of the Second World War, compounded by the emerging Cold War. *India's culturally ingrained pacifism was reinforced by a political distaste towards use of military power* for furthering expansionist agendas. India's CMR since independence and its impact on defence policy, institutional evolution, inclusion of the military and crisis/conflict management need reflection and analysis.

- **National Security Strategy and Defence Policy**. India's post-independence foreign and defence policies had *moorings in Nehruvian idealism,* unrelated to the *militarist and revisionist* policies of China and Pakistan. Lack of an institutional approach led to subjective political interpretations of *national interests* and non-articulation of a national security strategy (NSS) to secure them. Though George Tanham's criticism of India's strategic culture[6] triggered appropriate rebuttals[7], many military analysts have criticised India's reactive strategic responses[8]. Lack of strategic direction[9] and ad-hoc defence modernisation[10] have also drawn criticism. From a *defence policy perspective*, it is worth noting that *KC Pant, a serving defence minister,* had opined in 1989 that the *role of Indian Armed forces is strictly defensive- to safeguard autonomy of decision making, facilitate development and prevent turbulence spreading from neighbourhood*[11]. Indian *strategic thought was reflected* in the *broad*

guidelines for India's Defence Policy, explained in a statement to the Parliament by the Prime Minister in 1995[12], which encompassed- *defence of territory & trade routes; a secure internal environment to ensure unity and progress; ability to exercise a degree of influence in the immediate neighbourhood for harmonious relations; and the ability to contribute towards regional and global stability with an out of country contingency capability*. This *rational policy direction continues to guide the development of India's military capabilities*, even as she grows to be the 3rd largest economy in a decade, resolutely addressing the growing collusive threats from revisionist neighbours, in a turbulent regional environment.

Civil-Military Institutions for Policy & Decision Making.

- **From Progressive Separation Towards Incipient Integration**. Post independence CMR exemplify *politico-bureaucratic control and progressive detachment of the military from decision-making institutions*. The three-tier *committee based system(Cabinet, Ministry and Military-Chiefs levels), which did allow frequent politico-military engagements*, soon fell into disuse after 1947-48 War. The first 50 years saw progressive disjunction in CMR, for several reasons, including political aloofness towards a military unjustifiably perceived to be a *colonial vestige*; early antipathy between the civil-military due to *civilian meddling;* and lack of inter-service jointness, despite continued push from Lord Mountbatten, even after 1960[13]. In 1952, the defence forces were designated "attached offices", outside the Ministry of Defence (MoD)[14]. Promulgation of Allocation of Business (AoB) and Transaction of Business (ToB) Rules in 1961, *under Article 77(3) of the Constitution*, *mandated the defence of India to the Defence Minister, and the administration of business rules to the 'Secretary*', cementing the separation. The Kargil conflict (1999) broke the stasis, and recommendations of the the Group of Ministers Report[15] (GoM) in 2001 led to creation of *Headquarters Integrated Defence Staff* (HQ IDS) in 2001, *and designation of Service Headquarters as "integrated" offices* in the AoB rules[16]. The evolution and frailties are tabulated below (Table 2).

CMR- Institutional Framework Evolution & Reforms

Civil-Military Institutional Frameworks	Frailties and Concerns
1947 • Separate C-in-C for each Service	• Lack of Jointness; Service Autonomy
1952 • Services became of 'Attached' offices	• Separation of Civil and Military in decision making • Defence Committee of Cabinet and Defence Minister's Committee- diminished relevance
1961 • AoB and ToB Rules (Under Article 77 (3) of Constitution)	• Defence of the Union mandated to the Defence Minister • Administrative responsibility with Defence Secretary, heading 'Defence Department'
1967-1990s (Aborted Reforms) • Administrative Reforms Commission recommended CDS • 1990- Arun Singh Committee, recommended JCS	• Recommendations stonewalled • Arun Singh Committee Report not made public
1991 • *Military Wing* (Military Officer), under Cabinet Secretariat since 1947, providing secretarial support to Apex and all inter-Services Committees, shifted to MoD, merged with IDS in 2001	• The *political/ ministerial oversight through an institutional interface was lost.* • Reflects the distancing and perceived *irrelevance of military inputs*
2001-2002 • GoM Report. Creation of HQ IDS • Designation of Service HQs as 'Integrated' • DIA and cross-teaming with civil committees/ boards • Nuclear Command Authority (NCA) - Chairman COSC member of Executive Council	• Partial implementation of GoM report – No CDS Created. • Service HQ still lacked policy making role
2011-12 • Naresh Chandra Task Force Report (2011-12), recommended Permanent Chairman COSC	• Report was not made public. Permanent Chairman COSC not appointed.
2020 • CDS also Secretary, DMA & Permanent Chairman COSC • Resource optimisation though Jointness, integration, indigenization, long term capability development plans • Revenue expenditure is the charge of CDS. • Controls tri-service commands and institutions	• CDS is *Principal Military Advisor* to Defence Minister on Tri-Service matters. • Defence Secretary remains '*Principal Defence Advisor*', with DoD responsible for defence of India

Table No 2. Source: Author

CDS & DMA- A Pathbreaking Reform. It took over 70 years to demonstrate *political will to overcome the entrenched politico-bureaucratic* reservations, and notably also *resistance from the Services, fiercely guarding single-service autonomy*. The creation of *DMA, under CDS as Secretary, and its inclusion in the AoB Rules as a Department*[17] *on 01 Jan 2020, was a truly transformative step*. CDS is the *principal military advisor to the Defence Minister on tri-Service matters*[18]*, and the Permanent Chairman, COSC.* Charge of the Armed Forces of India, Service HQ, HQ IDS and the Territorial Army is vested with the DMA[19]. His major responsibilities and role clarity concerns are tabulated below (Table 3).

CDS- Charter and Role Clarity

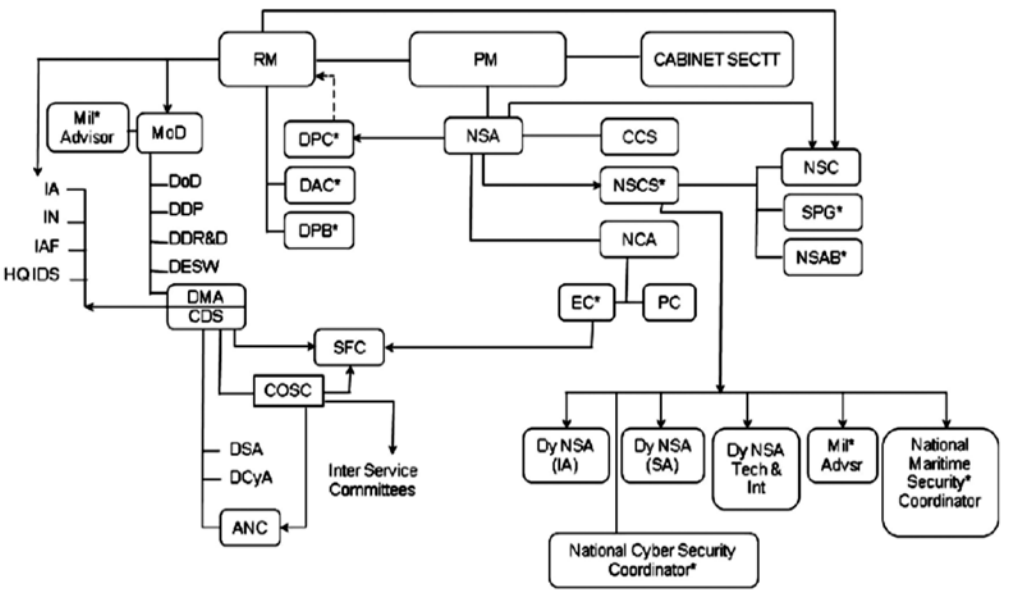
Major Responsibilities	Role Clarity
Policy Making/ Advice • Principal Advisor to RM on Tri-Service Matters • Member DPC • Mil Advisor to NCA • Impartial Advice to CCS	• Service Chiefs Access to the Defence Minister on Single Service matters
Jointness in Organisations • Administer Tri-Service Entities- ANC, SFC, Tri-Service Institutions, Defence Space & Cyber Agencies • Restructure Mil Commands to Joint or Theatre Commands Jointness in force structure to infuse efficiency	• Cyber & Space Agencies Cross Domain, Multi-Agency. Need greater CMF • Chain of Command for Future Joint Forces/ Theatre Commands
Capability Development • Joint Priorities in Procurements • Draft and Implement ICDP, DCAP & AAP • Promote Indigenisation	• ICADS process be made inter-departmental, inter-ministerial.

Table No 3. Source: Author

Military Inclusion in Apex National Security Institutions. The CCS is the apex constitutional body for national security decision making, where attendance of CDS/ Service Chiefs is by invitation only. The National Security Council (NSC), was resurrected in 1999 after the nuclear blasts in 1998, *with a role to advise the Cabinet on a wide range of security areas*[20]. The *National Security Advisor (NSA-elevated to*

Cabinet Minister rank in 2019), is the member secretary. It also includes Vice-Chairperson Niti Ayog and CDS/Chiefs may be invited. A Strategic Policy Group (SPG) chaired by the NSA (by the Cabinet Secretary till 2018) *provides policy inputs to the NSC*. *SPG has over 20 members from select ministries/departments/financial institutions, besides the CDS and the Service Chiefs*. The National Security Advisory Board (NSAB) of non-governmental domain experts, *which advises the NSC on specific issues*, has a variable tenure based membership, including senior retired military officers. The NSC Secretariat (NSCS), which provides secretarial support to these bodies, *has been included in the AoB rules in 2019*[21] giving it the *authority to make and enforce policies, underscoring its eminence*. Growing institutional inclusion of the military in national security is analysed below (Chart and Table 4).

APEX LEVEL CIVIL- MILITARY INTEGRATION



Source: Author

*Military Members/ Representative (s)

Military Inclusion in Apex National Security Institutions/Domains

Military Inclusion	Impact on CMF
CCS & NSC • CDS/ Service Chiefs on invitation	• Infrequent but highest level political interface
SPG • CDS and Service Chiefs	• Wide Inter-ministerial/ departmental consultations promote WoG approach
NSCS • 3 star (Retired) Military Advisor since 2011 • 2 Star National Maritime Security Coordinator since 2022 • Serving officers from the 3 Services • National Cyber Security Coordinator.	• Cross-flow of critical inputs at the functional level • Military perspective expertise and rigour to CMF
NSAB • 3 or 2 Star (Retired) Military domain experts invariably included	• Outside the Government, distilled inputs
MoD • 3 Star (Retired) Military Advisor since 2021	• Objective advice & distilled experience.
Maritime Security • 2008- Coastal Security coordination mandated to Navy • National Maritime Domain Awareness (NMDA) Centre • IFC-IOR	• Plugged security gaps • WoG maritime security coordination • International outreach for maritime security
Civil Aviation • Airspace coordination with IAF	• Better crisis response capability.
Internal Security & Disaster Management • MHA (LWE Wing) has a Security Advisor from the Military • States of NE and J&K have a Unified HQ model • MAC and SMAC connectivity with Military establishments • NSG- manning by Officers and soldiers from Military • NDMA – Military functionaries	• Helps leverage years of military expertise • Inter-agency coordination • Better crisis response • Joint Intelligence network • Joint Training, best practices

Table No 4. Source: Author

CMR in Crises and Conflicts. The litmus test of CMR is the response to crises, conflicts and instances of use of force. Historical evidence substantiates dysfunctional CMR in the 1962 war and IPKF operations (1987-90)[22], as well as robust CMR in *1971 war, Operation Meghdoot (Siachen 1984), Operation Vijay (Kargil 1999), Uri Strikes (2016) and Balakot air strike (2019). Even against China, politico-diplomatic-military responses were robust at Nathula (1967), Sumdorong Chu (1986-95), Doklam (2017) and Eastern Ladakh (2020- ongoing). The following table flags CMF during conflicts and post crises/conflict negotiations. The essence is that the apex crises/conflict handling capabilities have matured through the years, demonstrating a sophisticated understanding of use of the instrument of force for protecting and promoting national interests, including escalation management. CMF facets during and post conflicts are analysed below (Table 5).*

CMF During Crises/ Conflict Management

CMF During Crisis/ Conflict	CMF Post Conflict/ Crisis Negotiations
1947-48 J&K • Military operations not expanded beyond J&K nor offensive employment of air (Not used in Ladakh) • Trust in Military capability	• Political quest for early conflict termination (UN intervention) • Misplaced faith in diplomacy, peace and stability.
1950-61 Tensions with China • Tibet Occupation- Political acquiescence. • Aksai Chin Road Construction by China- Muted political and no military response emboldened China • Forward Posture (1959-1961) - disregard of military advice.	• Disregard of territorial integrity (Aksai Chin). • Delusional belief in non-expansionism by a socialist China • Misplaced faith in diplomacy to resolve tensions
1962 War • Disastrous politico-bureaucratic meddling. No use of offensive Air Power.	

CMF During Crisis/ Conflict	CMF Post Conflict/ Crisis Negotiations
1965 War • Expanded beyond J&K, but opportunities lost against exhausted Pakistan forces	• UN resolution in Kutch (April 1965) emboldened Pakistan • Soviet Union arbitration- squandering hard fought military advantages to diplomacy
1967 Nathula &1986-95 Sumdorong Chu • Robust and resolute response • Trust in military capabilities.	• Diplomacy in tune with military sensitivities and concerns
1971 War • Flawless planning and execution of operations exemplified robust CMR. • Total faith in military leaders and capabilities	• Political objectives in the East held primacy over military gains in the West • Simla Agreement- Diplomacy could not deliver lasting peace
1984 Operation Meghdoot (Siachen) • Trust in the unparalleled military valour.	• Politico-diplomatic approach in sync with military concerns
1987-90 IPKF • Questionable mandate and Muddled operations- deep fissures in CMR • No synergy – Military, foreign ministry, int agencies.	• Lessons in tri-Service jointness. • Lessons in use of force abroad.
1999 Kargil Conflict & Operation Parakram (2001) • Military honoured the political concerns in Nuclear overhang.	• Politico-diplomatic – military harmony. • Lessons in Military Coercion under Nuclear overhang.
Surgical Strikes- Uri (2016) and Balakot (2019) • Military forces given autonomy to conduct operations	• Excellent example of politico-diplomatic-military fusion in Escalation Control.
Doklam (2017) & Easter Ladakh (2020-Ongoing) • Political endorsement of the military strategy in grey situations.	• Joint military-diplomatic talks (first time). • Excellent example of politico-diplomatic-military harmony – No normalisation till peace and stability on borders.

Table No 5. Source: Author

CMI/CMF in Defence Capability Development (CD)

- **Defence Planning and CD.** Defence planning is an extremely complex and specialised process which encompasses capability-gap assessment, plugging the gaps through cost-informed and prioritised long term plans, underpinned by budgetary assurance. It calls for collaborative team work by military and R&D professionals and financial experts. In India, the initial planning was influenced by the Blackett Report (1948)[23]. Post the 1962 debacle, fledgeling efforts were made to infuse institutional rigour in defence planning- a Defence Planning Cell under the MoD in 1965[24]; a Committee for Defence Planning (CDP) under the Cabinet Secretary in1977, the Defence Coordination and Implementation Committee (DCIC) under the MoD[25]; and an ambitious inter-ministerial Defence Planning Staff (DPS) formed under the COSC in 1986[26], which was resisted by the bureaucrats,[27] being headed by the COSC, and marginalised by the military since it sought jointness.[28]Analysts have criticised the failure to link threats and defence acquisitions[29] driven by *service-specific modernisation plans, without exploring cost-effective joint force structures*[30]*. Post Kargil conflict*, a *Defence Acquisition Council (DAC)* was created under the Defence Minister, with CDS/Service Chiefs and Secretaries of other MoD departments as members. *The GoM recommendation for an indication of financial support for the plan period*[31]*, has been ignored*. A *Defence Planning Committee (DPC)* has been constituted under the chairmanship of NSA in 2018 for *facilitating integrated defence planning, strategic planning, CD, defence diplomacy and indigenisation*[32], with Chairman COSC/CDS, the Service Chiefs and Secretaries of Defence, Foreign Affairs and Finance as members. Its charter includes preparation of several *draft documents* including NSS, SDR and prioritised CD plans for the Armed Forces, *factoring the likely resource flows*[33]. After discontinuation of National Five Year Plans since 2017, the CDS has been mandated for implementation of ten year ICDP (Integrated Capability Development Plan), two five year DCAPs (Defence Capability Acquisition Plan), and a two year roll-on AAP (Annual Acquisition Plan), drawn from ICDP[34]. These are being evolved by HQ IDS, through an Integrated

Capability Development System (ICADS). *Approval for 5/10 years plans rests with the DAC (Defence Minister) and for the AAP with DPB (Defence Secretary)[35]. The cabinet last approved defence plan 2002-07 in its final year. There is no budgetary assurance beyond the current FY* and *defence plans*, prepared by the military, are *ignored by the Ministry of Finance (MoF). Capital procurements are practically driven by two year AAPs.* To guide and inform the industry, a Technology Perspective and Capability Roadmap (TPCR)[36] is issued by HQ IDS[37]. Evolution of CMF in defence planning is analysed below (Table 6).

CMF in Defence Planning

Civil-Military Integration	Financial/ Cabinet Oversight
1947 to 1962 • Based on Blackett Report of 1948 • Service Plans- No Jointness.	• Below 2% of GDP- Defence Policy adjunct to Foreign Policy (Non-Alignment). • Non-Plan (beyond Plg Commission)
1962-1999 • First Defence Plan-1964-69 (Service Plans) • 1965-Defence Planning Cell in MoD. • 1969-74 & 1970-75 (Roll-on). Disrupted by 1971 War • 1974-79 Plan (Deputy Chairman Planning Commission led Apex Committees) • 1977- Cabinet Secretary led CDP. • 1979- Defence Secretary led DCIC. Military excluded. • 1980-85 Plan. (Co-terminus with National Plans). • COSC led DGDPS 1986 to 2001. Marginalised by both MoD and Services.	• Financial commitment for 1964-69 plan • 1974-79 Plan questioned MoF, despite approval of Cabinet • 1977 – CDP curbed Pol-Mil interface. • Cabinet approved 6th Plan, 7th Plan in 4th year, 8th Plan not approved, 9th Plan approved, but financial support disrupted. • 1980s- Defence allocations peaked to 4% of GDP • Adhoc Committees - No joint planning. • Joint Plan 2020 by DGDPS presented to the Cabinet, but no financial commitment.

Civil-Military Integration	Financial/ Cabinet Oversight
2000-2017 • DAC formed under the Defence Minister. • DPB, DRDB and Acquisition Wing - in the MoD, headed by Secretary(s), with members from the Services. • 2002-2017 Long Term Integrated Plan. • 10th Plan(2002-07). Cabinet approval in 2007 • 11th Plan (2007-12)-Not approved by CCS • 12th Plan (2012-17). Last National Five Year Plan. • 2012-27- Second Long Term Plan. • 13th Defence Plan (2017-2022)	• No Cabinet oversight since 2007. • MoF is informed after approval of DAC. • MoD/DMA still evolving Joint ICDP (10 Years) and DCAP (5 Years) • Budgetary commitment only for the current FY • Defence allocations less than 2% of GDP (excluding pensions), and 13-15% of Central Government expenditure
2018-Till Date • 2018-DPC Formed - Draft NSS, SDR, Defence Plans, Indigenisation • 2020-CDS. Preparation and implementation of ICDP, DCAP, AAP • AAP (2 Year roll on) approved by DPB (Defence Secretary).	• DPC provides PMO oversight through NSA. • No budgetary assurance beyond the ensuing FY. • No CCS oversight of 5/10 yr defence plans.

Table No 6. Source: Author

- **Elusive Self Reliance in Defence Systems**. Though heavily de-industrialised at independence, India *aimed to be self-reliant in low end capabilities in defence*, as suggested by Wansborough Jones[38] and Blackett. The Defence Science Organisation, established in 1948, became the nucleus for the Defence Research and Development Organisation (DRDO) in 1958. Pioneering research was undertaken, however, prestigious indigenous design and development projects like supersonic fighter HF-24 (Marut), initiated in 1950s, *floundered for want of financial support for co-development of a jet engine*[39]. Some analysts hold that India's *prestigious driven R&D projects have been wasteful*.[40] Licensed production in Defence Public Sector Undertakings (DPSU) and Ordnance Factories (OF), became the default option, since *indigenous private sector alternatives proved sub-optimal*. Self-reliance in defence systems has remained elusive.

Between 2017-21, the percentage of foreign procurement for defence stores and equipment, both capital and revenue, varied from 34% to 42%[41]. Glaring reasons behind this failure are the *inability to make engines* for aircraft, ships and tanks, besides *near complete import dependence in semiconductors and critical materials*- areas which are heavily resource, capital and time intensive.

- **CMF in Defence Manufacturing and Indigenisation**. India's DIB is beset with entrenched DPSU interests obstructing fair play; unrealistic user requirements; glacial procurement processes and fragile supply chains. The public sector centered *defence manufacturing strategy* has drawn criticism for low capacity utilisation, high unit costs and poor quality[42]. Corporatisation of 41 OFs into 7 DPSUs in 2021[43], despite entrenched resistance, will likely induce the desired course correction. Having opened up to the private sector only in 2001, India's DIB presently comprises of 16 DPSUs, over 100 private companies and over 12000 MSMEs, but makes up a minuscule fraction of India's *manufacturing sector*, which itself contributes a meagre 17.5% of India's GDP[44]. The total value of *indigenous defence production* in FY 2021-22 was Rs 94846 Cr (*1.8% of India's manufacturing sector*), in which *the private sector contribution was 19920 Cr*[45]*(less than 0.4% of India's manufacturing sector)*. India's *defence imports* from foreign sources, which used to be *46% of capital expenditure*, have *fallen to 36%* between 2018 to 2022[46]. *Domestic procurement* has grown from about Rs 55000 Cr in 2017-18 to Rs 86,078 Cr 2021-22[47], largely an outcome of a resolute *Make in India (MII) policy.* Correspondingly, as a policy, the proportion of capital outlay earmarked for domestic procurement has been progressively enhanced from 64% (2021-22) to 75% (2023-24). Over 450 MoUs, ToT agreements, product launches and orders worth over Rs1.5 lakh Cr[48] to domestic industry during 2022 *testify growing CMF.* Ease of doing business, India's membership in arms transfer regimes between 2016-18 and grant of STA-1 status from USA, has incentivised foreign investments and collaboration. However, achieving 50-60% indigenous content (IC) is daunting, since global OEMs face challenges in breaking the existing supply chains to relocate production in India[49]. *The solution lies in spelling out long term requirements and realistic budgetary*

assurance for defence plans. A slew of policy reforms to incentivise investments, indigenisation, innovation & R&D, and exports, which are having a visible impact, are summarised below[50] (Table 7).

CMF in Defence Industrial Ecosystem

Investments	Indigenisation	R&D & Innovation	MRO & Spares	Exports
• Since 2020, 74% Automatic FDI; (100% Govtt route) • Licensing Liberalisation- 595 licenses to 366 Companies • License period - from 3 to 15 years • Two Defence Industrial Corridors- MoUs worth Rs 24000 Cr & invested over Rs 6000 Cr • Tax Incentives • FDI-Grown from Rs 1,382 crore between 2001-2014, to Rs 3,378 crore between 2014-22 • Rs 10,000 Cr 'Fund of Funds' for MSMEs	• Public Procurement Order 2017- 46 items be bought domestically. • PILS - Services (411) & DPSUs 278 items indigenised, and 85 at trial stage). • Buy (IDDM)- 86 proposals worth 93,727 Cr categorised • SP Model • SRIJAN Portal for Import Substitution. • Target - 5000 components between 2020-2025 • Make-1, Make-2 and Make-3 Procedures	• Testing Infrastructure- Rs 400 Cr • Offset Reforms- Incentivise ToT • TDF Schemes- 163 technologies being indigenized. • 108 Systems to be developed by Industry only • DcPP Model- Private partner of DRDO. • 25% of DRDO R&D Funds for Private Sector/Academia. • iDEX - Over 200 contracts awarded • MSMEs/ Start-ups may offer 'Make-II 'Suo Moto' • Over 1500 IPRs granted.	• IGA with Russia on "Mutual Cooperation in Joint Manufacturing of Spares, Components" in 2019- 550 items • Tax incentives in MRO sector • Buy (Global-Manufacture in India) introduced to enable indigenisation of spares	• Target Rs 35,000 Crore by 2025 • Outreach through DefExpo & Aero India (In 2023- 254 partnerships, 9 product launches and three ToT, worth around Rs 80,000 crore inked) • OGEL and eased. • Over 75 exporters (70-90% from private sector) to over 75 countries • Grown from less than Rs 1000 Cr in 2014 to over Rs 14000 Cr in 2022 • DPSUs to earn 25% from exports by 2025, assigned specific regions.

Table No 7. Source: Author

CMF-Promising Pathways

- **Apex Level CMR**.
    - **NSS**. Non-escalatory and resolute *politico-military-diplomatic sophistication* was manifest in Kargil, Doklam, Balakot and Ladakh. India's principled stance in the Ukrainian conflict is also NSS *in action*. A documented NSS is only one logical step away, which must be *collaboratively put together by SPG and DPC.* This document will infuse internal coherence towards a WoN approach to defence policy, strategy and defence planning.
    - **Politico-Military Engagement**. Historical creation of DMA and appointment of the CDS has demonstrated unprecedented political will. Annual engagement of the Prime Minister with the military commanders, besides frequent informal interactions during events, has strengthened mutuality and understanding. Reservation of jobs by the Centre and state governments for the Agniveers in future[51,] and the Services giving up network for spectrum (NFS), demonstrate robust CMF in action. Sanctity of the line of control with Pakistan and disengagement along the line of actual control with China, *must continue to reflect resolute politico-military commitment to safeguard sovereignty and territorial integrity*. Robust *CMR must uphold the time honoured and long established apolitical nature* of Indian armed forces. Military character should not be sacrificed[52.]
    - **Grey Zone Crises, Hybrid Conflicts and Responsive CMF**. Grey zone, hybrid and multi-domain challenges call for *reciprocal grey zone responses, which* are inherently multi-agency and multidisciplinary. Effective deterrence pre-supposes politico-diplomatic responses to be underpinned by calibrated *cross-domain military responses at the speed of relevance*. It is axiomatic that greater CMF be infused in the inherently dual use space[53] and cyber domains[54]. *A fine balance is needed between centralisation at the apex level and the need for specificity, speciality and delegation for deft and responsive crisis management, with escalation control mechanisms*. An example is the creation of the

Multi-Agency Maritime Security Group under the newly appointed NMSC in 2022, perhaps *superseding a similar committee created under the Cabinet Secretary in 2009. Issue focused civil-military groups must be formed under domain experts to deal with specific security challenges*. *Organisational faultlines and vulnerabilities are targeted*, and for this reason, *operational control of border guarding forces along disputed borders* must rest with one agency, the MoD, while the administrative control remains with the MHA. *The Union War Book advocates transition to a state of war*, *if decided by the cabinet. Sub-threshold grey zone provocations deliberately preclude such an invocation.* Constructs for *leveraging and protecting critical resources and infrastructure, without invocation of the War Book are needed*.

- **Infusing Bureaucratic Civil-Military Harmony**. Creation of DMA has provided *constitutional inclusion of the military in defence policy making, with inclusion of DMA in the AoB Rules*. However, the *defence of India, defence policy and prosecution of war remain the charge of DoD*[55]. *Defence matters (DoD) and military matters (DMA), are inherently intertwined and any attempt to compartmentalise the two is self-defeating*. Authority, responsibility and accountability go together. In the hierarchically stratified layers of Minister-Secretary-COSC, Secretary DMA is a co-equal at the second layer. This new equation calls for *a new modus vivendi, one of dialogue and accommodation, between the civil and military bureaucracies*, to forge trust and concordance. *The bureaucracy, civil and military, need to function as joint and equal stakeholders. Joint manning at the additional and joint Secretary levels in all departments of MoD, exactly the way in DMA, must be enforced*. Though the DoD presently has military manning at and below the Joint Secretary level in the Acquisition Wing, cross-staffing within the verticals is necessary.

- **Jointness & Integration within the Services**. Rifts and inter-service rivalries weaken the very edifice of CMF, since a divided military will continue to guard service autonomy and turf, nullifying all efforts to leverage jointness in force structures. True jointness

goes beyond the optics of joint exercises and training, and entails finding the best tri-service solution for all missions, tasks and force structures. The COSC needs to demonstrate more unity of purpose and effort, especially as regards joint and theatre commands on the anvil.

- **CMF in Defence Planning, CD and Expenditure.** Disjunct between the civil and military in defence planning and CD remains *the single most important fault line in CMF*. The lament is that the military decides the force structures and equipment profiles, the bureaucrats lack the understanding to suggest alternatives for ensuring resource informed deterrence, and the *MoF ham handedly delays or scales down the requirements, as was the case for the Mountain Strike Corps*. The 5/10 year plans prepared by DMA, *will be approved by the Defence Minister, not the Cabinet/parliament, implying no budgetary assurance beyond a linear projection of the Service-wise capital requirements*. Between 2021-26, the MoD had made a capital head projection of Rs 17.46 lakh crore, but visualised an allocation of Rs 9.01 lakh Cr only[56]. Between 2018-23, the shortfall on capital head has annually exceeded Rs 60000Cr[57]. *The MoD had sought a non-lapsable modernisation fund of Rs 55000Cr per year*[58]*,* which is still under discussion with the MoF[59]. *This disjunct with the MoF* must be removed by *mandating the approval of ICDP/ DCAP by the Cabinet*, correcting an irregularity existing since 2007. HQ IDS provides the secretarial support for the DPC[60]. Thus with NSA led DPC ensuring the PMO's oversight, bureaucratic coherence in defence planning will be ensured. *The ICADS process must institutionally include inter-departmental stakeholders (like the erstwhile DPS). Most importantly, the financial advisor*, must be involved from the *inception stage* itself, obviating the after-the-fact infructuous scrutiny.

    - **Restructuring Defence Acquisition**. Consolidating the experience gained over the last two decades since creation of the Acquisition Wing, the acquisition functions could be *brought under one entity (Secretary level)*, with separate verticals for Policy, R&D, Planning/ Programme Initiation, Trials, Programme Managers (three Services), DIB, International Cooperation/

Exports and Contract Management. The staffing should be a mix from the Services, *Specialised Civil Cadre*, Finance staff, DRDO, and Quality Assurance.

- **Audit and Oversight of Defence Expenditure**. Checks and balances remain critical in a parliamentary system. Objective scrutiny by the Parliamentary Standing Committee on Defence, Public Accounts Committee, Comptroller & Auditor General and the Defence Accounts Department, must be strengthened through cross-pollination of civil and military experts.

- **Specialised Civil Cadre for National Security and Defence Procurements**. This was recommended by the task force in 2000[61,] and accepted by the GoM, and also reportedly endorsed by the NCTF in 2012[62]. Specialisation is needed in contracts, budgeting and trade legalities. A specialised cadre needs to created and enlarged.

- **Academia Military Integration**. CMF must be institutionalised and reinforced through joint education and learning at all levels. Indian Defence University (IDU), a long pending recommendation of the GoM Report, must be created through an act of Parliament, for which a draft bill had been prepared[63.]

- **Enhancing CMF in the Indian DIB**

  - **Long Term military Requirements & Technology Forecasts.** Long term defence indigenisation plans and updated TPCR must be shared with the industry. *Since 75% of capital procurements will be domestically sourced, timelines for revenue (ammunition) and other capital needs must be shared with the industry*. DPSUs must cease to get the buyer nominated benefit, where the private sector offers alternatives.

  - **Indigenisation & Make in India**. Public-private collaboration can bridge critical supply-chain voids. A McKinsey report[64] of 2020 considers the A&D supply chains underweight due to lack of technological sophistication, and likely to add only $8bn to

manufacturing between 2020-2027. For creating a DIC to match India's needs, industry experts hold that India's spend on defence should be over 2.5% of GDP[65], which presently is 1.51%[66] (FY 2023-24, excluding pensions). However, facts on the ground show potential and promise. Private sector is partnering with DRDO and DPSUs to make critical components for platforms; and with foreign OEMs for making aircrafts, armoured vehicles and small arms. Private sector must accelerate indigenisation of semiconductors and strategic materials with production linked incentives. However, cost-competitiveness must be facilitated through assured orders at scale. Financial and other policy incentives must be provided to MSMEs to secure critical global supply chains. Cross-flow of talent across the industry, academia and DPSUs, will boost CMF. Talent retention through appropriate HR policies merits a serious thought by the military. Creation of two DICs acknowledges the role of MSMEs as lead integrators and competitors to the DPSUs. SEZs could be contemplated in future. *There is a need to upscale from reform to restructuring of the DIB*.

- **Maintenance Repairs and Overhaul (MRO) Chains**. Severe disruption of supply chains and MRO chains, especially of Russian/CIS origin equipment, was triggered by the Covid-19 pandemic, followed by the Ukraine war. The industry has responded to the government initiatives (tabulated above). India has the potential to become a global MRO hub for both Russian and western equipment, *if OEM certification is made feasible*. Drawing lessons from the pandemic, a *balanced approach may be needed by retaining limited captive capacity in Base Repair Depots and Service Workshops for critical needs and spares*. The Government Owned Company Operated (GOCO) model for repair workshops could be reviewed.

- **Incentivising Defence R&D**. Guidelines for research spelt out in 1952[67] - user need, within available resources and timelines- remain valid today. India spends meagre 1.7% of the defence budget on R&D[68], which pales in comparison to allocations by

China and the US. The private sector share in defence R&D is negligible, therefore, 25% DRDO budget was earmarked for the private sector/academia. Based on facts revealed by a CAG report on Mission Mode projects of DRDO, creation of an autonomous Defence R&D Council, with scientists and military officers as members, together with a tri-service division in the DMA to fund the Council and evaluate progress of projects, as suggested by a former Defence Secretary, merits examination[69]. The Defence Innovation Organisation (DIO) and innovation/ design verticals in the three Services, are delivering accelerated outcomes through iDEX, with DISC, Prime and Open Challenges having led to over 200 contracts in four years. The Services have also earmarked part of the capital budget for prototype development in FY 2023-24, which needs to grow. Joint technology research centres to meet specific needs and MoUs between Services and IITs/ universities must gather pace and show meaningful outcomes in projects and learning.

Conclusion

The arguments set forth above amply underscore the fact that the civil military paradigm in India has matured substantially since independence, especially since the turn of the century, addressing faultlines, silos and fissures, gradually adopting a WoN approach in defence strategies, understanding and use of the instrument of power. Integrated planning and capability development and effective CMF strategies for accelerated defence indigenisation and modernization have been forged. The DIB in India, though relatively small, has tremendous potential with the pragmatic pathways suggested. Future research must analyse the efficacy of reforms enshrined in DAP 2020, as the impact grows in scale.

***Lt Gen Sunil Srivastava, AVSM, VSM** (Retd)** is a former Commandant of the OTA Gaya and is presently, Director Centre for Joint Warfare Studies (CENJOWS), New Delhi, since 01 Jan 2021.

Endnotes

1 LN Rangarajan, “The Arthashastra”, Penguin Books, 1997, p 14

2 Dinakar Peri, “Integrating civil, military ecosystems key to resource use: CDS”, 22 Nov 2020, The Hindu, https://www.thehindu.com/news/national/integrating-civil-military-ecosystems-key-to-resource-use-cds/article33155044.ece; accessed 30 Dec 2022

3 Anmol Jain, “Civil Military Integration Essential to Tackle Future Challenges:Rajnath Singh”, The Times of India, 14 June 2022, https://m.timesofindia.com/city/dehradun/rajnath-civil-military-integration-essential-to-tackle-future-challenges/articleshow/92193816.cms; accessed 29 Dec 2022

4 ET Bureau, “Civil Military Fusion Will StrengthenLogistics: Rajnath Singh”, Economic Times, 12 Sep 2022, https://econimictimes.com/news/defence/repidly-moving-towards-jointness-of-three-services-says-rajnath-singh/articleshow/94146968.cms; accessed 30 Dec 2022

5 Press Information Bureau, Ministry of Defence, “Centre for Land Warfare Studies (CLAWS) Organises Two-Day Seminar on The Theme of Civil Military Integration: The Way Forward”, 26 Dec 2022, https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1886726; accessed 30 Dec 2022

6 George Tanham, Indian Strategic Thought: An Interpretive Essay (Santa Monica, CA: RAND, 1992).

7 Jaswant Singh, “Defending India”, Macmillan India Limited, Bangalore, 1999

8 V. P. Malik and Gurmeet Kanwal, Defence Planning in India (New Delhi: Observer Research Foundation, 2005), https://www.orfonline.org/wpcontent/uploads/2005/01/Defence.pdf

9 Stephen P Cohen & Sunil Dasgupta, “Arming without Aiming-India’s Military Modernisation”, Penguin Books, 2010

10 Chris Smith, ‘India’s Ad Hoc Arsenal Direction or Drift in Defence Policy?’, Stockholm International Peace Research Institute, Oxford University Press, 1994, https://www.sipri.org/sites/default/files/files/books/SIPRI94Smith.pdf

11 KC Pant, ‘Philosophy of Indian Defence’, in ‘Non-Provocative Defence: The Search for Equal Security’, Jasjit Singh & Vatroslav Vekardic, Eds, Lancer International, 1989

12 Jaswant Singh, ‘National Security: An Outline of Our Concerns”, Lancer Publications, New Delhi, 1996, p. 52-53.

13 Anit Mukherjee, ‘In Need of a Crisis? India’s Higher Defence Organisation at 75’, in ‘Defence Primer:India at 75’, Observer Research Foundation, 2016, p.29, https://www.orfonline.org/wp-content/uploads/2016/03/Military_Layout-.pdf, accessed 31 Dec 2022

14 R Chandrashekhar, “Higher Defence Organisation: Independence to the Mid-1990s”, Defence Reforms: A National Imperative, Eds. Gurmeet Kanwal & Neha Kohli, Institute For Defence Studies & Analyses New Delhi, Pentagon Press, 2018, pp 54-55. https://www.brookings.edu/wp-content/uploads/2018/04/book-defence-reform-3.pdf; accessed 30 Dec 2022

15 Group of Ministers Report on Reforming the National Security System, https://www.vifindia.org/sites/default/files/GoM%20Report%20on%20National%20Security.pdf, accessed 31 Dec 2022

16 Gazette of India Extraordinary 24 May 2002, https://cabsec.gov.in/writereaddata/allocationbusinessrule/amendment/english/1_Upload_302.pdf, accessed 10 Jan 2023

17 The Gazette of India, Cabinet Secretariat Notification, 30 Dec 2019, https://cabsec.gov.in/writereaddata/allocationbusinessrule/amendment/english/1_Upload_2224.pdfaccessed 10 Jan 2023

18 Press Information Bureau, 'Cabinet approves creation of the post of Chief of Defence Staff in the rank of four star General', 24 Dec 2019, https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1597425, accessed 31 Dec 2022

19 The Government of India (Allocation of Business) Rules, 1961, https://cabsec.gov.in/writereaddata/allocationbusinessrule/completeaobrules/english/1_Upload_3540.pdf, accessed 30 Dec 2022

20 The Gazette of India Extraordinary, Cabinet Secretariat, https://egazette.nic.in/WriteReadData/1999/E_94_2013_050.pdf, accessed 10 Jan 2023

21 Government of India op. cit. n. 19

22 J. N. Dixit, Assignment Colombo, Konark Publishers Ltd, Delhi, 1997, p. 327-350.

23 Christofer Nicholas Smith, "The Armament Process in the Third World: A Case Study of India", University of Bath, 1989, https://purehost.bath.ac.uk/ws/portalfiles/portal/188149073/Christopher_Nicholas_Smith_thesis.pdf; accessed 30 Dec 2022. p. 168

24 Anit Mukherjee, 'The Absent Dialogue: Politicians, Bureaucrats and the Military in India', Oxford University Press, 2020, pp 228-236

25 ibid

26 ibid

27 VP Malik and Gurmeet Kanwal, 'Defence Planning in India', Observer Research Forum, https://www.orfonline.org/wp-content/uploads/2005/01/Defence.pdf

28 Mukherjee, op cit

29 Chris Smith, 'India's Ad Hoc Arsenal Direction or Drift in Defence Policy?', Stockholm International Peace Research Institute Oxford University Press, 1994, https://www.sipri.org/sites/default/files/files/books/SIPRI94Smith.pdf, p. 222

30 Jaswant Singh, Defending India, p.215

31 Op. cit. note 15

32 Press Information Bureau, 'Enhancement of Capacity of Defence Forces', 4 Feb 2022, https://pib.gov.in/PressReleasePage.aspx?PRID=1795536, accessed 10 Jan 2023

33 Pawan K Verma, 'Defence Planning Committee Has Its Work Cut Out', The Economic Times, 28 April 2018; https://economictimes.indiatimes.com/news/defence/defence-planning-committee-has-its-work-cut-out/articleshow/63948919.cms, accessed 10 Jan 2023

34 Defence Acquisition Procedure, 2020; https://www.mod.gov.in/dod/sites/default/files/DAP%202020%20%2011%20Nov%2021.pdf, accessed 10 Jan 2023

35 ibid

36 ibid

37 Technology Perspective and Capability Roadmap; https://www.mod.gov.in/sites/default/files/tpcr.pdf, 2018, accessed 10 Jan 2023

38 Chris Smith, op cit.

39 Chris Smith, op cit.

40 Lorne J Kavic, "India's Quest For Security: Defence Policies, 1947-1965", University of California Press, Berkeley and Los Angeles, 1967, pp 128-130

41 Press Information Bureau, 'Military Spending', Ministry of Defence, 29 July 2022, https://pib.gov.in/PressReleasePage.aspx?PRID=1846136#:~:text=FDI%20policy%20has%20been%20liberalized,other%20reasons%20to%20be%20recorded, accessed 14 Jan 2023.

42 Laxman Kumar Behera, "Indian Defence Industry: A Reform Agenda", Eds. Gurmeet Kanwal & Neha Kohli, Institute For Defence Studies & Analyses New Delhi, Pentagon Press, 2018, pp 180-195; https://www.brookings.edu/wp-content/uploads/2018/04/book-defence-reform-3.pdf; accessed 30 Dec 2022

43 Press Information Bureau, Ministry of Defence, https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1821156, accessed 11 Jan 2023

44 Kishore Jayaraman, 'India's Aerospace & Defence Sector Can Lead the Way with Industry 4.0', Rolls Royce, 2021, https://www.rolls-royce.com/country-sites/india/discover/2021/indias-aerospace-and-defence-sector-can-lead-the-way-with-industry.aspx; accessed 10 Jan 2023

45 Ministry of Defence Dashboard, https://ddpdashboard.gov.in/, accessed 12 Jan 2023

46 Press Information Bureau, 'Production of Defence Products', 05 Aug 2022, https://pib.gov.in/Press Release Detailm.aspx?PRID=1848670 accessed 14 Feb 23

47 Press Information Bureau, 'Status Of The Production Of Defence Equipments', 13 Feb 2023, https://pib.gov.in/PressReleasePage.aspx?PRID=1898818, accessed 14 Feb 2023

48 Press Information Bureau, 'Ministry Of Defence - Year End Review 2022', 17 Dec 2022, https://pib.gov.in/PressReleasePage.aspx?PRID=1884353, accessed 31 Dec 2022

49 Phil Budden & Flona Murray, 'Defense Innovation Report: Applying MIT's Innovation Ecosystem & Stakeholder Approach to Innovation in Defense on a Country-by-Country Basis', MIT Lab for Innovation & Science Policy, May 2019, https://innovation.mit.edu/assets/Defense-Innovation-Report.pdf, accessed 31 Dec 2022

50 Press Information Bureau, Ministry of Defence, 12 Dec 2022, https://pib.gov.in/PressReleasePage.aspx?PRID=1882702; Reforms In Defence Sector- Propelling Private Sector Participation (2014 - 2021), https://static.pib.gov.in/WriteReadData/specificdocs/documents/2021/oct/doc202110411.pdf; Press Information Bureau, 'Aero India showcased 'New Defence Sector' of 'New India' to the world', https://pib.gov.in/PressReleseDetailm.aspx?PRID=1899388; Press Information Bureau, Ministry of Defence, 09 Dec 2022, https://pib.gov.in/PressReleseDetailm.aspx?PRID=1882249;

51 Laxman Behera and Vinay Kaushal, 'The Case for Agnipath', 9 Aug 2022, https://www.orfonline.org/research/the-case-for-agnipath/, accessed 12 Jan 2023

52 Prakash Menon, 'India's civil-military fusion order of the day but not at the cost of military identity', The Print, 27 Dec 2022, https://theprint.in/opinion/indias-civil-military-fusion-order-of-the-day-but-not-at-the-cost-of-military-identity/1283309/, accessed 12 Jan 2023

53 Diptendu Choudhury, 'Path to the Heavens (Part One)', Blue Yonder, Journal for Aerospace Studies, January-June 2023, Center for Air Power Studies, p.71.

54 Kartik Bommakanti, 'India and Cyber Power: The Imperative of Offensive Cyber Operations', Observer Research Foundation, 3 Nov 2022, https://www.orfonline.org/research/india-and-cyber-power/, accessed 12 Jan 2023

55 AoB Rules, op. cit. n 19

56 Defence and Internal Security, Volume-I Main Report, 15th Finance Commission, October 2020, https://fincomindia.nic.in/writereaddata/html_en_files/fincom15/Reports/XVFC%20VOL%20I%20Main%20Report.pdf, accessed 12 Jan 2023

57 Tushar Chakrabarty, 'Demand for Grants 2023-24 Analysis Defence', PRS Legislative Research, Institute for Policy Research Studies, 17 Feb 2023, https://prsindia.org/files/budget/budget_parliament/2023/DfG_2023-24_Analysis-Defence.pdf, accessed 18 Feb 2023

58 Finance Commission in Covid Times, Report for 2021-2026. Vol 1, Main Report, Oct 2020, Pg 335-360, accessed 13 Jan 2023

59 28th Report, Standing Committee on Defence (2021-22), 17th Lok Sabha, Demands For Grant (2022-23), 16 March 2022, https://prsindia.org/files/budget/budget_parliament/2023/DfG_2023-24_Analysis-Defence.pdf, accessed 12 Jan 2023

60 Harsh V Pant, 'Reforming Defence Planning in India', https://www.livemint.com/Opinion/YXsvzqyHhK6IoFqAK7MntO/Reforming-defence-planning-in-India.html, accessed 12 Jan 2023

61 NN Vohra, 'USI National Security Lecture – 2013 on Civil Military Relations: Opportunities and Challenges', https://idsa.in/resources/speech/CivilMilitaryRelations_NNVohra, accessed 13 Jan 2023

62 Manoj Joshi, 'Policy Report The Unending Quest to Reform India's National Security System', March 2014, RSIS, https://www.rsis.edu.sg/wp-content/uploads/2014/09/PR140301_The_Unending_Quest_to_Reform_India_National_Security_System.pdf, accessed 12 Jan 2023

63 Indian National Defence University Bill, 2015, https://www.mod.gov.in/dod/sites/default/files/Englishcom_0.pdf, accessed 12 Jan 2023

64 Rajat Dhawan and Suvojoy Sengupta, 'A New Growth Formula for Manufacturing In India', McKinsey and Company, 30 Oct 2020, https://www.mckinsey.com/industries/industrials-and-electronics/our-insights/a-new-growth-formula-for-manufacturing-in-india, accessed 12 Jan 2023

65 Report, 'The Indian Defence & Aerospace Sector Challenges In The Opportunity', Economic Laws Practice, Advocates and Solicitors, 2019, https://elplaw.in/wp-content/uploads/2018/11/ELP-Defence-Sector-Book.pdf, accessed 10 Jan 2023

66 op. cit. n 57.

67 Dr DS Kothari, 'Defence -Science And Its Organisation', Defence Science Journal, Vol 2, Number 2-3, April July 1952, pp. 66-82; file:///Users/sunil/Downloads/3362-Article%20Text_%20Manuscript-10171-1-10-20130104.pdf, accessed 31 Dec 2022

68 Kartik Bommakanti, 'Weak Investment in Defence R&D: Key Factor Behind India' Poor Defence Indigenisation', Observer Research Foundation, 19 Feb 2022, https://www.orfonline.org/expert-speak/weak-investment-in-defence-rd/, accessed 12 Jan 2023

69 G Mohan Kumar, 'CAG pulls up DRDO for delay in the completion of projects and failure to achieve key parameters', The Hindu, 23 Dec 2022, https://www.thehindu.com/news/national/cag-pulls-up-drdo-for-declaring-projects-successful-despite-non-achievement-of-parameters/article66297802.ece, accessed 14 Jan 2023

CIVIL MILITARY FUSION FOR INTEGRATED STRATEGIC DETERRENCE AND INTELLIGENCE SURVEILLANCE AND RECONNAISSANCE

Brig Anshuman Narang*

Abstract

Civil Military Fusion (CMF) is no new West innovated approach or Communist Party of China's (CPC) "Whole of Nation" approach with Chinese Characteristics. National security requires a coherent CMF approach since defence forces are not the sole guarantors of a country's peace and stability. Apropos, Indian civil agencies and military forces are equal stakeholders for ensuring Integrated Strategic Deterrence (ISD) to prevent war and provision of accurate and synthesized Intelligence Surveillance and Reconnaissance (ISR) to negate strategic surprises. The 'Sanjay' of Mahabharat and repeated strategic signalling to Karan by Krishna aptly highlight the DIME (Diplomatic Information Military Economic) approach for ISD and ISR from ancient Indian epics. This essay will focus on adoption of a synergised CMF approach for ensuring ISD and ISR.

Introduction

The ancient Indian civilization boasts of CMF right from the epics of Ramayana and Mahabharat, Vedas and Upanishads to Kautilya's Arthshastra. Dr (Mrs) Manju Narang in her book "Sanskrit Wangmaya Mein Sainya Vyavastha" (Military Systems in Sanskrit Literature) aptly highlights Indian original thoughts of CMF. In order to revive our 'Golden Bird' era, it is utmost essential for India to implement two visions

simultaneously 'GATI SHAKTI' and 'SAINYA SHAKTI' for a strong 'ATMARNIRBHAR-BHARAT 2047'.

21st century was predicted as the end of long-drawn conventional wars. Most NATO countries had drastically curtailed their defence expenditures. The Armenia-Azerbaijan war first and then Russo-Ukrainian war of 2022 has blown off all such predictions. The determination of Ukrainian populace, military and government together have shown the tremendous achievements of actual fused CMF strategy. Closer home, China is a nation in perpetual war state. The CPC General Secretary Xi Jinping's repeated video addresses including latest ones in 2023 ask for war preparedness from forward troops in Western Theatre Command as also CMF in ensuring People's Liberation Army (PLA) becomes a world class army by 2049.

The longest drawn Sino-Indian standoff peaked at Galwan clash in 2020 has neither faded nor remain restricted to one sector with latest clashes in Yangtse sector in December 2022. Two essentials stand out clearly- the failure of Integrated Strategic Deterrence (ISD) despite possession of nuclear weapons and importance of multi-domain ISR in timely anticipating military build-up and predicting adversary's courses of action and places of combat power application.

Integrated Strategic Deterrence (ISD)

The Chinese Science of Military Strategy (SMS) 2020 adopts Henry Kissinger's formula of calculating Deterrence as a product of Capability/ Strength, Intent/ Determination and Adversary's assessment of capabilities/ Strategic Information Transmission. The product in any multiplication is zero if any of the input is a zero. The three years of Sino-Indian standoff and ever-increasing aggressiveness against Taiwan has continuously shown Chinese practical CMF approach in climbing seven out of eight steps of its escalation ladder[1]. Whereas, the conversion of anticipated Russian short special operation into elongated attrition war has shown the dismal failure of synergy within Russian defence forces itself and an appreciable 'Whole of Ukraine' national resolve duly enabled by multi-nation NATO support. The Chinese Cs of modern-day grey zone coercion and compellance approaches adopted by our

adversaries need to be matched by the Ds of Deterrence together by the national civil and defence structures.

Grey Zone Cs / Stages	Recommended Indian Ds for Enhanced ISD	China's Escalation Ladder Steps[2]	Recommended CMF for Disrupting Escalation Ladder	
Co-exist / Collaborate / Cooperate			Civil Field	Military Field
Compromise / Constraint	Stage short of crisis		Convergent Confidence Building Measures	
Crisis	Deter	1. Create an atmosphere of war	Diplomatic manoeuvring & Strategic Signalling	Prepare, enhance capability, display strength
Communicate	Diminish the bluff / Discourage	2. Show advanced weapons	Develop technology, Narrative building	Visualise, Induct, train & update doctrine
Compete	Disturb & Display Cohesiveness	3. Holding military exercises	Academic wargaming with allied think tanks	Joint exercises – with and without allies
Contest	Dislocate / Deny	4. Adjust military deployment	Infrastructure development	Rebalance to plug vulnerabilities
Confront	Dissuade / Deceive	5. Raising the level of combat readiness	Enhance manufacturing capacity; Cognitive hardening	Display Operational Preparedness & Equipment Effectiveness
Coerce	Disorder & Decapacitate	6. Implementing information attacks	Sanctions; QPQ counter & harden to deny; Develop redundancy	Deny recce, develop counters & Strike

Compel	Delay, Disrupt & destroy	7. Restrictive military operations	DIME Narrative 'Depict Adversary as aggressor'	Defend disputed areas strongly & counter-attack decisively
Combat Provocation	Defeat Decisively to force de-escalation	8. Warning military strikes	Multi-domain National Resilience	Harden to prevent damage; Defeat ISR & precision; Assured counter-strike

Table 1: Disrupting Adversary's Grey Zone Coercion Escalation Ladder

An Indian CMF approach to ISD thus requires a cross-domain display of all three inputs - Capability, Intent and Strategic Signalling to punitively deter our adversaries from misadventures, Salami-slicing, Coercion or Compellance. The first part of this essay will thus focus on CMF to achieve ISD in Diplomatic, Information / Cognitive, Cyber, Military, Space, Technology, and Economic domains.

Diplomatic. Negotiations with Chinese is an art which can only be developed by aggregating diplomatic, political, and military lessons. The two varieties of Chinese negotiators, PLA's local Commanders and Diplomats, have limited manoeuvrability with remote control in the hand of CPC's boss. The continuity of Chinese negotiators also ensures an institutionalized knowledge of contentious issues facilitating timely identification of weak spots of adversaries' negotiation plan or historical fault line. Hence, any lack of coherence amongst Indian diplomats, frequently changing Military Commanders and five-yearly elected democratic governments can lead to negative fallout right from international UNSC resolution to Strategic negotiations and even tactical level border talks. A repeatedly displayed coherent messaging of 'One-India' stance with corresponding range of diplomatic manoeuvres will only deter a cunning adversary. The key CMF pillars in three stages of negotiations are illustrated below.

Stage	Pre-Negotiation	Negotiation	Post-Negotiation
Fused Actions	Common narrative – Core interests; Deny Adversary's hidden friendly traps; Identify possible additional demands; Deny ambiguity to adversary.	Common stand; Display endless patience & resilience; Avoidance of any gifts / unfavourable overtures.	One Voice; Clarity of Next course of action.
Government	Archive of previous negotiations; Identify national core interests; Publish White-paper justifying historical rights; Evolve favourable agenda.	Selection of best negotiating team; meticulous record keeping.	Multi-lingual media release for international understanding.
Military	Accurate ground survey; Profiling of Adversarial Military Commanders; Institutional archive of military negotiations; Maximise strengths for bargaining; Contingency planning for surprises.	Identify & draw out differences between opposing military & political bosses; Analyse minutest issues in Mandarin drafts	Translate the negotiation outcome to on-ground deployment without any scope for surprises.
Para-military forces	Involvement in the planning stage to highlight their patrolling problems.	One common stance with respective counterpart	Maintain strict vigil over to maintain territorial integrity
Local populace	Highlight their historical rights / grazing areas etc; establish connect with relatives across	Prevent any untoward incident	Exploit grazing areas and project revised border development requirements
Political Parties	Multi-party discussions to build common narrative; Deny adversary political manoeuvring space; Provision of experienced advice.	Display trust in the negotiators	Healthy & constructive parliamentary discussion on available courses of actions for favourable resolution

Stage	Pre-Negotiation	Negotiation	Post-Negotiation
Academia / Think Tanks / Military and government veterans	Exploit old existing interpersonal & organisational linkages; Identification of sympathetic adversarial officials from previous experiences; Provision of detailed background material.		Critically analyse the outcome to provide honest advice for the next step
Legal Experts	Provision of legal advice; Legally vet draft agenda & negotiation plan		Analyse the agreement from legal perspective
Historians	Strengthen historical claims & linkages to disputed areas		
Media	Display commonality of stance & national unity; Complete silence on negotiation plans; Present India as the aggrieved party.	Linguistic experts to translate pre-planned media releases	Multi-lingual media release world over highlighting own positives & adversarial negatives

Table 2: CMF Approach for Negotiations
(Some Ideas taken from Vijay Gokhale[3] and Rand Corporation Study[4])

Information/Cognitive. National Cognitive strength, in the Informatisation era, is the sum of civilian population's Cognitive Resilience, clarity of Government's Narrative, National Media's sincerity to National Narrative, strength of Political Parties' convergence of agendas for 'One Strong and Secured Nation', military's Information Dominance capabilities, level of cognitive amalgamation of paramilitary and civil forces for common national objective and most importantly the Cognitive Strength of Civilian and Military leaders particularly at strategic levels. This definition itself clearly brings out the requirements of the desired CMF depth in the information domain to collectively counter adversarial agenda, strengthen national Cognitive resilience, exploit our ancient cultural power and stitch together a 'BHARAT SHAKTI 2047' narrative to reinvigorate our story crafting and narration capabilities.

Figure 1: National Cognitive Strength

Cyber. The cyber domain both on civilian and military front can be divided into offensive, defensive and reconnaissance fields. While China is strengthening its Great Firewall against American offensive capabilities, it has achieved maximum CMF in the cyber offensive and reconnaissance domain. The strength of Chinese cyber warriors run into millions with hardly any differences between its fifty-cent army, cyber criminals and Militia, semi-official cyber companies, State cyber entities and firms, and PLA's cyber forces in form of Strategic Support Force (SSF) at Strategic level and Information Support Brigades at operational and tactical levels. This wide array of Chinese cyber force, also classified as multitude of Advanced Persistent Threats (APTs) by USA, have repeatedly conducted converging deep attacks on Indian critical infrastructure adversely affecting functioning of a normal Indian. The disruptive array of Chinese attacks on Indian power grids, Aerospace, and defence firms, AIIMS and other hospitals, military communications networks, internet service providers, hotels and airlines has diversified and intensified during the ongoing standoff due to lack of retaliatory measures. This relentless series of Chinese cyber-attacks has become a 'New Normal' causing grave economic losses and thereby making an

accepted fete accompli sadly. A broad array of Chinese cyber-attacks since 2009 are elucidated below in Figure 2.

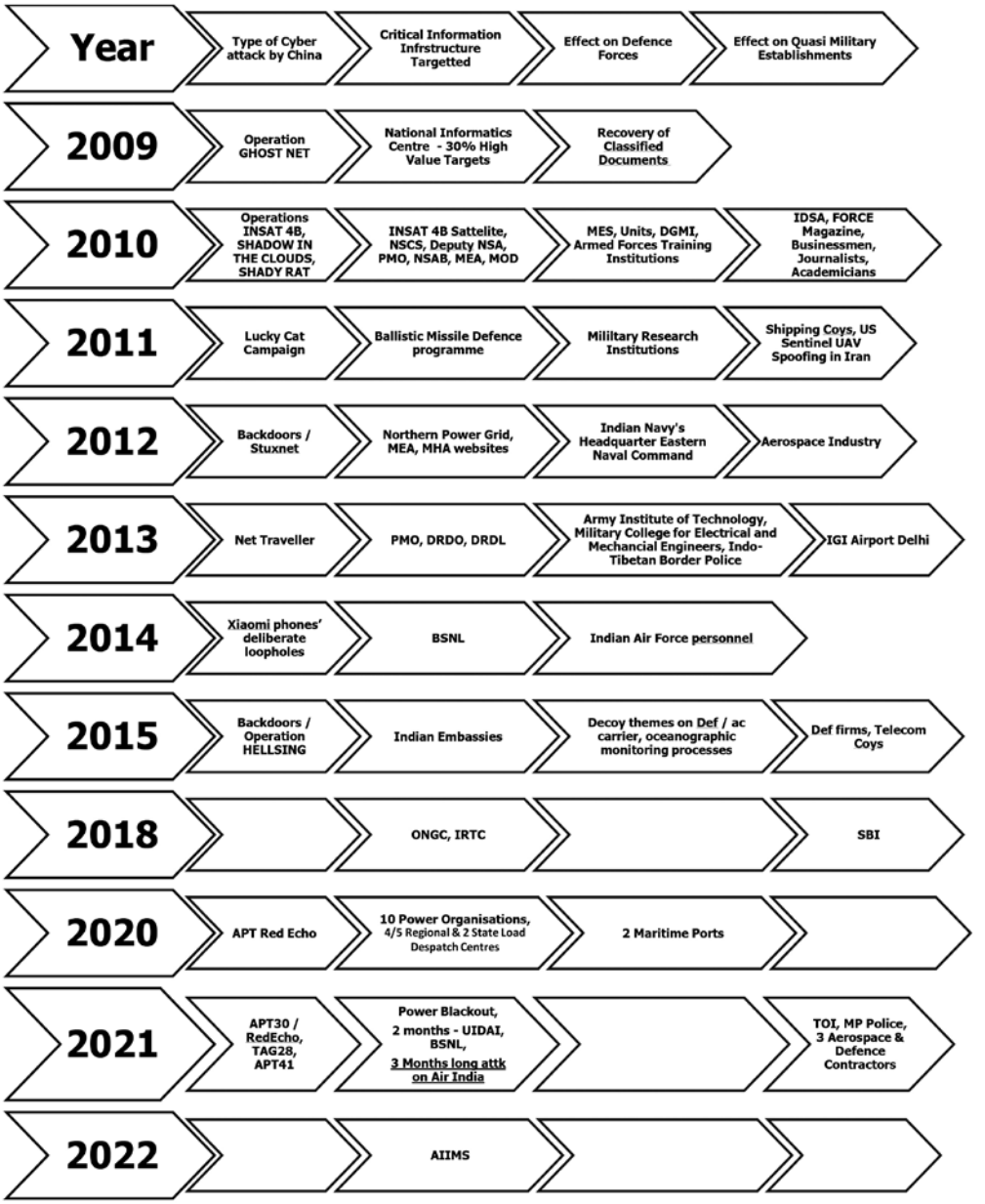


Figure 2: Array of CMF Enabled Key Chinese Cyber Attacks on India since 2009[5]

India has lost its advantage in the Information Technology, of having world's leading firms as shown in Figure 3, by not fusing cyber domain experts for protecting India's Cyber Sovereignty. A Cyber Balakot, aggressive cyber strike on adversarial weak points, optimally exploiting India's pool of cyber professionals in all domains is the essential imperative for proving our capabilities, displaying intent and significant strategic signalling. Reconnaissance of multitude of targets, infiltration into adversarial networks and execution of precise strikes with devastating effects requires Cognitive fusion and innovative integration of best cyber brains in India and abroad who can do it repeatedly with new advanced flawless techniques.

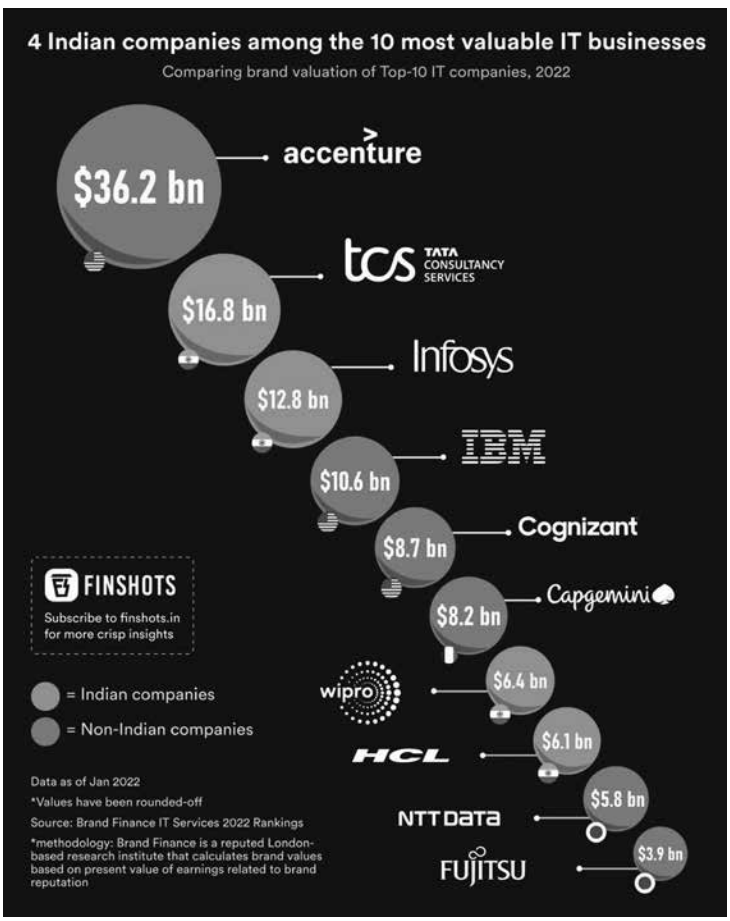


Figure 3: World's 10 Most Valuable IT Businesses [6]

The cyber-CMF approach must exploit the national patriotic fervour of every Indian Cyber expert, the Corporate Social Responsibility of leading Indian Cyber firms and evolve our own Cyber Million Talent Policy as further illustrated in Figure 4 below. Our defence forces and numerous government agencies need to integrate the multitude of compartments into a strong cyber force with punitive cyber strike capabilities.

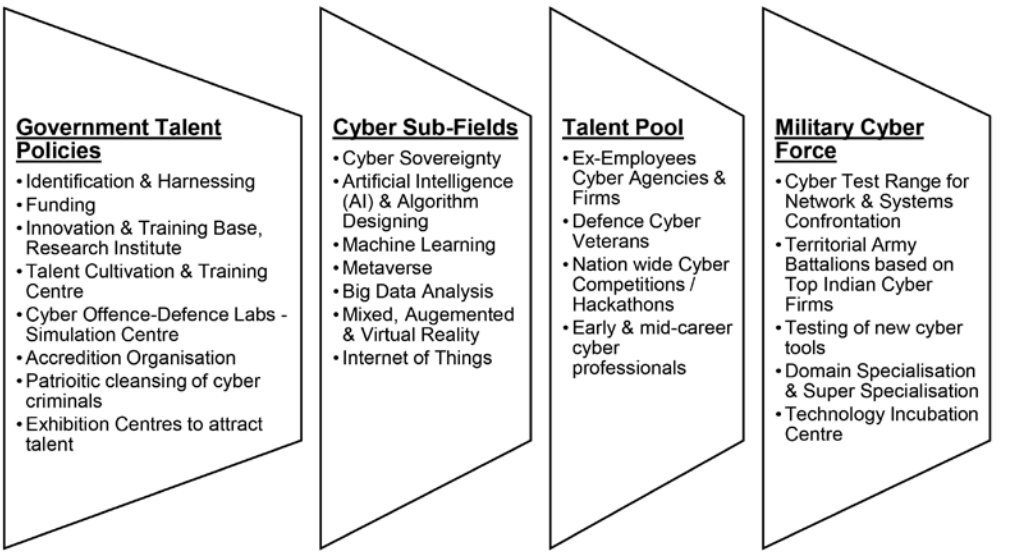


Figure 4: National 'Cyber Million' Talent Programme

Military. The biggest limitation of Indian conventional military Deterrence is the lack of jointness. It may be surprising but CMF is essential in the military domain too and most importantly to enforce jointness not only inter-service but intra-service and inter-ministry to ensure coherence of military aim of defeating enemy by combat power optimization amongst all uniformed forces. The increased budget allocation, clear national security policy, integrated public and private defence industry development are all essentials but joint doctrine and force structuring are the key requirements for projecting true Indian military capability with no budgetary requirements and actual manpower savings if planned correctly. The combat potential of largest numbers and most lethal

types too also does not translate into actual combat power if they are not stitched together as one cohesive force. The Chinese have learnt their lessons and undertaken suitable reforms of all their military, para-military, militia, and internal security forces to be placed under one joint integrated structure as shown below.

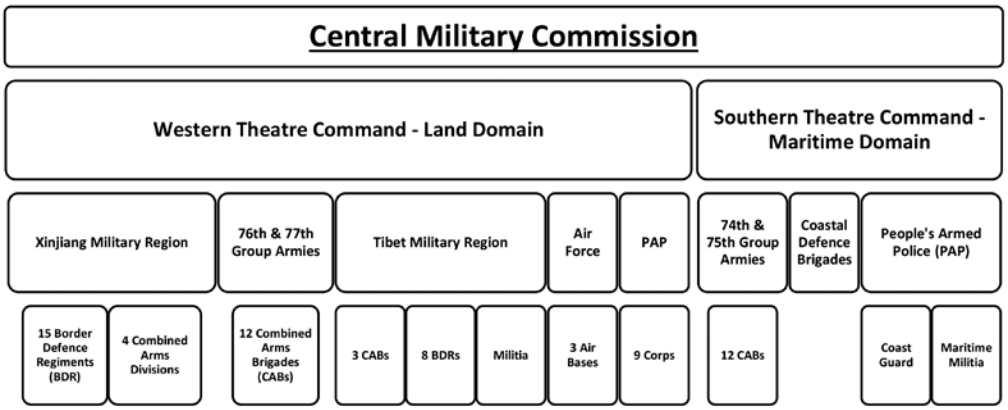


Figure 5: Chinese Integrated Theatre Structures – Land & Maritime Domains [7]

Similarly, India also needs to fuse its compartmentalised force structures under envisaged Theatre Commands, cutting across different ministries, for enhancing conventional deterrence on borders as elucidated below.

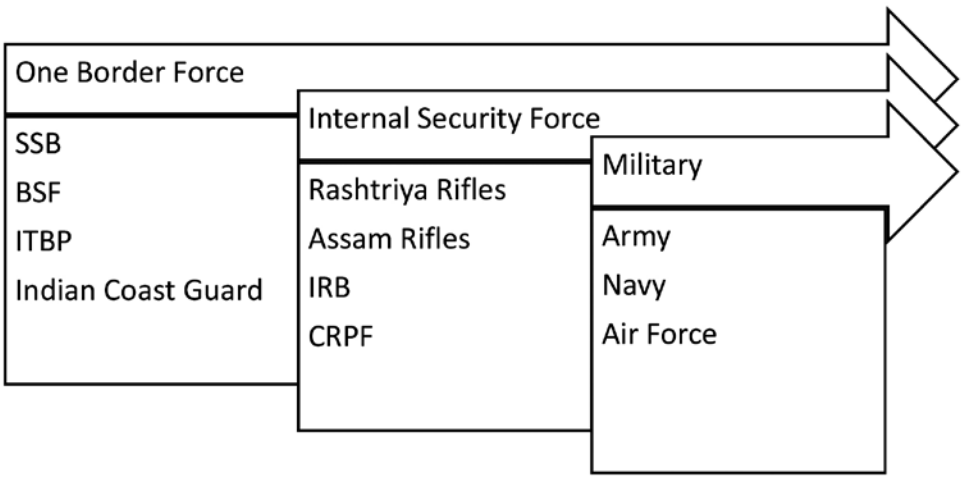


Figure 6: Fusion of Ministries for National Security under Theatre Command

The compartmentalized combat application of Russian defence forces has dented its conventional Deterrence drastically against a much weaker nearly one-tenth size Ukrainian defence force. The differences in response of Ukrainian and Russian civilian populace have manifested in a much larger Russian military struggling against nearly one-tenth size Ukrainian military. In the Indian context, the reactivation of Village Defence Committees in Jammu in 2022 is an example of CMF at tactical level. The latest Agniveer policy will eventually lead to a large quantum of military trained civilians who can be recalled anytime later. The essential CMF enabled imperatives for ensuring integration for combined arms warfare and jointness amongst services to ensure strengthened military capabilities are elaborated below.

Parameter	Civil Role	Military Responsibilities
Joint Vision & Systems Interoperability	Government – 'BHARAT SAINYA SHAKTI' Vision for 2047, Drafting National Security Strategy & Interoperability Standards for 'ATMANIRBHAR BHARAT' Indenisation; Defence Industry – Defence Visions – 2029, 2039 & 2047; Ensure system interoperability from design conceptualisation itself	Joint Capability Development Vision Documents – 2029, 2039 & 2047; Interoperability of Doctrine, Intelligence, Training, Networks, Communication, Policies, Protocols, Logistics etc.
Joint Training	Academia / Think Tanks / Veterans – Evolve a joint training curriculum	Joint Training Nodes by Lead Service / Arm with subject proficiency
Planning for Multi-Domain Intelligentised Precision Warfare	Government – Robot & Autonomous Systems Development Vision; AI industry and Veterans – Crafting of software for Joint Intelligence Preparation of Multi-Domain Battle-space (JIPMB); Quantum enabled C5I2SR (Command, Control, Communications, Computers,.	JIPMB doctrine & products – Theatre / Joint Commander's Priority Intelligence Requirement, Joint Targeting Lists, Sensor-Target-Weapon matched tasking orders, Joint Operations Order / Instructions with Contingency Plans, Multi-Domain Battle-space deployment,

Parameter	Civil Role	Military Responsibilities
	Cyber, Interoperability, Intelligence, Surveillance & Reconnaissance); Informatised & Intelligentised equipment development	and camouflage instructions
Multi-Domain Resilience for Long Attrition Wars	Think-Tanks / Veterans – Vulnerability analysis studies; Defence Industry – Development of Resilience tool-kits & Enhancing of Manufacturing Capacities	Integrated Air-Missile-Drone-Weapons Defence Umbrella; Electromagnetic cum cyber cum cognitive Resilience; Coherent & Automated physical security
Infrastructure Development	Government – 'GATISHAKTI' & Vibrant Villages Programme; Multi-purpose infrastructure development	Projection of Joint Infrastructure requirements; Asset Sharing protocols
Common Command for Border Management Posture	Government – Amalgamation of forces under different ministries under one ministry preferably Ministry of Defence for command & control for border management posture	Revised command & control, & strengthening of Border Security Force (BSF), Seema Suraksha Bal (SSB), Indo-Tibetan Border Police (ITBP) & Indian Coast Guard (ICG) etc

Table 3: CMF Enabled Integration for Combined Arms Warfare and Jointness

Space. Space Sovereignty is the new frontier for race from outer space resources to orbital spots, from Space Situational Awareness to orbital manoeuvrability and from spatial nomenclature to temporal firsts for national pride and most importantly Space based data independence. Thus, the space domain-based capability development, infrastructure resilience, resources exploitation and assured support requires effective Space Deterrence. This further necessitates close CMF encompassing clear government vision including policy and financial support; adequate R&D depth by both public and private institutions; energized, relentless and patriotic pursuit by Indian Civil industry; scalable military force structuring; generation of nationalist fervour particularly by media; and most importantly best talent provision and development. The dual-purpose requirements are plenty but are surely achievable- own

navigation system; assured satellite communication; redundant Space Situational awareness; multi-spectral accurate remote sensing with less than hour revisit; interplanetary resources exploration and offensive capabilities just to list a few.

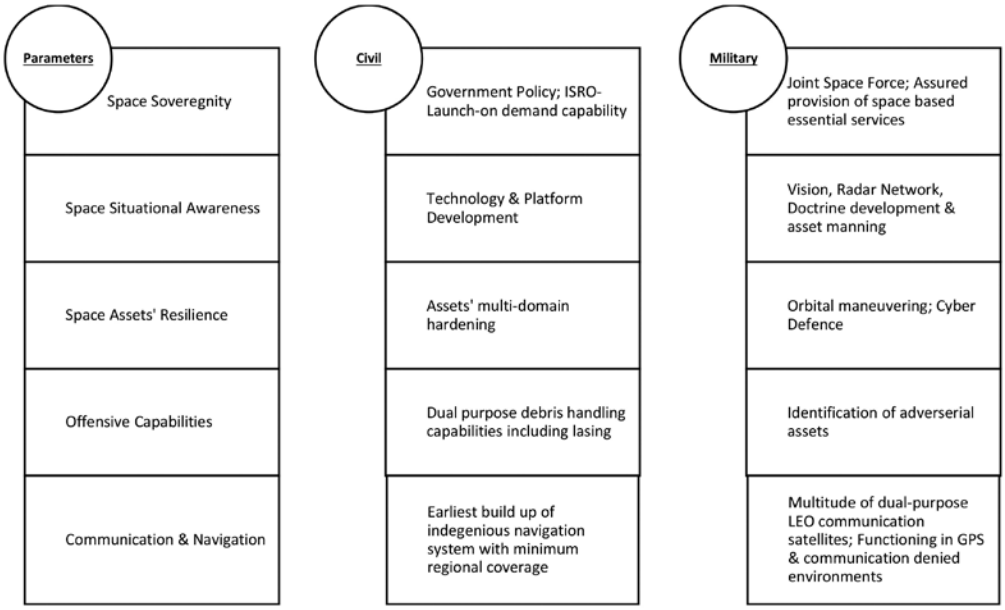


Figure 7: CMF Pillars for Space Deterrence

Technology. China has focused its CMF completely to develop technology as the core combat capability, talent as the most important strategic resource and innovation as the core concept. Despite American denial for decades, they accept that they have been outsmarted by the Chinese in many technological fields and sub-sets of Quantum, AI, Data analysis, unmanned platforms, Space, Cyber, and Robotics. The Chinese inferiority in most technologies is being overcome by quantity through massive production capacities. The biggest reality is that “Technology Indigenisation and Techno-nationalism” through CMF is the only solution available to India to transform from technology deprivation to the technologically self-reliant “Atmarnirbharat” thereby strengthening our technological deterrence. India, through CMF, needs to dominate the non-contact non-kinetic grey zone being dominated by Chinese disruptive technologies.

This requires best military brains to sit with our best scientists, wildest engineers, brightest civil academia, innovative defence start-ups, leading entrepreneurs and bureaucrats to crystal graze the future and clearly enunciate a dual-purpose technology development plan with achievable timelines. The most essential domain for CMF must cater for skipping few steps in between, if possible, to catch with the advanced nations. The dual-purpose nature of technology development, as explained below for few critical technologies, can facilitate advancements for both military and civil populace.

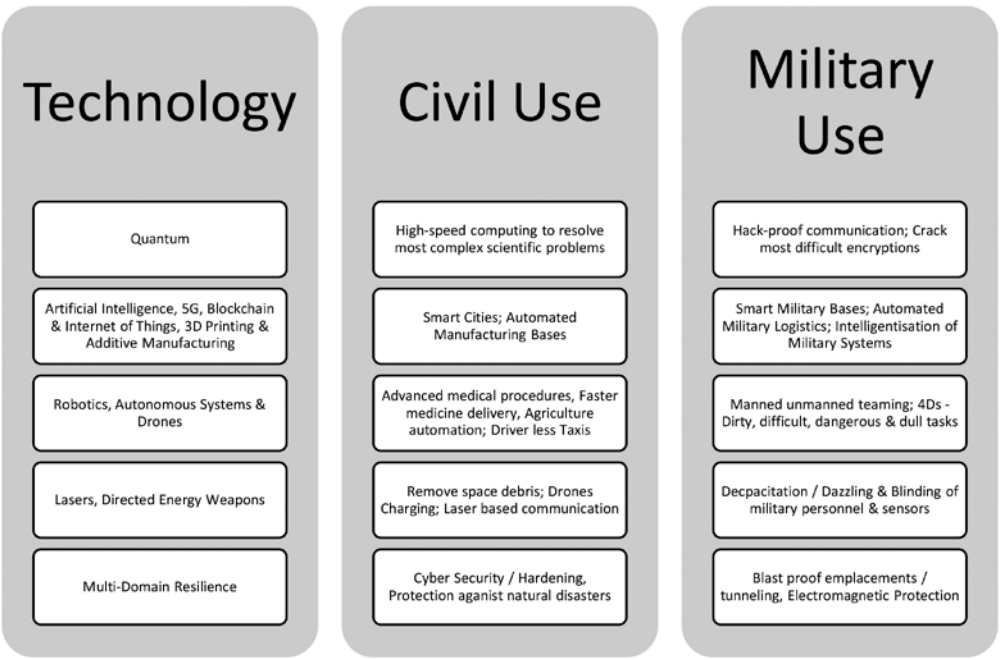


Figure 8: Dual-Purpose Advantages of Essential Futuristic Technologies

Economic. Any nation can deter adversary only if economic threat seems achievable or sanctions initiated are comprehensively implemented. Ideal example is the current Sino-Indian standoff. Despite Indian government banning multitude of Chinese apps and diplomatic concerns of border resolution first, Indian imports from China and apropos trade deficit was the highest ever in 2022. This clearly shows lack of coherence between national security objectives and civilian economic trade requirements. Hence, CMF in economic domain

needs maximum strengthening and convergence of national security objectives for viable ISD. Every common Indian needs to be explained his power, role, and responsibilities for economic Deterrence.

