



CENTRE for AEROSPACE & SECURITY STUDIES

# Disruptive Technologies – Impact on Future Warfare

*Dialogue Analysis*



**CENTRE for AEROSPACE & SECURITY STUDIES**

**June 2022**

All rights reserved.

No part of this Report may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior permission. Opinions expressed are those of the speaker(s) and do not necessarily reflect the views of the Centre.

**PRESIDENT**

Air Marshal Farhat Hussain Khan (Retd)

**EVENT COORDINATOR**

Air Marshal M. Ashfaque Arain (Retd)

**SENIOR EDITOR**

Sarah Siddiq Aneel

**Report Compilation & Rapporteurs**

Sameer Ali Khan, Shaza Arif & Maheen Shafeeq

**Layout**

Hira Mumtaz

All correspondence pertaining to this document should be addressed to CASS, Islamabad through post or email on the following address:

**CENTRE for AEROSPACE & SECURITY STUDIES (CASS)**

Old Airport Road, Islamabad, Pakistan

Tel: +92 051 5405011

Institutional URL: <https://casstt.com/>

Twitter: @CassThinkers

Facebook: cass.thinkers

LinkedIn: Centre for Aerospace & Security Studies

Instagram: cassthinkers

YouTube: Centre for Aerospace & Security Studies

Email: [cass.thinkers@gmail.com](mailto:cass.thinkers@gmail.com)

## Table of Contents

---

<b>INTRODUCTION.....</b>	<b>4</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>5</b>
<b>KEY TAKEAWAYS.....</b>	<b>7</b>
<b>PROPOSED WAY FORWARD.....</b>	<b>8</b>
<b>SUMMARY OF PROCEEDINGS .....</b>	<b>9</b>
<i>General Zubair Mehmood Hayat (Retd).....</i>	<i>9</i>
Political and Societal Impact of Disruptive Technologies .....	9
Military and Strategic Impact of Disruptive Technologies .....	9
Risks and Opportunities.....	10
Conclusion .....	10
<i>Dr Rizwana Karim Abbasi.....</i>	<i>11</i>
Disruptive Technologies and Deterrence Theory .....	11
Technologies undermining Strategic Stability .....	11
Conclusion .....	12
<i>Dr Adil Sultan.....</i>	<i>13</i>
Global Context .....	13
Character of Disruptive Technologies .....	13
Character of Future Warfare.....	14
Disruptive Technologies and Strategic Instability.....	14
Positive and Negative Impacts on Strategic Stability .....	15
Nuclear Entanglement .....	15
Disruptive Technologies and Major Powers.....	15
Conclusion .....	16
<i>Air Vice Marshal Faaiz Amir (Retd).....</i>	<i>17</i>
Impact of Disruptive Technologies on Pakistan .....	17
Disruptive Technologies and the War in Ukraine .....	18
Disruptive Technologies in the India-Pakistan Context.....	19
Importance of Airpower.....	19
Conclusion .....	20
<i>Air Marshal Farhat Hussain Khan (Retd).....</i>	<i>20</i>
Public-Private Partnerships (PPPs) Model.....	20
Future of the PAF in an Era of Disruptive Technologies .....	20
Decision-Making Loop .....	20
<b>ANNEXURES.....</b>	<b>21</b>
<i>Profiles of Speakers.....</i>	<i>21</i>
<i>Press Release .....</i>	<i>23</i>

## INTRODUCTION

---

Keeping pace with developments around the globe, the Centre for Aerospace & Security Studies (CASS), Islamabad regularly organises seminars, conferences, and webinars on key issues in world affairs, especially those that concern Pakistan. These events are aimed at informing policymakers, academics, media, and the civil and military bureaucracy about existing and future challenges and opportunities. Timely deliberations on such issues help policymakers assess and draft better response options. Moreover, such academic and policy discussions add value to existing literature and help fill knowledge gaps in critical areas of national security and global politics.

Disruptive technologies and their impact on future warfare is one such area. These technologies are not only transforming the socio-political landscape but are also finding their applications in the military domain. Owing to their potentially game-changing role in military and strategic affairs, leading powers are competing to establish their supremacy in this area.

In this regard, on 8 June 2022, CASS organised a seminar on the subject of **'Disruptive Technologies – Impact on Future Warfare.'** Senior former military officers and eminent intellectuals, who spoke at the event, included:

- General Zubair Mehmood Hayat, NI (M) (Retd) – Former Chairman Joint Chiefs of Staff Committee
- Dr Rizwana Karim Abbasi – Associate Professor, National University of Modern Languages (NUML), Pakistan
- Dr Adil Sultan – Acting Dean, Faculty of Aerospace and Strategic Studies (FASS), Air University, Pakistan
- Air Vice Marshal Faaiz Amir, HI (M), SBt (Retd) – Former Vice Chancellor, Air University, Pakistan

President CASS, Air Marshal Farhat Hussain Khan, HI (M), SBt (Retd) chaired the seminar and delivered the *Concluding Remarks* while General Hayat delivered the *Keynote Address*. Air Marshal M. Ashfaq Arain, HI (M), SBt (Retd), Advisor to the Chief of Air Staff on CASS Affairs, moderated the discussion.

## EXECUTIVE SUMMARY

---

Emerging technologies, although dual-use in nature, are fast finding their disruptive applications in the military domain. Advances in AI, cyber, quantum computing, advanced materials, hypersonic weapons, biotechnologies, and robotics, are not only transforming the socioeconomic landscape but are also playing the role of decisive enablers in future conflicts.

In his *Opening Remarks*, **Air Marshal M. Ashfaq Arain (Retd)** highlighted various opportunities that new technologies offered for both civilian and defence sectors. He cautioned that non-state actors could exploit many of these easily accessible technologies in inventive and disruptive ways. According to him, for smaller states, they presented immense opportunity to offset existing military asymmetries. However, attempts by states to establish and retain technological superiority in this area had resulted in intense technological competition and inter-state rivalries. It was, therefore, important for Pakistan to stay abreast of such technological advancements and their impact on military doctrines and strategy in the future – especially given its geographical contiguity with a nuclear-armed adversary with which there exist unresolved disputes and mutual distrust.

In his *Keynote Address*, **General Zubair Mehmood Hayat (Retd)** asserted that disruptive technologies had now become a new toolkit in the hands of policymakers and that their greatest impact would be in the political domain as they would disturb the existing balance of power. Such technologies would not only impact the military but also the economy significantly. All three traditional military domains would be impacted to the extent that the character of war was likely to be changed fundamentally. He warned that Artificial Intelligence, if left unbridled, could threaten the very existence of mankind. As a nation, Pakistan needed to be part of the debate and process to ensure human control over these technologies. He forecasted that disruptive technologies were likely to create technical apartheid, requiring Pakistan to harness them as catalysts of change to strengthen its national security and sovereignty.

**Dr Rizwana Karim Abbasi**, while shedding light on the 'Impact of Disruptive Technologies on Military Doctrines and Strategies', underscored that they could erode the foundation of 'Deterrence Theory', thereby undermining nuclear strategic stability through their effect on nuclear second-strike capability, including C4I2SR and force postures. Such new technologies could contribute to accidental or inadvertent nuclear escalation by threatening dual-use C2 assets in space and cyber space by squeezing the reaction time of decision makers. She stressed the need for Confidence Building Measures (CBMs) across the nuclear spectrum and urged that states developing hypersonic weapons should be encouraged to keep their nuclear and conventional delivery vehicles separate, distinguish clearly between tactical and strategic applications, and increase the time to launch them where possible. Dr Abbasi also recommended that an international agreement on the known deployment of hypersonic weapons and ban on autonomous nuclear-armed delivery systems as well a moratorium on targeting nuclear command and control systems, was urgently needed.

