

Evolution of Multi-Domain Operations and Prospects for Application of Aerospace Power

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The term multi-domain operations (MDO) encompasses the traditional physical domains as well as the rapidly expanding domains of space and cyber. It strives for selective interdependence and integration between services, down till the tactical level. Achieving information superiority and decision dominance through cross-domain application, synergy and tempo are central to successful MDO. Aerospace power's intrinsic attributes, doctrinal percepts, actual combat experience of cross-domain operations and proficiency in network-centric operations resonate well with MDO. While countries, like the United States, the People's Republic of China and Russia, are moving towards MDO in their unique way, there exists a lack of congruence amongst the services owing to incompatibilities in doctrine, concept of operations and capabilities. A clear understanding of the domains and their interplays in the MDO environment is a pre-requisite, with integration, technology and innovation as key elements. Concurrently, kinetic and non-kinetic capabilities have to be continuously upgraded to match/outdo the adversary to compete in the MDO paradigm.

Keywords: *Multi-Domain, Strategic Competition, Space, Cyber, Aerospace Power*

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Attributes of high speed, reduced response time, long reach, increased mobility, technological intensity, precision firepower, shock effect, ability to operate across domains and network centric operations have made aerospace power a formidable component of our nation's military might.

—Air Chief Marshal V.R. Chaudhari¹

INTRODUCTION

Advancements in technology have led to the proliferation of new capabilities, especially in the air, space and cyber domains. Further, hypersonic, space-based and other Next Generation (NG) weapons have added a new dimension to the threat spectrum, transforming the battlespace irreversibly. The character of war is also changing, partly on account of the above-mentioned developments. 'War by other means' or 'strategic competition' in multiple domains has taken precedence over direct physical conflict. The term multi-domain operations (MDO) has become a part of the conflict management lexicon over the last decade due to these ongoing transformations. This article traces the evolution of MDO, identifies its key tenets at the doctrinal and concept of operations (CONOPS) level and examines prospects of application of aerospace power in this new paradigm. The analyses are based on available academic research as well as transformations related to MDO that are underway in advanced militaries. While the Indian context has not been specifically examined, the issues delved into and inferences drawn are extremely relevant for the country.

EVOLUTION OF MDO

Contemporary Battlespace and Spectrum of Conflict

The depicted construct of MDO in Figure 1 encompasses the traditional physical domains of land, maritime and air, as well as the rapidly expanding, emerging domains of space and cyber. However, it is the non-physical information domain that transcends both the traditional and emerging domains.

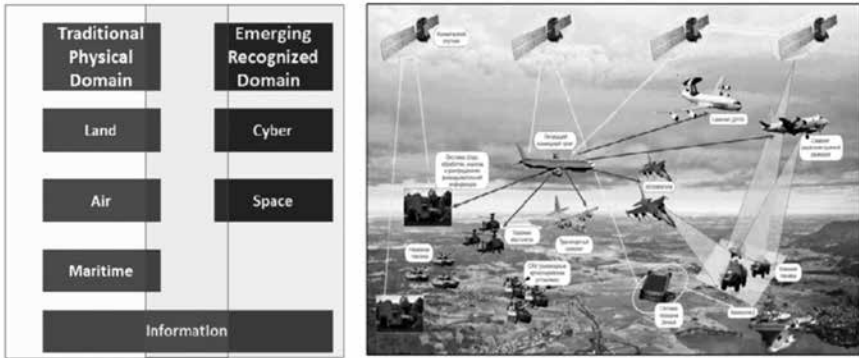


Figure 1 Contemporary Battlespace

Source: Picture on the Left is from the presentation slides made by author. Right: <https://en.topwar.ru/184387-mnogodomennye-sily-novyj-uroven-itnegracii-vidov-vooruzhennyh-sil.html>, last accessed on 01 February 2024.

There is a marked transformation in the spectrum of conflict and ensuing geostrategic choices as well (Figure 2). The grey zone occupies a dominating space between peace and war and in the present scenario, war would invariably be fought in the realm of hybrid warfare.