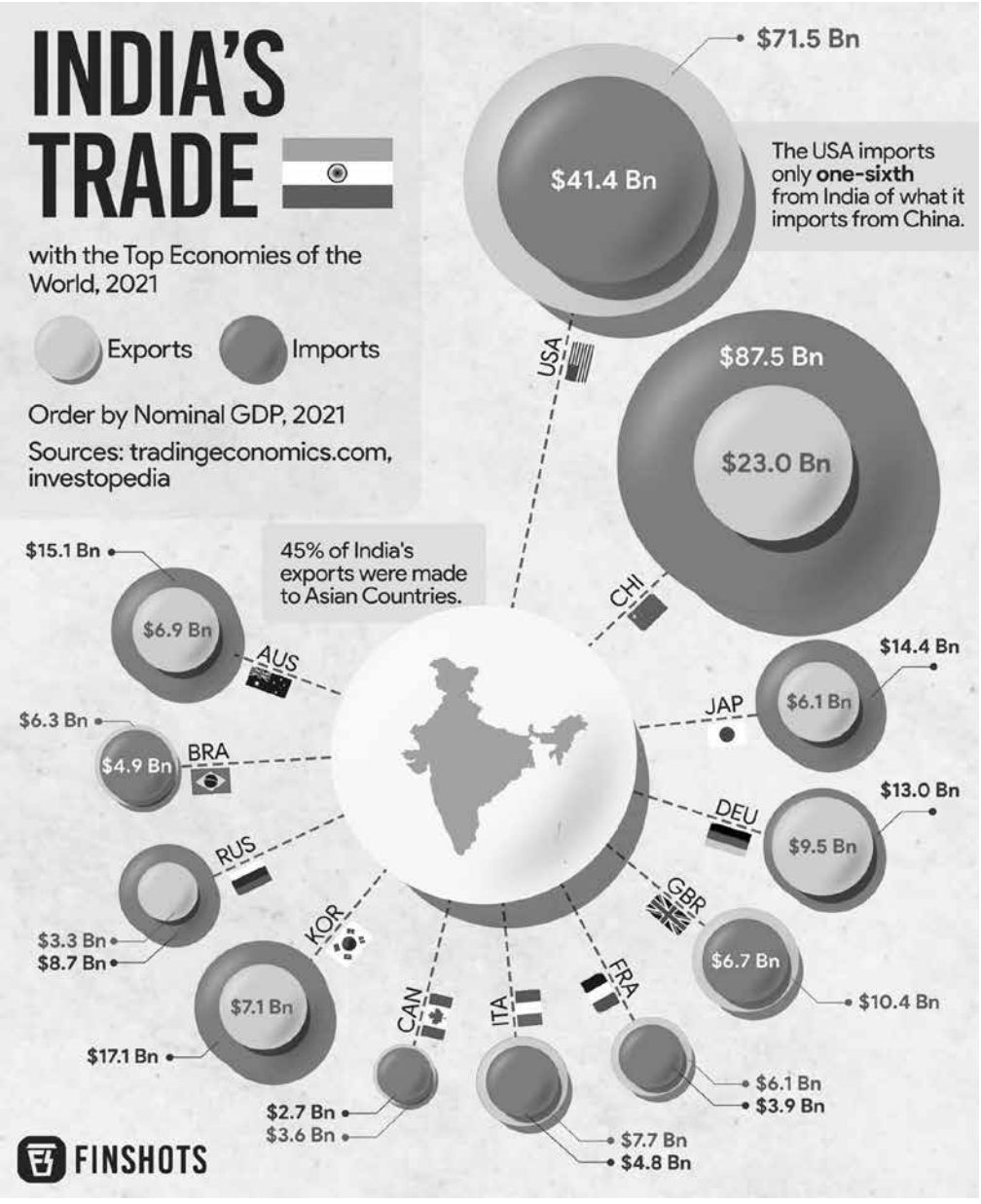


Figure 9: India's Increasing Trade Deficit with China [8]

(Source – Twitter Handle @finshots)

Intelligence Surveillance and Reconnaissance (ISR)

A functional multi-domain and multi-discipline ISR setup is the foremost step to ensure ISD. It is only a time critical common enemy picture across all levels which can facilitate timely response to deter the enemy from misadventures or prevent own strategic blunders. While timely identification of Chinese movements opposite Yangtse ensured pro-active stern response disrupting Chinese tactical ambition, ineffective ISR in 1999 led to a long drawn and extremely difficult but doggedly determined series of battles by Indian Army to dislodge Pakistan Army soldiers from Kargil heights.

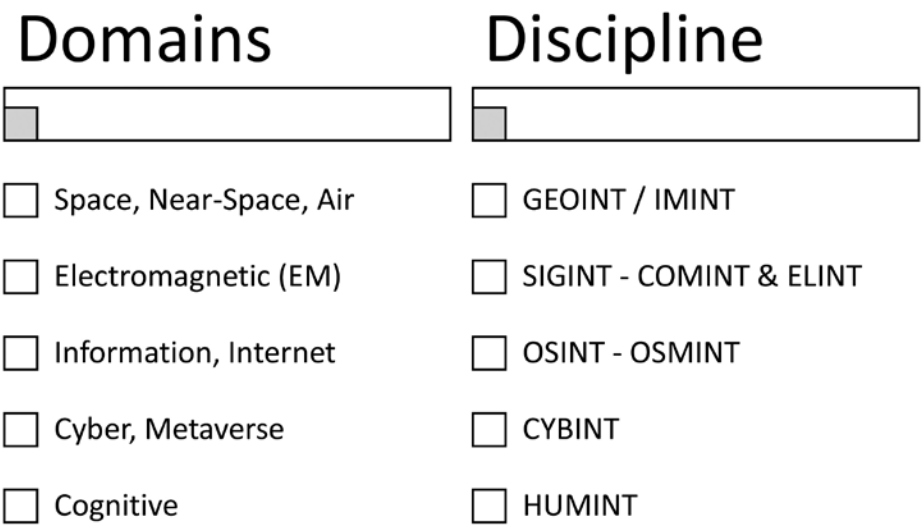


Figure 10: Multi-Domain Intelligence and Multi-Discipline Joint ISR Setup

As pointed out earlier, a coherent CMF enabled ISR setup can meet the complex requirements in the modern battlespace. While our neighbours are looking for territorial grab and destabilizing us regularly, our nation has also to look internally at many anti-national forces which are strengthened by external support. A long length of disputed borders, vast coastline with increasing adversarial activities, burgeoning social media, infosphere, cyber and cognitive domains of second most populated nation, increasingly shrinking and congested outer space and strongly

contested electromagnetic domain requires persistent multi-tiered ISR setup to safe guard our sovereign interests from any surprises. Hence, the key intelligence disciplines best exploited through CMF are discussed below.

OSINT/ OSMINT. The Armenian and Ukrainian wars and the longest ongoing Sino-Indian standoff highlighted the importance of Open-Source Intelligence (OSINT) or Open-Source Social Media Intelligence (OSMINT), particularly the role of Civilian Geospatial analysts, defence scholars and a large quantity of veteran imagery analysts. It became difficult for governments to hide anything since the OSINT community unearthed most military movements and infrastructure developments. As per varying estimates, 463 exabytes of data is likely to be generated daily by 2025. There are already approximately 6.6 billion mobile users, more than 5 billion internet users, and more than 5,500 active satellites in orbit in the world today.[9] There is thus a need for National and Theatre oriented OSINT cells, as proposed below.

National OSINT Cell - Under DIA, HQ IDS	Theatre Specfic OSINT Cells - Under Proposed Theatre Commands
•Financial Representatives - RBI, Leading Banks, Finance & Commerce Ministries, FICCI •Representatives of Leading Geospatial & Cyber firms •Defence correspondents of Selected media outlets •Reprsentatives of selected Think-Tanks •Retired Inelligence Agencies' officers & Defence veteran OSINT / IMINT experts on re-emplyment •Para-miltary & tri-service representatives	•State Police representatives •Regional media representatives with linguistic proficiency •Representatives from State Intelligence agencies •Local cyber firms / representatives of defence start-ups

Figure 11: Composition of Proposed OSINT Cells

When you combine the OSINT data available today with the data from military surveillance and reconnaissance platforms, the ISR analysts will be swimming in data. Hence, there is a need for a CMF enabled national

OSINT organization which should facilitate cueing of other intelligence discipline as well as play a key role in collaboration, collation, and easy archive.

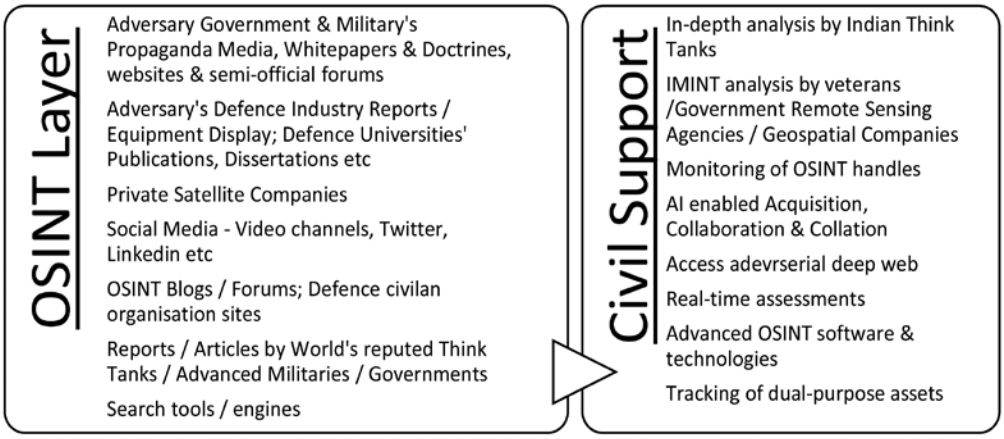


Figure 12: OSINT Layers – Civil Support for Military

IMINT/ GEOINT. Geospatial Intelligence, with Imagery Intelligence as its subset, is an intelligence field which requires domain expertise with a balanced combination of area expertise, continuous update of available Geospatial technologies, amenability to AI enablement and an in-depth knowledge of enemy ORBAT, bases, weapons, and equipment. When you add the quantum of drones (with minimum density of two per company), ISR aircrafts, electro-optical cameras, the translation of images into actionable data during hot wars is a mammoth task even with most advanced levels of Intelligentisation and automation. Hence, every IMINT expert matters whether in a natural disaster management or war fighting or grey zone management.

Today, every State has a Remote Sensing department, Drones' establishment involved with mapping, agricultural planners and many such IMINT experts. Indian defence forces have a large quantum of IMINT qualified people who have either retired or are on deputation. The expertise of every IMINT specialist needs to be harnessed through aggregation of IMINT efforts, cooperation, and coordination amongst all agencies during wars and disasters as well as in peace time. Additionally, a lot of foreign talent as well as software are available for exploitation.

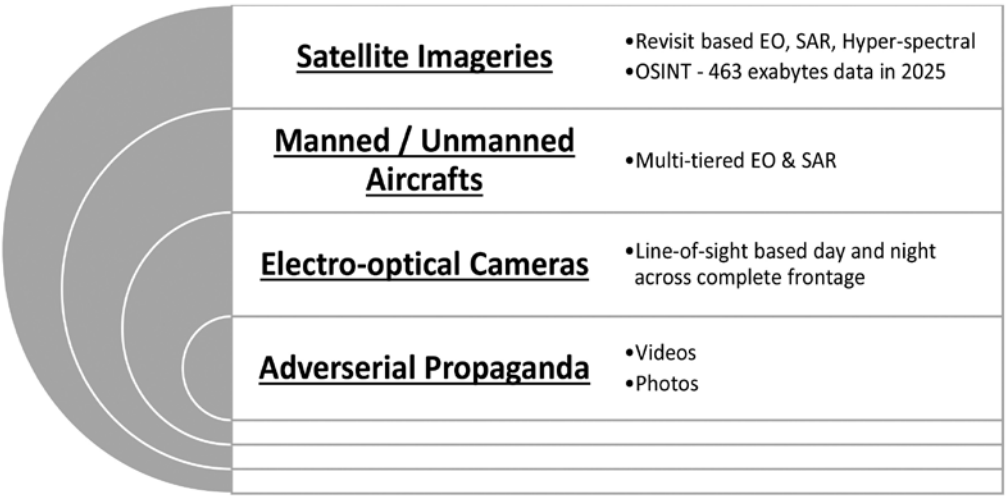


Figure 13: IMINT QUANTUM

CYBINT. Cyber Intelligence is in no way the responsibility of Indian military and government alone. Every Indian is a daily target of millions of Chinese cyber warriors, as elucidated in Figure below, guided by its SSF which itself is the most apt example of Chinese CMF. An Indian 'whole of Nation' cyber structure must comprise the CEOs and technological heads of leading cyber firms, Director Generals of Government and Military Cyber Agencies, heads of National Critical Information Infrastructure Agencies and Civilian Aerospace and defence firms and prominent ethical hackers to chalk out the contours of "Bharat Cyber Kavach 2024" facilitating Indian Cyber Sovereignty with persistent Cyber reconnaissance capabilities over adversaries' networks and cyber offensive architecture. The Indian CYBINT architecture will require to spread across and map multiple tiers of adversarial cyber organizations-government, military, quasi government, provincial, Militia, private companies, criminal networks etc. Hence, an effective Cyber ISR organization will require a coherent fusion of best brains within civil, government and military cyber setups.

Figure 14: Extent of Chinese 'Whole of Nation' Approach Enabled Cyber Warriors [10]

SIGINT. Signal Intelligence comprises Communication (COMINT) and Electronic Intelligence (ELINT). Although primarily military oriented, it still has a lot of Civilian participation in both acquiring as well as denying SIGINT to our enemy. While the mobile companies particularly in border areas can facilitate dual-purpose communication surveillance to provide COMINT, a large quantum of civilian satellite and aircrafts must facilitate critical ELINT collection.

HUMINT. In a longish grey zone scenario along borders and even during peacetime, border civilians play one of the most important roles in picking up early indicators of enemy movement. On our western front history, it's mostly own patriotic civilians which have given us information of Pakistan's repeated attempts to infiltrate large groups of terrorists and army personnel to disrupt peace in our valley. Although HUMINT requires expertise and military or intelligence training, the greater number of patriotic eyes and ears on ground are the only solution to persistent HUMINT cover. Since, HUMINT generally forms the basis of most corroborated intelligence, an enmeshed civil-military HUMINT grid across all levels, as elaborated below, is the necessity of truly fused ISR grid to stitch an accurate and common intelligence picture.

Agencies	Integration Parameters	Integration Tiers	
		Civil Levels	Military Tiers
RAW, CBI	Sources' Archive, Tasking – Areas of Interest	National	DIA / IDS – MI / IFSU, NI & AFI
State Police, CRPF, ICG	Multi-source data corroboration; Common Intelligence Picture	Regional – North East; Northern; Western; Southern; Central etc	Theatre Commands (Intelligence Battalions)
BSF, SSB, AR, RR, ITBP	Communication protocols;	State	Corps - Special Forces & Intelligence Battalions
Civil Administration		District	Divisions / Brigades
		Tehsil	Battalions

Figure 15: Joint Multi-Tiered HUMINT Grid

Veterans' Community. India, today has a very large veterans' population which has the unique combination of combat skills and technological expertise. Many of these veterans have developed super-specialisation in their respective domains while many of the other ranks retire at a very early age and can provide the desired longevity in certain critical fields. Talent today has been recognised as a strategic resource by most advanced countries. Indian military cannot afford to waste its specialist talent because of age, supersession at younger service, or lack of career progression avenues. Hence, there is a need of 'Talent Accreditation' policies which grade the talent levels of serving personnel and veterans in their specialisation domains and then find suitable means for their absorption within the military despite retirement or supersession, deputation to government agencies or civilian industry operating in those critical domains.

Conclusion

India today stands tall and strategically autonomous in a multi-polar world. However, the national progression aspirations and security requirements are unique to every nation's neighbourhood and internal conditions. Having gone through centuries of Western looting, India unfortunately today has a great super power with second largest economy and military to its North which wants to lead the world and a seemingly failing Army to its West which still wants to bleed us through thousand cuts. When two such resource and power-hungry entities - a Party and an Army run nations and collaborate to craft a common enemy with the aim to grab our natural resources and territory while questioning the strength of our civilization, it becomes utmost essential for every Indian national and organization to fuse their efforts together for one common objective 'One-India' or 'ATMARNIBHAR-BHARAT'.

The unique Indian civil military fusion approach thus needs to coherently integrate the existing independent architectures to maximize our strengths across all domains- Diplomatic, Information, Military, Economic, Space, Cyber, Electromagnetic, Land, Sea, and Air. Our rich culture and history are replete with examples to prove that 'Nothing is impossible' and no gap unsurmountable. When every fertile Indian brain, whether civilian or military, is cognitively joined for a common national cause, no enemy can hide from us neither can any adversary deter, compel, or coerce us. A resilient multi-domain ISR structure and an Integrated Strategic Deterrence CMF architecture are thus a must for a strong and prosperous Indian nation in its march towards 'BHARAT SHAKTI 2047'.

***Brig Anshuman Narang** is a keen scholar of developments in China and comprehensively researches Chinese strategic issues, military doctrinal and technological evolution. He has the unique distinction of having undertaken defence studies in reputed military institutions of all Quad countries -Japan, USA, Australia, and India. He graduated from the National Institute of Defence Studies, Japan in 2018. He is an expert on 'Intelligence, Surveillance and Reconnaissance' and OSINT and is currently pursuing PhD from CLAWS-MAHE joint doctorate

program. He has authored three books and is now working on his fourth book 'State of War with Chinese Characteristics – New Normal for India'. He is currently commanding a prestigious Artillery Brigade in Eastern theatre and has been an instructor in School of Artillery and Senior Command Wing, Army War College.

Endnotes

1 PRC's National Key Discipline Theory Works of National Defence University, 'The Science of Military Strategy (Revised in 2020)', translated in to English by USA's China Aerospace Studies Institute, January 2022, available at https://www.airuniversity.af.edu/CASI/Display/Article/2913216/in-their-own-words-2020-science-of-military-strategy/, accessed on 26 January 2022.

2 PRC's National Key Discipline Theory Works of National Defence University, 'The Science of Military Strategy (Revised in 2020)', translated in to English by USA's China Aerospace Studies Institute, January 2022, available at https://www.airuniversity.af.edu/CASI/Display/Article/2913216/in-their-own-words-2020-science-of-military-strategy/, accessed on 26 January 2022.

3 Vijay Gokhale, 'The Long Game-How the Chinese Negotiate with India', November 2022, ISBN: 9780143459293.

4 Richard H Solomon, Rand Corporation Study, 'Chinese Political Negotiating Behaviour, 1967-1984', available at https://www.rand.org/pubs/monograph_reports/MR663.html, accessed on 12 August 2022.

5 Saikiran Kannan and Abhishek Bhalla, India Today, 'Inside China's cyber war room: How PLA is plotting global attacks', 06 August 2020, available at https://www.indiatoday.in/amp/world/story/inside-china-s-cyber-war-room-how-pla-is-plotting-global-attacks-1708292-2020-08-06?__twitter_impression=true, accessed on 11 September 2021; Recorder Future, Insikt Group, 'China-Linked Group RedEcho Targets the Indian Power Sector Amid Heightened Border Tension', CTA-CN-2021-0228, 'Threat Activity Group RedFoxtrot Linked to China's PLA Unit 69010; Targets Bordering Asian Countries' dated 16 June 2021 and 'China-Linked Group TAG-28 Targets India's "The Times Group" and UIDAI (Aadhaar) Government Agency With Winnti Malware' dated 21 September 2021, available at http://www.recordedfuture.com/, accessed on 01 January 2022; Traffic Light Protocol White Joint Cybersecurity Advisory, 'Tactics, Techniques, and Procedures of Indicted APT40 Actors Associated with China's MSS Hainan State Security Department', 19 July 2021, available at https://www.cisa.gov/tlp, accessed on 21 November 2021.

6 FINSHOTS, Infographic, 'Top IT companies in the world, 2021', 28 February 2022, available at https://finshots.in/infographic/top-it-companies-in-the-world-2021/, accessed on 13 March 2022.

7 Minpao.com, 'Xinjiang and Tibet hide the two big armies that are powerful than the enemy'; Takungpao.com, 'The key to the victory of the new type of combat power/reconnaissance sergeant "Golden Falcon"; Sina.com, 'Combined Arms Reforms: large-scale replacement of the PLA's Sino-Indian border mechanized forces'; Zhuanlan.zhihu.com, 'Differences between Western Theatre Command, Lanzhou and Chengdu Military Regions'; Alexander Anatolyevich

Khramchikhin, Russian Institute for Political and Military Analysis, 'New Great Wall of China (Новая Великая китайская стена)', available at https://nvo.ng.ru/forces/2017-10-20/1_970_china.html, 20 October 2017, accessed on 07 August 2021; 'Chinese Distribution of tanks with Combined Arms Brigades'; Anshuman Narang, 'China's Strategic Deterrence'; IISS, 'The Military Balance 2021', Pp 250-258.

8 Twitter Handle @finshots, available at https://twitter.com/finshots/status/1583424810490597380, accessed on 26 December 2022.

9 Rodney Faraon and Peter Mattis, The Hill, 'We need an open source intelligence centre', 20 January 2023, available at https://thehill.com/opinion/national-security/3821075-we-need-an-open-source-intelligence-center/?s=03, accessed on 21 January 2023.

10 National Institute for Defence Studies (NIDS) China Security Report 2021: 'China's Military Strategy in the New Era', Japan MOD, November 2020, available at http://www.nids,mod,go.jp, accessed on 01 January 2022; Recorded Future, Insikt Group, 'Inside China's National Defence Mobilization Reform: Capacity Surveys, Mobilization Resources, and "New-Type" Militias', 10 March 2022, available at https://go.recordedfuture.com/hubfs/reports/ta-2022-0310.pdf, accessed on 12 March 2022.

CIVIL MILITARY FUSION: A MODEL FOR INDIA

Lt Gen PR Shankar, PVSM, AVSM, VSM (Retd)*

Background

The scientific and technological developments of the Industrial Revolution[1] in the 18th century transformed the rural agrarian societies of Europe and North America into industrialized and urban ones. The concept of civil military fusion goes back to this time. Discoveries in pure sciences like physics, and chemistry and innovations in engineering and technology were adapted to warfare. This led to vast improvements in weapons and their performance which made warfare deadly and sophisticated. As discoveries advanced, they were continuously oriented and purposed to produce military hardware - guns, rifles, ships, tanks, aircraft and other weapons to make armies more capable. This organic process is actually civil military fusion. From then to now nothing much has changed. The story of European continental empires and colonialism is one of civil-military fusion. Inventiveness in science and technology made respective colonial militaries better equipped, lethal and more efficient. Each colonial power wanted a military machine which could dominate the others in order to expand their empires[2]. All great nations have gone through a process of Civil- Military fusion.

In the last century, USA went through a process of intense civil- military fusion during the second world war. At its height, USA was producing military aircraft by the hour, tanks by the day and warships by the week or even less. The entire American industry focussed on churning out military equipment which could beat the Germans and Japanese qualitatively and quantitatively. They did it successfully. The mighty

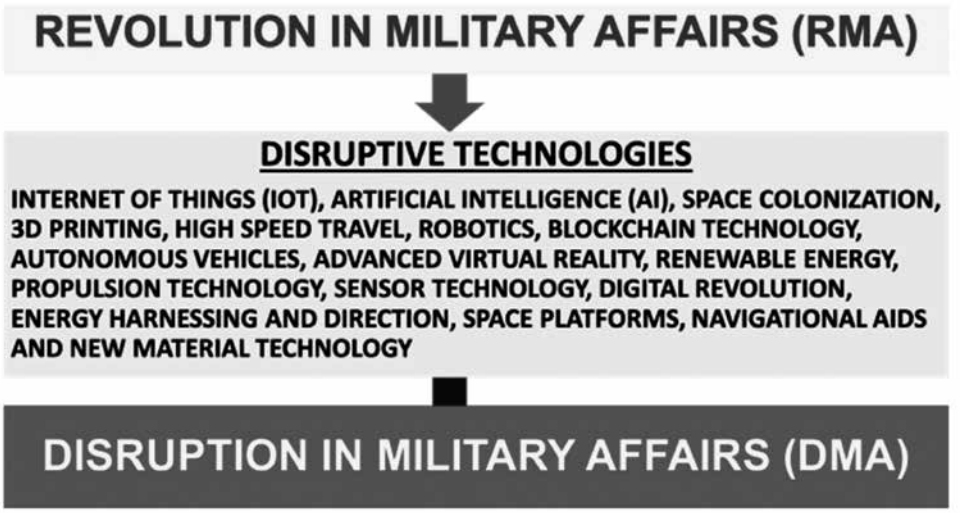
military - industrial complex[3] of USA, which drives its economy, is all about a military- civil system, fused together seamlessly. Hence, civil-military fusion is not just about making militaries strong but also about boosting economies to make nations great. China has embarked on this process in the 21st Century and is seeking its way to greatness [4].

In case India wants to make the transition into being a power of consequence it has to undergo a focussed Civil-Military fusion process. The path to greatness lies in shedding our image of being a soft, slow moving, big talking, status quoist nation. The latent potential, untapped in perpetuity, must be unleashed. However, Civil-Military fusion is a complex process which needs understanding. Every nation has to adopt a fusion strategy suiting its culture, political and industrial climate.

Military Technology : From Revolution to Disruption

The last quarter of the 20th century saw the onset of a Revolution in Military Affairs (RMA). It was the synergistic outcome of technological developments and doctrinal innovations, suitably adapted to battlefield environment through modified military organisations[5]. The RMA was most visible during the Gulf Wars. It was based on information, communication and electronic technologies which had burst on to the scene then. They contributed to better navigation, command, control, sensing, and precision on the battle field. However, since the beginning of this century, technologies have started emerging which are commonly known and termed as disruptors [6]. These super technologies are a combination of core technologies fused together. We know them as Internet of Things (IOT), Cyber, Artificial Intelligence (AI), Space Colonization, 3D Printing, High Speed Travel, Robotics, Block Chain, Autonomous Vehicles, Advanced Virtual Reality and Renewable Energy. These technologies are now being super fused with traditional brick and mortar technologies which have an enduring relevance and impact on the battlefield. These include Propulsion Technology, Sensor Technology, Digital Revolution, Directed Energy, Space Platforms, Navigational aids and new Material Technology to name a few. The fusion of these technologies is a disruptive revolution which is going to shape future militaries and the way wars will be fought. Hence it would be fair to say the Revolution in

Military affairs is giving way to a Disruption in Military affairs as depicted in the graphic below.



The thing to note about this disruption is that many of the technologies are still aspirational and under varied stages of development. While many of their contours are hazy, they have extensive and seamless dual application in civil and military domains. These are now being fast-tracked into battlefields in parallel. The duality of application is where civil military fusion is really taking place. The scale, level and approach to civil military fusion depends upon the technological base of the nation. The USA which was an already developed nation with cutting edge technologies, has a disaggregated approach to civil military fusion. The disaggregation is also guided by its democratic nature and largely predicated on its commercially driven civilian research. As against this, China began its process with a low technological base. It has a centralised statist approach. Its path to civil military fusion is vastly different. In this vein, India must chart out its own course and evolve a suitable model to achieve civil military fusion. Against this backdrop it is relevant that the US model and the Chinese models be understood to evolve an Indian model.

The Chinese Model of Civil Military Fusion

Image sourced from VIF[7]

China's Civil Military Fusion process is fundamentally driven by its superpower ambition and to establish a Sino-centric world order. It is a top down national strategy in China to make PLA the most advanced military in the world by 2049 [8]. The stress is on eliminating barriers between civilian, research, industrial, commercial, military and defence sectors. It is implementing this strategy, in order to achieve military dominance, not just through domestic R&D, but also by acquiring cutting-edge technologies through coercive business models and through theft of intellectual property. As per the US Government document on civil military fusion " China seeks accelerated military modernization through integration of new technologies with operational concepts, increased scientific research, and personnel reforms. The Civil Military Fusion infrastructure connects the military and civilian sectors to catalyse innovation, economic development, and advance dual-use technologies, especially those suited for informatised and 'intelligentized' warfare".

Civil Military Fusion, in China, took root at the beginning of the 21st century [9]. Initially China sought "*military-civilian integration*" by ensuring greater cooperation between the defence and civilian sectors. However "*integration*" did not make headway since centralized control was

weak and organizational barriers between the party and state and their various organisations. In 2007, China decided to replace 'integration' with 'fusion'. It started breaking barriers through a 'whole of the nation' approach. Civil Military Fusion expanded geometrically once ~~as~~ China adopted it to bridge economic/social development with security development. The net effect was national development. In 2015, Civil Military Fusion was elevated to a "*national-level strategy to build an integrated national strategic system and capabilities*," to support the goal of national rejuvenation. At a macro level, the day to day implementation of the Civil Military Fusion strategy is "*monitored and managed by the Politburo, the State Council (including the National Development and Reform Commission), and the Central Military Commission. A Central Commission for Military Civilian Fusion Development (CCMCFD) was established in 2017, headed by Xi Jinping along with Premier Li Keqiang*" as per US Government sources. In effect, the most powerful people and organs of the state, own and implement Civil Military Fusion. This special arrangement lays down directives for Civil Military Fusion and overcomes impediments to implementation.

The Chinese model aims "*to strengthen all instruments of national power and to achieve a world class military. It includes development and acquisition of advanced dual-use technology for military and civilian applications. It also includes reform of the national defence, science and technology industries to meld them into a single entity*". The model has six facets.

- It fuses the defence and civil technology and industrial base.
- Science and technology innovations are integrated and leveraged across military and civilian sectors.
- Military and civilian expertise and knowledge are blended and talent is cultivated across the board.
- Civilian infrastructure and construction is leveraged for military purposes by building them to military requirements and standards.
- Civilian services and logistics are utilised for military purposes.

- All aspects of society and economy are utilised for mobilization of resources and capabilities for defence of the nation.

Each facet has redundancy and overlap with others. All facets have internal and external facets. Implementation begins at the top. It filters down from national establishments and organisations and goes down to provincial and city level units. There are "*financial structures and regulatory mechanisms to incentivize civilian and military stakeholders*". These include local governments, academia, research institutions, private investors, and military organizations. It is a whole of the government approach. The focus is naturally on disruptive dual-use technologies and systems.

An overview of activities under various facets extracted from various documents are enumerated in point form below.

- "Improving efficiency, capacity, and flexibility of defence and civilian industrial and manufacturing processes. Simultaneously, increasing competitiveness within defence industrial base. It also includes achieving self-reliance and reducing dependence on imports, including those with dual-usage.

- Strengthening civilian and military R&D in advanced dual-use technologies and cross- pollinating military and civilian basic research.

- Factoring military requirements in dual use infrastructure such as airports, port facilities, railways, roads, and communications networks. It extends to space and undersea systems. The public and private sector resources to improve the PLA's basic services and support functions including habitation and healthcare are being harnessed. Outsourcing of non-military services is being encouraged.

- Developing expertise through common education programs, personnel exchanges, and knowledge sharing to build a highly skilled workforce. This is extended to reform of military academies, national universities, and research institutes. It also

includes recruiting foreign experts to provide access to know-how, expertise, and foreign technology.

- Ensuring multiple funding sources and lean management structures that are more dynamic, efficient, and effective than state-owned research bodies. There is also effort to leverage the economy and society to support China's strategic needs for international competition.

- The military logistics system is being tuned to support and sustain the PLA in joint operations, overseas operations with a global reach and a coordinated military-civilian response during a crisis".

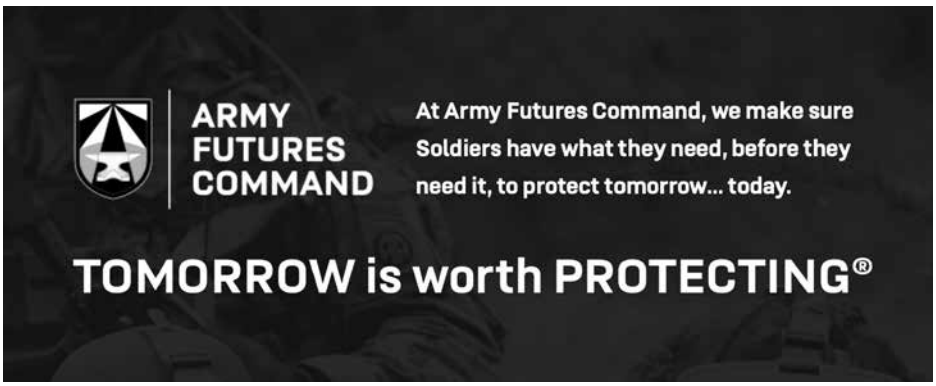
The system entails extensive linkages between various government entities. At the apex there are linkages between ministries (Defence, Foreign Affairs, Education, Science and Technology, Industry and Information Technology et al) and their subordinate establishments. All military organisations are linked on the Civil Military Fusion platform. Provincial and local governments are also factored in. "*State-sponsored educational institutions, research centres, and key laboratories*" are part of Civil Military Fusion. Students studying abroad specially in disruptive technologies are leveraged in. Major defence SOEs and quasi-private companies like COSCO, China National Offshore Oil Company, and major construction companies that have roles in BRI projects and also in building artificial islands in the South China Sea are keyed into Civil Military Fusion. Private companies that specialize in unmanned systems, robotics, artificial intelligence, cybersecurity, and big data have been co-opted. These include Huawei and ZTE. Provincial and local governments have Civil Military Fusion industrial plans and have established 35 national-level industrial zones. Civil Military Fusion linked investment funds have been created by central and local governments and private investors.

The overall effort is focussed, intense and completely centralised in the best Communist Party traditions[10]. However there are also assessments that the "fusion" that China intends to create is aspirational and not a true reflection of on ground realities[11]. It is also being analysed that Civil Military Fusion is still in its early stages, and that it is China's attempt to

overcome serious and persistent deficiencies in its military procurement and research and development (R&D) ecosystem. The issue gets a little more complex and needs greater scrutiny since the political scenario in China has changed. There is a discernible shift towards statism in China. The original path to acquire cutting edge technologies was through the private sector and international connections. These two issues are at dissonance with each other. Hence, going ahead, the success of Civil Military Fusion needs monitoring and study to draw the right lessons.

The US Model

The model of Civil Military Fusion in USA is far different than the all-encompassing top driven Chinese model. It is not designated or discussed as Civil Military Fusion in the first place. It is highly disaggregated and focussed, driven by the Services themselves. This is due to two reasons. The fundamentals of civil military fusion in USA were achieved long back whose outcome was the mighty military industrial complex[12]. The military industrial complex involves the armed forces and some of the largest corporations that have traditionally been designers, developers, producers and suppliers of cutting edge technology and weapons globally. This is an essential ingredient of the U.S. economy. The current wave of civil military fusion is only an extension of what happened earlier. The second reason is that cutting edge technologies are being researched and developed in the USA in the private sector at scale. The current efforts at fusion is only an upgrade on the ongoing dual use of new technologies. The nearest model to Civil Military Fusion in USA is that of the Army Futures Command and is therefore being examined.



The US Army established a new command called the Army Futures Command (AFC) in 2018 to modernise the Army[13]. It had six programs in order of priority - long range precision fire, next generation combat vehicle, future vertical lift platforms, a mobile and expeditionary Army network, air and missile defence capability and soldier lethality[14]. The US Army has undertaken this initiative in order to upgrade their existing systems as also induct next generation systems using all the emerging disruptive technologies. An outlay of 18 bn USD has been allocated for development of laid down future capabilities in this model. The AFC aims at transformative modernization of the Army in order to provide it with "*concepts, capabilities and organizational structures needed to dominate a future battlefield*".

The AFC has integrated entrepreneurs, scientists, academia, and businesses to work on various programs so that its goals can be achieved. It is also tapping in house talent and using all those who have the capability and qualification to be integrated into the designated projects. The AFC has identified areas in which technology collaboration is necessary to take place. These include all disruptive technologies related to sensors, terminal effects (kinetic/non-kinetic), command and control (manoeuvre, fires, intelligence), protection (EW, Physical), communications (SATCOM, aerial, terrestrial), robotics, AI/ ML, medical, sustainment, autonomy, cloud computing and, planning. They have also created a number of mechanisms to advance the programs. These include cooperative research and development agreements, small business innovative research, technology transfers and other transactional agreements.

Each of these technologies are being progressed in parallel at different locations. For example the AI Task Force was kicked off in Feb 19 and is based at Carnegie Mellon University. It aims to harness breakthroughs in AI and apply them to a range of Army operations which include talent management in human Resources, predictive maintenance of equipment and extend to support in projects related to all six modernization programs[15]. The task force is two thirds uniformed and one thirds civilian with agile teams to rapidly develop prototypes, capabilities and create a talent pool for the future. The task interfaces with academia, start-ups,

business houses, established defence industry and others in the chain to create and absorb AI into the system.

Organisationally, Army Futures Command has four subordinate/ supporting commands, which operate through collaborative partnerships with industry and academia to realise the programs. These are broadly as under :-

- The "*Combat Capabilities Development Command*" is the US Army's organic research and development agency which ensures creating, integrating, expediting and providing "*technology-enabled solutions*" to the Army.
- The Futures and Concepts Centre "*assesses threats and future operational environment, develops concepts, requirements and an integrated modernization path*".
- The Medical Research and Development Command manages and executes research in areas related to medical technology.
- The Army Software Factory is an integrated software development initiative to teach, develop, and employ self-sustaining talent from all ranks within the military and non-military pathways in order to develop cutting-edge applications for current and future systems.
- At the field level, the AFC has established Cross-Functional Teams (CFTs) which are based on training establishments of major Arms. These teams develop capability documents, based on research, experimentation and technical demonstrations, to enable the Army Acquisition System to take over actual procurement once a capability is established.
- The graphic below gives an indication of the US establishments involved in the AFC

The Army Futures Command has been in existence for four years now. Based on experience gained, the US government is thinking of shifting it from the exclusive ambit of the Army and put in under the larger Department of Defense. They want to convert it into an advisory body focused more on emerging technology and less on near-term programs[16]. The reason for this change in policy is largely due to bureaucratic tangles. Resultantly, the Army Futures Command might not be as empowered as it was envisioned. This dilute the 'Fusion' concept considerably.

Civil Military Fusion for India – Pointers

India has not had the benefit of either the Industrial revolution or the RMA. In case India has to modernise and rise as a power of consequence, the necessity of Civil Military Fusion for India is undisputed. The Chinese model is autocratic and top driven and will not suit our democracy or culture. The US model is too focussed, advanced and based on the existing Military Industrial complex edifice. However both models suitably adopted to Indian conditions can work in our environment. Resultantly the question at hand is what is the model to be adopted in India?

The initial issue which needs to be addressed for Civil Military Fusion to take place is the need for strong political will and inclination to do so. India must be prepared to walk the talk. The desire is evident and well-articulated in the 'Atmanirbharta' program and its predecessor 'Make in India'. However this desire must be driven by an unitary political leadership backed by a bipartisan consensus. It has to be a long term commitment. Accordingly, Civil Military Fusion needs a whole of the nation approach and the ability to stay the course for over a decade at least, so that the entire process becomes self-driven and irreversible as did our economic reforms of the 90s. This demands politico-military-bureaucratic fusion[17] of a high order as defined in an earlier article.

The most important factor in Civil Military Fusion is breaking barriers and establishing linkages with multiple channels of communication to promote dual use. Elimination of barriers to achieve fusion has to be the focus. In India the entire structure is siloed and disaggregated. People manning the structure indulge routinely in one upmanship and working to his/her concept of national interest. Further, Inter Service, Inter Department, Inter Ministry, Inter State, Inter Party and myriad other inter-se barriers are calcified and need to be permeated. Accordingly, Civil Military Fusion needs an empowered structure and a well-defined hierarchy to break these barriers. The structure has to be spearheaded by a clearheaded political leadership, an unshackled military and a cooperative bureaucracy. It has to be a top down approach. In fact the first step is politico military bureaucratic fusion as mentioned earlier [18]. If this can be achieved even partially, India will be on its way.

In India, Civil Military Fusion has to be a clustered approach and incrementally achieved. The span in each cluster should include concerned ministries, military departments, academia, PSUs, public sector industry, DRDO, CSIR labs, Science and Technological institutes of repute, Industry icons and more. Focus must be on key technologies, key products and key personnel. Talent capture and retention will be a major challenge in our system. We must pay adequate attention to this aspect. The identified clusters are as under :-

- The first cluster could be of successful and key sectors of national importance. This cluster invariably should be of Defence, Space, Atomic Energy, Energy, and Communications. India has achieved a lot of results in these sectors. With a certain amount of tweaking and repurposing and better coordination, a lot more can be achieved.

- The second cluster should be based on disruptive and modern technologies like AI, Cyber, robotics, unmanned systems, new materials and so on. These topics are all emerging technologies. To achieve civil military fusion, a national program in mission mode must commence which includes academia, start-ups, venture capitalists, established private industry with international linkages duly facilitated by the government.

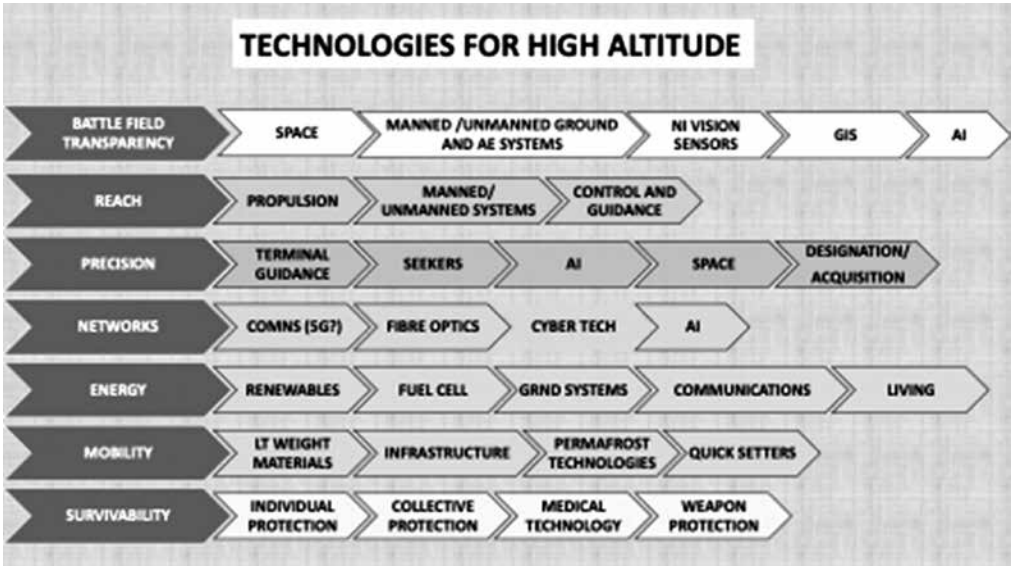
- The third cluster should be infrastructure and logistical in nature to include rail, roads, airports, ports, ware housing, freight services, transportation, housing, buildings and so on. These are all existing to a large degree. However, the focus needs to be on integrated development along our Himalayan borders. In order to do so, great amount of technology ingestion and leveraging is needed. One of the main focus areas in this sector is renewable energy in high altitudes.

- The fourth cluster should be financial fusion. The current government based financial models are archaic and linear in nature. Financing for civil military fusion should be based on venture capitalism and market principles which have a greater degree of risk taking ability especially in emerging technology.

- The fifth cluster should be related to conventional ‘bread and butter’ technology, goods and manufacturing where dual use can be exploited.

Civil Military Fusion must be operationally focussed. It must focus on areas and technologies which will ensure that our operational capabilities are directly enhanced. In this context it is important that we focus on capability development through Civil Military Fusion in our super high

altitudes. The reason for this is simple. Any technology or capability which succeeds in super high altitudes will succeed elsewhere. Most importantly, most requirements and endeavours in high altitudes are fundamentally dual use in nature and best suited to progress the Civil Military Fusion concept. In this connection, the importance of relevant and essential technologies and capabilities which are needed for high altitudes have been identified[19] and discussed in various fora. These technologies are shown in the graphic below. If these are to be focussed upon and if tangible results are to be realised, there is no way but civil military fusion.



Conclusion

In conclusion there two facets which need to be understood in any attempt at Civil Military Fusion. Firstly, the time for Civil Military has arrived. If India must rise to greatness it must tread this path. The cost that the nation has to pay for not enhancing Civil Military Fusion, will that the gap with China will keep widening till such time our sovereignty starts eroding. Further, Atmanirbharta, demands a high degree of Civil Military Fusion. Though achieving Civil Military fusion is a difficult task, India has no choice but to step up the occasion. Further, to state the obvious, Civil Military Fusion in India can only succeed if there is

politico-military-fusion. The second aspect is that the US and Chinese experiences indicate that the Civil Military Fusion is not a panacea for all ills. It has its own problems. In any case it is not a short term fix. All these must be factored into our thought process when we attempt this Civil Military Fusion at scale. As and when we think on these lines we must be cognisant to evolve an Indian model of Civil Military Fusion to seek Indian solutions to Indian problems.

***Lt Gen PR Shankar, PVSM, AVSM, VSM (Retd)** is a retired Director General of Artillery. He gave great impetus to the modernization of Artillery through indigenization. He has deep knowledge, understanding and experience in successful defense planning and acquisition. The General Officer is now a Professor in the Aerospace Department of Indian Institute of Technology, Madras., Chennai. He is actively involved in applied research. He writes extensively on defence and strategic affairs at www.gunnersshot.com

Endnotes

1 History.com Edirors, Industrial Revolution, Accessed 01 Dec, 2022, https://www.history.com/topics/industrial-revolution/industrial-revolution

2 Col David Edwards, Changes in Warfare in the 16th and 17th Centuries - A 'Military Revolution'?, The Forge, Accessed 01 Dec2022, https://theforge.defence.gov.au/publications/changes-warfare-16th-and-17th-centuries-military-revolution

3 Encyclopaedia Britannica Online, Academic ed.,Rachel N Webber, Military Industrial Complex, Accessed 01 Dec2022, https://www.britannica.com/topic/military-industrial-complex

4 Gunners Shot, Lt Gen P R Shankar (Retd), Civil Military Fusion An Indian Necessity, Accessed 01 Dec 2022, https://gunnersshot.com/2021/11/19/civil-military-fusion-an-indian-necessity-by-lt-gen-p-r-shankar-r/

5 Kapil Kak, Revolution in Military Affairs, Strategic Analysis, Apr 2000, (Vol. XXIV No. 1), Accessed 01 Dec 2022, https://ciaotest.cc.columbia.edu/olj/sa/sa_apr00kak01.html

6 Gunners Shot, Lt Gen P R Shankar (Retd), Disruption in Military Affairs, Accessed 01 Dec 2022 https://gunnersshot.com/2019/12/08/disruption-in-military-affairs-dma-a-technology-centric-approach/

7 Maj Gen P K Malick, VSM, (Retired), Military Civil Fusion in China, VIF, Accessed 01 Dec2022, https://www.vifindia.org/article/2022/august/01/military-civil-fusion-in-china

8 United States Government, U S Department of State, Accessed 01 Dec 2022, https://2017-2021.state.gov/military-civil-fusion/index.html

9 US Department of Defense, Military and Security Developments Involving the People's Republic of China, Accessed 01 Dec 2022, page 24, accessed 01 Dec 2022, https://media.defense.gov/2021/Nov/03/2002885874/-1/-1/0/2021-CMPR-FINAL.PDF

10 U S Department of State, Military-Civil Fusion and the People's Republic of China, Accessed 01 Dec 2022, https://www.state.gov/wp-content/uploads/2020/05/What-is-MCF-One-Pager.pdf

11 Elsa B. Kania and Lorand Laskai, CNAS Research, Myths and Realities of China's Military-Civil Fusion Strategy, Accessed 01 Dec2022, https://www.cnas.org/publications/reports/myths-and-realities-of-chinas-military-civil-fusion-strategy

12 Sociology: Understanding and Changing the Social World, Comprehensive Edition, Section 13.5, accessed 01 Dec 2022, https://saylordotorg.github.io/text_sociology-understanding-and-changing-the-social-world-comprehensive-edition/s16-05-the-milit, ary-industrial-comple.html

13 Army Futures Command, US Army, Accessed 01 Dec 2022, https://armyfuturescommand.com/supporting-commands/

14 Gunners Shot, Lt Gen P R Shankar (Retd), Defence Technology and Indian Conundrum, Accessed 01 Dec 2022 https://gunnersshot.com/2019/07/23/defence-technology-an-indian-conundrum-by-lt-gen-p-r-shankar-retd/

15 Gunners Shot, Lt Gen P R Shankar (Retd), Garnering AI for Indian Armed Forces, Accessed 01 Dec 2022 https://gunnersshot.com/2020/02/06/garnering-artificial-intelligence-for-indian-armed-forces-by-lt-gen-p-r-shankar-retd/

16 Defense News, Jen Judson, Futures Command Faces Identity Crisis as Army Shifts Mission, accessed 01 Dec 2022, https://www.defensenews.com/land/2022/09/06/futures-command-faces-identity-crisis-as-army-shifts-mission/

17 Gunners Shot, Lt Gen P R Shankar (Retd), Politico Military Challenges For a Future Ready India, Accessed 01 Dec 2022 https://gunnersshot.com/2021/03/10/politico-military-fusion-for-a-future-ready-india-by-lt-gen-p-r-shankar-r/

18 Gunners Shot, Lt Gen P R Shankar (Retd), Politico Military Challenges of 2021, Accessed 01 Dec 2022 https://gunnersshot.com/2021/01/06/politico-military-leadership-challenges-of-2021-by-lt-gen-p-r-shankar-r/ and https://gunnersshot.com/2021/03/10/politico-military-fusion-for-a-future-ready-india-by-lt-gen-p-r-shankar-r/

19 India Today Online, Retooling for War in Super-high Altitudes, Lt Gen. P. Ravi Shankar (Retd), Accessed, 01 Dec 2022, https://www.indiatoday.in/magazine/defence/story/20210621-retooling-for-war-in-super-high-altitudes-lt-gen-p-ravi-shankar-retd-1813375-2021-06-11

CHINA'S MILITARY-CIVIL FUSION AND LESSONS FOR INDIA

Brig (Dr) Rajeev Bhutani (Retd)*

Abstract

There is nothing novel about Military-Civil Fusion strategy adopted by the People's Republic of China. It had been followed in varied forms by all Chinese leaders, right from Chairman Mao to Xi Jinping. However, ***Xi Jinping elevated Military-Civil Fusion to the status of "national strategy",*** as he considered it vital for "***rejuvenation of the Chinese nation and in turn to strengthen its military".*** China has sought to gain dominance in technologies emerging from Fourth Industrial Revolution, such as in the fields of artificial intelligence (AI), novel materials, energy and so on, by adopting a 'Whole-of-the Nation' approach as these technologies are appreciated to provide foundation for various other technologies considered essential for enhancing its military capabilities as also providing consequent rapid gains for its down sliding economy. Further, technological development is not the sole objective of China's Military-Civil Fusion but it also encompasses talent development, logistics, as also a guiding concept for national defence mobilisation.

India's response to China's MCF endeavours should not seek to emulate China's state-driven MCF model, but rather it should take in to account the peculiarities of its own system in vogue, retain the procedures already in practice and launch new initiatives, particularly in the field of technologies, emerging from Fourth Industrial Revolution. It demands a Whole-of-the Nation approach, seeking absolute synergy between

the armed forces, scientists/ engineering institutes and public & private enterprises.

Introduction

In recent years, Chinese strategy of 'Military-Civil Fusion' has stirred the American security officials and analysts with concerns as China has sought to gain dominance in technologies emerging from Fourth Industrial Revolution, such as in the fields of artificial intelligence (AI), novel materials, energy and so on, by adopting a 'Whole-of-the Nation' approach as these technologies are appreciated to provide foundation for various other technologies considered essential for enhancing its military capabilities as also providing consequent rapid gains for its down sliding economy.

There is nothing novel about Military-Civil Fusion strategy adopted by the People's Republic of China (PRC). It had been followed in varied forms by all Chinese leaders, right from Chairman Mao to Xi Jinping. In the past, different terms were used such as, "Military-Civil Integration", "Military-Civil Fused Development", etc. until when it finally culminated in the adoption of its present name i.e., Military-Civil Fusion (MCF). However, a close scrutiny revealed that the current MCF strategy had evolved from the policy decisions taken by Jiang Zemin and later Hu Jintao.

The Americans consider China's MCF as an equivalent to their concept of 'Civil-Military Integration' (CMI), but in reality the former's scope is widely enlarged and more complicated. As regards, the United States, its CMI is "cooperation between government and commercial facilities in research and development (R&D), manufacturing, and/or maintenance operations"; whereas China's MCF strategy is a programme driven by the state, which plans to exploit all elements of state including its economic strength to support and fortify the People's Liberation Army (PLA). Presumably, that may be the reason that in all cases of China, it is the "Military" that comes first.

With a view to draw useful lessons for India, aim of this paper is to study China's MCF under the following heads: -

- Evolution of China's MCF as a Concept.
- Goals and Structure of China's MCF.
- Implementation of MCF under Xi Jinping.
- Lessons for India.

Evolution of China's MCF as a Concept

To make a pragmatic assessment of China's MCF strategy, it is extremely essential to study its historical evolution first because Xi Jinping has been preceded by four leaders, whose policies and directions provided the foundation for his MCF strategy.

Mao Zedong. Consequent to the termination of the Korean War, it became emergent that defence resources need to be utilised for economic development, hence Chairman Mao promoted the defence industries "to set up production lines with dual-use capabilities" for making the transition between defence and civilian production easier. As a result, production of civil usage items reached 60.8 percent of the defence industry's total output value between 1958 and 1965, attaining the highest proportion of 74.5 percent in 1960. However, the strained Sino-Soviet relations and withdrawal of aid to both civilian and defence development programs, forced China's leaders to redirect their efforts on defence production; and the civilian production was immediately delineated from the defence industry.

Deng Xiaoping. Starting in August 1978**,** Deng Xiaoping reoriented civil-military integration, with priority to build up initially China's civil economy as it had been ravaged by Mao's idiosyncratic policies. Accordingly, the concept was basically evolved to reorient and reorganise defence resources towards economic development. Deng underscored the requirement to disassociate China's defence industrial base from the Soviet model that it was following, as it failed to bring out overall technological development. Later in June 1985, he pointed out, "Military equipment modernization is only possible in earnest if the national economy has established a relatively good foundation. Therefore, we (the military) must stay patient for a few years". Following Deng's

directions, national defence and consequent building up of force were relegated to a lower priority.

Jiang Zemin. In January 1993, Deng's successor Jiang Zemin established a new strategic guideline directing that PLA should "place the basis of preparations for military struggle on winning local wars under modern high-technology conditions". This entailed major military modernization but not at the cost of economic development. Hence commencing with Jiang, the scope of military-civil integration was enlarged beyond the defence industrial base to incorporate other fields like logistics, education, and others. In fact, many core components of Xi Jinping's MCF strategy can be traced back to Jiang Zemin.

Hu Jintao. Immediately after assuming office in 2003**,** Hu augmented Jiang's policy of military-civil integration (MCI) by making a shift from **integration** to **fusion** but he made the first authoritative reference to MCF as a guiding principle while presenting his report to the 17th Party Congress in 2007, wherein Hu urged the country to ***"take a path of military-civilian fusion with Chinese characteristics***"***.*** Hu wanted MCI to be extended into new areas. His aim was to achieve a deeper level integration for which he considered that defence modernization and economic & social development should be joined together across their entire length and breadth. Hu's strategy consisted of four Systems of Systems (SoS): "the weaponry research and production; the military personnel training; the military support and sustainment; and the national defence mobilisation". All of these (in original or slightly altered form) are forming part of Xi's strategy for MCF.

In fact, in 2005 itself, Hu had opened the door for the private industries to enter into the defence industrial base. Military-Civil Fusion formed an inseparable part of national strategic planning with its inclusion in the Twelfth Five Year Plan (2011-15).

Xi Jinping. On 23 December 2012, Xi Jinping, as Chairman of the CMC, in his speech at the executive meeting of the Military Commission, acknowledged Hu's contribution by stating that *"military-civil fusion-style development path with Chinese characteristics"* was one of the basic experiences of their military construction. Later, Xi gave his assessment

of ongoing work and stated that they have "initially embarked on a path of military-civilian integration". On 11 March 2014, during the 2nd Session of the Twelfth National People's Congress, ***Xi elevated MCF to the status of "national strategy",*** as he considered it vital for "***rejuvenation of the Chinese nation and in turn to strengthen its military".*** In March 2015, after assessing the existing status of MCF programme in China, Xi demanded its transition from "**early-state fusion"** to "**deep fusion"**. Though, Xi had fully appreciated the efforts of his predecessors in guiding the MCI/MCF but he was not satisfied with its slow progress and was critical of its weak operationalisation. He identified ***Integration as the crux of the problem, which was yet to be resolved.***

Goals and Structure of China's MCF

While speaking to the Central Commission for Military-Civil Fusion Development (CCMCFD) on 20 June 2017, President Xi expressed his view of the MCF strategy as under:

"We must accelerate the **formation of a full-element, multi-domain, and high-return military-civil fusion deep development pattern**, and gradually build up **China's unified military-civil system of strategies and strategic capability"**.

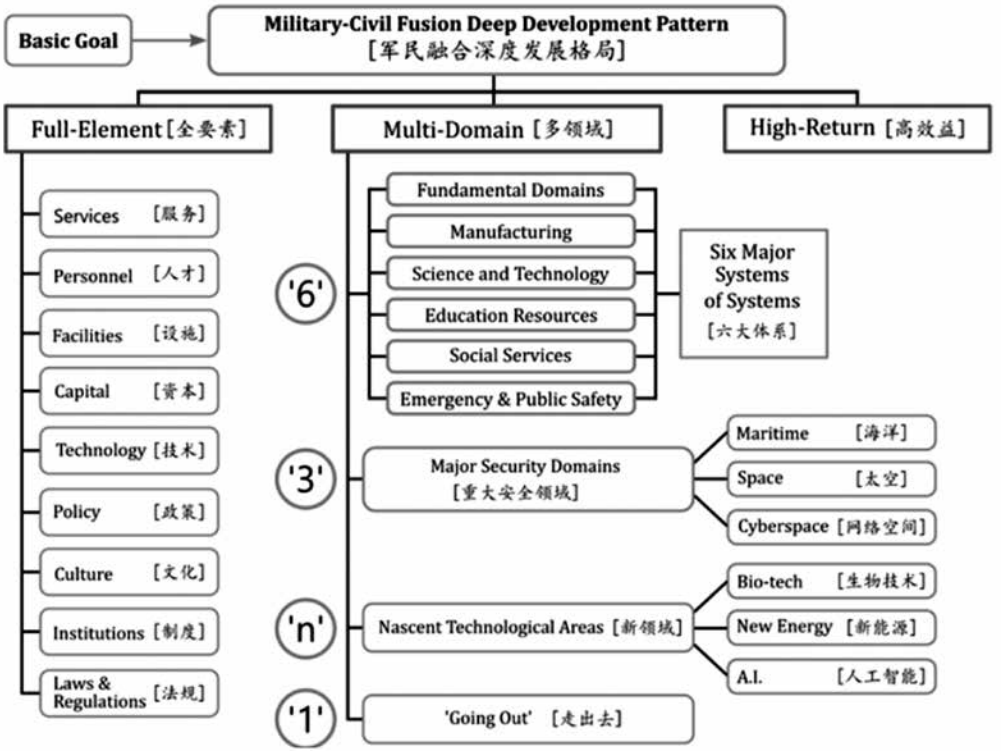
Apparently, the above was a simple statement but it was carefully framed. PLA National Defence University researchers have scrutinized Xi's statement, dividing it in to two halves and stated that "the first half reflects the basic (near-term) and the second half represents ultimate (long-term) goals of the strategy".

The Basic or Near-Term Goal is to form the "military-civil fusion deep development pattern," by including full-elements and multiple domains with a view to deliver high returns.

The "**full-element"** attribute encompasses various resources shared between the national defence and economic systems, viz., technology, personnel, services, capital, facilities, policy, culture, institutions and laws and regulations. Aim is to ensure that common resources are utilized in a coordinated manner for achieving synchronized economic and military development.

In the "**multi-domain"** attribute, the domains are clubbed in to four segments as follows: Traditional domains (6)-Fundamental, Manufacturing, Science & Technology, Education resources, Social services, Emergency & Public safety; Major security domains (3) - Maritime, Space and Cyberspace; Nascent Technological Areas ("n") - Biotechnology, New Energy, Artificial Intelligence; and "1" - "Going Out" of MCF. It is of interest to note that list of nascent technological areas is intentionally kept open-ended with symbol "n" as more new technologies are anticipated to join in future. The six traditional domains further have six Systems of Systems (SoS), which would take shape gradually as the MCF is matured in these domains.

The figure below shows the core components of the "military-civil fusion deep development pattern"



Source: Alex Stone and Peter Wood, "China's Military-Civil Fusion Strategy", p.28

The above figure displays a roadmap for MCF - outlining China plans for achieving the **deep-fusion pattern**, as envisaged by Xi Jinping. “High-Return”, the third vertical in the figure, entails the effects Chinese leaders intend to achieve through MCF.

“High-Return”. It has often been claimed by Chinese thinkers that the MCF strategy is targeted for economic as well as defence issues. A saying commonly found in writings on Military-civil fusion, is that it asks for “**one portion of investment and two portions of return”**. Currently, China is in a period of economic transformation, resulting in slowing down of the growth rate of total fiscal expenditure. Hence, China faces the challenge of declining increases to the defence budget, whereas the Chinese armed forces are still going through expensive modernization. **Brian Lafferty** in his study of **‘MCF and PLA modernization’** has conclusively brought out that Chinese *“reluctance to raise defence spending more dramatically stems in part from the belief that it would harm economic growth (and thus the foundation for long-term military strength), as well as from the common perception that one of the major causes for the fall of the Soviet Union was its ruinous attempts to match U.S. military spending.”*

The Ultimate Goal of China’s MCF strategy is to gradually build up a **“unified military-civil system of strategies and strategic capability”.** The Chinese strategists have analysed that adoption of CMI by the world’s major nations is not meant for resolving the problems of resource constraints or for up gradation of technology but it is primarily to makeup the “institutional deficit” (or what they call as ***tizhi*** barriers) in ability to unify the country’s overall security and development.

Hence, the end-goal of China’s MCF is arrived at achieving a “**unified military-civil system of strategies and strategic capability”** that comprises of two co-related elements: first, “a set of well-coordinated national strategies” and second, “the strategic capability this set of strategies generates”. Chinese academics further define the “National strategic capability” as the ability to use strategic resources and means to achieve strategic ends.

Xi’s vision of MCF, as articulated in various speeches, intends to achieve

three strategic objectives: "(1) Enhance sophistication of China's military technology (particularly in informationised warfare) through transfers between the defence and civilian sectors; (2) Achieve cohesion in Chinese industry and academia working in support of military objectives, so that the entire system can be effectively mobilised to support the military in the future; (3) stimulate technological innovation and economic growth."

Implementation of MCF under Xi Jinping

It is often being said that China is mimicking the American CMI. For Example, equivalent to the United States' Defence Advanced Research Projects Agency (DARPA), China has established the new Central Military Commission Science and Technology Commission (CMCSTC). Simultaneously, in Shenzhen, CMCSTC has established a "rapid response small group," reflected in some Chinese media as "China's DIUx," for national defence innovation that is designed to enhance/ improve the PLA's capability to 'leverage commercial technologies".

But there is an important difference as the American system has a long history of public-private partnerships and its mechanisms go back to World War II, while China is endeavouring to create an equivalent system in a much shorter timeframe by evolving plans that are being implemented actively from the state down to provincial and municipal governments. Simultaneously, defence or dual-use technologies are being developed by reorienting number of universities and enterprises and that too in partnership with military-affiliated research institutes. Industrial complexes have been launched even by the local governments e.g., Zhongguancun, a high-tech zone in Beijing, created a MCF Industry Alliance in 2014 that now has 600 members. In December 2017, they organised a special contest, which covered advancements in cyber security and unmanned systems, in addition to various other fields. Similarly, in coordination with the Academy of Military Science, the Tianjin city that leads China's supercomputer development, has set up an **"AI Military-Civil Fusion Innovation Centre"** close to its National Supercomputer Centre in October 2017.China has invested tens of billions of dollars for creating production facilities, research, and support for overseas acquisitions in 2019.

Moreover, in the US, commercial companies and the military benefit each other through mutual utilization of “spin-off” and “spin-on” technologies. Whereas in China, presently it has been considered as a “one-way process” where the civilian companies are assisting the military and any commercial benefit is just an aftermath. Moreover, the scope of China’s MCF as a concept is much more elaborate than the public-private partnerships of the US. Further, technological development is not the sole objective of China’s MCF but it also encompasses talent development, logistics, as also a guiding concept for national defence mobilisation, e.g., the People’s Liberation Army Air Force (PLAAF) get direct support from China’s leading e-commerce companies by using their drones for logistics;and of late, few Chinese shipping companies also provided cross-sea transport – that would act as a force-multiplier to an amphibious landing on Taiwan.

China’s current strategy of MCF and “the powerful momentum” provided by President Xi Jinping for its speedy implementation merit serious scrutiny. The important aspects, on which China has focused, are deliberated upon in the succeeding paragraphs.

Talent Search and Knowledge Appropriation

Using schemes like the **“Thousand Talents Plan”** (launched in 2008 to bring back reputed Chinese scientists as also attract foreign talent), China made lucrative offers to entice foreign scientists and engineers (e.g., “a onetime starting bonus of USD 1.51 lakh and research fund ranging from USD 4.53 lakh to $7.55 lakh for reputed scientists, above 40 years of age”), and provided them with top-of-the line research facilities in China. In certain cases, foreign scientists have been allowed to retain overseas affiliations and establish laboratories that replicate their U.S. counterpart. As in September 2017, about 7,000 scientists were enrolled in this Programme,and out of these 1,180 are working in the Beijing’s Zhongguancun tech hub alone and these were arranged through a network of 10 overseas recruitment centres**.** The recruiters have been infiltrated in the U.S. institutes under the disguise of visiting academic researchers by fraudulently obtaining visas for them, who in turn would entice talent from the United States back to China. Further, China also

sent its PLA personnel to steal knowledge from foreign institutions, portraying them as civilian academics, affiliated to "cover institutions" that existed only on paper. According to the Australian Strategic Policy Institute, "Out of more than 2,500 military scientists & engineers who had gone abroad since 2007, at least dozens used fake credentials to work in sensitive areas, such as hypersonic missiles and navigation".

Inconformity with MCF plan, with support provided by government funds, Chinese firms obtained dual-use technologies through overseas acquisitions, e.g., state-owned Aviation Industry Corporation of China (AVIC) had reportedly spent at least USD 3.25 billion for acquisition of automotive, aerospace and engineering companies, in the US, Austria, Germany, the United Kingdom, and Spain. Government guidance funds with MCF investments are also funding R&D centres abroad, including Zhongguancun Capital's innovation centres in Silicon Valley and Boston in the US and Heidelberg, Germany.

Venture Capital Funds are also used to support the MCF - Zhongguancun-Stanford New Technology Venture Investment Fund (established in 2013) was first such fund, which had raised USD 91.3 million by 2017, to launch projects at Stanford and other U.S. institutions.

Artificial Intelligence (AI)

AI is the primary focus of China's MCF strategy. The State Council's (July 2017) AI Development Plan (AIDP) is the key guiding document of China's AI strategy. The plan has laid down a three-stage process for China's ambition to lead the world in AI: "One, By 2020, China's AI industry shall catch up with the most advanced countries; Two, By 2025, China aims to attain "world-leading" status in some of the AI fields; Three, By 2030, China aims to attain the status of world's "primary" AI innovation centre". Hence, China is targeting tenfold growth of AI-related industry from USD150 billion in 2020 to USD1.5 trillion by 2030.In November 2017, Chinese government hand-picked Baidu, Alibaba, and Tencent (collectively known as BAT), as also iFlytek to constitute a "National Team" entrusted with developing AI in various domains as follows: Alibaba for cloud computing and smart cities; "Baidu for autonomous driving; Tencent for AI-enabled medical diagnosis; and iFlytek, which is

a voice recognition firm, should continue working on voice intelligence". Facial recognition start-up Sense Time, which is based in Hong Kong, was chosen later to work on intelligent vision.

The United States is reportedly ahead of China in overall AI capabilities. However, China's government intervention and its unique market structure aims to undermine the U.S. lead. In AI-enabled technologies, which are heading for transformational growth, such as commercial and military strike-capable drones incorporating autonomous navigation, China is ahead of or on par with the United States. In the field of autonomous vehicle (AV) technology, China trails the United States but is now rapidly catching up. By exploiting Internet and mobile applications, Baidu, Alibaba, and Tencent, which are China's major mobile platforms have gained unparalleled and unauthorized access to consumer data.China considers "***AI as the turning point at which China could catch up to and surpass the United States in the next generation of warfare".***

New and Advanced Materials

"New materials" have been promoted as one of the core ten industries under "Made in China 2025" and these are central to advancing China's overall manufacturing capabilities. Chinese military contractors are now able to produce carbon fibres, ever since the United States subjected these materials to export controls."China now accounts for 58 percent of global patents in respect of graphene and most of these patents have been registered in the last seven years. Currently, China produces 70 percent of the world's graphite; exfoliating graphite is the primary method of synthesising graphene". Graphene is expected to become an essential component in many future applications, such as quantum computing chips. In that case, China is well poised to develop components much less expensively than the United States.

China has also secured access for its mining companies in critical materials like cobalt and lithium outside of China's borders. China may become a global price setter for processed materials, and allot the crucial segments of the supply chain to Chinese components manufacturers – a great advantage beside the cheap and abundant access to these materials. In 2017, China shared more than 50 percent of world's production for 13 of minerals critical for manufacturing.

To reduce the radar signature of its military aircraft, China has reportedly succeeded in using metamaterials. Moreover, China's patent in this field are "highly concentrated in materials with dual-use potential, like antennas".

Energy Storage

China has become a leading exporter for renewables technology. China has displaced market leaders like Vestas (Danish turbine manufacturer) and General Electric in solar panels and wind energy.China has achieved success because of dumping this excess capacity at rates much lower than the incumbent countries, bringing down prices to the extent that higher quality and more innovative products developed by those countries were no longer competitive. China has circumvented the tariff and non-tariff measures adopted by the host country by locating production in other countries. Presently, China is replicating the same process for advancing ***"its lithium-ion battery production capacity to fulfill its ambition of becoming the leading new energy vehicle manufacturer"***.

In 2010, Chinese state planners had selected "new energy vehicles" as one of the seven Strategic Emerging Industries, leading to quick setting up of battery production facilities by provincial and local governments. "China's global lithium-ion battery exports increased from USD 4.8 billion in 2013 to USD 7.98 billion in 2017".China has been concentrating for consolidation of this industry since 2016.As a result "Shenzhen-based BYD, the world's largest manufacturer of cellphone batteries, and Contemporary Amperex Technology Co., Ltd. (CATL), have now emerged as the world's largest manufacturer of lithium-ion batteries". In 2018, China accounted for 61 percent of world's lithium-ion battery production capacity."While Panasonic and LG Chem are still the leading manufacturers of rechargeable batteries, it is assessed that China's planned mega factories may propel it ahead of competitors, further increasing global dependency on China. In addition, China also has substantial control over the supply chains for materials used in lithium-ion battery production".

Presently, China is focusing on development of lithium-ion batteries to power its air-independent propulsion submarines that could stay underwater for much longer duration compared to conventional diesel-powered submarines. Advanced batteries are also known to be used for powering unmanned aerial vehicles (UAVs) with strike and / or reconnaissance capabilities.

Domination of International Standards-Setting Bodies

Establishing influence in global standards-setting organizations to gain favours for Chinese companies and institutions is a key focus of China's technology strategy. Chinese researchers are dominating the Institute of Electrical and Electronics Engineers (IEEE) and International Standards Organization so as to exercise influence in developing standards that favour Chinese technologies. China is cleverly and proactively placing Chinese nationals or companies in dominating positions within the International Telecommunication Union and other bodies, which are working on AI applications, such as the Internet of Things and 5G.

Lessons for India

Xi Jinping's MCF strategy is aimed to not only counter the United States' current military, economic, and technological superiority but also to overtake it in the long-term. Consequently, it can enhance the vulnerabilities of India as also of other Western powers.

India's response to China's MCF endeavours should not seek to emulate China's state-driven MCF model, but rather it should take in to account the peculiarities of its own system in vogue, retain the procedures already in practice and launch new initiatives. India is not new to the concept of CMI. For instance, in the past Indian armed forces have been extensively using civil hired transport (CHT) for mobilisation of troops to the border, for their inter-theatre movement and even to meet their logistics requirements. Civil Flatbed trailers have been used for ferrying armoured vehicles to the operational areas. It forms part of the standard operating procedure (SOP) of units & formations that is rehearsed during exercises and enacted during mobilisation. There are contingency plans to even use civil aircraft for mobilisation of troops. Indian Army has also

been contemplating the concept of employing private firms for repair and maintenance of its weapons & equipments by replacing the Army Base Workshops (ABWs). Twenty expressways have been identified with the specifications of airstrips and on one of these, the Indian Air Force has done trial landing of its fighter aircraft thus keeping the option of using highways as emergency air bases.

To counter China's Dual Use Infrastructure, particularly the construction of 628 Xiakong (well-off) border defence villages along the LAC,India has launched its own "Vibrant Village Programme". A total of 27 districts in the states of Arunachal Pradesh, Uttrakhand, Sikkim, Himachal Pradesh and Union Territory of Ladakh bordering China have been identified as part of the Border Area Development Plan 2020-21 by the Ministry of Home Affairs and Rs. 190 crore has been earmarked for these. Infrastructure for better connectivity to LAC with China is being speeded up and that will reduce the induction time for troops.

Best example of CMI in India is its space programme in which a number of satellites have been developed with dual-use capability, meeting the requirements of both civil as well as military, such as in the fields of imagery and communications. Nuclear programme is another example, where civil and military have worked in unison.

The government has spelled out its policy of Aatma nirbhar Bharat (Self-reliant India) for promoting indigenous manufacturing and particularly for defence; it has issued three 'Negative Lists', containing 310 defence items banning their imports. India has also adopted a joint venture (JV) approach with foreign manufacturers and private industries. For example, JV model between ordnance factory and Kalashnikov for manufacture of rifles; consortium led by **Tata Group and Airbus** for manufacturing the C-295 transport aircraft for the IAF in Vadodaraand BrahMos cruise missile is manufactured by a JV between the India's DRDO and Military Industrial Consortium NPO Mashinostroyenia of Russia,and it has got orders for export. But these are only incremental approaches for indigenous manufacturing.

Indian Armed Forces are fully aware about cutting-edge technologies emerging from the Fourth Industrial Revolution and have included

some of these in its 2013 (updated in 2018) Technology Perspective and Capability Roadmap (TPCR) viz., AI, Robotics, EMP weapons and unmanned systems.

India's 2020 budget has given a fillip to Quantum technology by allocating US$1.12 billion to be spent over five years as part of a new "national quantum mission", which will encompass the development of quantum technologies for communications, computing, cryptography and new materials. This investment is comparable to the one made by the US ($1.2 billion over five years – bill signed by President Donald Trump in December 2018 for national quantum initiative) and similarly Europe had also allocated US$1.13 billion for quantum technologies in 2016.The Indian government is well aware about the role of AI technology in transforming the economy as well as national security. On 25 Aug 2017, the Ministry of Commerce and Industry constituted the 18 member Task Force on "AI for India's Economic Transformation", led by Professor V Kamakoti of IIT (Madras). On 02 February 2018, the Department of Defence Production formed a Task Force for studying the future employment of AI in defence. The Task Force is headed by Tata Sons Chairman N Chandrasekaran and is christened as "Task Force for Strategic Implementation of AI for National Security and Defence". At the same time, Niti Aayog and the Ministry of Electronics and IT are guiding the national effort for use of "AI in social sectors and industry". A Model International Centre for Transformative AI (ICTAI) has been set up in Bangalore with the collaborative efforts of Niti Aayog, Intel and Tata Institute of Fundamental Research (TIFR).

There is awareness at the highest level to develop the emerging and disruptive technologies but there appears to be no synergy between various branches of the government. CMF needs a 'Whole-of-the Nation' approach to be directed from the Apex level by the Prime Minister, with all the concerned ministries participating and thereby ensuring synergy between the armed forces, universities/engineering institutes, scientists, DPSUs and private industries.

Conclusion

Since long, Chinese leaders have promoted the integration of its military and civil industries but Xi Jinping has given a new dimension to this concept by making MCF as an inseparable element of China's all future industrial plans. As opposed to traditional sectors, advances in emerging and cutting-edge technologies will have two-fold implications - militarily, provide China's armed forces with force-multiplier advantages over its adversaries' conventional weaponry and economically, disrupt the current economic system by creating new class of job opportunities in fields hitherto unknown and in turn making the existing jobs redundant.

The MCF strategy is designed to enhance China's comprehensive national power by synchronising China's manufacturing strategies in all domains - land, maritime, space, electromagnetic spectrum and cyberspace - to provide high-quality products for defence of the country. Though, China may have been over-hyped as a technology superpower poised to overtake the United States but the ways and means adopted by China in implementing its MCF strategy definitely pose competitive challenge to the United States in particular and world at large.

China, being the next-door neighbour, its efforts to gain a decisive advantage in emerging and cutting-edge technologies present a serious threat to India. India should adopt a 'Whole of the Nation' approach by investing suitably in these technologies and coordinating between the armed forces, research institutes, and public and private enterprises.

***Brig (Dr) Rajeev Bhutani (Retd)**, Senior Fellow, CENJOWS is a keen China watcher, having authored two books: 'Rise of China 2030' and 'Sino-Indian Equation'.