**Dr Adil Sultan** while explaining the linkages between disruptive technologies and strategic stability, opined that there was a tendency to oversell new inventions and their potential to change the character of warfare. However, he pointed out that some disruptive technologies could be employed for non-kinetic warfare and provide additional incentive for states to engage in limited warfare without risking a major escalation. On the other hand, technology was evolving at a very fast pace, making it difficult for technologically-dependent countries like Pakistan to keep pace. He expressed disappointment about the country's relatively weak Research and Development infrastructure and disconnect between various national stakeholders. As a result, developments in emerging technologies were neither optimally utilised for national development needs nor military purposes.

**Air Vice Marshal Faaiz Amir (Retd)** discussed the impact of disruptive technologies on future wars in South Asia. He analysed the defence and security dimensions of specific disruptive technologies and highlighted that extensive use of outer space had become crucial to modern warfare and 'no nation should expect to win a battle without support from space.' However, when it comes to the use of drones, even though they were part of the evolution of airpower, their current generation remained vulnerable

to electronic warfare and air defence systems and therefore, were unlikely to shift the operational balance towards the offensive side. He cautioned that cyber warfare could emerge as a greater threat to Pakistan, both in peace and war time, owing to the Indian advantage which resided in its access to American, Israeli and Russian equipment and technologies.

In his *Concluding Remarks*, President CASS **Air Marshal Farhat Hussain Khan (Retd)** thanked the panellists for sharing their views on a relatively new and difficult subject. He outlined the future role and shape of PAF as an 'aerospace power' and acknowledged that technologies related to Air Power were not only expensive but also challenging to acquire. Therefore, indigenisation through Public-Private Partnerships and linking academia with industry was the way forward for ensuring affordability of technologies. He shared that the PAF had taken steps in this direction by setting up a campus of Air University, close to industry in Kamra; and the National Aerospace Science and Technology Park (NASTP) where the private sector was being incentivised to invest.

# KEY TAKEAWAYS

## Risks and Opportunities

- Disruptive technologies are a new addition in the toolkit of policymakers and their greatest impact will be in the political domain because they would disturb the existing balance of power.
- These technologies will also have a profound impact on the strategic domain and the entire spectrum of military affairs (land, naval, and aerospace) will be affected - changing the character of war fundamentally.
- Restricted access to these technologies can create technical apartheid between nations that possess them and those who do not. This, in turn, would impact national security and sovereignty.
- New technologies can prove to be game-changers given their ability to provide an asymmetrical advantage to a force with smaller numbers and power potential because of their lower cost and greater effects.

*“Data will be the single most vital component of disruptive technologies. Its availability, mining, scalability, and security will be fundamental in determining future developments in this field.”*

- Cyber warfare could emerge as a greater threat to Pakistan, both in peace and war time, owing to the Indian advantage which resides in its access to American, Israeli, and Russian equipment and technologies.

## Impact on Military Doctrines & Strategies

- Disruptive technologies can potentially erode the foundation of ‘Deterrence Theory’, thereby undermining strategic stability through their effect on nuclear second-strike capability, C4I2SR and force postures.
- Such technologies can contribute to accidental or inadvertent nuclear escalation by threatening dual-use C2 assets in space and cyber space or by squeezing decision time for policymakers as they may be forced to choose the nuclear use option under the false belief of an adversary’s imminent nuclear attack.

## Strategic Stability

- Today’s strategic environment is more complex and multifaceted than that of the Cold War.
- Dual nature of new technologies makes them difficult to regulate and build global norms to prevent their misuse. Their use for strategic purposes can blur the lines between conventional and strategic warfare - making future conflicts more complex and difficult to manage.
- While emerging technologies can change the character of warfare, conventional wars are unlikely to become obsolete. Neither will nuclear deterrence lose its salience.
- Disruptive technologies can incentivise states to engage in limited warfare without fearing the risk of major escalation.
- If modern technologies can neutralise the survivability of nuclear submarines, states would be disincentivised to invest in developing and maintaining second-strike capability that was no longer ‘assured.’
- India’s recently concluded agreements with the United States (Basic Exchange and Cooperation Agreement; and the Space Situational Awareness Agreement) are likely to further enhance India’s potential to monitor Pakistan’s strategic assets during crisis and improve its situational awareness and targeting strategy.

## Disruptive Technology and Air Power

- Drones are a part of air power evolution, but their current generation does have limitations of deployment in offensive roles.
- Airpower has become an instrument of choice available to leaders to achieve political, military objectives, but for it to remain lethal and viable in conflict, it needs a strategy that focuses on the importance of information warfare.
- To achieve a significant increase in military effectiveness, new technologies need to be integrated with an appropriate organisation, concept of operations, set of tactics, command and control systems and supporting infrastructure.
- Technology has impacted the character of war, not its nature, which remains intrinsically disruptive and destructive.

# PROPOSED WAY FORWARD

## Pakistan

- Pakistan needs to remain abreast with the current debates surrounding emerging technologies and be part of the movement calling for maintaining human control over disruptive technologies.
- It is vital for Pakistan to strengthen its civil and defence initiatives in the cyber and space domains while ensuring that all its national data is fully secure.
- Public-Private Partnerships are the only tried and tested model for reducing the costs of aerospace development and Pakistan needs to move in the same direction.

*To prepare for future warfare, the government needs to make long-term investments towards enhancing its human resource that specialises in cutting-edge scientific Research and Development so that it is in a better position to exploit the potential of emerging and disruptive technologies.*

- Pakistan should transform data collected from all over the globe as well as from the region into a system for informed decision-making. This is necessary to gain operational dominance without being overloaded with tremendous information.

## International Community

*From a global policy perspective, disruptive technologies need to be linked with disarmament. It is the only way that global standards of ethics can be brought into decision and policymaking loops.*

- The idea of retaining human control over disruptive technologies should cater to the interest of all. Human interests should take precedence over the interest of big powers.
- There is a need to (pre-emptively) ban autonomous nuclear-armed delivery systems.
- All states developing hypersonic weapons should be encouraged to keep their nuclear and conventional delivery vehicles separate.
- A moratorium on testing of anti-satellite systems needs to be pursued.
- States should agree not to target nuclear command and control systems.



## SUMMARY OF PROCEEDINGS

---

### Keynote Address: Disruptive Technologies: Risks and Opportunities

#### General Zubair Mehmood Hayat (Retd)

In his *Keynote Address*, General Zubair Mehmood Hayat (Retd) while highlighting the significance of the subject, which was both contemporary and futuristic, discussed the context, domains, effects, risks, and opportunities associated with disruptive technologies. He focused on four key points. One, all new technologies are 'disruptive' in nature. Therefore, there was nothing new, per se, in what were termed 'disruptive technologies.' Second, all technologies had always acted as catalysts for change. Therefore, emerging and disruptive technologies would also act as harbinger and catalyst of change. Third, disruptive technologies would help in the global reset that was already taking place and further accelerate its speed. Fourth, disruptive technologies were a new addition in the toolkit of policymakers.