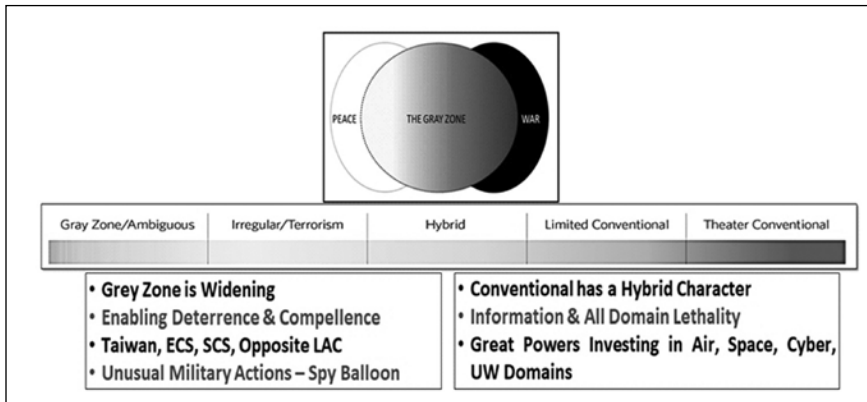


Figure 2 Spectrum of Conflict

Source: Dushyant Singh, 'Shades of Grey Warfare: Options for India', *Strive*, 18 January 2021, available at <https://striveindia.in/shades-of-grey-warfare-options-for-india>, last accessed on 01 February 2024.

Why MDO?

What has changed at the fundamental level of conflict management that necessitates MDO? The war on terror, the war to eliminate weapons of mass destruction (WMDs) and the war for regime change in Syria are examples where territorial objectives have not been the core cause of conflict. Increased surface friction, urbanised terrain and robust defences have made frontlines almost impregnable. Conflict termination criteria and end states are difficult to ascertain and continue to change even in one-sided contests. Technology has enabled effects-based operations (EBO) through stand-off precision attacks and yet, an asymmetric force or technological advantage is not enough. The decision of United States (US) and the North Atlantic Treaty Organization (NATO) to exit Afghanistan and stay out of Syria and Ukraine can be linked to these considerations.

There is a universal aversion to prolonged conflicts, destruction and large-scale loss of life. However, certain historical conflicts that present an existential threat to one of the belligerents could be likely exceptions. Indeed, data of casualties per year in conflicts post-World War II indicates a consistent declining trend till the end of twentieth century endorsing this inference (Figure 3), endorsing this inference. The problem becomes more pronounced in conflicts amongst peer or near-peer adversaries, where mutual attrition can be expected on a larger scale. Hence, risk mitigation is an important consideration for decision makers. For instance, China, despite its hegemonic aspirations, last fought a war in 1979 and follows the maxim of 'winning without fighting'. Further, the term strategic competition aims to pursue political objectives—even when linked to a specific domain—in multiple domains. Thus, according to a recent US paper, 'Strategic competition is an enduring condition to be managed and not a problem to be solved.'²

Understanding Domain

One of the well-accepted definitions of domain is:

a critical macro maneuver space whose access or control is vital to the freedom of action and superiority required by the mission. It is simply an area that one must have access into and an area in which one can make effects and this arena does not have to be physical.³

MDO emphasises the unique attributes of each domain rather than the associated service. For example, the air force, army, navy and where

World-wide battle deaths per 100,000 people

■ Colonial ■ Interstate ■ Civil ■ Civil with foreign interaction

Human Security Report Project, Uppsala Conflict Data Project, Peace Research Institute of Oslo, via WSJ

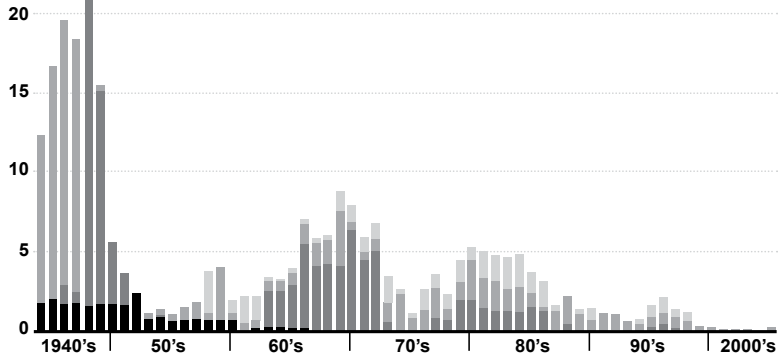


Figure 3 Battle Death Trends since World War II

Source: Zack Beauchamp, '600 years of War and Peace, in One Amazing Chart', Vox, 24 June 2015, available at <https://www.vox.com/2015/6/23/8832311/war-casualties-600-years>, last accessed on 01 February 2024.

applicable, the marines, all have an air component and also exploit space and cyber capabilities. A land or maritime asset could thus be employed for enabling control of air, as could an air asset enable sea denial or control of sea through cross-domain application. The MDO lays emphasis on the delivery of effects in the domain, rather than the force exercising ownership.

MDO versus Jointness

Coordinated cross-domain application, mostly comprising support operations (ops), has been at the core of debates on 'jointness' in modern military discourse. Even in successful joint ops, majority of missions are stand-alone, with resource allocation and deconfliction being key joint issues. In Gulf War I, 43 days of air campaign from 17 January to 28 February 1991 with the main ground campaign comprising the final 100 hours of the war.⁴ For 78 days, from March to June 1999, the United States and its NATO allies conducted an Air Campaign which proved pivotal in determining the outcome of the regional conflict⁵. Most successful ops have been restricted to one or two domains at a time, sequentially applied or, at best, well-coordinated.