Endnotes

1. U.S.-China Economic and Security Review Commission, 2019 Annual Report to Con-gress (Washington DC, US Government Publishing Office, 2019) Chapter 3 Section 2 “Emerging Technologies and Military Civil Fusion—Artificial Intelligence, New Materials and New Energy” p. 205. available at https://www.uscc.gov/sites/default/files/2019-11/Chapter%203%20Section%202%20-%20Emerging%20Technologies%20and%20Military-Civil%20Fusion%20-%20Artificial%20Intelligence%2C%20New%20Materials%2C%20and%20New%20Energy.pdf
2. Dr Brendan S Mulvaney, Director CASI, “Preface” in Wood and Stone, “China’s Mili-tary-Civil Fusion Strategy
3. Ibid.
4. Alex Stone and Peter Wood (2020), “China’s Military-Civil Fusion Strategy: A View from Chinese Strategists, China Aerospace Studies Institute, Air University, Montgomery, USA, p.21., available at https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/Other-Topics/2020-06-15%20CASI_China_Military_Civil_Fusion_Strategy.pdf
5. Jiang Luming, Wang Weihai, Liu Zuchen, “Initial Discussion on the Military-Civil Fusion Strategy”, (Beijing: People’s Press, 2017), pp. 5-6, as cited in Ibid, p.21.
6. Elsa B. Kania, “In Military-Civil Fusion, China is Learning Lessons from the United States and Starting to Innovate”, The Strategy Bridge, 27 August 2019, https://thestrategybridge.org/the-bridge/2019/8/27/in-military-civil-fusion-china-is-learning-lessons-from-the-united-states-and-starting-to-innovate
7. Selected Works of Deng Xiaoping [邓小平文选], Vol. 3, p.128; as cited in Alex Stone and Peter Wood (2020), op.cit, p.21.
8. Edmund J. Burke, et.al, “People’s Liberation Army Operational Concepts”, RAND Re-search Report, p.4., https://www.rand.org/content/dam/rand/pubs/research_reports/RRA300/RRA394-1/RAND_RRA394-1.pdf
9. Alex Stone and Peter Wood (2020), op.cit, p.22.
10. Audrey Fritz, “China’s Evolving Conception of Civil-Military Collaboration”, Center For Strategic & International Studies, 02 August 2019, https://www.csis.org/blogs/trustee-china-hand/chinas-evolving-conception-civil-military-collaboration
11. Alex Stone and Peter Wood (2020), op.cit, pp. 22-23.
12. Ibid.
13. Shi Shiyin, “Creating a Path of Fusion-Style Military-Civilian Development with Chi-nese Characteristics is a Great Achievement of 40 Years of Reform and Opening Up”, Security Internal Reference, 19 November 2018, https://www-secrss-com.translate.goog/articles/6515
14. Brian Lafferty, “Civil-Military Integrations and PLA Reforms,” in ‘Chairman Xi Remakes the PLA: Assessing Chinese Military Reforms’, eds: Philip C Saunders, Arthur S. Ding, Andrew Scobell, Andrew N.D. Yang, and Joel Wuthnow, pp. 641-642., (Washington, D.C: NDU Press, 2019); https://ndupress.ndu.edu/Portals/68/Documents/Books/Chairman-Xi/Chairman-Xi.pdf
15. David García Cantalapiedra, “The strategy of the Three Wars: the Political War with Chinese characteristics within the Grand Strategy of the People's Republic of China”, At-alayar, 29 March 2022, https://atalayar-com.translate.goog/blog/la-estrategia-de-las-tres-guerras-la-guerra-politica-con-caracteristicas-chinas-dentro-de-la
16. Alex Stone and Peter Wood (2020), op.cit, p.25.
17. Jiang et al., “Initial Discussion on the Military-Civil Fusion Strategy”, op.cit., pp.38-39

18. Alex Stone and Peter Wood (2020), op.cit, p.30.

19. Ibid., p.28.

20. "China'sNationalDefenseintheNewEra",StateCouncilInformationOffice, 24 July 2019. http://www.xinhuanet.com/politics/2019-07/24/c_1124792450.htm

21. Brian Lafferty, "Civil-Military Integrations and PLA Reforms," op.cit., p.631.

22. Jiang et al., "Initial Discussion on the Military-Civil Fusion Strategy", op.cit., p.38; and Shi Shiyin, op.cit.

23. Alex Stone and Peter Wood (2020), op.cit, p.36.

24. "U.S.-China Economic and Security Review Commission, 2019 Annual Report to Con-gress, Chapter 3 Section 2, op.cit., p. 210.

25. Elsa B. Kania, op.cit.

26. Ibid.

27. U.S.-China Economic and Security Review Commission, "Hearing on Technology, Trade, and Military-Civil Fusion", written testimony of Elsa Kania, June 7, 2019, pp. 66-67, https://www.uscc.gov/sites/default/files/2019-10/June%207,%202019%20Hearing%20Transcript.pdf

28. Zhang Yuling, "Military-Civil Fusion Industry Funds: Helping the Deeper Development of Military-Civil Fusion," AVIC Securities, March 19, 2019.

29. Dr Brendan S Mulvaney, op.cit.

30. Manoj Joshi, "China's Military-Civil Fusion Strategy, the US Response, and Implications for India", ORF Occasional Paper, 25 January 2022, p.9., https://www.orfonline.org/research/chinas-military-civil-fusion-strategy/

31. Elsa B. Kania, op.cit.

32. Liu Xuanzun, "China holds military-civilian cross-sea transport drills in Yellow Sea," Global Times, 11 July 2019, http://www.globaltimes.cn/content/1157581.shtml

33. Hepeng Jia, "China's Plan to Recruit Talented Researchers," Nature 553: S8, 17 Janu-ary 2018; https://www.nature.com/articles/d41586-018-00538-z

34. U.S.-China Economic and Security Review Commission, 2019 Annual Report to Con-gress, Chapter 3, Section 2, op.cit., p.212.

35. Alex Joske, "Picking Flowers, Making Honey," Australian Strategic Policy Institute, 30 October 2018, https://www.aspi.org.au/report/picking-flowers-making-honey

36. Greg Levesque and Mark Stokes, "Blurred Lines: Military-Civil Fusion and the 'Going Out' of China's Defense Industry," Pointe Bello, December 2016, pp.36-40., https://toinformistoinfluence.files.wordpress.com/2017/07/2613c-062017_pointebello_militarycivilfusionreport.pdf

37. Written testimony of Elsa Kania, June 7, 2019, op.cit, pp.75-76.

38. U.S.-China Economic and Security Review Commission, 2019 Annual Report to Con-gress, Chapter 3, Section 2, op.cit., p.213.

39. U.S.-China Economic and Security Review Commission, Hearing on Technology, Trade and Military-Civil Fusion, June 7, 2019, op.cit., written testimony of Jeffrey Ding, pp.20-21.

40. Meng Jing and Sarah Dai, "China Recruits Baidu, Alibaba and Tencent to AI 'National Team,'" South China Morning Post, 21 November 2017, https://www.scmp.com/tech/china-tech/article/2120913/china-recruits-baidu-alibaba-and-tencent-ai-national-team

41. U.S.-China Economic and Security Review Commission, 2019 Annual Report to Con-gress, Chapter 3, Section 2, op.cit., p.216.

42. Ibid., p.220

43. Bradley Perrett, “China Increasing Output of Strong Carbon Fiber,” Aviation Week and Space Technology, December 9, 2013.

44. U.S.-China Economic and Security Review Commission, 2019 Annual Report to Con-gress, Chapter 3, Section 2, op.cit., pp.223-225.

45. Scott Patterson and Russel Gold, “There’s a Global Race to Control Batter- ies—and China Is Winning,” Wall Street Journal, 11 February 2018, https://www.wsj.com/articles/theres-a-global-race-to-control-batteriesand-china-is-winning-1518374815

46. U.S.-China Economic and Security Review Commission, 2019 Annual Report to Con-gress, Chapter 3, Section 2, op.cit., p.225.

47. Ibid, p.226.

48. Daniel Cusick, “Chinese Wind Turbine Maker Is Now World’s Largest,” Scien- tific American, 23 February 2016, https://www.scientificamerican.com/article/chinese-wind-turbine-maker-is-now-world-s-largest/

49. U.S.-China Economic and Security Review Commission, 2019 Annual Report to Con-gress, Chapter 3, Section 2, op.cit., p.227.

50. David Coffin and Jeff Horowitz, “The Supply Chain for Electric Vehicle Batteries,” Jour-nal of International Commerce and Economics, December 2018, p.12., https://www.usitc.gov/publications/332/journals/the_supply_chain_for_electric_vehicle_batteries.pdf

51. Echo Huang, “China’s Breaking up the EV Battery Monopoly it Carefully Created,” Quartz, 25 June 2019, https://finance.yahoo.com/news/china-breaking-ev-battery-monopoly-130837519.html

52. Damien Ma and Neil Thomas, “China is Building the Batteries of the Future,” Foreign Policy, 02 April 2019, https://foreignpolicy.com/2019/04/02/china-is-building-the-batteries-of-the-future-tesla-li-ion/

53. U.S.-China Economic and Security Review Commission, 2019 Annual Report to Con-gress, Chapter 3, Section 2, op.cit., p.228.

54. Ibid.

55. Ibid., p.232.

56. Abhishek Bhalla, “Indian Army’s contract-based model for tank, military vehicle repair faces hurdles: CAG report,” India Today, 01 December 2021, https://www.indiatoday.in/india/story/indian-army-contract-based-model-repair-work-tanks-military-vehicles-face-delays-cag-report-1882705-2021-11-30

57. “India to get emergency landing facilities for fighter jets at 20 places. Full list,” Mint, 10 September 2021, https://www.livemint.com/industry/infrastructure/india-to-get-emergency-landing-facilities-for-fighter-jets-at-20-places-full-list-11631252994132.html

58. “China builds 'xiaokang border defence village' in Arunachal: Implications for India's security”, First Post, 10 November 2021, https://www.firstpost.com/india/china-builds-xiaokang-border-defence-village-in-arunachal-implications-for-indias-security-10124821.html

59. Rahul Tripathi," Districts abutting China earmarked for Border Area Development plan," The Economic Times, 02 July 2020, https://economictimes.indiatimes.com/news/defence/districts-abutting-china-earmarked-for-border-area-development-plan/articleshow/76746963.cms?from=mdr

60. Defence ministry's third negative import list prohibits import of another 101 items", Dec-can Herald, 07 April 2022, https://www.deccanherald.com/national/defence-ministrys-third-negative-import-list-prohibits-import-of-another-101-items-1098572.html

61. "Airbus-Tata Consortium to Manufacture C-295 Transport Aircraft in Vadodara", The Wire, 27 October 2022, https://thewire.in/business/airbus-tata-consortium-to-manufacture-c-295-transport-aircraft-in-vadodara

62. "Joint Venture" BrahMos Aerospace, https://www.brahmos.com/content.php?id=1

63. "Technology Perspective and Capability Road Map" HQ IDS, April 2013, https://www.mod.gov.in/sites/default/files/TPCR13.pdf

64. T. V. Padma, "India bets big on quantum technology", Nature, 03 February 2020, https://www.nature.com/articles/d41586-020-00288-x#

65. Commander Subhashish Sarangi, "National Initiatives on Artificial Intelligence in De-fence," United Services of India, Strategic Perspectives April-June 2019, https://usiofindia.org/publication/cs3-strategic-perspectives/national-initiatives-on-artificial-intelligence-in-defence/

MILITARY-CIVIL FUSION IN CHINA AND LESSONS FOR INDIA

Lt Col Saurabh Dixit*

"We must accelerate the formation of a full-element, multi-domain, and high-return military-civil fusion deep development pattern, and gradually build up China's unified military-civil system of strategies and strategic capability."

- **Xi Jinping (speaking to the Central Commission for Military-Civil Fusion Development On June 20, 2017)**[1]

In the present era, **the standing of a nation state in the world order and its performance in the Competition-Crisis-Conflict continuum** is not merely dependent on the military prowess but also on the **Comprehensive National Power** which includes **synergetic utilisation of all the National Strategic Resources**. The ongoing Russia-Ukraine conflict is a glaring example of the same wherein synergetic utilisation of Government, Military, Cultural and International resources has given **competitive advantage to the seemingly militarily weaker side**.

People's Republic of China (PRC) has pursued some form of **Military-Civil integration right from the Mao era itself**. According to **Chinese strategists, modern warfare is also characterized by a systems confrontation** that pits nation states' respective defence strategies, systems and **degree of civil-military synergy against one another apart from other elements**. The competition's outcome will be determined by a **nation's adaptability and ability to muster** the will and **strength of society** as a whole to **support security and developmental goals**. Military-Civil Fusion (MCF), in their view, is

regarded as a state governance approach that will ensure **development of PLA into a world class military by 2049** and could **directly enable China's ability to prevail in a long-term strategic competition**.[2]

As far as MCF in India is concerned, the foundational ethos are undergoing rapid changes. The establishment of the Chief of Defence Staff (CDS) & Department of Military Affairs (DMA) has been path-breaking as it empowers **the defence services to think, articulate, design and drive changes in an integrated manner under the overarching umbrella of the national security architecture**. Historically, MCF has formed part of **India's early modern history** wherein the foundation of British Colonialism in India was laid through the successful **MCF between the British East India Company and the British Crown**.

Aim

The aim of this paper is to analyse the theoretical framework and strategic goals of China's Military-Civil Fusion Strategy and lessons for India.

Preview

This paper has been divided into the following parts :-

- **Part** I. Theoretical Framework and Strategic Goals of China's Military in Civil fusion strategy.
- **Part II**. Military-Civil Fusion in India and lessons from the Chinese model.

Part I : Theoretical Framework and Strategic Goals of China's Military-Civil Fusion Strategy

Growth of Military-Civil Fusion Strategy in China. **The Chinese strategic thought process when analysed historically has always linked security of the state with its overall development**. Examples of Military-Civil integration in the **early Chinese history** can be found in the **Tuntian System** or "**Strategy of Military Farms**" implemented during the **reign of Western Han dynasty (206 BCE – 9 CE)**, wherein **farmers, soldiers and refugees** were utilised as a **collective human resource** to turn uncultivated land in the harsh landscapes of Chinese

frontiers into **self-sustained, agrarian settler colonies** while also **providing logistical support to the military**.[3] Since the founding of the People's Republic of China, each generation of leaders of the **Chinese Communist Party (CCP) has promoted a version of this idea driven by prevailing Geo-Strategic contours of the era**. A comparative analysis of growth of the concept during different Chinese leadership is given as under :-

Leadership	Period	Geo Strategic Compulsions / Policy decisions	Underlying Theme of Civil - Military Integration
Mao Zedong	1949-1954	**Conflict in the Korean peninsula**	Primacy of Defence expenditure in the overall budget (30% in 1953)[4]
	1958-1962	**Great Leap Forward (2nd Five year plan)**	Encouragement to defence industries to establish dual use production lines (**74.5% civilian products of the total defence industry output in 1960**)[5]
	1965-1976	**Sino-Soviet split**; withdrawal of soviet aid to **China's civilian and defence development programs**	Refocused efforts on defence production Civilian production lines removed from defence industry Decoupling of defence industry from soviet system
Deng Xiaoping	1978-1993	Chinese Economic Reforms – **Four modernisations**	National defence and force building took a back seat to economic development
Jiang Zemin	1993-2003	Imposition of an embargo by west on military equipment sales to China as a result of **Tiananmen Massacre of 1989.** United States' decisive victory in the **Gulf War**, the arrival of the **Revolution in Military Affairs (RMA)**, air campaigns against Bosnia (1995) and Kosovo (1999)	Need for access to advanced defence technologies Scope of civil-military integration expanded beyond the defence industrial base to include infrastructure, logistics, education, and others sectors. Constructing a civil-military integrated national defence technological and industrial ecosystem

Leadership	Period	Geo Strategic Compulsions / Policy decisions	Underlying Theme of Civil - Military Integration
Hu Jintao	2003-2012	Inclusion of Military-Civil fusion in the **12th five year plan**	Military-Civil fusion style development path with Chinese characteristics Aligning the design and formulation of China's national defence strategies with its national development strategies
Xi Jinping	2012-	**'Made in China 2025'** plan released in May 2015 Opinion on the **Integrated Development of Economic Construction and National Defense Construction** released by the CCP Central Committee, the State Council, and the Central Military Commission (CMC) in 2016 First meeting of the **Central Commission for Military-Civil Fusion Development** on June 20, 2017	**Transition from "early-state fusion" to "deep fusion"** Unified military-civil system of strategies and strategic capability

Goals of China's MCF Strategy. On June 20, 2017, Xi Jinping, speaking to the Central Commission for Military-Civil Fusion Development (CCMCFD), articulated his vision for the Military-Civil Fusion strategy. This was reiterated four months later during his speech delivered on October 18, 2017 during 19th Party Congress speech. The analysis of these speeches in the state run media has highlighted the goals of the strategy as under :-

- **Near Term Goal**. The near-term goal of the MCF strategy is achieving a state of "**MCF deep development**" characterized by streamlined processes and resource sharing to achieve **interconnectivity, higher efficiency, and optimal llocation of resources**. **Figure I** illustrates the core components of the "**military- civil fusion deep development pattern**" based on the analysis of the Xi Jinping speeches carried out by state run media.

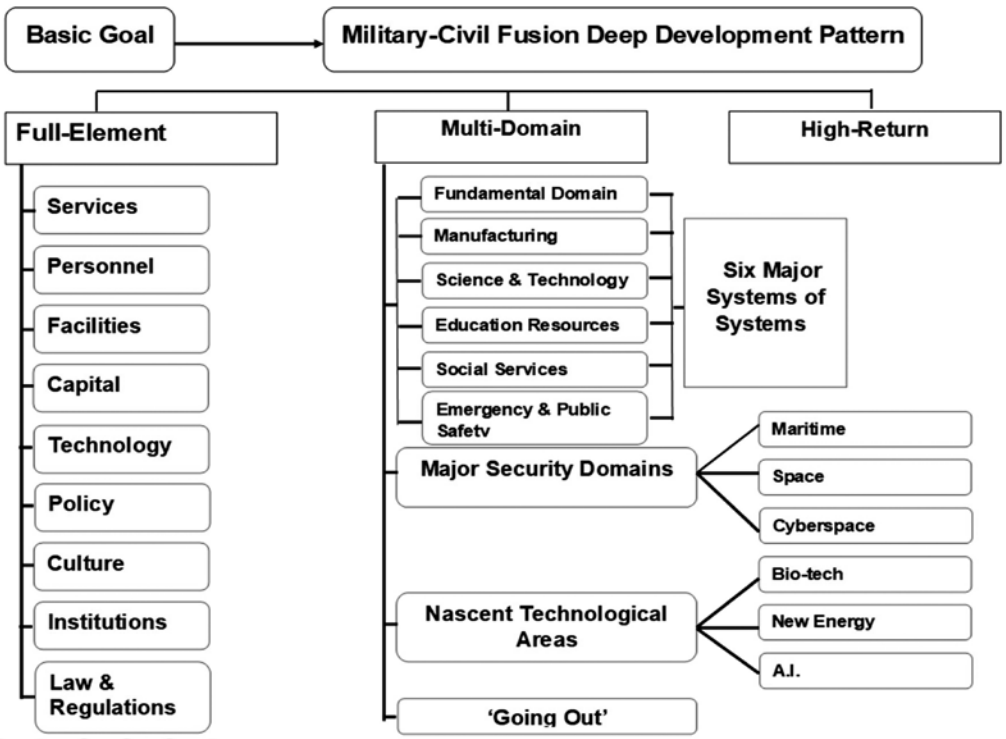


Figure I: Chinese Military - Civil Deep Development Pattern (Adopted by the author from study on 'China Military - Civil Fusion Strategy' published by CASI)

The three core components are described as "**full-element," "multidomain," and "high-return**". The "**full-element**" attribute defines the types of resources shared between the military and civilian sectors; the "**multi-domain**" attribute identifies the domains prioritized for MCF development. Taken together, they provide a **roadmap for MCF development, explaining how China plans to achieve the deep fusion pattern**. The last attribute -"**high return**"- describes the

effects Chinese leaders and MCF strategists hope to derive from MCF development.

- **Long Term Goal**. The long term goal of the MCF strategy is to gradually build up China's "**unified military-civil system of strategies and strategic capability**" which entails gradual unification all of the various military and civilian strategies in a way that creates a strategic capability for success in a systems confrontation. **Figure II** has been adopted from a report by **Alex Stone and Peter Wood for the China Aerospace Studies Institute** and illustrates how each core component of the **MCF strategy might interact with the national strategic priorities**.

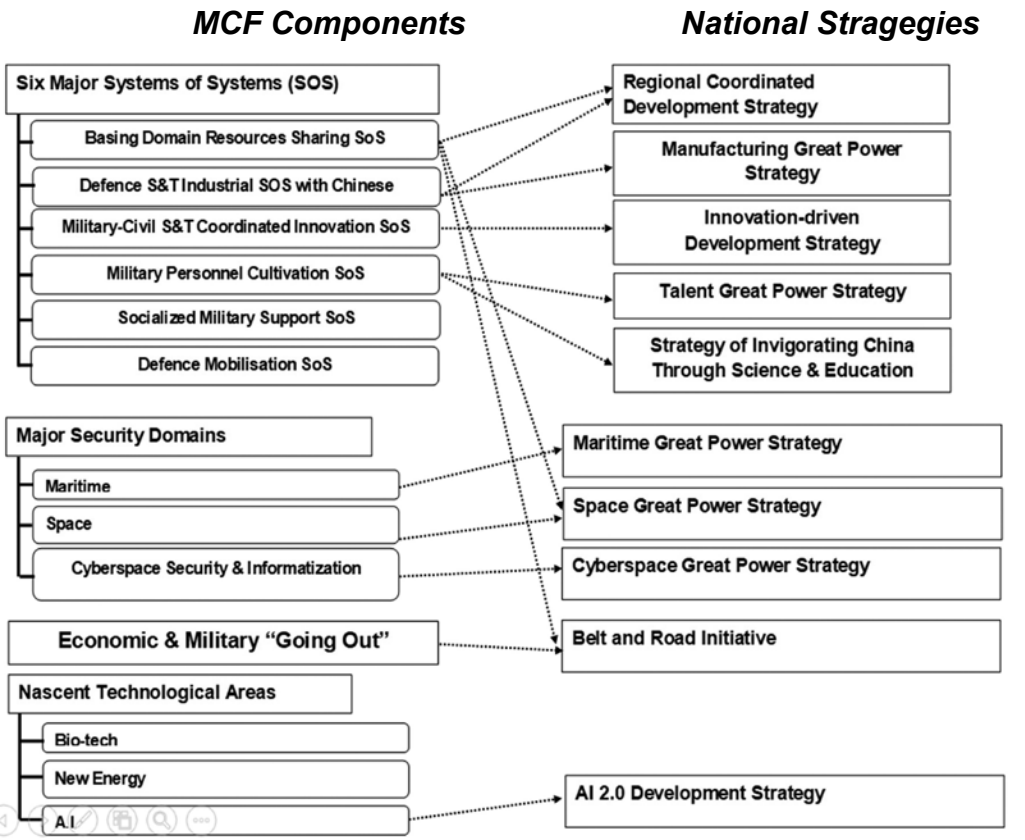


Figure II : Chinese Unified Military-Civil System of Stratgies (Adopted by the author from study on 'China Military - Civil Fusion Strategy' published by CASI)

Organisational Framework For MCF. China had previously relied on the **Department of CMI (Civil Military Integration) Promotion of the Ministry of Industry and Information Technology to act as the administrative body over CMI work**. This mechanism has **proved ineffective and ill-adapted at advancing MCF development**. This department lacked the authority to oversee much of the day-to-day operations that concern various civil and military institutions whose actual management was in the hands of other **higher-ranking agencies, such as MOST, NDRC, and SASTIND**. In **January 2017, Xi Jinping unified the leadership for MCF development** by establishing the CCP Central Commission for **Military-Civil Fusion Development (CCMCFD)**, which he personally chairs.

The **CCMCFD reports to the CCP Politburo** and the Standing Committee of the Politburo and acts as the **highest level decision-making and deliberative coordination mechanism for major issues in MCF development**. Table 1 presents the 27 founding members of the CCMCFD. Four out of the seven Politburo Standing Committee members, 10 out of 25 Politburo members, and five out of the 10 CMC members served on the committee. Several heads of the central Party organs and ministers of the State Council were also represented on the committee.

Table 1 : Founding Members of the Central Military-Civil Fusion Development Committee

Post in the Committee	Name	Leadership Position
Head	Xi Jinping	CCP General Secretary, PRC President
Deputy Head	Li Keqiang	Premier, PSC Member
	Liu Yunshan	Executive Secretary, CCP Secretariat; PSC Member
	Zhang Gaoli	Executive Vice Premier, PSC Member
Members	MA Kai	Vice Premier, Politburo Member
	Wang Huning	Director, Central Policy Research Office; Politburo Member
	Xu Qiliang	CMC Vice Chair, Politburo Member
	Fan Changlong	CMC Vice Chair, Politburo Member
	Meng Jianzhu	Secretary, Central Political and Legal Com; Politburo Member
	Li Zhanshu	Director, General Office of the Central Com; Politburo Member
	Yang Jing	State Councilor, Secretary-General of the State Council
	Guo Shengkun	State Councilor, Minister of Public Security
	Zhang Yang	CMC Member; Director, CMC Political Work Department
	Zhao Keshi	CMC Member; Director, CMC Logistics Support Department
	Zhang Youxin	CMC Member; Director, CMC Equipment Development Dep't
	Chen Xi	Executive Deputy Director, Central Organization Department
	Huang Kunming	Executive Deputy Director, Central Propaganda Department
	Xu Lin	Director, Office of the Central Internet Info, Leading Group
	Zhang Yesui	Party Secretary, Ministry of Foreign Affairs
	He Lifeng	Minister, National Development and Reform Commission
	Chen Baosheng	Minister of Education
	Wang Zhigang	Party Secretary, Ministry of Science and Technology
	Miao Wei	Minister of Industry and Information Technology
	Huang Shuxian	Minister of Civil Affairs
	Xiao Jie	Minister of Finance
	Yin Weimin	Minister of Human Resource and Social Security
	Li Xiaopeng	Minister of Transport

Funding For MCF. The **MCF strategy** has emerged to be not just an **ideologically driven campaign** but one which has **institutionalised funding support** from the state. As per a study carried out by **US based Centre for Strategic and International Studies** in 2019, 42 MCF related **investment funds were identified** - among them 2 national funds, 27 created by localities, and 13 created by companies. The study calculated that these funds collectively total at least $73 Billion. MCF **funds encapsulate the concept** of **China's MCF strategy**. The funds are encouraged, and often initiated, by the Chinese government with the **intention for civilian enterprises to invest in them**. **Local governments** are heavily involved in the **establishment of MCF funds**, which reflects substantial central pressure on **local officials to implement MCF**. Increased enterprise investment in MCF funds also suggests that the **private sector sees potential return of investment in the MCF strategy**. Although the provincial distribution of funds does not provide a clear trend, it indicates that actions are being taken to **implement the MCF strategy on central, local and commercial levels**. The map below depicts the total value of MCF funds within each province.

Source: Bureau of Economic Analysis, U.S. Department of Commerce.

Part II : Military-Civil Fusion In India And Lessons From The Chinese Model

Need For Military Civil Fusion In India. India as a nation has already achieved a high degree of Civil-Military integration which is evident during the handling of disasters in the country. Prior to formulating a **MCF strategy for India**, it is imperative to understand the intended effect of the strategy or **why the pursuit of the strategy is essential**. The implementation of a **progressive and dynamic MCF strategy** is likely to result in following **positive outcomes** :-

- **Economic Growth**. **India is currently at a critical stage of transformation into an economic powerhouse of the world** wherein it is widely recognised as **the fifth largest economy in the world**. The MCF strategy is likely to empower continued economic growth for India due to envisaged impetus on devp of **dual use infrastructure, opening up new business opportunities** thus generating more **employment and efficient use of resources**.

- **Technological Prowess**. **Development of disruptive technologies** has emerged as a **major area of investment** at the Intl level. Since Military Civil fusion entails integration of the nation's military and **civilian technological R&D resources and enhancing the military-civil coordinated innovation capability** development, **MCF strategy** for India is likely to **further enhance the technological prowess of India** wherein the **Armed Forces are likely to become the harbingers of the technological developments** in the country.

- **Optimising The Governance System**. The implementation of **MCF strategy** is likely to enable **creation of a Civil-Military integrated governing system across sectors, government bodies, and domains** resulting in optimum utilisation of National resources and availability of a platform at various levels.

- **Enhanced Military Capability**. Faced with **internal and external challenges to development and security**, MCF strategy is likely to ensure **enhancement of the overall military capability** by ensuring

that any security challenge to the country is addressed by a **Whole of the Nation approach**.

Effective Implementation of Military Civil Fusion in India. Implementation of a MCF strategy in India requires a **MCF organization and management system** that features **unified leadership, coordination between the military and the civilian sectors, and effective pathways** of communication. Since effective implementation of the **MCF strategy in India** will require **inter-ministerial and Central Govt-State Govt coordination**, the MCF organisational structure is recommended to be **driven from the Apex level of the Governence**. A suggested model of the Organisational structure for **Military Civil fusion at the apex level** alongwith recom composition of various sub-structures is depicted at **Figure III**. The indicative lines of efforts of the various sub-structures are enumerated at **Table 1**. It entails constitution of a **Cabinet Committee on Military Civil Fusion** and **seven different National Commissions** as under :-

- National Commission for **MCF in External Affairs**.
- National Commission for **MCF in Higher Education**.
- National Commission for **MCF in Manufacturing**.
- National Commission for **MCF in External Affairs**.
- National Commission for **MCF in Strategic Mobilisatin and Operational Logistics**.
- National Commission for **MCF in Technology and Innovation**.
- National Commission for **MCF in Border Area Development**.
- National Commission for **MCF in Strategic Communications and Perception Management.**

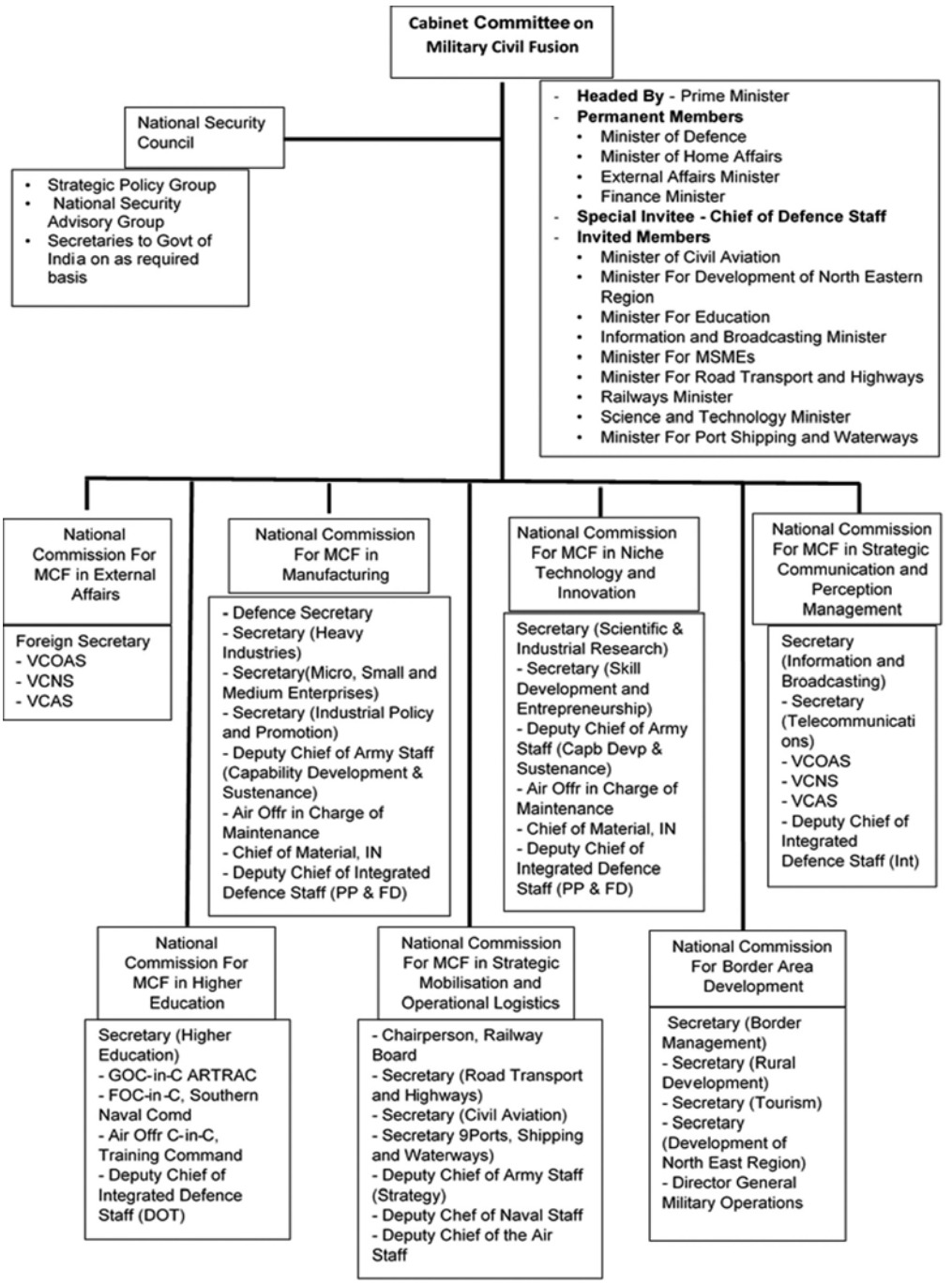


Figure-III : Organisational Structure for MCF in India

Tabe –II : Suggested Lines of Effort of National Commisions For MCF

National Commissions	Lines of Effort
National Commission For MCF in External Affairs	-Formulate **regulatory framework** to **encourage cooperation with internationally renowned** scientific **research institutions**, establish R**&D institutions overseas**, and build international cooperation platforms such as **joint research centres**, technology transfer centres, **technology demonstration promotion bases**, and **science and technology hubs** with countries with innovative advantages in niche domains. -Promote construction of **overseas logistics support and sustainment systems** with a view to enhance **strategic footprint of India**. -**Deepening of International military exchanges** and defence cooperation by empowering of Offices of Defence Attaches / Military Attaches and Overseas Military Training teams
National Commission For MCF in Higher Education	-Expansion in the scope of universities, IITs and other technical institutes with national defense characteristics to include funding to **strengthen individual faculty departments**, **disciplines with defense characteristics** and **development of defense oriented laboratories** - Formulate **regulatory framework** to leverage **civilian education resources** to complement and improve the **Professional Military Education in the Armed Forces** -Preparation and implementation of a **long term plan** to **leverage Agniveers** and **retired military personals** to support India's economic development by suitably empowering them with relevant skill sets

National Commissions	Lines of Effort
National Commission For MCF in Manufacturing	**Formulate Regulatory Framework for uniting the Defense Technology and Industrial Base and the larger Commercial Technology and Industrial Base to utilise common technologies, processes, labor, equipment, material, and/ or facilities for both defense and commercial needs.** **-** Oversee **implementation of 'Atmanirbhar Bharat' in the defence manufacturing sector** and formulate mechanisms to promote indigenous defence manufacturing industry -Formulating **regulatory framework** to make structural adjustments to the **defense product R&D ecosystem** nationwide, regardless of the nature of ownership **-**Oversee **corporatisation of Ordnance Factories** **-**Initiate and oversee **reorganization, restructuring, privatization, asset sales, mergers and acquisitions in Defence Public Sector Undertakings including DRDO** -Preparation and implementation of a **long term plan** to develop **dual use capability of state owned / public sector manufacturing industry** -Study the barriers to participation in Defense Production and initiate reforms -Promote integration of the indigenous defense industry and regional economies under the framework of India's regional development strategies like SAGAR

National Commissions	Lines of Effort
National Commission For MCF in Strategic Mobilisation and Operational Logistics	Formulate regulatory framework for the Defence Forces to rely on large and medium-sized transportation enterprises (both public and private) to organize and build strategic delivery support forces, enhance strategic delivery capabilities, and provide effective support for the rapid organization of long-distance and large-scale defense transportation. leveraging the national social service system and private sector resources to support the logistics functions—such as health services, housing, utilities, provisions of food—that help improve the quality of life of military personnel. Establish strategic cooperation with leading logistics and delivery service private sector companies to enable a civil-military integrated logistical delivery system capable of supporting and sustaining integrated joint wartime operations, HADR and OOAC operations. Leverage technologies such as cloud computing, big data, and the Internet of Things to innovate support models, upgrade support methods, and improve the quality and efficiency of logistics support. **Airways :** - Establish Joint working mechanism between DGCA, BCAS and Defence Forces - Enhance airport compatibility; build military-civilian airports - Optimize airspace usage

National Commissions	Lines of Effort
	- low-altitude airspace management reform; - establish dynamic airspace management and flexible use mechanisms **Railways :** - Strengthen the construction of major railway corridors in strategic directions - implement national defense requirements in railway construction and transformation **Highways :** - Dual use capability of Highways as auxiliary runways for aircraft - Strengthen Border Roads infrastructure to enhance strategic mobilization capacity **Sea lanes and Waterways :** - Regulatory framework for repurposing civilian vessels for Naval usage - Plan the security of Sea Lanes of Communication, and build corresponding logistics support facilities in line with Sagarmala initiative
National Commission For MCF in Niche Technology and Innovation	-Promote Two way transfer of mature technologies -Promote sharing of military and civilian resources including research facilities and collaborative innovation among industries -Setting up of military-civilian collaborative innovation research institutions to jointly promote high-tech R&D and commercialization of the resulting technologies

National Commissions	Lines of Effort
	- Space : - Oversee the coordination and promote data sharing between ISRO and Defence Space Agency - Promote the sharing of satellite resources between military and civilian entities - Promote military utilisation of GAGAN and NavIC services of ISRO -Promotion of space scientific research, enhancing space weather monitoring, early warning capabilities and improving civil-military coordinated response to space security threats **Cyber :** -Create and maintain a cybersecurity joint defense and control mechanism (cyber security monitoring, early warning capabilities and emergency responses) between Defence Cyber Agency and civilian resources.
	AI : -Effective utilisation of AI technology towards defense applications, encourage civilian researchers to participate in major national defense-related AI research, promulgating common standards for military and civilian AI technologies and setting up of shared platforms to promote AI based innovation
National Commission For Border Area Development	**-Effective utilisation of 'Vibrant Villages' initiative to amalgamate the Border area population in the overall operational construct of the Armed Forces** **-Strengthen the Border area infrastructure to be utilised during conflict**

National Commissions	Lines of Effort
National Commission For MCF in Strategic Communication and Perception Management	**Strategic Communications :** - Optimize the layout of satellite communication system - Oversee implementation of National Geo-Referencing Framework - Coordinate Military Electromagnetic Spectrum Management System **Perception Management** -Establishing a civil-military coordinated response mechanism to routinely guide public opinions, monitor and manage opinions during major news outbreaks, and strengthen screening of sensitive military information online to avoid leaking military secrets.

It is clear from the **Chinese experience** that the **leadership required to set in motion the goal of MCF** must be at the **very apex** level of the Governance. This has also been **validated by India's own experience in its nuclear and space programmes**. Due to the **inherent federal and parliamentary nature** of the **governing system** of the country, it is imperative that the **Military Civil Fusion is implemented in a tiered manner** wherein the first tier can be the **Cabinet Committee For MCF at the Apex** decision making level, the second tier can be the National Commissions For MCF at the policy formulation level and the **third tier can be the Departmental / Agencies / State Government level** responsible for effective implementation of the MCF policies.

***Lt Col Saurabh Dixit** is an Infantry Officer who has served in Counter Insurgency and Counter Terrorism in respective theatres. The Officer is an alumnus of Defence Services Staff College, Wellington.

Endnotes

1. See “CCP Central, State Council, CMC release Opinion on the Integrated Development of Economic Construction and National Defense Construction”, Xinhua, 21 July 2016, http://www.xinhuanet.com//politics/2016-07/21/c_1119259282.htm.
2. Alex Stone, Peter Wood (n.d.), “China’s Military-Civil Fusion Strategy”, China Aerospace Studies Institute, P. 23.
3. L. Dreyer, Edward (2008). "Zhao Chongguo: A Professional Soldier of China's Former Han Dynasty"
4. Bo, C. and Xing, X. (2011), "Military Spending and Economic Growth in China, 1953–2007: A Note on Econometric Analysis by Using Eviews", Chatterji, M., Bo, C. and Misra, R. (Ed.) Frontiers of Peace Economics and Peace Science.
5. “CCP Central, State Council, CMC release Opinion on the Integrated Development of Economic Construction and National Defense Construction,” Xinhua, 21 July 2016; Jiang et al., Initial Discussion on the Military-Civil Fusion Strategy, 60-61; Jin Zhuanglong “Promote Military-Civil Fusion Deep Development in the New Era, Xinhua, 16 July 2018, http://www.xinhuanet.com/politics/ 2018-07/16/c_1123133733.htm.
6. Alex Stone, Peter Wood (n.d.), “China’s Military-Civil Fusion Strategy”, China Aerospace Studies Institute, P. 38.
7. Cheng Li, “China’s Military-Civil Fusion: Objectives and Operations” Aug 30, 2022

   https://www.chinausfocus.com/2022-CPC-congress/chinas-military-civil-fusion-objectives-and-operations.
8. ibid.
9. Audrey Fritz and Scott Kennedy, “China's Military-Civil Fusion Funds: Big but Not Necessarily Effective”, October 4, 2019

   https://www.csis.org/blogs/trustee-china-hand/chinas-military-civil-fusion-funds-big-not-necessarily-effective.
10. ibid.

CHALLENGES TO INDIA'S LAND BORDER MANAGEMENT: A CALL FOR AN ALL OF GOVERNMENT APPROACH

Maj Gen Alok Deb, SM, VSM (Retd)*

'*A border is a real or artificial line that separates geographic areas. Borders are political boundaries. They separate countries, states, provinces, counties, cities, and towns. A border outlines the area that a particular governing body controls. The government of a region can only create and enforce laws within its borders…'*

National Geographic Education Resource Library

'When goods do not cross borders, soldiers will'

Frederic Bastiat (1801-1850), Prominent French economist, thinker and Member of the National Assembly

Introduction

Borders are expressions of national sovereignty. Disputes over these have been at the root of most conflict throughout human history. Borders have been created, redrawn or removed altogether based on the outcome of political and military engagements between nations, mainly through the use of force supplemented with diplomacy, or through a mix of compromise and consensus. Borders could be open, controlled or fortified; they can alternatively be classified as hard (fenced and guarded), or soft (open with regulations). Equally there are many

instances of unsettled or contested borders with both sides putting up conflicting claims. These conflicts have given rise to de facto borders that separate the respective rival militaries. As of today it is only the India Nepal border which does not require any travel documents for people crossing over from either side. Travel from India to Bhutan requires either a valid passport or voters card. Even the US Canada border requires documents.[1]

The fallout of 21st Century globalisation, has brought additional challenges for border management – security related, economic, climate induced and humanitarian. This necessitates an all encompassing and nuanced approach of nations towards management of borders at land and sea. In this regard, Frederic Bastiat's 19th century observation quoted above is extraordinarily prescient. However, the challenge of preventing any erosion of national sovereignty remains. Thus depending on respective inter state relations, a degree of control over entry and exit of people, goods and services at a border will always need to be exercised.

Prior to 1947, India was one political whole where economic, cultural and ethnic commonalities were drivers for movement of people, goods and services across this integrated landmass. Hastily imposed and artificial post partition borders on this previously united entity have led to unceasing conflict and tension. The legacy of unsettled borders with Tibet has resulted in similar outcomes. Consequently, issues of delimitation, demarcation and delineation continue to bedevil relations with most of India's neighbours. Borders cut across villages, and even houses of inhabitants of common ethnicity, giving rise to piquant situations[2]. Against this background and to bolster its position as *'primus inter pares'* in South Asia, India cannot apply the security related template alone for managing its different borders. ***An inclusive 'all of government approach', catering for aspects ranging from the military and security related to the geopolitical, economic and attendant aspects of border policy is mandated, to arrive at sound, mutually acceptable and progressive solutions.*** Such an approach has helped solve knotty issues earlier – resolution of the maritime dispute with Bangladesh after detailed consultations between all stakeholders including the Indian Navy is a case in point.

Outline Responsibilities for Border Management

India shares land borders with Pakistan (3323 Km), China (3488 Km), Nepal (1751 Km), Bhutan (699 Km), Bangladesh (4096.7 Km) and Myanmar (1643 km)[3]. Its border with Afghanistan through Pakistan Occupied Kashmir (POK) abutting the Wakhan Corridor extends 106 Km[4]. Each border has its own singular characteristics of terrain, climate, vegetation, population density, ethnicities and state of economic and infrastructural development including communications on either side. The Border Management Division of the Ministry of Home Affairs (MHA) has deputed one border guarding force (BGF) to guard each border. Thus the Border Security Force (BSF) is responsible for the India Pakistan and India Bangladesh borders, the Indo Tibetan Border Police (ITBP) for the entire Northern Border with Tibet / China, the Sahastra Seema Bal (SSB) for Nepal and Bhutan borders, and the Assam Rifles (AR) for the India Myanmar border[5]. However in the case of Pakistan and China, there are different categories of borders with each country, as amplified in succeeding paras.

The Line of Control (LoC) with Pakistan. The India Pakistan border, delineated by Sir Cyril Radcliffe just prior to partition in 1947 is unambiguous[6]. Accession of the princely state of Jammu and Kashmir extended this border Northwards from Punjab. Pakistan's invasion of Jammu and Kashmir immediately after this event and the subsequent Ceasefire Agreement of Karachi in 1949 gave rise to the Cease Fire Line (CFL) ***which expressly delimited the contested areas between the two nations at that time including the Siachen Glacier[7] (effectively rendering as meaningless Pakistan's claims to the contrary)*****.** The CFL subsequently has incorporated realignments after the 1971 war, giving rise to the current LoC in Jammu and Kashmir, defended by the Army. The BSF is also deployed in company strength here, under command of the Army during both peace and war. During peacetime it operates independently from the Jammu sector southwards along the international border (IB) with Pakistan, coming under the Army's command during war. Notwithstanding the current ceasefire, ***a realistic appraisal indicates that with Pakistan's continuing proxy war against India, the LoC will remain heavily militarised - a live border***

where even a small incident can dangerously escalate matters. Functioning of the five closely monitored crossing points (designated in 2005) is dependent again on the political and security situation prevailing[8]. Incidentally, the United Nations Military Observer Force for India and Pakistan (UNMOGIP) whose mandate to monitor the CFL has long expired also continues to be located in Kashmir.

The Line of Actual Control (LAC) and McMahon Line with China (Tibet). The 1962 war with China resulted in creation of the LAC in Ladakh. Eastwards, other portions of the IB with China lie across Himachal, Uttarakhand and Sikkim. Thereafter the McMahon Line (not recognized by China) defines the border between Arunachal Pradesh and Nyingchi Prefecture in Tibet. The Indian Army is deployed in strength along the LAC. The ITBP is deployed here too. The constantly aggressive Chinese posture the last few years culminating in border clashes in 2020 has resulted in a complete break in any communication across this border, with the Kailash Mansarovar Yatra postponed for the third year in succession[9] and even routine mail exchanges across the Nathu La in Sikkim suspended. *This situation has been further aggravated by the clash at Yangtse in December 2022. Almost the entire Northern Border is now akin to the LoC where a ''No War No Peace scenario prevails, with heavy troop, equipment and infrastructure build up on both sides.*

Border Guarding Mechanisms

Other than the LoC and LAC, the balance of India's borders fall in the open or controlled categories. Here, security threats are more in the arena of the non-conventional, as against purely territorial. These include illegal immigration, trafficking of humans, smuggling of weapons, currency and drugs, movement of insurgents across international boundaries, and others. Most of these threats are aided and abetted by forces inimical to India. The modus operandi of BGFs to guard against these is given in succeeding paragraphs.

Border Outposts (BOPs). BGFs ensure 'area dominance', by deploying BOPs which despatch patrols to cover their areas of responsibility. Essentially defensive in nature, deployment is carried out keeping in mind considerations like task, frontages, ground configuration,

communications, nearby habitations, history of the area, ability for self defense and so on. Additionally, on riverine terrain on the India Bangladesh border the concept of 'Floating BOPs' has been found useful. Where populations reside close to the border, BOPs are perforce deployed forward. *Given such a methodology, the dichotomy in the mandate and command and control arrangements of the ITBP vis a vis operational necessity is stark. It is deployed in BOPs for guarding the LAC against non conventional threats which do not exist. Also, it does not come under command of the Army (which shoulders ultimate responsibility) even in the current state of heightened tension when an integrated defensive posture is an operational imperative.* In the case of the India Myanmar border however, the Assam Rifles is deployed in Company Operating Bases (COBs) on a grid system, stretching into the hinterland where it also carries out counter insurgency (CI) operations.

Movement of Goods and Personnel. Movement of goods and services at authorised crossing points is regulated through a number of Integrated Check Posts (ICPs) that provide multiple transit services, Land Customs Stations (LCSs) for goods alone and Immigration Check Posts restricted to people. Considering the importance of trade and transit, it becomes vital to ensure security of these crossing points for unimpeded movement of goods and people. With subcontinental trade increasing yearly (except with Pakistan) boosted by enhanced road and rail connectivity, the number of these check posts continues to increase.

Upgraded Border Fencing. Patrolling is carried out astride the fencing put up at most parts of the Bangladesh and Pakistan borders, and in a very limited portion on the Myanmar border. The MHA envisages that the India Pakistan and India Bangladesh borders will be completely fenced by 2022[10]. These fences are floodlit and in certain areas of Punjab and Jammu, electrified. As part of its 'smart fencing' concept, the MHA has completed two pilot projects of the Comprehensive Integrated Border Management System (CIBMS), one each on the above mentioned borders covering a total of 71 Km[11]. The CIBMS *'involves deployment of a range of state-of-the-art surveillance technologies — thermal imagers, infra-red and laser-based intruder alarms, aerostats for aerial surveillance, unattended ground sensors that can help detect intrusion*

bids, radars, sonar systems to secure riverine borders, fibre-optic sensors and a command and control system that shall receive data from all surveillance devices in real time…'[12]. The CIBMS seeks to overcome challenges posed by riverine terrain, swamps, creeks and inhospitable areas that hinder physical movement, to finally cover a total of 1855 km across both borders, in multiple patches. It needs to be mentioned that fencing across the India Bangladesh border has come about after overcoming multiple challenges – the hostile attitude of Bangladesh amidst a history of illegal immigration, hurdles in land acquisition and opposition from villagers who feared that their agricultural land beyond the fence would be lost to them[13].

Emerging Challenges to Border Management

Impact of Technology. Terrorists and anti national elements have utilised technology in a big way to enable surveillance, execution of attacks and logistics support across the border. As per Director General BSF, the force has been "bombarded" by the onslaught of drone flights from across the Pakistan border on the western front, and instances of the aerial vehicles bringing drugs, arms and ammunition have more than doubled in 2022[14]. Consequently the BSF has had to upgrade its forensic capabilities to analyse chipsets from downed drones, '..successfully obtaining flight paths, launching and landing points, timings, GPS (global positioning system) coordinates and even messages exchanged.. '[15]. ***A sobering demonstration of the potential of drones for kinetic strikes was the terror attack on Jammu airport in June 2021 using two small drones carrying explosive charges***. Though deduced later that the attack had been launched from Indian soil[16], it has resulted in induction of anti drone equipment, depth patrolling and deeper BSF – state police coordination. Supply of food and medicines to infiltrated terrorists via drones is another threat. The BSF is now deploying 'laser-equipped anti-drone technology and anti-drone guns along the Intentional Border (IB) with Pakistan at 30 spots in Punjab'[17]. ***Given issues of air space management and air defence, anti drone operations become another area where detailed coordination between BSF, state police forces and the Army is a 'sine qua non'.***

Challenges of Enhanced Jurisdiction. In October 2021 the Central Government amended the jurisdiction of the BSF, empowering it to conduct searches, make arrests and seizures upto a uniform distance of 50 km from the international borders[18]. This rectifies a lacuna in West Bengal, Punjab and Assam, states having high population density in border regions, where these provisions were restricted to just 15 km from the border (unlike in others where these went up to 80 km, now reduced to 50 km. This jurisdiction however pertains only to powers under the Passports Act and specific sections of the Code of Criminal Procedure (CrPC), with a view to check illegal migration and crime[19]. It does not include prosecution of offenses. While such a notification is long overdue***, issues like cooperation of the local population, interfacing with the local civil administration and sensitivities of state police need to be factored in for successful execution***. More so, since the scale of deployment is huge - there are 1078 BOPs on the India Bangladesh border alone [20], (in addition to the floating variety, three of which were inaugurated in May 2022)[21]. ***Thus, mutual understanding between various uniformed forces and civilian hierarchy at the ground level for smooth functioning and withstanding myriad pressures is mandatory for effective management.***

Peculiar Aspects of the India Myanmar Border

- **The Fence Agitation**. Four Indian states of Arunachal Pradesh, Nagaland, Manipur and Mizoram share the 1643 Km long border with Myanmar. Most of this border (save the Northern tri junction with China) had been delimited and demarcated by 1967. Despite this, the boundary today remains only a line, cutting across common ethnicities, cultures, languages and relationships with several tribes living astride it. Recognizing this reality, India and Myanmar instituted the Free Movement Regime (FMR), permitting movement with a border pass, of local tribespeople through designated points upto a distance of 16 Km on either side of the border (reduced from the earlier 40 Km in 2010) for a stay of upto two weeks (movement was suspended due to covid and has yet to resume). However the porosity of the border in certain places in Manipur with movement of traffickers and insurgents, made it necessary to erect a 10 Km long

fence around Border Pillars 79 to 81. As work commenced, there were protests from locals as well as the Myanmar government. A total of four km was constructed before the project was suspended in 2013 after large scale protests[22]. Work recommenced in 2022 with a total of 5.6 Km completed, only to be suspended again, with villagers stating that the fence '*would take away between one to three km of Manipur's land'*[23]. ***Balancing border security against local sentiments in this sensitive border region will remain a challenge even as proposals for extending the fencing in Manipur and other states are examined, with insurgent camps functioning with connivance of state and non state actors.*** The issue is sure to take centre stage once trans border movement, suspended since onset of the covid pandemic is restored.

- **The Impact of Ethnicity.** Increased ethnic strife in Myanmar after the military coup of February 2021 has had its fallout on border management. The Tatmadaw's depredations against ethnic minorities has resulted in a stream of refugees across the open border from Chin state of Myanmar into Mizoram, with whom it shares ethnocultural similarities and historical ties. As of September 2022, Mizoram authorities had registered 30,000 refugees from Chin state (while estimating that the total number was around 40,000) spread out in 60 camps across the state[24]. Initially in March 2021 the MHA had advised the states bordering Myanmar *'to take appropriate action as per law to check illegal influx from Myanmar into India',* stating that *s*tate governments have no powers to grant refugee status to any foreigner with India not being a signatory to the United Nations Refugee Convention of 1951 and its 1967 Protocol[25]. Since then, MHA appears to have reviewed its stand, possibly appreciating local sentiments. The humanitarian activities of the Mizoram government in this regard have also been cited as an example of 'what a model asylum regime could look like for a country that has not ratified the Refugee Convention 1951 and is only half covered by the UNHCR system'[26]. In such a fluid situation, the BGFs face a dilemma, since they require clear directions on tasking and execution***. The larger issue which can crop up in other contexts however remains - of***

balancing an unwritten and ambiguous refugee policy against inviolable tenets of national security. Also, there could be other contingencies – of climate refugees looking to enter the country from regions devastated by climate change[27].

Managing Open Borders. Managing open borders (in the case of Nepal and Bhutan) as against others which are regulated, poses different challenges. India has friendly relations and wide ranging treaties with these strategically important countries. ***Maintaining harmony on the border and shaping peoples' perception through skilled management assume greater importance here, to prevent any incident however small, from vitiating friendly ties.*** The mixed population in border villages where even spouses in a household could have different nationalities necessitates a high degree of situational awareness and access to real time intelligence, in the shadow of the twin menaces of human trafficking and smuggling. The SSB has taken important initiatives such as formation of Border Interaction Teams comprising both men and women constables to gain confidence of the locals, conduct of civic action programs including medical and veterinary camps, and even made satellite imagery available at BOPs to analyse terrain and routes[28]. However the challenge of identifying hostiles remains, as Chinese and Pakistani nationals in the guise of Bhutanese and Nepalese continue attempts at infiltration[29]. ***The lure of India's economy and connected opportunities will continue to trigger trans border movement. Border management accordingly has to be objective, real time and dynamic.***

Conclusion

Given the regional geopolitics of South Asia, it would be impractical currently to consider more flexible models of border management, as prevalent in Europe (the Schengen Area), though here too there are calls for tightening border controls[30]. With conflicts raging in Myanmar and open borders available for exploitation, there is requirement of greater coordination of the civil administrative hierarchy and security forces within India and their counterparts across. There is need for a common policy, inter state coordination with structured and frequent

consultation between civil and security authorities of the four states bordering Myanmar. Considering the fluidity of the FMR, empowering the Assam Rifles with policing powers on own side of this belt as has been done for the BSF, is worth considering.

The aspect of reviewing the mandate and command and control of the ITBP on the LAC has been mentioned earlier. This has to be viewed holistically in light of the fundamental difference between policing a border and defending territory claimed by a hostile neighbour. Preventing further encroachment on grazing grounds in the border villages here again requires a common approach at the political, administrative and military levels. Similar efforts to improve coordination on the border to defeat Pakistan's unabated proxy war which affects all segments of society must continue.

Border policing is a full time 24/7 job. It is tedious, repetitive, time consuming and dangerous. Uninformed policy and consequent actions even in good faith have repercussions on India's relations with its neighbours. An integrated approach with joint civil – security force oversight at all levels is vital. As brought out earlier in this Paper, focussed civil military interaction yields positive results.

Maj Gen Alok Deb, SM, VSM (Retd), *is a former Deputy Director General of the Institute of Defence Studies and Analyses (now MP-IDSA). He is Distinguished Fellow with USI of India and Senior Visiting Fellow with The Peninsula Foundation. A Kargil veteran, he has commanded an artillery division*

Endnotes

1 Though Canada and the USA share the largest undefended border in the world, here too, crossings are permitted only at designated crossing points with respective national immigration authorities advising carriage of documents like valid passports. See Government of Canada https://travel.gc.ca/destinations/united-states

2 'These Naga villagers lead a double life' Yudhajit Shankar Das, Times of India TNN June 08, 2018. The piece pertains to Longwa village of Mon District in Nagaland inhabited by the Konyak tribe. Here the international border between India and Myanmar cuts through the house of the hereditary chief or 'Angh' who exercises control over villages on both sides of the border.

3 Government of India, Ministry of Home Affairs Annual Report 2021-22 available at https://www.mha.gov.in/documents/annual-reports, Chapter 3, Border Management pp 25

4 ibid

5 Ministry of Home Affairs Annual Report 2021-22 pp 25

6 The India Pakistan border drawn in 1947 is sometimes referred to as the 'Radcliffe Line'

7 'Siachen dispute needs India and Pakistan to revisit Karachi Ceasefire Agreement' Amit K Paul, The Print 27 July 2022

8 Joint Statement, India-Pakistan discussions on opening of crossing points across the LoC, October 29, 2005. Media Centre, Ministry of External Affairs, available at https://mea.gov.in/bilateral-documents

9 'Journey to Mount Kailash cancelled for the third consecutive year sans citing reason' ETV Bharat, June 13 2022, available at https://www.etvbharat.com

10 Govt To Fill All Fencing Gaps On Borders With Pakistan, Bangladesh By 2022: Home Minister Amit Shah' https://swarajyamag.com/ Jul 17, 2021

11 'Union Home Minister launches Smart Fencing on Indo-Bangladesh border, an effective deterrence against illegal infiltration' Press Information Bureau release dated 05 March 2019

12 Ibid

13 'India's Approach to Border Management; from Barriers to Bridges' Pushpita Das, Knowledge World Publishers 2021 pp 77

14 'Drones from across Pakistan border more than doubled in 2022: BSF DG' Press Trust of India, Nov 13 2022

15 ibid

16 'Two Drones used in airport attack launched from Jammu' Abhinandan Mishra, The Sunday Guardian 14 August 2021

17 BSF to deploy anti-drone system along Pakistan border' Harpreet Bajwa, The New Indian Express 27 September 2022

18 "Ministry of Home Affairs Notification, New Delhi, the 11th October, 2021", The Gazette of India: Extraordinary.

19 'Implications of the Enhancement of Area of Jurisdiction of the BSF' Pushpita Das, 11 November 2021 IDSA Comment.

20 Ministry of Home Affairs Annual Report 2021-22 pp 26.

21 'Union Home and Cooperation Minister, Shri Amit Shah, on the first day of his two-day visit to West Bengal, inaugurated the Narmada, Sutlej and Cauvery Floating Border Outposts (BOP) on the Indo-Bangladesh border today to protect inaccessible areas of Sundarbans'. Press Information Bureau (PIB) release dated 05 May 2022

22 'India's Approach to Border Management; from Barriers to Bridges' pp 76

23 'Fencing work on disputed Myanmar border areas stopped, says Manipur CM Biren Singh' Iboyaima Laithangbam, The Hindu 23 June 2022.

24 'Over 40,000 refugees from Myanmar based in 60 camps set up in Mizoram, says Rajya Sabha MP' Vijaita Singh, The Hindu September 25, 2022

25 'Stop illegal influx from Myanmar, Centre tells northeastern States' The Hindu 12 March 2021

26 'How Mizoram has set up a de facto asylum regime for Myanmar refugees' Angshuman Choudhury The Indian Express 04 October 2022

27 'India needs to recognise the rights of climate refugees' Surbhi Arul, India Development Review dated 03 June 2022 on https://idronline.org

28 Interview with the Director General Sashastra Seema Bal, Shri Kumar Rajesh Chandra on the eve of the 51st Raising Day of Sashastra Seema Bal. YouTube Akashvani AIR 19 December 2020

29 'India urges Nepal to check the entry of Chinese, Pak nationals through the border' IANS 30 September 2022

30 'A "New Normal" for the Schengen Area. When, Where and Why Member States Reintroduce Temporary Border Controls? Fabian Gülzau, Journal of Borderlands Studies 17 November 2021 DOI: 10.1080/08865655.2021.199626

THE ROLE OF CIVIL - MILITARY FUSION IN SHAPING FUTURE MILITARY LEADERSHIP

Lt Gen AB Shivane, PVSM, AVSM, VSM (Retd)*

"Not all battles are fought with swords."

— Margaret Rogerson

The Doctrinal Construct of Civil-Military Fusion

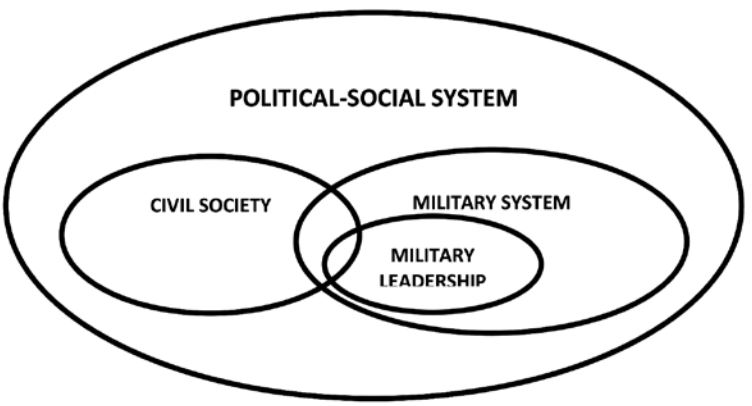
Civil-Military Fusion (CMF) is essentially the fusion of military and civilian resources and capabilities for optimising a nation's comprehensive national power both during war and peace[1]. In a larger sense, CMF is beyond just dual use but the effective military fusion of civilian facilities, technology, and talent and leveraging the close relationships between its defence sector, bureaucrats, politicians, academia, and the private sector. The most important factor in CMF is breaking cultural barriers and establishing linkages with mutual trust to achieve fusion beyond just integration. It thus needs a top-down approach with Politico-Military-Bureaucratic fusion as the doctrinal construct.

Clausewitz stated that *"war is politics by other means"*[2]. Civil-Military relations describe the relationship between military organizations and civil society, military organizations and other government bureaucracies, and leaders and the military. The field is inherently both normative and empirical.[3] Thus, in a democracy, the political leadership based on recommendation from the military and advice pf the bureaucracy execute options for national defence. The outcome strategy is a manifestation of harmonious civil-military relations (CMR) to achieve the desired end state. Thus, while the military needs to understand the instruments of statecraft; the polity, bureaucrats, technocrats, industry and academicians need to understand warcraft too.

CMF has become increasingly relevant in contemporary conflict situations wherein battle zones have permeated the physical battlespace into the societal information space, cognitive domain and technology revolution causing disruptions in military affairs. Thus, deterrence has acquired an integrated construct of the whole-of-nation approach and conflict a whole-of-society approach, wherein neither military nor civil society can exist in silos. The recent Russia -Ukraine Conflict has many lessons not only relating to geopolitics and military, but also of CMF as a future force multiplier.

Amos Perlmutter in his balanced theory of civil-military relations[4] rejects the view that a clear-cut division of functions exists between civilian and military. The assumption *"that professionalism removes military from politics*" is grounded on classical traditions of administrative theory, which is built on the premise that policymaking is distinguished from policy implementation. The modern administrative theory is fusionist, recognising that bureaucracy, military and politics are symbiotically connected. While politisation of military is not desirable yet understanding politics and the political system is necessary at the strategic level. The military's role in the evolution and implementation of the policy on national security, mandates it to be intrinsic in the policy formulation process.

Samuel Sarkesian in his theory on CMF states three areas of civil-military relations as systemic interaction between civilian, military, and political-social systems (Figure Below)[5].



This relationship separates the realisation of CMR into three areas and two layers. The three areas are “political-military”, “political-society”, and “military-society”. The two layers are “institutional” and “cultural”. The institutional layer is a manifestation of laws, procedures and organisations and the second is the cultural layer which influences areas of perception, attitude, trust and behaviour. It accounts for the value system of the actors in civil-military relations, their level of education, exposure and interaction. Thus, the greater the investment in educating the military, bureaucracy, polity and society, the greater the harmony in matters of national security. The greatest challenge will always remain the cultural layer bedded in the historic baggage and thus education becomes the primary means to transform for the future.

It must never be forgotten that in the three primary facets of nation-building - Defence (military), Diplomacy(bureaucrats) and Development (Politicians); unless the defence is empowered the other two will lack the stability to perform. Thus, both understandings of matters of defence and adequacy of resource allocation remain critical factors for national security.

The Indian Civil-Military Relations Model

In India, the civil-military divide is complex with historical underpinnings and reveals two distinct issues[6]. The first is a conscious and deliberate decision by the political leadership to insulate the military from political influence and interference shrouded in a cloud of distrust shaped by apprehensions of Pakistan’s military coup model. The second is a systematic and gradual degradation of the status of the military vis-à-vis the bureaucracy. While the former aspect may be viewed positively to keep the military apolitical, it denied the military playing a crucial role in policy making. The other aspect, of side-lining, emanates from political apathy and bureaucratic arrogance of calling the shots. The greatest void in the Indian political system is the lack of experience and continuity of thought on matters military both by the bureaucracy and the politicians. Some of the more recent policy decisions taken by the MoD devoid of military logic and advice are indicative of a lack of civil-military fusion, more oriented to populistic vote bank politics and insensitivity

to a national security vision. The void of a 'National Security Strategy' remains glaring.

Prof Steven I Wilkinson, a political scientist at Yale University, in his book '*Army and the Nation: The Military and Indian Democracy since Independence*', decodes why India, unlike other countries that inherited colonial 'divide and rule' armies, has been able to consolidate its democracy and make its army safe for democracy. He elucidates the central premise of political leadership: to make the military 'coup proof' by various constitutional, institutional and administrative statutes.[7] Thus, the military was kept out of the policymaking loop by intent and willingly took a backseat allowing both the semi-literate polity and an egoistic bureaucracy to hold the stirrups. The mindsets of invisible trust barriers and lack of maturity, understanding and sagacity have resulted in a heavy price.

The discourse on professional military education in India evolved in a siloed approach to understanding warfare with a skewed imbalance in training and education focus. Anit Mukherjee in his study "Educating the Professional Military", makes a sound case for civil-military fusion in PME (Professional Military Education) and points out the weaknesses which, to him, are *'primarily due to its model of civil-military relations, with a limited integration with civilians.'* He enumerates that the civilians have had an limited role as professional educators in shaping the content of military education, leaving PME almost entirely to the services. The military has focused more on training rather than balancing training, education and experience. This has created a intellectual and strategic void in thought leadership needed by senior military leaders at the strategic level of warfare.

The need for this multidisciplinary knowledge is not meant just for the military but is a two way process of educating the non-uniformed fraternity who deal with matters military. The politicians and bureaucrats are intelligent, well qualified and experienced but hardly educated on nuances of national defence. The civil bureaucracy, the political class and the academics also need to be trained and educated appropriately on matters military.[11] James S. Corum, the Dean of the Baltic Defence

College, and an experienced military educator argues: *"Indeed, no modern armed forces can operate without the support of a cadre of professional civilians who work in the fields such as logistics, education, military, administrative support, law enforcement, and research and development."*[8] Christopher Clary another noted scholar on the subject asserts the importance of a well informed and educated political leadership and bureaucracy in matters of defence strategy: *"Militaries are complicated, expensive organizations, and there is a tendency for civilians to shirk the specialised demands of defence oversight".*[9]

The reality remains that it is both impractical and undesirable to make politicians military philosophers, yet advice both by the military and bureaucracy must be knowledge-based and deep-rooted which is the academic pursuit in a harmonious CMR.

Calibrating the CMF in Shaping Future leaders

The core to shaping future military leadership is the liberal cultural review of the educational system, its trainers, and its curriculum and accepting a paradigm shift from civil-military integration to civil-military fusion. The review must be balanced based both on the nation-specific operational environment and academic freedom. Traditionally most militaries are apprehensive of integrating the non-uniformed human resource out of a sense of organisation turbulence or dilution of control due to civil interference. Yet without this turbulence, the transformation to meet future challenges of military effectiveness will not manifest. Thus, both the quality of change and the management of change are important. The comfort zone of the sprinkling of civil guest lectures must lead to a more liberal and integrated approach of having civil faculty of policymakers, technologists and academicians who work in unison with the military to impart holistic PME.

It equally important to study the models in other countries and pick up the best practices suited to Indian environmental needs. Civilian integration and contribution on matters of PME have been most distinct and transformational in the case of the U.S. Goldwater-Nichols Act in 1986 and the follow-up Skelton Committee 1989. These civilian-led initiatives however faced considerable misgivings of loss of autonomy

from the military. One of the architects of Goldwater-Nichols reforms, Arch Barret, admitted that they viewed *"changes in education as the means to change the culture of the organization of the U.S. armed forces*"[10] The Goldwater-Nichols Act strengthened the office of the Joint Chiefs who in turn, re-shaped PME by ensuring that all military education institutions adhere to it. The committee recommended amending the present regulation to enable and encourage hiring civilian faculty at all the war colleges leading to an increase in the quality and quantity of military educators contributing to a better PME model. The process also led to the accreditation of the military with civilian institutions of higher education and matching the demands to maintain higher educational standards. This paved the path to CMF in the field of PME leading to a better informed and educated leadership. A lesson India could well imbibe.

In the U.K., CMF in PME led to 'modern forces' to meet future challenges—a euphemism for enhancing military effectiveness[11] (U.K. Ministry of Defence, 1998, p. 10). This emphasis was stressed by the Defence Training Review, conducted by an integrated team of military officers and civilians in 1999[12]. Its report aimed at reforming military education based on the felt need that the military needs to "shift to joint, multinational and inter-Agency operations"[19] (U.K. Defence Training Review. 2001, p.6). As an outcome the Defence Academy was raised in April 2002.

In China, the strategy was called 'Military-Civil Fusion' (MCF) which was focused at spurring innovation in key sectors and leveraging dual-use technologies for military end-uses has given space to several debates. However, the scope of MCF was much larger than just education being primarily focused on ideological, political and technological facets. China, which has long practised what is called Civil-Military Integration (CMI) sees MCF as a master strategy that needs to be amalgamated with other national strategies for economic development and transformation, to achieve an organic, powerful, and comprehensive national system of strategies.[13]

CMF in Indian Military Education

The PME construct in India has been driven by the military with little civil interface. This resulted in a fractured PME which lacked a holistic horizon in keeping pace with changing character of war. The role of the MoD was mainly confined to granting policies, budgets, training teams, foreign visits etc. Their contribution to the qualitative enhancement or transformation has been minuscule as the bureaucracy lacked expertise and understanding of matters military which was best considered a military domain. This comfort zone in silos has led to stagnation in PME and the shaping of future military leaders.

A very high-quality knowledge pool exists in the civil domain in our country. Its leverage needs no elaboration. ‘‘Outsourcing’’ of training to industry and civil institutions, would enable a joint approach is critical to strategic success. The Indian PME policy has incorporated this aspect albeit in a limited fashion which merits consolidated in future. Increased interaction and subscription to seminars, capsules and courses run by civil establishments and agencies with due accreditations must be pursued to derive best practices and insight into competencies existing in the non-military domain. As a matter of policy, accreditation to academic institutions/universities must be encouraged with the dual objectives of benchmarking standards of instructions/evaluation at par with the standards prevalent in the academic world, as also to give recognition to the qualification gained by the individual.

Another important deficiency is the understanding of the military beyond the proverbial Iron curtain. The military leadership in India has little institutional understanding of both the environment and the functioning of politicians, bureaucrats, technocrats, CAPF and other organisations contributing to national security calculus. This has often resulted in cynicism becoming a style statement driven more by mistrust and apprehensions as a result of the education and knowledge void. The primary reason is the cocooned approach to silos in the PME system and not understanding that prevailing in future wars is not only a whole-of-government approach but also a whole-of-society approach. The solution lies in a more meaningful interface at all levels to understand

the national security apparatus without politicisation of the military. This aspect becomes even more critical at the Flag rank level when the interaction beyond the military enhances and the demand for synergy expands. Military leaders at the strategic level must be empowered to be heard and have a say in policies relating to national defence in particular and national security at large. At the PME level, the civil faculty could meaningfully contribute towards a mature and well-informed military. It will also help the other organs of national security to understand the military better. The vice versa is also true for IAS, IFS and CAPF educational institutes.

Recommendations - Policy Framework for Shaping Future Military Leaders and the Role of CMF in Military Education

The transformation towards shaping future military leaders must lead to a more liberal CMF approach to imparting holistic PME by the military. Similarly, all those associated with national defence need to be educated and well-informed in their understanding of matters military. This forms the basis of the following policy recommendations.

- The start point is to reflect, reorient and strengthen the roots of the CMF in the present PME. This is relevant both for the military studies departments in civil universities and military institutions, particularly DSSC and War Colleges. This will require holistic funding, cross-pollination and a review of curricula. The synergy with CAPF, BSF, IAS/IRS/IFS and IPS only takes place at NDC which is too little too late. It must start from the JC level upwards. It would involve institutional fixing the cause and roots not symptoms as a hot patch. Certain aspects of national security and non-military subjects can be outsourced to universities or even think tanks to run capsules as a progressive road finally leading to the establishment of a civil faculty. The transformation has to be gradual for both management and acceptance of the change. Even civil university departments must subscribe to military officers on deputation or veterans for employment in their Defence Studies Department. This requires synergy of culture, thought and effort by military war colleges, academic departments in universities, and the military and civil

bureaucracy. The PME construct has to be multi-disciplinary, filled up with balanced academics which must bring in academic rigour and research without turning warriors into professors.

- Secondly, the glaring void in military education and strategic thought connect remains the nonexistence of a stated national security strategy. For a country that has fought five wars and is hemmed in by nuclear-armed states, India surprisingly does not have a published document that spells out its national interests, identifies its threats -- political, economic, diplomatic or concerning security -- and thus logically evolve policies to deal with them. The void of such a strategic enunciated construct conceptually makes India's defence policy look ad hoc and hinders both the character of CMF and PME.

- Thirdly, the Indian Defence University must overcome the existent political barriers for the largesse of the national cause. Once established it will provide an appropriate platform to have a healthy mixture of CMF by veterans having military knowledge and experience, and civilian academicians for a wider understanding of national security and mentoring research.

- Fourthly, at mid-service levels, higher specialisations on matters that contribute to the wider canvas of national security must be encouraged as post-graduation and PhD pursuits. This can lead to better officer management and be a win-win situation for all.

- Fifthly, an important deficiency is the understanding of the military beyond the proverbial Iron curtain. At the PME level, the internal civil faculty including retired bureaucrats, ambassadors, CAPF and other instruments of national security will go a long way toward a mature, balanced, professional and well-informed military. The percentage induction can be graduated as a test bed and subsequently firmed in for an optimal balance. It will also help the other organs of national security to understand the military better. The vice versa is also true for IAS, IFS and CAPF educational institutes.

- Lastly, education on matters military has to be also organised for the bureaucracy, civilians in MoD and Defence Industry who deal

with national security, strategy and defence capability development. The MoD and other Ministries dealing with National Security have no educational background or institutionalised mechanism for national security. The need is for a National Security Professional Orientation Program which could be run by either a reputed University or Defence Think Tank or a Defence Training Institution like War College. This requires an institutional policy framework beyond just visits to border areas and photo ops.

*__Lt Gen A B Shivane, PVSM, AVSM, VSM (Retd)__ a second generation officer is an NDA alumnus and a highly decorated Armoured Corps officer with over 39 years of distinguished military service including a tenure in a UN mission. He has authored over a hundred publications on national security and matters of defence, besides two books and is an internationally renowned keynote speaker and a TEDx speaker. He is a Distinguished Fellow and held COAS Chair of Excellence 2021-2022 at the Centre for Land Warfare Studies. His book “PME for 21st Century Warriors” is to be released shortly.

Endnotes

1 Panel Discussion on “Civil Military Fusion in India’, IDSA June 2022, https://www.idsa.in/event/Panel-Discussion-on-Civil-Military-Fusion-in-India

2 Clausewitz: War as Politics by other Means, https://oll.libertyfund.org/page/clausewitz-war-as-politics-by-other-means

3 Brooks, Risa A. (2019). "Integrating the Civil–Military Relations Subfield". Annual Review of Political Science. 22 (1): 379–398. doi:10.1146/annurev-polisci-060518-025407. ISSN 1094-2939.

4 Douglas L. Bland, A Unified Theory Of Civil-Military Relations, 1999, https://www.jstor.org/stable/45347130

5 Todor Tagarev, The Role Of Military Education In Harmonizing Civil-Military Relations, 1997, https://www.researchgate.net/publication/237760204_THE_ROLE_OF_MILITARY_EDUCATION_IN_HARMONIZING_CIVIL-MILITARY_RELATIONS

6 Sawan Ranendra Singh Commander, Civil-Military Relations in India – Introspection and Reform, USI Mar 2020, https://usiofindia.org/publication/usi-journal/civil-military-relations-in-india-introspection-and-reform/

7 Steven I. Wilkinson, Army and Nation: The Military and Indian Democracy since Independence, Harvard University Press, London, UK, 2015.

8 Corum, ‘Some Key Principles of Multinational Military Education’, n. 19,

9 Christopher Clary, Bureaucracy In A Democracy, https://wwnorton.com/college/polisci/american-government12/core/ch/08/outline.aspx

10 Anit Mukherjee, Educating the Professional Military: Civil–Military Relations and Professional Military Education in India, https://www.academia.edu/34390083/Educating_the_Professional_Military_Civil_Military_Relations_and_Professional_Military_Education_in_India

11 Ibid

12 Ibid

13 Manoj Joshi, China's Military-Civil Fusion Strategy, the US Response, and Implications for India, ORF Jan 2022, https://www.orfonline.org/research/chinas-military-civil-fusion-strategy/

References

1. Mukherjee Anit, Educating the Professional Military: Civil-Military Relations and Professional Military Education in India, Aug 2017, https://www.researchgate.net/publication/319283607_Educating_the_Professional_Military_Civil-Military_Relations_and_Professional_Military_Education_in_India
2. Clausewitz: War as Politics by Other Means, https://oll.libertyfund.org/page/clausewitz-war-as-politics-by-other-means
3. Brooks, Risa A. (2019). "Integrating the Civil-Military Relations Subfield". Annual Review of Political Science. 22 (1): 379–398. doi:10.1146/annurev-polisci-060518-025407. ISSN 1094-2939.
4. Sam C. Sarkesian, Military Professionalism and Civil-Military Relations in the West, 1981, https://www.jstor.org/stable/1601063
5. Todor Tagarev, "The Role of Military Education in harmonizing Civil-Military Relations: The Bulgarian Case", 1997, https://www.academia.edu/1893074/The_Role_of_Military_Education_in_harmonizing_Civil_Military_Relations_The_Bulgarian_Case
6. Douglas L. Bland, A Unified Theory Of Civil-Military Relations, 1999, https://www.jstor.org/stable/45347130
7. Sawan Ranendra Singh Commander, Civil-Military Relations in India – Introspection and Reform, USI Mar 2020, https://usiofindia.org/publication/usi-journal/civil-military-relations-in-india-introspection-and-reform/
8. Steven I. Wilkinson, Army and Nation: '*The Military and Indian Democracy since Independence'*, Harvard University Press, London, UK, 2015.
9. James S. Corum, *'Some Key Principles of Multinational Military Education'*, https://www.jstor.org/stable/26326294#metadata_info_tab_contents\
10. Christopher Clary, '*Bureaucracy In A Democracy'*, https://wwnorton.com/college/polisci/american-government12/core/ch/08/outline.aspx
11. Joshi Manoj, *'China's Military-Civil Fusion Strategy, the US Response, and Implications for India',* ORF Jan 2022, https://www.orfonline.org/research/chinas-military-civil-fusion-strategy/
12. Lindsay P. Cohn, *'Political Realism and Civil-Military Relations',* in Robert Schuett and Miles Hollingworth (eds), The Edinburgh Companions to Political Realism, Edinburgh: Edinburgh University Press, 2018.