***Disruptive technologies have a 360° radar and a 360° zone of influence as they are spread across all domains and spectrums.***

#### Political and Societal Impact of Disruptive Technologies

According to General Hayat, the greatest impact of disruptive technologies would be in the political domain as they would disturb the existing balance of power. Linked to that would be their effect on the social domain wherein society would be disrupted to such an extent that these technologies would extend an overarching influence on the political domain, and there, the great contestation with dialectics of will between powers, would overtake.

#### Military and Strategic Impact of Disruptive Technologies

Keeping in view the possibilities and probabilities opened up by disruptive technologies, they would also play a vital role in the military and strategic domain. They would also impact the financial, economic and environmental side in a significant manner.

General Hayat was of the view that AI was at the top of the spectrum of disruptive technologies. In his analysis, the idea of AI was new to humanity because previously the focus had remained on human intelligence – whose era was about to end – if it had not already ended. Other technologies like quantum computing, advanced materials, would also play their role in respective spectrums.

***As a military man, I understand how hypersonic missiles, some of which have already been developed and deployed by at least two nations if not three in the world, will impact strategic stability in the globe.***

The Keynote Speaker cautioned that in the military domain, all three traditional domains, i.e., land, naval and maritime, and air and aerospace, would be impacted, fundamentally changing the character of war. According to him, the tell-tale signs of this changing character of war could be seen in the Nagorno-Karabakh and Russia-Ukraine war. Apart from the three traditional military domains, the two emerging domains of cyber and space were of great significance and could overpower the traditional domains.

***It is in the field of cyber and space that disruptive technologies will have their premium shock and awe. Internet, which was once thought to have brought about a new world, would only act as a small component of the bigger cyber world – way beyond Earth and into future worlds.***

General Hayat admired and saluted the people who had put Pakistan in the space field in the 1960s since he saw space having vital importance. He hoped that one day Pakistan would become a space-faring nation. He further noted that in the strategic domain, disruptive technologies would increase strategic leverages and the greater and more diverse the toolkit, the stronger would be the possessor's strategic leverages. Such technologies would also increase strategic swath and strategic space for those who were using or could employ disruptive technologies by choice and as per their design, and therefore, in his view, they would impact the Time, Space and Relative Strength (TSR) matrix in the strategic domain.

***Pakistan, as a nuclear state, needs to closely look at these emerging trends, and it is heartening to know that respective individuals and organisations are cognizant of this and are working towards this end.***

### Risks and Opportunities

Listing the risks associated with disruptive technologies, General Hayat asserted that such technologies could create technical apartheid between nations that possessed them and those that did not. This, in turn, would impact national security and national sovereignty of countries significantly. Disruptive technologies had challenged Homo sapiens, as technologies like AI could threaten their very existence – if left unbridled.

***Disruptive technologies could create effects of disruption, paralysis, and critical imbalances.***

On the other hand, he also listed two strategic opportunities that disruptive technologies could bring:

1. Prove to be a game changer across the spectrum.
2. Provide asymmetrical advantage to a force that was less in number or had lower power potential as these technologies were low in cost and high in effects.

In the global construct, there was a need to link disruptive technologies with disarmament because that was the only way that global standards of ethics could be induced into the decision and policymaking loops. General Hayat stressed that the idea of retaining human control of disruptive technologies ought to cater to the interest of all. Human interests needed to be given priority over the interest of big powers. However, he expressed pessimism on that account. He identified data as the single most vital component of disruptive technologies and asserted that it was the core foundation upon which any disruptive technology would be based. Its availability, mining, scalability, and security would be fundamental in the future. This added a new dimension to national security and sovereignty, hence, data national sovereignty needed to be looked into seriously.

### Conclusion

General Hayat concluded that:

- Pakistan should harness disruptive technologies at a lightening pace and embrace these technologies as a catalyst for change. The country needed to particularly focus on cyber and space domains while keeping national data fully secured.
- It was important for Pakistan to observe emerging trends in the field of disruptive technologies, craft and implement a national policy to secure national security and sovereignty while synergising national efforts.
- Efforts should be made at the state-level to be a part of the debate and process of maintaining human control over disruptive technologies.

### Dr Rizwana Karim Abbasi

Dr Abbasi highlighted that, for more than 70 years, nuclear deterrence had stabilising effects between adversaries where neither side had an incentive to initiate a nuclear first strike. The world was experiencing the Fourth Industrial Revolution (4IR) in which a wave of new and transformative technologies were under development. 4IR was leading to new generation of smarter, cheaper and highly effective weapon systems. She posited that the world was entering a smarter precision era. New technologies have always had a transformative effect on warfare and military thinking.

***There is correlation between geopolitical settings and technological evolution which in turn undermines the tactical, operational, and strategic levels of warfare. Doctrines and strategies crafted and implemented in the previous decades are becoming obsolete.***

### Disruptive Technologies and Deterrence Theory

The speaker explained that new technologies were not the only factor undermining the doctrines, deterrence, and survivability of nuclear forces. Geopolitical settings and status-driven ambitions were forcing states to include disruptive technologies in their arsenals. All these new technologies, were disruptive in nature since they aimed at changing the status quo to their possessor's advantage once fielded in the battlefield. She highlighted that the existing bodies of literature suggested that these disruptive technologies could erode foundation of deterrence theory, thereby undermining nuclear strategic stability through its effect on nuclear second-strike capability, including C4I2SR and force postures.

Dr Abbasi further added that the impact of these technologies on nuclear domain correlated to the capacity of these technologies' operationalisation and understanding of force structure of the states against which these technologies were to be employed. Advances in technologies made nuclear forces more vulnerable, by providing confidence to the first mover, thereby increasing the risk of a disarming first strike in a crisis. Leaders fearing disarming first strikes were likely to decide in favour of using their nuclear weapons rather than losing them. New technologies could contribute to accidental or inadvertent nuclear escalation by threatening dual-use C2 assets in space and cyber space or by squeezing time for decisionmakers.

### Technologies undermining Strategic Stability

The speaker discussed those technologies that were undermining doctrinal strategies which included hypersonic weapons, drones, AI, space-based technologies and cyber technologies.

#### a) Hypersonic Weapons

The speaker referred to the two types of hypersonic weapons that were being produced: hypersonic glide vehicles and hypersonic cruise missile technology. The implications of both types were often cited as key challenges to nuclear stability. Hypersonic missiles could be nuclear-armed and could bypass an adversary's missile defence system. The sophisticated guidance system and high accuracy made hypersonic weapons potentially suitable for non-nuclear precision strikes and disarming first strikes. During a crisis, it would not be clear whether delivery systems were nuclear or conventionally armed, or what the intended target was, which in turn would affect operational strategies and the spirit of declared doctrines. Given the improved accuracy and target acquisition capabilities, the survivability of nuclear forces was becoming more challenging – eroding the effectiveness of nuclear deterrence.

#### b) Drones

Speaking on drones, Dr Abbasi explained that, if developed in quantities, drones could operate as swarms that could overwhelm adversary's military platform and targets. They could eventually have full

autonomy over engagement without human input. Armed drones and other weapons, with varying degree of autonomy, were being far more commonly used by high-tech militaries such as the United States, Russia, United Kingdom, Israel, and South Korea along with China, and had already become effective precision strike weapons and damage control instruments of the era, thereby compromising the notion of existing doctrines and concept of deterrence.