Joint-warfare commands exist to move beyond de-confliction into true cooperation and have done so with mixed success. Multi-domain initiatives aim to move beyond cooperation and into selective interdependence,

pushing integration between services and warfare disciplines down from the operational level to the tactical level.⁶

Application in the grey zone would require even greater integration and an imaginative, *de novo* approach, especially to harness the potential of emerging cyber and space domains. The MDO goes beyond ‘joint done right’ and involves seamless exploitation of core characteristics of each domain to create multiple and concurrent dilemmas for the adversary.

The US

The US ‘2018 National Defense Strategy’ has emphasised the need to prepare for MDO.⁷ As per the 2022 version, the first of four priorities of the Department of Defense (DoD) is: ‘Defending the homeland, paced to the growing multi-domain threat posed by the PRC [People’s Republic of China].’⁸ The shift is driven by the strategic environment, with operations in multiple domains, while staying below the threshold of armed conflict, being the preferred path. The MDO is described as:

a concept that the Joint Force can achieve competitive advantage over a near peer adversary by multiple complimentary threats that each requires a response, thereby exposing their vulnerabilities to other threats. It is an artful combination of these dilemmas, rather than a clear overmatch in terms of any clear capability that produces the desired advantage.⁹

This competition covers an expanded battlespace that also recognises information as the sixth domain—the cognitive domain.¹⁰ Conceptually aligned with the US thought process, the NATO’s working definition of MDO is: ‘the orchestration of military activities across all domains and environments, synchronized with non-military activities, to enable the Alliance to create converging effects at the speed of relevance’.¹¹

China

Historically, China has displayed a propensity for resorting to conflicts as a means to resolve territorial disputes and has cannily avoided escalating them along dimensions that would place them at a tactical disadvantage.¹² China is pursuing its hegemonic aspirations systematically through evolution of its military doctrine, CONOPS and capability-building processes (Figure 4).¹³ In November 2012, the People’s Liberation Army (PLA) adopted a doctrine of informative local wars with integrated joint operations (IJO) as the

CONOPS, followed by multi-domain IJO in 2017. This entails improving joint operations based on network information systems and evolving to all-domain operations (ADO).

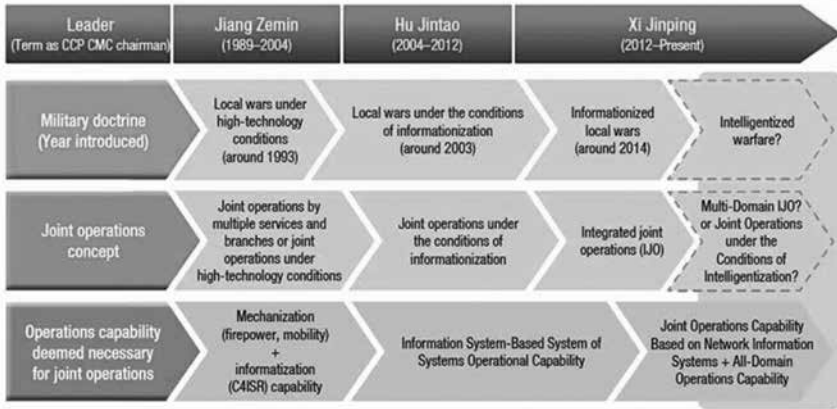


Figure 4 Evolution of PLA's Joint Operations Concept

Source: 'Assessment of the PLA's Joint Operations Capabilities', *Indian Military Review*, 15 December 2022, available at <https://imrmedia.in/assessment-of-the-plas-joint-operations-capabilities/>, last accessed on 04 February 2024.

The guiding rationale and drivers of the evolution are quite similar to the US and West. The evolution of MDO in the PRC is also premised on the expanding battlespace beyond conventional domains to include space and electromagnetic (EM) spectrum. The establishment of the Strategic Support Force (SSF) by the PLA, to centralise its strategic space, cyberspace, electronic warfare, information warfare, communications and psychological warfare, is an apt example of harnessing the emerging domains as part of MDO or ADO. The SSF has two major verticals of Cyberspace Space Force (CSF) and Space Systems Department (SSD), also referred to as Aerospace Force, responsible for military space operations, including counter-space capabilities.¹⁴ Chinese scholarship considers air and space as a merged battlespace, which will become a strategic commanding point.¹⁵ Additionally, China's military modernisation efforts are aimed at achieving decision dominance through a three-pronged approach: doctrinal transformation and ideological rigour; exploitation of advanced technology to shape the character of modern conflicts; and innovation of its training methods to compensate for the lack of wartime fighting experience.