13. Perlmutter, A. (1977). '*The Military and Politics in Modern Times'*. Yale University Press, New Haven.

14. Stephen P. Cohen, *'The Militaries of South Asia'*, in Paul Brass (ed.),Routledge Handbook of South Asian Politics, London and New York: Routledge, 2010.

15. Pradeep Kumar Gautam, '*Broadening the Education for Synergetic Civil-Military Relations'*, http://www.idsa.in/journalofdefencestudies.

16. Pradeep Kumar Gautam (2019): *'Broadening the Education for Synergetic Civil-Military Relations',* Journal of Defence Studies, Vol. 13, No. 2, April-June 2019, pp. 5-23 URL https://idsa.in/jds/jds-13-2-2019-civil–military-relations

17. Claire Goode, *'Best Practice Principles For Professional Military Education: A Literature Review',* https://www.researchgate.net/publication/337826974_Best_practice_principles_for_Professional_Military_Education_A_literature_review

18. Event Report, '*Reforming Professional Military Education: The (non) Debate over India's National Defence University'*, Brookings India, 2019, https://www.brookings.edu/wp-content/uploads/2019/02/Reforming-professional-military-education-The-non-debate-over-India's-National-Defence-University.pdf

19. Sankaran Kalyanaraman, *'The Theory and Practice of Civil-Military Relations'*, IDSA Jan 16, https://www.researchgate.net/publication/305995851

20. Gurmeet Kanwal, *'The New Arthashastra: A Security Strategy for India'*, Oct 2016, Harper Collins Publisher, India

129-147

CIVIL MILITARY FUSION IN DIPLOMACY

Ms Ulupi Borah*

Abstract

Defence Diplomacy is fundamental in developing a sturdy foreign and security policy. The role of a civil military fusion is immense in enhancing the defence diplomacy of a country. Although India's global position is rising with an enhanced outreach but a strong civil military fusion in defence diplomacy is still at an optimal level. There are various integral aspects in defence diplomacy which requires significant focus. In his Arthashastra, Chanakya has highlighted the value of defence diplomacy in order to increase a nation's might. This paper defines those areas in defence diplomacy which needs reviewing and structural shifts to enable India hold a strong and stable international position.

Introduction

Chanakya's most well-known text Arthashastra is the basis of defence diplomacy and is considered as one of the most powerful texts in Asia. It has composed a significant number of strategies and defence concepts. Realists like Chanakya believed that diplomacy is just one tool in the long-term conflict that was constantly raging or being prepared for. He believes that in the world of international relations there are two options: "conquering or being conquered". He no longer believed in the phrase "get ready to fight but still hope for peace", rather advised "prepare for war and plan to conquer". Chanakya contends that diplomacy is a covert act of war, a series of measures made to weaken the opponent and benefit the country itself. "Arthashastra" also demonstrates how the ancient Indian literature flaunts about a strong civil military fusion[1].

In the twenty first century, Civil Military Fusion has a crucial role to play in conducting and managing interactions between states in all of their forms, which is the essence of diplomacy. The military or the defence component of diplomacy is continuing to have a salient impact in advancing a country's national interests, particularly when considering its foreign policy. Through influence operations that foster long-lasting cooperative relationships and trust, the military's responsibility extends beyond national security and defence against external threats to include conflict avoidance and promotion. However, it is important to note that although there exists a slight difference between the terms "military diplomacy" and defence diplomacy but they can be used interchangeably. The whole set of activities commenced by the entire defence establishment, including its civilian administration, research and development, could be referred to as defence diplomacy whereas the term "military" emphasises exchanges and interactions between uniformed forces.[2]

Defence diplomacy is a word that was only used to describe new activities and international roles carried out mostly during the post-Cold War era by the armed forces and "Ministry of National Defence" leadership. There shouldn't be any interpretation which infers it as a classic form of "military plus diplomacy," though. Since there is no agreed-upon definition of "defence diplomacy," states attempt to tailor its substance to the requirements of their respective security policies. Strategies related to state security and its execution, co-development and promoting stronger international relations remain integral part of defence diplomacy.[3]

The term defence diplomacy has its roots in the post-Cold War when there was a shift in thought that national security and the foreign policy are analogous to each other. Going beyond the conventional roles of the armed forces such as offensive or deterrent roles is a salient feature of it. The term "defence diplomacy," which is still relatively new, has its roots in the need for a new political vocabulary to describe the collaboration of governments and other international institutions following the post-Cold War era. It doesn't have a commonly accepted definition, while being used relatively frequently in political and scientific discourse.[4]

The military or armed forces of a nation, however, have played and will continue to play an important part in both traditional and contemporary methods of conducting diplomacy. It has previously been used for coercive diplomacy, such as the gun-boat diplomacy of the USA against Japan in the latter half of the nineteenth century, as well as for external defence.

India too conducts such similar diplomatic procedures. Traditionally, diplomacy has always been carried out by ministers and diplomats who primarily belong to the old school. The new diplomatic strategies were Track II and III.[i] At most cases, the military has shied away from the topic of advancing the nation's national interests in international fora.[5]

Yet there are number of factors which exhibit the active role played by Indian military in the foreign policy framework of the nation. These include: geopolitical and security concerns, apart from the evolution of the global political landscape since the end of the Cold War and Pakistan's promotion of the ethno-religious insurgency in Kashmir since the 1990s.[6]

Evolution of India's Defence Diplomacy

When India attained independence in 1947, Cold War divisions began to solidify in Europe and spread into Asia as well. Meanwhile, Delhi was focused to maintain its position of "military isolationism" as it wished to stay away from the impacts of the Cold War. Nehru vehemently opposed using the Indian army for expeditionary operations. Nehru proclaimed that India would not ally with either the East or the West and would pursue an independent foreign policy while Cold War armed blocs approached India. In 1961, the Non-aligned Movement (NAM) was formed and India was very particular with the NAM membership. Only those countries

i Track 2 Diplomacy: Unofficial dialogue and problem-solving activities aimed at building relationships and encouraging new thinking that can inform the official process. Since it is unofficial – you can expect to see influential academic, religious, and NGO leaders and other civil society actors who can interact more freely than high-ranking officials.
Track 3 Diplomacy: People-to-people diplomacy undertaken by individuals and private groups.
Source: Different Levels of Diplomacy Track 1, Track 2, Track 3,Civils Daily, [Online: web], Accessed 13 February 2023, URL: https://www.civilsdaily.com/different-levels-of-diplomacy-track-1-track-2-track-3/

who had no foreign military bases could become a member of NAM. In 1971, India signed the treaty of friendship with Soviet Union but despite that India refrained from initiating joint exercises with Soviet Union. Apart from that, India avoided to offer any sort of military support or cooperation to its friendly countries.[7]

However, one exception which could be highlighted during its phase of military isolationism was Delhi's active engagement in the international peace-keeping operations sanctioned by the "United Nations Security Council" during the Cold War[8]. Despite this extraordinary role, India was set aside in international discussions of peacekeeping and China has been appreciated more for its recent contribution. Another significant contribution New Delhi made despite its isolationist position was to act as a security supplier to the smaller governments of the Subcontinent after independence throughout the Cold War. India's relationship with Nepal and Bhutan included a significant amount of military diplomacy, but Delhi also employed coercive diplomacy and military action in its immediate neighbourhood. Meanwhile, independent India also wanted to make an influence in South Asia which would include an Indian version of Monroe Doctrine for the Subcontinent. India's foreign policies focused on preventing the major powers making any significant influence and intervening in the region, although it wasn't a complete success. Additionally, New Delhi aimed to stop its neighbours from granting military bases and other infrastructure to powerful nations.

With the Soviet disintegration, India emphasised on economic liberalisation and reconfigured its foreign policies. It was then followed by a military engagement with the United States (US). The Kickleighter proposals[ii] from the early 1990s served as a platform of collaboration between the US and Indian military services. They offered a foundation for service to service contact between the armed forces and were named after the then-US commander of the Pacific Armies. Since 2005, India has acquired a variety of systems, such as the LPD ship Trenton, C-130

ii The 1991 Kickleighter proposals (Lt. Gen. Claude Kickleighter was the Army commander at the U.S. Pacific Command) suggested establishing contacts between the three Services to promote exchanges and explore areas of cooperation. **Source**: Rakesh Sood (2020), "The India-US partnership is deepening", Observer Research Foundation,[Online Web] https://www.orfonline.org/research/the-india-us-defence-partnership-is-deepening/

and C-17 military transport aircraft, and has recently placed an order for P-8 maritime surveillance aircraft. India never bought a single weapon platform from the US throughout the Cold War. At the end of 2011, India's FMS purchases from the US had increased to about $6 billion from a zero base at the turn of the millennium.[9]

Furthermore, India has extended its defence cooperation with countries ranging from Mozambique in Africa to Mongolia in Inner Asia and from Brazil in Latin America to Australia in the Pacific. Considering the geo-strategic and geo-economic significance of the Indian Ocean littoral states, India's focus has been to enhance defence ties with those states. In precise, those countries could be grouped into three categories: major powers, immediate neighbours, and other actors of interest to India in the Indian Ocean littoral and beyond.

Another development observed in India's defence diplomacy was when the "Look East Policy (LEP)" was commenced in 1992 and defence diplomacy remained an integral part of it. India's defence diplomacy mostly empahsised on forging amicable ties with its neighbours in Southeast Asia. Nonetheless, one of its main worries was China's expansionist behaviour in the region. Prime Minister Narendra Modi brought an evolution to LEP by forming the "Act East Policy (AEP)" in 2014. AEP became a significant platform to enhance India's defence networks. Indian Navy initiated various joint naval exercises with the Southeast Asian countries including the ones with Australia known as "AUSINDEX" which is a salient biannual naval exchange between the two countries.[10] Apart from this India has initiated world class naval exercises such as Milan, Indian Ocean Naval Symposium and Malabar.

Apart from these, India is also part of security forums such as ASEAN Regional Forum (ARF), East Asian Summit (EAS), ASEAN Defence Ministers Meeting etc. Despite India having bilateral relationship with many countries, it is shifting towards multilateralism. However, this transition has been mostly based on circumstances. Prof. GVC Naidu, Jawaharlal Nehru University, New Delhi stated:

"India participates actively in the Quad and BRICS since it serves a vital purpose. However, neither of these are initiatives taken by India.

India never took an initiative on regional multilateralism, economic or security, including SAARC and BIMSTEC. Even now, there is confusion over a number of issues, including the Indo-Pacific, the Quad, and the BRICS."[11]

However, India has been looked up to as a proactive security provider in the region. Especially considering its geo-strategic location and China's increasing influence in the Indian Ocean.

Existing Models of Civil Military Fusion in Diplomacy

- **The US Model.** The US has the largest military budget in the world which is larger than the combined budget of the next seven countries. This has enabled US to enhance its defence diplomacy by intervening on several continents. The US offers the most instructive example of how to use military as a potent tool of foreign policy. This has been made possible through the use of alliance organisations like NATO, which has allowed it to control Europe, and alliances with specific nations, which offer the stronger partner significant influence over the foreign policies of the weaker partner. The US gives the military a lot of room in its external relations through arms sales and military aid, training of foreign military officers, joint exercises, military-to-military contacts, exchange of top-level visits, periodic publication of strategic and defence reviews, and reports created by think tanks affiliated with the Pentagon.[12]

- **The China Model.** With its expanding military strength, China is expanding its diplomatic influence throughout the world. Examples include its demonstration of ability to maintain naval forces far from its shores, appearance of its submarines in the Indian Ocean, particularly in Colombo port, growth of its arms exports, participation in UN peacekeeping operations, financial support of Organization of African Unity (OAU) peacekeeping missions, and supply of arms to our neighbour.[13]

India's Pillars of CMF in Diplomacy

To achieve civil military fusion in diplomacy India's focus has been to

emphasis on several aspects. They have been discussed elaborately in the following paragraphs:

Atmanirbharta and Make In India Initiative

Under the Modi administration, the Indian Defence industry is witnessing a large wave of indigenization as a result of Atmanirbharta and Make In India Initiative. To undergo defence manufacturing and technical self-reliance, a series of measures have been promoted by the Indian government. The most salient motive is to shift India's position from an importer of defence products to an exporter. India's defence exports reached a record high of Rs 14,000 crores, and the government now aims to reach Rs 25,000 crores in exports by 2025[14].

- **India's journey towards achieving Atmanirbharta.** For arms import, India mostly has been dependent on the US, Russia and Israel. Then India came up with its "Defence Research and Development Organisation (DRDO)" which has achieved many successes in developing major systems and critical technologies. The private companies such as the Adanis, Ambanis, L&T, Tata soon got involved with arms production. However, the process of acquisition and production have never been an unchallenging task. To make the process smoother and easier, the Modi administration has commenced some remarkable initiatives to enhance the production of indigenously built ammunitions. The "Ministry of Defence" came up with significant documents such as the "Defence Procurement Manual (DPM)", Defence Acquisition Procedure (DAP), etc. which focuses on simplifying the defence acquisition procedure.[15]

Military Hardware as a tool of Defence Diplomacy

- **Foreign nation's dependency on Indian Navy hardware in the Indian Ocean.** Over the recent years, China's imprint in the Indian Ocean is significantly increasing. It has made investments in at least seventeen ports which worries not only India but also other nations like France, which has a significant stake in the water. According to experts, China may use some of the infrastructure it has built for military purposes in the future, allowing the People's Liberation Army Navy to keep naval deployments in the region.

On the other hand, French interests in the Indian Ocean are not solely commercial in nature. Over a million people reside on the islands of Réunion and Mayotte which are overseas departments of metropolitan France.[16] Thus, regional stability remains a major focus for France. But to provide the necessary security to the islands in the Indian Ocean which are so far from mainland France, it is heavily dependent on the Indian Navy. Indian Navy has been dispatching its warships and deploying the P-8I aircraft to the island for the third time in four years. In 2020, an Indian Navy P-8I aircraft took part in a combined patrol with France from Réunion Island. The P-8I aircraft landed on Réunion Island in May 2022 to conduct coordinated surveillance with French Navy warships stationed nearby. In the above backdrop, the role played by Indian Navy here can be seen as a significant tool of defence diplomacy.[17]

- **Arms Exports.** The Philippines Defence Ministry signed an order of $374-million contract for BrahMos missiles from India. The supersonic cruise missile BrahMos is made by the BrahMos Aerospace Private Limited (BAPL), a joint venture between Russia and India. It can be launched from land, sea, or air platforms.[18]

The Misnistry of Defence of India also authorised the export of indigenous Pinaka multi-barrel rocket launchers to Armenia. Although the deals value hasn't been disclosed but reports claim that it is worth $250 million.[19]

Joint Military Exercises and Training

Joint military exercises are an integral part of India's defence diplomacy. Some of the significant joint exercises and trainings initiated by India are discussed in the following paragraphs:-

- **Malabar Exercise.** India's Malabar is a world class naval exercise initiated by the Indian Navy where navies across the globe participate. It began as a yearly bilateral naval naval drill between the US and India in 1992. and later Japan became a permanent member. Since its inception as, the Malabar series of exercises has grown in size and complexity.[20]

- **Yudh Abhyas.** The Indian Army is undergoing some significant joint exercises such as “Yudh Abhyas” between US and India close to the Line of Actual Control (LAC), the de facto border between India and China. Indian Army is also undergoing joint exercises with Singapore with the most recent one being 12th edition of “Exercise Agni Warrior” at Devlali, in the Indian state of Maharashtra. India held “Exercise Garuda Shakti ” with its Southeast Asian neighbor Indonesia intended to improve “understanding, cooperation, and interoperability” between the two parties by “gaining an insight into the lifestyle and culture of both countries to enhance military cooperation.”[21]

- **IND-INDO CORPAT.** The Andaman & Nicobar Command (ANC) of the Indian Navy and the Indonesian Navy also participated in the 38th Coordinated Patrol (IND-INDO CORPAT) which took place earlier in June 2022 and lasted for more than 10 days in the Andaman Sea and Straits of Malacca. This manifests the level of mutual trust and confidence both the countries hold for each other.[22]

- **Surya Kiran.** Indian Army is initiating joint training exercise with Nepal known as the “Surya Kiran” to share theoretical and practical knowledge of jungle warfare in relation to military counterterrorism capabilities as well as disaster management.[23]

- **Veer Guardian-2023.** Veer Guardian-2023 is a joint training where the air forces of both Japan and India will promote air cooperation in January 2023 at Hyakuri Air Base, Japan. Four Su-30 MKI, two C-17, and one IL-78 aircraft from the Indian contingent will take part in the air exercise. The JASDF, meanwhile, will take part with four F-2 and four F-15 planes.[24]

- **Indian Navy signs MoUs to Initiate Hydrographic Cooperation.** Hydrographic applications are expanding all over the world in marine coastal development and environmental preservation. About 50% of coastal states lack hydrographic capabilities, according to a UN study. India is among the remaining 25% of countries with sufficient hydrographic capability. The Indian Naval Hydrographic Department

(INHD) already provided assistance and signed MoUs with Mauritius, Tanzania and Seychelles.[25]

- **Indian Army Offers Training to the Afghan National Army.** The majority of the Afghan military personnel were being trained at the National Defense Academy (NDA) in Pune, the Officers' Training Academy (OTA) in Chennai, and the Indian Military Academy (IMA) in Dehradun. The Government of India was bearing with the training expenses of the Afghan cadets as apart of nation-building efforts in Afghanistan after 2001.[26]

Offering Courses to Foreign Practitioners

Lt Gen Vinod G. Khandare, a former officer of the Indian Army and currently serving as the Principal Adviser in the Ministry of Defence stated the significance of offering courses to foreign practitioners in the Indian defence institutes. This includes various course vacancies and sometimes offering free courses to the cadets coming from poor neighbouring countries.[27] Historically, right from independence India has been getting officers from the friendly nations. In fact, it is a matter of pride for India that a large number of the alumni are heading some of the most significant government positions in their respective countries. For example, the President of Nigeria is a product of the Defence Services Staff College.

Visits by the Defence Minister, Service Chief and Research by Defence Linked Think Tanks

Apart from the visits by the Defence Minister and Service Chiefs, the involvement of retired military officers in Track 2 and Track 1.5 discussions are remarkable. India has few renowned think tanks such as Manohar Parikkar Institute of Defence Studies and Analysis (IDSA), United Service Institution (USI), Centre for Joint Warfare Studies (CENJOWS) etc. which have been intensely promoting defence related research and holding seminars and webinars.[28]

India Initiates Joint Secretary-Level Talks for Disengagement in LAC

India initiated joint secretary level-talks with China to resolve the Ladakh

row. Involvement of a civil diplomat to resolve the border issue between the two countries is something India is doing for the first time. India has said that it expects that China will sincerely work with it for complete disengagement of troops along LAC in Eastern Ladakh. This can be stated as a classic illustration of civil military fusion to resolve dispute.[29]

The Significant Role of a Defence Attache in Defence Diplomacy

The former Defence Attache to France, Maj Gen Sudhir Sharma said that a Defence Attache (DA) is a person with efficiency and well preparedness. His contacts in relation to social and professional is appreciating. He has access to polity, bureaucracy, military, corporate and the overseas diaspora. The DA stands next to an ambassador holding a significant position. Apart from holding formal connection, he has the ability to create an informal rapport with the military fraternity of other countries. This in a way could help push agendas of which are of India's national interest.[30]

Lt Gen Khandare also elaborately discussed on the role of a Defence Attache in context of Atmanirbharta or Make in India. He stated that it is a very recent phenomenon and arms sales being a significant element of this initiative, tt has been noted that expectations exist for the DA to play a substantial role in the selling of these indigenously built weapons.[31]

In addition, the DA gets a chance to have a direct access to the Department of Defence Production (DDP). A very good relationship is maintained between the DA and DDP which otherwise is not possible for an officer in the armed forces. The role of a DA is significant while discussing about military hardware and defence technology. A DA would certainly have more first-hand experiences in dealing with different defence technologies than an IFS officer.

In terms of defence acquisition, the DA makes a list of niche technologies which would involve a proposal with a proper action plan. He works in collaboration with the ambassador. Apart from these, the DA's role is immense as a middle man. Anybody can reach out to the DA from his home country. For instance, if a group of MSMEs have any interest in a particular country then the DA there can act as the middleman to partner

them with that particular country. This could be in terms of guidance, consultancy or a meeting. It could also be the vice-versa. If a foreign country has interest in India and has a proposal but doesn't have any base in India or being a foreigner, there is a gap created in terms of security issues. Under such circumstances the role of the DA is immense and makes him a very influential person standing next in the line to the ambassador.[32]

The Gap

Countries like France and US have one agency which deals with the weapon system without the interference or involvement of any other agencies. The Direction générale de l'armement (DGA), is the French Government Defense procurement and technology agency which is in charge of managing programmes, developing, and acquiring weapon systems for the French military.[33] The Defense Advanced Research Projects Agency (DARPA) of US facilitates in the development of technology having possible military uses. Although India has DDP but its main task is only in terms of production.[34] The main power rests with the Ministry of Defence, the finance is dealt by the Ministry of Finance and at the topmost is the Prime Minister's Office. India lacks a single agency like DGA and DARPA to which would deal solely with the weapons system.

The process of acquisition in India has been too long. There are different stages such as: a detailed qualitative requirement (QR), request for information which might go on for more than a month, request for proposal, receiving a sealed code, opening of the bid, cost negotiation, trial, fabrication, delivery etc.

The Means

In 2020, the Government of India declared the raise in "Foreign Direct Investment" (FDI) in the defence sector. This implies an increase from 49% to 74% under the automatic route and up to 100% via the government route. According to the Minister of State for Defence, Ajay Bhatt, following the notification of the amended policy's issuance, there has been a total FDI inflow of about Rs 494 crore into the defence sector.[35]

The role of DefExpo and Aero India is immense in this aspect. Since India is already driving with its "Make in India, Make for the World", DefExpo and Aero India have the ability to demonstrate the strength of the indigenous defence sector to the world. The DefExpo 2022 themed "Path to Pride" has been the 12th and the largest defence exhibition. This is an indicator of developments happening in India's defence industry and can attract investment on a worldwide scale.[36]

Meanwhile, Aero India is India's major aerospace and defence exhibition. It enables India to highlight its expanding aerospace and defence capabilities. The five-day Aero India 2023, with the theme "The runway to a billion opportunities," was launched by Prime Minister Narendra Modi on February 13 at the India Air Force base in Yelahanka, Bengaluru. Argentina and Egypt have expressed great interest in procuring them while the defence PSU is trying to sell HAL's Light Combat Aircraft (LCA) Tejas to Royal Malaysia.[37]

To deal with the above mentioned issues and to make Atmanirbharta a success, the government has initiated few measures:

- **Innovations for Defence Excellence (iDEX).** The government established the Innovations for Defence Excellence (iDEX) framework with the intention of promoting innovation and technological advancement in the defence and aerospace sector by enlisting the aid of businesses like MSMEs, start-ups, lone inventors, R&D institutions, and academia as well as promoting independence. The government has authorised a central sector scheme for iDEX with financial support of Rs 498.78 crore for the ensuing five years, from 2021-2022 to 2025-2026. The program's objective is to provide financial support to 300 startups, MSMEs, and independent innovators through Defense Innovation Organization (DIO).[38]
- **SRIJAN.** Defense Minister Rajnath Singh introduced the SRIJAN Portal of the Department of Defense Production in 2020. The portal is an all-in-one online store that gives vendors access to products that can be used for indigenization.

The site displays data that includes the item's name, a picture and description, import values, a NATO Classification (indicative), etc. in a systematic manner. Additionally, there is a search feature.

- **Defence Industrial Corridors (DICs).** The Center has created two Defense Industrial Corridors (DICs), one in Uttar Pradesh and the other in Tamil Nadu, to attain self-reliance in the defence sector in accordance with the Make In India strategy. The government seeks to establish a defence manufacturing ecosystem that is advantageous through these DICs. To promote economies of scale and the development of internationally competitive firms in the country, it is intended to create a robust supply chain for increasing production, testing, and certification.

  According to data from the MoD, the Uttar Pradesh Expressways Industrial Development Authority (UPEIDA), the nodal organisation for the Uttar Pradesh Defence Industrial Corridor (UPDIC), signed 69 Memorandums of Understanding (MoUs) with industries, with a potential investment of Rs 10,545 crore.[39]

- **Special Purpose Vehicle.** In accordance with the SPV model, the private sector will be encouraged to design and build military platforms and equipment alongside the Defense Research and Development Organization (DRDO) and other institutions.

The following two platforms fall under this category:

  - Long Range Unmanned Aerial Vehicles (UAVs) [High Altitude Long Endurance (HALE)]
  - Indian Multi Role Helicopter (IMRH)[40]

- **Defence Production and Export Promotion Policy (DPEPP 2022).** The Ministry of Defence (MoD) has developed DPEPP 2020 as a guiding document to give the nation's defence production capabilities a focused, structured, and major push for exports and self-reliance.[41]

- **Defence Acquisition Procedure (DAP).** A system of policies and processes known as the Defence Acquisition Procedure (DAP) 2020

governs how the Indian government purchases military hardware. By giving home manufacturers the upper hand, attracting foreign direct investment in the defence sector, and defending the native Indian industry's interests, it aims to further the Make in India project. The DAP 2020 also seeks to make the defence procurement process more effective and transparent.

- **Strategic Partnership Model (SPM).** At its meeting on May 20, 2017, the Defence Acquisition Council (DAC) approved the SPM's general framework. The goal of the policy is to work with the Indian private sector to produce cutting-edge defence equipment there. Through an open and competitive procedure, it is the creation of long-term strategic alliances with competent Indian industry leaders.[42]

Recommendations and the Way Ahead

- The major munition suppliers of the world such as Russia faces a critical shortage of artillery munitions, most of the weapons US and France sell are expensive. For arms import, the countries might look for a market beyond Russia, US or France. Although China and Pakistan (most of its arms are copied from China) offer a market for arms, India has the leverage to expand its arms export trade considering them to be of better quality and cheaper in price.

- Most of the arms sold by Pakistan are the ones received from China. For example, the JF-17 fighter jets exported to India's neighbor Myanmar and its oldest defence partner in Africa, Nigeria are created in joint collaboration with China.[43] Moreover, Pakistan's sales procedure is quite faster than India. Although it is a concern for India but under Prime Minister Modi, it has been expected that India's military capabilities are strengthening and gradually transforming the country from the largest arms importer to a heavyweight maker. Initiatives such as DefExpo are promoted by the Ministry of Defence to display the land, naval, air as well as homeland security systems of India. The objective is to demonstrate the strength of the indigenous defence sector, which is currently driving the government's and the country's will to "Make in India, Make for the World." It is the first edition made just for Indian businesses.[44]

- The US sells defence systems to other countries which is a part of its defence diplomacy and creates a situation of dependency for those countries. It has been able to offer a level of security assurances such as military protection for Taiwan and the Baltic and Scandinavian states through NATO. On the other China's strategy is quite opposite to that of US. China focuses on making a country economically dependent and then makes it militarily dependent. In this context, India so far has no interest to offer such military assurance or make any country militarily dependent on it. However, India's Gross Domestic Product (GDP) is growing and is soon going to me one of the topmost economies of the world in few years. Considering its growing economy and the conflict and confrontation between the two super powers US and China, India should grab the opportunity to enlarge its influence across the globe especially in the defence and strategic aspect.

- The civil diplomacy of India is led by an officer from the Indian Foreign Service and the defence diplomacy is led by an officer from the Indian Armed Forces. There exists a gap between the two fraternities. According to Maj Gen Sharma, the personality of the Ambassador plays a salient role in this context. Some share a good rapport with the Defence attache while some might not share the same. A cordial relationship between the Ambassador and the Defence Attache plays a salient role in achieving a particular agenda of national interest. He has also additionally noted that there should be more officers from the armed forces in the Indian embassies across the globe. He illustrated that during the pandemic, a military person could have been more resourceful and efficient to deal with the chaotic situation than anyone else.[45]

- To deal with this gap, there should be a common directive under which both the fraternities can work in coordination. There should be an indicator to check the level of achievement made by the two fraternities which could be monitored by an IAS officer.[46]

Conclusion

Compared to US and China, India's defence diplomacy is still at a budding state. Despite the gaps, the Modi administration has made major shifts in the defence sector. From Atmanirbharta to arms exports India's moves are commendable. Although the results of these missions and initiatives might require some time however, in the long run it will make India hold a significant strategic position in the world. For example, the indigenously produced arms might not meet the standard of those India imported in the last few decades and there persists calculated risks but if seen in the long run then it's a great move for India. India has all the capabilities to enlarge its ammunition manufacturing base. An enhanced fusion between the civil and military is of utmost salience. With a stronger civil military fusion in diplomacy New Delhi can reach out to various countries of the globe and extend defence cooperation and partnership which would eventually help India achieve its interests in the defence sector.

***Ms Ulupi Borah** is a Doctoral Researcher of International Relations and Security Studies from the School of International Studies (Centre for Indo- Pacific Studies), Jawaharlal Nehru University, New Delhi. Ms Borah is the first Indian to receive the Japan Student Service Organisation (JASSO) scholarship offered by the Government of Japan in 2019. Previously, she was an Assistant Professor in the School for Internal Security, Defence and Strategic Studies, Rashtriya Raksha University, Gandhinagar, Gujarat.

Endnotes

1. Channarong chati etal, (2018), "state Defence Diplomacy in channakya View point (study of Arthashartra Tent as a Basic Stratergy of defence Diplomay)", vidyottama Samatana International Journal of Hindu Science and Religious studies 2 No 2 : 218-225.
2. Lech Drab, "Defence Diplomacy: An Important Tool for the Implementation of Foreign Policy and Security of the State", *Security and Defence Quarterly* 20, No 3 (2018): 57-71
3. Ibid
4. Ibid
5. Pranay K Shome, "Maturing of India's Defence Diplomacy", Raksha Anirveda, 14 August 2022. https://raksha-anirveda.com/maturing-of-indias-defence-diplomacy/
6. Ibid

7. C Rajamohan “From Isolation to Partnership: The Evolution of India’s Military Diplomacy”, Institute of South Asian Studies, No 144 (2012): 1-13
8. Ibid
9. Ibid
10. Lt Gen GS Katoch (2019), “The Startegic Promise of India’s Act East Policy”, The United Service Institution, [Online: web], Accessed 3 February 2023, URL: https://usiofindia.org/publication/usi-journal/the-strategic-promise-of-indias-act-east-policy/
11. Prof GVC Naidu (2023), personal interview, New Delhi, 30 January 2023
12. Kanwal Sibal, “The Role of Militray Diplomacy in India’s Foreign Policy”, World Affairs The Journal of International Issues 23, No 1 (2019): 24-37
13. Ibid
14. Mint (2022), "India's Defence emports hit Rs 14000 crores, highest ever", [online: web], Accessed 13 January 2023.
15. Maj Gen Sudhir Sharma (2023), personal interview, New Delhi, 13 January 2023
16. Edmund Goldrick (2018), “France and India: A reunion in the Indian Ocean ?”, IISS, [Online: web], Accessed 3 January 2023, URL: https://www.iiss.org/blogs/analysis/2018/03/france-and-india-reunion
17. Swarajya Staff (2022), “India Deploys P-8I Aircraft At France’s Reunion Island For Third Time In Three Years As China Increases Presence In Western Indian Ocean”, [Online: web], Accessed 2 January 2023, URL: https://swarajyamag.com/defence/india-deploys-p-8i-aircraft-at-frances-reunion-island-for-third-time-in-three-years-as-china-increases-presence-in-western-indian-ocean
18. Business Standard (2022), “India to export BrahMos Missiles to Philippines”, Accessed 12 January 2023, URL: https://www.business-standard.com/article/current-affairs/india-philippines-conclude-375-mn-contract-for-brahmos-missiles-122012800827_1.html
19. Sakshi Tiwari (2022), “India Strikes Big deal with Armenia to export Pinaka Missiles with Amid Conflict with Azerbaijan”, The Eurasian Times, [Online: web], Accessed 12 January 2023, URL: https://eurasiantimes.com/india-set-to-export-indigenous-pinaka-missile-system-to-armenia/
20. Press Information Bureau (2021), “Multilateral Malabar Exercise 2021 Phase II in Bay of Bengal”, Government of India, [Online: web], Accessed 12 January 2023, URL: https://pib.gov.in/PressReleasePage.aspx?PRID=1762720
21. Rajeswari Pillai Rajagopalan (2022), “India’s Expanding Programme of Joint Military Exercises”, Observer Research foundation, [Online: web], Accessed 9 January 2022, URL: https://www.orfonline.org/expert-speak/indias-expanding-programme-of-joint-military-exercises/
22. Ibid
23. Press Information Bureau (2022), “Indo Nepal Joint Training Exercise Surya Kiran XVI to Commence at Nepal Army Battle School”, [Online: web], Accessed 10 January 2023, URL: https://pib.gov.in/PressReleasePage.aspx?PRID=1883751
24. Saurabh Anand (2023), “Japan India to Hold Joint Exercises to Promote Air Defence Cooperation ”, [Online: web], Accessed 12 January 2023, URL: https://www.livemint.com/news/india/india-japan-to-hold-joint-exercise-to-promote-air-defence-cooperation-11673092343225.html
25. Hydrobharat (2023), “Har Kaam Desh ke Naam”, [Online: web], Accessed 12 January 2023, URL: https://hydrobharat.gov.in/international-co-operation/
26. Manjeet Negi (2021), “India to Complete Training of Afghan Army soldiers in its military academies”, India Today, [Online: web], Accessed 22 December 2022, URL: https://www.indiatoday.in/india/story/india-to-complete-training-of-afghan-army-soldiers-in-its-military-academies-1848575-2021-09-02

27. Lt Gen Vinod G. Khandare (2022), personal interview, Ministry of Defence, New Delhi, 16 December 2022
28. Kanwal Sibal, "The Role of Militray Diplomacy in India's Foreign Policy", World Affairs The Journal of International Issues 23, No 1 (2019): 24-37
29. Business Standard (2020), "India China to hold Joint Secretary -level talks to discuss disengement", [Online: web], Accessed 2 January 2023, URL: https://www.business-standard.com/article/current-affairs/india-china-to-hold-joint-secretary-level-talks-to-discuss-disengagement-120082000150_1.html
30. Maj Gen Sudhir Sharma (2023), personal interview, New Delhi, 13 January 2023
31. Lt Gen Vinod G. Khandare (2022), personal interview, Ministry of Defence, New Delhi, 16 December 2022
32. Maj Gen Sudhir Sharma (2023), personal interview, New Delhi, 13 January 2023
33. Hipeac (2020) "Directorate General of Armaments", [Online: web], Accessed 12 January 2023, URL: https://www.hipeac.net/network/institutions/8240/dga/
34. Michael Aaron Dennis (2022), "Defence Advanced Research Projects Agency", Britannica, [Online: web], Accessed 12 January 20223, URL: https://www.britannica.com/topic/Defense-Advanced-Research-Projects-Agency
35. The Economic Times (2022), "Rs 494 crore FDI received in defence sector since revising policy: Govt", [Online: Web], Accessed 2 February 2023, URL: https://economictimes.indiatimes.com/news/defence/rs-494-crore-fdi-received-in-defence-sector-since-revising-policy-govt/articleshow/93117701.cms
36. Press Information Bureau (2022), "DefExpo 2022 propels 'Aatmanirbharta' in defence to next level", Government of India, [Online: Web], Accessed 2 February 2023, URL: https://pib.gov.in/PressReleasePage.aspx?PRID=1870082
37. Times of India (2023), "Aero India 2023: Argentina, Egypt keen on buying Tejas", [Online: Web], Accessed 2 February 2023, URL: https://timesofindia.indiatimes.com/city/bengaluru/argentina-egypt-keen-on-buying-tejas/articleshow/97932706.cms
38. PBNS (2022), "Atmanirbharta in Defence: Know about the major indigensiation initiatives', News on Air, [Online: web], Accessed 7 January 2023, URL: https://newsonair.com/2022/12/13/atmanirbharta-in-defence-know-about-the-major-indigenisation-initiatives/
39. Ibid
40. Press Information Bureau, Defence Wing (2022), "Ministry of Defence identifies 18 major platforms for industry led Design and Development", Government of India, [Online: web], Accessed 12 January 2022, URL: https://www.mod.gov.in/sites/default/files/PRESS%20RELEASE%20%2816%29.pdf
41. Maj Gen C.P. Singh (2022), "Indian Defence Industry: Striding Towards Atmanirbharta", [Online: web], Accessed 13 January 2023, URL: https://raksha-anirveda.com/indian-defence-industry-striding-towards-atmanirbharta/
42. Ibid
43. Global Village Space (2019), "Pakistan Set to Export JF-17 Thunder Fighter jets to 4 Countries', [Online: web], Accessed 12 January 2023, URL: https://www.globalvillagespace.com/pakistan-set-to-export-jf-17-thunder-fighter-jets-to-4-countries/
44. Drishti Ias (2022), "DefExpo 2022", [Online: web], Accessed 1 January 2023, URL: https://www.drishtiias.com/daily-updates/daily-news-analysis/defexpo-2022-2
45. Maj Gen Sudhir Sharma (2023), personal interview, New Delhi, 13 January 2023
46. Ibid

CIVIL-MILITARY FUSION FOR EMERGING TECHNOLOGIES IN INDIA

Lt Col Akshat Upadhyay*

Introduction

The character of warfare has undergone a major change since the end of the Cold War with Armed Forces across the globe transitioning from platforms to capabilities. Here, the Cold War is taken as an inflexion point since it marks the high point of use of conventional weaponry and role of the defence ecosystem in fostering innovation in the civilian sector, creating "spin-offs"[1] such as the global positioning system (GPS) and the Internet. Today, the situation is reversed and the defence industrial base lags behind the civilian sector in developing and using emerging technologies. Civil-military fusion (CMF) is a strategy that optimises complementarities across the civil and military domains to counter threats to an expanding ambit of national security which now encompasses food, environmental, cyber, human, economic and physical security. China did it in the form of creating "Military-civil fusion (MCF) with Chinese characteristics" during the 17th Party Congress of 2007, elevating it to a national-level strategy in 2015 and 20162. The US has a much more diffused model in place which involves the Defence Advanced Research Projects Agency (DARPA), various universities and private industry[3]. Israel has a revolving-door system between the military and the private industry[4] while Turkey's Bayraktar TB2 drone, a successful use case of CMF, has been used to further the country's national interests around the globe[5]. Can there be a CMF model for India? This paper looks at the utility of the CMF model in the Indian context by using emerging technologies as a case study.

Why is CMF Needed?

A traditional view of warfighting links the military inventory with the threat. For militaries equipped with conventional platforms, the visible threat is the military buildup of the adversary. As a result, the adversary's use of new and emerging technologies in new domains is neither acknowledged nor responded to in a befitting manner. Instead, most of these threats are clubbed under the rubric of the so-called grey zone warfare. This places the target country at a disadvantage since the response through conventional platforms is considered disproportionate to the deemed offensive action. As a result, the only measures available are either inaction or escalatory actions using the available platforms and hence, crossing into the domain of warfighting.

There is, therefore, a need to search for options that do not escalate into full-scale war, at the same time ensuring that the other side is forced to respond - at the cost of initiating hostilities. It is equally necessary to involve other organs of the state, as well as the private sector since in India's case, national security threats have expanded to include pandemics, cyber-attacks, human and drug trafficking, climate change, religious fundamentalism, terrorism and insurgencies, among others. State agencies and private actors have equally been at the receiving end of several attacks by a diffused group of actors. A majority of the cyber attacks on the Mumbai power grid[6], All India Institute of Medical Sciences (AIIMS) and other critical institutions have been traced back to the Chinese state[7]. Similarly, state and non-state actors have waged consistent information warfare (IW) against the country using social media platforms and other forms of media[8]. China's entire approach to economics has become securitised to an extent that the MCF model is considered predatory towards its private sector[9]. India's national security challenges, therefore, require a whole-of-nation approach when dealing with threats of such nature and amorphous form. In such a scenario, emerging technologies especially Big Data analysis, artificial intelligence (AI), unmanned systems and advanced semiconductors will play a huge role requiring the involvement of private players.

CMF has to be viewed from three perspectives. First, the "multi-level consumerisation of technology" ensures that more and more technology and tech-enabled platforms and systems are visible and used on the

battlefield leading to a higher expense of fighting wars. This means that the cost of using this technology in the military domain is diffused across the civil-military domain so that wars can be fought affordably. Second, CMF has traditionally been defined as the military use of civilian technology, talent and facilities which is a very constrictive view. While a majority of CMF projects look at militarising the technological lead of their civilian counterparts, the reciprocal view ie the use of military facilities by the private sector to hone their products for commercial purposes, as a way to increase the country's GDP is seldom considered. Third, use of technology on the battlefield requires that the private sector be involved more intimately in the national security matrix. It is to innovation, particularly military innovation, that we turn to since innovation forms the pivot on which the entire structure of CMF revolves.

CMF and Innovation

While several definitions exist for military innovation, they differ on whether innovation is a process[10] or an outcome[11], whether it completely changes the military[12], incrementally changes structures[13] or introduces new technologies or uses existing technologies and structures[14]. There are also differences on which component to be changed in militaries - organisation, doctrine, strategy/tactics or technology.[15] However, despite these divergent definitions, the common thread is change. Military innovation denotes a change in how militaries plan to fight or conduct military operations. For this paper, military innovation is defined as change involving a thorough understanding of technology and its potential and applying it so that the output produced in terms of military effectiveness far outstrips the input in terms of time, money and resources. Understanding technology and its application to produce military effectiveness are where the first phase of CMF comes in ie the military use of civilian expertise in industry and academia to increase effectiveness. The second phase ie the civilian use of military facilities and expertise needs to be emphasised as well since the weaponisation of trade interdependence between countries means that economic security will also have to be considered under the expanded national security threat perception.

For India, with a limited defence budget, the need for CMF has never been felt more. CMF, once fully operationalised fulfils four key requirements: by indigenising a major portion of R&D, production and managerial processes of defence manufacturing, it ensures that the requirements of the Indian Armed Forces are not constrained by foreign policies of other countries. Dependence on imports also has a follow-on disadvantage. The operational doctrines, force structures and tactics have been tailored as per the characteristics of the imported equipment and not what may be the optimal requirement for victory in the Indian context. There is now an opportunity to design, from first principles, technologies, doctrines and concept of operations based on indigenous manufacturing capability. Second, the handholding of private firms and academic research by the Indian Armed Forces and the Ministry of Defence (MoD) may lead to the growth of these industries to "unicorn" status and increase exports, spurring increased R&D in these companies, encouraging more industries in the defence sector and finally increasing the size of the economic pie so that additional resources may be diverted to the military. Third, an expanding notion of national security means that a holistic approach needs to be taken against threats. As an example, India's G20 presidency and its emphasis on digital solutions and the success of the India Stack means that several residual cyber capabilities of institutions within the state, academia and private industry need to come together so that India's model of cyber governance and provision of digital public goods can be exported to other countries[16]. Fourth, the acquisition of military capability, either in the form of a technology or a platform or both does not end with the product itself. A support structure that includes bases, airfields, ranges, maintenance, repair and overhaul facilities (MRO) also needs to be in place. This is again where CMF can offer solutions, in terms of offering civilian facilities for military use and vice-versa. Emergency landing strips (ELFs) for fighter aircraft on highways operated by the National Highway Authority of India (NHAI), the Bharatmala project, the National Logistics Policy (NLP) and Gati-Shakti are all examples of CMF at the national level[17]. All four key requirements point to the need for innovation: at the cognitive level so that a broadened concept of national security is understood by all stakeholders; at the organisational level so that there is greater inter-

agency and interministerial coordination and finally at the structural level so that silos are broken down and a more flatter structure begins to emerge. All these changes point to greater opportunities for coordination and entrepreneurship.

Military innovation devolves around the confluence of two sets. The first set consists of actors i.e. the military as a whole, private industry (talent, know-how, R&D and managerial practices), academia and think tanks. The second set comprises military doctrines, organisation and concept of operations. The utility of CMF then flows from the defence strategy, based on acquisitions, capability development, training and educational requirements and operations. There needs to be a flow of ideas from the first to the second set and the common factor between the two i.e the Armed Forces' role, therefore, becomes crucial. For India to evolve an effective structure for CMF, there is a need to look at various CMF strategies in use by different countries around the globe. We will briefly look at five countries viz the US, the UK, Turkey, Israel and China and also analyse the challenges that may help in formulating an effective model for India in the field of emerging technologies.

Examples of CMF in Other Countries

In the China model, the PLA has annointed itself as a captive market for certain companies in fields designated critical from China's national security perspective like AI, quantum communications and advanced semiconductor devices. These companies may be globally uncompetitive but still benefit from the PLA funding due to their importance to the national security calculus. Changsha Jingjia Microelectronics Ltd and Cambricon Technologies are two examples of homegrown Chinese companies specialising respectively in graphic processing units (GPU) and specialised hardware for cutting-edge AI applications. This model is known as step-up and in China's case is state-directed[18].

The US has two sub-models. In the first sub-model, the private sector fuels innovation and the military has, over the past few years, created several organisations such as the Defence Innovation Unit (DIU) and the Army Futures Command (AFC) which looks at a mix of civilian and defence experts to position the US Army at the top in several identified

areas[19]. The second sub-model is that of DARPA which comprises Program Managers in six technical offices responsible for identifying breakthrough technologies and ensuring that concepts are converted into capabilities. Programs such as AFWERX (Air Force Work Project)[20] and SOFWERX[21] (Special Operations Forces Works) aim to create a virtual 'marketplace' of ideas similar to Uber, Airbnb and Amazon where the user (soldier), acquirer (Service) and the provider (manufacturer) are iterating continuously for rapidly testing prototypes and fielding them.

The Israeli model involves a revolving door policy where soldiers, after finishing their mandatory service in the Israeli Defence Forces (IDF) use their military expertise to create commercially successful defence companies[22]. In Israel's hi-tech Unit 8200, prospective programmers are selected from high schools and are seated next to their clients ie intelligence officers and all products are designed and produced in-house[23]. Several Unit 8200 alumni have founded companies such as Check Point, Imperva, Nice, Gilat, Waze, Trusteer, NSO and Wix[24].

The Turkish government allowed Selçuk Bayraktar, the Chief Technology Officer (CTO) of Baykar and the creator of Bayraktar TB2 to join the Turkish military in field conditions to test out his UAV models[25]. The company's exports to Ukraine and Azerbaijan created asymmetries for the side using these drones and fulfilled Turkey's foreign policy goals without the live involvement of the Turkish government.

The United Kingdom (UK) has embarked on an ambitious goal of replacing its current fleet of combat aircraft namely, the Eurofighter Typhoon with a Future Combat Air System. Team Tempest, as the designing consortium of private and government agencies is known, aims to field the system by 2035. The FCAS design starts with a computer instead of the physical aircraft design for incorporating deep learning, swarms, virtual cockpit in helmet, hypersonic weapons and directed energy weapons (DEW). The team is attempting a digital age model of procurement in a virtual collaborative environment based on non-hierarchical peer-to-peer platforms, open behaviours and agile practices for the generation of an information management system[26]. This will be done to continually upgrade and enhance the system, both virtually and in real time. This

includes creating a digital twin of the aircraft together with a digital thread to establish through-life linkage with the twin and the aircraft such that the thread runs through all organisations and contexts with which the product interacts. This will ensure that the platform is never out of sync with the latest technological developments.

Challenges Faced by Countries in Incorporating CMF

While China's model of MCF is one of the most commented on due to the opaque nature of the regime, it is also one of the least objectively analysed. In his magisterial study of the Chinese system of military innovation, Professor Tai Ming Cheung acknowledges that China's MCF is a pedestal for the operationalisation of what Chinese President Xi Jinping calls an integrated national security strategy (INSS) and without his intervention, it would have remained a "floundering mid-tier policy initiative lacking political support that would occasionally receive passing leadership attention." China's MCF project is a top-down initiative where all actions are taken based on the directions of the top leadership. While MCF has been incorporated into the Chinese constitution in 2017, there has been no major exposition of its details and a majority of Chinese works just regurgitate the Chinese president's speeches[27]. The other major challenges for China are the construction of an integrated innovation and acquisition system which is still antiquated and bureaucratised; creation of dedicated and permanent MCF personnel workforce and institutional identity; facilitating access to resources and; adapting the system to react to and pre-empt the international threat environment apart from extrinsic factors such as climate change and increasingly hostile sanctions regime.

The US also suffers from an acquisition process that prioritises legacy platforms. As of date, the US Department of Defence (DoD) is invested too much into legacy platforms and weapon systems already catered for in the defence budget at the expense of new technology that will determine whether such platforms can survive and succeed in a more contested environment[28]. This is a hangover from the end of the Cold War era where Western militaries have been habituated to conduct operations in almost uncontested environments especially poor air

defence (AD) and electronic warfare (EW) resources of the adversary which have tended to be terror and non-state groups. The UK, on the other hand, recognises that its model of acquisition i.e. CADMID (Concept, Assessment, Demonstration, Manufacture, In-Service and Disposal) is a linear one and utterly unsuited when it comes to dealing with new technologies and is looking at a spiral development model for the new range of emerging technologies[29].

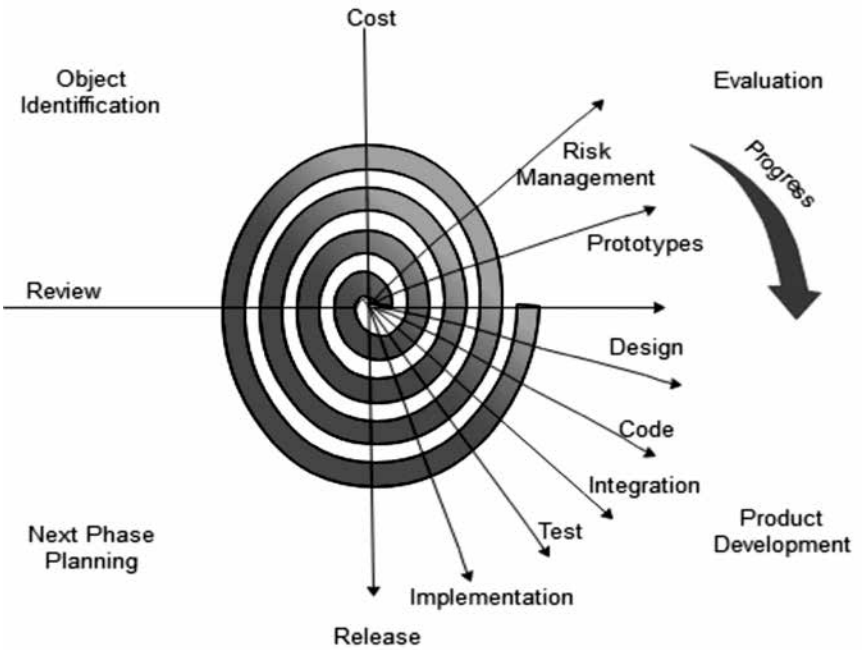


Fig 1: Details of the Spiral Model.

Reference:https://www.javatpoint.com/software-engineering-spiral-model

The spiral model is said to be one of the best when it comes to developing customised software-based solutions for high-risk and unstable projects. It is an evolutionary software process model that couples the iterative feature of prototyping with the controlled and systematic aspects of the linear sequential model. Using the spiral model, the software is developed in a series of incremental releases. During the early iterations, the additional release may be a paper model or prototype. During later iterations, more and more complete versions of the engineered system are produced[30]. This model can be used for developing moonshot prototypes which are risky yet highly innovative projects.

India's Model of Acquisition of Emerging Technologies

The Indian Armed Forces have focused on micro, small and medium-sized enterprises (MSMEs) and startups in the defence sector since they have the intellectual capital and energy to design unique systems and technologies. There has been a multi-agency and multi-pronged approach to attracting and handholding selected startups in certain selected technology segments. Broadly the effort to encourage defence startups, individual R&D, MSMEs and academia has been in two directions. The first and the most exhaustive is by the Department of Defence Production (DDP) in MoD.

A Defence Innovation Fund (DIF) has been established along with a Defence Innovation Organisation (DIO) which will act as a corporate venture capital firm for handholding enterprising startups[31]. While the DIO has been envisaged as a high-level policy guidance body, the executive functions are being performed by the Innovations for Defence Excellence (iDEX) with functional autonomy. The CEO of iDEX and DIO will be the same, in theory providing the linkage between executive action and policy guidance. DIO comprises the Secretary (Defence Production) as the Chairman, the Chief Managing Director (CMD) of Hindustan Aeronautics Limited (HAL) and the CMD of Bharat Electronics Limited (BEL) as members, apart from a member from the Atal Innovation Mission/ Niti Aayog and the CEO iDEX. There is also an advisory council constituted of the vice-chiefs of the three Services, the Chief of Integrated Defence Staff to the Chiefs of Staff Committee (CISC), Additional Secretary (Defence), Secretary (Defence Finance), Secretary (R&D) and representatives from other Defence Public Sector Undertakings (DPSUs), Department of Science and Technology (DST) and Department for Industrial Policy and Promotion (DIPP)[32]. The idea is that the Services Headquarters (SHQs) and the DPSUs will play the primary role in identifying potential topics through the promulgation of problem statements and the Technology Perspective and Capability Roadmap (TPCR). iDEX will act as the translating layer between the SHQs and DPSUs and the Indian innovation ecosystem based on the principles of co-creation and open innovation[33]. iDEX will coordinate with partner incubators (PIs) based on the Silicon Valley model such

as CODISSIA, T-Hub (Hyderabad), FORGE (Coimbatore), SINE IIT Bombay, IIM Ahmedabad's CIIE, IIT Delhi FIIT and IITM Incubation cell (IITMIC) and defence innovation hubs (DIHs), two of which are likely to be set up in Nashik and Chennai respectively, to nurture them. This will include advice, guidance, funding, and assistance in the expansion of markets. Since the funding of DIO and thereby iDEX is through the corporate social responsibility (CSR) and non-CSR funds of the various DPSUs and MoD and in India, DPSUs still get the first option for accepting or rejecting a project, the DPSUs will be entrusted with 'productising' of the innovations of the startups. This also assumes that the DPSU has the technical know-how of completing the project, scaling it in requisite quantities.

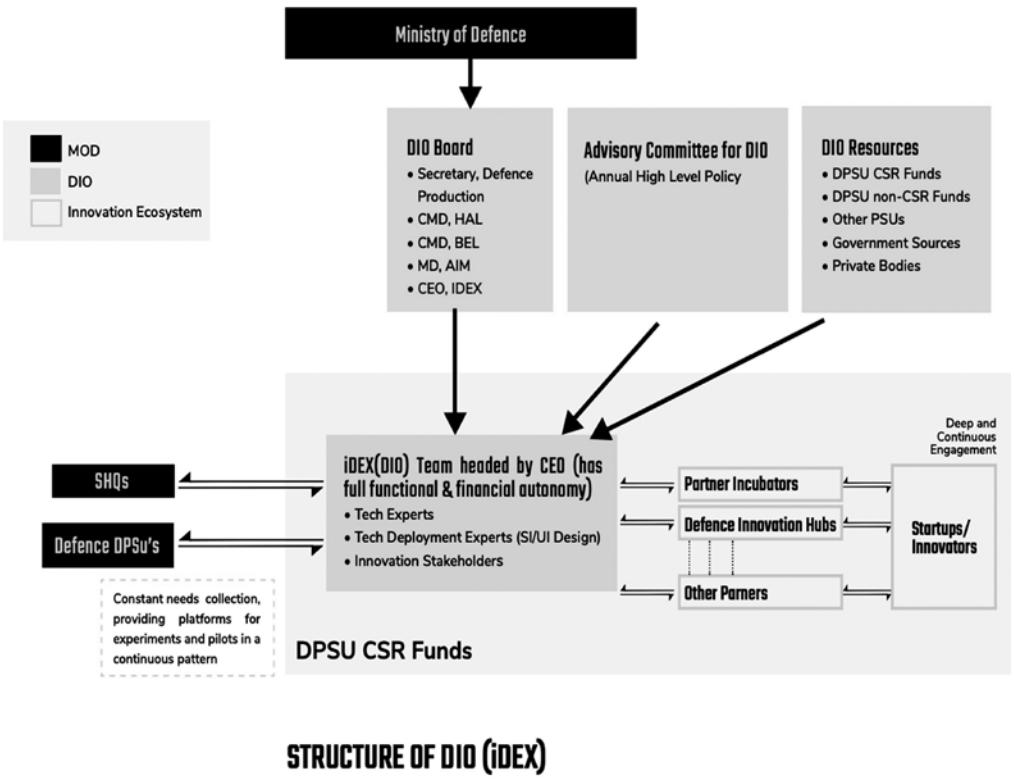


Fig 2: Structure of the Defence Innovation Organisation (DIO)

Reference: Operationalisation Plan for Defence Innovation Organization (DIO) And Defence Innovation Fund (DIF)

While this framework looks at creating commercially viable companies out of MSMEs and defence startups, there is an alternate pathway called the Support for Prototype and Research Kickstart (in Defence) (SPARK) which provides an amount of Rs 1.5 crores each to selected projects that help "create functional prototypes of products/technologies relevant for national security" and help new technologies find markets in the Indian defence establishment[34]. The innovators eligible for the SPARK grant will be based on the Defence Innovation Startup Challenge (DISC), which has entered its eighth iteration. A newer version of SPARK, known as SPARK II envisages the selection of projects by startups if they have received interest from any of the three Services, discovered through open challenges, pitch events or Technology Watch of iDEX or if it has received any interest, work order or investment from any friendly foreign country (FFC)[35]. The evaluation of the company will be based on four parameters viz technology advantage, product advantage, commercial advantage and finally, integration advantage. Similarly, risks will also be evaluated and finally, a risk matrix will be created. Those companies which cross a laid down opportunity score will be eligible for the grant. The latest DISC 8 challenge emphasises electro-optical (EO) and synthetic aperture radar (SAR) payloads for mini-satellites of up to 150 kg, high-speed onboard data processing for low earth orbit (LEO) imaging satellites, AI-based change detection for multi-payload fused imagery data, conversion of an Android phone to a satellite phone, autonomous CubeSat swarms in LEO and development of nano and micro-imaging satellites. The main area for funding research is space-based technologies supplemented by AI and imaging[36]. iDEX has also evolved into iDEX (Prime) which selected two challenges each by the three Services for resolution by innovators, iDEX Prime (Space)[37] and iDEX Prime (Sprint)[38] and even an Open Challenge.

The next process is the Technology Development Fund (TDF) sponsored by the Defence Research and Development Organisation (DRDO). It provides funding of up to Rs 50 crores to MSMEs and startups[39], with the caveat being that the industry must be owned and controlled by a resident Indian citizen with a minimum of 51% ownership. TDF also allows collaboration with academia and research institutions and

industry consortiums with the development period being a maximum of four years[40]. The development agency is evaluated under 4 heads:

- **Design capability (60 points)**: Proposed configuration and approach to meet functionalities; indigenous design capability; infrastructure.
- **Fabrication and manufacturing capability (25 points)**: indigenous manufacturing capability especially plant and machinery.
- **Maintainability and life cycle support (10 points): a** methodology for life cycle support.
- **Commercial Criteria (05 points):** nature of the company; net profit and turnover.

The passing points are 60. Here commercial viability, maintainability and life cycle support have been given the lowest qualifying marks. Out of 100, even if a company hypothetically scores zero on these two and gets 60 in the first two, it can get the funds. DRDO being a government organisation looks only at the design capability and not the long-term sustainability of the commercial enterprise which is a lacuna that needs to be rectified. DRDO has also launched a Dare To Dream program which envisions the sponsoring of individual R&D and then handholding to ensure that the individual is able to create a company[41].

Challenges. The system is undoubtedly a major step for unlocking the entrepreneurial spirit of the Indian technological ecosystem, mutually benefitting the Armed Forces as well as the private companies involved in designing, creating and incubating new technologies. If conceptualised and executed properly, it has the potential to nearly double or triple India's current defence exports. In its current form, the scheme suffers from being overly complex, concentrated and biased towards the public sector. It needs to be reiterated that the challenges being analysed and measures suggested are for emerging technologies and the same can be applied, albeit with minor modifications, to the wider defence industry and the national security calculus.

The challenges and their recommended solutions are:-

- **Concentration within Public Sector**. Though the idea of the DIO and a corporate VC fund i.e. iDEX are conceptually sound, they suffer from being concentrated in the hands of government officials, serving and retired. There is no representation from the private industry or academia, either in the advisory council or the main body. The translator layer between the Services and the private industry is, therefore, wholly bureaucratic. Instead of a collaborative or a co-creator approach, provision of grants is followed, where companies and startups compete with each other for limited funds. This is unlike the US model of DIU where the US Armed Forces have stationed program managers and project officers in Silicon Valley in order to actively seek out the best R&D and researchers in eight priority areas[42]. The DPSUs have been designated for productising the prototypes selected by iDEX. This implies that inefficient managerial practices of DPSUs, which have no experience in handling or producing technologically sophisticated weapon systems, will be used to produce high-technology systems.

- The composition of both DIO and iDEX reflects a hierarchical view of CMF. The recommendation is to drastically change the composition of the translator layer and break it into a set of clusters. While the top governing body i.e. DIO can have an industry veteran as the Chairman, members may be from DDP, SIDM, DPSUs, the Design branches of the three Services and selected academia and think tanks. This will provide a more non-hierarchical policy-making structure with increased collaboration between the industry, MoD and the Services. The practice of DPSUs getting the first choice for productising the MSME/ startup design needs to be rethought and startups must have the option of either feeding to bigger industries which can act as integrators or starting their own production lines, based on commonalities with requirements of other ministries.

- **Clusterisation**. Currently, the model followed by iDEX is to coordinate with SHQs who release their requirements in the form of technological problem statements. iDEX then organises its own

challenge apart from the DISC and open challenges to select startups for funding through SPARK/ SPARK II and/ or further nurturing through PIs and DIHs. However, being solely government guided and funded, this is not an ideal model either for a private-public partnership model (PPP) or CMF. The iDEX competitions have started to evolve. Initially, they were a mix of problem statements by the three Services. Now they have their categories such as iDEX Prime (Space). But a number of major ministries are missing. For example, the requirement for a counter UAV (C-UAV) system affects not only the MoD but also the Ministry of Home Affairs (MHA), the State Police and the Ministry of Civil Aviation (MoCA). Similarly, UAVs are required by the MoD, MHA, State Police, Ministry of Agriculture and Farmers Welfare, Archaeological Survey of India (ASI) and other agencies.

- There is therefore a need for clustering together the representatives of various user bodies along with the necessary makers of components which belong to different industries. The Prime Minister's Office (PMO) can constitute a coordinating body, focused on national security, comprising representatives from all ministries and top manufacturing houses and decide on five priority clusters where CMF can be effectively implemented. These can be autonomous systems, information management systems, advanced semiconductors, intelligence, surveillance and reconnaissance (ISR) and logistics. These clusters can be geographically co-located in areas with the maximum R&D and educational institutions in that particular field and can also act as centres of excellence (CsOE) as well as standard-setting bodies, in line with the best practices in the world. The process of CMF has to be top-down and a constantly monitored initiative for effective coordination between the various ministries and agencies. Once the clusters have been decided, the Gati Shakti platform can be used for virtual collaboration, open innovation and creating integrated solutions for national security. Within the clusters, a new form of iDEX, let's call it iMCFX (Innovations for MCF Excellence) may be instituted in the form of open challenges, sponsored by all affected ministries and agencies. This will also serve to increase

the prize amount. The difference from the previous model will be the encouragement for joint ventures (JVs) and consortiums. The mantra to be followed is to collaborate and compete. The role of the government ministries will be two-fold: assured funding for crossing over from the Valley of Death and adequate orders for scalability. A report by Ernst and Young (EY) and the Federation of Indian Chambers of Commerce and Industry (FICCI) has found that in major components such as motor and propeller, autopilot, batteries, high-end navigation, camera payloads, sensors and communication systems in UAVs, the imported component ranges from 50 to 75%. The major countries of import are China, Taiwan, the US, the EU and Japan[43]. A host of Indian companies can collaborate in UAVs by competing for modular systems in propulsion, airframe, battery packs, and payloads and make them within the country rather than competing piecemeal for the entire UAV which leads to the import of a majority of systems.

- **Financing and IP Rights**. The current model of financing is based on grants and loans to promising startups and MSMEs which acts as seed money. Once the prototype is built, a model of no cost no commitment (NCNC) demonstrations follow post which the longer process of the acquisition comes into play. Sometimes the same startup may be catering to the piecemeal requirement of all three Services apart from other ministries. This leads to duplication of efforts. The cluster system aims to remove these redundancies. Effective ways of testing and failing fast will ensure that the companies can discard unworkable models to innovate along different lines. For this, effective bankruptcy laws, reduced cost of borrowing capital and protection of IP rights is critical. The system of L1 may need a relook as repetitive competition depletes the resources of cash-strapped startups and there may be a need for a longer engagement period with the industry as well as assured orders. L1 also forces the companies to cut costs in terms of imports, indirectly benefiting adversaries resorting to dumping steel and other materials onto Indian shores.

- **Two Way Sharing of Data and Infrastructure**. There are a number of ranges, facilities and labs available with the Services, DRDO and various DPSUs which can be commoditised and shared with MSMEs and startups on a nominal cost basis. Furthermore, some inventors can also be taken to field conditions in Eastern Ladakh or Kashmir for testing out their products in actual field conditions, similar to the Bayraktar model. This will help improve the ruggedisation of the equipment, apart from providing real-time feedback from the actual users i.e. the troops on the ground. For developing AI systems for reading satellite imagery or parsing intelligence reports for possible predictive results, it is important that the training set be composed of actual data and not the synthetic training data generated by algorithms. For this, data has to be unshackled from the clutches of archaic classification rules which prevent classified information to be shared with the private industry. The advent of open-source intelligence (OSINT) and commercial satellite imagery firms such as Maxar[44] have rendered these notions obsolete and a new policy directive needs to be promulgated that relooks at the way information is classified. Safety nets such as non-disclosure agreements (NDA) may be insisted on. On the other hand, academia and private industry have a big role to play in encouraging innovation within the Armed Forces. The iDEX4Fauji initiative which looks at the tapping of the potential of personnel from the Armed Forces needs to be given a foundational basis in science and technology and the incubators within academia and startups may lease labs and facilities for selected Armed Forces personnel to intern with them and use their equipment for honing their products and testing the prototypes.

- **Cross-Pollination**. The need for inter posting of personnel from different ministries to MoD and vice-versa has been mooted for long. For effective CMF, it is not only necessary to post personnel from different agencies and ministries at the level of Directors and below, but also allow service personnel to be posted in various ministries, in order to understand the requirements and commonalities within different branches of the government. The study leave provisions for the Armed Forces may include a new vertical of industrial internship

(II) which may involve deputing industrious officers and men from the Services to different industries, MSMEs and startups. The follow-up of these actions is equally important. Specialisation needs to be built in within the Services. Once done with the study leave, the personnel need to be utilised in the procurement and acquisition branches where their experience and expertise will ensure practicable General Staff Qualitative Requirements (GSQR). Slowly, this will lead to a core group of officers proficient in interfacing between the industry and the Services and also other ministries.

Conclusion

The main reason why CMF is critical for India is the expanding notion of national security and India's rising clout in the comity of nations. CMF has to be a top-down policy-oriented approach that utilises the Indian entrepreneurial spirit rather than being supported and hand-held by the government at all times. The Indian Armed Forces will play a crucial role in CMF but need to be sufficiently equipped, educated and trained to take on this role. Finally, CMF will ensure that India attracts a significant chunk of orders from the developing world, and act as the net security provider for the Third World.

***Lt Col Akshat Upadhyay** is a Research Fellow in the Strategic Technologies Centre at Manohar Parrikar Institute for Defence Studies and Analyses (MP-IDSA). He has a Bachelors in Electronics and Telecommunication, Masters in History as well as Political Science and an MPhil in Defence and Strategic Studies. He has also authored a book on India's Coercive Diplomacy against Pakistan (KW Publishers). At MP-IDSA, he is researching disruptive technologies, non-contact warfare and semiconductors.

Endnotes

1 Jong-Tsiong Chiang, "Technological spin-off: Its mechanisms and national contexts", Technological Forecasting and Social Change 41, No 4 (June 1992): 365-390, https://doi.org/10.1016/0040-1625(92)90044-T

2 Tai Ming Cheung, Innovate to Dominate: The Rise of the Chinese Techno-Security State (Ithaca: Cornell University Press, 2022), 83-142

3 Erica RH Fuchs, "Rethinking the role of the state in technology development: DARPA and the case for embedded network governance", Research Policy 39, No 9 (November 2010): 1133-1147, https://doi.org/10.1016/j.respol.2010.07.003

4 Rubin, Eliran. "Tiny IDF Unit Is Brains Behind Israeli Army Artificial Intelligence." Haaretz, Aug 15, 2017. https://www.haaretz.com/israel-news/2017-08-15/ty-article/tiny-idf-unit-is-brains-behind-israeli-army-artificial-intelligence/0000017f-e35b-d7b2-a77f-e35fc8f40000

5 Nicholas Danforth, "How much Multipolarity does a Strongman Need?: Why Erdogan has benefited from Russia's Failure in Ukraine", War On The Rocks, 09 September 2022. https://warontherocks.com/2022/09/how-much-multipolarity-does-a-strongman-need-why-erdogan-has-benefited-from-russias-failure-in-ukraine/

6 Sanger and Schmall. "China Appears to Warn India: Push Too Hard and the Lights Could Go Out." New York Times, Feb 28, 2021. https://www.nytimes.com/2021/02/28/us/politics/china-india-hacking-electricity.html

7 Manral and Sheriff. "The AIIMS cyberattack and its China links: What we know so far." The Indian Express, December 16, 2022. https://indianexpress.com/article/explained/the-aiims-cyberattack-and-its-china-links-8324982/

8 Namita Barthwal, "Information Warfare and India's Level of Preparedness", Centre for Land Warfare Studies, Feb 11, 2022. https://www.claws.in/information-warfare-and-indias-level-of-preparedness/

9 Margaret M. Pearson, Meg Rithmire and Kellee S. Tsai, "China's Party-State Capitalism and International Backlash: From Interdependence to Insecurity", International Security 47, No 2, Fall 2022, 135-176. https://doi.org/10.1162/isec_a_00447

10 Thomas G Mahnken, 'China's anti-access strategy in historical and theoretical perspective', The Journal of Strategic Studies 34, no. 3 (2011), 303. https://doi.org/10.1080/01402390.2011.574971

11 Stephen Peter Rosen, 'New ways of war: understanding military innovation', International Security 13, no. 1 (1988), 134. https://doi.org/10.2307/2538898

12 Chad C Serena, A revolution in military adaptation: the US Army in the Iraq War (Washington, DC: Georgetown University Press, 2011), 9.

13 Tai Ming Cheung, 'The Chinese defense economy's long march from imitation to innovation,' The Journal of Strategic Studies 34, No. 3 (2011), 326.

14 Michael Horowitz and Shira Pindyck, "What is a military innovation and why it matters", The Journal of Strategic Studies, March 2022, 1-30. https://doi.org/10.1080/01402390.2022.2038572

15 Martin Van Creveld, Technology and war: from 2000 BC to the present (New York: The Free Press, 1989), 219

16 "Panel: Digital Identities: Foundational Architectures for a Digital Society The Road to G20 | Global Technology Summit 2022," YouTube video, 54:55, "Carnegie India," 01 December 2022, https://www.youtube.com/watch?v=DyGc7V2j0WQ&list=PLeXQMWQXRkJUgzoJROMgNCE5T5C3qORJz&index=7

17 Lieutenant General Anil Puri, "Role of the Department of Military Affairs in Enhancing Civil-Military Integration," Seminar on Civil-Military Integration: The Way Forward (Panel Discussion, Centre for Land Warfare Studies, Manekshaw Centre, New Delhi, December 26, 2022)

18 Bradford Waldie, "How Military-Civil Fusion Steps Up China's Semiconductor Industry", DigiChina, April 01, 2022. https://digichina.stanford.edu/work/how-military-civil-fusion-helps-chinas-semiconductor-industry-step-up/

19 Kathleen Hicks, "Getting to Less: The Truth About Defense Spending", Foreign Affairs, March/April 2020. https://www.foreignaffairs.com/united-states/getting-less

20 Milligan and Tresslar (2022), "Air, Space Forces transition to AFWERX 3.0", US Air Force Website, November 25, 2022. https://www.af.mil/News/Article-Display/Article/3225640/air-space-forces-transition-to-afwerx-30/

21 Bottoms (2018), “SOFWERX: A smart factory of innovation helping the warfighter”, US Special Operations Command (USSOCCOM) Website, February 02, 2018. https://www.socom.mil/sofwerx-a-smart-factory-of-innovation-helping-the-warfighter

22 Eliran. “Tiny IDF Unit Is Brains Behind Israeli Army Artificial Intelligence.” Haaretz.

23 Tendler, Idan. “From The Israeli Army Unit 8200 To Silicon Valley.” TechCrunch, March 21, 2015. https://techcrunch.com/2015/03/20/from-the-8200-to-silicon-valley/

24 Tendler. “From The Israeli Army Unit 8200 to Silicon Valley.” TechCrunch

25 Stephen Witt, “The Turkish Drone That Changed the Nature of Warfare”, The New Yorker Magazine, May 09, 2022. https://www.newyorker.com/magazine/2022/05/16/the-turkish-drone-that-changed-the-nature-of-warfare

26 John Louth and Adrian Spragg, “UK Future Combat Air: A Programme Management Imperative”, The RUSI Journal 164, No 4, September 25, 2019, 46-59. https://doi.org/10.1080/03071847.2019.1666509

27 Tai Ming Cheung, Innovate to Dominate: The Rise of the Chinese Techno-Security State, 83-142.

28 Kathleen Hicks, “Getting to Less: The Truth About Defense Spending”.

29 John Louth and Adrian Spragg, “UK Future Combat Air: A Programme Management Imperative”, 46-59.

30 Java T Point, https://www.javatpoint.com/software-engineering-spiral-model. Date: Unknown, Author: Unknown

31 Department of Defence Production (2018), “Operationalization Plan for Defence Innovation Organization (DIO) And Defence Innovation Fund (DIF)”, Ministry of Defence (MoD)

32 Ibid.

33 Ibid.

34 “Operationalisation Plan for Defence Innovation Organization (DIO) And Defence Innovation Fund (DIF)”

35 Ibid.

36 Department of Defence Production (2022), “Challenges under DISC 8”, Ministry of Defence (MoD). https://idex.gov.in/disc-category/31

37 Department of Defence Production (2022), “Challenges under DISC 8”, Ministry of Defence (MoD). https://idex.gov.in/disc-category/33

38 Department of Defence Production (2022), “iDEX Prime Sprint Challenges”, Ministry of Defence (MoD). https://idex.gov.in/disc-category/30

39 Ministry of Defence. “Funding under Technology Development Fund scheme of DRDO enhanced to Rs 50 crore per project from Rs 10 crore.” MoD Press Release, June 08, 2022.

40 Defence Research and Development Organisation (DRDO), Technology Development Fund (TDF), https://tdf.drdo.gov.in/

41 Defence Research and Development Organisation (DRDO), Dare to Dream 3.0, https://www.drdo.gov.in/dare-dream-30

42 Sean Carberry, “Reined-In Army Futures Command Moves Out Under New Leadership”, National Defense, November 29, 2022. https://www.nationaldefensemagazine.org/articles/2022/11/29/reined-in-army-futures-command-moves-out-under-new-leadership

43 Ashish Rajvanshi, Ankit Mehta and Neel Mehta. “Making India the drone hub of the World”, EY and FICCI Report, Aug 2022. https://assets.ey.com/content/dam/ey-sites/ey-com/en_in/news/2022/09/ey-ficci-drones-report.pdf

44 Thomas D Taverney. “The Evolution of Space-Based ISR”, Air and Space Forces Magazine, Aug 10, 2022. https://www.airandspaceforces.com/article/the-evolution-of-space-based-isr/

PARADIGMS OF CMF FOR DEFENCE R&D AND PRODUCTION ECO SYSTEM : CREATING LEVEL PLAYING FIELD FOR PRIVATE SECTOR

Lt Gen Rameshwar Yadav PVSM, AVSM, VSM (Retd)*

The edifice of national power lies in strength of vibrant economy, effective diplomacy and credible military deterrence. Countries that are heavily dependent on import of weapon and equipment are vulnerable due to prospects of non supply when needed the most, besides political linkages attached to the it. Moreover, it siphons out national financial resources which can be better utilized to enhance structural strength of the country. India in face of two adversaries with inimical designs, unstable periphery and presence of extra regional powers in seas pace needs to be self reliant as regards to her security structures. Therefore, **cutting edge technology and a vibrant defence production eco systems are essential for ensuring high national strategic pull.**

India, as on date, is the fifth largest military spender after the US, China, Russia and Saudi Arab accounting for 9.5 % of global sales of military hardware1below[1]. We have spent more than $ 100 billion in arms deal over last 15 to 16 years. The major arms suppliers to India are Russia(49%), France 18%, US (15%), Israel (11%) and few others[2]. 60% of weapons and platforms continue to be of Russian origin and that too of old technology that needs replacement with state of art weaponry. Major arms importers during 2017-2021 are India, Saudi Arab, Egypt, Australia and China. On other hand the major arms exporters have been US, Russsia, France, Germany and China.[3]

India has missed out on nurturing the indigenous defence production industry despite availability of all the requisite ingredients within the country. **The basic fault lines can be traced to the policy of restricting the private sector due to security reasons**. In consequence, monopoly **of the government controlled R&D establishments have failed to deliver to the expected levels.** In that, the scientific community, despite adequate facilities and high skill human resources, could not come up with cutting edge technologies which could be leveraged to cut down the import of weapon systems**. While there have been success stories in the field of space, missile and mechanized equipment technologies, the overall output has not been optimal when compared to innovative streak of Indian scientists working in foreign countries.**

One of the reasons attributed to this state is restrictive serpentine bureaucratic procedures to clear the projects and finances. Accordingly**, environmental freedom for innovation and exploration, a much needed tenet for research has been missing leading to 'sarkari' culture in R&D establishments.** It resulted into an unending cycle of imports in absence of seriousness and sensitivity of the organizations and individuals mandated to keep the armed forces in fine fettle.