***A deadly drones' arms race is growing while regulators are lagging behind.***

**c) Artificial Intelligence**

Dr Abbasi, while discussing impact of AI and machine learning, argued that AI could be employed to rapidly sift through vast quantities of data. Thereby, improving intelligence, surveillance, and reconnaissance – making it easier to target adversary's forces. Different variants of AI and autonomy, in terms of function and sophistication, could be used right across the nuclear realm. However, there were limitations like users' lack of confidence in AI-produced information and its decision-making capability. AI and machine learning in military applications risked increasing nuclear instability due to blurred lines between the conventional and nuclear realm.

**d) Space-based Technologies**

Dr Abbasi shared that space-based technologies were going to impact nuclear settings as space weapon systems, sensors, defensive interceptors and diffusion of counter-space capabilities would make space an increasingly contested environment. Such technologies were effective for operationalisation of nuclear forces in terms of communication with C2 systems, target identification and acquisition, surveillance and intelligence gathering, and guidance for delivery systems and BMD systems. ISR capabilities were essential for nuclear weapon states to envision an effective first-strike against a nuclear adversary. Space based technologies were the most reliable means for real-time ISR data at locations where military tools were non-productive. However, she pointed out that their cost-effectiveness and wider availability was restricting progress on development of normative instruments of regulation. This was reflected in the impasse over Prevention of Arms Race in Outer Space (PAROS) at the Conference on Disarmament (CD) as the possessors were unwilling to discuss these issues.

**e) Cyber Technologies**

According to the speaker, the impact of cyber domain on nuclear issues was quite significant. In the nuclear realm, cyber challenges involved the risk of malicious actors intruding in the software, hardware, data networks and processes of computer systems that governed weapons, C2, communications, and warning systems as well as people and information that operated them. The vulnerability of a nuclear weapon system to hackers was a product of its reliance on digital software. Any intruder that wanted to compromise network-centric systems, data, and people, could use a range of different paths. In her view, the most difficult was direct attacks on weapons and C2 systems by gaining access to these highly protected networks to release malware. The supply chain of hardware and software, used across a nuclear enterprise, could also be targeted. Another risk would be interference with the data and information needed by these systems or human operators. Hence, this would have clear implications for signalling, communication and inadvertent escalation between nuclear-armed adversaries during a crisis.

**Conclusion**

In conclusion, Dr Abbasi asserted that existing concepts of deterrence, doctrines, and operational strategies were challenged by the technological evolution – creating an emerging grey area blurring lines between conventional and nuclear domains. A likelihood of less time for decision-making and a more complex information environment in which to operate, created new pathways to escalation, miscalculation, and entanglement, increasing the risk of nuclear use. She recommended that:

- Since technological developments and risks do not transpire in a political void, Confidence Building Measures (CBMs) across the nuclear spectrum were important.
- All states developing hypersonic weapons ought to be encouraged to keep nuclear and conventional delivery vehicles separated, distinguish clearly between tactical and strategic applications and, where possible, increase the time it took to launch them.
- An agreement was needed on the known deployment of hypersonic weapons, and a ban on autonomous nuclear-armed delivery systems. This could include working towards the moratorium on anti-satellite system testing.
- There was also a need for states to consider a moratorium on targeting nuclear command and control systems.
- Governance of AI and lethal autonomous weapons was also needed.
- professional and academics must educate policymakers on these technologies and the risks they posed. This would also involve engaging the private sector where many of the most important developments in AI and automation were taking place.

---

## Disruptive Technologies and Strategic Stability

### Dr Adil Sultan

#### Global Context

Providing an overview of the global context, Dr Sultan asserted that the strategic environment today was more complex and multifaceted in terms of political, security and technological developments than it was during the Cold War period. The evolving multipolar, or what could be best described as a non-polar world order, was being shaped by the growing influence of multinational corporations, and big tech companies were likely to define the future security outlook. This, he argued, would profoundly change international relations in the next 30 years. But while this prediction might take some time to materialise, the ongoing revolution had already altered collective orientation towards warfare. He pointed out that, most emerging technologies had been developed by commercial entities for use in everyday banking, health, communications, transport etc. Militaries had mainly adopted some of these to revolutionise and prepare for intelligent wars. He opined that, due to the dual nature of new technologies, it had become difficult to regulate and build global norms to prevent their misuse.

***There is an ongoing debate on the legality of use of emerging and disruptive technologies for military means under International Humanitarian Law (IHL), but without any consensus on the basic definitions and how these technologies could risk human lives.***

This, in his view, had become especially complex when their use might not necessarily lead to mass casualties.

According to the speaker, acquisition and integration of some emerging and disruptive technologies into conventional weapons had the potential to reduce the power differential between relatively smaller but technologically advanced countries, and the established major powers. He cautioned that, use of these technologies for strategic purposes might also blur the lines and firebreaks between conventional and strategic warfare, thus, making future conflicts more complex and difficult to manage.

#### Character of Disruptive Technologies

According to Dr Sultan, biotechnology could help prevent pandemics, but it could also spread pandemics, and gave the example of how a pangolin consumed in one part of the world led to the spread of COVID-19 and disruption of global supply chains. Developments in Quantum Science had led to unprecedented computational speed that could solve the hardest analytical problems - which reduced the time for decision-making. Advanced materials made today could be stronger, lighter, and

withstand extreme temperatures, and then used for carrying more payloads on missiles and spacecraft. AI was another enabling technology that could be used in automated decision-making. Development of hypersonic missiles drastically shortened flight time with their ability for extreme manoeuvring which made these penetrable in a highly defended air space environment.

#### Character of Future Warfare

The speaker further discussed that there were several other technologies that were transforming daily lives and, once incorporated into military use, could make future battlefields multidimensional and technologically integrated across the air, land, sea, and space domains. However, in his view while this could change the character of future warfare, it did not necessarily mean that conventional wars would become obsolete, or the salience of nuclear deterrence would reduce in the era of emerging technologies.

***The world has not yet experienced 'cyber-Hiroshima' or all-out AI guided 'robotic warfare' to fully comprehend the impact of disruptive technologies on strategic stability.***

Looking at the history of technological revolutions, he asserted that, there was a tendency to oversell new inventions and their potential to change the character of warfare. Most assumptions might eventually be proven wrong as some of these technologies might become obsolete even before they were tested. The fate of the others would be decided on the battlefield, dependent upon how different militaries were to employ them into their operations and reap the desired dividends. In the speaker's view, there was uncertainty surrounding the future of disruptive technologies. However, many countries had built their capacity in the field of cyber, AI, quantum computing, etc., to achieve 'information dominance' necessary to gain superiority in decision-making considered essential for the future of warfare.

***The desire to achieve information dominance has pushed the world towards an 'Information Arms Race' with more resources being diverted to build and modernise national technical means that can help access information, while the same is denied to others.***

#### Disruptive Technologies and Strategic Instability

Dr Sultan simplified the concept of strategic stability as 'absence of a major war' more desirable amongst nuclear weapon states where a conventional conflict could escalate to an all-out war with the possibility of nuclear use. The resultant stability at the strategic level, due to the existence of nuclear weapons, could also provide incentive for states to engage in a limited military conflict at the lower spectrum of warfare, which had been explained by social scientists as the 'Stability-Instability Paradox.'