The force structuring overhaul, initiated from 2012 to 2015, has included substantive downsizing of the PLA and its mechanisation.¹⁶ The PLA Rocket Force has emerged as a separate service and an impetus has been given to modernisation and expansion of the PLA Navy and the PLA Air Force.¹⁷ The objective is to establish information and decision systems dominance in air, maritime and other domain-centric approaches. A conscious transition to ADO is also apparent across the Line of Actual Control (LAC), and this is indicative of the expected changes in the nature and scope of transgressions in future. The inevitability of cross-domain application of forces and primacy to information dominance are other enduring tenets of China's MDO that largely mirror Western concepts.

Russia

In 2013, Russia's Chief of General Staff, General (Gen) Valery Gerasimov, operationalised the Primakov Doctrine of the late 1990s, now referred to as Gerasimov Doctrine or New Generation Warfare (NGW; *vioni novogo pokoleniia*). The core concept of NGW is adopting 'whole of government warfare, fusion of hard and soft power across various domains and blurring the boundary between peace and war'.¹⁸ The NGW, like in US MDO, recognises 'information' as a domain, in addition to space, air, land and maritime domains, and 'information warfare' as a major element. Thus, there is the universal preference for grey zone, with emphasis on deferring and limiting kinetic action, as well as preference to all/cross-domain ops. The West uses 'coercion' as an umbrella term that has two subsets: deterrence and compellence. The Russians only use deterrence (*sderzhivanie*) for reactive use and compellence (*prinuzhdenie*) for proactive use. There is no equivalent word for coercion. The NGW stipulates a ratio of 4:1 between non-kinetic and kinetic options.¹⁹

Russia's transition to NGW is also stated to be a response to hybrid warfare leashed out against it by its adversaries. The NGW lays down phases and forms of struggle owing to the changing character of war. In the military domain, emphasis is on manoeuvre and stand-off actions with massive employment of precision-guided munitions (PGMs), unmanned systems and weapons based on new principles, like hypersonic/directed energy weapons. The phases of ops are information or cyber war, subversion, followed by kinetic action—that is based on aerial and space-based attacks. It factors anti-access/area denial (A2/AD) principles and envisages declaration of no-fly zones. Surface action/occupation of territory is envisaged only in the end, after the adversary's ability and will to resist has been broken.²⁰

KEY ATTRIBUTES OF MDO

Figure 5 depicts various attributes of MDO. The ‘sensor layer’ integrates sensors from all domains and their outputs are shared seamlessly through robust networks. This needs to be converted to actionable intelligence by cyber warriors, enabled by artificial intelligence (AI). A multi-domain command, control and communications (C3) wherewithal then creatively plans MDO and undertakes ‘synchronised and coordinated’ operations.

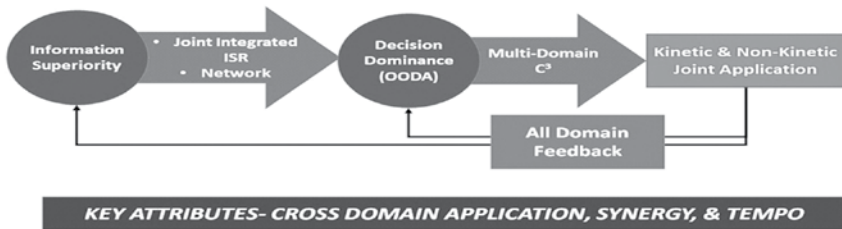


Figure 5 Key Attributes of MDO

Source: Sydney J. Freedberg, Jr, ‘How We Fight: Army Issues All-New Handbook for Multi-Domain War’, *Breaking Defense*, 10 October 2022, available at <https://breakingdefense.com/2022/10/how-we-fight-army-issues-all-new-handbook-for-multi-domain-war>, last accessed on 01 February 2024.

Continuous all-domain feedback is integral to the MDO matrix to complete the cycle, review the plans and generate fresh options. The MDO entails high-tempo ops across domains, with high level of synchronisation amongst forces as well as non-military players, with a creative use of all capabilities to achieve ‘decision dominance’ through ‘information superiority’.

A2/AD and MDO

The strategy of A2/AD is designed to prevent an adversary’s access to own area of interest. To illustrate, China has put up a shield of long-range sensors and Area Denial weapons, such as ballistic missiles, and is utilising its aircraft and maritime assets for aggressively patrolling the East China Sea (ECS) and the South China Sea (SCS) by expanding claim lines. Electronic warfare to degrade the adversary’s space-based systems, like global positioning system (GPS), communications, installations and anti-satellite weapons (ASAT), is the other component. The successful cyber ops by Russia in Georgia in 2008

has led to coining of the term 'information A2/AD'. All layers of MDO, comprising sensor, C3 and the effects, need to be addressed to penetrate the A2/AD shield.²¹

Challenges

Generating a common all-domain picture is a challenge, even for modern nations. Further, cyber and space ops are largely managed at the national level. There is a view that cyber and space components must form a part of the Joint Force.²² Advances in non-nuclear capabilities, especially in cyber, space, air and undersea domains, can create complex and unpredictable pathways for conflict escalation, especially where collective experience, common understandings, established norms of behaviour and 'rules of engagement' lack clarity, presenting challenges at all levels.