Given our dependence on imports of almost 65 % of our military hardware, it is essential to build up own military industrial base so as to minimize dependence on outsiders. The **Atmanirbhar/Make in India initiative** by the present political dispensation has brought in some hope to inject much needed dynamism in the defence production sector. Looking at the sensitivity of the matter, the government is trying to bring in a paradigm shift by way of **pragmatic approach to achieve a long term vision** to enhance national power in all its manifestations. The team leaders have **reset and reposition the national priorities to exploit the in-house leverages to boost the defence production and affiliated industries.**

While world over it is the private sector which is the main stay of the defence production, it is not so in India due to deep set security concerns. Moreover, lack of strategic culture and concomitant politico-military synergies, have not taken national security with the kind of seriousness

it deserves. In consequence, **defence technology inadequacy has resulted in strategic vulnerabilities in absence of accountability of institutions and individuals entrusted with providing with structural strength to the armed forces.** Hence, t**here is a need to involve the private sector and create a level playing field** to beat the competition from well entrenched public sector as well as foreign OEMs**.**

It is a **function of financial viability** of the private enterprise through cutting edge technology, assured long term demand, optimal purchase commitments,industry friendly procurement procedure and flexibility to operate in open national as well as international markets. **It would require an enabling eco system and encouraging leadership to make the private sector a viable participant in the nation building alongside well experienced public sector.** To do that, defence technology is the essential denominator of the national power in order to retain our strategic autonomy and we must remove all the stops to acquire it.

In western countries the major part of research is done through the academic institutions wherein the private industry as well as the government provides the funding for the research work. This model has been proved to be a success story, hence need to be implemented in our country also. In this model, the research problem is spelled out by the industry to number of technology institutions, who then give the task to the domain experts and the research scholars. The research scholars are granted higher degrees for such industrial research work as an incentive. The public sector R&D establishments may also like to outsource part of their research work to the academia instead of hiring scientists on permanent basis, thereby increase their research base and at the same time infuse competition.

The Defence Research and Development Organisation (DRDO), Ordinance Factory Board (OFB) and Defence Public Sector Units (DPSUs) have well established laboratories and affiliated infrastructure for R&D. These may be made available to the private sector, university research scholars and even individual scientists under certain terms and conditions. The armed forces ranges and government test facilities

may also be made available for trials and quality assurance of the equipment being developed by the private industry. The DRDO, OFB and DPSUs may also share their R&D work and functional designs with the selected private companies who have essential infrastructure as their manufacturing partners.

Government may help selected universities in establishing R&D centres. These centres may employ retired armed forces officers and scientists from DRDO as advisors to the research scholars. Few scientists(NRIs) from foreign countries who have worked in the defence industry may also be considered as professors and advisors. These **universities may be designated as nodes of excellence for certain specific scientific fields with requisite laboratories and test facilities for better focus.** Taking the idea of such R&D research centres further, establishing a national university exclusively for defence R&D may be considered by the government.

The concept of startups is yet another emerging layer which is proving to be a source of transformation in the field of scientific research arena. The defence industry is a reasonably unexplored domain with possibilities of providing opportunities to give expression to the creativity of young minds **The startups are normally focused on creating smaller supportive technologies and products required for fabrication of the weapon systems and platforms.** Therefore, the ancillary units would be the biggest beneficiary of the startups as they have potential to provide technology and consultancy to meet their industry objectives. The startups also have a potential for substituting import of expansive technologies from the foreign countries.

The private sector with its higher operating flexibility has even larger scope to exploit the potential of the startups for their research and manufacturing needs. Large number of startups in closer vicinity of defence industrial hubs and defence corridors especially in Bangalore, Chennai, Hydrabad, Pune, Nagpur etc are testimony of success of this phenomenon. The central and state governments have schemes with lucrative incentives to encourage innovation including part compensation of the costs involved.

The current procurement policy stipulates transfer of technology as a preconditions for arms purchases from foreign Original Equipment Manufacturers (OEMs). Whereas, it is unlikely to be given by them easily as it would impact on their own future businesses. In consequence, the concept of **'Make for India'** as prompted by few visiting foreign dignitaries **may encourage the foreign OEMs to set up their global manufacturing hubs in India** with freedom of operations, management and marketing of their products world over. **To** be fair to foreign OEMs, even they need to have a reasonable degree of confidence in Indian systems and their own profitability prior to transferring the technologies. It is also a fact that that there are shades of grey in the business of arms production and sales. Hence, need of utmost caution in proceeding ahead with schemes.

India in such an arrangement would be benefitted by cutting down expenditure on weapons due to competition and also reduction in logistics and after sale services costs. Moreover, eventually the technology and techniques would be known to Indian workforce over period of time. In addition, large number of ancillary units would also come up as supporting mechanism to produce sub systems and also take care of the offset obligations**. Having acquired adequate experience and skills to absorb the new technologies, the Indian industry would be in a position to achieve higher degree of self reliance.** China, from a net weapon importer has become fifth largest weapon exporter as on date with this concept. In 2017-21, China accounted for 4.6 per cent of global arms exports. However, 47 per cent of China's exports during 2017-21 went to Pakistan[4].Therefore, it is worth looking at this model suitably modified in Indian context.

The government is encouraging selected big Indian business houses to start joint ventures especially big ticket weapons, platforms and support systems. Reliance, TATA, Mahindra & Mahindra, L&T, Bharat Forge etc are leading companies known to have entered into partnership with foreign manufacturing giants. These companies have defence verticals that have started manufacturing of combat vehicles, optronics, radars, air frames, ships, sub marines, missiles, artillery guns and the like.

Reliance Naval and Engineering Limited (RNAVAL) is into building warships. RNAVAL operates India's largest integrated shipbuilding facility with 662 M x 65 M Dry dock. TATA companies are manufacturing large number of transportation equipment like troop carriers, combat support platforms, Infantry combat support vehicles etc. Mahindra defence systems is also into combat vehicles besides manufacture of naval equipment. L&T is manufacturing land and naval weapons, air defence and artillery platforms, fire-control systems, combat engineering systems, communication, avionics, and missile systems. Bharat Forge is manufacturing armoured vehicles, artillery and air defence guns. There are large number of private companies that have shown interest in the field of defence production.

Since it is the public sector that have experience and structural facilities for defence production, it would be better to **club them with selected private companies as** partners. It would optimize capabilities of public as well as private sectors as regards to infrastructure, engineering support, skilled manpower, finances, market dynamics and managerial interface of the enterprises. The government has opened up few manufacturing fields exclusively for private sectors depending on their domain specialties and capabilities.

Manufacturing of high technology, high secrecy big ticket strategic equipment certainly needs government interface in Indian context, wherein public sector companies along with private partners would be better bet than leaving it purely to the private enterprise. Such an arrangement may **also take care of security concerns of foreign countries as regards to transfer of their cutting edge technology as Government of India would be one of the stake holders.**

Unlike government financed and protected public sector, the **focus of private sector is profit maximization for which they invest, innovate and struggle to create a niche for their product so as to survive in the dynamics of open market.** Unless there is a reasonably assured market and optimal profit generation, they are unlikely to venture out in a new business line. **It is therefore, essential for government to facilitate fair market conditions for private players to enter in the defence production.**

The government needs to create opportunities for private sector for higher participation. To do that, products available in the open market at competitive rates may be purchased exclusively from the private enterprises instead of PSUs. The Ordinance factories producing such products may then be **gradually repositioned to produce different products of importance** to utilize their structural capabilities and skilled manpower**.** Subsequently, **Permitting private companies also to export the surplus production** after fulfilling laid down internal obligations would be a big incentive to the private sector in this model.

India enjoys reasonably high economic buoyancy as on date and it is time to relieve the government from the responsibility of running the businesses which is best avoided. Therefore, **privatizing selected DPSUs and ordinance factories would be an appropriate step to infuse better management practices to draw economies of scale.** Another option is to go in for **Government owned and corporate operated (GOCO) concept** which is a hybrid business management model to involve private sector with minimal financial liabilities. This has already been introduced in running the **Army Base Work Shops** dealing with repair and recovery of sensitive defence equipment.

The present **procurement procedure is too complex and complicated** and does not infuse confidence amongst private sector and foreign vendors who are used to fast track procedures. It needs to be simplified for **'ease of doing business'** by aligning it with corporate sector practices. The concept similar to **''Single Window Clearance''** already in vogue in other sectors may be looked at with appropriate changes as regards to special requirements of the defence industry.

There are **hardly any secrets which are not known world over as regards to weapon sales** and their operational connotations in the global digital environment. Therefore, **present day information transparency when hyphenated with our obsession with security concerns prompts a reality check of our restrictive policies**. Moreover, there are far too many sequential procedures alongside checks and balances which make the system very lengthy with high degree of uncertainty. There exists a scope of simplifying the entire procurement mechanism thereby facilitating a level playing field in sync with international practices.

What we have as on date is primarily a defensive military structure with substantial percentage of weapon and platforms of vintage variety. The disputes with both China and Pakistan happen to be in the mountainous terrain, where as India does not have offensive capability in these sectors. The Indian offensive content is designed against Pakistan and that too in areas of settled international borders. These doctrinal and structural mismatches need to be corrected without further delay. The ongoing coercive Chinese build up in Laddakh has amply highlighted this structural short coming.

The air force is short of combat squadrons as against authorized strength of 42 that too with low tech vintage equipment in number of units. There is an urgent need to replace older generation aircrafts so as to enhance offensive capability in the aerospace domain. The naval power is barely sufficient for defence of marine territories with limited power projection capability with only one carrier group. The emerging threat in Indo pacific warrants additional carrier groups for domination and power projection in our areas of interests. Besides this, the security structures are also required in cyber, space and other non contact hybrid war domains. Winning wars is a function of technological edge which comes at a high cost and not to forget that technology is changing very fast.

The defence budget needs to cater for these national security essentials, organizations, weapon platforms and support systems. Yes, it possibly cannot be done in one budget looking at other national priorities, but the time for acquisitions and their absorption need to be shortened. Accordingly**, the finances for defence establishment need to be delinked from precedence centric model to operational capability synthesis.** There is also a **need to remove the camouflage of expenditure on pay & pensions of civil service personnel** which is reasonably high and cuts into availability for capital expenditures.

There is an allocation of Rs 525166.15 crore for the defence budget which is Rs 47000 crore more than the last year's allocation of 4.78 lac crore[5] With these figures, it would be possible to spare more funds for capital purchases as compared to last year. **The union budget 2022-23 has stipulated that 68% of capital procurements would be from Indian companies**. Besides this,**25 % of R&D budget (11981 cr) has**

been earmarked for private sector, academia and start ups[6]. India spends 6% of defence budget on R&D which is far less than US and China that spend around 20% on research. Moreover, their defence budget is much higher than Indian budget, hence there is a lot to catch up to come at par with their capabilities. Another positive move is to permit the private sector to use the government testing facilities so as to create a level playing field.

During last three years there have been RFPs worth Rs 2,475,75 lac cr to be procured from Indian vendors. In that, 121 contracts out of total of 191 contracts were signed with Indian companies during this period. The positive indigenization list now stands at more than 2800 items which cannot be imported. There have been exports worth Rs 13000cr last year which is 50% higher than the previous year. The government has targeted a turnover of Rs 1.75 lakh crore in defence manufacturing, including Rs 35,000 crore from exports in aerospace, and defence goods and services by 2025[7]. **FDI has been increased to 74% for automatic route and upto 100% in case of selected equipments[8]**

History is a reckoner that it is technology that has been the biggest battle winning factor. While government policies to create better eco system for R&D is a welcome step, it would take decades before it can produce some tangible results. Moreover, there is always a probability of slippages especially the way technologies and the concepts of weaponry are changing. Therefore, it would be most sensible and cost effective to acquire proven technologies at any cost, if we are serious to push our agenda. **It warrants removing all the stops to motivate the foreign** OEMs to either sell their technology, or establish their units in India. **The terms of business should be so attractive that it becomes difficult to refuse.**

Let us understand one point very clear that India has no choice but to confront the adversaries from position of strength. That **strength will only come with building a modern defence industry and support structures duly backed with sufficient budgetary allocations.** To do that, the entire political dispensation needs to be on the same page as **we need to shift from a perceived soft state to a hard power with**

credible deterrence. It needs inculcate strategic culture amongst the decision makers in order to sanitize the nation from inimical afflictions impeding rise of India as a world economy.

Self reliance in defence production is essential to offset out existing political fault lines impacting on our strategic pull. Hence, need of wholehearted involvement of the leadership, institutions and individuals to synergize their act to achieve national security objectives in right earnest. While the government is trying to play its role as a facilitator, what matters is the commitment of the industry to play their part in the nation building. Let us take this national mission forward as a matter of utmost priority.

***Lt Gen Rameshwar Yadav, PVSM, AVSM, VSM (Retd)** was the former Director General Infantry, Indian Army. The General has been ADC to the President of India and has held Principle Staff officer and operational appointments at all levels. The General Officer has been awarded the VSM, AVSM and PVSM for his distinguished service and outstanding contribution to the organisation The General is associated with number of think tanks and has written more than 150 articles on varied professional and international geo political issues.

Endnotes

1. Pandit Rajat (16 March 2021), ‘’India’s weapon imports’’, Times Of India, page 1

   https://timesofindia.indiatimes.com/india/indias-weapon-imports-fell-by-33-in-last-five-years-but-remains-worlds-second-largest-arms-importer/articleshow/81516403.cms

2. Ibid
3. Singh Suchet,(15 March 2022), “’ India biggest importer of arms’’, The Print, page 1, https://theprint.in/defence/india-biggest-importer-of-arms-in-2017-2021-but-atmanirbharta-push-sees-volume-fall-by-21/872896/
4. Ibid
5. ‘’Defence Budget 2022-23, securing India’’, (01 Feb 2022), ORF, page 1, https://www.orfonline.org/expert-speak/defence-budget-2022-23/
6. Union budget 2022-23,01 Feb 2022, PIB, Government of India, https://pib.gov.in/PressReleasePage.aspx?PRID=1794415
7. PIB Govt of India, ‘’Rakha Mantri Exhorts Indiian Defence industry’’ dated 27 Sep2022,https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1862541
8. Nagial BS, (02 May 2022),‘’ Atmanirbhar Bharat and selfreliance in defence’’, Times of India,

177-195

ACHIEVING CIVIL MILITARY FUSION IN SPACE

Gp Capt Puneet Bhalla*

"Space technology is an example of what security will mean for any strong nation in the future. Various challenges in this area have been reviewed and identified by the three services. We have to work fast to solve them."

Indian Prime Minister Shri Narendra Modi

Introduction

Civil-Military integration (CMI) may be defined in various ways but the underlying principle remains the integration of national military and civilian capabilities to meet the nation's needs, both civil and military. The concept is not new and has been pursued by many developed countries for decades now, although the terminology has gained more visibility in recent years. This has been caused by another recent phenomenon – the democratisation of technology that has ensured that advancing technology and path breaking innovation is no longer the prerogative of governmental agencies. The contemporary world thus has evolved from just spin-offs (application to and conversion of military technologies in civil fields) to include "spin-on" (developments for civil purposes or for commercial applications having relevance for national security or military purposes).[1] Many of these emerging technologies are dual-use, having both civil and military applications, and this is of particular importance for capability and capacity enhancement in the technological and capital-intensive domain of outer space. Analysts are comparing this to the

evolution in the aviation sector and the spread of the internet, both of which started as military centric technologies but saw rapid expansion through private participation and commercial applicability.

More recently, emergence of disruptive technologies and trends and a shift of global focus on economic outcomes has resulted in emergence and proliferation of smaller establishments and start-ups who are capable enough to make significant contributions. With an acceptance of these entities into the domain, there is a need to evolve further to Military-Civil Fusion (MCF) – strategizing the integration of these commercial entities for incorporating the latest technological capabilities available globally and investing in emerging and disruptive technologies towards dual-purposes. CMI in the domain of space has been pursued differently by various governments, defined by their respective interests, budgets and human resources.

In India, the civil-military interaction in the domain of space has been a complex one. The sole organisation entrusted with space activities is Indian Space Research Organisation (ISRO), which has tried to stay closely aligned to its civilian mandate, focussing preferably on science rather than the business potential or the optimum exploitation by the armed forces of downstream applications. Lately however, there is a greater cognisance at the apex level of the economic and military aspects of the domain, resulting in a spate of initiatives since 2020, when the government of India (GoI) decided to open up the Space sector. While this has resulted in some important transformations in the sector, there is a need to more comprehensive study, understanding, implementation and evolution of reforms to achieve effective CMF in the sector.

Evolution

At the beginning of the space age, the quest for access to the domain was for strategic purposes that resulted in both the Cold War rivals investing heavily into achieving the technological edge. Space had limited usage for operational or tactical level military operations and offered few civilian applications. There were very few commercial services on offer, which in the absence of technology diffusion catered to a limited and geographically dispersed customer base. Space exploration efforts thus remained confined to national agencies funded by governments.

The first Gulf War demonstrated the utility of space-based systems for force enhancement functions, introducing it to the operational and even tactical levels and inciting interest among the militaries across the world. In the U.S., many civilian applications also emerged, either as an offshoot or through some dedicated programmes by National Aeronautics and Space Administration (NASA). In the Soviet Union, a similar, but limited role was played by State Owned Enterprises (SoE).

In the past couple of decades, the digital revolution, rapid pace of technological advancements, miniaturisation of components and the receding geopolitical tensions that led to the emergence of globalisation have all significantly lowered the cost curve of access to technology. Concomitantly, access to the hitherto 'distant' space has been democratised. With greater technologic proliferation and awareness, there are ever more set of use cases emerging, providing opportunities for established private entities as well as budding entrepreneurs to invest in this sector for scientific, as well as economic reasons. Nations or organisations no longer have to invest in owning satellites or have launch capabilities to exploit the space domain, as commercial enterprises would be able to provide these at highly economical rates. In 2022, the number of global space launches leapt to 186, with 182 successful. Of these, 82 were carried out by governments; 21 by commercial companies under contract to their host governments, and 83 by commercial companies for commercial customers, including foreign governments. [2]

Private Participation

Some of the innovative ideas in recent years that have revolutionised the domain have gained maturity through majorly private initiatives, even as government agencies and large aerospace companies largely focussed on incremental improvement of existing systems. The most prominent example of this has been SpaceX, whose use of technological innovations to drive down the launch costs and the concept of reusable rockets have been revolutionary successes. Even the concept of smaller satellites that are cheaper to design, develop and produce in much shorter timelines and modular concepts in satellite production that together enable mass production through assembly line processes, have mainly been private sector initiatives.

More recently, private companies are investing in more niche capabilities such as SAR and hyperspectral sensing. Pixxel, an Indian company, has already launched three of its inhouse developed hyperspectral satellites on its way to a complete constellation to 24. Mass production has enabled constellations for low latency communications from LEO and swarms of satellites to be developed, tested and deployed. Other private initiatives include optical communication, use of additive manufacturing for aerospace systems, enhancing space situational awareness (SSA), automatic identification system for maritime traffic monitoring and automatic dependent surveillance sensors for aviation activities, among many others.

While some of these are far from reaching the desired level of sophistication, rapid technological advancement and proliferation is ensuring that progress towards achieving technological maturity or achieving near parity with extant systems is relatively much faster. Success stories like SpaceX and Blue Origin have inspired hundreds of space start-ups and companies and attracted funding, contributing to the speed and diversity of innovation. Economic competition has also spurred innovations, encouraged shortening of product development cycles and in rapid evolution of product lines. New age private establishments have been seen to be less risk averse while investing in developing and testing novel technological applications and more agile and responsive to innovative ideas that could have a potential end use. The lower access cost has also allowed greater diversity and proliferation of the space industrial base, invigorated the ecosystem and allowed for more democratisation of the supply chains.

A major hindrance to the linear development of space enabled services has been the disconnect between the space technologists and the potential consumers. The experts have tended to focus on the science even as the potential end user has remained largely unaware of the technological capabilities, potential and limitations. This has been especially evident in India, where the government departments, including the armed forces, and the private sector have severely lagged behind in drawing use cases from its successful space program. Private companies, looking at commercialising their products, are more adept at understanding the demand-supply dynamics and the needs and agendas

of potential customers, be those businesses or nations. As compared to governmental behemoths, they display greater interest in proactive customer engagement and education. Their interest in commercial viability makes them better focus on end user requirements. This is largely different from the conventional approach of supplying raw data through complex pipelines. Private companies can acquire technology and expand reach through mergers and acquisitions. SatSure, an Indian deep tech start-up working at the intersection of spacetech, Artificial Intelligence (AI), and Software as a Service (SaaS) to drive decision intelligence, has acquired a U.S.-based Geospatial services company called Old City Innovations.[3] Working for commercial interests, private entities also better collaborate on technology development and testing and more smoothly reach agreements on use of each other's products. Indian companies Skyroot and Bellatrix signed a memorandum of understanding (MoU) in February 2021, under which Bellatrix's orbital transfer vehicle is supposed to launch on a rocket that Skyroot is developing.[4]

CMI in Space

Spin-off and spin-on cooperation in the space industry have become common and solid practices with the intent to lessen product and technology development costs, expand the utilisation of dual-use resources and expedite the introduction of advanced commercial products to the defence sector.[5]

- **Intelligence, Surveillance and Reconnaissance (ISR).** A number of private satellite companies have been launched to cater to varying requirements of the satellite imagery and analysis market. Hi-resolution imagery up to 30-cm native spatial resolution is now available through privately owned satellites and they are persistently working at enhancing their capabilities. Use of data from privately owned satellites to the Ukraine military is the most fitting and recent example of CMI. Following this, the U.S. National Reconnaissance Office (NRO) has announced contracts worth billions of dollars over the next decade to a trio of satellite-imagery companies: Maxar, Planet and BlackSky.[6] The NRO has noted that the increasing availability of commercial companies' imagery "increases our resilience and enables an integrated approach" to national security.[7]

- **Communications.** Satellite communication has been the backbone of the commercial space industry. The successful resilient employment of SpaceX's Starlink constellation by Ukraine armed forces, when the legacy ViaSat system succumbed to cyber-attacks has been noticed by militaries across the world. In an effort to expand their revenue streams, private companies are investing in innovations towards expanding broadband connectivity, extending 5G connectivity to air, sea, and other remote areas, providing high speed internet on commercial airlines and on satellite-to-mobile device connectivity. All these have applicability to enhancing military communication networks and would be enablers for the futuristic Internet of Military Things (IoMT).

- **Constellations.** The advent of satellite applications based on constellations comprising hundreds, and envisioned thousands, of satellites offer unique capabilities, capacities and applications. For ISR, they offer increased temporal resolution with an option to diversify the spatial and spectral resolutions. Communication and networking abilities from LEO based mega-constellations enable more ubiquitous, persistent coverage to even remote and inaccessible areas, at lower latency. Together, these enable more expansive and persistent C4ISR coverage and shortening of the OODA loop. Large constellations of satellites would offer resilience to the national security and military users, making it near impossible to neutralise or meaningfully degrade the functionality of a system by targeting individual satellites through kinetic or non-kinetic ASATs.

- **Operationally Responsive Systems (ORS).** Mass production capability could contribute to an ORS by providing a stockpile of easily replaceable satellites, increasing the speed at which a satellite constellation can be reconstituted or improved. Smaller launch vehicles being developed could be utilised for quick responsive launch to enhance capacities and inject replacements in the event of a conflict.

- **Anti-Satellite (ASAT).** Small satellites also have ASAT potential (on-orbit rendezvous and proximity operations), which the militaries would need to factor in for their offensive as well as defensive operations.

Militaries have the option of procuring or coordinating services from commercial systems for their various planning and execution requirements. This would allow rationalisation of effort related to developing and operating organic capacities. The more regular, less-demanding requirements could be offloaded to commercial entities to enable national agencies to concentrate on more intensive research, designing and development. Concurrently, the armed forces could continue to explore the newest technologies and emerging trends and applications in the civil domain for military-specific opportunities. Many governments are already incentivising private investments in further development and deployment of these capabilities that would benefit national security users.

CMI - United States

The U.S. has been at the forefront of civil military integration in Space, encouraging private investment in the domain, initially to enhance capacities and subsequently to build advanced capabilities. As seen from the example of SpaceX, the ecosystem has prospered from the enabling policies and governmental support through funding and business opportunities. In return, these private companies have provided services to the country's space programme, as well as to the military and helped contribute to the nation's economy. More recently, it allowed the U.S. government to support operations in Ukraine, while providing it the benefit of plausible deniability of its active participation.

The U.S. Space Development Agency, created in 2019, has put forth an ambitious plan involving small satellites, as part of its National Defense Space Architecture to quickly deliver needed space-based capabilities to the joint warfighter to support terrestrial missions. The SDA aims to harness commercial development to lower costs and achieve a proliferated architecture and enhanced resilience and employ spiral development methods, adding capabilities to future generations as the threat evolves.[8] U.S. Army's Project Convergence, aimed at building the Army of 2030, where the service will reorganize and develop innovative technologies to outpace near-peer adversaries in future battles, has been experimenting with leveraging both national assets as well as commercial constellations for imaging and communications. Combining

this with novel capabilities in data fusion and artificial intelligence, it reported cutting down the sensor to shooter timeline from 20 minutes to 20 seconds.[9]

China

China's "military-civil fusion" (MCF) aims to eliminate barriers between China's civilian research and commercial sectors, and its military and defence industrial sectors. These are being pursued through reorganisation and interactive efforts between government institutions and private industry.[10] In terms of space capabilities, the Chinese government issued Document 60 (Guiding Opinions of the State Council on Innovating the Investment and Financing Mechanisms in Key Areas and Encouraging Social Investment) in 2014. It was followed by other policy documents that encouraged private and international investment in space, a previously protected sector. Civil–military integration (CMI) was uplifted as a national-level strategy in 2015 and Outer Space was one of the sectors included in its military White Paper issued in 2015 and the 'Made in China 2025' (MIC2025).[11] The commercial participation has seen a steady increase and of the 182 total satellites launched by China in 2022, 100 (55 percent) were of commercial class.[12] Towards CMI, thirteen technical experts from private companies had been appointed to the PLA Rocket Force's National Defence Science and Technology Expert's Panel upon its founding.[13]

Even as it tries to adopt private participation and a market-oriented approach against the entrenched traditional state-led approach, these initiatives are planned to be directed at economic development and technological advancement rather than on military modernisation.[14] State-owned enterprises (SOEs) and their subsidiaries (most major commercial space companies are either subsidiaries of SOEs or are spin offs from government or other government organizations or SOEs) continue to dominate its space sector.[15] Purely private initiatives are at relatively lower levels of technological accomplishments and are heavily dependent on government's support with very little autonomy in operations. The government has allowed commercial space companies to leverage the government's supply chains and other capabilities, such as the use of government launch sites and the facilities of space SOEs. China could possibly utilise these efforts for the export potential of their

low-cost products and services and to reduce China's reliance on space-related systems and technologies from other countries.

Challenges

There are challenges to expansion of the use of the domain by private entities that could impact their utilisation for military purposes.

- **Regulating.** The existing global space regimes are inadequate to address the issues emerging from growing private sector participation – the crowding of orbital space, the dual-use potential and liability issues when dealing with multinational operations. Parochial interests in maintaining the technological edge and preferred access to the domain have precluded consensus on any new initiatives aimed at regulating the environment. The use of commercial space assets in support of Ukraine's military in the Russian-Ukrainian conflict have highlighted the complications related to the legitimacy of such action. The ambiguity of purpose of a system also complicates application of existing legal mechanisms related to application of force on it being targeted by an adversary during a conflict. This was evident in the targeting of the ViaSat network through cyber hacking by Russia, as it was the primary system being employed by the Ukraine military, but which also resulted in collateral damage to civilian services across Europe. While SpaceX stepped in with their Starlink system to resume wartime services, it was evident that there was no clarity on legal or military options to respond to the attack or options for the civilian customers for resumption of services or to claim for the losses suffered.

- **Domestic Regulation.** Being a technologically intensive and strategically sensitive sector, space has unsurprisingly been drawn into the tussle related to geopolitics and technology in a highly polarised global environment. Governments are already showing reluctance to give unbridled access to private companies, especially when dealing with niche technologies and sharing of sensitive data. The greater political oversight and control could impede technological advancement through collaborations and sharing, as also disincentivise investments.

- **Geoeconomics.** Commercial space enterprises are also becoming part of the economic competition between states with governments vying to garner a greater share of the burgeoning space market. In the U.S., there are demands for policies and incentives to keep U.S. companies competitive internationally.[16] The European nations have also boosted their spending on space by 17% over coming years to address the intensifying global competition.[17] Nations are looking at diversifying their sources to avoid being denied capabilities for strategic reasons. China seeks to utilise the potential of its Belt and Road Initiative (BRI), signing 23 pacts with 11 countries along the BRI route for space-related cooperative activities, displacing the U.S. commercial services. These measures could either spur innovation, or act against a more efficient collaborative approach to innovation.

- **Commercial Rationalisation.** As seen with the dot-com sector, experts expect the next few years in the sector to be tumultuous as expectations, capabilities and commercial realities pan out,[18] An example is that of the U.S.' Defence Innovation Unit (DIU), an organisation focussed exclusively on fielding and scaling commercial technology across the U.S. military, whose success rate has been around 23 percent – projects that ended up in actual applications.[19] Stringent government control could delay important projects, allowing alternatives to displace space enabled initiatives as has been seen by terrestrial communications and unmanned aerial RS. Uncertainty in the sector would reduce funding and stall important projects that have implications for dual-purpose employment.

- **Survivability**. Growing commercial interest is adding onto the orbital traffic, increasing the vulnerability of deployed assets. This would require investments in enhancing domain awareness and measures towards resilience.

- **Protection of Civil Assets.** In the recent Russian-Ukrainian conflict, as the U.S. continues to leverage more commercial satellites for providing intelligence and communications services to Ukraine, Russia has issued a warning that this "quasi-civilian infrastructure may become a legitimate target for retaliation." A recent Chinese paper titled "2022 Challenges to Security in Space", from its People's Liberation Army (PLA) Xian-based research institute, considers

Elon Musk's Starlink satellite system a threat, to be targeted and neutralised, primarily through electronic warfare.[20] This brings forth the question of the state's responsibility in devising technological and non-technological means to deter and protect not only government controlled but also commercial space assets being employed for military purposes against physical, jamming and cyber-attacks.[21] The question is important as commercial systems are not designed and engineered as sturdily or secured against attacks as military ones. As these assets provide plausible deniability to governments, it becomes difficult to profess or define overt sureties to their operations.

- **Technology Awareness and Adoption.** An important aspect of space enabled technologies is the awareness at various levels of military hierarchy about the capabilities and potential and the ability among the military practitioners to adopt them. History is replete with examples that profess that technology in itself is not a battle winner, unless supported by effective doctrines and training.

CMI in Space – India

While Indian space program has been a success, it has suffered from a lack of vision on developing futuristic capabilities like LEO based constellations, spaceplanes and reusable launch systems and lack of coordination among various agencies. A case in point is the lack of coordination among various agencies on the IRNSS system that has precluded wide-spread adoption by the potential end-users, both military and civil. A scientific, rather than an application-based approach, has also affected the return on investments. Despite India's advanced space capabilities, its share in the global commercial space sector is only 2 percent, [22] owing to lack of capacities as well as business acumen. The GoI has now set a projected target of commercial space industry contributing 1 percent to the country's $5-trillion economy target by 2024 and to expectedly increase India's global share in the space market to around 10 percent by 2030. This is to be achieved through enhanced private participation and harnessing the huge untapped potential that exists in the country in terms of human resources, technical acumen and capabilities established in the industries in space sector.[23]

Actions by the GoI have been demonstrative of the its resolve. NewSpace India Limited (NSIL) was set up in March 2019 as a PSU under the administrative control of the DOS to function as the commercial arm of ISRO. Indian National Space Promotion and Authorisation Centre (IN-SPACe) was established in June 2022 as an autonomous agency in Department of Space (DOS) to act as a single-window, independent, nodal agency for promotion & regulation of all space sector activities of private entities. All technology transfer is to take place through NSIL, while authorisation and regulation would be done through INSpace. Already, these two entities have facilitated some important collaborations with the private sector for space-based applications and services and monetised ISRO's potential and services. These organisations also facilitate bringing together the industry stakeholders for their suggestions on the new space policy, spectrum allocation and licensing framework to make the regulatory environment conducive to private sector participation, towards creating a level playing field. The Prime Minister has clearly enunciated that he did not want to see the industry only as vendors, but as leaders in space development. ISRO has been made a facilitator to offer technological assistance and sharing of existing space infrastructure towards faster technology maturation and cost saving. The companies also stand to benefit by leveraging the aerospace grid vendor ecosystem comprising more than 400 private entities specialising in domain specific technology development, manufacturing and supply of components.

Some of the significant events, among many, have been:

- Award of contract for the commercial development of next five polar satellite launch vehicles (PSLVs) to space conglomerate formed by Larsen & Toubro (L&T) and Hindustan Aeronautics Limited (HAL)
- Signing of MoU between ISRO and Skyroot Aerospace in 2021, which led to the successful maiden launch of India's first privately built rocket for suborbital flight, the Vikram-S, in November 2022.
- Dhruva Space, pursuing a communications constellation, successfully validated its satellite orbital deployer during the PSLV C53 mission and subsequently launched two nanosatellites for amateur communications onboard PSLV-C54 in November 2022.

- Signing of MoU between IN-SPACe and QNu Labs in December 2022 to develop Indigenous Quantum Tech Satellite QKD, with the support of ISRO.[24]

- Global private initiatives are also vying for the Indian market through tie-ups with local companies to deliver satellite broadband services. Significant ones are UK's OneWeb with Bharti Airtel, Luxembourg-based SES with Reliance Jio and Canada's Telesat with Tata's Nelco.

More space-linked private entities have mushroomed to avail the opportunities being offered and in November 2022, Chairperson of ISRO S Somanath said that 100 start-ups had already registered with the space agency, of which at least 10 are working on upstream applications (developing satellites and rockets).[25] Besides the initiatives already covered, Agnikul Cosmos and Space Fields have been developing launch vehicles for smaller payloads, Digantara is on line to developing and deploying technologies for contributing to Space Situational Awareness (SSA) and Tathya Earth is looking at downstream applications based on remote sensing. The growing interest and positive policy initiatives have helped these companies raise a cumulative funding of more than $245.35 million in 2022, with expectations of over $300 million in investment in 2023.[26] Indian investment however, has remained low owing to the lack of investors with sufficient risk appetite to venture into an emerging domain, as also lack of clarity in relation to defined space policy. More demonstrable successes would beget more investment, preferably from domestic investors, to avoid commercial exploitation by foreign players, lesser foreign exposure in a sensitive domain and ease of CMI.

The CMI/MCF implementation would require a national strategy or plan that defines a mechanism that facilitates the interaction of a top-down centralised governance structure and bottom-up commercial-led development. [27] Towards this the GoI has established Defence Space Research Agency (DSRA) in 2019 as a civilian scientific organisation responsible for developing space-warfare systems and technologies for Defence Space Agency (DSA), a tri-services institution mandated to aggregate the demands of the armed forces.[28] DSRA is in its formative years and is providing limited assistance to the armed forces. On the other hand, while most initiatives being pursued by these New Age space companies have dual-use potential, there is lack of clarity on

structures and processes for their interaction and coordination with the armed forces.

A relatively clearer initiative has been Mission DefSpace, launched by the Prime Minister during DefExpo in October 2022 with 75 Defence Space Challenges relevant to the end users. These challenges have been categorised into existing DDP initiatives of iDEX, Make-I and Make-2. Private Industries, including Start-ups, MSMEs and Individual Innovators, are eligible to apply. The challenges have been classified into five buckets viz. Launch System, Satellite System, Communication & Payload System, Ground System and Software System to provide a holistic 3600 overview of space.[29]

Path Ahead

A committed governmental approach has often produced spectacular results through a national coordinated effort. The U.S. moon landing program was one such example. In India, success of the Unified Payments Interface (UPI) story has been achieved through public private partnership. Today, almost 40 percent of the world's UPI business happens in India, confirming that India could innovate and implement through a national approach and need not always look at use cases across the world to adapt. India's opening up of the space sector to private participation and efforts at adoption and implementation of CMI in the domain have more similarities with the Chinese model than the western one. The need is to develop and evolve its own model adapting the best of both, for optimising MCF in Space.

The fundamental aspect of MCF would be a comprehensive and systematic legal and regulatory framework that is enabling for the private sector participation and provides for institutionalised coordination among all agencies that could contribute to national security. Towards this, the approval by the cabinet of the new India Space Policy (draft was released in 2020), followed by the approval by the parliament of the Space Activity Act are much awaited. These are expected to provide clear and transparent policy guidelines and regulations, procedures and opportunities. Along with more enabling well-defined import and export control norms, these would help private sector entities expand the business in the sector, boosting the space economy, attract foreign

investment and give a boost to the local manufacturing. The country enjoys a clear advantage in terms of possessing a vibrant, technologically advanced and cost-efficient space sector, lower input costs and strength of its proven software prowess that could be leveraged judiciously, to propel growth in the commercial space sector.

India remains a resource constrained country and it would best achieve its objectives through optimum utilisation of the capabilities and capacities available. Presently, the efforts by private entities lack the desired sophistication and establishment of a vibrant commercial space sector manufacturing industry in the country is a distant goal. The government is thus focussed on providing technological support and access to infrastructure to facilitate the development of commercial space rather than funding technological innovation and has decided not to include the space sector into the Performance Linked Initiative (PLI) scheme.[30] However, the interactive and collaborative mechanisms to promote the sustainable development of the space industry need a focussed and evolving approach. At a later date, these should be able to utilise and incorporate technological innovation benefits from the civil and private enterprises. The entrenched bureaucratic and technocratic mindset that is distrustful of all commercial activity and sceptical of private entities competence should give way to increased interdependence in capability development and innovation. Owing to the sensitivity of the sector, indigenisation is the key to access to technology and achieving scales and to overcome challenges related to export and IPR restrictions.

After years of dithering, the military use of space for its impact on all terrestrial operations has now been openly accepted by India. The increasing requirement of space enabled capabilities for the armed forces in terms of expansion and diversification is challenging the extant structures and capacities. There is a requirement for a formalised MCF strategy that could better define the space doctrines, roles and roadmaps for the defence forces and the way to capability and capacity building. Air Chief Marshal VR Chaudhari, as the Vice Chief of Air Staff in September 2021, had highlighted the lack of robust “military-civil fusion”-like framework that was preventing the nation from innovating and manufacturing next-generation space technologies on a large scale.[31] A pertinent example of military role and requirements is that of SSA,

which he had also referred to as critical for the armed forces to protect and defend its assets in space as also for enabling an effective ASAT capability.[32] Civil specific SSA capabilities would not be sufficient for the defined tasks of the DSA that would require to be extended to tactical, predictive and intelligence driven SSA that comes under an integrated C4ISR architecture.[33] These would require dedicated sensors as also networking with the civilian capabilities towards a more comprehensive network and would necessitate a 'whole of nation' approach.

A further enabler would be a National Security Strategy that would encourage coming together of military and civil components (government, industry, academia) of the nation to contribute to the national well-being. This would also help better define the role of private players during conflict and the role of government agencies in incorporating their capabilities and protecting them against harmful attacks. A more robust structure is required for military specific reform and to cater to military specific requirements, which in the future could explore private sector participation in strategic or military domains.

Of vital importance to the MCF process is awareness and understanding of the demands/requirements and the supply/capabilities and the possibilities that exist for synergy. This can only be achieved through educating the constituent elements, constant interactions and even cross-directorate attachments.

***Gp Capt Puneet Bhalla** is a Senior Fellow, Centre for Joint Warfare Studies, New Delhi.

Endnotes

1 Xiaodan Wu, Jie Long (2022), "Assessing the Particularity and Potentiality of Civil–Military Integration Strategy for Space Activities in China", Science Direct, [Online: web], Accessed 30 October 2022, URL: https://www.sciencedirect.com/science/article/abs/pii/S0265964622000406

2 Theresa Hitchens (2023), "China tops US in defense-related satellites orbited in 2022: Report", Breaking Defense, [Online: web], Accessed 08 January 2023, URL: https://breakingdefense.com/2023/01/china-tops-us-in-defense-related-satellites-orbited-in-2022-report/

3 CISION (2022), "SatSure enters the US Market through acquisition of Philadelphia-based Geospatial services company" [Online: web], Accessed 10 November 2022, URL: https://www.prnewswire.com/in/news-releases/satsure-enters-the-us-market-through-acquisition-of-philadelphia-based-geospatial-services-company-896027136.html

4 T E Narasimhan (2021), "Skyroot, Bellatrix signs MoU to use latter's orbital transfer vehicle", Business Standard, [Online: web], Accessed 11 November 2022, URL: https://www.business-standard.com/article/companies/skyroot-bellatrix-signs-mou-to-use-latter-s-orbital-transfer-vehicle-121020800711_1.html

5 Xiaodan Wu, Jie Long (2022), "Assessing the Particularity and Potentiality of Civil–Military Integration Strategy for Space Activities in China", Science Direct, [Online: web], Accessed 30 October 2022, URL: https://www.sciencedirect.com/science/article/abs/pii/S0265964622000406

6 Michael Sheetz (2022), "Satellite-imagery firms Maxar, Planet and BlackSky awarded billions of dollars in government contracts", CNBC, [Online: web], Accessed 05 November 2022, URL: https://www.cnbc.com/2022/05/25/nro-announces-satellite-imagery-contracts-to-maxar-planet-blacksky.html

7 Michael Sheetz (2022), "Satellite-imagery firms Maxar, Planet and BlackSky awarded billions of dollars in government contracts", CNBC, [Online: web], Accessed 05 November 2022, URL: https://www.cnbc.com/2022/05/25/nro-announces-satellite-imagery-contracts-to-maxar-planet-blacksky.html

8 SDA, "Space Development Agency", [Online: web], Accessed 07 November 2022, URL: https://www.sda.mil/

9 USNI News (2022), "Report to Congress on Army's 'Project Convergence'", [Online: web], Accessed 07 November 2022, URL: https://news.usni.org/2022/06/03/report-to-congress-on-armys-project-convergence

10 Manoj Joshi, "China's Military-Civil Fusion Strategy, the US Response, and Implications for India", Observer Research Foundation, [Online: web], Accessed 02 November 2022, URL: https://www.orfonline.org/research/chinas-military-civil-fusion-strategy/

11 Xiaodan Wu, Jie Long (2022), "Assessing the Particularity and Potentiality of Civil–Military Integration Strategy for Space Activities in China", Science Direct, [Online: web], Accessed 30 October 2022, URL: https://www.sciencedirect.com/science/article/abs/pii/S0265964622000406

12 Theresa Hitchens (2023), "China tops US in defense-related satellites orbited in 2022: Report", Breaking Defense, [Online: web], Accessed 08 January 2023, URL: https://breakingdefense.com/2023/01/china-tops-us-in-defense-related-satellites-orbited-in-2022-report/

13 Andrew W. Hull et al, ""Private" Chinese Aerospace Defense Companies, China Aerospace Studies Institute, [Online: web], Accessed 06 November 2022, URL: https://documents2.theblackvault.com/documents/usaf/CASI_Chinese_Aerospace_Defense_Companies.pdf

14 Xiaodan Wu, Jie Long (2022), "Assessing the Particularity and Potentiality of Civil–Military Integration Strategy for Space Activities in China", Science Direct, [Online: web], Accessed 30 October 2022, URL: https://www.sciencedirect.com/science/article/abs/pii/S0265964622000406

15 Irina Liu et al. (2019), "Evaluation of China's Commercial Space Sector", Institute for Defense Analyses Science & Technology Policy Institute, [Online: web], Accessed 16 November 2022, URL: https://www.ida.org/-/media/feature/publications/e/ev/evaluation-of-chinas-commercial-space-sector/d-10873.ashx

16 Makena Young, Akhil Thadani (2022), "Low Orbit, High Stakes: All-In on the LEO Broadband Competition" CSIS Aerospace Security Program [Online: web], Accessed 08 November 2022, URL: https://www.csis.org/analysis/low-orbit-high-stakes

17 Tim Hepher (2022), "Europe flags space ambitions with spending hike and new astronauts", Reuters, [Online: web], Accessed 09 November 2022, URL: https://www.reuters.com/lifestyle/science/european-space-nations-wrangle-over-funding-increase-2022-11-23/

18 Anton Brevde (2022), "2023 Will Be the Year That the New Space Bubble Pops", Prime Movers Lab, [Online: web], Accessed 09 November 2022, URL: https://medium.com/prime-movers-lab/2023-will-be-the-year-that-the-new-space-bubble-pops-21f228db355f

19 John Beckner (2020), "The West's Military Technology Imperative: Public/Private Partnerships", MilSatMagazine, [Online: web], Accessed 15 December 2022, URL: http://milsatmagazine.com/story.php?number=1592616838

20 Jessica Mao (2022), "Chinese Researchers Reportedly View Elon Musk's Starlink as a Military Threat", The Epoch Times, [Online: web], Accessed 08 December 2022, URL: https://www.theepochtimes.com/chinese-researchers-reportedly-view-elon-musks-starlink-as-a-military-threat_4511936.html

21 Julia Siegel (2022), "Commercial satellites are on the front lines of war today. Here's what this means for the future of warfare", Atlantic Council, [Online: web], Accessed 10 December 2022, URL: https://www.atlanticcouncil.org/content-series/airpower-after-ukraine/commercial-satellites-are-on-the-front-lines-of-war-today-heres-what-this-means-for-the-future-of-warfare/

22 Space Tech Analytics (2021), "SpaceTech Industry 2021 / Q2: Landscape Overview", [Online: web], Accessed 10 October 2022, URL: https://analytics.dkv.global/spacetech/SpaceTech-Industry-2021-Report.pdf

23 Manish Pant (2022), "Meet the Start Ups Who Are Turbo Charging India's Space Economy" Business Today, [Online: web], Accessed 10 October 2022, URL: https://www.businesstoday.in/interactive/longread/meet-the-start-ups-who-are-turbo-charging-India-s-space-economy-120-20-05-2022

24 Press Trust of India (2022), "IN-SPACe inks pact with QNu Labs to develop satellite quantum key distribution products", Economic Times, [Online: web], Accessed 02 January 2023, URL: https://economictimes.indiatimes.com/news/science/in-space-inks-pact-with-qnu-labs-to-develop-satellite-quantum-key-distribution-products/articleshow/96368515.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

25 Communications Today (2022), “India’s Space-Tech Expects Over 300Million In Investment In 2023” [Online: web], Accessed 05 January 2023, URL: https://www.communicationstoday.co.in/indias-space-tech-expects-over-300-million-in-investment-in-2023/

26 Communications Today (2022), “India’s Space-Tech Expects Over 300Million In Investment In 2023” [Online: web], Accessed 05 January 2023, URL: https://www.communicationstoday.co.in/indias-space-tech-expects-over-300-million-in-investment-in-2023/

27 Xiaodan Wu, Jie Long (2022), “Assessing the Particularity and Potentiality of Civil–Military Integration Strategy for Space Activities in China”, Science Direct, [Online: web], Accessed 30 October 2022, URL: https://www.sciencedirect.com/science/article/abs/pii/S0265964622000406

28 Asian News International (2019), “Defence Space Research Agency: Modi govt approves new body to develop space warfare weapon systems”, India Today, [Online: web], Accessed 15 October 2022, URL: https://www.indiatoday.in/india/story/defence-space-research-agency-modi-govt-approves-new-body-to-develop-space-warfare-weapon-systems-1546951-2019-06-11

29 Press Information Bureau (2022), “Space Defence Mission”, [Online: web], Accessed 10 December 2022, URL: https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1882082

30 Arup Dasgupta (2022), “A Conversation with Pawan Goenka, Chairman, IN-SPACe”, Geospatial World, [Online: web], Accessed 12 December 2022, URL: https://www.geospatialworld.net/prime/interviews/a-conversation-with-pawan-goenka-chairman-in-space/

31 Press Trust of India (2021), “Lack of military-civil cooperation framework impeding innovation in space tech: IAF Vice Chief”, [Online: web], Accessed 12 December 2022, URL: https://www.thehindu.com/sci-tech/technology/lack-of-military-civil-cooperation-framework-impeding-innovation-in-space-tech-iaf-vice-chief/article36361278.ece

32 Press Trust of India (2021), “Lack of military-civil cooperation framework impeding innovation in space tech: IAF Vice Chief”, [Online: web], Accessed 12 December 2022, URL: https://www.thehindu.com/sci-tech/technology/lack-of-military-civil-cooperation-framework-impeding-innovation-in-space-tech-iaf-vice-chief/article36361278.ece

33 Refer Kartik Bommakanti (2020), “ISRO’s DSSAM and the expectations of India’s armed forces”, Observer Research Foundation, [Online: web], Accessed 12 December 2022, URL: https://www.orfonline.org/expert-speak/isro-dssam-expectations-india-armed-forces/

CMF IN CYBERSPACE DOMAIN

Air Marshall Daljit Singh, PVSM, AVSM, VM (Retd)*

Introduction

The world is witnessing disruptive technological developments especially in the fields of computer technology, communications, digitisation, and sensors, which have been well exploited by all. This new wave has generated a different operating space, known as 'Cyberspace'. Cyberspace is "*global domain within the information environment consisting of the interdependent network of information technology infrastructures and resident data, including the internet, telecommunications networks, computer systems, and embedded processors and controllers*." [1]It is an open and complex environment which is easily accessible, and extensively employed in almost all domains by people, public and private organisations, governments as well as the armed forces.

In the public sector domain, energy, communications, railways, civil aviation, other transportation systems, banking, and financial institutes, are some of the major agencies employing cyberspace gainfully. All Private corporates dealing with Information Technology (IT), internet service, manufacturers and communication network providers are increasingly dependent on cyberspace domain for providing services.

The armed forces have embraced technological advances, suitably evolved operational concepts and acquired cyberspace based capabilities quite rapidly. They are well networked to exchange information, obtain real-time situational awareness, manage coordination, and take informed

decisions, which are conveyed at the speed of light. In fact, all other operational domains of land, sea, air, and space exceedingly depend on the cyberspace domain in all facets of operations.

Internet has been developed by design, to be open and easily accessible to the users, who could connect and share information through standard protocols. Internet security was neither considered seriously nor factored in establishing the connectivity norms. Today, cyberspace vulnerability is exploited copiously by rogue elements, state and non-state actors for ransom demands, cybercrime, cyber espionage, and cyberspace denial/ suppression of internet use. It is quite evident that more the dependence on cyberspace by any entity, more catastrophic would be the effect, if freedom of use of cyberspace is denied.

In recent armed conflicts worldwide, attacks in cyber domain are parallelly executed along with attacks in other domains, and their intensity would continue to increase as the dependence on cyberspace increases. The latest Ukraine-Russia conflict is the live example of this trend.

While India has software skilled force, cyber law enforcement agencies, emergency response and cyberspace monitoring agencies in place, they are all federated and work in their own verticals, resulting in sub-optimal countermeasures to the cyber threats, that threaten the national security. "*Defending against cyber-attacks demand cooperative approaches, collective efforts and pooling of resources, guided by policy guidelines*."[2] It is, therefore, important to examine the existing cyber environment, gaps and look at how India could ensure a robust, resilient, and superior offensive capability in cyberspace domain by exploiting civil-military fusion.

Present Civil Cyber Environment

As per Telecommunication Regulatory Authority of India (TRAI), there are 816.4 million broadband subscribers in India.[3]Due to digital transformation taking place, the internet penetration rate has reached 47 percent of the population. Information Technology (IT) is the growth engine of Indian economy and Indian enterprises have been providing IT services to other countries as India has large number of IT skilled,

motivated, and adaptive work force. Even sensitive organisations are connected to open internet domain, albeit in a restricted manner. Internet connectivity would continue to expand as the government is committed to expand the scope of Digital India, internet, and communications reaching the rural areas.

With exponential usage of cyberspace, there has been surge in cyber-attacks on governmental and other major private industries websites. The Indian Cyber Emergency Response Team (Cert In) detected and recorded 12.67 lakhs of cyber-attacks in the year 2022.[4] There are bound to be many more cyber-attacks going undetected and un-reported. The Government websites like DRDO, PMO and Department of Atomic Energy managed by National Informatics Centre (NIC), have been cyber attacked many times in the past, even though serious damage does not appear to have been done. The latest ransom attack on All India Institute of Medical Science (AIIMS) on 23 November 2022 had crippled the working of the Institute as medical records of four crore patients, including the medical records of the President, Prime Minister, other ministers, and top bureaucrats were lost and these records would be available for sale in dark web. Social media perception management is another area which has been copiously employed by people, terrorist organisations and other parties as an influence campaign. The Indian private and public agencies are gradually realising the urgent requirement to have more secure, robust, and resilient network with data retrieval backup.

Present Cyber Security Organisation and Legislation

India was one of the few countries to promulgate IT Act in the year 2000, duly amended in 2008 to deal with cyber threat. The National Cybersecurity Policy was published in 2013 (NCSP 13) mainly to bring out the government strategy to provide a "*secure and resilient cyberspace for citizens, businesses and Government*."[5]. The present cyber security organizations are established under diverse agencies of PMO, Meity, MHA and MoD. Under PMO, National Critical Information Infrastructure Protection Centre (NCIIP) has been formed to function under National Technical Research Organisation (NTRO). It facilitates protection of the Critical Information Infrastructure (CII), intelligence

collection, and extrapolating emerging and imminent threats in cyber space. The National Security Council Secretariat (NSCS) is entrusted with coordination of all cybersecurity issues, including cyber diplomacy. Under MeitY, Centre for Development of Applied Computing (CDAC), CERT In and National Informatics Centre (NIC) operate, to provide relevant developmental impetus and security response to a cyber-attack. MHA has a C&IS (Cyber & Information Security) Division. The primary role of National Intelligence Grid under MHA is to create a framework for data linking, data mining and analytics, issuing security guidelines for securing physical infrastructure and strengthening security measure. Under MoD, DRDO conducts research on technology-based software and hardware development for cyberspace applications. Reaction to the recent cyber-attack on AIIMS computer systems points to ambiguous and overlapping jurisdictions in protecting against, regulating, and investigating cyber-attacks. In this case, various agencies from MHA, CERT India, MietY, CBI, NIA, NTRO, DRDO, BEL and many other intelligence agencies came in to investigate the cyber-attack individually and investigating specific aspects[6]. There is a serious requirement for re-organisation of the cyber agencies to function under an umbrella organisation like Cyber Commission.

Indian Military Cyber Status

Cyberspace has matured into the fifth domain of war- fighting, which pervades other domains of land, sea air and space. Both state and non-state actors employ cyberspace as an asymmetric tool to conduct espionage, intelligence, and denial of service operations through cyberspace domain. Indian Armed Forces have been absorbing technological advances and they have moved ahead with netcentric operations, secure communications, and inducted smart sensor-fused and networked weapon systems. The Indian Air Force (IAF) was the first to operationalise Air Force Network (AFNET) in August 2010, which is the fiber optic network laid out throughout the country as the digital information grid under the 'Network for Spectrum' project. The IAF later operationlised Integrated Air Command and Control System (IACCS) which is an automated command and control (C2) system riding over the AFNET, in which, all IAF ground based, and airborne surveillance radars

are networked to provide composite air picture at all C2 nodes. With this networking, the IAF has achieved a high degree of netcentric operational capability. The IAF has been using software based Integrated Material Management Online System (IMMOLS) for long and has recently operationlised the automated electronic Maintenance Management System (eMMS). Indian Army has progressed in establishing strategic and tactical secure communication through Defence Communication Network (DCN), which will network all the elements from headquarters to field units through secure multi-spectral communications network. The Indian Navy has embraced netcentric operations by inducting Maritime Domain Awareness Software system and by integrating various sensors and C2 elements. All the services have employed data-linked and networked surveillance systems in various configurations. Cyberspace domain has been well employed by the armed forces while ensuring multiple layers of security.

To address cybersecurity issues, most of the software driven systems in the Armed Forces are isolated and 'air gapped' from open internet and all the three services have CERTs, monitoring data flow for intrusion at all the times. However, for updating the operating systems and other cyber hygiene measures, the systems would be net-connected in a sanitised environment. Exclusive optical fiber network provides some degree of intrusion protection to the networks. To ensure integrated approach to cyber security, the Government has approved establishment of Defence Cyber Agency (DCyA) to function under Chief of Defence Staff (CDS). The DCyA is tasked to handle cyber security threats for the armed forces and the manpower is pooled from all the three military services. This Establishment is the first step in consolidation cyber war capabilities and a lot more is required to follow.

Present Gaps in Military Cyber War Capabilities

- **Lack of Cyberwar Strategy**. Cyberwar involves actions to maintain freedom of action in cyberspace and deny the same to the adversary. These actions involve cyber surveillance of adversaries, ascertain their cyber vulnerabilities, shortlist potential targets (cyber intelligence), prepare cyber plans to degrade/disrupt hostile cyber

targets (offensive) and protect own cyberspace based assets against cyber-attacks (cyber defence). Hostile forces include states, non-state actors, terrorist organisations, independent or state sponsored cyber militia, against which the armed forces are required to protect their crucial war waging capabilities. Non attribution to the origin of attack and legislation gaps in defining the act of war, and ambiguity in the right to retaliate against such attacks, throw a lot of challenges to the armed forces in prosecuting offensive cyber operations.

- **India does not have clearly defined cyber war strategy**. NCSP-2013 has no mention of generation of national cyber power, and scope of cyber operations, especially offensive cyber operations, to be conducted against an adversary. Only cyber security has been the focus, leaving a wide gap in the national security strategy. Cyber deterrence is one of the effective strategies to dissuade and discourage other nations from cyber-attack. Deterrence by 'denial' to the adversary, by ensuring a robust and resilient cyber security is a prudent defensive strategy. However, offensive cyber capability is essential for effective deterrence and to cause prohibitive deterioration in cyber environment of the adversary. Today there are no defined cyber-attack 'triggers' which would authorise military action against the attacker. This a crucial gap in military cyber strategy.

- **Gap in Cyber War Organisation**. Defence Cyber Agency (DCyA) has been tasked with limited scope to ensure secure and resilient cyberspace for the armed forces, which is mainly defensive in nature and action. This scope and authority need to grow significantly with promulgation of Joint services Cyber Doctrine, strategy, equipping policies, training, recruiting cyber warriors, exercising and coordination with other civil agencies. At present, there appears to be ambiguity in organisational structure at headquarters, command and field levels, to the scope and authority for executing cyber war.

- **Gap in Skilled Manpower**. The armed Forces do not have the 'cyber specialist' cadre. The personnel employed in other jobs get trained to undertake cyber duties while manning CERT teams or undertaking other cyberspace management duties. The personnel, therefore, do

not achieve the required proficiency in cyberspace operations. There is a serious shortage of cyberspace trained manpower in the armed forces. The civil organisations have vast cache of trained personnel in many aspects of cyber security, software development, cyber audits, and cyber forensics. Many other countries employ trained civilians to conduct military cyber operations. Training expertise and cyber development for military operations would require substantial fusion with civil agencies, universities, and academia.

- **Gap in Military Cyber Intelligence**. Many civil cyber organisations like NTRO, NCIIP and NATGRID are mandated to monitor cyberspace environment against cyber threats and protection of critical infrastructure, however, there is no focus on cyber vulnerabilities of adversary militaries, which could be effectively targeted during operations. It requires consistent and continuous monitoring of potential targets in cyberspace, as, unlike physical targets where physical infrastructure can be located and is visible, the cyberspace based targets are more elusive, dynamic and the vulnerabilities could be plugged anytime.

- **Cyber R&D**. India has vast number of universities and other academic institutions where research and developmental work on various facets of cyber-security and computer technology is undertaken. The armed forces lack such facilities. The civil expertise could be well employed to support cyber war operations.

- **Dependence on Foreign Manufacturers**. Indian armed forces have been quite dependent on Foreign Original Equipment Manufacturers (OEM). Most of the fighters, secure communication systems, EW systems operational today, have Integrated semiconductor chips and back end software from foreign companies and OEMs have Intellectual Property Rights (IPR). This makes the armed forces dependent on OEM to update/upgrade the software, for which, they are given access to the systems. This increases the chances of the 'outsiders' meddling with operating systems which could be detrimental to the armed forces, especially in a networked environment. While this issue will continue to persist with already acquired systems, this

vulnerability would addressed through Defence Acquisition Policy 2020 (DAP 2020) issued on 30 Sep 2020, in which, indigenous front-end software has been insisted on and mechanism to safeguard cyber security issues has been addressed.[7]

- **Lack of Exposure to International Military Cyber Exercises.** The Indian armed forces have been engaging other foreign armed forces in military exercises dealing with HADR, anti-terror and other operational aspects. However, there has been no cyber operations themed exercise conducted so far. The US military has recently announced sixteen nation multilateral exercise in Africa, during which, cyber was exercised to defend cyber infrastructure and to operate under cyber-attack conditions.[8] Israel regularly conducts such exercises with the US and other friendly forces. Indian military would gain a lot by exercising in this field.

Way Forward

- **Promulgation of Military Cyberspace Strategy**. A comprehensive Military cyberspace Strategy (MSS), which should clearly define the mandate, and strategic missions for the military force, should be promulgated at the earliest. The national policy to treat any attack on national cyber sovereignty, as an act of war, and authorise armed forces the freedom of action of the full spectrum of offensive weapons including offensive cyber power, should be clearly defined in the strategy. This would convey our resolve and deter others against cyber-attacks. The armed forces would continue to plan and conduct cyber operations even without promulgation of MSS. However, MSS would provide clear roadmap and guideline to establish effective cyber war capabilities.

- **Cyber Intelligence**. Intelligence on cyber infrastructure of the adversary military, its vulnerabilities, weak links and cyber resilience and cyber war capability is crucial for the armed forces to plan all aspects of cyber war, especially the offensive operations. Cyber intelligence would be analysed along with Signals Intelligence, IMINT and HUMINT to generate comprehensive ‘target folders’. This should be collated at HQ IDS (DIA). DCyA should be the nodal agency

to coordinate with NTRO, NCIIP and NATGRID and convey the military intelligence requirements. Consultation with civil intelligence agencies would result in rich and actionable intelligence.

- **Offensive Cyber Plans**. Offensive Cyber plans follow a cycle of analysing cyber intelligence to assess weak and vulnerable areas in adversary cyberspace, ascertaining effective offensive cyber tools to shortlist the best options, gaming the cyber weapon and keeping the target under surveillance, to ensure existence of the vulnerable gap in target. Typical cyber targets would be networked Air Defence Systems, Command and Control Centres, Communication nodes, surveillance centres, satellite communications, critical military information infrastructure, maintenance support, administrative and logistic network. Cyber offensive would be synchronised with other tools of offensive operations including Electronic Warfare (EW) attacks, and physical attacks of cyber infrastructure. The armed forces must involve other governmental specialist agencies to ensure that cyber actions do not lead to uncontrolled and unintentional consequences, causing collateral damage and even cyber fratricide, especially in critical infrastructures. Civil support would be required to mask the cyber-attack trail. Specialists from other civil agencies should be involved in developing the most effective attack option.

- **International Cooperation**. India has signed MoUs with many countries on cooperation in cybersecurity defence cooperation. Ministry of External Affairs (MEA) and MoD should consider expanding the scope of cooperation to conduct joint military exercises and training in digital and cyber domain, to learn the nuances of cyber operations. The US and Israeli military conduct such exercises, regularly with other friendly countries.

- **Human Resource Training and Retention**. The armed forces must be authorised to recruit personnel in the ‘cyber specialist’ cadre. The terms and condition of the service should be introduced to ensure continued employment in cyber domain. Special retention bonus may be considered to retain the trained specialists, as is done in many other countries. The recruits should be trained at dedicated

Cyber School for the armed forces. Some specialist training could be outsourced to select civil universities and military related cyber training should be imparted at the dedicated Defence Cyber School. Senior leaders should be indoctrinated thoroughly on cyber security at civil organisations and on cyber war operations at military school, at regular intervals to update them on ongoing developments. HQ IDS should consider employing civil specialists for conduct of cyber operations. However, implications of laws of Armed Conflict should be clearly understood by the stakeholders.

- **Interaction with Defence Industry.** With emphasis on 'Atmanirbharta' in defence production, future induction of weapons and systems is likely to be from Indian companies and with embedded Indian software. Availability of indigenous software would ensure better software hygiene management and software up-dation in a secure and reliable cyber environment. The armed forces must continuously interact with Indian defence industry to appraise them of the armed forces requirements of interoperable data links, operating systems and computer hardware and firmware. Standardised systems communication protocols would ensure better connectivity amongst the three services. The armed forces must task CDAC and DRDO for research in the latest computer technologies.

- **Legislation and Cyber Laws**. Cyber operations must have legislative backing and legitimacy in conformity with international norms. There must be provisions to act against cyber offenders for which cyber laws must be in place to deal with cyber operations under laws of Armed Conflict and International Humanitarian Laws. Specialised civil agencies should be involved in their correct interpretation and applicability.

Conclusion.

Disruptive development in digitisation, computer technology, communications and networking has ushered in a new domain of cyberspace, in which the entire world is networked, information gets shared and massive stored data is instantaneously accessed.

Cyberspace is a common domain used by people, public and private industries, governments, and military, without any boundaries. Internet design has far exceeded its design objective of interconnecting all participants, without any restrictions. However, internet security was not considered during inception and now this standard and open internet protocol has been exploited by rogue elements for espionage, denial of service, ransomware, and frauds. Internet service providers prioritise financial and commercial gains which leave open gaps in cyber systems to be exploited by agencies with evil intent. Critical infrastructure that significantly impacts daily life of people and functioning of finance and commercial entities and government departments are vulnerable to cyber attacks. The government has laid down some policies and regulations to make cyberspace environment robust and resilient for economic stability and national security. Cyber-attacks, however, continue unabated with lethality and complexity increasing every day.

The armed forces have imbibed the modern technology and netcentric operations are the standard norms of all the armed forces. Cyberspace is now a new battlefield for military and cyber war has been regularly and parallelly waged along with other domains. Military or intelligence agencies of more than thirty nations have acquired cyber offensive capabilities.

As ninety percent of cyberspace usage is in civil domain, good cyber security expertise and skilled workforce are available in civil domain. The armed forces have been originally organised and structured for kinetic warfare in land, sea air and space domains. They require more impetus in skilled workforce, training, and research in cyberspace. The military requires national cyber approved cyber war strategy to prepare for effective cyber war and safeguard cyber critical infrastructure, ensure cyber deterrence, and acquire credible cyber offensive capability as crucial instrument of war. Civil-military fusion is, therefore, essential for the nation to acquire winning cyber war strategy. Military Cyberspace Strategy must be promulgated which authorises the armed forces to employ offensive cyber weapons in retaliation to any cyber-attack on the national critical infrastructure, people or military assets. The armed forc-

es require cooperation from civil agencies in training, cyber intelligence and cyber legislation and offensive cyber tools.

*__Air Marshal Daljit Singh, PVSM, AVSM, VM (Retd)__, is a former AOC-in-C, South Western Air Command and Assistant Chief of Air Staff (Air Defence) and Director General (Air Operations).

Endnotes

1 Defense Primer: Cyberspace Operations issued by Congressional Research Service, updated on 09 December 2022. https://sgp.fas.org/crs/natsec/IF10537.pdf accessed on 10 Dec 2022

2 Gp Capt Ashish k Gupta, Cyber War: Conquest over Elusive Enemy, p 141, Published by KW Publishers Pvt Ltd

3 India largest connected nation with over 800M broadband users: Rajeev Chandrasekhar, https://yourstory.com/2022/12/more-than-800-million-broadband-users- Medianama, Ayeshwaria Lakshmi updated on 12 Dec 22.

4. 12.67 Lakh Cyber Attacks Reported In India By November 2022: IT Ministry In Parliament, https://www.medianama.com/2022/12/223-12-67-lakh-cyber-attacks-reported-november-2022-meity/ by Villari Sanzgiri accessed on 23 Dec 22

5 National Cyber security Policy issued on 02 Jul 2013 by Ministry of Electronics and IT

6 Who should be accountable for AIIMS poor cyber security, Hindustan Times, https://www.digitalsecure.in/post/who-should-be-accountability-for-aiims-poor-cyber-security,accessed on 22 Dec 22.

7 Defence Acquisition Policy 2020, para 13 Chapter II, page 25, issued on 30 Sep 2020 by Government of India, Ministry of Defence.

8 Cyber to be featured for the first time in US military Exercise in Africa, Colin Demarest,\https://www.c4isrnet.com/cyber/2022/12/22/cyber-to-be-featured-for-first-time-at-us-military-exercise-in-africa/?utm_source=sailthru&utm_medium=email&utm_campaign=c4-cyber. Accessed on 28 Dec 2022.

208-225

CIVIL-MILITARY FUSION IN MARITIME SECURITY: A STATUS-CHECK

Capt (IN) Kamlesh K Agnihotri (Retd)*

Abstract

The Indian Navy, as a relatively smaller service, and characterised by the nature of its technologically-driven operational profile, has naturally internalised comprehensive Civil-Military Fusion (CMF) in its various facets. Some of these attributes also apply to the other maritime security agency – the Indian Coast Guard. This article elaborates upon the various nuances of 'Civil-Military Fusion' in the maritime security domain under three inter-connected strands viz, CMF in materials and infrastructure, CMF in organisational structures, and CMF for operational effectiveness. Certain pitfalls of organisational and cognitive nature that may hinder the very spirit of effective CMF, and which must be guarded against at all costs, have also been identified. The usefulness of the naval veteran community as highly skilled and talented 'human resource' pool to engender effective CMF in maritime security domain has been specifically highlighted.

Introduction

India has always had a grand vision of achieving self-sufficiency in technology-intensive defence sector. The country has sought to infuse indigenously developed technologies into the sensors, weapons, ammunition, communication networks and associated systems in all three domains of land, sea and air. The Indian Government accordingly established the Ordnance Factory Board (OFB), Defence Public Sector Undertakings (DPSUs), and the Defence Research & Development Organisation (DRDO), to meet its 'self-sufficiency through indigenisation'

vision. The OFB was dissolved in October 2021; and its 41 factories producing, testing and marketing weapon systems, ammunition stores and related components for the Armed Forces were reorganised into seven new corporations, making a total of 16 DPSUs under the Department of Defence Production (DDP) of the Ministry of Defence.[2] The DRDO oversees more than 50 laboratories researching on a broad spectrum of technologies for defence forces and developing applications for use in all three domains.[3]

This technological infrastructure – created quite early-on post Indian independence – was envisioned to serve the interests of the Indian Armed Forces in a comprehensive manner. Over the last half-century, it has progressively contributed towards meeting varied technological needs associated with the modernisation of Indian defence forces, particularly in the face of technology denial regime – declared or unstated – enforced on India under one pretext or the other. Under such challenging circumstances, it is indeed creditable that the Indian technological set-up has made major progress in high technology domains like the unmanned aerial systems (UAS) and unmanned submersibles; conducted technology demonstration of hypersonic glide vehicles and scramjets; and carried out 'proof of concept' experiments on electromagnetic rail gun. Defence sector shipyards have also started constructing special purpose ships like intelligence collection vessel and mother ships for manned submarine rescue submersibles – in addition to regular shipbuilding for the Indian Navy and the Coast Guard. The Indian Ministry of Defence has initiated a detailed roadmap for incorporating artificial intelligence into all its operating domains – overseen at the highest level by a Defence AI Council – so as to improve the operational efficiency and effectiveness of its Armed Forces.

However, despite all this technological effort – driven mainly by the public sector scientific community – India has not been able to keep the desired pace with the global growth in certain technological domains, and even faster rate of obsolescence in many cases. A major reason for this 'less than desired' progress in the Armed Forces' high-technology assets-based war-fighting capacities is the lack of sufficient integration of the users – the military personnel responsible to fight with those assets

– with the designers, developers and manufacturers of such assets and capacities (hereinafter collectively referred to as the 'civil technologists').

This spans various levels of outlook and understanding – ranging from the strategic requirement of the desired technology, its operational leverage to achieve the desired strategic objective, and the tactical usage to gain immediate upper hand over the adversary on the ground. The success of this reasoning entails that there must be a seamless integration between the users and the 'civil technologists' at all these levels – the very crux of 'Civil-Military Fusion' (CMF). There have been various initiatives to ensure better integration between the asset creators and asset users over the years, with an aim of engendering better understanding of the users' requirements vis-à-vis manufacturers' limitations.

The situation of CMF can be said to be comparatively better in the maritime domain. This is mainly due to the Indian Navy being quite a small service – and hence easier to integrate with its civilian technology counterparts. Further the maritime security forces – by the nature of their work profile – largely use high technology platforms, equipment and other assets which per-force require them to be heavily dependent on the 'civil technologists' outputs, be it in designing, developing or manufacturing such platforms/equipment. In this backdrop, this article seeks to look at the issue of 'Civil-Military Fusion' in the maritime security domain from the three inter-connected strands viz, CMF in Material and infrastructure, CMF in organisational Structures, and CMF for Operational Effectiveness. This in turn, would ensure that the optimum capabilities of the maritime forces can be brought to bear on the adversary by leveraging the most suitable capacities provided to them by the fully integrated 'civil technologists'.

CMF in Material and Infrastructure

It is a given that warships/submarines and their weapons and systems, engines, machinery and repair facilities – considering the scale of heavy engineering and ship construction competencies involved – require comprehensive all-level interaction between the military users/maintainers and the specialised 'civilian technologists'. The naval dockyards – co-located with the naval fleets in Mumbai and Visakhapatnam – which

provide ship/submarine repair, refit and renovation support including dry-docking, as also equipment maintenance, mainly comprise civilian workforce, supervisors and junior level officers. The very profile of these industrial units which requires them to deliver results to the satisfaction of the Indian Navy as users, calls for the naval technical officials to closely associate with this civilian workforce at all levels to ensure quality outputs in time-bound manner. Therefore, starting from the Admiral Superintendents; the General Managers, planners, Centre Managers, right down to deputy managers on the shop floor; a hierarchy of naval officers are appointed in the dockyards to guide all the technology processes, monitor the progress and ensure seamless connectivity of the manufacturing supply chain.

However, even this time-tested and well-oiled CMF does not meet all the naval hardware requirements. As the older platforms get phased out, the new ones have to be built or acquired as replacement. While the Indian Navy used to acquire a large number of platforms till the 1990s in 'ready to use' state from foreign countries; that quantum has progressively been reducing, with the indigenously built ships by the Defence public sector shipyards, taking their place. These government owned shipyards – Mazagaon Docks Limited (MDL) at Mumbai, Hindustan Shipyard Limited (HSL) at Visakhapatnam, Garden Reach Shipbuilders and Engineers (GRSE) at Kolkata and Goa shipyard Limited (GSL) – building ships for the Indian Navy and the Indian Coast Guard are civilian enterprises and are fully staffed by the 'civil technologists'. However, the naval maritime security expectations from their products – to meet the technical specifications, maintain the requisite quality and fulfill their operational roles; all within the assigned budgets and stipulated timeframe – still remain unchanged. Since it is not organisationally feasible to appoint naval personnel at all levels – as earlier explained in case of the naval dockyards – It requires far greater CMF to ensure that the eventual deliverables meet the naval expectations. In this scenario, complete onus of matching the expectation-delivery matrix rests on a small overseeing team of naval technical personnel, who are deputed to the said shipyards for this mammoth task.

The indigenisation endeavour in warship building which has particularly picked up pace over last decade – after *Atmanirbhar Bharat* initiative becoming a national mission – has raised the bar manifold for the CMF in both, scope and intensity. The indigenisation mindset in the Navy though, is not a recent phenomenon. The Indian Navy has always been an early proponent of indigenisation; with the first set of six '*Nilgiri'* class frigates being indigenously designed and built in the 1970s. The 'Directorate of Indigenisation' at Naval Headquarters is spearheading this movement. It promulgated the first '15 Year Indigenous Development Plan' in 2003; and followed it up with a more detailed and refined 'Indian Naval Indigenisation Plan (2015-2030)'.[4] As of mid-2022, Indian shipyards were in the process of building 39 indigenously designed warships and submarines, out of a proposed induction schedule of 41 platforms.[5] If this be the scope of naval indigenous shipbuilding, one can easily fathom the extent of CMF required to bring it to credible fruition.

As though the scope of naval shipbuilding and repair/refitting within the government enterprises was not enough, the field has also been thrown open to the private sector. Major players in the domain include the Larsen & Toubro (L&T) shipyard[6] at Katupalli near Chennai in Tamil Nadu and the Reliance Naval and Engineering Limited[7] at Pipavav in Gujarat. The L&T shipyard is also undertaking repairs and refit of Indian and foreign naval ships. For instance, a US naval ship, USNS Charles Drew (T-AKE-10) came for a 2-week scheduled repair to the L&T shipyard in Aug 2022 – first time ever in for the US to award such a task to India.[8] Since private enterprises are intrinsically profit-oriented – and bottom line can be improved either by selling at high prices or by reducing input costs – the task for naval overseeing teams deputed to such enterprises to ensure that the quality and reliability of delivered products conform to the stipulated standards without cost or time overruns; is clearly cut out. This requirement to achieve the best results for the service while dealing with work-ethos specific to the private industry; broadens the spectrum of CMF even more.

At the topmost aspirational level of indigenisation effort lies the 'Strategic Partnership Model' (SPM) prescribed in the Defence Acquisition Procedure-2020 (DAP-2020). It provides opportunities to the

Indian private sector to collaborate with the foreign original equipment manufacturers (OEMs) to build helicopters, fighter aircraft, submarines and main battle tanks as whole platforms for the Indian defence forces – the first three definitely being relevant to the Indian Navy.[9] If the private industry indeed chooses to explore this option, the scope of CMF between the naval users, Indian Industry and foreign OEMs – right from the time of design, development, manufacture till the very end of operational life-cycle of such platforms – could not grow higher in terms of complexity and time duration.

There is also a huge push towards manufacturing ship propulsion systems in India, so as to increase the share of indigenous content in the 'move' component of the shipbuilding process from the current share of 60 percent.[10] The Indian Ministry of Defence, in April 2022, accorded 'approval in principle' for the private industry to manufacture medium speed marine diesel engines for the Navy under 'Make-1[11] category of DAP-2020.[12] Consequently, there are unconfirmed reports that M/S L&T are bidding for a contract to design and manufacture 6 MW Marine Diesel Engines in India. A 5 MW electric propulsion system has also, reportedly been installed at the Indian Navy's Electrical Training School in Jamnagar, Gujarat in collaboration with the German firm Siemens, to train the crew of future ships that are to be fitted with this system.[13]

CMF in Organisational Structures

It is however posited that none of the above endeavours can be effectively implemented if there is no synergy between the human element involved in conceptualising, designing, developing, and eventually using the product so produced. For such deep-ingrained civil-military fusion to occur towards a win-win outcome, it is essential that the organisational structures which undergird these processes be suitably reformed, transformed or tweaked suitably.

Since uniformed and non-uniformed personnel largely have different outlook towards life, profession and personal commitment; the group dynamics when they are constrained to work together for a common cause, can best be handled by suitably empowered coordinators. For instance, Government of India cleared the much delayed appointment

of National Maritime Security Coordinator (NMSC) in February 2022,[14] despite the same being recommended by the 2001 Report of the Group of Ministers on National Security; and the Mumbai terror attack of 26 November 2008 rudely bringing home its absolute necessity. The complexity and extent of the CMF which the NMSC will have to engage in – to bring a large number of ministries and departments responsible for administering various facets of the maritime domain on same page as the implementors of holistic maritime security on the ground – is indeed considered to be quite humongous. This has been explained in some detail by Captain Himadri Das, a specialist maritime analyst in his article of August 2022.[15]

While the NMSC, working from the National Security Council Secretariat (NSCS) establishes himself to fulfil his assigned role and charter;[16] other armed Forces Officers – including from the Indian Navy – have been appointed to the Military Advisor (MA) and Technology wings at the NSCS, as also to the Joint Intelligence Committee. Similarly, naval Officers are also embedded as Directors and Joint Directors in the Ministry of External Affairs – Disarmament & International Security Affairs and Southern Divisions respectively. A naval Officer is also appointed as the Joint Director in the International Cooperation department of the Ministry of Defence. These naval Officers – in addition to their desk specific jobs – are the principal points of contact between the uniformed and non-uniformed personnel, thus acting as key cogs in the CMF wheel, in the assigned ministries.