***Some disruptive technologies employed for non-kinetic warfare could also provide additional incentive to states to engage in limited warfare without the fear of risk of a major escalation.***

Speaking on the issue of exploiting the 'Stability-Instability Paradox', Dr Sultan opined that such strategies were inherently dangerous, especially amongst nuclear-armed states. A conflict triggered by a sub-strategic offensive due to the employment of enabling technologies could quickly escalate to a nuclear conflict, thus, was difficult to predict and regulate. The potential wormhole escalation, as a consequence of unregulated use of disruptive technologies, could unfold across different domains and switch from one echelon of conflict to another. To deal with this complex threat, states would have to

develop capacity for integrated deterrence across the full spectrum of threats and potential wormholes, dependent upon their resources and nature of threat matrix.

#### Positive and Negative Impacts on Strategic Stability

According to Dr Sultan, disruptive technologies could have both positive and negative effects on strategic stability, crisis escalation, and crisis management. If AI and quantum sensors reduced the required time for decision-making, targeting, and delivery launch time, and led to quick escalation with a greater possibility of miscalculation, the advantage of compressed time for data analysis would also be available to the other side, allowing it more time for decision-making and responding with the most appropriate option. Similarly, if advanced sensing and surveillance radars helped improve the accuracy of long-range delivery vehicles; they could also be used to potentially detect nuclear-capable submarines, thus making these vulnerable to adversary's interdiction through precision long-range hypersonic and other conventional or nuclear weapons.

***A submarine-based second-strike capability is considered advantageous only if it remains undetectable. If modern technologies are able to neutralise this advantage, states would have little incentive to invest in developing and maintaining second-strike capability that was no longer invincible and did not provide the option of an 'assured second-strike'.***

#### Nuclear Entanglement

Dr Sultan highlighted that nuclear entanglement was a relatively new concern and could happen when one side used or threatened to use dual-capable or conventional delivery systems, or employed non-kinetic means to neutralise or degrade the adversary's nuclear forces or C2 infrastructure. For instance, if a state used a conventional hypersonic weapon or launched a cyber-attack against adversary's nuclear command and control centre or early warning systems, there was a likelihood that the defender might perceive such an attack as part of adversary's decapitating 'first-strike.' Thus, forcing it to respond with nuclear weapons to avoid 'use it or lose it' dilemma. To counter such a threat, and as part of its deterrence by denial strategy, the defender could also put its nuclear forces on a higher alert status and pre-delegate the launch authority. This would have the potential of miscalculation leading to an unauthorised use of nuclear weapons, and therefore, could adversely impact strategic stability.

#### Disruptive Technologies and Major Powers

On the role of major powers, Dr Sultan said that all major powers, including Russia, China and the US, were developing nuclear and non-nuclear capabilities as part of their cross-domain deterrence postures that could provide multiple options to deter potential adversaries from contemplating nuclear or non-nuclear counterforce operations that could otherwise lead to uncontrolled escalation. He explained that **Russia**, for instance, was concerned about the prospects of a non-nuclear regional conflict escalating to a nuclear one. To ensure that NATO or the US did not exploit its conventional vulnerabilities, Russia had adopted a nuclear posture that was labelled as 'escalate to de-escalate. Russia had retained the option to respond with nuclear weapons in case the US or NATO forces contemplated a disarming strike using non-nuclear high precision weapons, hypersonic boost glide weapons, or other disruptive technologies to target Russian offensive forces or its C2 infrastructure. Russia feared that NATO's conventional advantage, coupled with adequate missile defences in the region, made such a scenario plausible. Therefore, escalating a non-nuclear conflict to nuclear one, was the most suitable response option to prevent the other side from embarking on that kind of adventurism. President Putin's statements during the ongoing Ukrainian crisis on the possibility of nuclear use in case the US or NATO forces got directly involved in what Russia termed to be a regional conflict - reflected similar thinking.

On China, Dr Sultan pointed out that it was another major power wary of new technological developments that could impact its strategic thinking in the long run. China was the only country with an unconditional 'No First Use' nuclear policy and did not see emerging technologies contributing towards nuclear entanglement, as it struggled to maintain distinction between nuclear and non-nuclear

wars. He added that, according to some Chinese experts, the hype over disruptive technologies and its impact on strategic stability could be deliberate and intended to prevent China from pursuing some of the advance technologies for its legitimate military needs.

*Interestingly, China, itself is developing new offensive technologies, including anti-satellite capability. It has also tested the Fractional Orbital Bombardment System (FOBS) to evade US' fixed missile defence system. Such developments are being viewed by China's adversaries as destabilising and could encourage some of them to develop similar capabilities or consider launching a pre-emptive 'first strike' against China in a future crisis, to sufficiently degrade its offensive strategic forces.*

Dr Sultan stated that the **US** had not only invested in emerging technologies, but also declared that in case of a cyber-attack by its adversaries, it reserved the right to respond with nuclear weapons. This offensive posture, as a result of cyber and nuclear entanglement, was likely to complicate deterrence dynamics between major powers. The US was already spearheading the global competition in disruptive technologies, which included the capability to interfere with an adversary's C2 structure. The speaker shared a recent statement by its Head of Cyber Command that the US had carried out probing operations against Russia from the Ukrainian territory to map the former's network infrastructures and identify potential vulnerabilities. He highlighted that the US had also developed non-nuclear precision weapons that could be used to target adversary's nuclear C2 and delivery systems, which further heightened the possibility of miscalculation, forcing the other side to respond with nuclear escalation. Space domination was another area where the US had invested significant resources. It had developed the capability to interdict an adversary's space-based surveillance platforms. Such offensive capabilities could potentially increase the dangers of nuclear entanglement, which was not specific to great power' competition only but was also relevant to South Asia where India was operationalising its anti-satellite capability.

Discussing **India**, Dr Sultan cautioned that the country was in the process of developing hypersonic weapons that could be used for non-nuclear counterforce precision strikes. It had developed a missile defence shield, which included the acquisition of S-400 anti-missile system from Russia. He remarked that while these capabilities, once operationalised, did not provide fool proof protection against an adversary's retaliatory strike capability, but could incentivise the Indian decision-makers to contemplate a pre-emptive 'First Strike.' India could also use this capability as a coercive strategy and prevent Pakistan from early deployment of short-range missiles, in response to India's evolved doctrine of fighting a limited war under a nuclear overhang. After the conclusion of four foundational agreements with the US, India's spatial orientation had received a significant boost. The Basic Exchange and Cooperation Agreement (BECA) that the two sides had signed, provided India access to US space-based assets. The recently concluded Space Situational Awareness Agreement (SSAA) was likely to further enhance India's potential to monitor Pakistan's strategic assets during crisis and improve India's situational awareness and targeting strategy.

