

Future conflict scenarios

Changes in warfare and their implications



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The United States is going through unprecedented times. Never before has the Capitol been stormed or the President been impeached twice.

CHANGING GEOSTRATEGIC ENVIRONMENT

The 21st-century geostrategic environment is one with complex relationships, strategic interests and influences. Political compulsions, globalisation, and digitisation are redefining the basic concept of warfare. Even major military powers are restrained

WARFARE: 2040
THE FUTURE OF MILITARY TECHNOLOGY

AIRCRAFT TECHNOLOGY

- B-21 "Raider" 2020s**
This long-range stealth strategic bomber is expected to replace the current B-2 "Spirit" stealth bomber.
- Next Generation Air Dominance Fighter 2020s**
Next-generation fighter for the US Navy's F/A-18E/F Super Hornet light attack program, featuring a 6th Gen, supercruise, stealth fighter with a 30 MW laser weapon.
- SR-72 2030s**
The estimated successor to the famed SR-71, the SR-72 jet of Blackbird is expected to be a hypersonic reconnaissance aircraft employing a dual-mode, carbon-based core and cyclic engine capable of operating from subsonic to hypersonic speeds at Mach 5.
- Hypersonic Weapons 2030s**
The next evolution of first-order hypersonic weapons can be ground-, sea-, and air-launched and maneuvered at speeds of up to Mach 20 (20,000 km/h) in the stratosphere. They are capable of autonomous or autonomous weapons that can be launched from a variety of platforms.
- 55-1 Defiant 2030s (F)**
A part of the 55th Fighter Wing, the Defiant will provide a new level of performance and capability to the 55th Fighter Wing.
- V-280 Valor 2020s**
The V-280 Valor is a next-generation attack helicopter that will have the role of a multi-role helicopter with ground attack, support, and reconnaissance that the current V-22 Osprey.
- Carrier Based Aerial Refueling System 2030s (F)**
This project is expected to be completed by 2030. It will allow the US Navy to refuel its carrier-based aircraft from the sea.

NAVAL TECHNOLOGY

The science of war is beginning to look more like science fiction. Technologies that were once confined to the fever dreams of Hollywood's sci-fi directors are becoming commonplace throughout projection of tomorrow's military: lasers, railguns, hypersonic missiles, and secretive spaceplanes.

- Zumwalt-Class Destroyers 2016 on**
The USS Zumwalt, which was commissioned in October 2016, is the first of a new class of destroyers. It features a stealth design, a flat-top hull, and a variety of advanced weapons, including a laser and directed energy weapons system.
- Columbia-Class Nuclear Submarine 2031 - 2055**
Designed to replace the current Ohio-class nuclear submarines, the Columbia-class will employ electric drives and a new design for advanced stealth, together with a new fuel core that needs replacement throughout the ship's life.
- ADVANCED WEAPON SYSTEMS**
- Electromagnetic (EM) Railgun 2030s (F)**
The EM railgun uses electromagnetic force to accelerate a projectile to speeds of Mach 5. It is a long-range, high-velocity, and precision energy weapon. The 2030s EM railgun is expected to be a game-changer for maritime warfare. The Zumwalt-class destroyers are perfectly equipped to accommodate these weapons, and they may see widespread use for land-based applications.
- 2031 Laser 2031 - 2035**
Science fiction or real, laser weapons are already a part of military weaponry. The US Navy is equipped with a laser technology and advanced directed energy weapon. The 2031 Laser Weapon System is a 30 kW infrared laser that has already been used to destroy unmanned aerial and surface vessels in a simulated exercise. Future weapons may be installed on Aegis ships.
- Rapid Launch Spaceplanes 2030s**
The high horizon is the central theme of the future war. It is a new way of thinking about the world. The US is going to see a new kind of war. It is a war that is fought in the sky. It is a war that is fought in the air. It is a war that is fought in the space. It is a war that is fought in the future.

The changing character of warfare is changing the fundamentals of application of mass vis a vis precision effects. Whereas the earlier concept used mass to achieve a breakthrough and needed large numbers to deliver sufficient quantity at a critical point to achieve destruction, precision can neutralise or dislocate using a much lesser amount. This makes aerospace power a dominant factor in the modern battlefield.