Another crucial challenge is of 'time', since every domain works on a different time frame. Troops on foot, destroyers at sea, supersonic fighter jets and cyber ops operate on vastly asymmetric time frames and timelines, making synchronisation and coordination complex. As per the US Air Force (USAF), MDO Implementation Plan 2018: "The Air Force, in conjunction with fellow joint war fighters, must adapt our thinking and culture to be able to seamlessly shift between domains, components and regions to create high velocity, precision war-fighting effects to satisfy the Joint Force Commander's mission needs."²³ This captures most core tenets of MDO being universally articulated.

Further, the 'US Army describes MDO as combined arms employment of joint and Army capabilities to create and exploit relative advantages that achieve objective, defeat enemy forces, and consolidate gains on behalf of joint force commanders.'²⁴ It also emphasises employing army and joint capabilities to make use of all available combat power from each domain to accomplish missions 'at least cost'. The description lacks specifics, with no mention of information superiority, cross-domain application, high-tempo ops, decision dilemmas and decision dominance. The US Navy, meanwhile, has mostly been silent on the issue. Where the USAF is concerned, a senior General lamented: "We need purple command and control. It takes too long for us to do air command and control, and ground command and control, and navy command and control, and then try to come back together and talk about what we are going to do."²⁵ This familiar refrain is service-agnostic and highlights the limitations of even the most evolved joint structures. This can be linked to a lack of congruence on the interpretation of MDO amongst

the three services in the US. The challenges to MDO can, thus, be summed up as addressing the incompatibilities in ‘technology’, ‘time’, ‘timing’ and ‘thinking’ amongst all domains.

MDO and India

India is upgrading and enhancing its military prowess, and the impetus to military applications in space, cyberspace, communications and networking is evident in government policy. Defence reforms that focus on enhancing efficiency and jointness, including theatrisation, are under active consideration. These initiatives are in sync with modern militaries and are driving the transformation of our defence forces. Any future conflict will inevitably entail a contest in multiple domains with our potential adversaries. Cross-domain application to achieve synergy through jointness or integration is acknowledged as a crucial imperative amongst all stakeholders in India, and there is an extensive discourse on these developments in the strategic community as well. Studying the systems of countries ahead in the evolutionary curve (not necessarily perfect) will allow us to open our minds and break free from existing mindsets.

AEROSPACE POWER IN MDO

The architects of the air campaign did not limit themselves to ‘servicing a target list’ approach. Jointness is the use of the most effective force for a given situation.²⁶

—Brigadier General David A. Deptula, USAF

Historical Context

The historical evolution of air power can be viewed in four epochs (Figure 6). By World War II, air forces had established their effectiveness for application in the traditional domains of land, sea and air. Air power became an all-domain entity almost since inception and control of air became an imperative for any successful operation. Post-World War II, air power also became the preferred tool for power projection, deterrence as well as operations below the threshold of conflict. There were setbacks as well, when incorrect cross-domain application of air power, like in Vietnam, and botched-up missions, like Operation Eagle Claw to rescue American hostages from Iran, led to failures.



Figure 6 Historical Perspective of Air Power Capability Evolution

Source: Figure is from the presentation slides made by author

Lessons learnt, along with advancements in technology, got air power many more successes. Osirak, Entebbe, Arab–Israel wars, 1971 Indo-Pak War, Operation Poomalie, Operation Cactus, Operation Neptune Spear and Balakot are apt examples of successful cross-domain application of air power for influence, projection and conflict resolution. Gulf War I was undeniably a watershed moment where air power redefined military conflict. The shock and awe effects of PGMs and other weapons, space-based intelligence, surveillance and reconnaissance and communications enabled high-tempo ops. Gen Schwarzkopf, the US Central Command (CENTCOM) commander during Gulf War I stated: ‘At the bottom, neither Powell, nor I wanted a ground war.’²⁷

Interplay amongst Domains

The concept of MDO was established as a spiritual successor to the AirLand Battle concept of the 1980s.²⁸ Figure 7 depicts MDO and the interplay amongst domains. Air power transcends all the domains to create joint effects. Impetus to tech-driven domains (air, space, information, etc.) and capabilities is obviously visible. The confluence of air and space is of immense interest as near-space and trans-domain threats are taking shape. Looking further into the future, the Chinese and Western programmes to develop spaceplanes, hybrid engines and hypersonic weapons are expanding air power and air defence upwards, making air and space one continuum. Aerospace power has attributes as well as actual combat experience of cross-domain ops,

which will complement these developments and enhance its intrinsic multi-domain character to give it a decisive role in MDO.