### Conclusion

Dr Sultan concluded that technology was evolving at a very fast pace, making it difficult for technologically dependent countries like Pakistan to remain abreast with the new developments and explore their utility for the military purposes. Due to relatively weak Research and Development infrastructure and disconnect between various national stakeholders, existing developments in emerging and disruptive technologies were not being optimally utilised for national development needs and for military purposes. He stressed that Pakistan faced serious internal and external challenges that were likely to be compounded with the introduction of destabilising technologies and military doctrines by its adversary. However, despite the challenges, its conventional and nuclear deterrence remained credible as of now. He recommended that, to meet the future challenges:



- Pakistan needed to review its Full-Spectrum Deterrence (FSD) posture to deal with all possible threats from land, air, sea, or space. To meet such an ambitious deterrence posture, Pakistan would need significant resources, which might be difficult to spare in the near future, but the objective could be achieved by bringing synergy in the existing efforts and prioritising national needs.
- There is need to increase collaboration between the defence and academia. The US Department of Defense (DoD) had an ongoing programme, called SMART (Science, Mathematics and Research for Transformation). Under the programme, the DoD funded undergraduate and graduate students who had the aptitude to become digital and keyboard warriors. These people were then offered jobs in relevant labs to work on emerging and disruptive technologies. If Pakistan planned to prepare for the future warfare, it needed to consider similar initiatives and make long term investment in building human resource that specialised in the field and was in a better position to exploit the potential of emerging and disruptive technologies for socioeconomic development and military purposes.

---

### Impact of Disruptive Technologies on Future Wars in South Asia

#### Air Vice Marshal Faaiz Amir (Retd)

Air Vice Marshal Amir shed light on the geopolitical environment and said that the topic 'Impact of Disruptive Technologies on Future Wars in South Asia' needed a new focus given the fact that the strongest military power in South Asia was not an Asian power rather, with its fleets and bases in the region, it was American power. He underscored that the US-India strategic partnership, underpinned by their three bilateral military agreements (LEMOA, COMCASA and BECA) made the US a party to all conflicts in the region.

***US' technological and material assistance to India – whether logistical, secure communications, or geospatial services – will impact any war in South Asia. In the future, South Asia could see a similar extension of the US' support to India that is being extended to Ukraine.***

Since a future war could occur between India and China, this made the latter a serious stakeholder in South Asia – a region already overcrowded due to converging and competing interests of three major powers.

#### Impact of Disruptive Technologies on Pakistan

The speaker added that in the age of the Internet, Pakistan was in a perpetual state of war since actual war in many ways was about information dominance. But, also pointed out that no technology had or would continue to shape war in South Asia as did the existence of nuclear arsenals.

***Pakistan's relations with both India and the US are shaped by its nuclear capability.***

He was convinced that the convergence between technologies made them potentially more disruptive. Convergence between AI and robotics created Lethal Autonomous Weapons (LAWS), convergence between AI, Big Data, cyber security and electronic warfare were shaping wars as was evident in the war in Ukraine. Quoting a New America Foundation study, Air Vice Marshal Amir asserted that technological drivers of warfare had erased the boundaries between war and peace, military and civilian, public and private, and national and international. These blurred lines had given rise to grey

zones which entailed coercive statecraft activities that remained below the threshold of a formal declared war. Grey zone campaigns were cumulative and could cause targets to lose without fighting. The range of grey zone activities involved coercive economic actions, cyber-attacks, disinformation campaigns, assassinations, and other influence operations such as support for insurgencies in the target country. He also referred to deep-fake technology which was used on social media to amplify messages or narratives to foment discord and confusion in the target audience.

***Grey zone activities are considered to be more pronounced and effective in large urban centres where people live in slum-like areas and youth can be easily radicalised. Pakistan has over a 100 cities with a population of more than 100, 000 and two mega cities with populations over ten million people. Pakistan is in the midst of one such comprehensive campaign that includes economic pressure, external support for subversive activities by non-state actors, generation of false news reports to influence public discourse, erode public trust and blackmail government officials.***

## Disruptive Technologies and the War in Ukraine

### a) Cyber Warfare

Air Vice Marshal Amir remarked that cyber warfare had emerged as a key enabler in the Ukraine war and included neutralisation of command and control centres in the field, network disruptions, website hacking and intense jamming of GPS of Ukrainian drones used for locating Russian troops and tanks to direct artillery fire. Russia also moved its heavy jamming equipment, close to the battlefield in Donbas region and was shaping the war by disrupting C2 of Ukrainian forces. These measures were used along with conventional forces (tanks, cruise missiles and air power) to force its way through Ukrainian defences. Ukraine claimed to have stalled Russian offences through NATO supplied intelligence, Javelin anti-tank missiles and Stinger missiles.

### b) Satellites

The speaker opined that the greatest help to Ukraine had come from commercial satellites. Amateur civilians used commercial satellite imagery, open-source intelligence and various apps to create a virtual network – linking social media, smartphones and drones to coordinate intelligence over Russian military manoeuvres with Ukrainian forces. Elon Musk's Starlink, with more than 2200 satellites in low orbit, provided broadband internet for communication networks which Russians were finding hard to jam. Additionally, NATO satellites and surveillance aircraft helped in keeping vigil on Russian forces.

***It is widely believed that private satellites are transforming the character of modern conflict. Extensive use of space has become crucial to modern warfare and no military should expect to win a battle without support from space.***

### c) Drones

About drones, the Air Vice Marshal was of the view that they were being used to capture enormous datasets for analysis by AI and subsequently used for precision targeting. He gave the example of how drones were also shaping the perception of war by recording and sharing videos of Russian losses as well as Ukraine's civilian casualties during the war.

***Drones have emerged as a war-enabling rather than war-winning technology. The current generation of drones remain vulnerable to electronic warfare and air defence systems and, therefore, are unlikely to shift operational balance towards the offensive side. Drones were also unlikely to offset existing military asymmetries because they require support from expensive and complex military assets as well as highly trained personnel.***

## Disruptive Technologies in the India-Pakistan Context

### a) Drones

The speaker claimed that in the India-Pakistan context, the use of drones in missions was almost similar to Ukraine where they were used in missions for data collection, reconnaissance, directing artillery fire and making videos to shape public perceptions. Additionally, drones could also be used against tanks and air defence assets in spoofing, jamming and kill roles. He cautioned that small commercial drones, in the hands of non-state actors, could create huge problems for military planners, personnel and installations.

### b) Cyber Warfare

***Cyber warfare could emerge as a greater threat to Pakistan, both in peace and war. The Indian advantage resides in its successful procurement of American, Israeli, and Russian equipment.***

The Indo-US agreement, BECA, enabled supply of high-end equipment and real-time intelligence and information to India. Similarly, Russia was likely to make its electronic and cyber warfare equipment available to India following the latter's stance on the war in Ukraine. The speaker cautioned that Pakistan could face Denial-of-Service attacks at one or more of the undersea fibre optic cables which would highly undermine the functionality of its computer systems. This could be followed by a more massive, far-reaching and invasive cyber-attack.

### c) Hypersonic Weapons

Speaking on hypersonic weapon systems, Air Vice Marshal Amir underlined that since BrahMos would have the ability to defeat advanced air and missile defence systems, it would grant certain advantage to India. The speaker highlighted that BrahMos – with a speed of Mach 2.8 – did not qualify as hypersonic weapon but it remained a threat to Pakistani ships and deep targets in land. BrahMos-II, with a claimed speed of Mach 8, is expected to be test-fired in 2024. There were no indications that it would have strategic warheads. However, many analysts feared that BrahMos' short flight time and its unpredictable flight path would heighten the risk of miscalculation or unintended escalation in the event of a conflict. On whether India would employ BrahMos in a pre-emptive decapitating strike – having abandoned the No First Use (NFU) policy, the speaker was of the view that this was highly unlikely but remained an option in India's bag of tricks.