As for the defence hardware and related technology infrastructure realm, the Indian Navy has evolved a comprehensive policy to engender effective multi-level CMF. Senior naval personnel are deputed/seconded to DRDO Headquarters to ensure seamless macro-level planning, carry out apex-level liaison with the naval Headquarters, monitor budgetary allocation of naval projects and oversee their progress. The DRDO in fact, established a Naval Research Board (NRB) in 1996 to "… strengthen and deepen the knowledge-base related to the naval science and technologies". Its charter follows flexible approach towards research, funding and project execution. The Board collaborates with higher institutions of technology like the IITs, Universities and Research

Centres to harness scientific talent by way of grant-in-aid financial support.[17] A Rear Admiral from the Navy's technical branch, namely the Assistant Chief of Material (Information Technology and Systems) from the Naval Headquarters is a standing member of the NRB.[18] The constitution of NRB is placed at Table 1 below. The mere fact that the Directors of all maritime research organisations like the Naval Science & Technological Laboratory (NSTL), Naval Physical and Oceanographic Laboratory (NPOL), Naval Materials Research Laboratory (NMRL), Defence Metallurgical Research Laboratory (DMRL), NIO and NIOT are represented, is quite instructive about the seriousness with which the Indian Navy views the CMF in technological Research & Development.

Dr. V. G. Idichandy	Chairman
Director General (TM)	Co-Chairman
Director General (NS&M)	Member
Integrated Financial Adviser (IFA) R&D, Delhi	Member
Asst. Chief of Materials (IT&S) – Indian Navy	Member
Directors of NSTL, NPOL, NMRL and DMRL	Member
Director, National Institute of Oceanography (NIO), Goa	Member
Director, National Institute of Ocean Technology (NIOT), Chennai	Member
Member Secretary, SERC, DST, New Delhi	Member
Prof. Vikram Kumar, Faculty IIT, Delhi	From academia
Prof. Nirendra Dev Delhi Technical University, Delhi	From academia
Member Secretary, NRB	Member

Table 1 - constitution of the DRDO's Naval Research Board
Source: https://www.drdo.gov.in/naval-research-board/board-constitution

NRB's scientific rigour is coordinated through the following domain-specific panels, with the detailed sub-disciplines covered under each panel also provided in its website:-[19]

- Materials (MAT)

- Hydrodynamics (HYDRO)
- Sonar and Signal Behavior(SSB)
- Ocean Environment(OE)
- Scientific Computing(SC)
- Marine systems(MAR)
- Hydro-Vibro- Acoustics (HVA)

Naval Officers are also appointed to maritime-relevant laboratories of DRDO like the NSTL, Visakhapatnam, NPOL, Kochi and NMRL, Ambernath. The ordnance factories – like Jabalpur, Itarsi and Pune – producing ammunition for naval guns and other explosives for different maritime roles, also have representatives of the Indian Navy to monitor the process of production and quality assurance. The Indian Navy also maintains naval liaison cells (NLC) in following locations for smooth project-related CMF:-

- Bengaluru – Aviation [like Hindustan Aeronautics Limited (HAL), Aircraft Development Agency (ADA) and other strategic systems PSUs and private industry/ start-ups (like Honeywell)]
- Hyderabad – Missile systems establishments [like Missile Systems Quality Assurance Agency (MSQAA)], DRDO laboratories [like Defence Electronics Research Laboratory (DLRL) and Research Centre Imarat (RCI)] and private industry/ start-ups
- Chandigarh – Strategic systems applications centre [Terminal Ballistics Research Laboratory (TBRL)]

The Weapons and Electronic Systems Equipment Establishment (WESEE), organisationally functioning under the Ministry of Defence, is another highly successful CMF model. The Establishment which is the core designer of the Indian Navy's combat information systems, datalinks and crypto products – and fully funded by the Navy – is manned by naval technical Officers and civilian scientists in the ratio of 80:20. A Rear Admiral of the Indian Navy heads WESEE, with the

senior most civilian technologist being of 'Scientist-F' Grade (notionally equivalent to a Navy Commodore). The effectiveness of CMF in WESEE towards "… *its focused resolve of translating the needed capabilities into engineering solutions by delivering state-of-the-art contemporary systems …*" was widely recognised; when it became the first defence entity to achieve 'Capability Maturity Model Integration CMMI V2.0 level 3 rating' certification for Development and Supplier Agreement Management.[20]

CMF for Operational Effectiveness

Comprehensive CMF in defence – including in the maritime domain – is only a 'means' to the ultimate 'end'; wherein the best possible force must be brought to bear effectively on the adversary in a 'whole of Nation' approach by synergistic leveraging of defence hardware so produced, by equally efficient human resource. An apt case of CMF as a 'means' to the maritime operational effectiveness 'end' relates to Chinese Navy, where ships for commercial use as merchantsmen are institutionally built to military specifications. The Chinese government, in 2015, approved the '*Technical Standards for New Civilian Ships to Implement National Defense Requirements*' prepared jointly by China Classification Society's Shanghai Specifications Institute and PLA's Nanjing Military Command. These technical guidelines which are applicable to five types of ships – container, roll on–roll off (RO-RO), multipurpose, bulk carriers and tankers – have been ratified as a 'national military standard'.[21]

The PLA has concurrently created formal organisational structures within its 'military transportation department (MTD) to absorb these commercial ships when they are called upon to join the PLA Navy for military missions. To facilitate easier command and control, such ships are assigned numbered 'Military Formation' numbers. For instance, the commercial RO-RO vessels from Bohai Ferry Group and Hainan Strait Shipping Company are assigned as the 'Eighth and Ninth Transport *Dadui*'[22] respectively. Similarly, a large vehicle ferry ship *Changlong,* capable of transporting heavy military equipment – including tanks, infantry fighting vehicles, armoured personnel carriers, trucks and trailers – is assigned as the 'Fifth Transport *Dadui',* when working with the PLA's

MTD.[23] This measure has had a huge 'force multiplier' effect, wherein such merchantsmen are readily available to augment the PLA Navy's logistics transportation capacity at very short notice, either in emergency situations or in deliberate 'strategic power projection' endeavour.

While the extent and scope of CMF in the Chinese PLA is a subject in itself, it suffices to say that similar model has been in usage in the US Navy for a long time. The Indian Navy does call in some merchant ships – particularly oil tankers and cargo ships – from time to time, to augment its logistics support capacity during major exercises under 'ships taken-up from trade (STUFT) arrangement. However, there is no formal edict for the Indian merchant ships to be built to military specifications.[24] Taking a cue from these two navies, the Indian Navy must seriously consider phased implementation of such a concept for enhanced operational effectiveness of its afloat operational logistics management, without having to make commensurate investment in related hardware.

The Indian Navy is working closely with the DRDO and other private industry – particularly start-ups – for finding hardware solutions to unmanned aerial warfare by getting involved in design and development process of UAVs and UCAVs. For instance, M/S Mahindra Defence is developing naval unmanned vehicles that can be operated from Indian Navy ships, in collaboration with M/S Aeronautics Ltd of Israel.[25] Active cooperation with NSTL and the Indian Navy for development and prototyping of UUVs is also underway, with reasonable success. The UUVs/AUVs being built, range from small slow-speed vehicles to military-class, free-flooding ones weighing up to 1.7 tons, customised for roles like surveillance and mine counter-measure (MCM) – in ports/ harbours, coastal waters, as well as in deep seas.[26]

There is also great scope for active CMF in generation of Maritime Domain Awareness (MDA) in India's areas of maritime interests, as an essential prerequisite for conducting effective naval operations during both, peace and war time. Active collaboration with Indian Space Research Organisation (ISRO) for ensuring Space-based ISR cannot be over-emphsised. The direct collaboration would involve the building and launch of Navy-specific communication – like the GSAT-7 (Rukmini)

– and remote-sensing satellites, construction of dedicated ground stations, and training of personnel for downloading and analysis of data. Indirect cooperation could take the shape of occasional requests for data from civil-use satellites of ISRO – say from AIS constellation – to support specific maritime security missions of national significance. The Information Fusion Centre-Indian Ocean Region (IFC-IOR), set up by the Indian Navy in 2020, is a live and successful example of such CMF with ISRO.

Indian government organisations, like the National Institute of Oceanography (NIO) at Goa, under the Council of Scientific & Industrial Research (CSIR), and the NIOT at Chennai, under the Ministry of Earth Sciences, are actively engaged in underwater hydrological conditions data collection, analysis and collation. Both these institutions, as their affiliation suggests, are primarily engaged in scientific tasks and experiments of civilian nature, with research towards maritime security not figuring in their vision statements and stated missions.[27] NIOT is also developing a manned submersible; and has also built an unmanned vehicle with robotic arms, capable of operating 6,000 m deep – having been tested up to 890 m depth.[28] Both these platforms and the associated knowledge-base can be of great use for under-water operations enablers like the AI-enabled ocean bed mapping, retrieval of submerged objects, and the like. Therefore, notwithstanding their overtly stated civilian roles, these organisations manned by specialised civilian scientists, can definitely be co-opted under the CMF rubric for furthering the maritime security requirements.

Possible Pitfalls to Effective CMF

The concept note for this thematic volume of 'Synergy' Journal, articulates the spirit of CMF as *"… an idealistic situation involving the convergence of military and civilian resources and systems for maximising a nation's ability to express its comprehensive national power, both during war and peacetime*". However, the 'group dynamics' predicated on the vagaries of basic human nature, attitude and sincerity, as also the nuances of organisational behaviour, culture and professionalism, tend to make it less than perfect.

A case in point is that of the Defence Institute of Advanced Technology, which was set up at Pune as the Institute of Armament Technology (IAT), under the aegis of DRDO in 1967. Its main objective was to train the defence technical Officers and civilian scientists together in niche military technologies. It was possibly envisioned that this combined intellectual stimulation of technological minds would engender lifelong CMF – individually and organisationally – between the participants, to the ultimate benefit of the Defence establishment. The IAT, after receiving the status of a 'Deemed University' in 2000, was renamed as DIAT in 2006.[29]

However, the training curriculum for military technical Officers was segregated from DIAT in January 2012, when a separate entity, namely, the Military Institute of Technology (MILIT) was carved out of DIAT. The residual connect with DIAT still remained as MILIT continued to function as the 52nd laboratory of DRDO. The decoupling was complete when MILIT was transferred from DRDO to the Headquarters, Integrated Defence Staff (HQIDS) in April 2015.[30] This put paid to the very essence of CMF, that could have been so handy for ensuring civil-military synergy in developing and innovating upon advanced defence technologies and solutions in future.

Without going into the 'what, why and how' of the above development – since the internal dynamics of the Institution are not in public domain – some or all of the factors mentioned below could have contributed to this state of affairs:-

- Lack of appreciation of each other's (military men and civilian scientists) perspectives and requirements
- Differing working styles, organisational culture and work ethos
- Tendency to protect information/ turf
- Possible clash of egos
- Absence of adequate organisational structures to support CMF
- Insufficient clarity on procedures to further the spirit of CMF

Suggested Remedy – Role of Veterans in improving Civil-Military Cohesion?

The above example is indicative of the fact that the Indian defence establishment is not able to implement the desired level of CMF towards achievement of optimum efficiency and effectiveness in terms of men, material and productivity management. By same logic, the maritime security domain too suffers from the same malaise. Herein, the possible role of retired defence-service Officers – who form a readily available pool of 'domain-trained human resource' – merits exploration. The veterans can act as the vital cogs in bridging the gaps – whether visible or perceived – in the civil-military equation.

Various public and private sector industries involved in designing, developing and producing naval hardware, as also providing technology-based solutions, are harnessing the knowledge-base and skill-sets of such veterans. Public sector enterprises like the Bharat Electronics Limited (BEL), HAL, MDL, HSL and high-technology Projects like the one handling Advance Technology Vehicle (nuclear submarines) are already employing retired naval Officers as consultants or full-time employees. Even joint ventures like BRAHMOS have retired defence Officers on their rolls. Private industries like L&T and Tata Consultancy Services (TCS) are also benefitting from the expertise of the naval veterans in all their divisions, providing technology solutions for the Indian Navy and the Coast Guard.

The good part is that this pool will continue to grow in future; as all naval Officers being inducted since at least 2010, are 'graduates in technology', with many having achieved higher educational and professional qualifications during their service. Needless to say, such veterans – having shed their uniform and the trappings therefrom – can easily form the natural linkages between the 'avowedly civilian technocrats' and the 'uniformed community'. Therefore, the overall value-proposition of utilising the skill-sets, domain-excellence and inter-personal skills of the veterans towards substantial enhancement of CMF in Defence domain, leaves little room for doubt about its viability.

Conclusion

There is no argument to the contrary that the level and scope of holistic civil-military integration as a 'means' to achieve optimum preparedness levels to deal with the security challenges posed by our adversaries as the ultimate 'end', needs to be institutionally enhanced. This article has cited various examples where reasonably well-functional civil-military fusion in the administrative, structural, technological and operational domains of the Indian Navy has yielded the desired results towards organisational efficiency and effectiveness. While there are some lessons for the other two services to learn from certain success stories of the naval CMF – like from the WESEE and DND models – there is still ample scope for improvement within. For instance, the indigenisation roadmap of the Indian Navy would certainly beget better results, if a concurrent human capital strategy (with comprehensive CMF in mind) to complement it, is formulated.

At the administrative structural level, there is an urgent need for the role and charter of the NMSC to be made public, so that the intent of the apex national leadership to enhance the CMF in maritime security domain becomes clear to all the stake-holders. Similarly, the grant of more responsibility and functional autonomy to the naval Officers deputed in various ministries, government departments, PSUs and research organisations – all civil personnel led organisations – will engender better outcomes. Though some issues raised in the article – like leveraging of the scientific prowess of NIOT and NIO scientists through CMF – are of aspirational nature; their relevance with regard to the operational benefits for maritime security of the nation cannot be understated. It is also begs introspection whether the time for integration of commercial shipping assets to benefit the supply chain management of the navy at sea – like the US and the Chinese Navy are gainfully doing – has come.

Finally, it is posited that the CMF involves 'thinking' human beings. So, its success is purely contingent upon identifying and addressing all such organisational behaviour' factors, which could possibly act as physical/ cognitive obstructions to its viable implementation. In that context,

the role of veterans in bringing the two components of CMF together is considered to be indispensable. The moot question is whether the defence policymakers see it that way; and how long they take to decide on this issue, keeping the security interests of the nation in mind.

***Capt (IN) Kamlesh K Agnihotri (Retd)** is a Senior Fellow at the National Maritime Foundation, New Delhi. He was earlier a Senior Fellow at the Centre for Joint Warfare Studies (CENJOWS), New Delhi. Views expressed in the Paper are personal. He can be reached at *kkumaragni@gmail.com*

Endnotes

1. For list of DPSUs, see Department of Defence Production, https://www.ddpmod.gov.in/about-department-defence-production (accessed 16 December 2022).

2. For list of DRDO laboratories, see DRDO, https://www.drdo.gov.in/labs-and-establishments (accessed 16 December 2022).

3. Indian Navy website, 'Directorate of Indigenisation,' https://www.indiannavy.nic.in/content/ directorate-indigenisation#:~:text=Directorate%20of%20Indigenisation%20(DOI).,in%20consultation%20with%20 Professional%20Directorates (accessed 16 December 2022)

4. Press Information Bureau, "Raksha Mantri Launches Two Indigenous Frontline Warships - Surat (Guided Missile Destroyer) & Udaygiri (Stealth Frigate) - in Mumbai", Press Release, 17 May 2022, https://pib.gov.in/PressReleseDetailm.aspx?PRID=1825981 (accessed 16 December 2022)

5. For details, see L&T Shipbuilding, "New constructions-Defence shipbuilding," https://www.lntshipbuilding.com/products-services/new-construction-defence-shipbuilding/ (accessed 16 December 2022)

6. For details, see Reliance Naval and Engineering Limited, "What we do," https://www.rnaval.co.in/web/rnaval/ naval-shipbuilding (accessed 16 December 2022)

7. Naval News, "USNS Charles Drew Repair In An Indian Shipyard Marks A First," 08 August 2022, https://www.navalnews.com/naval-news/2022/08/usns-charles-drew-repair-in-an-indian-shipyard-marks-a-first/ (accessed 16 December 2022).

8. See Defence Acquisition Procedure-2020, para 7, p. 481, available at https://www.mod.gov.in/sites/default/files/ DAP2030new_0.pdf (accessed 16 December 2022).

9. Indian Navy, 'Swavlamban: Ship's Systems, Weapons, Aviation and Electronics Atmanirbharta Abhiyan' (New Delhi, Naval Headquarters, 2020), p.9.

10. The 'Make' Category mentioned in the DAP-2020 aims to achieve national self-reliance by greater participation of Indian industrial eco-system including private sector. Make I sub-category is fully funded by the Government, wherein MoD provides financial support up to 70% of prototype development cost for projects involving design and development of equipment, systems, major platforms or upgrades thereof by the industry.

11. Ministry of Defence, Dept. of Defence Production, "Ongoing Make-I Projects", https://ddpdashboard.gov.in/MakeIIProjects/Make1Navytbl (accessed 16 December 2022).

12. Vishal Thapar, 'Indian Navy takes a big leap towards electric propulsion of warships,' SP's Naval Forces, 02 July 2019, http://www.spsnavalforces.com/news/?id=505&h=Indian-Navy-takes-a-big-leap-towards-electric-propulsion-of-warships (accessed 16 December 2022).

13. Krishn Kaushik, "First Coordinator for National Maritime Security Appointed, to Report to NSA," The Indian Express, 17 February 2022, https://indianexpress.com/article/india/ashok-kumar-first-coordinator-for-national maritime-security-appointed-7777016/ (accessed 16 December 2022).

14. Captain Himadri Das, "India @75: Reflections on the Homeland Dimensions of Maritime Security in India", 08 August 2022, https://maritimeindia.org/15395-2/ (accessed 16 December 2022).

15. The exact role and charter of the NMSC has not yet been made public.

16. Naval Research Board, "About Board", https://www.drdo.gov.in/naval-research-board/about-us (accessed 16 December 2022).

17. Naval Research Board, "Board Constitution", https://www.drdo.gov.in/naval-research-board/board-constitution (accessed 16 December 2022).

18. Naval Research Board, "About Board", Ibid.

19. Indian Navy website, "WESEE Became the First Defence Organisation to be Appraised for CMMI V2.0 Lvl 3', https://www.indiannavy.nic.in/content/wesee-became-first-defence-organisation-be-appraised-cmmi-v20-lvl-3 (accessed 16 December 2022).

20. Zhao Lei, "New Rules Mean Ships can be used by Military", China Daily, 18 June 2015, https://www.chinadaily.com.cn/china/2015-06/18/content_21036944.htm (accessed 23 December 2022).

21. A *Dadui* is like a military 'Division' formation.

22. Conor M. Kennedy, 'China Maritime Report No. 4: Civil Transport in PLA Power Projection,' China Maritime Studies Institute, December 2019, https://digital-commons.usnwc.edu/cmsi-maritime-reports/4 (accessed 23 December 2022).

23. Kamlesh Kumar Agnihotri, *Leveraging High-Technology Developments in the Chinese Military and Maritime Domains: Impact on Indian Ocean Regional Security* (New Delhi: Knowledge World Publishers, 2021), p. 198.

24. KV Kuber, UAVs: An Omnipresent Necessity for the Present and Future (New Delhi: Ernst and Young, 2018), p. 19. This knowledge paper was released during Indian Military Review's 'UAV India: Civil and Military Seminar–2018'.

25. 'Indian Navy to Induct Ten DRDO NSTL Autonomous Underwater Vehicles,' India Defence Blogspot, 11 May 2015, https://indias-defence.blogspot.com/2015/05/indian-navy-to-induct-ten-drdo-nstl.html?m=0 (accessed 23 December 2022).

26. For respective organisation's mission statements, see NIO, https://www.nio.org/about_nio/general-information/mission_mandate, and NIOT, https://www.niot.res.in/niot1/index.php (both, accessed 23 December 2022).

27. M. Ramesh, '6 Km Below: Coming Soon, India's Own Crawler to Walk the Ocean Floor,' The Hindu, 01 August 2019, https://www.thehindubusinessline.com/news/variety/6-km-below-coming-soon-indias-own-crawler-to-walk-the-ocean-floor/article28787158.ece# (accessed 23 December 2022).

28. Defence Institute of Advanced Technology, "About DIAT", https://www.diat.ac.in/about-diat/history/ (accessed 23 December 2022).

29. Military Institute of Technology, "MILIT", https://www.ids.nic.in/milit.php (accessed 23 December 2022).

CIVIL MILITARY FUSION FOR NAVAL OPERATIONS – A PERSPECTIVE

Capt (IN) Indrajit Talukdar*

"An Italian of the early sixteenth century terming Charles V's conquest as a sudden tempest, a Sudanese warrior in 1898 confronting British machine guns, a Frenchman in 1940 experiencing the German blitz-krieg, or an Iraqi in 1991 facing American smart bombs, all found themselves in the midst of a military revolution they did not understand – and all paid a heavy price for their backwardness."[1]

Introduction

China's endeavour to surpass the US as a global superpower by 2049, has seen an unprecedented expansion of its military capabilities, incorporation of advance military technologies and focus on dual use technologies. Academic pursuit in Western universities, employing it for development of technologies and equipment, primarily through technological theft, have been resorted to by China, in particular the PLA. Civil Military Fusion (CMF)[2] for development and induction of technologies and state-of-the-art military capabilities, has been a well construed and organised effort of China since 1990s. In the history of military affairs, contributions of academia, innovators and engineers have been key to evolution of warfare. Warfare in the 21st century is transforming 'Revolution in Military Affairs' of the late 20th Century, with the advent of advance military technologies. As has technology evolved, so has the means of warfighting.

The First Gulf War introduced post-modern, networked and seamless warfare, capable of completely overwhelming enemy forces, thus

compelling aspiring countries to recalibrate, adopt advance military technologies and reorganise. The recent wars between Armenia-Azerbaijan and Russia-Ukraine have brought to fore the emergence of Unmanned Systems as lethal means, disrupting the post-modern way of warfighting. Hence, it reinforces the fact that challenging the status quo, employment of dual use technologies and innovative methods of warfighting can provide advantages to a weaker force over its adversaries in the battlefield. Moreover, wars can be prolonged as has been the case in Russia-Ukraine war, emphasising the need to be self-reliant in military capabilities with adequate capacities.

The push for greater indigenisation, through introduction of a ban on 'Buy Global', introduction of Positive Indigenisation Lists, promoting participation of private industry and start-ups in defence manufacturing and re-vitalisation of DRDO and DPSUs, has been calibrated to fulfil India's Vision@2047, the centenary year of independence, in order to become a true global leader. Faced with prospects of greater friction and military contact with China and a volatile global scenario, underlining the adage of 'no permanent friends and enemies in international politics', an *Atmanirbhar Bharat*, especially in military and security capabilities, is the only way to counter such threats. Consequently, the need to fuse civil and military efforts in defence R&D and manufacturing is key to achieve self-reliance and weaning away from foreign OEMs.

As regards naval operations, there is a need to understand the changing nature of naval warfare and align efforts to harness the potential of India's entrepreneurial resources, business companies, academia, DRDO and DPSUs to achieve indigenous capabilities to prevail in the maritime domain. This article is an attempt to analyse these two aspects, evolving nature of naval operations and indigenous development of naval warfighting capabilities, with a roadmap for CMF in development of naval technologies.

Evolving Nature of Naval Warfare

The nature of warfighting has transformed due to Information Revolution, Quantum Technology, Artificial Intelligence and Big Data Analysis. The effective use of cyberwarfare as was demonstrated by Russia in Georgia

and Ukraine wars, and space-based operations including protection and disruption of satellites, make modern warfare complicated and highly contested. Moreover, large scale employment of Unmanned Systems, as witnessed in recent wars, is amalgamating the use of sub-conventional means with regular conventional warfighting. The innovative application of modern technologies by the Ukrainians has denied freedom of operations to Russian forces both on land as well as at sea. Sinking of the flagship of Russian Black Sea Fleet, Moskova in April 22, within the second month of war, while operating 60-65 nm from the Ukrainian coast, forced withdrawal of the fleet to safer waters.[3] However, that too was challenged by the employment of lethal Autonomous Unmanned Vessels (AUVs), allowing Ukraine to attack Russian warships off Sevastopol, home base of the Russian Black Sea Fleet at Crimea.[4]

Multi-Domain, Cross-Domain and Integrated Joint Operations. In a highly contested and degraded operational environment, the concept of Multi-Domain Operations focuses on "combined arms full spectrum operations" through integration and synchronisation of various capabilities.[5] A Multi-Domain Task Force (MDTF) was also created within the U.S. Army Pacific Command in 2017 that consists of an Intelligence, Information Ops, Cyber, EW and Space (I2CEWS) detachment with assets to counter enemy capabilities.[6] Japan too has recognised the need to adapt to "warfare that combines capabilities in the new domains - space, cyberspace and EM spectrum - and traditional domains land, sea and air."[7] Japan's National Defense Program Guideline describes in detail the capabilities required to be developed to counter future threats in all the domains. The PLA had initiated the "Integrated Joint Operations (IJO) concept of warfighting under informationised conditions" with "highly integrated and networked tactical forces."[8] It is also aimed at providing greater flexibility of employment of joint forces across organisational divisions and between services. The need to adapt to multi-domain warfare in future conflicts cannot be disregarded any further. It will require a focused approach at the joint operational command level.

Battlefield Transparency. Transparency of the battlefield both on land and at sea, is being achieved with credible ISR, supplemented with Space Based Surveillance. The unprecedented proliferation of surveillance

satellites, both state and private, combined with databasing of ISR inputs from multiple sources, their analysis and availability of actionable intelligence over networks, are rapidly evolving naval operations. In this regard, private satellite imagery companies like Planet Lab and Maxar Technologies have transformed OSINT.[9] Planet Lab's Dove satellites that have enabled spotting of warships at sea, and Maxar Technologies satellite imagery providing OSINT extensively during the Russia-Ukraine war, can impact the course of a war. While the US and Western allies possess high resolution satellite imagery capabilities, China's space based ISR capabilities have also achieved a fair degree of transparency in the West Pacific and to a large extent in IOR.

In an increasingly transparent maritime battlespace, a 'Systems of Systems' approach with dispersed, but connected, units for application of concentrated combat power on the enemy would define naval operations. A case in point is the strangulation of freedom of operations of the Russian Black Sea Fleet off the Ukrainian coast, through classical employment of 'Sea Denial' operations. This has been largely achieved with the help of Western aerial and space-based ISR, cueing precision shore-based missile batteries.

Autonomous Unmanned Vessels. Autonomous unmanned surface and sub-surface vessels and aerial vehicles are greatly impacting warfare. Tactical employment of drones in battle for spotting and observation has tremendously lethalised precision firepower, denying the enemy tactical advantage in achieving its military objectives. Similarly in the maritime domain, use of autonomous unmanned vessels and aerial drones for swarming attack, tactical ISR, underwater surveillance, kamikaze attacks on ships at harbour, are revolutionising naval operations. AUVs, teamed with manned platforms, termed as Manned Unmanned Teaming (MUM-T), is further altering warfare at sea, which will allow long duration surveillance by unmanned vehicles, relaying of ISR information to Maritime Operations Centres and manned platforms, and cueing of manned platforms or long-range precision guided weapons for prosecution of enemy units.

AUVs are being increasingly employed in naval operations by both militaries as well as non-state actors. China's capability of swarm vessels that can be employed for attacking adversary ships, has been developed by Yunzhou-Tech, partnering with Zhuhai's municipal government and the Wuhan University of Technology.[10] In September 2021, the US Naval Forces Central Command set up a new task force, TF-59 to deploy and integrate unmanned systems, which includes "surface vessels Sea Hunter and Seahawk, the MQ-9B Sea Guardian HALE RPA, and the MQ-8B Fire Scout autonomous helicopter, supported with AI, for Maritime Domain Awareness and aid regional partners to increase deterrence".[11] Ukraine, in a surprise commando-style operation, employed aerial and sea surface drones to attack the Black Sea Fleet ships off Crimea in end October 22. The Houthis in Yemen too have extensively been employing drones and unmanned vehicles against Saudi Arabia, in attacks on oil refineries and naval ships at port.[12] The utility and employment of AUVs in the maritime domain has gained ascendency in naval operations.

Defence Indigenisation

Indigenous Shipbuilding. Indigenisation in defence capabilities has been endeavoured since independence. Though the Indian Navy inducted ships from the Royal Navy in the initial years, followed by that from erstwhile Soviet Union, yet at the same time, naval planners had comprehended the importance of indigenous shipbuilding. From the first indigenous warship, INS Ajay built at GRSE, Kolkata and delivered to Indian Navy on 21 September 1960, to INS Vikrant, the first Aircraft Carrier indigenously built by Cochin Shipyard Limited and commissioned on 02 September 2022, India has taken giant strides in indigenous shipbuilding. Hon'ble PM Modi has described INS Vikrant as a "testament to the hard work, talent, influence and commitment of 21st Century India, and a symbol of indigenous potential, indigenous resources and indigenous skills."[13] It is reported that, INS Vikrant's "76 % of the overall 'Float' component has been local in origin, nearly 70 % of its 'Fight' component and an equal proportion of its 'Move' component have been imported."[14] Indigenisation in Indian warship building in its three categories, that is Float, Move and Fight, has been achieved to a great extent, while at the same time implying that considerable efforts in the 'Fight' component are required.

Indigenous Weapons and Sensors. Efforts in indigenisation of weapons and sensors remains a key focus area for the three Services. Established in 1958, DRDO has been the torchbearer of Defence R&D and indigenisation. Beginning with 10 units, the organisation presently has 50 labs organised under seven clusters. Several flagship projects i.e., Indian Missile Development Programme, LCA Tejas, LCH Prachanda, ALH Dhruv, MBT Arjun, Multi-barrel Rocket system Pinaka, Sonars and EW systems have culminated successfully, albeit with long gestation time. DRDO's development programmes are based on the three Service's Long Term Integrated Perspective Plan (LTIPP) and its technology forecasting, resulting in DRDO's Five Year Plans under three major categories, Mission Mode projects, Technology Demonstration projects and Science and Technology projects. Measures such as Govt policies, Services participation, industry initiative to qualify as Development cum Production Partners (DcPP), involvement of academia and DRDO initiatives in project management and HR are critical in the growth of India's defence industry.[15]

Nonetheless, India remains predominantly dependent on Russia, Israel, France and the US for supply of weapons and sensors, with specialised equipment such as Air and Surface Surveillance Radars, Maritime Patrol Radar, ESM, Airborne Sonar, SONICS suite and sonobuoys as well as associated weapons without indigenous replacements. Moreover, DRDO and the DPSUs remain reliant on foreign OEMs for niche technologies in development and manufacturing of products e.g., seeker homing head and engines for missiles, processors, and microchips to name a few. In 'Buy Indian' defence products, while more than 50% Indigenous Content (IC) is being claimed, most often the core sub-systems are outsourced from foreign suppliers. Furthermore, a CAG report tabled in the winter session of parliament in December 2022, has brought out "time and cost overrun in completion of DRDO projects, irregular closure of projects declaring them successful despite non-achievement of one or more key objectives or parameters, and taking up of new projects for realising the unachieved objectives of earlier closed projects declared as successful", thus reiterating the fact that DRDO alone cannot be a one-stop solution to *Atmanirbharta* in defence manufacturing.[16]

Course Corrections. Major course corrections have been initiated by the Govt of India (GoI) towards incorporation of technology as a principal characteristic of military advantage, promoting increased participation of the private industry and innovation of technologies, which will aid in overcoming the deficiencies in advance military technologies and wean away from foreign OEMs. The Kelkar Committee 2004 recommended streamlining of defence acquisition process, emphasising the criticality of "rapidly transitioning technology from Science and Technology to an operational capability."[17] It also recommends the need to develop partnerships between the Ministry of Defence (MoD), academia and research institutes, DRDO, DPSUs and OFB, Private and Public Industry, other agencies and international collaboration for technology development in areas where indigenous R&D is weak or deficient. Since then, several measures have been introduced in defence procurement procedures that encourages participation of private industry and development of advance military technologies, which include 'Buy Indian (IDDM)' as first priority, setting up of Technology Development Fund, 'Make' procedures with 70 % Govt funding with specific reservations for MSMEs, FDI in the defence sector up to 74 %, 'Strategic Partnership' Model and above all promoting an ecosystem of innovation for defence (Innovations for Defence Excellence -iDEX).[18]

Indian Navy's Initiatives. In Naval Commanders Conference 2019, the Hon'ble RM called for greater indigenisation of cutting-edge naval weapons and sensors, urging the Indian Navy to keep its focus on futuristic capability development.[19] Since the Defence Acquisition Procedure 2020 has envisaged creation of Innovation and Indigenisation Organisation (IIO) within Services, accordingly the Indian Navy has established a Naval Technology Acceleration Council (NTAC) to accelerate induction of disruptive combat technology to enhance warfighting capabilities and focus primarily on the 'Fight' component. To aid NTAC in its objective, Naval Innovation and Indigenisation Organisation (NIIO) Working Group and Technology Development and Acceleration Cell (TDAC) have been established to enable and coordinate technological development of warfighting capabilities. In order to absorb futuristic and emerging technologies for naval use, TDAC has been mandated to identify such

technologies and ideas, formulate operational requirements and Concept of Operations (CONOPS) for adaptation to naval operations, at the same time, identify industry partners to develop prototype and production models. This process is synchronised with the acquisition process of the navy, wherein the Directorates responsible for indigenisation and acquisition are entrenched in the process.

Swavlamban. A document, 'Swavlamban – Ship's System, Weapons, Aviation and Electronics Atmanirbharta Abhiyan', issued by Naval Headquarters, New Delhi, brings out the items that have been indigenised and those that need to be indigenised in all three categories of 'Float', 'Move' and 'Fight'.[20] As efforts are being stepped-up in the field of military technologies from leap-frogging to pole-vaulting, the Indian Navy launched 75 iDEX Supporting Pole-vaulting in R&D through iDEX, NIIO and TDAC (SPRINT) challenges, unveiled by the Hon'ble PM during NIIO Swavlamban Seminar on 18-19 July 22. Spanning across a wide range of niche technology fields including Artificial Intelligence (AI), autonomous and unmanned systems and Information Technology, in addition to regular *suo moto* proposals, challenges are being considered under both Defence India Startup Challenge (DISC) and Prime categories of iDEX with grants up to Rs 1.5 Cr and Rs 10 Cr respectively.[21] While eight editions of DISC have Problem Statements related to technologies for the navy, the 7th edition was launched with 75 Problem Statements from Indian Navy alone, of which six were recategorised to iDEX Prime.[22] These challenges include a range of technologies and products, and includes AUVs, AI enabled equipment, underwater technologies, material sciences and many other naval technologies. Concerted initiatives from NIIO along with nodal Directorates and project facilitation teams for indigenisation and innovation will be key to ensure adoption and adaptation of futuristic and niche technologies in naval warfighting.

Road Ahead

The process for indigenisation and innovation of military technologies has been well initiated and laid out in detail. It depends on the right fusion of civil military institutes, including the MoD, DRDO, DPSUs, academia and private industry. There exist many challenges in organising and

shepherding initiatives for benefits in the long term. A high degree of trust and handholding between the stakeholders is required to allow Defence startups to successfully develop technologies and products, as well as aid DRDO and the private industry in absorption of defence technology and achieve indigenous manufacturing. Given the evolving nature of naval operations and ascendency of futuristic technologies in warfighting, there is an increasing need to streamline innovative development of indigenous technologies and defence manufacturing. A few pointers towards fulfilling the objectives of defence innovation and fusing civil and military capabilities would be as follows: -

- **Integrated and Networked Forces.** Naval operations with integrated and networked tactical forces will provide operational flexibility in a highly contested and degraded environment. Development of a robust NCO structure and the establishment of sensor, operational information and weapon grids, over a High Level Data Network, has been made possible due to the advent of Internet of Things, 5G and Mobile Ad hoc Network (MANET). Harnessing GoI's Digital India initiative, including 5G driven automated guided vehicles, has great potential for military application.

- **Satellite Imagery.** As has been brought out, proliferation of private imaging satellites has tremendously augmented battlefield transparency. The historic launch of India's first private Vikram-S rocket from Sriharikota, developed by Hyderabad based startup Skyroot Aerospace Private Ltd., has opened up possibilities of building India's own space ecosystem, including development and launching of private imaging satellites.[23]

- **Unmanned Systems.** AUVs for swarming, as well as their utilisation for long endurance surface, sub-surface and aerial surveillance have revolutionised naval operations. Indian Navy has published '*Integrated Unmanned Roadmap for Indian Navy*' in Naval Commanders Conference 2022/2 in October 22, that aims to provide overall guidance for AUV capability development in consonance with naval CONOPS, whilst staying ahead of the technology curve.[24] Accordingly, Indian Navy is engaging DRDO labs/ units such as

Aeronautical Development Establishment (ADE), DRDO's Young Scientist Lab (D-YSL), Mazagon Dock Shipbuilders Limited, Larsen & Toubro, and private startups for development of unmanned capabilities.[25] Incorporation of indigenously developed sensors and weapons on AUVs would further solidify Indian Armed Force's ability in unconventional warfare.

- **Integration of Indigenous Sensors and Weapons.** Indian Navy has a mixed bag of platforms, indigenous and foreign, with imported weapons and sensors. Ability to integrate indigenised sensors and weapons on such platforms, especially aircraft, has been a challenge. Focused approach with assistance from the private industry and foreign OEMs is being explored and taken forward.

- **Absorption of ToT and Defence Manufacturing.** Towards creation of facilities to absorb Transfer of Technology and boost India's defence manufacturing capability, several projects have been concluded in the recent past. A case in point is Tata Aerospace and Defence (Tata A&D). Tata has made a foray into Aerospace and Defence by collaborating with Boeing for manufacturing of fuselages of Apache helicopter and aerostructures for Boeing's commercial and military aircraft, including P8I and C-17.[26] This has further been consolidated by the Tatas with a Joint Venture with Airbus and bagging the contract for manufacturing C-295 medium-lift transport aircraft. Equipping such aircraft with indigenous sensors and weapons developed by DRDO or other private and public industry, will catalyse defence manufacturing in India and boost *Atmanirbhar Bharat*.

- **Interfacing Civil Initiatives with Military Requirements.** Thorough interface between the three Services, defence R&D and manufacturing agencies, including private industry, is essential to achieve the objectives of *Atmanirbhar Bharat* and self-reliance in defence capabilities. The Indian Navy has taken initiatives in this regard by establishing TDAC to interface with private defence startups and also putting in place a Naval Project Monitoring Team to liaise with DRDO labs to facilitate progress of naval projects to logical conclusions. These initiatives would coalesce R&D for military

technology development and their materialisation as warfighting means.

- **Promoting Innovation within the Services.** While efforts have been put in place for DRDO and private startups to innovate and develop military technologies, there are many potential innovators within the Services. A prime example is Commodore Arogyaswami Joseph Paulraj (Retd), a naval electrical engineer, who while in service did pioneering work in development of the indigenous APSOH sonar and was also the 'founding director for three major labs in India - Centre for Artificial Intelligence and Robotics (CAIR), CDAC (Center for Development of Advanced Computing) and CRL (Central Research Labs of Bharat Electronics)'.[27] Finding the 'next Paulraj' initiative, promoting promising and genuine innovators within the Service, is being intensely followed up by the Indian Navy.

Conclusion

China's military modernisation and focus on development of futuristic technology for warfighting capabilities has in effect put India's efforts in defence indigenisation under the spotlight. As China races away in the '100 years marathon', India too has set goals to be achieved by its centenary year of independence. Accordingly, the MoD and three Services have set themselves goals to be achieved in indigenous defence manufacturing. Major steps towards achieving Vision@2047 are the introduction of Positive Indigenisation Lists and ban on 'Buy Global'. In such circumstances, the defence industry has no other choice but to 'pole-vault' in adoption and adaptation of indigenous advance military technologies. This is certainly going to make India less dependent on foreign OEMs, and also boost India's defence exports, which has gained traction in the recent years. The Indian Navy is cognisant of the evolving nature of naval operations and has put in place several initiatives to meet future warfighting requirements. In addition to its personnel now being technically qualified, encouragement of personnel with aptitude for defence innovation has also been instituted. Interaction with DRDO and private industry as well as startups has been a key focus area for the Services, which encompasses handholding of defence industry,

academia and startups, and coordination of projects to their fruition. There are many success stories and there are many in the anvil. However, *Atmanirbharta* in defence innovation and manufacturing is a continuous and long term process, and the Indian Navy has been fastest off-the-block in the *SPRINT* towards *Atmanirbhar Bharat* and being a 'Combat Ready, Credible, Cohesive and Future Proof' force.

***Capt (IN) Indrajit Talukdar** is an alumnus of Naval Academy, Goa and was commissioned in July 1999. He is a Naval Air Operations Officer and Qualified Navigation Instructor. The officer has undergone JMSDF Maritime Command and Staff Course in Tokyo and 33rd Naval Higher Command Course at Naval War College, Goa. He is presently appointed at IHQ MoD (Navy)/ Directorate of Naval Air Staff.

Endnotes

1. Max Boot, *War Made New* (New York: Penguin Group (USA) Inc., 2006), 40.
2. Civil Military Fusion abbreviated as CMF in the article
3. Janes online, 15 Apr 2022. https://customer.janes.com/janes/search?q=sinking%20of%20Moskva&pg=1
4. Hugo Bachega and James Gregory, "Massive Drone Attack on Black Sea Fleet – Russia," *BBC News*, 29 October 2022. https://www.bbc.com/news/world-europe-63437212
5. Col Dennis Wille, "The Army and Multi- Domain Operations: Moving Beyond AirLand Battle," *New America*, October 2019, 7. https://d1y8sb8igg2f8e.cloudfront.net/documents/The_Army_and_Multi-Domain_Operations_Moving_Beyond_AirLand_Battle_2019-09-23_175932.pdf accessed 06 October 2020.
6. Sean Kimmons, "Army to Build Three Multi-Domian Task Forces using Lessons from Pilot," *Army News Service*, 15 October 2019. https://www.army.mil/article/228393/army_to_build_three_multi_ domain_ task_forces_using_lessons_from_pilot accessed 06 October 2020
7. Japan National Defense Program Guidelines for FY 2019 and Beyond, 18 Dec 2018, 10.
8. McCauley, *Op Cit.*, n.32, 8.
9. Market and Markets, "Maxar Technologies (US) and Planet Labs PBC (US) are the Key Players in the Remote Sensing Services Market [2022-2027]," *Global Newswire*, 17 November 2022. https://www.globenewswire.com/news-release/2022/11/17/2558065/0/en/Maxar-Technologies-US-and-Planet-Labs-PBC-US-are-the-Key-Players-in-the-Remote-Sensing-Services-Market-2022-2027.html
10. Drake Long, "China Releases Video of 56-Boat Swarm near Hong Kong," *The Defence Post*, 02 June 2018. https://www.thedefensepost.com/2018/06/02/china-56-boat-drone-swarm-hong-kong/

11. MC1 Roland Franklin, “Task Force 59: Creating Maritime Capabilities for the 5th Fleet Area of Operations,” *SLDinfo.com*, 24 October 2021, https://sldinfo.com/2021/10/task-force-59-creating-maritime-capabilities-for-the-5th-fleet-area-of-operations/ accessed 21 December 2020.
12. Dan Sabbagh, “Could Ukraine’s Drone Attack on Russian Ships Herald a New Type of Warfare?,” *The Guardian*, 01 November 2022. https://www.theguardian.com/world/2022/nov/01/could-ukraines-drone-attack-on-russian-ships-herald-a-new-type-of-warfare
13. PM Narendra Modi at commissioning of INS Vikrant, 02 September 2022. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1856230
14. Rahul Bedi, “Spotting the Truth and the Hype About INS Vikrant’s Domestic Sourcing of Material”, *The Wire*, 03 September 22. https://thewire.in/security/ins-vikrant-indigenous-sourcing-imported-material
15. Nabinita R Krishnan, “Critical Defence Technologies and National Security - The DRDO Perspective,” *Journal of Defence Studies, Vol 3 July 2009*. https://www.idsa.in/system/files/jds_3_3_nrkrishnan.pdf
16. PTI, “CAG report raises issues of ‘inadequate monitoring’ of mission mode projects by DRDO,” *The Print*, 22 December 22. https://theprint.in/india/cag-report-raises-issues-of-inadequate-monitoring-of-mission-mode-projects-by-drdo/1277784/
17. Kelkar Committee Recommendation, MoD website. https://www.mod.gov.in/dod/sites/default/files/kelkar.pdf
18. VAdm AK Chawla (Retd), “Defence Procurement: Indigenisation by Private Sector and Single Vendor”, *SP’s Naval Forces*, 29 March 2022. https://www.proquest.com/military/docview/2646097912/A487E5DA91024BC4PQ/1?accountid=192936
19. Vishal Thapar, “Rajnath asks for greater Indigenisation of Naval Weapons and Sensors,” *SP’s Naval Force*, 22 October 2019. https://www.proquest.com/military/docview/2307688243/CD-8F6E6D1D64921PQ/10?accountid=192936
20. https://www.indiannavy.nic.in/sites/default/files/SWAVLAMBAN_Final.pdf
21. MoD, “‘Swavlamban’ – Indian Navy’s Maiden Naval Innovation and Indigenisation Seminar,” *Press Information Bureau Delhi*, 20 July 22. https://pib.gov.in/PressReleasePage.aspx?PRID=1842970
22. MoD/ DDP, “DISC #7,” iDEX. https://idex.gov.in/disc-category/29
23. Sangeetha Kandavel, “Vikram-S, India’s First Private Rocket, Lifts off from ISRO Spaceport,” *The Hindu*, 18 November 2022. https://www.thehindu.com/sci-tech/vikram-s-indias-first-private-rocket-lifts-off-from-isro-spaceport/article66152534.ece
24. “Indian Navy Launches Integrated Unmanned Road Map,” *Indian Defence Industries*, 19 October 21. https://indiandefenceindustries.in/navy-integrated-unmanned-road-map
25. Raunak Kunde, “DRDO to Develop Armed Underwater Drones for IOR,” *Indian Defence Research Wing*, 12 June 22. https://idrw.org/drdo-to-develop-armed-underwater-drones-for-ior/
26. Tata Press Release, “Tata-Boeing Joint Venture establishes Aerospace Facility in Hyderabad,” 18 June 2016. https://www.tata.com/newsroom/Tata-Boeing-joint-venture-establishes-aerospace-facility-Hyderabad
27. https://military-history.fandom.com/wiki/Arogyaswami_Paulraj#Early_life_and_naval_career

239-255

CIVIL MILITARY FUSION IN INTELLIGENCE IN INDIA - THE WAY FORWARD

Col Vijay Narayan Shukla, VSM*

Introduction

Intelligence is often referred as the first line of national defence. A nation state needs an effective, loyal and evolving intelligence system, which can forewarn on all issues related to its national security. Most of the existing Indian intelligence systems trace their history to the British Indian intelligence apparatus, predominantly in their military domain under a very tight control managed by their best military officers. Post independence, the vacuum caused in these systems due to abrupt moving out of British officers were attempted to be plugged by relatively junior and inexperienced Indian officers, mostly from the civilian intelligence agencies, thus reducing erstwhile military dominance. This may be attributed to lack of faith by political leaders on military, fear of coup by military and also reluctance on part of military to Indianise itself quickly. Over a period of time, gradual downgradation of military intelligence systems occurred, while the civil intelligence systems grew exponentially and some of them were covered with statutory and regulatory provisions for their mandates and equipped with latest technology and resources. With their top leadership drawn from bureaucratic cadres, mostly from Indian Police Services (IPS), the civil intelligence agencies enjoyed easy access to political decision makers, strengthened their organisations, gained primacy over military intelligence systems and slowly became India's international intelligence face. The gap between civil and military intelligence organisations has only widened during the past 75 years.

However, in recent past, the requirement of synergy between civil and military intelligence organisations has been felt and is being attempted by efforts towards liaison, good relations, jointness and integration. The national security however demands fusion of all intelligence efforts.

India's Highest Intelligence Authority

The National Security Advisor (NSA) is the Chief Advisor to the Prime Minister on national security policy and international affairs. He receives all intelligence from various civil and military intelligence agencies, coordinates, reports and presents them before Prime Minister and advises him on all threats and opportunities and oversees strategic and sensitive issues. National Security Council (NSC) is the apex body of the three tiered structure of the national security management system, which are Strategic Policy Group, National Security Advisory Board (with experts in their field to render advise beyond realm of government working) and a secretariat from Joint Intelligence Committee (now functioning through various verticals under NSA). NSC Secretariat (NSCS) is the coordinating agency in respect of all national security issues for coordination between various ministries (which also includes National Cyber Security Coordinator and National Maritime Security Coordinator to ensure government coordination on their respective issues)[1].

Civil Intelligence Agencies in India

- **National Technical Research Organisation (NTRO).** NTRO is technical intelligence gathering agency under NSA.[2] It is highly specialised in multiple disciplines, to include COMINT, ELINT, TELINT, IMINT, CYBERINT, cyber operations, cryptology, monitoring launches of missile and acts as a super feeder to other agencies on all security matters.[3] It controls National Critical Information Infrastructure Protection Centre, which is the national nodal agency for protection of critical information infrastructure.[4] It also includes National Institute of Cryptology Research and Development.[5] NTRO is a member of US NSA led 10 member counter terrorism platform called SIGINT Seniors Pacific.[6]

- **The Research and Analysis Wing (R&AW).** The R&AW is responsible to gather foreign intelligence, counter terrorism, counter proliferation, advising Indian policymakers and advancing India's foreign strategic interests and security of India's nuclear programme.[7] Its primary mission includes intelligence collection through HUMINT, specialised intelligence and psychological warfare. Child Agencies of R&AW include the Radio Research Center, Electronics and Technical Services and Aviation Research Centre**.** R&AW maintains active liaison with other agencies and services in various countries.

- **Intelligence Bureau (IB).** IB is India's domestic internal security and counter intelligence agency under the control of Ministry of Home Affairs**.** It has employees from various Indian law enforcement agencies, mostly from the IPS.[8] It grants the necessary security clearances to Indian diplomats and judges before they take oath. IB also passes intelligence between other Indian intelligence agencies and the police. At the national level, IB has several units to keep track of terrorism, counter intelligence, VIP security, threat assessment and sensitive areas. At the state level, the Subsidiary Intelligence Bureaus (SIBs) function, which also have their units at district headquarters.

- **National Investigation Agency (NIA).** NIA was created on 31 December 2008 on enactment of NIA Act, as the Central Counter Terrorism Law Enforcement Agency, to be involved in counter terrorism and other investigations related to national security and prevent activities of terrorist groups and individuals.[9] The concurrent jurisdiction of NIA empowers it to investigate terrorist attacks anywhere in India, which covers offences which include challenges to the India's sovereignty and integrity, detonation of bombs, aircraft and ship hijacking, targeting nuclear installations, smuggling in counterfeit Indian currency. It is also empowered to look into terror attacks which target Indians and Indian interests outside India and investigate human trafficking, flow of fake currency, production and transaction of proscribed arms and cyber terrorism. NIA officers have been empowered with all the powers, privileges and liabilities

entitled to a police officer to investigate any offence[10]. 38 Special NIA Courts have been notified for trial of cases registered at various NIA Police Stations. NIA maintains the NIA Most Wanted List. Though not a classical intelligence agency, the large mandate of NIA makes it a big stake holder in India's intelligence and security matters.

Intelligence Set Up in Central Armed Police Forces (CAPF) Border Guarding Forces

- **Assam Rifles.** Assam Rifles Field Intelligence Unit is responsible for collection, collation and dissemination of actionable intelligence inputs and other intelligence tasks, in area of responsibilities of Assam Rifles.[11]

- **Border Security Force (BSF).** BSF Intelligence headed by IG (G) at BSF Headquarters[12] collects and shares information related to border activities and operational purposes.

- **Indian Tibet Border Police (ITBP).** ITBP Intelligence Wing generates information along the Sino-Indian frontier.

- **Shashtra Seema Bal (SSB).** SSB is deployed along the Indo Nepal and Indo Bhutan borders and is the nominated Lead Intelligence Agency for these areas. Intelligence Directorate at SSB Headquarters has a very effective intelligence network in the field[13].

Intelligence Set Up of CAPF Internal Security Forces

- **Central Reserve Police Force (CRPF).** CRPF Intelligence Directorate functions under IG (Intelligence) at CRPF Headquarters[14] and has an effective HUMINT network**.**

- **Central Indian Security Force (CISF).** CISF has its own crimes and intelligence wing in each PSU and they can provide reliable intelligence especially on pilferages and officers conniving, procurements and foul plays therein[15].

Financial Intelligence Set Up in India

- **Central Economic Intelligence Bureau (CEIB).** CEIB functions

under the Department of Revenue of Ministry of Finance and is the nodal agency for economic intelligence and mandated to ensure effective interaction and coordination among all concerned agencies in the area of financial offences. It also functions as the clearing house of all economic intelligence and provides a platform for such exchange between various agencies[16].

- **Financial Intelligence Unit - India (FIU-IND).** FIU-IND is an independent body, which directly reports to the Economic Intelligence Council headed by Finance Minister and responsible to receive, process, analyse and disseminate information relating to suspected monetary transactions to intelligence/enforcement agencies, regulatory authorities and coordinate and strengthen efforts of intelligence, investigation and enforcement agencies (both national and international) in pursuing their efforts against money laundering and terror financing[17].

- **Directorate of Enforcement (ED).** ED functions under Department of Revenue, Ministry of Finance. It is a multi disciplinary organisation, mandated with investigation of offences of money laundering and violations of foreign exchange laws, for which it has various statutory functions including enforcement of various Acts of Parliament[18].

- **Directorate of Revenue Intelligence (DRI).** DRI works under the Central Board of Indirect Taxes and Customs, Ministry of Finance. It is the apex anti smuggling agency tasked with detecting and curbing smuggling of contraband, including drug trafficking and illicit international trade in wildlife and environmentally sensitive items, as well as combating commercial frauds related to international trade and evasion of customs duties[19].

- **Directorate General of GST Intelligence (DGGI).** Functioning under Central Board of Indirect Taxes and Customs, Ministry of Finance, DGGI is the top intelligence and investigative agency with respect to matters relating to violation of Goods and Services Tax, Central Excise Duty and Service Tax and tasked with improvement of compliance of Indirect Tax laws[20].

- **Directorate of Income Tax (Intelligence and Criminal Investigation).** Located at 18 cities in the country, the core areas of intelligence related to Income Tax include deepening of tax base by providing information for proper selection of cases for scrutiny assessments, through collection, collation of information from internal and external sources and its dissemination to IT Department users and collection of information on financial transactions like investment, expenses, payment of taxes, identification and investigation of cases of tax evasion arising out of criminal matters[21].

Other Notable Agencies

- **Narcotics Control Bureau (NCB).** NCB functions under Ministry of Home Affairs and is the apex coordinating and enforcement agency on matters related to drug abuse, coordination of actions for the enforcement provisions of NDPS Act 1985, implementation of responsibility of counter measures against illegitimate traffic under various international conventions and protocols, assistance to related authorities in other countries to assist in coordination and universal action for deterrence and repression of illegal traffic in drugs and substances[22].

- **Central Bureau of Investigation (CBI).** CBI functions under the Ministry of Personnel, Pension and Public Grievances. It is the leading investigative police agency in India and nodal police agency, which coordinates investigation on behalf of Interpol member countries[23].

- **Intelligence Organisations in States.** The various state police have numerous intelligence organisations such as Criminal Investigation Department, Local Intelligence Unit, Special Cell and so on.

Military Intelligence Agencies in India

- **Defence Intelligence Agency (DIA).** DIA is the nodal agency for all military intelligence and provides and coordinates military intelligence to the Armed Forces. DGDIA is the principal intelligence advisor to Defence Minister and the Chief of Defence Staff. DIA controls Additional Directorate of Signals Intelligence, which is responsible for intelligence related to enemy communications.

- **Defence Image Processing and Analysis Centre (DIPAC).** DIPAC (presently under the control of Defence Space Agency) controls imagery intelligence capabilities.

- **Army Intelligence.** Directorate General of Military Intelligence, headed by DGMI at the Army Headquarters is the apex Army intelligence body, which undertakes human and technical intelligence activities. The Intelligence Corps constitutes Army Field Intelligence Units/Battalions, involved in intelligence acquisition, counter intelligence, prophylactic security and IMINT. Scouts, Territorial Army and other arms elements are also involved in Electronic Intelligence, Surveillance, Target Acquisitions, UAVs and other intelligence activities.

- **Air Force Intelligence.** Directorate of Air Intelligence at Air Headquarters provides timely and synchronized intelligence support for tactical, operational needs of Air force including imagery intelligence collection through MIG-25R and Jaguar reconnaissance aircrafts.

- **Naval Intelligence.** Directorate of Naval Intelligence at Naval Headquarters undertakes various maritime intelligence activities.

- **Rashtriya Rifles Intelligence.** Rashtriya Rifles has integral intelligence resources.

- **Coastguards Intelligence.** Post 2008 Mumbai attacks, the maritime security apparatus was beefed up with increased emphasis on surveillance and intelligence gathering and sharing, leading to designation of Coastguards as authority responsible for coastal security in territorial waters including anti smuggling and narcotics control operations[24].

Present Status of Joint Mechanism

- **Multi Agency Centre (MAC)**. Formed in December 2001, MAC functions under IB as the nodal body for sharing intelligence inputs and coordinate with representatives from 28 military, security, intelligence, law enforcement agencies of centre and state. MAC has

daily nodal officer's meetings (to discuss and devise follow up action on intelligence of last 24 hours), monthly meetings on terrorism in J&K and North East and fortnightly meetings on Naxal terrorism. MAC Headquarters has around 400 secured sites connected with it, with plans to link the system up to district level in a phased manner[25]. The state offices are designated as Subsidiary MACs, whose fortnightly meetings are attended by state police and other agencies. MAC plans to have close to six sub groups with additional division at different levels, to help all 28 agencies understand the system easily and also widen limitations on input receiver and reach of input[26].

- **National Intelligence Grid (NATGRID).** NATGRID operational since 31 December 2020, is the integrated intelligence master database structure under the IB for counter terrorism purpose connecting databases of various core security agencies, collecting comprehensive patterns procured from 21 different organisations (including tax and bank account details, credit/debit card transactions, visa and immigration records and itineraries of rail and air travel) that can be readily accessed by security agencies. It has access to the CCTNS, a database that links crime information, including FIRs, across 14,000 police stations in India. It enables security agencies to locate and obtain relevant information on terror suspects from pooled data sets of various organisations and services. NATGRID is planned to be implemented in four phases, accessible to 11 central agencies in first phase and to State Police in later phases with plans to integrate 950 additional organisations into it[27].

- **National Memory Bank (NMB).** NMB is part of MAC. It is the database of all terrorists in the country, including interrogation reports, maintained at the national level. Any police unit just needs to type the name of a terror suspect in the system and the NMB will show cases registered and under which he is wanted. The force requiring more details of interrogation and crucial investigation can request the feeder agency, which has exclusive rights on these, which are shared only after a formal request by user agency[28].

Why is Fusion Needed?

- Apart from the jointness of the three services, there are other vital ingredients without which the level of synergy required to successfully project our power strategically cannot be achieved. The most important of these elements is Intelligence. Accurate and readily available information/intelligence would play a vital role in making the new weapon systems effective. The compression of time and extension of space in transmitting intelligence and information, which technology now makes possible is also essential. Apart from effective collection methods, all essential ingredients of a modern intelligence apparatus are required for strategic operations. Such a capability would act as a real force multiplier. Some of our adversaries have already taken significant steps in this direction while redesigning and modernising their military and intelligence structures[29]. China has quite effectively achieved military and civil intelligence fusion by optimising its dual use technology and intelligence structures to support the Theatre Commands. Pakistan has an effective intelligence system led by ISI. Both our adversaries have military intelligence systems in lead over their civilian counterparts.

- Intelligence is serious and competitive business and can be extremely productive. The new generation warfare needs and changing war and security environment demand a faster political decision making apparatus, which depends on outcomes of timely intelligence products created out of appropriate civil military intelligence fusion. To make our present intelligence apparatus capable of delivering the goods and becoming an effective part of a seamless organisation necessary to become a potent military power and take the Comprehensive National Power to the next level, fusion of civil military intelligence is desired.

- Fusion of civil and military intelligence agencies would mean effectively joining different agencies together through some reliable mechanism to achieve the highest level of integration to prevent the intelligence failures and achieve the desired national security objectives. The change in emphasis required is from control to

strategic productivity and to achieve this, dynamic, vibrant, energetic cultural transformation across the intelligence spectrum is essential.

- During the past 75 years, India has somehow lacked the Intelligence Culture, as the civil and military intelligence structures mostly developed in their silos, looked at their self serving domains and did not let others come in their sphere. Lack of civil and military hierarchical understanding by each other, mutual distrust, lack of coordination caused severe voids leading to few intelligence failures and gains by our adversaries.

- Demand from integration usually comes from those, who feel to have been left out. In the recent past, the military has been demanding increased integration, possibly due to less involvement in the decision making. Military power lies at the heart of state power and Military Intelligence is extremely important component of national security, which is best handled by military people and therefore cannot be left out.

- Most of the civil intelligence agencies are police centric and lack military understanding, some viewing military persons as outsiders, which further alienates Military Intelligence form the national intelligence and security resources.

- The civil intelligence involves numerous agencies having unique mandates and overlapping charters.

- **Challenges Faced by Military Intelligence Agencies.** Military Intelligence agencies have different command and control structures to meet their service intelligence requirements. Intelligence is one of the General Staff functions in the Army and not yet designated as a specialist job. Intelligence manpower below officer level is recruited based on the standard military recruitment policies and may lack the desired talent. The senior Military Intelligence hierarchy mostly has limited specialised training and exposure on field intelligence assignments and view intelligence from their operational experiences and biases, which may affect the long term Military Intelligence vision.

- **Difficulties in Information Sharing.** Information sharing among various agencies is not effective as states are often reluctant to share information on MAC and there are several gaps in sharing critical information at the right time[30]. MAC lacks sorting process and an input gets shared with all, making the system less effective. Sometimes, agencies don't even check, as there are 200-250 inputs shared daily and no nodal officer takes the pain to read all and act on the input relevant to them. The continued threats of terrorism, terror financing, narco terrorism, organised crime terror nexus, illicit use of cyber space throws the security challenge as how to coordinate, create and act upon inputs gathered by the intelligence agencies. At times, due to lack of coordination, distrust amongst the intelligence agencies, timely actions to prevent terrorist incidents do not occur[31].

- **Monopoly of Civil Intelligence Agencies on Communication Intelligence Resources.** Communication intelligence (be it personal or official communication interception) is the most potent means of information and intelligence, as it helps understand the thought process, ideas and intentions of individuals and organisations and subsequent planning of own information warfare campaigns. Military Intelligence agencies do not have mandates and capabilities on communication intelligence (except limited facility with Additional Directorate of Signals Intelligence specific to Union Territories of Jammu and Kashmir and Ladakh and North East states only) and therefore request for such information, including such information related to military personnel and matters from mandated civil intelligence agencies through formal, informal and personal interactions, provisioning of which is at the discretion of the concerned civil intelligence agency. With some major communication and messaging players being of foreign origin/control and selected civil intelligence agencies having exclusive mandate to interact with them, further distances the Military Intelligence agencies from required and desired military communication intelligence resources.

- **Lack of Joint Training.** If you have to work jointly, you need to train jointly. Unfortunately, there is no joint institutionalised training mechanism for intelligence personnel of civil and military intelligence

agencies, leading to ignorance about each other and cultural differences. Few minor training capsules may exist here and there, which may not be adequate.

- **Multiplicity of Agents**. In HUMINT domain, multiplicity of agents is a major trouble, as some professionals, who are deep into the intelligence business feed the same information to more than one intelligence agency, leading to corroboration of wrong information at times. We lack the system to check and counter these things at various levels.

- **Technology and Equipment.** Different software used by agencies for intelligence process and data management systems may not to be able to talk to each other. Intelligence agencies, both civil and militarily rely heavily on foreign intelligence equipment, mostly from Israel and West, which may create some functional discomfort due to lack of required support and services.

CMF in Intelligence - The Way Forward

- **Apex Intelligence Authority.** We may have to segregate intelligence and security at the level of NSC and create an appointment like Director of National Intelligence (DNI) in USA (to be open to both civil and military intelligence agencies in rotation) to commence the desired fusion.

- Before attempting civil military intelligence fusion, civil - civil and military - military intelligence fusion must take effective shape.

- **Strengthening Foreign Intelligence.** Ministry of External Affairs needs to have some unique intelligence capabilities for Foreign Intelligence including some innovative ideas with R&AW. The Military Wings in Indian Embassies/High Commissions/Missions abroad can play a vital role in such endeavours.

- **Intelligence on Narco Terrorism.** Narco Terrorism is one of the serious and emerging threats to the national security. NCB needs to integrate with Military and CAPF Intelligence Agencies to meet these challenges.

- **Lead Intelligence Agencies.** There is a need to nominate Lead Intelligence Agency for various intelligence disciplines (IMINT, SIGINT, COMINT, ELINT, Measurement and Signature (MASINT), OSINT, Cyber Int, Space Int, HUMINT and so on). For instance, CISF deployed at all major airports may be designated as Lead Intelligence Agency for MASINT.

- **Strengthening Existing Sharing Mechanism.** MAC needs to bring into effect landmark changes to make it real time, swifter and more effective. Information should travel in a specified time frame manner and reach the right person at ground level. The system needs to find out details shared by different agencies without any delay to back the input and an easier way of sorting inputs with next level data encryption. The input is required to be sent directly to the concerned persons or agency to facilitate functional ease. NMB requires to be more efficient to include interrogation reports and details in addition to that of terror outfits. NATGRID, MAC and NMB should get integrated in more efficient way.

- **Integration of Local Intelligence.** It is believed that the best intelligence is available with the local Police Station. Therefore, state police and intelligence set up need to integrate with local civil and military intelligence set up at the ground level to ensure increased coordination and cooperation among all intelligence agencies at district, state and regional level, which will facilitate similar cooperation world over with friendly foreign counterparts in developing and sharing intelligence to mitigate and nullify security threats.

- **Joint Training.** Civil and military intelligence cultures need to converge. For civilians to understand military culture and vice versa, joint institutionalised education and training are essential. The joint training needs to have an integrated approach and not short duration capsules. In this regard, creation of National Intelligence College/ University at Delhi/NCR, with mandate to function under the NSC may be considered, to impart training to officer cadres of all civil and military intelligence agencies.

- **Management of Human Resources.** The way governments are modelled, they do not always attract the best talent. Therefore, the Human Resource Policy of intelligence agencies needs fast changes. Based on the evolving intelligence problem, unique talent/ experts may be pipelined and inducted with liberal service conditions. Segregation of 'in service' specialists is also essential. Parent cadre personnel should have primacy over transients. Inter agency posting by deputations must be encouraged and may be made mandatory for career progression in the parent intelligence agency beyond the rank of Colonel/Deputy Secretary/equivalent posts.

- **HUMINT.** Multiplicity of HUMINT Agents needs to be handled by creating a National Agent Inventory controlled at the apex level with necessary safeguards.

- **Technology and Equipment.** The intelligence requirements, be it civil or military will only increase manifold in times to come and modes of intelligence collection will continue to evolve with infusion of evolving technology such as AI, Automation, Unmanned Platforms, Cyber, Space and their timely integration in intelligence spectrum is paramount, which need to be tapped and shared uniformly. We need to focus on indigenous production of intelligence equipment to create uniqueness in equipment. Start ups related to intelligence equipment need to be encouraged duly keeping national security in mind. Some common and interoperable software need to be created at the apex levels to handle multiplicity of software and management of data by various intelligence agencies. Agencies involved in similar mandate/ intelligence discipline need to have real time interface and should compulsorily share the same software and data resources.

- **Oversight and Integration with Law and Order Components.** Political involvement in management of intelligence agencies is essential with appropriate oversight. All ministries/departments in Centre and States need to have an intelligence set up (the way it is mandatory to have Vigilance Department now) to help link intelligence at all levels with vigilance, security, operations, law and order and implement whole of nation approach in intelligence.

- **Take Aways of Effective Fusion.** Effective fusion of civil and military intelligence agencies will result in economy of intelligence effort, discarding of unreliable agents, timely intelligence sharing, corroboration, effective intelligence analysis, uniformity of technology and equipment, financial prudence, accountability of all intelligence agencies, predictive intelligence and forecasts, leading to a safer India, which can guarantee required safety and security to its citizens.

Conclusion

Salience of civil military intelligence fusion in any context involves inter agency harmonization and fusion, multi agency response which will facilitate in conflict resolution. In view of resource constraint which may be faced by us due to evolving state and non state threats, changing, social, economic, environmental and financial situations, fusion of these resources is inescapable. Transition to civil military intelligence fusion will help us move upwards from mediocrity and transform attitude of status coism to change. While the global intelligence is changing, we should not waste our time by involvement in repetitive and wasteful activities. If we have to engage well with Pakistan and China and take our national ambitions beyond LC and LAC, then intelligence fusion efforts are required. In fact, addressal of neighborhood challenge with strong intelligence can be game changing and we need to muster up such deterrence to facilitate asymmetric balancing and balance anxieties. The nation expects civil and military intelligence agencies to fight with our adversaries together.

***Colonel Vijay Narayan Shukla, VSM** is a Senior Fellow with Centre for Joint Warfare Studies (CENJOWS), New Delhi. He is an alumnus of National Defence Academy, Indian Military Academy and Joint Military Intelligence Training Centre, Defence Intelligence Agency, Washington DC, USA and has served in numerous infantry, intelligence and counter intelligence assignments in field and as an Instructor at Military Intelligence Training School and Depot.

Endnotes

1 Ammar Nainar, “The Evolution and Roles of India’s National Security Council”, ORF America, 25 February 2022. https://orfamerica.org/newresearch/the-evolution-and-roles-of-indias-national-security-council, accessed on 12 January 2023.

2 Viajaita Singh, “NTRO now under Intelligence Act”, The Hindu, 18 May 2017. https://www.thehindu.com/news/national/ntro-now-under-intelligence-act/article18475771.ece, accessed on 13 January 2023.

3 RS Bedi, VrC, “NTRO : India’s Technical Intelligence Agency”, India Defence Review, 23 April 2015. http://www.indiandefencereview.com/spotlights/ntro-indias-technical-intelligence-agency/, accessed on 12 January 2023.

4 nciipc.gov.in, accessed on 13 January 2023.

5 “Key Security Outfit now near Hyderabad”, Hindustan Times, 07 May 2007. https://www.hindustantimes.com/india/key-security-outfit-now-near-hyderabad/story-UZz98GoeIXjaHheFU6CfKK.html, accessed on 13 January 2023.

6 Sanjib Kr Baruah, “India joined US led top secret alliance in 2008”, The Asian Age, 10 March 2018.https://www.asianage.com/india/all-india/100318/india-joined-us-led-top-secret-alliance-in-2008.html, accessed on 13 January 2023.

7 The Times of India, https://timesofindia.indiatimes.com/topic/research-and-analysis-wing, accessed on 13 January 2023.

8 The Times of India, https://timesofindia.indiatimes.com/topic/intelligence-bureau, accessed on 13 January 2023.

9 https://www.nia.gov.in/, accessed on 07 January 2023.

10 https://www.newindianexpress.com/nation/2022/oct/28/nia-footprint-in-all-states-by-2024-2512372.html, accessed on 13 January 2023.

11 https://www.assamrifles.gov.in/DOCS/POLICY%20ACTS/Assam%20Rifles%20Regulation%202016(1).pdf, accessed on 07 January 2023.

12 https://bsf.gov.in/, accessed on 07 January 2023.

13 Press Information Bureau, Ministry of Home Affairs, Government of India, 15 September 2017. https://pib.gov.in/newsite/PrintRelease.aspx?relid=170803, accessed on 13 January 2023.

14 https://crpf.gov.in/org-structure.htm, accessed on 13 January 2023.

15 https://www.cvc.gov.in/sites/default/files/art2k33.pdf, accessed on 07 January 2023.

16 https://dor.gov.in/link/ceib, accessed on 06 January 2023.

17 https://fiuindia.gov.in/#, accessed on 06 January 2023.

18 https://enforcementdirectorate.gov.in/, accessed on 06 January 2023.

19 https://dri.nic.in/, accessed on 06 January 2023.

20 http://dggi.gov.in/, accessed on 06 January 2023.

21 https://office.incometaxindia.gov.in/intelligence-and-criminals-investigation/pages/about-us.aspx, accessed on 06 January 2023.

22 https://narcoticsindia.nic.in/, accessed on 07 January 2023.

23 https://cbi.gov.in/, accessed on 07 January 2023.

24 https://indiancoastguard.gov.in/content/247_3_ContactUs.aspx, accessed on 08 January 2023.

25 Vijaita Singh “Home Ministry’s push to Intelligence Bureau’s Counter Terrorism Grid”, The Hindu, 04 January 2022. https://www.thehindu.com/news/national/home-ministry-push-to-intelligence-bureaus-counter-terrorism-grid/article38113950.ece, accessed on 07 January 2023.

26 Ankur Sharma, “Multi - Agency Centre, India’s Biggest Intel Inputs Sharing Platform to see Big Ticket Upgrades Soon”, News 18, 12 May 2022”. https://www.news18.com/news/india/multi-agency-centre-indias-biggest-intel-inputs-sharing-platform-to-see-big-ticket-upgrades-soon-5157961.html, accessed on 07 January 2023.

27 https://www.pib.gov.in/PressReleasePage.aspx?PRID=1822356, 03 May 2022, accessed on 13 January 2023.

28 The Week, https://www.theweek.in/news/india/2021/01/13/ib-sets-up-national-memory-bank-to-share-info-on-terrorists.html, accessed on 07 January 2023.

29 RS Bedi, VrC, “NTRO : India’s Technical Intelligence Agency”, India Defence Review, 23 April 2015.http://www.indiandefencereview.com/spotlights/ntro-indias-technical-intelligence-agency/, accessed on 12 January 2023.

30 Vijaita Singh, “Home Ministry Push to Intelligence Bureau’s Counter Terrorism Grid” The Hindu, 04 January 2022. https://www.thehindu.com/news/national/home-ministry-push-to-intelligence-bureaus-counter-terrorism-grid/article38113950.ece, accessed on 07 January 2023.

31 Semein Joy, “Intelligence Gathering - Multi Agency Centre to Spread to Districts” Deccan Herald, 06 March 2020. https://www.deccanherald.com/national/north-and-central/intelligence-gathering-multi-agency-centre-to-spread-to-districts-811030.html, accessed on 07 January 2023.

256-268

CIVIL MILITARY FUSION IN COMMUNICATIONS AND SPECTRUM MANAGEMENT

Air Vice Marshal Ajay Shukla, VM*

Introduction

Spectrum management and communication are closely intertwined subjects; efficient management and exploitation of spectrum by a nation leads to robust capabilities in the many manifestations in the communication realm. While considering the various fields under the ambit of Civil Military Fusion (CMF), spectrum management in particular presents itself as an **interesting** and **peculiar** test case. The civil and the military are both **gainers** through sharing of mutually beneficial and converging technologies and infrastructures flowing out of pragmatic handholding in spectrum. However, unlike most other vistas involving CMF, here the two stakeholders are also in **direct competition** in partaking of this scarce resource.

The paper aims to highlight the existing challenges in CMF in the domains of spectrum management and communications, measures under implementation for plugging them and recommends a way ahead for a viable fusion in spectrum management and communications in India in this era of Atmanirbharta.

Growth of Communication Technologies and Need for Spectrum Management

In an interconnected world, ubiquitous communication using wired and wireless technologies is essential for both the civil and the military. In the domain of wireless communication, starting with the 1st Gen

mobile systems in the late 1980s, the academia and industry have continued to evolve and adopt newer technologies. A new generation of communication systems has emerged roughly every decade (1G to 5G) enabling digital communications, higher bandwidths, lower latencies and greater reliability in wireless communications. In the wired domain too, there have been various technology enhancements that have complimented the growth in wireless technology—by enabling capacities and Quality of Service to support increasing backhaul network traffic. It has also enabled growth of the internet and helped extend broadband services across the world.

The advent of 4G and 4G LTE services has led to an exponential growth of mobile applications and digital services. This is being leveraged by governments and businesses to provide better services to its citizens and customers, besides fuelling the internet boom. As of 2022, 5.25 billion of the 7.9 billion people worldwide have access to internet.[1] This is about 2/3rd of the global population with mobiles accounting for 59.72% of global internet traffic[2]. In comparison, only about 0.7% of internet traffic worldwide was from mobile devices in 2009.

5G communication systems support much higher bandwidths including ultra-high band services in the millimetric wavelengths. It also facilitates Ultra-Reliable Low-Latency Communications (URLLC) with enhanced reliability and support for network slicing which is supporting new use-cases in wireless solutions. Applications of 5G include IoT, autonomous systems/ platforms, factory automation, tactile internet, Virtual and Augmented Reality, enhanced Mobile Broadband (eMBB) etc. The 5G services utilise different frequency bands - lower band (less than 2GHz), medium band (2 to 6 GHz) and high mm-Wave (24 to 39 GHz band). The evolution of WiFi and High-Altitude Platform Stations (HAPS) connectivity have brought in additional competing requirements. In addition to previous use of 900 MHz, 2.4 GHz and 5 GHz bands, newer Wi-Fi technologies are being implemented in 60 GHz (57 - 66 GHz) and 6 GHz (5925 - 7125 MHz) bands to support high bandwidth low latency applications facilitated by 5G.[3] New applications are also being explored in the Terahertz band (100 to 3000 Ghz, at presently used mainly for space-based research- that could provide much larger bandwidths, albeit

over relatively shorter distances for communication between satellites, drones, within/ across buildings, mobile towers etc.

The Defence services have been the avant-garde users of most modern communication technologies in all domains of warfare, manifested in improved intelligence, situational awareness and robust Network Centric Operations. With the development and economic viability of space technologies, space is being increasingly used for communication services and sensing applications, and greater numbers of LEO and MEO satellites (of different sizes) are being regularly launched. This use of satellite technologies, high endurance manned/ unmanned platforms, and precision targeting have expanded the battlefield, with the use of cyber space opening a new dimension in warfare. Apart from communication systems, the Defence services also need to operate sensors in various frequency bands for navigation, surveillance, target acquisition, tracking and signal intelligence. The operations in dense EM environment requires use of suitable mechanisms to ensure EM compatibility as also the ability of spectrum to use EW, ECM and ECCM measures, while denying the adversary similar use of the spectrum. Select frequencies/ bands are also kept aside for use during hostilities. Further, the communication needs to be supported by a robust backhaul core network with adequate redundancies to ensure that the information is available on demand to authorised personnel at different levels in the hierarchy.

While the higher frequency bands were traditionally reserved for use by military radars, the advent of wireless technologies and increased usage of space with promise to contribute significantly to a country's growth and GDP, have inspired a relook at the usage of the limited spectrum by both the civil and the military. Though Defence requirements have contributed to development of many technologies, it is the economic viability that has driven further developments and use-cases in the civil world. A classic example of technological growth due to CMF is the present day internet. Conceived for Defence requirements, it was initially funded by US DoD, but the real advancements happened on realisation of its commercial potential by the private industry. Similarly, the Defence services are expected to immensely benefit from the

technological advances that arise out of 4G, 5G and 6G use cases. As the technological advancements would benefit both the civil and the military and the spectrum is limited, CMF in spectrum management and communication technologies is essential for the growth of the nation.

Challenges in Spectrum Management

The increasing demand for Radio Frequency (RF) spectrum poses challenges due to competing requirements of different kinds of communication devices, systems (both terrestrial and space) and need to co-operate with RF based sensors in different frequency bands. Unregulated use of the spectrum may not only lead to mutual interference resulting in degraded performance, but may also result in system burn-out and non-functionality. Historically, the Defence services have always coordinated spectrum usage both during peace and war. Spectacular growth of major cellular networks in the country could not have been possible without major readjustments by the Defence services to make way for the commercial segments in the larger national interest. The roll-out of 5G services in the country requires further release/ harmonization/ co-existence in requisite bands of the spectrum, some of which are also being utilised by the Defence.