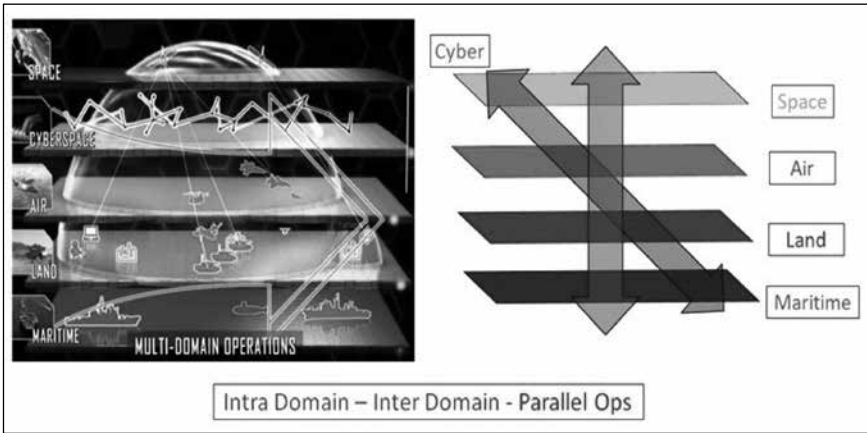


Figure 7 Interplay amongst Domains

Source: <https://globalsecurityreview.com/defense-department-multidomain-operations-challenge/>, last accessed on 01 February 2024.

Information Superiority and Decision Dominance

Air forces continue to enhance capabilities for ubiquitous and persistent presence to collect information. All operations, including peacetime tasks, are carried out in a networked environment with sensor integration and communications. This also provides the backbone for effective command and control. Successful air operations hinge on shortening the observe, orient, decide, act (OODA) loop and achieving decision dominance in battle.²⁹

Airborne platforms, like airborne early warning and control (AWACS), overcome the limits of terrestrial sensors and communications, providing real-time, seamless picture as well as C3 to control the air battle, including cross-domain missions. The joint surveillance target attack radar system (JSTARS) and intelligence, surveillance, target acquisition and reconnaissance (ISTAR) enable operations in other domains as well.

Air operation centres have made significant advancements to fuse space, air and some nascent cyber effects to support the joint fight (Figure 8). There is similar progress at space, land and maritime operation centres—but they are all somewhat stove-piped.³⁰ Information superiority and decision dominance are central to successful MDO and have been key objectives of air operations to continue to shrink the OODA loop. Integrating all five domains into

existing architecture would entail a de novo command and control, as alluded to while discussing the challenges.³¹ In fact, the USAF has identified multi-domain command and control (MDC2) as the most important requirement for successful MDO. The US Joint Staff, which has agreed to this core requirement, is leading the efforts to move joint all-domain command and control (JADC2) from a concept to policies, doctrine and requirements. The USAF, on account of reasons discussed earlier, has been nominated as the executive agent and is making progress towards achieving the same.³²

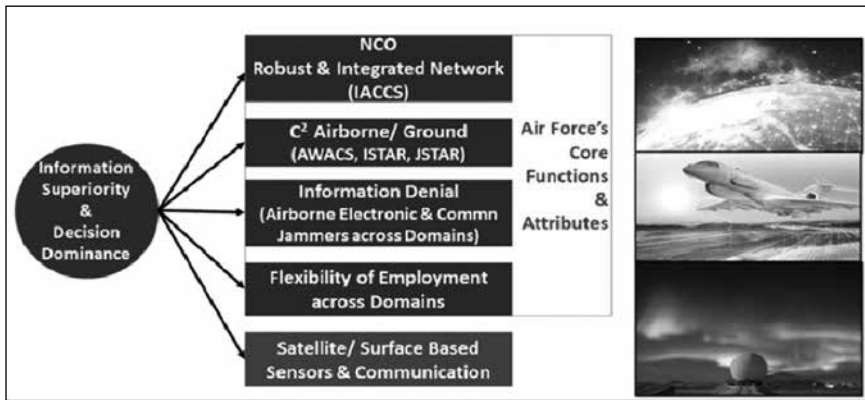


Figure 8 Information Superiority and Decision Dominance

Source: Figure is from the presentation slides made by author.

