



**INSTITUTE OF
STRATEGIC STUDIES**

web: www.issi.org.pk
phone: +92-51-9204423, 24
fax: +92-51-9204658

Report – Seminar

“Emerging Technologies and their Impact on Strategic Stability in South Asia”

March 12, 2020



Rapporteur: Ghazala Yasmin Jalil

Edited by: Najam Rafique

The Institute of Strategic Studies, Islamabad's (ISSI) Arms Control and Disarmament Centre (ACDC) hosted a Seminar on "*Emerging Technologies and their Impact on Strategic Stability in South Asia*" on March 12, 2020. Professor Dr. Atta-ur-Rahman, Patron-in-Chief, International Centre for Chemical and Biological Sciences, University of Karachi was the Chief Guest at the Inaugural Session.

Major General Ausaf Ali (Retd), Advisor, Strategic Plans Division chaired the Working Session, with presentations by Ms. Aamna Rafiq, Research Associate, ACDC-ISSI, Dr. Adil Sultan, Director, Nuclear and Strategic Current Affairs, Center for Aerospace and Security Studies (CASS), and Mr. Husham Ahmed Cheema, Director Arms Control and Disarmament Division, Ministry of Foreign Affairs.

INAUGURAL SESSION

Introductory Remarks - Malik Qasim Mustafa, Director ACDC-ISSI

Introducing the subject of the Seminar, Malik Qasim said that technology is a "fundamental agent of change," which is not only changing our day-to-day life, but has the potential to transform our future. In this domain, the term "emerging technology" is gaining much attention. In simplistic terms "emerging technology" refers to the emergence of new technology or the continuing development of existing technology, with a significant impact on a single or across all domains. For example, Internet of Things, Artificial Intelligence, 3D printing, drones, autonomous weapon systems, robotics and hypersonic missiles are considered among some of the top emerging technologies. However, it is important to note that access to such technologies, their application and realization of their true potential, sometimes create complex challenges.

He stressed that in the security domain, military modernization programs are a major driver of world-changing technological innovations which are not only advancing rapidly, but are impacting weaponry, military operations, wartime preparations and defense budget priorities. States are utilizing emerging technologies for military superiority and battlefield dominance, which is already altering the "balance of power" and fuelling-up new regional and global arms races. He said that the 2018 US National Defense Strategy clearly outlines that new technologies

like ‘big data’ analytics, artificial intelligence, autonomy, robotics, directed energy, hypersonic and biotechnology are the very technologies that ensure that the US will be able to fight and win the wars of the future. Consequently, new regional and global “Strategic Competitions” are evolving. States are investing heavily on the development of new advanced conventional and nuclear weapons and their ultimate delivery systems. They are even developing and deploying lethal autonomous technologies in outer space.

South Asia, he said, is not an exception to this trend. In this region, India is in a relentless race to catch up with other global powers in the development of emerging technologies. It is pursuing an ambitious military modernization program ostensibly to elevate its status as a major global and regional power. In its *2017 Joint Doctrine of Armed Forces* and the *2018 Land Warfare Doctrine*, India has already made it clear that “defense technology is an important strategic resource”. In 2018, India launched its *National Strategy for Artificial Intelligence and Innovations for Defense Excellence (iDex)* initiative. In addition to anti-satellite capability, it has also started research and development of next generation hypersonic missiles. Such technological advancements are likely to affect deterrence stability in South Asia, encourage arms racing tendencies and enable India to adopt a more aggressive posture. Therefore, it is important to look at how India’s pursuit of emerging technologies in the military domain would impact the strategic stability in South Asia.

He stressed that with this background, there is a need to explore key policy-relevant options for Pakistan to maintain strategic stability by maintaining a Minimum Credible Deterrence.

The premise of the Seminar he said, was to:

- Understand the evolving concept and explore the key characteristics of emerging technologies.
- Analyse its potential impact on the strategic stability in South Asia.
- Bring together the national strategic community for policy discourse to help formulate policy-relevant recommendations.

Welcome Remarks - Ambassador Aizaz Ahmad Chaudhry, Director General, ISSI

Welcoming Dr. Atta-ur-Rahman, speakers and guests, Ambassador Aizaz said that with every new century, we see new technologies emerging. These have had significant impact as tools of warfare. We saw this in 20th century in the form of invention of airplanes which were later used in wars. Thus, weaponization of technologies lead to death and destruction. At the same time, he noted that framework of rules and regulations are also made to regulate technologies. He expressed concern that while the 21st century has seen unprecedented technological advancements, structures of international rule-making are not keeping pace with it. Arms control regimes are collapsing. International rule-making is either not there or suffering set back due to unilateralism. International environment is characterized by breakdown of arms control, new arms races, and development of a range of new weapons.