A major challenge for the Defence Services to support the CMF initiatives is the perceived 'big inventory' they hold. There are persistent queries on portions of the Defence band spectrum that are not being populated or utilised by the Services. This involves placing details on the spectrum used by sensitive Defence emitters in the public domain, which the services are loath to, and justifiably so. Additionally, it is a painstaking regular exercise to convince the civilian stakeholders and government functionaries that much of the 'unused' spectrum is earmarked for operations/ hostilities. Any attempt to constrict the spectrum band seriously compromises the operational capability of the emitter in question.

Vacation of Defence spectrum, when effected, is irretrievable due to industry investments in infrastructure and its impact on services to the citizens/ end-users in civil domain. A case in point on the adverse implications of spectrum release without comprehensive diligence relates

to that of M/s Ligado Networks of US. The US Federal Communications Commission (FCC) in April 2020 had permitted Ligado to deploy a low-power network. However, in Sep 2022, the US DoD said that a study ordered into possible interference issues had found that Ligado's planned nationwide mobile broadband network would interfere with military GPS receivers, and that it was impractical to mitigate the impact of that interference. It further noted that the proposed mitigation and replacement measures 'are *impractical, cost prohibitive, and possibly ineffective*.'[4] Additional challenges lie in vacation in the bands in which sensors and equipment are already operating or where the Defence services have plans for induction of new equipment/ capabilities. Retro-mods are costly, require additional resources and the transition process may necessitate significant lead time. Even if the modification or replacement costs incurred by services are borne by the government through the inflow of funds accruing out of spectrum auction, the migration process may entail security vulnerabilities and voids in capabilities.

The Defence services, therefore, remain uncomfortable with co-existence, as EM compatibility may not be guaranteed, and any restrictions could adversely impact both operations and training. Further, applications using the spectrum can have both licensed and unlicensed usage and regulators must be mindful of this and the potential value of unlicensed technologies when allocating and designating the spectrum. In effect, the CMF in spectrum management requires striking a fine balance to ensure that the needs of both the civil and military are effectively met. This not only needs effective collaboration across various government verticals including Defence, but also suitable tools and applications developed by academia and industry, with institutionalised mechanisms to ensure efficient spectrum management and allocation.

Global Trends: CMF in Management of Spectrum

Civil-military fusion in spectrum management has been implemented variously in different countries; some have a more centralised approach, while others have a more distributed mechanism with stronger roles for private actors. All strive to improve spectral efficiencies, and effectively manage and monetise spectrum, while balancing the requirements for

the Defence services and national security. In many countries, a central agency at the cabinet level has been set up to oversee management of the spectrum for commercial mobile and broadcast. The Defence usually still occupies large bands of the spectrum and a separate organisation manages the Defence spectrum. In addition to use of flexible mechanisms for sharing spectrum, many countries, including India, have enacted policies to share both passive and active infrastructure. This has enabled ISPs and mobile network operators to share the available spectrum.

In the UK, the Spectrum Board comprises of Office of Communications (Ofcom) and MoD (Spectrum team). The Ofcom regulates and assigns radio frequencies to civil users, while the spectrum governance of the MoD is managed by the Defence Spectrum team which has three separate constituents handling Defence spectrum policy, Defence spectrum for military capabilities and impact of EM environment on the operational capabilities of Defence Forces, systems, equipment and platforms.[5]

In the United States, the FCC and the DoD work together through organisations such as National Telecommunications and Information Administration (NTIA), Inter-department Radio Advisory Committee (IRAC) and National Coordination Committee (NCC) to ensure that the RF spectrum is used in the most efficient and effective manner possible, using approaches such as Dynamic Spectrum Access and Cognitive Radio etc to mitigate issues of interference. In the US, 93.8 percent of the spectrum in 0–300 GHz band is shared between the private sector and the federal government on a shared non-exclusive basis.[6]

In Netherlands, its Telecommunications Agency is launching a 'Dynamic Spectrum Management and Sharing' (DSMS) pilot project, which will explore mechanisms for local private industrial networks to co-exist in the 3.8 – 4.2 GHz band, without interference of the reception by satellite ground stations. Results are expected by mid 2023, and if successful the new technology would demonstrate that larger protection zones around satellite ground stations may not be required. This could open new possibilities and methods for frequency spectrum allocation in Europe.[7] In France, to enable the reallocation of frequencies in defence band,

and bear the costs for re-development, the government has initiated a Spectrum Reallocation Fund (FRS). Through this model new users of the released spectrum pay the fund after their licensing. This method has been used to release defence spectrum for Digital Terrestrial TV and mobile.[8]

China has long recognised the crucial role telecommunications play as an engine of growth and development, and has taken the pole position in manufacturing of high-tech goods, thanks to the expansion of its mobile telephony and information technology industries. Telecommunications are governed by the Ministry of Industry and Information Technology (MIIT), which also has control over other manufacturing sectors. Planning, allocating, assigning, and monitoring of radio spectrum for mobile, satellite, radio, and related fields is solely under the purview of the MIIT's Bureau of Radio Regulation. It does not formally allocate spectrum for the Defence Department, though it collaborates with the Central Military Commission (CMC) on civil radio management issues.[9]

The UN's International Telecommunication Union (ITU), arbitrates on all policy regulations for global spectrum usage. The ITU constitution clearly highlights every State's sovereign right to regulate its telecommunication, and emphasises that since propagation of spectrum frequencies does not recognise man-made boundaries, its effective management needs suitable regulation at all levels; national, regional, and global. The constant spectrum review for future technologies does not always go well with all members. Specifically, the World Radio Conference (WRC) is the forum that provides an arena for all technology, telecommunication, scientific and business providers and developers to showcase their wares, as also provide a voice to various policy formulators from the member countries. The forum is witness to intense debates, disagreements and mitigation methods for adoption and proliferation of future developments.

CMF in Management of Spectrum in India

India's National Broadband Mission policy document mentions that in Sep 2019, the broad band penetration in India stood at 625.42 million, an increase of over 100% since 4G networks were introduced in the country in 2015. The data usage now is about 12 GB per user per month.[10] India

is also the largest consumer of mobile data in the world. The National Digital Communications Policy-2018 recognises digital communications infrastructure and services as key enablers and critical determinants of India's growth and well-being. A report published by the Indian Council for Research on International Economic Relations (ICRIER) found that a 10% increase in India's mobile internet traffic, delivers on an average a 1.6 percent increase in India's GDP.

In India, coordination for allocation of frequency spectrum is undertaken at a national level with due cognisance to guidelines promulgated by globally recognised institutions, discussed earlier. DoT, Ministry of Communications, is responsible for planning, management, and spectrum allocation in India. The Wireless Planning and Coordination (WPC) wing of DoT is the regulatory body responsible for management of spectrum, including licensing, catering to all users (private and government) in the country. The Telecommunications Regulatory Authority of India (TRAI) is an independent sector regulator instituted by the GoI. The allocation of spectrum for various applications and services within the country is undertaken in accordance with the National Frequency Allocation Plan (NFAP). The revision of the NFAP is done usually after the ITU, World Radio Conference, and though this is mandated to be undertaken 'no later than every two years', there are slippages in this.[11] The NFAP committee is chaired by the Wireless Advisor to the GoI. The committee comprises of various stakeholders including large users of the spectrum.[12] To manage the radio spectrum globally, the ITU has divided the world into three regions, with each region having its own set of frequency allocations. India is a part of Region 3 of the ITU.

The Directorate of Joint Communications and Electronics Staff (JCES), a vertical under the Information, Communication & Technology Division of HQ IDS functions as the spectrum administrator, including handling of Standing Advisory Committee on Frequency Allocation (SACFA) for the Defence services, DRDO and DPSUs. It spearheads all deliberations with WPC on Defence Band spectrum. JCES also participates alongwith the WPC in the regular 'spectrum wars' fought in the WRC under the aegis of ITU. It keeps a careful eye on any unreasonable attempts of the industry to nibble away at the Defence Band spectrum, since the

mitigation options manifesting as retro-adjustments of frequency usage, forced modifications/ changes to equipment profile etc are complex and time-consuming. The rationalising skills of Defence interlocutors in realistic give and take, accommodation, and adjustment are the order of the day in this complex domain of civil military fusion.

CMF in Communications

While CMF to manage the RF spectrum effectively is important for a nation's security, economic growth and societal well-being, it is equally relevant for developing communications technologies and systems. A key aspect of CMF in communication is sharing of communication infrastructure, such as towers and satellites, as well as sharing of communication technologies, both software and hardware based. This sharing of resource lends itself to effective use of resources, and reduction of costs. The challenges in CMF in communication relate to the need to balance the requirements of the military and civilian sectors. The former requires secure and robust communication systems, while the latter is concerned more with user-friendly and easily accessible systems.

The Chinese government is effecting CMF through significant investment in R&D in 5G and quantum communication, aimed at building a strong domestic communication industry that can support the needs of both the military and civilian sectors. For this, the government is working closely with companies and researchers in the private sector, providing funding and other support for R&D, and encouraging collaboration between the military and civilian sectors. Some Chinese universities have established research centres involved in developing advanced communication technologies that can be used by both the military and civilian sectors. CMF is also being applied to communication infrastructure, as the Chinese government is working to build a dedicated military communication network that is separate from the civilian network, while still having capabilities to link the two seamlessly. Additionally, CMF is also increasing in the field of satellite communication in China, with many military-owned satellite manufacturers and civilian companies jointly developing satellite communication systems and applications,

including earth observation, positioning, and navigation services. CMF in communication technologies has also enabled the Chinese government to better monitor and control information flow within the country. Advanced AI technologies developed by military research institutions are known to be used to keep tabs on inter and intra country flow of communication through internet, in order to suppress dissent.

Terrestrial communication systems like Software Defined Radios (SDRs) also have immense civil and military usages, as do various other wired communication and network devices. In the US, the Joint Tactical Radio System (JTRS) initiative is aimed at developing SDRs that can be used by both the military and civilian agencies. While the use of SDRs provides many benefits, an important requirement is to address the interoperability of SDRs from different sources. While standards like SCA and ESSOR have been defined, it is practically seen that mere compliance to these standards does not ensure portability of waveforms. The reasons include use of proprietary implementations/ interfaces; and required technical details for porting applications, integrating indigenous security modules not being available to the end user. In addition, waveforms/ applications need to be tweaked for use on different hardware platforms (GPP, FPGA, ADSP etc). There is also a need for the SDRs to operate with legacy communication sets already in use, and this is a complex task. Given the utility of SDRs of different form-factors across both the civil and the military, a need is felt to develop India Standards for SDRs to enable porting of waveforms and facilitate secure communication. Suitable testing and certification facilities within the country are also required to be set up for this purpose. Further, sustaining the standards and productionising SDRs in large volumes for both the civil and the military will require building an eco-system within the country. Towards this, attempt is being made to utilise the talent, capabilities and capacities available in the Indian academia and industry. Developing a strong technology base in this domain will enable *'Atmanirbharta'*, and also contribute to economic growth.

Security of networks and data at rest and in transit is paramount for safe and effective usage of ICT infra and services. While security of communication systems is aspired by the civilian sector too, the difference

lies in the level of protection. The influx of 5G and IoT devices will create another layer of networked systems, in an already interconnected world, bringing with it related issues of cyber security. Development of indigenous solutions in the domains of perimeter and end-point security, cloud security, development of network devices and management systems, enhancing the ecosystem for use of open standards, and customised open source solutions would be key to improving transparency and building more secure communication systems. While the armed forces lay much score by relying on air-gapped captive networks due security concerns, there may be a case for also considering redundant or fall-back means of communication that ride on open networks being used in the civil domain. Adoption of the 'best in industry' tools such as zero trust frameworks for data and communication security may be necessary, which ought to be developed indigenously by the civil IT industry for them to be used with confidence by the military.

The Way Ahead

The inevitable demand for spectrum with the advent of new technologies has led the Defence services to migrate, vacate, harmonise or share its spectrum. This has impacted the usage of the concerned military equipment and in some cases restricted its full exploitation. That said, one cannot refrain from adopting the latest communication technologies being progressed in the civil sector and reaping the attendant benefits, though this may entail giving away certain portions of spectrum that are not planned to be gainfully utilised. Thus there is a clear and present need for civil military fusion to do a careful balancing act and pragmatically manage this 'gold rush'.

In India, while the mantle of coordinating all spectrum usage rests with the WPC, MoC, the military requirements are looked after and monitored closely by the JCES in HQ IDS, and no effort is spared in articulation of specific requirements of the Defence Services. In order to meet the growing demands of the Defence Forces with reduced exclusive access of the spectrum, there is a pressing need for more involved collaboration between the military and civil (academia and industry). The forces would be keen to encourage R&D with industry to develop new technologies that

can improve spectral efficiency, and implement systems that are more agile, flexible and have better resilience to interference. Collaboration effort is already underway with the academia and industry to help in EMI and EMC studies, modelling spectrum footprint, and developing pragmatic spectrum management solutions and applications. This needs to be stepped up. A number of use-cases are being developed by various departments of the Government and industry for use of 5G, IoT, AV/ VR and tactile internet. Going forward, applications in the Terhertz communication band would also be of relevance to both the civil and the military. CMF and knowledge sharing will help in re-use of solutions developed and reduce duplication of effort.

The academia and industry can play a vital role in development of required CMF eco-system within the country. Use of open source and open standards initiative can be galvanised through the academic institutions that have a large and continual pool of students, supported by the industry. The government may suitably incentivise this sector by giving policy incentives to solutions built through using or supporting open source technologies and those using open standards. The industry can also actively participate in setting up testing and certification labs for ICT products. The testing and certification could be monetised by the industry to become a financially viable and profitable model. The government could suitably hand-hold such endeavours that will benefit both the civil and the military.

Air Vice Marshal Ajay Shukla, VM is posted as ACIDS (ICT) at HQ IDS since 31 Mar 22. He is an alumnus of NDA and was commissioned in Jun 1987. A Qualified Flying Instructor and an Experimental Test Pilot, he has undergone the Staff Course at DSSC Wellington and Higher Comd course at AWC Mhow. He holds an MPhil in Defence and Strat Studies and an MBA in Aviation Management, besides PG (Dip) in Journalism & Mass Com.

Endnotes

1. 'Broadband Search', Key Internet Statistics to Know in 2022, 11 Jan 23, URL https://www.broadbandsearch.net/blog/internet-statistics
2. Statistica, 'Internet usage worldwide - Statistics & Facts', 10 Jan 23, URL www.statista.com/topics/1145
3. Deok-Won Yun and Won-Cheol Lee, 'Intelligent Dynamic Real-Time Spectrum Resource Management for Industrial IoT in Edge Computing', 22 Jan 22, URL https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8659737
4. David Shepardson- "Pentagon warns of GPS interference from Ligado broadband network", 24 Feb 23, URL https://www.reuters.com/world/us/pentagon-warns-gps-interference-ligado-broadband-network-2022-09-09/
5. UK MoD, Electromagnetic Spectrum Blueprint, 11, 14 Jan 23, URL https://www.gov.uk/government/publications/electromagnetic-spectrum-blueprint
6. NTIA, US DoC, 'NTIA Reply Comments on Allocations and Service Rules' 24 Jan 23, URL https://ntia.gov/fcc-filing/ntia-reply-comments
7. Netherlands launching 3.8GHz-4.2GHz Dynamic Spectrum Management & Sharing pilot, 14 Jan 23, URL https://www.commsupdate.com/articles/2022/12/12/
8. Rohit Prasad, et al, 'An Institutional Analysis of Spectrum Management in India', 281, 25 Dec 23, URL www.jstor.org/stable/pdf/10.5325/jinfopoli.6.2016.0252.pdf
9. Jinjin Chen and Ke Hu, Mondaq, China: Telecoms, Media And Internet Laws And Regulations 2018, 12 Jan 23, URL https://www.mondaq.com/china/telecoms
10. Muntazir Abbas, "India's growing data usage, smartphone adoption to boost Digital India initiatives, ET, 19 Jan 23, URL https://economictimes.indiatimes.com
11. Snehashish, Centre for Internet & Society, Spectrum Management, 05 Feb 23, URL : https://cis-india.org/telecom/resources/spectrum-management
12. Rohit Prasad et al, 267.

269-287

CIVIL-MILITARY FUSION IN INFRASTRUCTURE & LOGISTICS POLICY DOMAINS BY LEVERAGING NATIONAL LOGISTICS POLICY & PM GATI SHAKTI

Brig Mandeep Grewal, VSM*

National Logistics Policy (NLP) and PM Gati Shakti are seminal Government initiatives based on which the Indian Logistics Sector is at the cusp of a major transformation. These form the binding edicts to coalesce the myriad dimensions of logistics in India, with the aim to put on table bespoke solutions for this critical but important Sector.

In view of the major connectivity infrastructure impetus and policy re-alignment that will be accrued through these two path-breaking initiatives, it is imperative that Defence Forces get on-boarded, with their own be spoke infrastructure requirements duly dovetailed in the overall canvas of national infrastructure development. Accordingly, there is a need to assiduously identify defence infrastructure projects, both green field and brown field, and ensure their amalgamation in the PM Gati Shakti National Master Plan (NMP).

Tenets of NLP and PM Gati Shakti NMP and their Interplay in the Context of Civil-Military Fusion

In 2017, the Logistics Sector was granted infrastructure status by Government of India. Since then, there has been a perceptible focus on this sector, with unveiling of major policy changes. To nominate a lead agency, Logistics Wing (Division) was created under Department of Commerce, Ministry of Commerce & Industry on **07 Jul 2017**[1]. It was

allocated the task of **'Integrated Development of Logistics Sector'**. Two other path breaking and seminal initiatives by the Government were promulgation of National Logistics Policy and PM Gati Shakti.

National Logistics Policy

The Draft National Logistics Policy (NLP)[2] was promulgated by Ministry of Commerce & Industry (Logistics Division) on **05 Feb 2019** and thereafter after taking views of all stakeholders, NLP-2022[3] was promulgated on **28 Sep 2022**.

The vision of NLP is 'To develop a technologically enabled, integrated, cost-efficient, resilient, sustainable and trusted logistics ecosystem in the country for inclusive and accelerated growth'. Accordingly, the six key objectives of the policy are Integration, Optimization, Standardization, Modernization, Formalisation and Democratization.

The policy identifies logistics as a function of three key parameters to include infrastructure, services (processes, regulatory framework and digital systems) and human resource (HR). It further brings out that development of integrated infrastructure will be spearheaded by PM Gati Shakti and the other two parameters i.e. services and HR will be covered by NLP.

The NLP identifies for itself three achievable targets to include reduction in logistic costs in India by the year 2030 so that it becomes comparable to international benchmarks, improvement in Logistics Performance Index (LPI) ranking so as to reach top 25 by 2030 and generate 'data driven' decision support mechanism to achieve an efficient logistics ecosystem.

Comprehensive Logistics Action Plan (CLAP). The NLP 2022 identifies **eight Key Action Areas** for development of the logistics sector in India, which will be the focus of the relevant Ministries. These include Integrated Digital Logistics Systems; Services Improvement Framework; Logistics HR Development & Capacity Building; Standardization of Physical Assets & Benchmarking of service quality standards; State Engagement; EXIM Logistics; Sectoral Plan for Efficient Logistics

(SPEL); and Facilitation of development of Logistics Parks.

The Logistics Division under Ministry of Commerce & Industry will have the primary responsibility to drive the key action areas and facilitate alignment across key Central Ministries and State Governments.

PM Gati Shakti

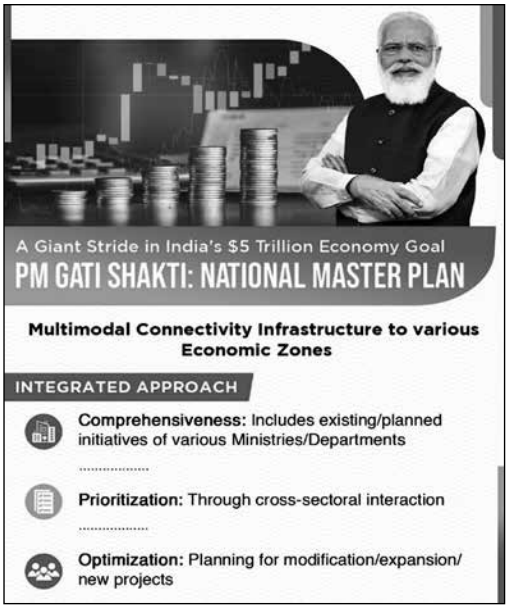
PM Gati Shakti was launched on **13 Oct 2021** by Hon'ble Prime Minister for providing multimodal connectivity infrastructure to the economic zones. It is a digital platform to bring together 16 Ministries for integrated planning as well as coordinated implementation of infrastructure projects related to connectivity.

It was felt necessary to break the silos and to integrate all the existing/ planned initiatives being undertaken by various Ministries/ Departments for better synergy as part of a comprehensive National Master Plan. Economic zones (textile clusters, electronic parks, industrial corridors, defence corridors etc) will be provided with multimodal connectivity to enhance competitiveness of Indian businesses. This will boost economic growth, attract foreign investments and give a fillip to country's global competitiveness.

Role of BISAG-N. PM Gati Shakti National Master Plan has been developed as a Digital Master Planning tool by BISAG-N[4] and has been prepared in dynamic Geographic Information System (GIS) platform wherein data on specific action plan of all the Ministries/ Departments has been incorporated within a comprehensive database. Dynamic mapping of all infrastructure projects with realtime updation tools will be provided by way of maps developed by BISAG-N. The maps are built on open-source technology and hosted securely on Meghraj i.e. GoI cloud. These use satellite imagery available from ISRO and base maps from Survey of India. All the stakeholders can create required layers in the system and update database through Application Programming Interface (APIs).

Envisaged Outcomes. Using an integrated approach, the National Master Plan aims at achieving enhanced efficiency through Compre-

hensiveness, Prioritization, Optimization, Synchronization, Analysis and by following a Dynamic Process.



Institutional Structure of PM Gati Shakti NMP. The institutional framework for rolling-out, implementation, monitoring and support mechanism is designed to have a three-tier sys to include Empowered Group of Secretaries (EGoS), Network Planning Group (NPG) and Technical Support Unit (TSU).

Both NLP and PM Gati Shakti are opportune and seminal Government initiatives. These will provide the requisite impetus to arduous and complex logistics sector in India.

Civil-Military Fusion Dynamics

One of the major shortcoming of Draft NLP-2018 and NLP-2022 is that infrastructure requirements of defence forces have not been adequately addressed. While concepts like 'Viability Gap Funding' have been introduced to push projects not financially viable, one of the main focus area for this funding should logically have been defence infrastructure projects, which are constructed from the prism of security needs. But, these seemingly coherent linkages are missing.

The perceived shortcoming of the NLP seem to have been overcome with the Gati Shakti initiative. The following developments support this line of though-process:-

- The Logistics Division and all Infrastructure Ministries have reached out to Defence Forces to moor military requirements in National Master Plan.
- There has been an assiduous endeavour to identify 'Dual Use Infrastructure', duly factoring in the infrastructure requirements of Defence Forces.
- The Network Planning Group, the sword arm of planning & implementation of Gati Shakti, has expressed willingness to act as a catalyst to push cases pending with Ministries/ State Government for clearances and sanctions.

Calibration of Own Approach. Notwithstanding the above, the Armed Forces need to draw a fine line in projecting their critical infrastructure requirements, especially in hinterland. To that effect, a calibrated approach will pay handsome dividends. The contours of the same are elucidated as under:-

- For optimum leverage, the military requirements must ride on planned civil infrastructure projects. This will ensure requisite traction in sanction and execution. Therefore, for adequate resonance with decision makers, the spirit of 'dual use' should always be implicitly factored-in in all defence proposals, where feasible.
- At this nascent stage, there is an all-pervasive zeal to ensure overwhelming success of Gati Shakti initiative. Coupled with sizeable allocation of funds and gradual integration of other stake holders, it presents the Defence Forces a 'fleeting window' to robustly push their infrastructure cases.
- The integration of Defence Forces at the inception stage of the platform will set a precedent to leverage all future civil infrastructure projects in their alignment with defence requirements.

- Legacy understanding of GIS, and its myriad features, places Defence Forces at a higher pedestal of understanding to leverage the NMP Portal to their advantage and ensure requisite coalescing of defence-specific projects.

- This is an opportune moment to break from legacy 'infrastructure utilisation dogmas' and profess inclusiveness in usage of defence infrastructure for multitude of agencies, government or otherwise.

In sum, the NLP and PM Gati Shakti have manifested at an opportune time for Defence Forces and their innumerable features must get leveraged to push sui generis defence logistics infrastructure projects.

WAY FORWARD FOR CIVIL-MILITARY FUSION IN INFRASTRUCTURE DOMAIN

Infrastructure Projects Listed by Central Ministries in PM Gati Shakti. Based on National importance & priority, the Infrastructure Ministries have identified and short-listed **614 infrastructure projects,** which need to be **completed by 2024-25.** These projects have been uploaded on PMGS-NMP Portal. All these projects are at blue print stage and likely to be sanctioned in near future. At present, the consolidation of these projects is underway, so as to optimise their construction and on-board requirements of all Ministries on these alignments. There is a need to identify projects

out of these, which have a bearing on defence infrastructure. Proposals aligned with these high priority projects have the highest likelihood of sanction and time-bound implementation.

Road Infrastructure Projects

Road infrastructure is crucial for India's economic growth since 70% of goods traffic and about 90% of the passenger traffic relies on the road network. A total of **215 projects** have been prioritised as part of PM Gati Shakti. These include **27 road corridor projects** totalling to 14,270 Km, **38 economic corridor projects** for a cumulative length of 20,768 km, **seven expressways** for a total length of 2,398 Kms, **18 greenfield corridor projects** of 5,310 Km length and **68 port connectivity projects**. Majority of these projects are at the stage of being awarded or are under construction.

The expressways will have world-class infrastructure and passenger amenities to include advanced traffic management systems, trauma centres, ambulances, fire brigades, traffic police, bus bays, interchanges, recreational facilities, food courts and refuelling facilities. The projects will have environment-friendly features that include water harvesting spots and tree plantation on both sides of the corridor. All the greenfield expressway projects have been planned with an aim to decongest major cities.

A detailed analysis of these 'High Impact' & 'Priority' Infrastructure Projects with respect to their applicability in defence domain is essential. The ibid analysis will then culminate into specific recommendations on these projects with respect to **'Critical Infrastructure Gaps'** and **'Last Mile Connectivity'** for meeting operational and peace-time requirements of Defence Forces.

Multi-Modal Logistics Parks (MMLPs)

A total of **39 MMLPs** are being planned to be set-up pan-India as part of **Bharatmala Pariyojana**. The construction of these MMLPs is well-timed and can be suitably exploited by Defence Forces to smoothen military logistics supply chains.

Integration of Defence Requirements at MMLPs. There is a necessity to integrate the requirements of Defence Forces in all MMLPs being constructed. To that effect, the following is recommended:-

- All MMLPs must sign an agreement with LMA (Local Military Authority) that on invoking of War Book or issuance of orders for general mobilisation for defence forces, the infrastructure will be re-oriented towards defence logistics requirements.
- Arrangements for peace-time utilisation be worked out and published, both for direct use by defence logistics and for contractors who aspire to utilize the infrastructure for supply to defence forces.
- All railway sidings must construct defence specification ramps for loading/ unloading of vehicles.
- There is a requirement to construct warehousing facility for Defence Forces in these MMLPs, which can then be used for storage of critical spares, equipment and other logistic stores.
- The management committees of MMLPs must have a representative from LMA for liaison, planning and feedback on defence related logistics.

While most listed MMLPs are civil agency led, there is a case that some of these can be Defence Forces led, with 'dual use of infrastructure' clause for civil agencies.

Rly Projects

The Ministry of Railways has identified **251 rail projects** to include new lines, doubling and gauge conversion projects which are scheduled for completion by 2024-25. Defence railway infrastructure requirements must get incorporated in these.

Airports & Heliports

Ministry of Civil Aviation has proposed development of **109 Airports/ Heliports** in the country by the year 2024 which includes 51 Airports, 18 Greenfield Airports, 12 Water Aerodromes and 28 Heliports. These must be leveraged for defence requirements.

In summation, the alignment of defence infrastructure requirements with the high impact projects of roads, MMLPs, railways, airfields and heliports will give Defence Forces the fastest dividends since all these projects are high priority and at blue print stage.

Development Projects

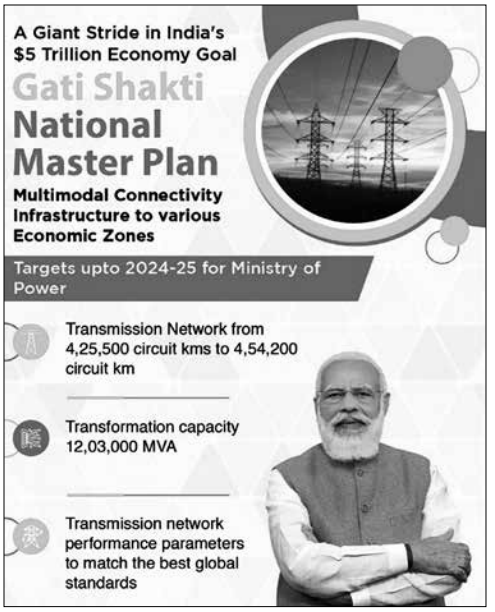
Electrification of Border Villages. Government of India, Ministry of Power has launched the Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY) to improve the quality and reliability of power supply in rural areas. Rural Electrification Corporation (REC) is the nodal agency for implementation of DDUGJY. 28 Apr 2018 was the landmark day when electrification was achieved in all 18,374 un-electrified villages in the country. International Energy Agency (IEA) has acknowledged that 'India's move to energize every village in the country with electricity is one of the greatest success stories of the world in 2018'[5]. However, the power consumption especially in the border villages is increasing every day and there is a need to carry out a detailed analysis for capacity upgradation with respect to installation of new Sub-Stations, augmentation of capacity of existing Sub-Stations, proliferation of Distribution Transformers, finalise alignments of High Tension (11 & 33 KVA) and Low Tension Lines and implementation of Feeder & Consumer Metering. The infrastructure layers of Ministry of Power on National Master Plan portal should be used for robust upgradation of 'Electrification Status' of all border villages i.e. those within 25 km distance from borders.

Increase in Cellular Tower Density. One key deliverable of National Broadband Mission[6] is to enhance connectivity and improve quality of service by increasing cellular tower density, to be at par with countries leading in telecom infrastructure. This will address the demands of new and emerging technologies such as 5G which has been recently rolled-out and to cater for high mobile data consumption and phenomenal increase in the number of broadband users. The existing tower density is 0.42 towers per thousand population with around 5.65 lakh towers. This needs to be increased to 1.0 per thousand population, with setting up of an additional 10 lakh towers. Using the PMGS-NMP, the cellular tower density along border areas should be increased to cover all gaps in cellular connectivity.

Acceleration of Fiberization. Another key deliverable of National Broadband Mission is to accelerate Fiberization. Under this, it has been proposed to increase the present route length of 22 lakh km OFC to 50 lakh km. This is being achieved by working with States/UTs to align their Right of Way (RoW) policy with the Right of Way Rules notified by the Central Government and support a workable financial model for common ducting. Necessary tools have been built in NMP for paperless & timely RoW clearances. Fiberization (OFC) projects of Defence Forces must leverage these tools for faster clearances and implementation.

OFC Connectivity to Gram Panchayats & Villages. Bharat Net,[7] also known as Bharat Broadband Network Ltd, is a government-owned broadband infrastructure provider, set up by Department of Telecom, under Ministry of Communication for establishing, management and operation of the National Optical Fibre Network to provide a minimum of 100 Mbps broadband connectivity to all 2,50,000 Gram panchayats in the country, covering nearly 6,30,000 villages, by improving the middle layer of nation-wide broadband internet in India, to achieve the goals of Digital India. As of Jul 2021, Phase-I has been completed and 1,50,000 Gram Panchayats and associated villages have been made service ready with 5.09 lakh km of OFC laid. Bharat Net Phase-II, to connect the remaining gram panchayats and villages, will be completed by 31 Mar 2023. All gram panchayats and villages in border areas (10 km belt from IB) should be connected with OFC/ Broadband on priority. In addition to the development of the border region and ensuring its amalgamation in main stream, it will also help the Armed Forces in having viable duplicity in communication infrastructure. The Department of Communication has already uploaded the 'OFC Layout layer' in PMGS-NMS, with dynamic updation. The features of the same should be used to identify gaps in OFC layout and the same be thereafter prioritized for completion.

Solar Power. National Solar Mission (NSM) was launched on 11 Jan 2010[8]. It is a landmark initiative of Government of India with active participation from States to promote ecologically sustainable growth while at the same time addressing India's 'energy security' challenges. The Mission's objective is to position India as a global leader in solar energy by creating favourable policy ecosystem for diffusion of solar technology



across the country. Itstarget is to install100 GW grid-connected solar power plants by the year 2023. By Jun 2022, India has achieved an installed capacity of 56.951 GW and reached 5thglobal position in solar power deployment. 42 solar parks have been established and 36.03 GW of solar projects are under different stages of implementation. The following is suggested:-

- As part of this initiative, unutilized defence land parcels should be identified to install 5 MW or more solar projects.
- These solar projects will be timely contribution of Defence Forces to the green initiative. These will be ideal projects of civil-military fusion. The burgeoning electricity bills of Defence Forces will be partially mitigated. The threat of encroachments of defence land and the need for guarding the same will be taken care of.
- It is recommended that agreements be worked out with Electricity Departments of State Governments for the generated electricity to be connected and uploaded on the grid. This metered contribution to the Electricity Grid can then be adjusted by the Electricity Department against the electricity bills at various Cantonments/ Military Stations.

The proclivity of Defence Forces to work in isolation to plan infrastructure projects will squander the limited allocation of funds under the defence capital budget. Military infrastructure projects must coalesce with national infrastructure projects. These must get juxtaposed with civ infrastructure projects, to address all incongruities at planning stage itself. Thereafter, synergised implementation will result in their requisite induration.

POLICY PROPOSALS FOR FUSION OF MILITARY LOGISTICS WITH NATIONAL LOGISTICS

Policy & Facilitation Issues

NMP Portal. User access on NMP Portal be provided to key appointments of Defence Forces for its effective exploitation.

Uploading of Layers. MoD should upload various non-sensitive layers concerning its functioning on NMP. Defence Forces should compile and upload non-sensitive infrastructure layers, with requisite access rights, to exploit features of NMP.

Facilitation of Clearances, NOCs & Approvals. Access to NMP Portal by functional appointments will also enable them to use the tools in the portal for facilitating clearances, NOCs & various approvals from stakeholder Ministries like Ministry of Environment, Forest & Climate Change etc to ensure speedy implementation of new projects, as also pushing long struck cases. The infrastructure projects, the clearances for which are pending with State Governments, can also be taken up. There is a Nodal Officer for PM Gati Shakti in each State Government who can be approached by NPG to expedite requisite sanctions.

Palletisation and Containerisation. There is an all-pervasive need for Armed Forces Logistics to gravitate towards Palletisation/ Containerisation. As per industry norms, movement of stores in CHTs beyond 500 km is sub-optimal utilisation of the asset class and railways should be the preferred mode. Containerisation will lead to overcoming this shortcoming. At present there is lack of handling infrastructure for pallets, which will be overcome with creation of MM Logistics Hubs equipped with all cargo handling machinery, especially LOLO[9]

infrastructure. It is well documented that palletisation of cargo leads to lowering of costs and also prevents handling losses. The containers are RFID tagged and are easy to monitor with respect to their movement in the logistics chain. These also contribute to reduction in pollution and is a green initiative. The specific proposal recommended for defence forces is:-

- With the completion of Western DFC[10], all movement of logistics stores from Central and Southern India should be only by dedicated defence containers. These containers can be unloaded at MMLPs under the supervision of defence representatives duly incorporated in the management of MMLPs.

- The DFCs are the way forward and in addition to Western DFC, the Eastern DFC[11] is under construction and East-West DFC[12] has been announced in Budget 2021.

- Aligning of defence logistics with the DFC mode of transportation will allow us to leverage the best mode of transportation, as these are futuristic, high speed with reduced turnaround time of rolling stock, reduced unit cost of transportation and with rationalised tariffs. It will also address the issue of **skewed modal transportation mix,** wherein presently in India 60% freight is moved by road and only 30% by rail, against the global benchmark of 25-30% by road and 50-55% by rail.

Reforms in Civil Transport Hiring Domain. The most fragmented sub-sector in logistics today is 'transport sector', with crying need for major reforms. As per MoRTH website, 75% of owners own less than five trucks in the Trucking Industry. Juxtapose this reality with the fact that each government agency today regularly hires transport. However, this hiring is done piecemeal by each agency. There is a need to aggregate the requirement of various government agencies, including defence forces, at District level under a District Transport Cell and thereafter enter into consolidated contracts. The way forward is to nominate one agency in the District HQ to carry out consolidated hiring for all users. The District Transport Officer is ideally suited to take on this task. Defence representatives can be suitably dovetailed to curate military-

specific hiring. The annual rate contracts for various classification of vehicles, under varied clauses, can then be concluded. Thereafter, the truck owners can register with the District Transport Agency and provide vehicles, as required, at pre-fixed rates. This hiring model can also have a clause wherein superannuated government/ defence drivers can register with vehicles, bought from soft loans offered by Government, with the Government having a lien over hiring of these vehicles. An arrangement like this will also mitigate the nebulous nature of requisition/ impressment of civil transport which is planned to be carried out during operations. The Gati Shakti NMP platform can be used for verifying vehicle/ driver details and track movement of transport. It is recommended that under PMGS-NMP, a pilot project be carried out.

Synergy in policy domain and impetus to various facilitation issues will create the requisite momentum in aligning the civil and military logistic requirements.

Thrust Areas of National Logistics Policy 2022

There are eight Key Action Areas[13] under the concept of CLAP mentioned in NLP-2022, which cover both infrastructure and policy domains. Aligning military logistics to the postulates of NLP will allow us to leverage the focus areas of the Government, thereby creating a win-win situation. The applicability of these action areas on specific defence domains is covered in this sub-part.

Strengthening of Warehousing Sector. By convention, defence forces don't maintain gargantuan warehouses and are proponents of 'Just in Time' logistics. However, one domain where modern warehousing could be implemented is CSD stores. The present CSD Warehousing is archaic and needs to align itself with modern warehousing practices. Effective warehousing can bring a 15-20% cost reduction in the entire logistics operation.

Viability Gap Funding. The NLP elucidates concept of non-lapsable Logistics Fund to drive progress in key thrust areas. One of the identified areas of its expenditure is 'Viability Gap Funding' for remote areas. However, it is conspicuous in not identifying the defence sector

requirements for expenditure of this fund, which in most cases will be economically un-viable. A case needs to be taken up for inclusion of defence sector requirements under this funding.

Generate Employment & Enhance Skill. One of the key thrust areas of NLP is generation of employment and enhancement of skill levels for persons employed in Logistics Sector. The Logistics Fund also identifies one of its areas of expenditure as 'logistics skilling programs' and incentivising training institutes. Both the funds and the skilling programs must be used by defence forces to re-skill the agniveers/ ex-servicemen for their effective second career employment in logistics sector and Infrastructure Ministries.

Integration with ULIP. The logistics sector in India is unorganised and fragmented with large No of stakeholders. There is an informational asymmetry which results in increased transactional costs. The NLP envisions utilising Unified Logistics Interface Platform (ULIP), as a one-stop digital integrator of all logistics services. It will be single window transactional platform on-boarding various logistics service providers like transporters, warehousing providers, 3rd Party service providers, freight forwarders and various government agencies. While majority of defence procurement is presently being done on GeM (Government e-Marketplace), with a robust migration in last few years, the ULIP will be a niche domain platform bringing in more visibility and simplification of procedures. A cross-platform integration of GeM and ULIP can be a way forward for natural consolidation and meaningful symbiosis.

CSD Facility through e-commerce Platform. One of the path breaking steps in defence can be on-boarding of CSD facility through a standalone, defence specific e-commerce platform. This will obviate the need to have thousands of CSD stores across the country employing critical trained manpower in non-core activity. E-commerce in India is growing exponentially and with the penetration of mobile internet services, all defence persons are technologically savvy to place orders online. With a captive manpower of almost 25 Lakh (including ex-servicemen and defence civilians), the system will generate adequate volumes to break even and self-sustain. All CSD items can be catalogued and made

available online through an Application. The system will be akin to shopping on Amazon, an experience which majority of today's generation is quite apt at. The delivery, by itself, can be outsourced to a 3PL[14] Firm, multitude of which are operating in the market, including some very innovative start-ups. Coupled with modern warehousing reforms, the CSD is in for a major transformation, riding on the focus areas of NLP.

Standardization in Logistics Sector. One of the principal reforms that can be undertaken in the Indian Logistics Sector is 'standardization' in logistics value chain to incl packaging, warehousing and transportation. These standards will ensure consistent service levels and quality of goods to the end user and thereby drive logistics efficiency. For the defence sector, the aspect of standardization assumes a heightened magnitude of importance. Typically, the peace time requirements of defence are limited and its integral logistics assets are adequate to cater for the same. However, during mobilization there is a quantum surge in the requirement of logistics resources and traditionally this surge is met by harnessing civil resources like trucks, civil trailers, trains, aircrafts etc. Elaborate plans exist to carry out requisition/ impressment of civil transportation resources. However, in certain category of vehicles, the dimensions of vehicles are not aligned and hence the civil transportation resource either can't be harnessed for the national cause or elaborate modifications have to be done to the civil vehicles to make them fit for employment by defence forces, albeit with a heavy time and resource penalty. For a nation like ours with strategic ambitions, this coalescing of civilian resources to that of wartime military requirement, will provide unparalleled dividends.

Recommendations for Refinement of NLP-2022. Based on the shortcomings noticed, a set of recommendations for refinement of NLP-2022 are as under:-

- Typically, the logistic resources of a nation can be classified under three distinct heads i.e. 'Military Use', 'Civilian Use' and 'Dual Use'. A Nation with strategic ambitions in the military realm, must constantly endeavour to expand the domain of 'dual use infra/ physical assets', as this will provide innumerable leverage points including saving of precious defence budget, fastest possible mobilization etc.

- As per NLP 2022, the three pillars for efficient logistics are Infrastructure, Services and HR Development. Out of these, infrastructure is planned to be addressed under PM Gati Shakti and Services (Processes, Digital Systems & Regulatory Framework) & HR Development under National Logistics Policy. There has been a sustained focus to on-board military in the infrastructure domain, however the alignment of defence requirements in Services and HR domain has been underwhelming.

- One of the identified targets of NLP is to mitigate logistic costs in India and make it comparable to global benchmark standards by year 2030. However, alignment of National Logistics to defence requirements may slightly temper this target. Notwithstanding, this strategic alignment has nuanced pay-offs and a suitable balance needs to be endeavoured by all stake-holders.

- The spirit and zeal of inclusiveness emanates from the 'Whole of Nation/ Govt' approach, which is the guiding light of these new age logistic initiatives. It is imperative to incorporate the defence requirement in order to leverage this all-encompassing, inclusive approach.

- While a number of Ministries have been identified to take action on the various Key Areas, MoD/ IDS/ Military has not been made a stated stake holder in any of the identified Key Action Areas of NLP-2022.

- For nuanced military perspective in any decision matrix, there is a need for incorporation of defence representatives in decision making bodies like EGoS/ NPG (PM Gati Shakti) / SIG-Services Improvement Group (NLP-2022).

- Efficacy to grant 'Sector Status' to Defence under SPEL (Sectoral Plans for Efficient Logistics), one of the Key Action Areas of NLP-2022, needs to be explored.

- National Logistics HR Strategy, another Key Action Area in NLP-2022, completely overlooks trained manpower of defence forces which can form an important segment for development of requisite

talent pool in logistics sector. Agniveers, who will exit the military service after four years and ex-servicemen can form an important source for this lateral talent induction.

- Leveraging National Defence University (NDU) to work on the domain of civilian-military fusion in the field of logistics.

The implementation of recommendations on the thrust areas of NLP will ensure that the requirement of defence forces are duly factored-in and the vision of NLP is achieved. Necessary correctives would then have been applied in the Civil-Military Fusion domain.

Conclusion

NLP and PM Gati Shakti are pivotal Government initiatives, which are bellwether in their manifestation. Leveraging on their innumerable features, the Indian Logistics Sector is at the rubicon for a major transformation. Both these form the binding edicts to coalesce the myriad dimensions of the gargantuan Logistics Sector in India, with the aim to present innovative solutions for this critical but important sector. In view of the major connectivity infrastructure impetus that is in the pipeline, it is imperative that Defence Forces harmonise their infrastructure projects on National Master Plan, duly dovetailed in the overall canvas of national infrastructure development.

*__Brig Mandeep Grewal, VSM__ was commissioned in the ASC on 10 Dec 94. He is an alumni of RIMC Dehradun, NDA Khadakvasla, IMA Dehradun, CDM Secunderabad & DSSC Wellington, for which he qualified on competitive vacancy. In staff, he has tenanted the appointments of GSO-3 (Intelligence) of a Mountain Brigade, AQMG of an Independent Armoured Brigade, Movcon in United Nations, AMS-4B & AMS-9A in MS Branch, Col Q of an Armoured Division, Col CAB at Complaints & Advisory Board COAS Sectt & Col ST in HQ Corps. The officer is presently tenanting the appointment of Brig ASC in a Corps in Western Theatre. He was awarded Vishisht Seva Medal in 2010 for his contribution to cadre management policy issues in MS Branch.

Endnotes

1. Logistics Wing (Division) was createdunder Department of Commerce, Ministry of Commerce & Industry by an amendment to the Second Schedule of Government of India (Allocation of Business) Rules, 1961.

2. National Logistics Policy-2018 issued vide Government of India, Ministry of Commerce (Logistics Division) vide Letter No 63/Logistics/2018 dated 05 Feb 2019.

3. NLP promulgated vide Gazette of India No 4575(E) dated 28 Sep 2022.

4. Bhaskaracharya National Institute for Space Applications and Geoinformatics.

5. https://powermin.gov.in/overview.

6. The National Broadband Mission was launched on 17 Dec 19 with a vision to provide affordable and universal access of broadband to all citizens of the country.

7. Booklet on National Broadband Mission issued by Ministry of Communication.

8. https://mnre.gov.in/solar/current-status.

9. LOLO is the industry acronym for 'Lift Off- Lift On' machinery which is a pre-requisite for handling containers.

10. The Western Dedicated Freight Corridor (DFC) is a 1,504 km long, under construction broad gauge freight corridor which will connect Dadri in UP with JNP in Navi Mumbai, Maharashtra. Approximately 720 km is operational and balance is under construction.

11. Eastern DFC is 1,873 km in length from Ludhiana in Punjab to Dankuni in West Bengal.

12. East-West DFC is 2,000 km in length from Dankuni to Palghar.

13. Appx A to NLP-2022 refers.

14. 3PL in the industry acronym for Third Party Logistics.

288-303

CIVIL-MILITARY FUSION IN LOGISTICS INFRASTRUCTURE DEVELOPMENT

Col MB Singh*

CMF-Background and Overview

The Civil Military Fusion (CMF) aims at making full use of military and civilian resources under the unified planning and guidance, for achieving the higher state of military preparedness, leveraging **'Whole of the Nation'** approach. United States defines Military Civil Fusion or MCF (*note the difference in terminology*), as an aggressive, national strategy of the Chinese Communist Party (CCP) with goal to enable the China to develop the most technologically advanced military in the world by eliminating the barriers between China's civilian research and commercial sectors, and its military and defense industrial complex implementing this strategy, "*not just through its own research and development efforts, but also by acquiring and diverting the world's cutting-edge technologies – including through theft – in order to achieve military dominance"*.Chinese scholars on other hand credit USA for implementing the concept and claiming to have learnt from it.

Irrespective of how it evolved, USA and China have advanced CMF in all facets of national defence. This fusion helps in, using commercially available off-the-shelf technology, leveraging the synergised strength of the nation for national security by streamlined processes and resource sharing to achieve interconnectivity, higher efficiency, and optimal allocation of resources. Much talked about Chinese MCF called for six System of Systems (SoS) which are formed by fusing civilian and defense ecosystems that possesses high levels of commonality but which have previously been separated into distinct silos. It aims to

gradually integrate military and civilian resources in a way that creates a strategic capability for success in a systems confrontation. Chinese MCF is a strategy whose components are well meshed into China's other national security apparatus to advance the Chinese overarching security and developmental goals. One of the SoS is '*Socialised Support and Sustainment for the PLA SoS*' which is MCF in the area of logistics.

Case for CMF in Logistics Infrastructure in India

Most of our infrastructure development has been taking place in isolated silos. It was marked by lack of coordination between different Ministries/ Departments, for example, once a road was constructed and completed, other agencies dug up the road for activities like laying of underground cables, gas pipelines etc.Piecemeal development of infrastructure took place with complex and fragmented regulatory environment which resulted in wasteful expenditure and suboptimal use of available infrastructure. Government of India (GoI) has been lately working on development of infrastructure in an integrated manner. Minister of MoRTH Shri Natin Gadkari said in Aug 2020 that, "*To take India's infrastructure to the next level it has been decided to work on it in an integrated manner as per Prime Minister Narendra Modi's vision. Plans are afoot to tap full potential while building newer highways*."

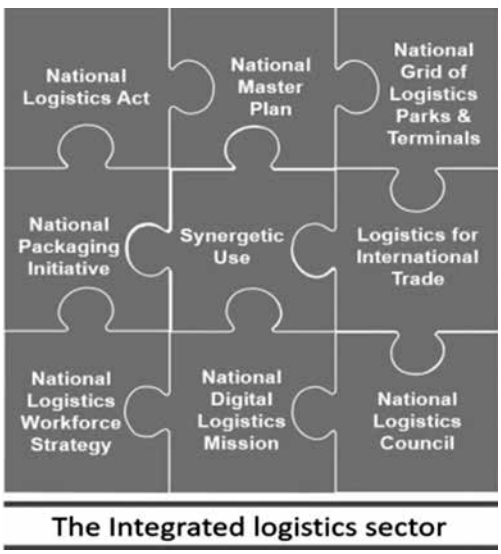


Figure 1 : Ingredients of Developing Integrated Logistics Sector

In recent past number of other path breaking initiatives have been taken by the GoI to, *"Develop a technologically enabled, integrated, cost-efficient, resilient, sustainable and trusted logistics ecosystem in the country for accelerated and inclusive growth".* India, 5th largest economy of the world is endeavouring to become a self-reliant USD 5 Trillion economy by 2025. Prime Minister launched National Logistics Policy on 17 Sep 2022 with desired outcome of reduction in logistics cost to 8% which is currently 13% of GDP and to be among top 25 countries by Logistics Performance Index and create data driven decision support mechanism. **While all this transformation is happening in national logistics ecosystem, there a need to dovetail and fuse military logistics infrastructure need in national logistics architecture.**

Transformation of National Logistics Infrastructure

Fastest Segment of Indian Economy. The civil logistics sector has been one of the fastest-growing segments of the Indian economy in recent years. The sector has expanded at a 15 percent compound annual growth rate (CAGR) in revenue in the past five years and is likely to grow at an even faster pace in the future.

PM GatiShakti & National Logistics Policy are a transformative approach for economic growth and sustainable development. The approach is driven by seven engines, which are:-,

- Roads
- Railways
- Airports
- Ports
- Mass Transport
- Waterways
- Logistics Infrastructure

PM GatiShakti. The **PM GatiShakti National Master Plan (NMP)** is aimed at breaking departmental silos and bringing in more holistic and integrated planning and execution of projects with a view to addressing the issues of multi-modal and last-mile connectivity . Launched on 13 Oct 2021, it is a giant stride in India's ambitious goal for becoming $ 5 trillion economy. It aims to transform the logistics efficiency and reduce logistics cost, with focus on integrating existing and proposed infrastructure of all developmental agencies, ministries and state governments. NMP will ensure first and last mile connectivity for seamless movement of people and goods. It has also been a transformative approach towards integrated planning and synchronised infrastructure project implementation. Adopting a 'whole of the government approach', the NMP has successfully incorporated more than 1900 GIS data layers for infrastructure mapping of different ministries and state governments. In the last one year, the NMP has effectively expedited many projects which had been previously stalled.

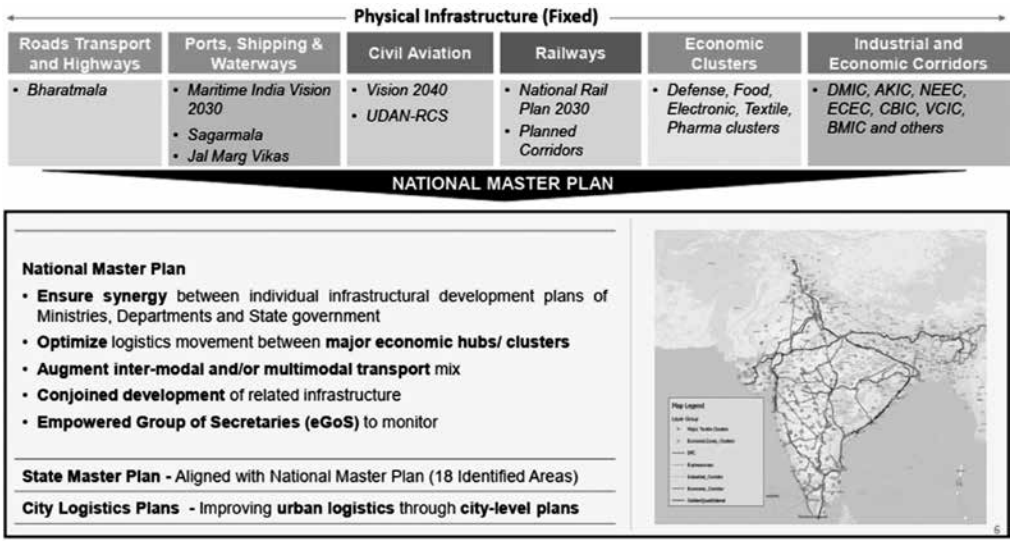


Figure 2 : National Master Plan (NMP)

For supervision and execution of PM GatiShakti, The institutional framework for formulation, implementation, monitoring and support is designed to have a three-tier system. The first tier is Empowered Group of Secretaries (EGoS), headed by Cabinet Secretary, consisting

of Secretaries of 18 Ministries as members and Head of Logistics Division, DPIIT, Ministry of Commerce & Industry as Member Convenor that oversees the formulation and execution of the NMP. Second tier is Network Planning Group (NPG) consisting of heads of Network Planning wing of respective infrastructure ministries and it will assist the EGoS in planning the infrastructure. To avoid duplication of works for holistic development of any region as well as reducing logistics costs through micro-plan detailing, the Technical Support Unit (TSU) is constituted for providing the required competencies which becomes the third tier. It brings together 18 crucial ministries such as railway, road, transport, civil aviation, telecommunications and agriculture for synergised and coordinated creation of infrastructure.

National Logistics Policy (NLP). On September 21, 2022, the Union Cabinet approved the National Logistics Policy (NLP). The policy complements the PM GatiShakti National Master Plan. NLP lays down an overarching interdisciplinary, cross-sectoral, multijurisdictional and comprehensive policy framework for the logistics sector. The NLP aims to develop a technologically enabled, integrated, cost-efficient, resilient, sustainable and trusted logistics ecosystem in the country for accelerated and inclusive growth to reduce logistics cost by 40% from current 13% of GDP by integration, optimisation, standardisation and modernisation of logistics space. This will provide a comprehensive agenda for development of entire logistics ecosystem. NLP is proposed to be implemented through a

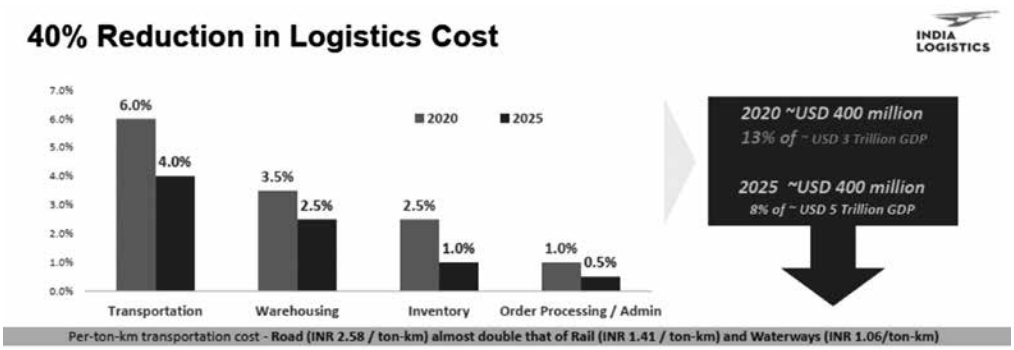


Figure 3 : Logistics Cost as Percentage of GDP in 2020 and Projection for 2025

Comprehensive Logistics Action Plan (CLAP). Action areas proposed in CLAP are:-

- **Integrated Digital Logistics Systems**. NLP proposes to develop a system of unified logistics interface linking multiple data sources and develop cross sectoral use cases for logistics professionals.
- **Standardisation of Physical Assets and Benchmarking Service Quality Standards**. NLP has undertaken to enhance interoperability, minimise handling risks, synergise processes, and improve ease of doing business, through standardisation of physical assets and benchmarking of service quality standards in logistics.
- **Logistics Human Resources Development and Capacity Building**. Develop an overarching logistics human resource strategy and under its guiding principles, stake holding ministries to develop action plans to address skill development.
- **State Engagement**. Provide support for development of state/city level logistics plans, set up institutional framework to take action at city/state level, measure and monitor action by states and rank them.
- **Service Improvement Framework**. Improving regulatory interface to enable seamlessness between sectors, promote standardisation, formalisation, and interoperability; eliminate fragmentation in documentation, formats, processes and liability regimes; and reduce gaps in regulatory architecture.
- **Sectoral Plan for Efficient Logistics**. Sectoral Plans for Efficient Logistics (SPEL) aligned with PM GatiShakti, will be developed for each sector with underlying philosophies of inter-operability, resiliency, sustainability, and innovation. Specifically, SPEL would address logistics issues pertaining to infrastructure, processes, digital improvements, policies and regulatory reforms, and capacity building for better workforce, and prioritise cross-sectoral cooperation to complement and not duplicate efforts and focus on optimisation of modal mix.

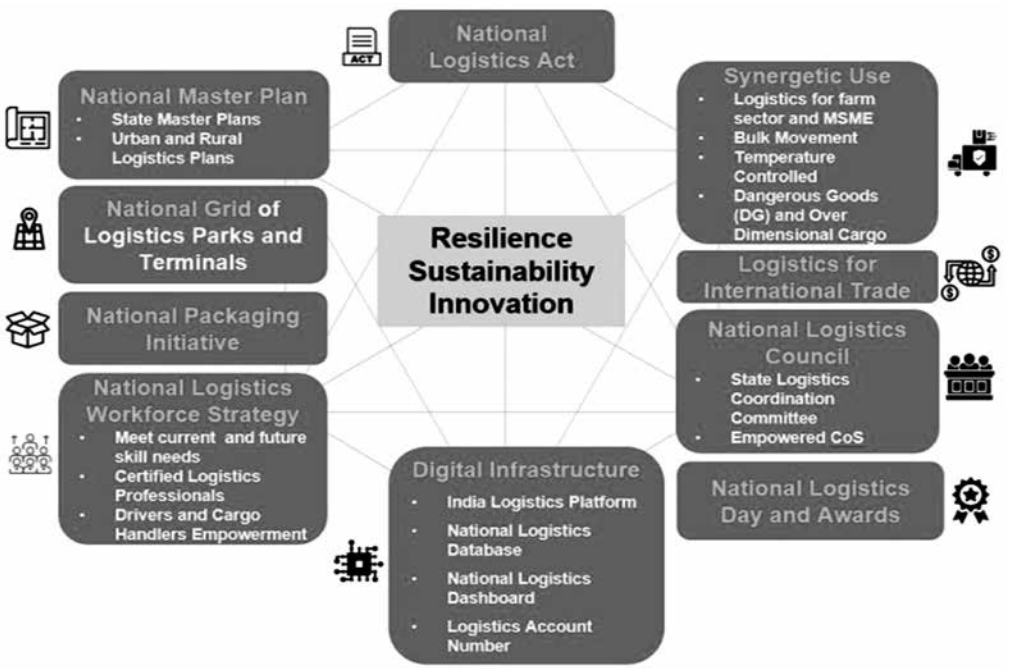


Figure 4 : Pillars of Integrated Logistics Development[17]

Development of Logistics Parks. Logistics parks (e.g. Multi Modal Logistics Parks, Air Freight Stations, Inland Container Depots, Container Freight Stations, cargo terminals, etc.) will be hubs for intermediary activities (storage, handling, value addition, inter-modal transfers, etc.) in the supply chain connected by a transportation network. It is envisaged to promulgate framework guidelines to facilitate development of Logistics Parks in the country with focus on encouraging private investment, create a network of logistics parks by mapping them on the PM GatiShakti NMP, for enhanced visibility, improved logistics efficiency, optimum utilisation and connectivity.

Military Logistic Infrastructure Voids

Physical Infrastructure especially roads and defence works along international border (IB) and Line of Control (LoC), are somewhat developed, however, our infrastructure along Line of Actual Control (LAC) is far from what is required state of development considering Chinese infrastructure development across LAC. After 1962 war with

China, general thought process of decision makers, political as well military, was that best way to hamper Chinese offensive on own side was by denying axis for developing operations. This was best achieved by deferred and delayed infrastructure development. Shri AK Antony, then RM, in 2010 said that, "*Earlier, the thinking was that inaccessibility in far-flung areas would be deterrence to the enemies*."

Thought process started changing with formation of China Study Group (CSG) in 1970s; however, the intent of improvement of infrastructure along LAC didn't translate on ground. Though, 73 roads, which are known as India-China Border Roads (ICBR) were conceived in 1997 and approved by CCS in 1999 and were to be completed by 2006. These roads have witnessed many extension of deadline and are yet to be fully completed, reason for which was informed by the BRO to standing committee on Defence in 2018-19. It is beyond doubt that these roads are critical for many purposes in addition to military requirements. Same Standing Committee on Defence noted in its report that border areas, "*which are generally underpopulated, be populated with sympathetic indigenous population. This policy requires a good road network, firstly for motivating migrated population to return to their areas and secondly, for their logistics sustenance*."

ICBR Phase-2 for construction of additional 104 roads along LAC of approximately 6700 kms, approved in 2020-21 continues to face multiple challenges. Same is the case of Border Airports, ALG projects, Border Bridge Projects, Border Railway Projects, Border Tunnel Projects and Sea Ports & Water Ways Projects of strategic nature. Though completion of LAC projects such as Leh to DBO road in Ladakh, Lipulekh road in Uttarakhand along Nepal border, Damping to Yangtze road in Arunachal Pradesh, Atal Tunnel on Manali to Leh axis, Bogibeel and Sadiya bridges in Assam, Forward ALGs do offer some hope.

General Manoj Pande, the Chief of Army Staff while speaking at **Army Logistics Seminar** on 12 Sep 2022 said that one of the important lessons from Russia-Ukraine war is that **the pace, intensity and reach of military operations ride on strength, agility and capacity of logistics support**. "*While military infrastructure will continue to*

meet the immediate and specific demands of the armed forces, it is the civil-military fusion with the support of Indian industry that shall provide the bulwark for execution and sustenance of future operations," COAS further added.

Raksha Mantri Shri Rajnath Singh, while delivering key note address at the same seminar **called for Civil-Military Fusion**. He said that, "*The government is taking steps to create a robust, secure, speedy and self-reliant logistics system, with the requisite civil-military fusion, to effectively deal with future security challenges*".

RECOMMENDATION ON CIVIL-MILITARY FUSION FOR INFRASTRUCTURE DEVELOPMENT

PM GatiShakti Infrastructure Plan targets set by the Indian government till 2024-25 for major infrastructure creation are as follows:-

- **Expanding National Highways**. Extend national highways to 0.2 million kilometres, powered by **Bharatmala**, completing four or six-lane national highways of 5,590 kms along coastal areas and connecting all state capitals in the northeast.
- **Increasing Cargo Capacity**. Railways has a target to handle 1,600 million tonnes of cargo, decongest 51% of the rail network by completing additional lines and implement two Dedicated Freight Corridors (DFCs).
- **Shipping**. Powered by **Sagarmala**, shipping sector to see an increase cargo capacity at the ports to 1,759 million tonne per annum.
- **Doubling the Existing Aviation Footprint**. Powered by **Regional Connectivity Scheme – UDAN**, the Ministry of Civil Aviation, has a target to increase the existing aviation footprint and have a total of 220 new airports, heliports and water aerodromes by 2025 including the development of an additional 109 facilities.
- **Construction of the Pipeline Network**. Doubling the gas pipeline network to 34,500 kms by building an additional 17,000 km long trunk pipeline.

- **Extending the Transmission Network**. The total power transmission network is targeted to be ~0.5 million circuit km and the renewable energy capacity to be increased to 225 GW.

Institutional/Functional Mechanism for Military Infrastructure Requirement Projection. Infrastructure mentioned above are critical, as well for the military and it is imperative that **military requirements are included in the PM GatiShakti NMP ab-initio.** It needs to be done by the **way of inclusion of defence forces representation in the formal consultative mechanism of GatiShakti and NLP.** However, in case creation of institutional mechanism is getting delayed for some reason, **defence forces can formulate its requirements and project to Department for Promotion of Industry and Internal Trade**, Ministry of Commerce and Industry which is nodal department, through MoD/ DMA or IDS for functional ease and speed.

Provision for Military Infrastructure in NLP. Similarly, National Logistics Policy is silent on requirement and modalities of construction of logistics infrastructure along border areas. One of the plausible reasons could be its financial viability and return on the investment. It is imminently desirable to formulate defence logistics infrastructure requirements and reach out to Logistics Division, Department of Promotion of Industry and Internal Trade for inclusion of defence forces need in National Logistics Policy. These requirements must be comprehensive, riding on proposed multimodal connectivity infrastructure to various economic zones. Military should also aim to:-

- **Integrate** existing military infrastructure with proposed multimodal infrastructure.
- **Optimise** logistics infrastructure of defence forces with synergistic usage of civil infrastructure.
- **Standardise** our physical assets, seek to update civil standards to suit military requirements and enforce standardisation of processes, taxonomy and service quality standards as being adopted in civil.
- **Formalise** to reduce fragmentation within the Services and with civil logistics sector, up skill and reskill the logistics workforce.

Suggested Inclusion in NLP. Some suggestions for immediate inclusion in logistics infrastructure creation as part of NLP are:-

- **Dedicated zones in proposed logistics parks** for use by military to be catered wherever these are required; or a separate military logistics park, land for which must be acquired along with civil Logistics Park Land, to be created adjacent to civil Logistics Parks.
- **Last mile connectivity to be extended either to border areas** where needed or to an existing road. If last mile connectivity is economically unviable, it should be given capital subsidy.
- **Capital subsidy** to be also provided to logistics companies **for construction of warehouses in remote areas** or an arrangement of clubbing these with profitable location may be resorted to.
- Inclusion **of military logistics infrastructure development parameters** to be included in **LEADS (Logistics Ease Across Different States) Survey** for focus on creation of military infrastructure.

Airfields. More number of Airfield and ALGs are required to be developed in border areas **under UDAN** scheme which can **induce the reverse migration** and also act as dual use infrastructure. For example, ALG proposed to come up in **Tangtse may be developed as part of UDAN.**

Military NPG and TSU for Integrated Infrastructure Development. The concept of NPG and TSU enshrined in NLP and discussed earlier need to be replicated in Border Areas **comprising of civilian** and **military representatives**, having powers of making decisions pertaining to infrastructure development. This may include the **local formation commanders, engineers from the GREF/ BRO detachment (if stationed), representatives from Navy or Air Force where required** from the military domain and the **representatives of civil administration**.

Dual Purpose Projects. Any project being undertaken in forward location should be considered for feasibility of dual-purpose utilisation, at the planning stage itself.

Use of Tunnels in Border Area for Dual Purpose. Tunnelling is the **only viable point defence in face** of **increasing precision** and **lethality of warheads**. The **PLA** has built **tunnels** for aircrafts at Lhasa and **underground storage facilities** to store nuclear missile submarines in Hainan Islands in South China Sea . In our case, tunnel based **billeting** and **defences** are required to be constructed, in mountainous areas along LAC. **Provisions of Tunnels for defence works and for storage facility** to be planned **ab-initio**. The same to be provided with **requisite arrangements** for troops during **winters** and also provide security in **CBRN environment**.

Cavern Ammunition Storage Facility. Conventional ammunition storage infrastructure in forward areas is prone to enemy **surveillance** and observation during peace and precision strikes during war. We need **underground ammunition storage facilities**, keeping in view the terrain and climate considerations in forward areas. Construction of these will strengthen **defence capability and reduce logistical vulnerabilities**. These facilities must be planned in conjunction with NLP.

Pipeline Network for Fuel. The Indian Oil Corporation Limited is in process of laying pipe lines for supply of fuel to important hubs as part of NLP from where, based on the **Hub and Spoke Concept**, **lines should be laid ahead** to supply **fuel to remote locations. This is required to be extended to forward border areas to economise on transportation requirement and create ease and redundancy in supply of Fuel & Oil**.

Critical Pre-requisites. Though not as part of physical infrastructure, however; as critical enablers, military has to upgrade its digital interface and logistics organisation.

- **Logistics Vertical at IDS.** Logistics have achieved fair degree of jointness among the services. In absence of Defence Logistics Agency type of central organisation in India**, logistics vertical at IDS is required to lead the way**. Going forward, **size of logistics vertical at HQ IDS does not complement the role it plays and potential it has**. Logistics vertical at IDS, suitably augmented, to be responsible for centralised policy formulation and coordination of

logistics aspects at tri-services. While the Services can continue to be responsible for their own logistics function, the logistics vertical at IDS to be responsible for:-

- **Coordination with other organs and ministries** of government for factoring in military logistics requirement in creation of logistics infrastructure and ecosystem.
- **Policy intervention** to encourage the civil logistics initiatives in addressing military logistics needs and encourage creation of military logistics ecosystem.
- Optimisation of resources by eliminating duplication in logistic functions, achieving economy of scale and reduce wastage by catering centralised reserves.

- **Digital Interface**. Integrated Material Management On-Line System (IMMOLS) of Air Force, Integrated Logistics Management System (ILMS) of Navy and Computerised Inventory Control Project (CICP) of Army need to be **fully integrated with tri-services seamless interoperability** and **inventory visibility**. **Digital architecture** to take advantage of **United Logistics Interface Platform (ULIP)**, proposed as part of NLP, has to be developed by the military.

ULIP will help logistic stakeholders in multiple ways. It is in line with the overall objective of PM GatiShakti which aims at breaking individual silos, promote integration among various Ministries/Departments and create a single window thus bringing efficiency and transparency in the logistics industry and thus making India cost competitive and 'Atmanirbhar' in the logistics sector.

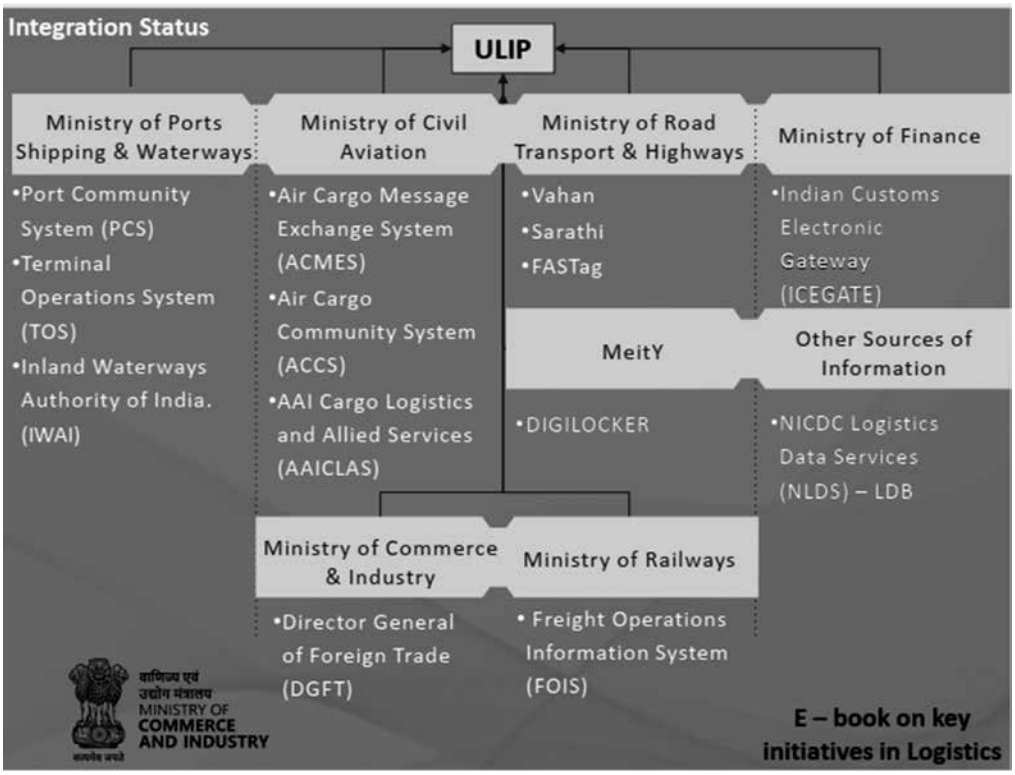


Figure 5 : ULIP Integration Architecture

- **Integrated Logistics Organisation**. Some measures like **setting up of Joint Logistics Nodes** (JLNs) at Mumbai, Guwahati and Port Blair have materialised, however**, logistics continues to be planned virtually in Services silos**. Need of the hour is to **evolve an integrated logistics organisation** suitable for **forward linking to Service** while having capability of **being able to fully take advantage of PM GatiShakti and NLP** by **seamless backward integration**.

Conclusion

Logistics efficiency is function of infrastructure, services which includes digital, processes & regulatory services; and Human Resource. The government has been proactively working to bring quantum improvement in logistics infrastructure. For us in military, the need of the hour is

to be innovative which when backed by integrated organisation & effort will become a 'Force for Modernisation'. Proactively reaching out and fusing our requirement with GatiShakti & NLP will plug the military infrastructure gaps in this highly complex and fragmented environment at optimal cost and least burden to defence expenditure.

*Col MB Singh has served along LAC as well as LoC. An alumnus of OTA Chennai, DSSC Wellington and CDM Secunderabad; he was Col GS (Operations) of a Command along Northern Borders. The officer is currently posted as Deputy Commander of a Rashtriya Rifles Sector in North Kashmir. Views expressed are personal.

Endnotes

1. MCF One Pager, US State Department, https://www.state.gov/remarks-and-releases-bureau-of-international-security-and-nonproliferation/what-is-mcf-one-pager/
2. Xiaobai Liu, Fei Shao and Xingxing Zhang, "Civil-Military Integration Logistics Support System of Warships," IOP Conference Series: Materials Science and Engineering, Volume 853, 2020 The 6th International Conference on Electrical Engineering, Control and Robotics https://iopscience.iop.org/article/10.1088/1757-899X/853/1/012031/meta
3. Alex Stone and Peter Wood, "China's Military-Civil Fusion Strategy", China Aerospace Studies Institute, https://www.airuniversity.af.edu/CASI/Display/Article/2217101/chinas-military-civil-fusion-strategy/
4. ibid
5. The Economic Times, 23 Aug 2020, https://economictimes.indiatimes.com/news/economy/infrastructure/ critical-road-infra-building-to-put-india-on-par-with-us-uk-in-2-years-gadkari/articleshow/77702276.cms
6. GoI, National Logistics Policy 2022, Ministry of Commerce and Industry Gadzette Notification dated 28 Sep 2022
7. https://www.moneycontrol.com/news/business/logistics-industry-seeks-subsidies-on-electric-vehicles-faster-development-of-ulip-platform-in-2023-budget-9718701.html
8. One year of PM GatiShakti – National Master Plan, Ministry of Finance Press Release, 13 Oct 2022, https://static.pib.gov.in/WriteReadData/specificdocs/documents/2021/oct/doc2021102511.pdf
9. One year of PM GatiShakti – National Master Plan, Ministry of Finance Press Release, 13 Oct 2022, https://static.pib.gov.in/WriteReadData/specificdocs/documents/2021/oct/doc2021102511.pdf
10. PM GatiShakti November 2022 Newsletter, GoI, Department for Promotion of Industry and International Trade; https://dpiit.gov.in/publications/e-newsletter
11. First National Conference on Logistics of States Report, Logistics Division Department of Commerce, Ministry of Commerce and Industry, https://logistics.gov.in/
12. PM GatiShakti – National Master Plan, Ministry of Finance Press Release, 25 Oct 2021, https://static.pib.gov.in/WriteReadData/specificdocs/documents/2021/oct/doc2021102511.pdf

13. PM GatiShakti Plan, https://www.ibef.org/blogs/pradhan-mantri-gati-shakti-plan
14. Ebook on National Logistic Policy, GoI Ministry of Commerce and Industry, https://dpiit.gov.in/logistics-division#e-BookonLaunchofNationalLogisticsPolicy
15. First National Conference on Logistics of States Report, Logistics Division Department of Commerce, Ministry of Commerce and Industry, https://logistics.gov.in/
16. Ebook on National Logistic Policy, GoI Ministry of Commerce and Industry, https://dpiit.gov.in/logistics-division#e-BookonLaunchofNationalLogisticsPolicy
17. Vivek Raghuvanshi, 07 May 2010, https://www.defensenews.com/story.php?i=4616391&c=ASI&s=LAN
18. GoI, Ministry of Defence, Standing Committee on Defence (2018-19) report to Sixteenth Lok Sabha, Para 1.5, Page 8
19. Ibid, Para 1.2, Page 1
20. Vijaita Singh, "Critical road on China border being constructed in Ladakh: MHA", Mar 15 2021, https://www.thehindu.com/news/national/critical-road-on-china-border-being-constructed-in-ladakh-mha/article34077712.ece
21. First National Conference on Logistics of States Report, Logistics Division Department of Commerce, Ministry of Commerce and Industry, https://logistics.gov.in/
22. ibid
23. One year of PM GatiShakti – National Master Plan, Ministry of Finance Press Release, 13 Oct 2022, https://static.pib.gov.in/WriteReadData/specificdocs/documents/2021/oct/doc2021102511.pdf
24. https://www.aai.aero/sites/default/files/basic_page_files/list%20of%20airport%20bilingual.pdf Kapoor, S. 07 September 2022. The Indian Express. Retrieved from www.indianexpress.com: https://indianexpress.com/article/explained/explained-global/china-fully-solar-powered-semi-satellite-drone-explained-8137035/
25. (News I., 2020) News, I. (2020, November 22). Indian Army takes a leaf out of Chinese warfare, deploys tunnel defences in Ladakh. Hindustan Times. Retrieved from https://www.hindustantimes.com/india-news/indian-army-take-a-leaf-out-of-chinese-warfare-deploys-tunnel-defences-in-ladakh/story-4RVVPMjeofhzB9kUQCKTeL.html
26. (IOCL, n.d.) IOCL. (n.d.). Indian Oil Corporation Limited. Retrieved from www.iocl.com:https://iocl.com/Pages/pipelines-overview

INDIA'S NORMATIVE ASPIRATIONS OF CIVIL-MILITARY FUSION KNOWLEDGE ABSORPTION BY PRIVATE SECTOR THE KEY

Cmde Somen Banerjee*

Introduction

When the Cyberspace Administration of China(CAC) requested user data from DiDi, a Chinese car-rental company, the latter was initially reticent. Then, upon insistence by the regulatory authorities, it reluctantly complied by providing hardcopy printouts of the data, thus denying digital data analysis of its customers. However, DiDi's defiance didn't last long. It was eventually forced to delist from the New York Stock Exchange and was fined 1.2 Bn Euros by the CAC in July 2022.[1] In another Apple-FBI standoff, the manufacturer has refused access to the iPhone used by a terrorist in the San Bernardino shooting. It was eventually unlocked by a small Australian hacking firm Azimuth Security in 2016, ending a momentous standoff between the US government and the tech titan Apple[2]. The DiDi-CAC and Apple-FBI faceoffs suggest that it is problematic for the civil industry to cooperate with governments in China or elsewhere for national security and, by extension, 'Military-Civil Fusion' (MCF). A US equivalent of the concept, Civil-Military Integration (CMI), has also yielded mixed results posing fundamental doctrinal concerns for battlefield logistics post-9/11. In comparison, India's experiment with *Atmanirbhar Bharat* is relatively nascent. In September 2022, Hon'ble Raksha Mantri's call for 'Civil-Military Fusion' (CMF) and the Indian Army's allusions to *Samanjasya Se Shakti* were encouraging but normative.