Air Power in Grey Zone

Grey zone occupies a wide band in the spectrum of conflict and there is an unprecedented, though nuanced, usage of air power in the grey zone to achieve the objectives of deterrence as well as compellence. Aerospace power is being frequently exercised as an instrument for calibrated kinetic operations in the sub-conventional domain through punitive strikes. It has also been used for signalling and power projection. The punitive strikes by Israel, including Osirak and Entebbe, Operation Neptune Spear, Operation Poomalie, Operation Cactus and Balakot would fall in the grey zone. The PLA Air Force CONOPS includes 'air-blockade'³³ and it is being extensively employed in the ECS, the SCS and against Taiwan. China has promulgated two air defence identification zones (ADIZs) in the ECS and for the first time, Chinese aircraft crossed the mutually respected median line on 12 April 2020 and intruded into Taiwan's ADIZ. The incursions have increased in frequency and intensity and are now a new normal. This cartographical

aggression on airspace is part of intimidation of Taiwan and signalling for the US.³⁴

The employment in grey zone has been extended through unusual actions, like trans-continent spy balloons that were recently sighted and shot down over the airspace of the US and Canada. In the non-kinetic domain, employment of non-nuclear electromagnetic pulse (NNEMP) weapons to sever the network or provide rapid strategic and tactical lift capability enhance speed, reach and sustenance of land and maritime operations. Air power is also being extensively used for projection of national power. Humanitarian assistance and disaster relief, non-combatant evacuation operations and international exercises in proximity to contested areas have also proved effective tools for signalling and power projection. Creation of aviation infrastructure close to borders and their regular activation, along with forward deployment of Air Defence sensors and weapons are measures adopted for projection and showing resolve.

Fighter Aircraft and MDO

Unmanned platforms, advanced surface-to-surface missiles (SSMs), ballistic missiles, ASAT and hypersonic weapons would influence outcomes in future conflicts. This has generated a debate that perhaps existing combat platforms have become less relevant and, in due course, will become redundant. Persistent requests for high-tech fighter aircraft by Ukraine were finally acceded to by the West owing to the limitations of drones and SSMs.

To see this discussion in correct context, one also needs to analyse the developments in fighter and bomber designs and capabilities. While SSMs, ballistic missiles and drones have their advantages, there are limitations as well and optimal results can be best achieved through complementary application. Stealth and low-observable (LO) technology, AI-fused sensors, air-launched ballistic missiles (ALBMs), long-range anti-ship missiles, electronic warfare equipment and hypersonic missiles are being integrated on fighter aircraft. Manned-unmanned teaming (MUM-T)/'Loyal Wingman' concepts, along with stealth, next-generation PGMs and sensors, electronic warfare systems, data linking and network applications are other key technologies that are transforming the capabilities of fixed-wing combat aircraft.

The US Next Generation Air Dominance (NGAD) programme for developments in F-35 and F-15EX; Europe's Future Air Combat System (FCAS); the United Kingdom's Tempest; upgradation of J-20/FC-31 and development of J-X sixth-generation aircraft by China; and the recently unveiled Su-54 and Su-35 aircraft of Russia are all vying for similar capabilities.

An overview of capabilities of existing fifth-generation fighters (Figure 9) and the evolving Next Generation (NG) bomber and sixth-generation fighters (Figure 10) brings out how these aircraft are enhancing and expanding their efficacy for employment from sub-surface to near-space domains, making them truly MDO entities.

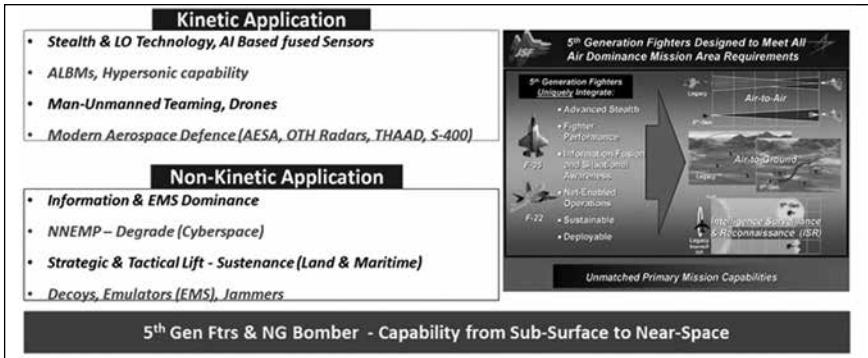


Figure 9 Fifth-Generation Fighter

Source: David Cenciotti, ‘How does the F-35 JSF Fly and Fight’, *The Aviationist*, available at <https://theaviationist.com/2010/12/21/how-does-the-f-35-jsf-fly-and-fight/#jp-carousel-3238>, last accessed on 01 February 2024.