### Importance of Airpower

Discussing the role of airpower, Air Vice Marshal Amir noted that it would continue to play an important role while also providing support to land and sea forces. Pakistan needed to understand the changing political and technological environment in which air power would be employed. To achieve a significant increase in military effectiveness, any new technology needed to be married to an appropriate organisation, concept of operations, set of tactics, command and control systems and supporting infrastructure.

## Conclusion

Air Vice Marshal Amir concluded that:

- It was imperative for Pakistan to transform data collected from all over the globe as well as from the region into a system for informed decision-making. This was necessary to gain operational dominance without being overloaded with tremendous information.
- Airpower had become a weapon of choice, but for it to remain lethal and viable in a conflict, it needs a strategy focused on the importance of information warfare.
- Technology had impacted the character of war and not its nature which remained intrinsically disruptive and destructive.

---

## CONCLUDING REMARKS

### Air Marshal Farhat Hussain Khan (Retd)

President CASS, Air Marshal Farhat Hussain Khan (Retd), in his *Concluding Remarks*, thanked the speakers for their in-depth analysis of emerging technologies, especially their impact on Pakistan's national security, defence and development. In his comments, he focused on impacts related to Pakistan Air Force (PAF), cost of technologies, and the shape and future of the PAF.

### Public-Private Partnerships (PPPs) Model

President CASS acknowledged the fact that technologies related to Air Power were not only expensive but also challenging to acquire. Therefore, indigenisation through Public-Private Partnerships (PPPs) and linking academia with industry was the way forward. He briefed that work was being done in all three military domains and indigenisation was being pursued in the public sector.

### ***CASS proposes the model of Public-Private Partnership for development of technologies.***

He shared that the PAF had taken steps in this direction by setting up a campus of the Air University, close to industry in Karma; and the National Aerospace Science and Technology Park (NASTP) where the private sector was being incentivised to invest. To further reduce costs, he suggested that industry may engage in exporting its products. This approach would help in reducing the cost of emerging and other technologies.

### Future of the PAF in an Era of Disruptive Technologies

He shared that CASS had undertaken research to analyse the drivers of PAF's force goals and its prospective force structure components and quality for the next decade. The PAF leadership was fully cognizant of its future role as an 'Aerospace Power' and the nation's expectations and requirements.

### Decision-Making Loop

President CASS also explained the concept of the OODA (Observe, Orient, Decide and Act) Loop instrumental in determining application of force. Both AI and cyberspace helped in shrinking the OODA Loop and he gave the example of the Russia-Ukraine war, where Russia had attacked the social sector of Ukraine through cyber-attacks and denied the use of ATMs to the whole nation. He concluded that airpower, with the integration of disruptive technologies, was the instrument now available to political-military leadership to achieve their respective objectives with speed and surprise.

In the end, Air Marshal Khan again thanked the panel, audience, and the CASS team for making the seminar a success.

## ANNEXURES

---

### Profiles of Speakers

#### Session Chair:



**Air Marshal Farhat Hussain Khan, HI (M), SBt (Retd),  
President, Centre for Aerospace & Security Studies (CASS),  
Islamabad & Former Vice Chief of the Air Staff, Pakistan Air  
Force**

Air Marshal Farhat Hussain Khan (Retd) is President, Centre for Aerospace & Security Studies. He has rich experience in aviation and industrial management, diplomacy, and negotiations. During his service, he remained on various important command and staff appointments, including Vice Chief of the Air Staff and Chairman Pakistan Aeronautical Complex Board. He has also served as Pakistan's Air Attaché in New Delhi, India. He is the co-author of two books 'The Aviation City' and 'Milestones' about the growth of military aviation industry in Pakistan and its way forward.

#### Keynote Speaker:



**General Zubair Mahmood Hayat, NI (M) (Retd), Former  
Chairman Joint Chiefs of Staff Committee**

Commissioned in 1976, General Zubair Mahmood Hayat has had a decorated military career that spans over four decades. He is a graduate of Fort Sill Oklahoma (USA), Command and Staff College, Camberley (United Kingdom) and National Defence University (Pakistan). He has two Masters Degrees in War Studies and Military Science. He is also a recipient of 'Humanities Gold Medal', 'Master Gunner Award', and 'Master War Fighter Award'. During his service, the General has commanded an Infantry Division and Corps. His key staff appointments included Army & Air Adviser (United Kingdom); Chief of Staff of a Strike Corps; Private Secretary to Chief of Army Staff; Director General Staff Duties at General Headquarters; Director General Strategic Plans Division (responsible for Pakistan's Nuclear Programme); and Chief of General Staff, Pakistan Army. In November 2016, the General took over as the 16<sup>th</sup> Chairman Joint Chiefs of Staff Committee. He is also the 3<sup>rd</sup> Col-in-Chief of Regiment of Artillery. In November 2019, he hung his uniform after 43 years of military service. The General continues to give lectures on geostrategic and nuclear matters as well as issues pertaining to defence and security in foreign military institutions and think tanks.

#### Speakers:



**Dr Rizwana Karim Abbasi, Associate Professor, National  
University of Modern Languages (NUML), Pakistan**

Dr Rizwana Karim Abbasi is presently serving as Associate Professor at the National University of Modern Languages (NUML). Previously, she was serving as Associate Professor in the School of Humanities and Social Sciences in Bahria University, as well as in National Defence University, Pakistan. Dr Abbasi is a fellow of East West Institute since May 2018. She received her PhD from the University of Leicester, UK, specialising in International Security and Nuclear Non-proliferation. She was also a post-doctoral research fellow and

has taught at University of Leicester. She is also a graduate of the Daniel K. Inouye Asia-Pacific Center for Security Studies, Hawaii. She is the author of 'Pakistan and the New Nuclear Taboo: Regional Deterrence and the International Arms Control Regime.'



**Dr Adil Sultan, Acting Dean Faculty of Aerospace and Strategic Studies (FASS), Air University, Pakistan**

Dr Adil Sultan is Acting Dean Faculty of Aerospace and Strategic Studies (FASS) and Chair Department of Strategic Studies (DSS) at the Air University in Pakistan. Earlier, he served as a Director at CASS and a Visiting Research Fellow at Centre for Science and Security Studies (CSSS), King's College London. He had also been a Visiting Fellow at the International Institute for Strategic Studies (IISS), London in 2015 and a Visiting Fellow at the Henry L. Stimson Centre, Washington, D.C. in 2006. Dr Sultan has served Pakistan Air Force for 31 years and at the Strategic Plans Division (SPD) for over 14 years, where he dealt

with arms control and nonproliferation related issues. During his tenure at the SPD, Dr Sultan served as Director Arms Control and Disarmament Affairs (ACDA) and Director Research and Analysis at the Policy, Doctrine and Strategy (PDS) branch of the SPD.



**Air Vice Marshal Faaiz Amir, HI (M), SBt (Retd), Former Vice Chancellor, Air University, Pakistan**

Air Vice Marshal (Retd) Faaiz Amir is former Vice Chancellor of Air University and earlier served in the Pakistan Air Force (PAF) for over 35 years. He is a graduate of PAF Air War College and National Defence University (Pakistan). He has had a distinguished career in the PAF and commanded the prestigious Combat Commanders School (PAF), an operational base of PAF's Northern Air Command. He also served as commandant of the National Security College of National Defence University.