Essentially, the fourth industrial revolution is redefining the character and nature of warfare and smudging the borders of liminal technologies. Moreover, its propensity to cause economic disruption and desolation to the civil population fundamentally challenges the International Humanitarian Laws (IHL) on armed conflict. In response to this new normal, countries must learn to absorb technological know-how rapidly and widely from commercial sources. Incidentally, the private sector is better structured to grab fleeting opportunities and absorb galloping technologies at a pace probably faster than Moores's law.

Against this backdrop, the paper seeks, firstly to declutter the alphabet soup of oft-quoted adages like CMF, CMI, and MCF. Next, it describes the various phases of knowledge absorption necessary for CMF and identifies the current gaps in the Indian defence R&D sector. Essentially the paper argues that the intensity and speed of absorbing knowledge from abroad by India's private sector are indeed strewn with challenges but will be critical for realising the full potential of CMF.

Alphabet Soup of MCF, CMI, and CMF

The relationship between military and civilian technology is as old as human civilisation. For example, the Walls of Jericho in the West Bank were built around 8000 BCE. Its massive stone walls with intermediate watchtowers are clear signs of early human endeavour to harness civil technology for military purposes.[3] Ever since, warfare has constantly evolved to gain an edge over the enemy. However, it is difficult to say if commercial technology drove military modernisation or *vice-versa*. Incidentally, face recognition, microwave, GPS, the internet, and virtual reality are some military research that transformed the commercial world profoundly.[4] By the way, the reverse is also true. All defence forces are now being forced to adapt their doctrines and equipment with commercial-off-the-shelf (COTS) products, such as wearable computing, the Internet of Things (IoT), 3D printing, drones, and 5G.

In addition to valour and military tactics, there are perhaps less spectacular but significant forces behind the scenes of visible warfare. I call these Organisations, Innovations, and Logistics, or the OIL of warfare. MCF, CMI, or CMF essentially enhance the quality of this OIL for creating

asymmetry on the battlefield. For example, PLA's Strategic Support Force (SSF) organisation (O), formed in 2015, seeks to "overcome the superior with the inferior" through the application of asymmetric commercially available technologies for information countermeasures against critical nodes in space, cyberspace, and the electromagnetic domains.[5] Similarly, the Byraktar drone is an asymmetric innovation (I) that has altered the trajectory of wars in Kurdistan, Syria, Nagorno-Karabak, Tigray, and Ukraine.[6] Asymmetry in logistics (L) is clearly altering the Chinese force posture on the Line of Actual Control (LAC). To win localised conflicts, the PLA's Western Theatre Command (WTC) plans to build 20 new border airports by 2025, upgrade the G219, G331 and G318 national highways, and complete the Siachun-Tibet (Chengdu-Lhasa) railway link.[7] Thus, one could argue that CMF is the elixir for creating asymmetric OIL for winning wars. In another time, this would have been known as Revolution in Military Affairs (RMA). Be that as it may, the leitmotif of the alphabet soup of MCF, CMI, or CMF is two folds. Firstly, to harness the potential of commercial R&D and, secondly, to cut government spending by integrating defence specifications into commercial goods and services. In a larger sense, these acronyms are not just about dual-use technology but the effective military use of civilian facilities and talent. It could mean using highways as emergency airstrips, civilian transport for military logistics, commercial technologies to create new systems, upgrading the capabilities of the older weapons and sensors, or attracting civilian talent and venture capital to aid military programmes.[8] Civil-military relations for unified central leadership and organisation have been kept out of this paper's scope or ambit.

Chinese Military-Civil Fusion*.* China's 2006−2020 Medium- and Long-Term Defence Science and Technology Development Plan (MLDP) draws inspiration from the experiences of Japan, South Korea, and the Soviet Union. Between the 1950s and 1990s, Japanese and Korean firms signed know-how contracts with the West, allowing access to manufacturing, knowledge, and blueprints. In addition, it provided them with knowledge of reverse engineering and critical skills for catching up. The Soviet Union simultaneously engaged in indigenous development and extensive industrial espionage.[9] Notably, the Chinese MLPD

stresses these paradigms of absorbing foreign technology to leapfrog the present gap with the western world. It is incidentally distinct from building innovation capacities, which rely on an indigenous R&D system.

Although China has implemented a slew of policies and plans, like the MLPD, its badly needed *fusion* of MCF still remains aspirational. It is because the Chinese defence sector is heavily dominated by sclerotic state-owned enterprises (SOEs) and cannot respond to the dynamic commercial technology. Despite years of reforms, the participation of Chinese private companies in defence projects, barring probably logistics, has been frustrating. As a strategy, MCF is miles away from STEM driven US defence ecosystem. Whilst the Chinese Communist Party (CCP) does not need a law to compel private companies to turn over their technologies, unfortunately, coercion has proven to be an unsustainable method. The recent DiDi-CAC face off is a vindication of such intimidations. Thus, the repackaging and relabeling of Chinese CMI into its current avatar of MCF seeks to remedy this problem by shedding and moderating the old draconian ways.[10] However, MCF's in China is a hostage of its deep systemic problems of knowledge absorption from the commercial sector.

The U.S. Civil-Military Integration*.* Since World War II, the US' Offset Strategies (OS) have defined its defence posture. 1OS had sought to create nuclear deterrence against the Soviets, which the Soviets neutralised by achieving nuclear parity and conventional dominance against NATO in the 70s. The post-Cold War 2OS strategy was about achieving conventional superiority through network-centric warfare, which the Chinese Anti-Access Area Denial (A2/AD) managed to counter.[11] In response, Pentagon's Third Offset Strategy (3OS) pursues next-generation technologies and concepts to ensure conventional deterrence. 3OS aims to answer Russian and Chinese parity by deploying asymmetric Artificial Intelligence (AI), lethal autonomous weapons, hypersonic weapons, directed energy weapons, biotechnology, and quantum technology. All these technologies can be injected into the sensor, C4I, logistics and support grids.[12] In effect, the current version of the US CMI seeks to leverage military advantage over adversaries whilst simultaneously harnessing the common potentials of technologies,

processes, labour, equipment, material, and facilities. The US private sector, fortunately, has robust defence R&D capable of learning, absorbing and galloping alongside the commercial sector. From 3OS, it also becomes evident that today's CMI necessitates rapid absorption of cutting-edge commercial technologies.

India's Civil-Military Fusion. During the formative years after independence, State Public Sector Units (PSUs) and Council of Scientific and Industrial Research (CSIR) laboratories took the lead in space, nuclear energy and defence sectors. However, in the 1980s, self-reliance petered off unsuccessfully due to decreased support for PSUs and their inability to upgrade technologies. Even the liberalisation of Indian industries in the 1990s did not bring new technological knowledge into India. The private sector in India showed little interest in R&D and was content with collaborating with foreign Original Equipment Manufacturers (OEMs) on the latter's terms. India thus wholly missed out on the Third Industrial Revolution, characterised by semiconductors, mass manufacturing, electronics, white goods, etc. Years of enticing foreign defence majors to set up shops in India also came to nought. As a result, India has emerged as the largest defence importer in the bargain, causing a big drain on taxpayers' money and strategic dependence on foreign countries. Hon'ble Raksha Mantri's call for 'Civil-Military Fusion' (CMF) in September 2022 is meant to correct this.[13] However, India's experiment with *Atmanirbhar Bharat* and CMF @75 is relatively normative and will need real-time knowledge absorption by the Indian private sector from high-tech foreign firms. In this context, The National Security Advisors of India and the US launched the initiative on Critical and Emerging Technologies (iCET) on 01 February 2023, which promises to foster an open, accessible, secure technology ecosystem. iCET is the fruition of intent expressed at the Biden-Modi meeting in May 2022 to further and elevate the US-India strategic partnership and defence industrial cooperation. This opens opportunities to envelop cutting-edge commercial technologies in the defence sector more seamlessly, such as Desktop as a Service (DaaS), robotics, AI, semiconductors, jet engines, SpaceX Starlink communication systems, and autonomous weapons, to name a few.

Knowledge Absorption

India's ability to value, assimilate, and apply new knowledge will be critical to realising the true potential of CMF. It is a deliberate process and cannot be sustained by ad hocism and rhetoric. Many scholars like Shaker A. Zahra and Gerard George have demonstrated how Absorptive Capacity (ACAP) is critical for providing strategic flexibility and freedom to adapt and evolve in a dynamic and high-velocity environment like the defence industry. They argue that ACAP exists in two dimensions. While *potential ACAP* comprises knowledge acquisition and assimilation, *realised ACAP* is concerned with knowledge transformation and exploitation.[14] In the following sections, this paper posits that ACAP has received disproportionately less attention in India, and India's private sector has the requisite flexibility and agility to adopt CMF to make a truly self-reliant India.

Acquisition through Vicarious Learning and Grafting

Organisations do not begin their lives on a tabula rasa. R&D organisations are initially created on cognitive knowledge. After that, institutions of R&D add experimental knowledge through systematic processes and accidental discoveries. We have witnessed this kind of knowledge growth in India's premier defence research organisation, the Defence Research and Development Organisation (DRDO). Adapting to the impending threats and potential technologies, DRDO's experimental journey has resulted in outstanding achievements. India's strategic missiles, nuclear submarines, fighter aircraft, main battle tanks, and personal weapons are its illustrious products, to name a few. However, the Indian Armed Forces are still resorting to foreign acquisitions to tide over the immediate capability gaps. The high production costs and prolonged timelines of DRDO can be attributed to technology denial, foreign monopoly and the political economy of the global defence industry. Under these circumstances, George P. Huber proposes two additional acquisition methods: *vicarious learning* and *grafting.* Indian defence R&D could adopt these to bridge the production and time cost. Both domains of knowledge acquisition support CMF.

Vicarious Learning. Vicarious Learning is a strategy of second-hand learning of niche technologies by borrowing or through corporate intelligence. Automobile and computer manufacturers routinely indulge in corporate intelligence by examining their competitors' products. Such information is acquired from consultants, professional meetings, trade shows, publications, vendors and suppliers and networks of professionals in less competitive environments. However, defence industries typically resort to mimicry in a highly secretive environment encumbered by prohibitive sanctions. China has wildly succeeded in this technique. Some Chinese clones remarkably resemble the Lockheed Martin F-35 Joint Strike Fighter and Northrop Grumman X-47B unmanned combat air vehicle (UCAV). Several technologies used in these designs were mainly acquired through vigorous Chinese cyber spying campaigns[15]. India's vision of *Atmanirbhar Bharat* and CMF will need to incorporate these ACAP methods in an institutional and organised manner. However, Vijay Mahajan, Subhash Sharma, and Richard A. Bettis have argued that organisational imitation is often haphazard and fraught.[16] Based on empirical research, Bourgeois and Eisenhardt have concluded that mimicry is not always efficacious in stiffly competitive and fast-changing environments.[17] Instead, organisations can improve their expertise by grafting new members from outside who possess transformational knowledge.

Grafting. Grafting is more likely to succeed in acquiring complex information or knowledge and is a faster acquisition method. Ostensibly, China has long been recruiting western researchers and planting its own scientists in the US national security research facilities. Between 1987 and 2021, at least 162 scientists joined the Chinese defence R&D projects after receiving scientific training at Los Alamos.[18] Private sector companies are most suitable for such learning methods as government, or public sector R&D organisations cannot undertake grafting due to organisational pride and reticence.

Coincidentally, DRDO has created five new Young Scientists Laboratories (DYSLs). These were expected to draw talented youth and prevent brain drain to western MNCs. DYLSs envisage integrating new technological horizons in defence R&D, such as Artificial Intelligence, Quantum

Technologies, Cognitive Technologies, Asymmetric Technologies and Smart materials. In addition, DRDO has also introduced Research Fellowships for young scientists/Engineers to undertake cutting-edge research. Further, the Defence Industry Academia Centre of Excellence (DIA-CoE) provides financial support to ten IITs/Universities to undertake science and technology projects and create special test facilities. DRDO has also commenced Cyber and Artificial Intelligence (AI) and Machine Learning (ML). So far, more than 1000 professionals have been trained in these domains.[19] These are bold and decisive steps initiated by DRDO but fall short of grafting. For this, DYSLs will need to absorb the corporate work ethics, culture, and human resource practices of MNC's. A highly paid, stiffly competitive, project-based, time-sensitive, and hire-fire environment of MNCs is essential in DYSLs to achieve the desired transformation for CMF. However, youth seeking job security will be a liability in an intensely competitive environment.

Assimilation to Escape the Learning Trap

It is natural for any organisation to favour familiar technologies over the unfamiliar, prefer the mature over the nascent, and search for solutions from the existing ones. Defence labs worldwide are no exception. For example, some components of new torpedoes, like the battery or the servo, may change the functional parameters of the weapon. Typically such critical components are imported after extensive in-house developmental trials fail. But the rest of the numerous components are borrowed from existing technologies. Such pathological entanglement with old technologies is called a *learning trap.*[20] Similar trends can be seen in most weapon systems, especially in developing countries. Development of a novel (unfamiliar), emerging (leading edge), and pioneer (no antecedents) technology is problematic as external knowledge is often contextual and prevents outsiders from understanding or replicating. Such endeavours need corporate entrepreneurship, capable of understanding opportunities and breaking the learning trap. Large private firms worldwide have demonstrated the capacity and incentive to create RMA through CMF. A case in point is the private Turkish drone maker Baykar by the Byraktar family in Turkey. The nexus between technological breakthroughs and large private firms

are founded on the ability to combine private wealth creation with social benefits.[21] Unfortunately, such market-driven capitalist motivations cannot be expected from government-led R&D facilities.

Transformation for Integrating Multiple Specialities

Transformation is the ability of an organisation to create and integrate knowledge from different sources and speciality areas. This is especially the case in the defence sector where knowledge from the private sector or multiple labs need to be integrated. The clustering of 52 DRDO labs into seven technology clusters has been a step in the right direction. For example, it has ensured that technology integration within the aeronautical sector (Aero) happens seamlessly. Similarly, we have the Missile and Strategic Systems (MSS), Armament and Combat Engineering (ACE), Electronic and Communication Systems (ACE), Micro Electronic Devices, Computational Systems & Cyber Systems (MED & CoS), Naval Systems and Materials (NS& M), and Life Science (LS).[22] However, despite these foundational changes in DRDO, it will not be easy to keep pace with the dynamism of technological innovations.

he recent takeover of Xilinx by AMD is an example of how technology is integrated into a company to enhance ACAP and lead the world. AMD is a Santa Clara-based tech giant that drives innovation in high-performance computing, graphics and visualisation technologies. Integration of Xilinx into AMD now offers it the leadership in Field Programmable Gate Arrays (FPGA), adaptive SoCs, AI engines and software expertise with an approximately $135 billion market opportunity.[23] Ironically, such investments are opportunistic and cannot be made by PSUs and DRDO labs. Hence, large private sector enterprises will always have an edge and must be included in *Atmanirbhar Bharat*.

Exploitation

Exploitation reflects a firm's ability to harvest and incorporate knowledge into operations.[24] Using patent citation data to track knowledge transfer between firms, Almeida has shed startling new light on foreign direct investment (FDI). He shows how FDI in semiconductor industries is used to access technical knowledge in overseas countries.[25] But this

is easier said than done. It is well-documented that China's weak IP regime has discouraged foreign technology transfer to domestic firms. As a result, though foreign firms may increase overall innovation, it does not essentially translate to the capability-building of indigenous entities. So, even if FDI in China continues to grow, they do not enhance the innovation abilities of Chinese enterprises. Instead, they are used for building plants, importing technology, and managerial expertise. In recent years, Chinese firms are increasingly in-licensing patents, which, when absorbed, have improved their indigenous technological capabilities. But the same is not the case with the absorption of foreign technologies. This is attributable to China's prohibitive Technology Import Export Regulation (TIER).[26] The Chinese experience shows that despite an authoritarian government, technology absorption is difficult due to IPR issues, type of FDI, and domestic regulations. So, the Indian MoD has to revisit the Foreign Trade (Development & Regulation) Act of 1992, India's Export-Import (EXIM) Policy, the IPR regulations, and the nature of FDIs to enable the meaningful realisation of CMF.

Conclusion

MCF, CMI, or CMF are essentially similar adages used for enhancing the quality of organisations, innovations, and logistics (OIL) on the battlefield. Firstly, to harness the potential of commercial R&D and, secondly, to cut government spending by integrating defence specifications into commercial goods and services.

This paper argues that today's CMF necessitates rapid knowledge absorption of cutting-edge foreign technologies by the Indian private sector. The private sector is better structured to grab fleeting opportunities and absorb galloping technologies at a pace probably faster than Moores's law. Such knowledge can be obtained through industrial intelligence and grafting. Large private firms have the incentive to create private wealth. Even if companies were to absorb high-end technology from abroad, their productionisation would need a review of various regulatory roadblocks.

Essentially, India's experiment with *Atmanirbhar Bharat* and CMF is relatively normative and will need real-time knowledge absorption by the

Indian private sector from high-tech foreign firms. The recent India-US iCET tech collaboration has afforded the Indian private sector a golden opportunity to invest in defence R&D.

***Cmde Somen Banerjee** is currently the DyDG of NCC Odisha Directorate. He has authored two books and published several papers. He can be contacted at somenbanerjee2018@gmail.com

Endnotes

1 Vincent Brussee, Didi fine marks new phase in Beijing's rectification of tech sector, 09 August 2022, https://merics.org/en/short-analysis/didi-fine-marks-new-phase-beijings-rectification-tech-sector

2 Ellen Nakashima and Reed Albergotti, The FBI wanted to unlock the San Bernardino shooter's iPhone. It turned to a little-known Australian firm, *Washington Post,* 14 April 2021, https://www.washingtonpost.com/technology/2021/04/14/azimuth-san-bernardino-apple-iphone-fbi/

3 *Britannica,* Prehistory: The earliest military weapons, accessed on 20 December 2022, https://www.britannica.com/technology/military-technology/Prehistory

4 Thomas C. Frohlich, Evan Comen and Grant Suneson, 15 commercial products invented by the military include GPS, duct tape and Silly Putty, *The USA Today,* 16 May 2019, https://www.usatoday.com/story/money/2019/05/16/15-commercial-products-invented-by-the-military/39465501/

5 John Costello and Joe McReynolds, China's Strategic Support Force: A Force for a New Era, *China's Strategic Perspective 13,* National Defence University Press, Washington 2018, p 7

6 Stephen Witt, The Turkish Drone That Changed the Nature of Warfare, *The New Yorker,* 09 May 2022, https://www.newyorker.com/magazine/2022/05/16/the-turkish-drone-that-changed-the-nature-of-warfare

7 Kartik Bommakanti and Aditya Gowdara Shivamurthy, China's Military Modernisation, *ORF,* 13 May 2021, https://www.orfonline.org/research/chinas-military-modernisation-recent-trends-2/

8 Manoj Joshi, China's Military-Civil Fusion Strategy, the US Response, and Implications for India, *ORF,* January 2022, https://www.orfonline.org/research/chinas-military-civil-fusion-strategy/

9 Tai Ming Cheung, Innovation in China's defence technology base, ed. Richard A. Bitzinger and James Char, *Reshaping the Chinese Military The PLA's Roles and Missions in the Xi Jinping Era*, 2019, Routledge, London, p163

10 Elsa B. Kaniam and Lorand Laskai, Myths and Realities of China's Military-Civil Fusion Strategy, *Center for a New American Security*, 2021, https://www.cnas.org/publications/reports/myths-and-realities-of-chinas-military-civil-fusion-strategy

11 Octavian Manea, An interview with Robert O. Work, 31st US Deputy Secretary of Defense – The Role of Offset Strategies in Restoring Conventional Deterrence, 19 March 2018, https://securitypolicylaw.syr.edu/the-role-of-offset-strategies-in-restoring-conventional-deterrence/#:~:text=To%20counter%20Soviet%20conventional%20superiority,The%201OS%20strategy%20worked.

12 Cheryl Pellerin, Deputy Secretary: Third Offset Strategy Bolsters America's Military Deterrence, *U.S. DepartmentofDefense,*31 October 2016, https://www.defense.gov/News/News-Stories/

Article/Article/991434/deputy-secretary-third-offset-strategy-bolsters-americas-military-deterrence/

13 *Press Information Bureau (Defence Wing) Government of India*, 12 September 2022, https://mod.gov.in/sites/default/files/Raksha_Mantri_delivering_the_keynote_address.pdf

14 Shaker A. Zahra and Gerard George, Absorptive Capacity: A Review, Reconceptualization, and Extension, The *Academy of Management Review*, Vol. 27, No. 2 (April, 2002), pp. 185-203

15 George P. Huber, Organizational Learning: The Contributing Processes and the Literatures, *Organization Science*, Vol. 2, No. 1, (1991), pp. 88-115.

16 Vijay Mahajan, Subhash Sharma, Richard A. Bettis, The Adoption of the M-Form Organizational Structure: A Test of Imitation Hypothesis, *Management Science*, Vol. 34, No. 10 (Oct., 1988), pp. 1188-1201

17 Bourgeois, L. J., & Eisenhardt. K. 1987. Strategic decision processes in Silicon Valley: The anatomy of a "living dead." *California Management Review*, 30: 143-159.

18 Ashish Dangwal, China Recruited Top US Scientists To Gain Military Edge In Hypersonic, UAV & Submarine Tech – Reports, *Our Asian,* 24 September 2022, https://eurasiantimes.com/china-recruited-top-us-scientists-to-gain-military-edge-over/

19 DRDO, Defence Research Institutes, 05 August 2022, https://www.pib.gov.in/PressReleasePage.aspx?PRID=1848675

20 Daniel A. Levinthal, James G. March, The myopia of learning, *Strategic Management Journal*, Vol. 14, 95-1 12 (1993)

21 Gautam Ahuja and Curba Morris Lampert, Entrepreneurship in the Large Corporation: A Longitudinal Study Of How Established Firms Create Breakthrough Inventions, *Strategic Management Journal*, J, 22: 521–543 (2001)

22 DRDO, Website accessed on 25 December 2022, https://www.drdo.gov.in/technical-clusters

23 AMD, AMD Completes Acquisition of Xilinx, Calif, 14 February 2022, https://www.amd.com/en/press-releases/2022-02-14-amd-completes-acquisition-xilinx

24 Frans A. J. Van Den Bosch and H.W. Volberda, Coevolution of Firm Absorptive Capacity and Knowledge Environment, *Organisation Science,* Vol. 10, No. 5, Focused Issue: Coevolution of Strategy and New Organizational Forms (Sep. - Oct., 1999), pp. 551-568

25 J.-C. Spender and Robert M. Grant, Knowledge and the Firm: Overview, *Strategic Management Journal* Vol. 17, Special Issue: Knowledge and the Firm (Winter, 1996), pp. 5-9

26 Dan Prud'homme, China's intellectual property policies for transmission and exploitation of technological knowledge, Section 4.4 in: Prud'homme, D. & Zhang, T., 2017. Evaluation of China's intellectual property regime for innovation. *Report for the World Bank*, pp 69-82

316-339

UNDERSTANDING CIVIL-MILITARY RELATIONS IN THE UNITED STATES FROM A SOCIAL SCIENCE APPROACH

Anant Mishra*

Abstract

Every day countless discussions occurs between senior military officers, public servants, and political representatives that shape India's foreign & domestic policy under a Prime Ministerial term. These national security professionals can maximise their effectiveness on the job appointments by taking into account academic research on civil-military relationships on perspectives from western scholars offering their insights on civil-military partnership (between military & political leadership, the military & civil society, civil society's response towards national and foreign policy) and reflecting their thought processes on current civil-military engagement.[1] In an effort to understand the Western perspective of civil-military relations to Indian professionals of national security, the author presents a case of civil-military relationship from the United States and analyses three critical relationships—between federal government & military, military & civil society, and civil society perspectives on military and federal policymaking. This enables both military and civilian partners to examine vivid perspectives (presented through this study) in an effort to enhance their operational capability in a joint domain.

Introduction

When we analyse the civil-military relations from the United States, historical moments revive our memories of multiple tussles/frictions within

the highest echelons in Washington. The firing of Gen Douglas MacArthur and a public spat with President Truman[2], policy disagreements between President Bill Clinton and the then Chairman of the Joint Chiefs, General Colin Powell[3] (on opening doors for members of the gay community to join the military). The *General's Revolt*[4], series of staunch criticism by retired generals on public platforms against the decisions undertaken by George W. Bush and Secretary of Defense Donald Rumsfeld during the Iraq War. President Obama requesting the resignation of General Stanley McChrystal over an article published in the *Rolling Stone* which openly criticised civilian leadership's command capability, to name a few.[5]

Although not focusing on the aforementioned headlines (largely fiascos), the fact remains unchanged: members of the military, political representatives and federal civil employees engage in countless discussions engage at multiple levels laying the foundation of America's civil–military relationship.[6] It is therefore critical for policymakers themselves to formulate a structure that evolves and assist vivid civil-military actors to evolve in their engagements. There are countless educational opportunities provided to US military personnel, especially in the context of civil-military relationship including special coursework customised for their professional appointments, civil policy makers are not privy to a similar educational ecosystem in the US. Furthermore, civil policy makers do not receive necessary opportunities to make themselves aware (self-paced learning) in the context of academic researches (on-going & past) in the domain of civil-military relations.[7] Academic approaches to civil-military relations provides valuable insights and new discourses in the context of military & federal government partnership, the military with civil society, and how civil society view both the military and the federal government through the prism of foreign & domestic policy.[8] Academic researchers (in addition to opening new debates) provides opportunities for discourses on on-going civil-military relations in current context while keeping a reality check on expected outcome versus hypothetical discourse.[9] This literature provides more than just theory rather, a detailed analysis for Indian civil-military practitioners who are carrying critical responsibilities that involve civil-military discussions on a daily basis.

Civil – Military Relations

Civilian and Military Perspectives: Peter Feaver's Guide

	Micromanagement & Trust	Different Cultures & Demographics	The Chain of Command	Planning Options & Development	Risk Aversion & the American Way of War	Independent Military Advice
Civilian	"Military leaders don't think civilians should question their expertise or reasons for a decision, particularly when civilians don't have military experience!"	"Military leaders are old men; they're not intelligent, creative, or flexible!"	"Military leaders slow roll options they don't want and won't respond to requests if they don't agree with a policy."	"The military prefers certain policies and won't develop options it doesn't like!"	"Military leaders are reluctant to do anything unless they get everything they ask for, and they always ask for more resources and people than they really need!"	"The military uses the media and Congress to box the President in; DOD always leaks information to undermine the Administration!"
Military	"Civilians micromanage the military and won't leave DOD alone to do its job!"	"NSC Staffers are young (women), know-it-alls who lack experience and common sense!"	"Civilians call the wrong person and ignore the Chain of Command; they don't understand how complex even simple military operations are!"	"Civilians won't make up their minds about what they want to accomplish, and they expect the military to solve every problem!"	"Civilians don't think strategically; they nickel and dime us on every request, and then hang us out to dry when things go badly!"	"Civilians use the military as political props and call us disloyal whenever we disagree; they leak information to make us look bad and advance the Administration's position!"

Figure 1: Civilian and Military Perspectives: Peter Feaver's Guide[10]

Although numerous scholars have and continue to analyse American civil–military relationship in cross-academic field[11], not limited to economics[12], civil society engagement[13] and reactionary/response of civil society to military perspectives on war & peace and reactions/responses of federal government on civil-military approaches[14], this research retains its focus on the social science approach[15], limiting the scope of analysis on civil–military relations to national policy perspectives and political expectations keeping the Indian military audience at helm.

A Social Science Approach to Civil–Military Relations: The Western Way

As stated in the aforementioned arguments, the social science perspective of studying civil-military relations is to establish an interaction between a nation's *public or civil society*, its *government* and *civil society* and their respective interactions with the *military*.[16] The informal pillars of a state, is separated to form three independent components in this research, and does not involve industries/civil owned enterprises. This segregation is made to assist the reader understand influence of civil-military relations on vivid types of regimes. Taking the case of the United States, a democratic regime[17], the public makes the decision to elect

the government, which then delegates the responsibility of national/ federal security to the military[18]. According to one political scientist, in a democratic ecosystem (style of governance) the civil society remains in control through the power to elect a federal government which is operational by experts who conduct business as tasked by elected representatives.[19] To put it plainly, in the theory of democratic system, this style of governance puts civil society in-charge, even though they do not hold expertise in vivid domains.[20] This delegation of power lays the foundation for a fundamental challenge in civil-military relationship. According to him, this challenge is what he terms as the *civil–military problem*: identifying ways to resolve a military in doing anything the civilian leadership tasks them to do using one military subordinate who would do only what the civilian leadership authorises him to do (See Fig 1).

The theoretical gambit of civil-military relations is too broad, hence to prevent deviating from the topic it is important to separate our discussions on what we *expect out of civil-military relations*—instead keep our arguments on—discussions of what *civil military is*. Some scholars limit the aspect of civil-military relations in the United States within the gambit of individual ideology, learning trait and values.[21] A large quantifiable empirical data could have assisted the scholar in making a distinction but in the light of limited access to existing imperial studies, the author retains his arguments on personal discussions with political scientists on the basis of anonymity, open sourced documents and existing research on civil-military relations in the context of a democratic state. Some empirical data provide significant details—for example percentage of military personnel identified as republicans or democrats on the basis of their membership[22]—and some empirical data makes an attempt to study their thought processes[23]—through, social gatherings, military training in an effort to identify their ideology and values. The first set of empirical data provides us with accurate details of military members as party affiliates, while the latter requires a detailed set of parameters to establish a relationship between different variables and calculative indicators. It is safe to say that in the context of civil-military relations in the US, co-relating factors are not principal actors, making the second set of data unreliable for this research.[24]

The author makes the aforementioned statement on the basis of vivid characteristics that plays an important role in the general selection of subject's criteria in a limited scope of study, which could derail our efforts to truly understand the extent of civil-military relations in the US. As there could have more than one co-relation between multiple variables involved in the existing empirical studies while some may not hold any significance in our study at all. This means, that if we have a repository of military personnel who identify themselves as democrats than the repository of members of the civil society, we cannot make an assumption that their identity altered or attained during the course of their service.[25] This could also mean that they/their:

- military training or outcomes during deployment/decision making of peers and/or expected actions on federal policy matters could have motivated them to maintain an identity as a Democrat,
- identify was of a Democrat even before joining the military and their decision to join respective services has no correlation with their identity, or
- external factors (local politics, topography, voting patterns, regional influence, ethnicity, or familial influence) could have given them a sense of purpose to join the military service, without altering their identity.

In the context of American civil-military relationship, the most accepted argument in the academia is that of civilian influenced military.[26] In military circles, most define civil military relationship as that of military as a subordinate arm of the federal government.[27] There are other notions too but are too controversial to deliberate in this research gambit. Is there a line that military leaders should not cross unknowingly and make the civilian government insecure? Should military function under an autonomy? Is there a warrior clan, an ethnic society or a caste that should be called for undertaking military action for civilian led government? Is military subjective to society's influence, ethnic based values and inclusivity? These are some of the key unanswered, undiscussed issues underlying with academia that may not have hold significance

to a US audience but in the context of India as a nation of diversity and multi-ethnicity, holds immense importance in the context of civil–military relations in India which members of the academia must analyse.

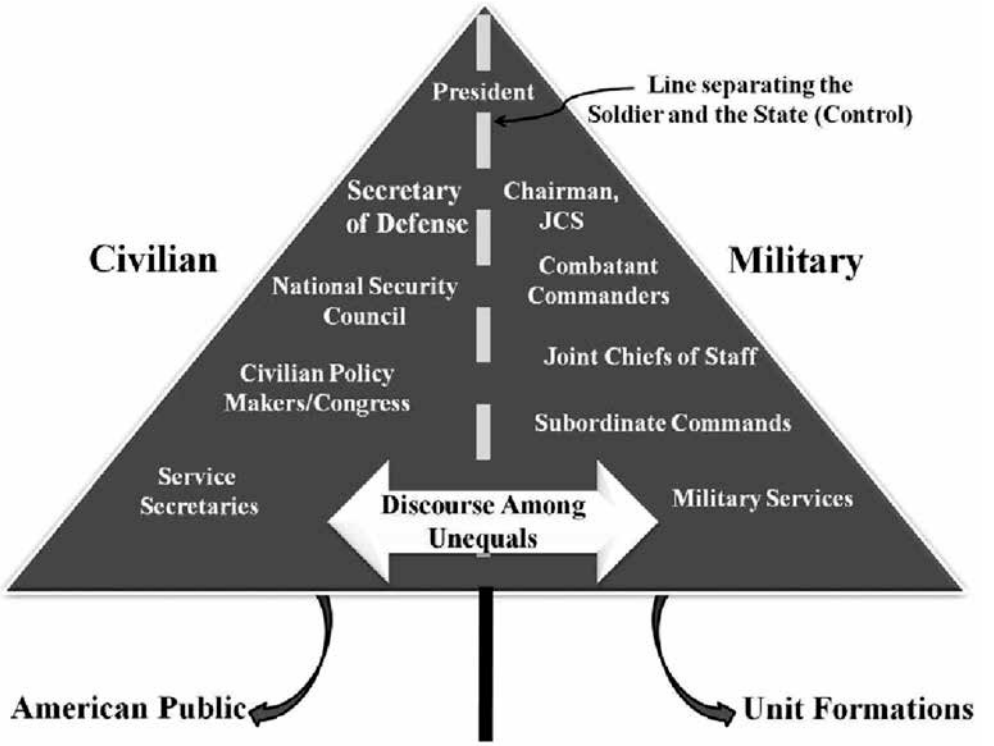


Figure 02: The Civil-Military Triangle[28]

Examining the Relationship: When Military Interacts with the Civilian Government

As seen from the aforementioned diagram (Refer Figure 02) the relationship between the civil government and the military has received maximum attention from members of the academia in the west.[29] Most scholars have conducted some of the exhaustive studies to identify answers for the following questions:

- How do higher echelons at the highest levels, interact?

- What are the possible points of contention and agreement between political representatives, civilian leadership, and military commanders at the highest levels?
- Do the civil-military interactions affect the balance between the civil & the military echelons? What are its implications on civilian control and how does it affect military's efficiency and effectiveness?

For western scholars, most researches are based either on two extreme military characteristics and rarely focus on the research areas existing between them.[30] Either the military is too weak to deter against an adversary and collapse in the battlefield, fending the civil society to defend itself.[31] Or the military is too powerful that it successfully overthrows the elected civil government.[32] Although there are numerous scenarios/ possibilities that exists within the two extreme characterises[33], but one US based scholar[34] argues that since, the military has the capability to face any adversary in any/all conditions, it develops coercion to retain power and potentially challenge the legitimate government.[35] As coercion gives the ability to the host to hold on power (as long as it fulfils civilian expectations), the traditional argument comes into account on the military's capability to use coercion against the people, while exposing new risks to the society:[36]

- Rise of tyranny through military dictatorship helm bent on cultivating new societal norms (by destroying existing social structure) and drain resources, or
- A rogue faction influencing certain military actions to facilitate or maximise benefits through politicisation of war and conflicts based on individual interests, or
- The military decides to pursue separate interests and forfeit larger civilian population on their own

The Civilian 'overwatch'

For political scientists in the US, the term *civilian control* refers to the civilian government's ability to extort to desired military policies with expected outcomes, understanding the fact than the civilian government is inferior

to the military in the context of its exposure to numerous instruments of violence.[37] But in the case of US, many scholars forfeit the idea there is no need to worry on a military coup occurring within the United States.[38] This is largely true because in US all federal & state machineries have a common understanding of *who controls whom*.[39] The extent of control exists beyond one particular individual or a political representation and largely exists on the foundation of governance, democratic values, and principles of law. Hence, in the context of the US, it is safe to say that: civilian authority lays the foundation of an institution that has the *real* authority to issue orders, without any external or internal influence during the formulation of those orders, with the expectations from all other subordinate institutions to duty fully comply and fulfil.[40]

Although elaborated in theory, this relationship (between military & civil) is much complicated in practice. Both the sides have a tenacity to disagree on all matters. The military can evade options or provide multiple recommendations for a policy framework (with an effort to confine the impact of similar recommendations from civil establishment) or tailor/ predict severe consequences to actions (exaggerating scenarios)[41]:

- by using veteran associations and former Generals as lobbyists to influence the Congress or the opposition (using various indirect forms of communications); or
- by reaching out to the public for support, indirectly. They can delay in implementing critical decisions, or create unexpected hindrances to derail the policy.

  That said, the coup is simply out of the question, and so does the illegality or unethical characteristics; the moot issue is who takes the call (in terms of military action) among the higher echelons today.[42]

The aforementioned statements strike a firm contrast between the theoretical concepts of the civil-military relations and the tussle between civil-military echelons *in practice*.[43] Let us now understand/examine who truly exercises civilian control in practice, and how the civil government employ assertive measures to retain that control.

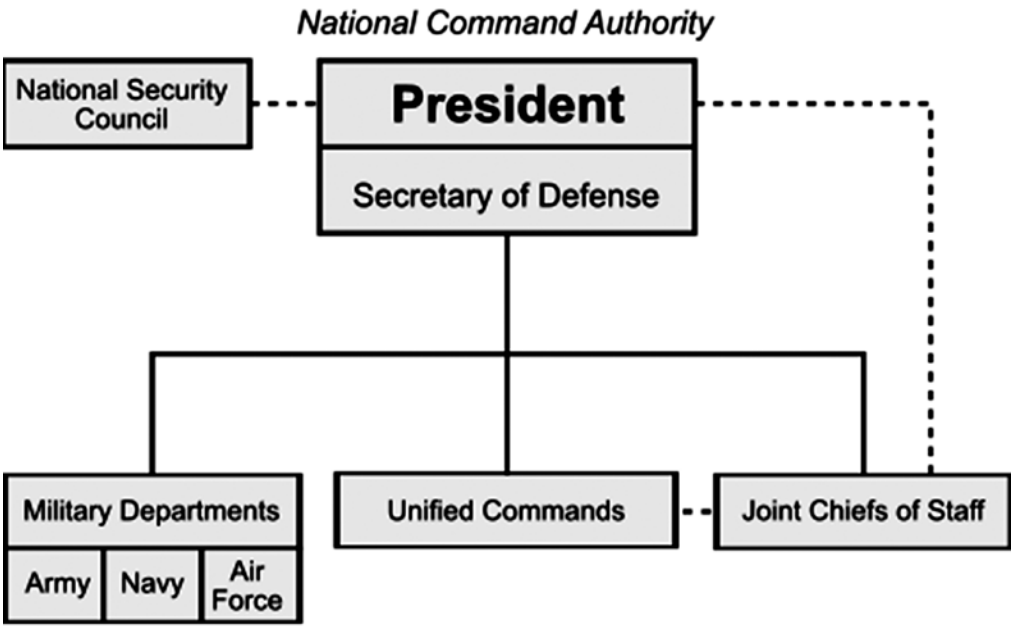


Figure 03: Command Structure in US[44]

Taking the case of the US, civilian authority is complex because of the separation of powers between the executive and the legislative.[45] What does it mean for a subordinate military when a divided civilian government disagrees on military policy? As the US President and the Secretary of Defence is in control of the military when it comes to kinetic action, military strategy and rules on engagement, Congress is in direct control over the entire manpower of the force, their equipment, and the organizational structure as a whole (command authority), and exercise indirect control over doctrines and personnel management.[46] The Senate confirms the Presidential appointment that impacts the selection on military higher echelons, as President's tend to appoint senior leadership who agrees with their ideology and choice of command style in an environment when the President's affiliated political party is in control of the Senate.[47] But in the context of disagreement, the military leadership intends to take a side that favours with their line of thoughts, without directly or indirectly disobeying the orders of the Commander-in-Chief.[48] While making a comparison between the US and the Indian military decision-making ecosystem, the author finds that disagreement among

civilian leadership significantly affects military's capability to fulfil civilian expectations and drastically impacts military's capability to implement certain policy.[49] Taking the note of vivid studies, the author argues that disagreement between civil echelons over policy implementation (in the context of military planning) results in more repulsion from military commanders on the context of their mission outcomes.[50]

While the author negates the possibility of a military coup in the US today, the aforementioned arguments have pointed out certain challenges where the military had and will continue to challenge civilian government's capability to implement policy, as and when it deems fit.

Impact of Civil-Military Relations on Military Effectiveness

As evident from the aforementioned statements, the civil-military relations have two prong challenges emanating from this relationship; in addition to a subordinate military (against civilian control), the civil society also expects a strengthened military to protect them from adversaries.[51] Thus, another important segment of civilian control is its ability to contribute in making the military strengthened and operationally effective.[52] To this end, how does civil-military relations impact military's effectiveness? Taking one of the extreme pillars (discussed above), it is in the interest of civilian control to have an inferior military survivable enough to function on minimum arms and limited ammunition, in an effort to deny any expectations of coming to power.[53] According to western scholars, many would state this to be the truest stature of the military in the United States.[54] But more bluntly, this pattern of civilian control may adversely affect the states capability to maximise the military's operational capacity with political goals intrinsically connected to military objectives.[55] One such example is the inherent nature of political leaders to hold appointments within vital/sensitive national security institutions—such as the National Security Council and the Joint Chiefs of Staff—to exercise political control over military matters rather than focussing attention on maximising their ability to implement better federal policies, in the interest of the people.[56]

During the author's interaction with a US based civil-military relations expert[57], he contradicted Huntington's theory of civilian control[58] by

stating historical incidents of numerous civilian leaderships during wartime (Winston Churchill, Abraham Lincoln among others) who were actively engaged in numerous strategic, tactical and operational decision making.[59] He further argued that civilian *trenching* military decision-making did result in positive exercised outcomes, and which negates the general thinking of the civilian/political control as demoralising military's performance and operational effectiveness, and illustrate the fact that civilian control does not always prove to be a hurdle in military operational effectiveness, and may rather provide an alternate nuisances in some cases to the military leadership which it may have missed at the planning stage.[60] Rather civilian interference may bridge the military's operational excellence with that of state's policy, which in turn makes the war *just*.[61]

Dr. Richard H. Kohn is a leading authority on civil-military affairs in the United, who taught at the U.S. Military Academy, The National War College, The Paul H. Nitze School of Advanced International Studies at Johns Hopkins University, and held the Omar N. Bradley Chair of Strategic Leadership at the U.S. Army War College. He continues to analyse the impact of civil-military relations on state's ability to formulate military strategy. During discussions with the author, he argued that strategic assessment at the higher echelons involves information exchange and multi-level coordination within civil-military ranks, along with a competent military to analyse their capacities while bringing clarity in decision-making and in necessary authorizations.[62] He further argued that the divergent arguments between the civil and the military will further enhance the quality of a military operation without hampering the existing structure of their balance of power.[63] He further stated that, strategic planning would be of a poor quality if the military does not put up a fight and the civil-politico leadership solely dominate this relationship.[64] It will be a disaster if a consensus points towards an equal share power between military and the civil-politico actors without a clear dominant in this relationship. The strategic assessment will be of *moderate quality* if the military leadership dominate the equation.[65] He further argued using the case study of strategic assessment conducted by the higher echelons during the post-conflict period of the Iraq War.[66] He argued that this case brought out *poor* results as the strategic planning ecosystem

was dominated by civilian-politico leadership, but it could have resulted in a strategic disaster if the military wouldn't have resisted against further altercation to existing military plans.[67]

By now you may have noticed that the article significantly discusses military-government relationship with an emphasis to military responsibilities and statuary code of conduct (compulsions). The article refrains on discussing the responsibilities of the civilian-politico leadership, not because it has been categorically side-lined or ignored but reasons pertaining to unavailable data on civilian-politico responsibilities in the open source. The author made up a case (role of civil-politico responsibility and implications on civil-military relations for the United States) during his discussion with Dr. Patrick Paterson, the author of *Civil-Military Relations: Guidelines in Politically Charged Societies*, and the professor of practice of national security studies in the William J. Perry Center for Hemispheric Defense Studies at the National Defense University, who argued that the larger responsibility for advising political leadership rests on civil servants, who must be thorough on the context of national security policy and must be prepared to engage in deliberations.[68] It is safe to say that the *civilians* in the civil-military relations cannot be segregated as *not military*.[69] Instead, the experience, insight, skill and knowledge that civil echelons demonstrate in their politically-nominated responsibilities provide the necessary backbone to the military profession of arms, laying the foundation for them to prove their expertise.[70] Prof Paterson further contradicted one expert's argument on civilian control (which was discussed in the aforementioned sections) where he argued that a competent and confident civilian leadership strengthens civil-military relations during national security/strategic planning.[71] He further argued that strengthening civilian leadership will not only result in a strong civilian control but simultaneously strengthens military's effectiveness.[72]

Disagreement is Dissent or Disobedience?

As stated in the aforementioned discussions, military echelons play the critical role of advising and assisting political leadership on critical decisions, and execute actions based on orders they may not agree

with.[73] This may look *clean* in theory, but there exists a thin line that separates disagreement with dissent and disobedience, which is all the more complex in definition and *murkier* in practice.[74] From those actively studying the US model of civil–military relations, Prof Mackubin Thomas Owens argued of an existing divide between military supremacists, (who argue for more adequate military vice within the higher echelons and limiting civilians from micromanagement, rather mismanagement of affairs suitable only for the military) and civilian supremacists (who argue on the vitality of strategically sound civil echelons who provide strategic guidance to the political leadership that helps shape critical policies, even when the military echelons does not seem to agree with it).[75] One professor described this is a multilateral engagement that exists between the civilian and military echelons who sometimes present their arguments aggressively, repeatedly with the final authority laying with the political leadership.[76]

Taking the aforementioned argument into account, one cannot consider the point of disobedience or moralistic autonomy without taking into account the entire context, without making a clearer distinction as to whether the order was disobeyed as it was challenging the autonomy of the mission commander, or the order was in its truest sense inherently immoral (not moralistically illegal), and if the order obeyed would have reflected political affiliation or personal inclination or devoid of state's interest.[77] Many scholars agree that military officers must exercise tactical judgement and moralistic principles before planning an operation, but remains silent on whether military officer should put up his papers for resignation due to disagreement in strategic planning.[78] Should the military officer resign if the operation fails to fulfil national interest, or the officer is not convinced of its tactical value? is a question too controversial to receive clarity from the academia. While it may tempt military officers to disobey a decision on the basis of the aforementioned context influencing its take between professional action and personal morality, it brings great consequences in the context of disobedience with larger and deeper ramifications.[79] For US military officers' the idea of performing as an apolitical military actor may cloak greater political ramifications of their actions: a military leader may speak its mind, in the

context of national interest or security or personal conscience, but it may fail to truly understand the larger political picture in play.[80]

From the aforementioned arguments it is clear that US audience (members of the academia) should be subordinate to both civil and political leadership and continue to provide their valuable insight in matters of national security, it remains silent on numerous issues.[81] The friction while delivering advice for critical policymaking continues even today. Today, the friction stands on how much military advice is required on a policy decision and to the level of push military echelons must give in an effort to exert control over policy recommendations.[82]

Public Perspectives to Civil-Military Relationship

Let us now analyse public's relations with that of the federal government and the military. Since the relationship between the two are intertwined, in this research we will analyse it together. Military personnel are members of the civil community, and share an intimate relationship with the general public. This is the same public which in turn also hold the federal government responsible for the state's national security policy, and have the power to bring in new change through electoral ballots.[83] Many scholars argue that their emotions are connected deeply with that of the military which may influence their choice of leadership through the electoral ballots.[84] The military too play a critical role in bridging the public perspectives with the federal government directly through public relations initiatives and active involvement of political representatives associated with critical appointments, indirectly with the public.[85]

To that context, we aim to identify answers to the following questions, in this section.

- Who gets to serve in the military?
- With what perspectives does the public perceive members of the military?
- Does an altercation in existing military policy makes an impact on public's perception towards national security?

Serving in the US Military

The US military, since its inception has been an all-volunteer force, and maintains significant numbers of active-duty personnel during peace time since the end of the Cold War.[86] According to scholars, the nature of an all-volunteer force shares a unique representative structure from all members of the society in greater aspects than conscription.[87] By that account, if the military has unequal distribution of youth with predominantly male population at large, the ethnic/racial distribution of the force will still have members of other communities which would reflect participation from the society (even marginal groups) at large.[88]

That said scholars argue that in a volunteer-based recruitment system, ideally a society, through the federal representatives must decide on keeping the maximum size of the military, eligibility criteria of individual services, the length of service for enlisted ranks, and the pay per service rules or pre-release minimum service bracket.[89] On the contrary, conscript based service can involve certain period of mandatory service for some sections of the population, or a draft criterion for a select members of a community to be eligible for recruitment within the ranks.[90] Many scholars continue to promote the idea of standing reserves, who would only be needed to reinforce traditional military numbers in case of an active conflict.[91] They further argue that to make the military resource centric (for all skilled manpower) the federal government must maximise the 'National Guard Concept'—focussing recruitment opportunities to scientists, scholars, linguists, political representatives, through lucrative remuneration and benefits (a lucrative career option for members of the academia/technical expertise groups providing vital skills to the US Military).[92]

But, in US public perception for who should serve in the US Military rests majorly on:

Civil Service, the Controlling Authority. Extending the argument from the aforementioned section, scholars argue that the military has more representation of the society which automatically incline their interests towards civil service members, though bridging the civil-military gap but a diminishing military voice during decision making. But in the light of

serious disagreements between the civilian leadership and the military, the civilian may control the narrative and win the discussions because the military does not have anything (individual interests or conflicting arguments) to challenge them.[93] This further means that joining the military institutions will have no impact on individual interests. This further retains the American interpretation of a civilian-solider.[94]

Diversity Impacts Military's Effectiveness. The choices between the military service, service durations, and vividity of ethnic/racial civil members joining the military greatly impacts military effectiveness.[95] Scholars argue that voluntary service is more effective and efficient than conscription based.[96] Taking the US military (which operates with superior technology) rapid deployment of short-term conscripts would greatly impact military's operational readiness which will pave the way for private military companies as secondary manpower.[97] The author argues that, with liberalistic principles seeping in the US society including the greater emphasis on individualistic rights, may soften the military's approach and appearance, challenging the leadership to either adapt to the growing liberalistic principles or wither which may prove disaster in a long-drawn war, such as the Cold War or the incumbent Russo-Ukraine War.

Adapting to a New Mindset. Many scholars argue, that the impact of civilian control or the diversity on military's effectiveness, brings a positive change as it covers the larger gambit of society's value and ideological principles, or the enlistment of vivid members of the community (referring to LGBTQ joining the ranks of the military).[98] While interacting with civil members, the author found many vocal for specialised ranks being available for gay service members and greater participation of women.[99]

Civilian Perspectives Towards the Military

Why should leadership in uniform focus much on public perspective about the military? The main reason being, the public perception (which understand military vs federal government from a distance), their distance may aggravate existing tension between in the military-government relationship, which the author elaborated above.[100] It will always be difficult and more challenging for federal officials to

push aside the advice rendered by the military echelons because of the existing persona-driven relationship (fondness for uniform and dedication to service of the nation) military enjoys has with the public.[101] Similarly, factions with inclination to a certain party further diminishes the neutral character of the military, further complicating the relationship between military echelons and federal government (either Democrats or Republicans, whosoever's administration it may be) in power.

Civilian Attention to Government Policy Making

In case of the US, it rests on the citizen of the nation (which is directly represented by the federal government) to assess the military's role in its society and in the context of US foreign policy (through State Department).[102] The military exists to maintain national security, but is that all in theory? How should a nation use its military? Should the public have a say on how its military be employed, and should they hold the government accountable for any action that caters to military's direct involvement? Numerous scholars have opined that, in US, the *soldiery* is a *family affair* creating a dedicated warrior legacy for those that runs in their families for generations.[103] That said, it is common for *soldiery* to exist within numerous families with a legacy but how does it impact the functioning of a society and how does the society view this is a debatable never-ending argument. One section of scholars promotes the idea of a voluntary force, while others call it a special treatment to the *warrior clan*, discreetly supporting their arguments for conscription.[104] How should the US military recruit and retain its military personnel? It is for the US policy makers to decide.

Conclusion

While deciphering the quagmire that exists in the civil–military relations within the United States, the author presented in-detail arguments (taking both the academic and practitioners' perspectives) with an intent to give an idea to Indian military leadership through this academic literature. In his examination of multiple perspectives within the civilian-military relations, the author tried to make sense of the existing quagmire within the civil-military relations to Indian military leadership keeping them at the driving seat throughout this research. While deciphering the existing

tension within civil-military relations, the author made a conscious effort to first dissect the two pillars of this relationship and then bring in a third pillar i.e., the role of public at large to take into account their perspectives on military and civil leadership and with that of the society as a whole.

To conclude, the author seeks to present three critical findings from this research:

- Civilian leadership controlling the military has more to offer than preventing military leadership from achieving absolute power (from the fear of a coup) or simply noncompliance (with an intent to control discussion outcomes). That said, it is equally important for civil service echelons and political representatives to heed to military's advice and accept opposition even during policy discussions (civil matters) involving general public.

- Establishing a relationship between the idea of a military, its composition/architecture for an acceptable positive exercised outcomes and its apprehension/perspectives towards bureaucratic control, its impact on military's operational readiness/effectiveness and state's external policies, sum of all within the background of principles of democracy and individualistic liberty, is too complex and needs serious research.

- Those with reserve status (other than active military) especially employed in public service, and those who do not wear a uniform but continue to serve the public in vivid public appointments, share vivid perceptions, contradicting each other at times but in complete contrast to the general public perspective who see both the categories as *special civilians*. This is also reflected in their perceptions towards the state's security/defence and foreign policy, which may, in a broader sense, reflect the state's mindset.

*__Anant Mishra__ is an Associate Fellow at the Centre for Joint Warfare Studies (CENJOWS). He specializes on Afghanistan and his analysis is released as Afghanistan Watch, a bi-monthly bulletin. At CENJOWS, he published a net assessment titled An Unsettling Triumph: Predicting Taliban's hold to Power in Afghanistan. His academic research is

supplemented by three combat deployments in Afghanistan, where he served on multiple appointments advising higher Afghan military echelons.

Endnotes

1 Mukherjee, Anit. 2018. “Educating the Professional Military.” *Armed Forces & Society* 44 (3): 476–97. https://www.jstor.org/stable/48609256.

2 Ryan, Halford Ross. 1981. “Harry S Truman: A Misdirected Defense for MacArthur’s Dismissal.” Presidential Studies Quarterly 11 (4): 576–82. http://www.jstor.org/stable/27547748.

3 Bessner, Daniel, and Eric Lorber. 2012. “Toward a Theory of Civil–Military Punishment.” Armed Forces & Society 38 (4): 649–68. https://www.jstor.org/stable/48609115.

4 Dyson, Stephen Benedict. 2009. “‘Stuff Happens’: Donald Rumsfeld and the Iraq War.” Foreign Policy Analysis 5 (4): 327–47. http://www.jstor.org/stable/24909882.

5 Marsh, Kevin. 2014. “Obama’s Surge: A Bureaucratic Politics Analysis of the Decision to Order a Troop Surge in the Afghanistan War.” Foreign Policy Analysis 10 (3): 265–88. http://www.jstor.org/stable/24910832.

6 Nix, Dayne E. 2012. “Samuel P. Huntington and the Political Dimensions of Military Professionalism.” Naval War College Review 65 (2): 88–104. http://www.jstor.org/stable/26397288.

7 Croissant, Aurel, David Kuehn, and Philip Lorenz. 2012. “Breaking With the Past?” East-West Center. http://www.jstor.org/stable/resrep06501.

8 ROSÉN, FREDERIK. 2009. “Third-Generation Civil–Military Relations.” Security Dialogue 40 (6): 597–616. http://www.jstor.org/stable/26299837.

9 Forster, Anthony. 2002. “New Civil-Military Relations and Its Research Agendas.” Connections 1 (2): 71–88. http://www.jstor.org/stable/26322938.

10 Feaver, Peter D. 2015. “The Irony of American Civil-Military Relations.” Strategic Studies Quarterly 9 (3): 3–12. http://www.jstor.org/stable/26271515.

11 Herspring, Dale. 2009. “Civil–Military Relations in the United States and Russia.” *Armed Forces & Society* 35 (4): 667–87. https://www.jstor.org/stable/48608933.

12 Albright, David E. 1980. “Comparative Conceptualization of Civil-Military Relations.” World Politics 32 (4): 553–76. https://doi.org/10.2307/2010057.

13 BLAIR, DENNIS, ed. 2013. Military Engagement. Brookings Institution Press. http://www.jstor.org/stable/10.7864/j.ctt4cg8dn.

14 BLAND, DOUGLAS L. 1999. “A Unified Theory Of Civil-Military Relations.” Armed Forces & Society 26(1): 7–25. http://www.jstor.org/stable/45347130.

15 LINDENBERG, SIEGWART, JAMES S COLEMAN, and STEFAN NOWAK, eds. 1986. Approaches to Social Theory. Russell Sage Foundation. http://www.jstor.org/stable/10.7758/9781610443616.

16 Lebel, Udi. 2007. “Civil Society versus Military Sovereignty.” Armed Forces & Society 34 (1): 67–89. https://www.jstor.org/stable/48608805.

17 Smith, Anton K. 2007. “TURNING ON THE DIME:” Strategic Studies Institute, US Army War College. http://www.jstor.org/stable/resrep11348.

18 KAUFMAN, DANIEL J. 1987. “National Security: Organizing the Armed Forces.” Armed Forces & Society 14 (1): 85–112. http://www.jstor.org/stable/45304968.

19 Lunn, Simon. 2002. “The Democratic Control of Armed Forces in Principle and Practice.” Connections 1 (4): 83–102. http://www.jstor.org/stable/26322968.

20 Alexander, Jeffrey C, and Philip Smith. 1993. “The Discourse of American Civil Society: A New Proposal for Cultural Studies.” Theory and Society 22 (2): 151–207. http://www.jstor.org/stable/657770.

21 Lipset, Seymour Martin, and Richard B Dobson. 1972. “The Intellectual as Critic and Rebel: With Special Reference to the United States and the Soviet Union.” Daedalus 101 (3): 137–98. http://www.jstor.org/stable/20024084.

22 McDermott, Monika L, and Costas Panagopoulos. 2015. “Be All That You Can Be: The Electoral Impact of Military Service as an Information Cue.” *Political Research Quarterly* 68 (2): 293–305. http://www.jstor.org/stable/24371833.

23 Higate, Paul, and Ailsa Cameron. 2006. “Reflexivity and Researching the Military.” Armed Forces & Society 32 (2): 219–33. https://www.jstor.org/stable/48608712.

24 Rothman, Steven B. 2007. “Understanding Data Quality through Reliability: A Comparison of Data Reliability Assessment in Three International Relations Datasets.” *International Studies Review* 9 (3): 437–56. http://www.jstor.org/stable/4621834.

25 SEGAL, DAVID R, MARY SCHEUER SENTER, and MADY WECHSLER SEGAL. 1978. “The Civil-Military Interface in a Metropolitan Community.” Armed Forces & Society 4 (3): 423–48. http://www.jstor.org/stable/45346087.

26 Levy, Yagil. 2012. “A Revised Model of Civilian Control of the Military.” Armed Forces & Society 38 (4): 529–56. https://www.jstor.org/stable/48609110.

27 Feaver, Peter D, and Richard H Kohn. 2021. “Civil-Military Relations in the United States.” *Strategic Studies Quarterly* 15 (2): 12–37. https://www.jstor.org/stable/27032894.

28 Collins, Joseph J, and Ole R Holsti. 1999. “Civil-Military Relations: How Wide Is the Gap?” International Security 24 (2): 199–207. http://www.jstor.org/stable/2539257.

29 Forster, Anthony. 2002. “New Civil-Military Relations and Its Research Agendas.” Connections 1 (2): 71–88. http://www.jstor.org/stable/26322938.

30 Dempsey, Martin E. 2021. “Civil-Military Relations.” Strategic Studies Quarterly 15 (2): 6–11. https://www.jstor.org/stable/27032893.

31 Caparini, Marina, and Philipp Fluri. 2002. “Mapping Civil Society in Defense and Security Affairs.” Connections 1 (4): 51–62. http://www.jstor.org/stable/26322966.

32 BURK, JAMES. 2002. “Theories of Democratic Civil-Military Relations.” Armed Forces & Society 29 (1): 7–29. http://www.jstor.org/stable/45346973.

33 McCoy, Katherine E. 2010. “Beyond Civil–Military Relations.” Armed Forces & Society 36 (4): 671–94. https://www.jstor.org/stable/48608876.

34 The author’s discussion with a civil-military expert from the John Hopkins University, dated on 22 Dec 2022.

35 Excerpts from the author’s discussion with an expert from the John Hopkins University, dated on 23 Dec 2022

36 Excerpts from the author’s discussion with an expert from George Washington University, dated on 27 Dec 2022

37 FEAVER, PETER D. 1996. “The Civil-Military Problematique: Huntington, Janowitz, and the Question of Civilian Control.” Armed Forces & Society 23 (2): 149–78. http://www.jstor.org/stable/45347059.

38 Meernik, James. 1996. “United States Military Intervention and the Promotion of Democracy.” Journal of Peace Research 33 (4): 391–402. http://www.jstor.org/stable/424565.

39 ARCHER, PETER. 2000. “The Twilight of National Sovereignty.” Medicine, Conflict and Survival 16 (4): 423–33. http://www.jstor.org/stable/45351839.

40 Shulman, Mark R. 2012. “LEAD ME, FOLLOW ME, OR GET OUT OF MY WAY:” Strategic Studies Institute, US Army War College. http://www.jstor.org/stable/resrep11641.

41 Jennings, M Kent, and Gregory B Markus. 1977. “The Effect of Military Service on Political Attitudes: A Panel Study.” The American Political Science Review 71 (1): 131–47. https://doi.org/10.2307/1956958.

42 GENNAIOLI, NICOLA, and HANS-JOACHIM VOTH. 2015. “State Capacity and Military Conflict.” The Review of Economic Studies 82 (4 (293)): 1409–48. http://www.jstor.org/stable/43869472.

43 Michael, Kobi (Jacob). 2007. “The Dilemma behind the Classical Dilemma of Civil–Military Relations.” Armed Forces & Society 33 (4): 518–46. https://www.jstor.org/stable/48608599.

44 Stephenson, Matthew C. 2013. “Does Separation of Powers Promote Stability and Moderation?” The Journal of Legal Studies 42 (2): 331–68. https://doi.org/10.1086/671055.

45 Nourse, Victoria. 1999. “The Vertical Separation of Powers.” Duke Law Journal 49 (3): 749–802. https://doi.org/10.2307/1373085.

46 Travis, Donald S. 2017. “Saving Samuel Huntington and the Need for Pragmatic Civil–Military Relations.” *Armed Forces & Society* 43 (3): 395–414. https://www.jstor.org/stable/48609209.

47 Meernik, James, and Elizabeth Oldmixon. 2008. “The President, the Senate, and the Costs of Internationalism.” Foreign Policy Analysis 4 (2): 187–206. http://www.jstor.org/stable/24907243.

48 Owens, Mackubin Thomas. 2012. “WHAT MILITARY OFFICERS NEED TO KNOW ABOUT CIVIL-MILITARY RELATIONS.” Naval War College Review 65 (2): 67–87. http://www.jstor.org/stable/26397287.

49 Kohn, Richard H. 2002. “THE EROSION OF CIVILIAN CONTROL OF THE MILITARY IN THE UNITED STATES TODAY.” Naval War College Review 55 (3): 8–59. http://www.jstor.org/stable/45236385.

50 Institute, National Defense Research. 2010. “Unit Cohesion and Military Performance.” In Sexual Orientation and U.S. Military Personnel Policy, 137–66. An Update of RAND’s 1993 Study. RAND Corporation. http://www.jstor.org/stable/10.7249/mg1056osd.13.

51 Rosen, Stephen Peter. 1995. “Military Effectiveness: Why Society Matters.” International Security 19 (4): 5–31. https://doi.org/10.2307/2539118.

52 Biddle, Stephen, and Stephen Long. 2004. “Democracy and Military Effectiveness: A Deeper Look.” The Journal of Conflict Resolution 48 (4): 525–46. http://www.jstor.org/stable/4149807.

53 Nobel, Jaap W. 1995. “Morgenthau’s Struggle with Power: The Theory of Power Politics and the Cold War.” Review of International Studies 21 (1): 61–85. http://www.jstor.org/stable/20097396.

54 O’Hanlon, Michael, and David Petraeus. 2016. “America’s Awesome Military: And How to Make It Even Better.” Foreign Affairs 95 (5): 10–17. http://www.jstor.org/stable/43946951.

55 Sullivan, Patricia L. 2007. “War Aims and War Outcomes: Why Powerful States Lose Limited Wars.” The Journal of Conflict Resolution 51 (3): 496–524. http://www.jstor.org/stable/27638561.

56 Huntington, Samuel P. 1957. The Soldier and the State. Harvard University Press. https://doi.org/10.2307/j.ctvjf9wx3.

57 The author’s discussion with a civil-military expert from the US Army War College, dated on 03 Jan 2023.

58 Travis, Donald S. 2019. “Pursuing Civilian Control Over the Military.” Armed Forces & Society 45 (3): 546–60. https://www.jstor.org/stable/48609280.

59 Levy, Yagil. 2012. “A Revised Model of Civilian Control of the Military.” Armed Forces & Society 38 (4): 529–56. https://www.jstor.org/stable/48609110.

60 Rosen, Stephen Peter. 1995. “Military Effectiveness: Why Society Matters.” International Security 19 (4): 5–31. https://doi.org/10.2307/2539118.

61 Binkley, John. 2016. “Clausewitz and Subjective Civilian Control.” Armed Forces & Society 42 (2): 251–75. https://www.jstor.org/stable/48670246.

62 Excerpts from the author’s discussion, dated 05 Jan 2023

63 Excerpts from the author’s discussion, dated 02 Jan 2023

64 Excerpts from the author’s discussion, dated 29 Dec 2022

65 Excerpts from the author’s discussion, dated 30 Dec 2022

66 Excerpts from the author’s discussion dated 02 Jan 2023

67 Excerpts from the author’s discussion dated 06 Jan 2023

68 Excerpts from the author’s discussion, dated 24 Dec 2022.

69 SCHIFF, REBECCA L. 1995. “Civil-Military Relations Reconsidered: A Theory of Concordance.” Armed Forces & Society 22 (1): 7–24. http://www.jstor.org/stable/45346714.

70 Kohn, Richard H. 2002. “THE EROSION OF CIVILIAN CONTROL OF THE MILITARY IN THE UNITED STATES TODAY.” Naval War College Review 55 (3): 8–59. http://www.jstor.org/stable/45236385.

71 Excerpts from the author’s discussion, dated 30 Dec 2022

72 BURK, JAMES. 2002. “Theories of Democratic Civil-Military Relations.” Armed Forces & Society 29 (1): 7–29. http://www.jstor.org/stable/45346973.

73 BLAND, DOUGLAS L. 1999. “A Unified Theory Of Civil-Military Relations.” Armed Forces & Society 26 (1): 7–25. http://www.jstor.org/stable/45347130.

74 Travis, Donald S. 2017. “Saving Samuel Huntington and the Need for Pragmatic Civil–Military Relations.” Armed Forces & Society 43 (3): 395–414. https://www.jstor.org/stable/48609209.

75 McCoy, Katherine E. 2010. “Beyond Civil–Military Relations.” Armed Forces & Society 36 (4): 671–94. https://www.jstor.org/stable/48608876.

76 Nix, Dayne E. 2012. “Samuel P. Huntington and the Political Dimensions of Military Professionalism.” Naval War College Review 65 (2): 88–104. http://www.jstor.org/stable/26397288.

77 Collins, Joseph J, and Ole R Holsti. 1999. “Civil-Military Relations: How Wide Is the Gap?” International Security 24 (2): 199–207. http://www.jstor.org/stable/2539257.

78 Lee, Terence. 2005. “Military Cohesion and Regime Maintenance.” Armed Forces & Society 32 (1): 80–104. https://www.jstor.org/stable/48608671.

79 Pfaffenzeller, Stephan. 2010. “Conscription and Democracy.” Armed Forces & Society 36 (3): 481–504. https://www.jstor.org/stable/48608899.

80 Dempsey, Martin E. 2021. “Civil-Military Relations.” Strategic Studies Quarterly 15 (2): 6–11. https://www.jstor.org/stable/27032893.

81 Kümmel, Gerhard. 2002. “The Military and Its Civilian Environment.” Connections 1 (4): 63–82. http://www.jstor.org/stable/26322967.

82 McCoy, Katherine E. 2010. “Beyond Civil–Military Relations.” Armed Forces & Society 36 (4): 671–94. https://www.jstor.org/stable/48608876.

83 Pearson, Frederic S, Scott Walker, and Stephanie Stern. 2006. “MILITARY INTERVENTION AND PROSPECTS FOR DEMOCRATIZATION.” International Journal of Peace Studies 11 (2): 63–86. http://www.jstor.org/stable/41852946.

84 Teigen, Jeremy M. 2013. “Military Experience in Elections and Perceptions of Issue Competence.” Armed Forces & Society 39 (3): 415–33. https://www.jstor.org/stable/48609014.

85 Lee, Terence. 2005. “Military Cohesion and Regime Maintenance.” Armed Forces & Society 32 (1): 80–104. https://www.jstor.org/stable/48608671.

86 Sheehan, James J. 2011. “The Future of Conscription: Some Comparative Reflections.” Daedalus 140 (3): 112–21. http://www.jstor.org/stable/23047352.

87 Asal, Victor, Justin Conrad, and Nathan Toronto. 2017. “I Want You! The Determinants of Military Conscription.” The Journal of Conflict Resolution 61 (7): 1456–81. http://www.jstor.org/stable/26363936.

88 Kohn, Richard H. 2008. “COMING SOON: A Crisis in Civil-Military Relations.” World Affairs 170 (3): 69–80. http://www.jstor.org/stable/20672810.

89 Siminski, Peter. 2013. “EMPLOYMENT EFFECTS OF ARMY SERVICE AND VETERANS’ COMPENSATION: EVIDENCE FROM THE AUSTRALIAN VIETNAM-ERA CONSCRIPTION LOTTERIES.” The Review of Economics and Statistics 95 (1): 87–97. http://www.jstor.org/stable/23355652.

90 Heinecken, Lindy. 2009. “Discontent Within the Ranks?” Armed Forces & Society 35 (3): 477–500. https://www.jstor.org/stable/48608920.

91 Carlton-Ford, Steve. 2010. “Major Armed Conflicts, Militarization, and Life Chances.” Armed Forces & Society 36 (5): 864–89. https://www.jstor.org/stable/48608963.

92 Travis, Donald S. 2018. “Discovering the Fault Lines in American Civil–Military Relations.” Armed Forces & Society 44 (4): 731–47. https://www.jstor.org/stable/48609082.

93 AVANT, DEBORAH. 1998. “Conflicting Indicators of ‘Crisis’ in American Civil-Military Relations.” Armed Forces & Society 24 (3): 375–87. http://www.jstor.org/stable/45346820.

94 Herspring, Dale. 2009. “Civil–Military Relations in the United States and Russia.” Armed Forces & Society 35 (4): 667–87. https://www.jstor.org/stable/48608933.

95 Kümmel, Gerhard. 2002. “The Military and Its Civilian Environment.” Connections 1 (4): 63–82. http://www.jstor.org/stable/26322967.

96 Cohn, Lindsay P, and Nathan W Toronto. 2017. “Markets and Manpower.” Armed Forces & Society 43 (3): 436–58. https://www.jstor.org/stable/48609211.

97 Leander, Anna. 2005. “The Market for Force and Public Security: The Destabilizing Consequences of Private Military Companies.” Journal of Peace Research 42 (5): 605–22. http://www.jstor.org/stable/30042371.

98 Krebs, Ronald R. 2009. “The Citizen-Soldier Tradition in the United States.” Armed Forces & Society 36 (1): 153–74. https://www.jstor.org/stable/48608865.

99 Szayna, Thomas S, Eric V Larson, Angela O’Mahony, Sean Robson, Agnes Gereben Schaefer, Miriam Matthews, J Michael Polich, et al. 2015. “The Integration of Women and Other Excluded Groups into the U.S. Military:” In Considerations for Integrating Women into Closed Occupations in the U.S. Special Operations Forces, 15–46. RAND Corporation. http://www.jstor.org/stable/10.7249/j.ctt19rmddv.12.

100 Santibañes, Francisco Fernando de. 2007. “The Effectiveness of Military Governments during War.” Armed Forces & Society 33 (4): 612–37. https://www.jstor.org/stable/48608603.

101 Feaver, Peter D, and Richard H Kohn. 2021. “Civil-Military Relations in the United States.” Strategic Studies Quarterly 15 (2): 12–37. https://www.jstor.org/stable/27032894.

102 Kennedy, Liam, and Scott Lucas. 2005. “Enduring Freedom: Public Diplomacy and U.S. Foreign Policy.” American Quarterly 57 (2): 309–33. http://www.jstor.org/stable/40068267.

103 Griffith, James. 2011. “Contradictory and Complementary Identities of U.S. Army Reservists.” Armed Forces & Society 37 (2): 261–83. https://www.jstor.org/stable/48608994.

104 Agøy, Nils Ivar. 1996. “When Officers Need Internal Enemies: Aspects of Civil-Military Relations in Scandinavia between the World Wars.” Journal of Peace Research 33 (4): 469–81. http://www.jstor.org/stable/424570.

ADVISORY BOARD & EXECUTIVE COUNCIL
CENJOWS

Printed and published by Lt Gen Sunil Srivastava on behalf of Centre for Joint Warfare Studies (CENJOWS), 301, B-2 Wing, 3rd Floor, Pt Deendayal Antyodaya Bhawan, CGO Complex, Lodhi Road, New Delhi-110003, and printed at M/s. Xtreme Office Aids Pvt Ltd., Plot No.11, Basement, Below Canara Bank, Commercial Complex, Nangal Raya, New Delhi-110046.

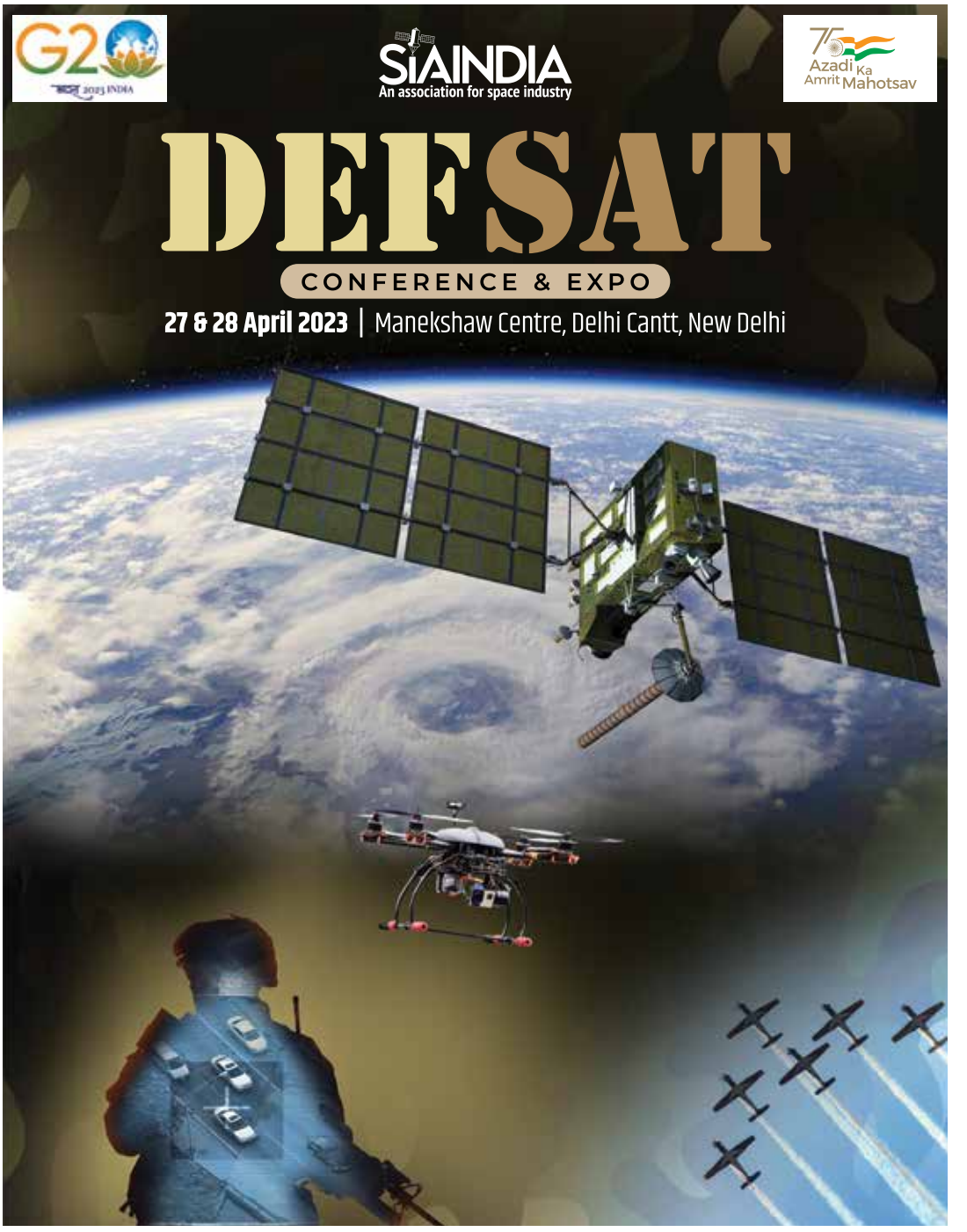
Editor: Lt Gen Sunil Srivastava (Retd)

Organised by

Supported by

Knowledge Partner

Media Partner



SCAN HERE TO REGISTER

For more information, please contact

K. Anbalagan, Dy. Director-Projects & Coordination

Email: k.anbalagan@sia-india.com | **Mobile:** +91 98100 93569

SATCOM INDUSTRY ASSOCIATION

Suite B-306, 3rd Floor, Somdatt Chambers-I, 5, Bhikaji Cama Place, New Delhi-110066

Tel: +91-11-4604 8743 • Email: info@DefSatindia.com • www.DefSatindia.com

MAKING IN INDIA FOR THE WORLD

KALYANI STRATEGIC SYSTEMS LIMITED

KALYANI

Artillery Systems

Protected Vehicles

Supercharger | Turbocharger | T-72 & T-90 Wheels | BMPII Wheels | Tunguska Tracks | BMPII Tracks

Armoured Vehicles Spares & MRO

Mortar Bodies | Glide Bombs | GP Bomb | Rocket Warhead | Shells of various types 40 – 155mm

Ammunition Shells

5.56 X 30 mm | 5.56 X 45 mm | Protective Carbine

Small Arms

Pune Cantonment,
Mundhwa, Pune - 411036
+91-20-67042868
+91-20-26821250
contact.defence@bharatforge.com
www.kssl.in

ARTILLERY | PROTECTED VEHICLES | AEROSPACE | ARMOURED VEHICLES | AIR DEFENCE SYSTEMS

AMMUNITION | DEFENCE ELECTRONICS | SMALL ARMS | MARINE SYSTEMS