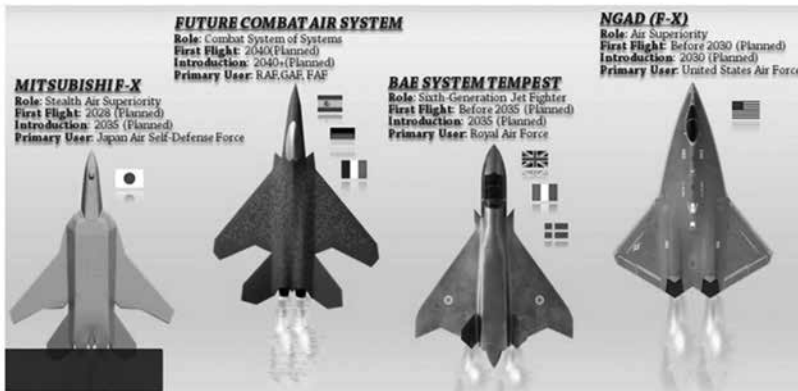


Figure 10 Sixth-Generation Fighters

Source: <https://www.ajashukla.com/2022/12/uk-italy-and-japan-team-up-to-build-6th.html>, last accessed on 01 February 2024.

Training and Organisation

Three-dimensional thinking and technical orientation, along with a better understanding of air and space continuum, network centricity and utilisation of virtual combat simulators, are integral to air force training. While this gives some head start, there is a need to widen the intellectual horizons for the MDO environment. The evolution of the 'Joint Warfighting Concept' (JWC) in 2021 to address the four tenets of MDO, namely, joint fires, JADC2, logistics and information advantage, is an endorsement of this inescapable requirement for specific training regimens for MDO.

The US DoD acknowledges the challenges and has stated that a shared vision is not enough and there is need for a joint MDO doctrine and CONOPS to 'compel' the services to a coordinated approach to MDO. The US Joint Staff has recently evolved the JADC2 as a part of the Joint Warfighting Concept 3.0, which is not available on open sources.³⁵ The PLA has adopted a three-pronged approach to training for MDO or all-domain IJO. Laws and regulations have been amended to incorporate facets of joint ops. Professional military education curriculum for officers has been amended substantively to make it joint. Individual service exercises have been reduced and extensive joint training is being conducted within the theatres. Employment of AI and simulators for opposition forces is better than the West and is being used to refine CONOPS and tactics.

CONCLUSION

The MDO represents the changing framework of conflict management and resolution. Enabled by technology, it is conscious of the changing nature of war, with 'war by all means' being the core tenet. Even sceptics concede the manifold increase in domains and their complex interplays. Air power came into being for supporting surface forces and while it evolved into a decisive entity, its joint roles have also expanded in scope and complexity. This cross-domain exposure is integral to modern air forces that have also transited to operations in a networked environment. Use of space and the existing air power doctrinal percepts and CONOPS resonate well with MDO—though significant upscaling is required.

Air forces will play a decisive role in evolving MDO command and control and CONOPS. While exploitation of emerging domains and the cognitive domain of information is crucial to MDO, kinetic and non-kinetic capabilities have to also be continuously upgraded to match/outdo the adversary to compete in the MDO paradigm. The MDO goes well beyond

jointmanship even in the military sphere of activities. Modern militaries—the US, the NATO, the PRC and Russia—have adopted MDO in their unique forms. However, despite elaborate and robust joint structures, interpretation of MDO within these militaries lacks congruence on account of inter-service differences and incompatibilities in doctrine, CONOPS and capabilities. A clear understanding of the domains and their interplays in the MDO environment is a pre-requisite, with integration, technology and innovation as key elements. The MDO requires a domain-agnostic approach and mindset, especially at the military leadership level, to drive training as well as evolve doctrines, CONOPS and tactics, techniques and procedures (TTPs) that are truly ‘purple’.

NOTES

1. Air Chief Marshal V.R. Chaudhari, Chief of the Air Staff, Indian Air Force (IAF), speaking at the Arjan Singh Memorial Seminar conducted by Centre for Air Power Studies at Air Force Auditorium, New Delhi, on 18 April 2023.
2. A paper, ‘Joint Concept for Competing’, was released by General (Gen) Mark A. Milley, Chairman Joint Chiefs of Staff, US government, on 10 February 2023. It amplifies how the Joint Force will engage in strategic competition in order to ‘deter aggression’ and ‘prepare for conflict’. If deterrence and competition fail, it will counter adversaries competitive strategies and support efforts of inter-organisational partners. See Anthony H. Cordesman, ‘The U.S. Joint Chiefs New Strategy Paper on Joint Concept for Competing’, Center for Strategic and International Studies, 17 March 2023, available at <https://s3.documentcloud.org/documents/23698400/20230213-joint-concept-for-competing-signed.pdf>, last accessed on 1 February 2024.
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