EMERGING THREAT SPECTRUM

The contours of conventional war/conflict are changing and becoming more ambiguous and wide-ranged. Long-drawn out conventional wars are a thing of the past due to diminished international acceptability of capture of territory & collateral damage and also increasing economic costs. Future conflicts are likely to be short, swift, and

from unmitigated use of force due to loss of faith amongst their population in political institutions and lack of appetite for military action. Thus, there is an inclination to invest in 'remote warfare' which favours the use of remote sensing and surveillance, targeting

and precision weapons rather than 'boots on the ground.' Information, automated decision making, and data science all add to new capabilities and provide a clear edge to those who possess them and have mastered them for battlefield usage.

intense engagements against a nuclear backdrop.

Terrorism, piracy, and sectarian conflicts are extending the boundaries to grey zone, hybrid, sub-conventional conflicts in the 'no peace, no war' realm. The battlespace for warfighting is expanding (into multi-domains) with compression of time.

Future security challenges will be more and more complex, multi-dimensional, and non-traditional in both kinetic and non-kinetic form. Success would lie on the ability to act in the shortest possible time, inside the decision cycle of the adversary, demanding a very high level of real-time situational awareness. The threat spectrum spans from sub-conventional conflict, a conventional war to a nuclear exchange.

India has to be prepared to face this entire spectrum of threats which will consistently increase in technological sophistication and complexities, demanding a matching full-spectrum capability. Aerospace power will inevitably

have to reorient itself accordingly and gradually shift from a threat-based assessment to a capability-based approach.

Once acquired, a specific capacity can be adapted or tailored to meet a specific challenge in any segment of the entire conflict spectrum. This is easier said than done as it will require new technology, modernisation, and acquisition of state of the art platforms. To supplement and use this new capacity, the forces will have to develop matching doctrines, organisational and support structures and training facilities. This will come at a high cost to the exchequer.

INDIA'S NEIGHBOURHOOD

Asia is fast emerging as the fulcrum and not without reasons- along with rising economies in the region and the power wielded by China, both economic and military, there have been turmoil and instabilities. Furthermore, the region has been plagued by terrorism almost across

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its entire expanse.

India lives in a dangerous neighbourhood which can easily be labelled as one of the most war risk-prone regions in the world. With nearly 7000 km of a 'hot' border with two aggressive nuclear powers, it has its hands full.

China is emerging as a credible world power, and today it dominates Asia, which has serious implications for India. It would be prudent to remember that China has been assiduously adapting the philosophy of systems destruction warfare (i.e. disruption, paralysis or destruction of enemy operational systems).

India's relations with China are changing from cooperative to competitive, and as seen recently, combative through frequent trigger incidents like Galwan

Valley encroachment across the Line of Actual Control (LAC) and Doklam face-off. These events could easily lead to war. China also continues to enhance its strategic presence in the Indian Ocean Region, and simultaneously it is investing in the Indian Ocean littoral countries to achieve a foot-hold and extend influence. It would like to keep India off-balance.

China has strategic interests in using Pakistani territory to reach West Asia and Africa for trade and geostrategic positioning. It has invested in the China Pakistan Economic Corridor (CPEC) that connects the Xinjiang region in West China to the China-built-and-operated Gwadar port near Gulf of Hormuz.

On its western frontiers, India confronts a recalcitrant Pakistan presenting a security threat in all dimensions, i.e. nuclear, conventional and sub-conventional. It remains the epicentre of world terror and would not be restrained from the use of non-state actors to maintain a situation

of unrest. Asymmetric warfare will be an instrument of its state policy. Pakistan's strategy would continue to be wage proxy war and in the event of an escalation, use the nuclear card.

The biggest concern for Indian security planners is a China-Pak collusive challenge. For a long time, it remained a theoretical discussion point, but 2020 was the first time when it emerged as a very real possibility. China has helped Pakistan militarily, including supplying technologies for its nuclear weapons and missile program.

In case of a conflict between India and Pakistan, China would posture along the northern and eastern border to keep the Indian military divided and would also use its influence in the international forums to bring about a ceasefire at the earliest. In the worst-case scenario, both could simultaneously orchestrate their military operations to tie down India on all its borders. Pakistan openly boasts of collusive support from China in case of

a war with India.

Within the context of India's search for aerospace dominance, the capability and preparedness should cater for a collusive challenge from both its adversarial neighbours, the challenge of a serious internal security imbroglio, multi-front challenges including grey zone operations.