Moderator:



**Air Marshal M. Ashfaq Arain, HI (M), SBt (Retd), Advisor to the Chief of Air Staff on CASS Affairs**

Air Marshal M. Ashfaq Arain is Advisor to the Chief of Air Staff, PAF on CASS Affairs at CASS, Islamabad, Pakistan. He is a graduate of Combat Commanders' School, PAF Air War College and National Defence University. He holds a Master's Degree in Defence & Strategic Studies from Air War College (AWC) and a Master's Degree in War Studies from National Defence University (NDU), Islamabad. In his 41 years of illustrious career as a fighter pilot with Pakistan Air force, the Air Marshal flew various top of the line fighter aircraft with a singular honour of being first PAF pilot to achieve 2000 hours on the F-16 aircraft. During his career, he has

served in senior command and staff assignments including command of a fighter squadron, an operational base, Air Adviser Pakistan's High Commission in New Delhi, Chief Project director Horizon, Assistant Chief of the Air Staff (Operations), Assistant Chief of the Air Staff (Plans), Director General Air Force Strategic Command (AFSC), Director General Projects, and Deputy Chief of the Air Staff (Administration). His areas of expertise include Emerging Technologies. The Air Marshal has been awarded Tamgha-i-Imtiaz (Military), Sitara-i-Imtiaz (Military), Hilal-i-Imtiaz (Military) and Sitara-i-Basalat.



***Pakistan needs to harness emerging technologies to strengthen national security and national sovereignty.***

This was the key message of former senior military officers and eminent intellectuals at the seminar on **‘Disruptive Technologies – Impact on Future Warfare’** organised by the Centre for Aerospace & Security Studies (CASS) in Islamabad.

General Zubair Mehmood Hayat (Retd), Former Chairman Joint Chiefs of Staff Committee was the Keynote Speaker, while other eminent speakers included Dr Rizwana Karim Abbasi, Associate Professor, National University of Modern Languages (NUML); Dr Adil Sultan, Acting Dean, Faculty of Aerospace and Strategic Studies (FASS), Air University; and Air Vice Marshal Faaiz Amir (Retd), Former Vice Chancellor, Air University. The seminar was chaired by President CASS Air Marshal Farhat Hussain Khan (Retd), while Air Marshal M Ashfaq Arain (Retd), Advisor to Chief of the Air Staff on CASS Affairs moderated the proceedings.

**Air Marshal M. Ashfaq Arain (Retd)**, while delivering the *Opening Remarks*, highlighted that new technologies offered enormous opportunities for civilian as well as defence sectors, but also presented new vulnerabilities and security challenges. While analysing the role of state actors and non-state actors, he cautioned that the latter had greater prospects of exploiting many of the easily accessible technologies in inventive and disruptive ways. They also provided opportunities to smaller states to offset military asymmetry. He further noted that in the endeavour to stay ahead, rapid technological advancements had resulted in increasingly intense technological competition and rivalry between states. Looking at the impact of these changes on Pakistan, he urged that it was important to stay abreast of such technological advancements and how they would affect military doctrines and strategy in the future. This was especially important in case of nuclear-armed adversaries with unresolved disputes, mutual distrust, and shared borders, significantly reducing reaction time, he said.

In his *Keynote Address*, **General Zubair Mehmood Hayat** outlined how disruptive technologies had now become a new toolkit in the hands of policymakers and in his assessment, their greatest impact would be in the political domain as they would disturb the existing balance of power. He explained that such technologies would not only impact the military but also the economy significantly. On the military side, all three traditional domains would be impacted to the extent that the character of the war was likely to be changed fundamentally, the General said. He warned how Artificial Intelligence, if left unbridled, could threaten the very existence of mankind. General Hayat recommended that as a nation, Pakistan needed to be part of the debate and process to ensure human control over these technologies. 'Disruptive technology is likely to create technical apartheid. We, therefore, need to harness it as a catalyst of change to strengthen our national security and national sovereignty,' he concluded.

**Dr Rizwana Karim Abbasi** underlined that disruptive technologies could erode the foundation of 'Deterrence Theory', thereby undermining nuclear strategic stability through its effect on nuclear second-strike capability, including C4I2SR and force postures. In her assessment, new technologies could contribute to accidental or inadvertent nuclear escalation by threatening dual use of C2 assets in space and cyber space by squeezing the reaction time of decisionmakers. She stressed that Confidence Building Measures across the nuclear spectrum were important, and urged that states developing hypersonic weapons should be encouraged to keep their nuclear and conventional delivery vehicles separate, distinguish clearly between tactical and strategic applications and increase the time to launch them where possible. Dr Abbasi also recommended that an international agreement on the known deployment of hypersonic weapons and ban on autonomous nuclear-armed delivery systems as well a moratorium on targeting nuclear command and control systems, was a need of the hour.

While analysing the defence and security dimensions of specific disruptive technologies, **Air Vice Marshal Faaiz Amir (Retd)** highlighted that extensive use of space, using satellites, had become crucial to modern warfare and 'no nation should expect to win a battle without support from space.' However, when it comes to the use of drones, he remarked that while they were part of the evolution of airpower, their current generation remained vulnerable to electronic warfare and air defence systems and therefore, were unlikely to shift the operational balance towards the offensive side. The speaker cautioned that cyber warfare could emerge as a greater threat to Pakistan, both in peace and war due to the Indian advantage which resides in her access to American, Israeli and Russian equipment and technologies.





**Dr Adil Sultan** was of the view that there was a tendency to oversell new inventions and their potential to change the character of warfare. However, he also pointed out that some disruptive technologies could be employed for non-kinetic warfare and provide additional incentive for states to engage in limited warfare without risking a major escalation. He pointed out that technology was evolving at a very fast pace, it difficult for technologically dependent countries like Pakistan. He expressed disappointment that due to a relatively weak Research and Development infrastructure and disconnect between various national stakeholders, developments in emerging technologies were not being optimally utilised for national development needs nor military purposes.

While delivering the *Concluding Remarks*, **Air Marshal Farhat Hussain Khan (Retd)** thanked the speakers for their in-depth analysis of emerging technologies, especially their impact on Pakistan's national security, defence and development. He shared that air power, with the integration of disruptive technologies, had now become an instrument available to political-military leadership, especially for adversarial countries, to achieve their politico-military objectives with speed. President CASS recommended that in order to catch up with the rest of the world in the technological domain, Pakistan needed to strengthen and enhance Public-Private Partnerships in this area as well as build industry-academia linkages.

The seminar was attended by a large number of diplomats, senior military officers, heads of various think tanks, scholars, journalists and students, who actively participated in the interactive question and answer session.



**CENTRE for AEROSPACE & SECURITY STUDIES (CASS)**

Old Airport Road,  
Islamabad, Pakistan

Tel: +92 051 5405011

Institutional URL: <https://casstt.com/>

Twitter: @CassThinkers

Facebook: cass.thinkers

LinkedIn: Centre for Aerospace & Security Studies

Instagram: casstinkers

YouTube: Centre for Aerospace & Security Studies

Email: [cass.thinkers@gmail.com](mailto:cass.thinkers@gmail.com)