PREREQUISITES FOR AEROSPACE POWER

While it is true that aerospace power by itself cannot win a war, the contradiction is that no major war has been won without the use of aerospace power! This axiom is going to get even more relevant as technology-driven concepts of warfighting assume greater importance. The cor-

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ollary to this is that to support an aerospace power capability, a country must invest in thriving aerospace industry.

A commonly held perception is that Aerospace Power pertains to aircraft and satellites only. While these two segments occupy a greater part of it, it actually relates to the total capacity of a nation to exploit the medium of air and space. In the wider perspective, besides aircraft, airborne weapon systems, satellites and space control, it would also include civil aviation, communications for the management of airspace, radars, data links, airfield and more recently cyberspace.

To support all this, there is a need to create an ecosystem based on a strong technological infrastructure which can not only absorb newer technologies but also help give rise to cutting edge technologies through in-house R&D, a tech-savvy and trained human resource coupled with matching training centres and institutions. Most impor-

tantly, a robust indigenous manufacturing sector is critical-both in the public and private sector with depth and dexterity to meet the challenges of a rapidly evolving tech ecosphere.

In sum, a credible aerospace capability requires huge investments, commitment on the part of all stakeholders, R&D, a comprehensive policy crafted at the highest level backed up by strong national will.

FUTURE AEROSPACE POWER

Evolution of aerospace technologies at a rapid pace is an ongoing process. Artificial Intelligence (AI), the revolution in engine design, quantum computing are some areas where the progress is especially mind-boggling.

Technologies for Intelligence and Surveillance are leap-frogging generations at a time with the immense computing power available to scientists, instrumentations, metallurgy, and communications are being revolutionised.

Space will be the

strategic centre of gravity in future battlefields with the side which can dominate space for communications, collection and positioning-while denying the same to the adversary- will get the winning edge. With Intelligence, Surveillance and Reconnaissance (ISR) entirely satellite-based, both sides will carry out kinetic and cyber attacks against spaceborne platforms. It will be extremely difficult for high signature surveillance platforms to survive as satellites, especially in low earth orbits, will be vulnerable. Attacks will also concentrate on terrestrial infrastructures like launch pads, command and control nodes and telemetry stations.

Hypersonic missiles with projected speeds of Mach 3-5 or hypersonic glide vehicles boosted by multi-stage rockets pose challenges which even the latest anti-ballistic missile systems will be hard-pressed to defend. With reaction times greatly reduced, accurate tracking made nearly impossible, and the required hypersonic

velocities for a kinetic attack to knock them down means that current inventories have no antidote for them. The Chinese DF 21 D ballistic anti-ship missile and the Russian 3M22 Zircon hypersonic cruise missiles are some examples.

Directed-energy weapons such as high energy lasers and electromagnetic railguns have undergone field trials in the U.S. and China. They have the potential to disrupt the fine balance between attack and defence at the tactical level across the entire spectrum of conflict.

Quantum information technologies comprise quantum computers, cryptography, radars, clocks and a host of other systems which work on the principles of quantum mechanics. This is a highly complex science which may render obsolete existing understanding of computing across many fields and impact national security- impacting everything from secure communications to faster code-breaking and making it almost impossible for stealth aircraft and submarines to hide.

CAPABILITY BUILD-UP

Aerospace power, with its inherent flexibility and ability to respond at a moment's notice, provides the national authority many options to face contingencies.

Preparedness would include a review of doctrines, strategy and tactics, organisational structures, human resource adaptation and training, and maintenance & logistics concepts to meet the operational requirements.

IAF will have to build deterrence and have the ability to dominate the air. It will have to induct modern systems for situational awareness, intelligence and precision strike ability.

Technological advancements and evolving changes would have to be factored. Artificial Intelligence (AI) has great applications for airpower. India must take an early lead.

IAF would need to think differently to be able to tackle the various asymmetric and non-traditional security threats and would require more

innovative, out of box solutions which would leverage the prevalent technology. Self-reliance and investment in future technologies is most important.

CREATING SUITABLE ECOSPHERE

To prepare for the battlefield of the future, especially in aerospace, the user, academia, R&D, and Industry have to come on the same page. Preparing for future conflicts is a core responsibility of the government, and the perspective of a nation's hard and smart power is viewed by its potential adversaries through the prism of its level of preparation. This is also critically examined by potential investors to check whether their investments are in a 'safe' place to do business.

The impetus is, therefore, required in the related fields of hypersonic weapons systems, development of better power packs and propulsion systems, unmanned swarms and drones and metallurgy and composites.