He said that India's military modernization is going ahead at a fast pace. Indian military chief is looking for actions under the threshold of all-out war with short, intense, escalatory cycles of action. Consequently, there is hostile rhetoric coming from India. Pakistan recognizes creative and destructive potential of the emerging technologies, and needs to understand and make wise policy choices for maintaining strategic stability in the region.

Keynote Address - Professor Dr. Atta-ur-Rahman

Dr. Atta-ur-Rahman said that "We live in a world where knowledge has become the key driver of socio-economic development. Those countries that have realized that their real wealth lies in their children through education, science and through innovation, through unleashing the creative potential that lies within, are the ones marching forward leaving others behind."

Saying that technology has become the driver of advancement, he estimated the impact of emerging technologies at \$100 trillion by 2025. He said that the estimated impact of Artificial Intelligence related industry alone will be \$13.6 trillion by 2025. Keeping this in view, he emphasized the need to develop knowledge economy for a country like Pakistan that lags behind in technological developments. This essentially means that there is the need to educate the coming generations to bring Pakistan up to speed with the technological race. In order to do so,

he said that three task forces have been created by the present government which are working on projects worth Rs. 132 billion.

He gave the example of Singapore which is a small country but has a large economy based on manufacture and export of high technology products. He said that hi-tech manufacturing export has overtaken all world exports. Pakistan also needs to diversify its exports and break out of traditional exports of textiles, agricultural products and sports goods.

He also gave the example of China and how it built its knowledge economy which has today become the driver of its economy and technological advancements. He said that starting at the end of 1970s, China sent thousands of people abroad to study. It continues to do so. In 2019, it send nearly 600,000 people abroad to study. These people and scientists have come back to China and have contributed to extraordinary development of high technology.

While he touched upon the military applications of emerging technologies, the thrust of his address was on its vast non-military applications. He talked about the power of technological advancement in such diverse fields as taxation, agriculture, textiles, medicine, law, water resource management, and military. He elucidated on some of the fascinating developments taking place in materials engineering with military applications - including development of bulletproof material, invisible cloaking technology, stealth mosquitoes and flies and 3D printing. He also said a lot of work was being done on gene editing which is making changes in agriculture. It is now possible to grow crops using sea water and Provitamin rice is being developed to overcome Vitamin A deficiency. Varieties of fruit and vegetable are also being developed that will be available the whole year around. There is also work being done on slowing and reversing aging process. There is also 3D printing that is being used to create human organs. He said that the field of medicine was being transformed using stem cell technology. There are tremendous developments in neuroscience that are helping to restore partial eyesight to the blind and enabling the blind to drive as well.

In conclusion, he said that there is a tremendous potential for socio-economic development utilizing emerging technologies that Pakistan must tap into. It must develop its knowledge economy.

QUESTION & ANSWER SESSION

Q: Pakistan is heavily reliant on agriculture. Has the government taskforce made any steps to improve things in the field of agriculture?

A: Pakistan's agriculture yield is one third of India and many other countries. We do not even produce our own seeds. We import them from China mostly. Pakistan has started a project with China that will help produce hybrid and more efficient seeds. These will require very little water to grow.

Q/Comment: We have never focused on development of society. The perpetual focus on conflict and security has detracted us from human development. Pakistan has to get its priorities right and have to get out of India-centric security mindset. We have to focus on socio-economic development.

A: There is a tremendous potential for socio-economic development that Pakistan needs to catch up with.

Q: Knowledge needs to be made available to all schools and universities. Online databases are a treasure-trove of knowledge that was not available 10-15 years ago. Some schools and universities have adopted latest methods of learning.

A: There are massive online courses. Top US universities have online databases. HEC has organized video conferencing, and lectures from top professors in the world that our students are attending. There have been 4000 lectures delivered over the last 5 years. There are tremendous opportunities, overall a holistic approach is needed. Pakistan needs to revisit its education system, how we teach and learn.

Q: Universities like MIT and Harvard what is it that distinguishes them to produce graduates that stand apart. Is it the knowledge they impart, is it their teachers or their organizational culture? What can we learn from them? Regarding the Private sector, why we don't motivate them?

A: I agree that universities like Harvard do not just materially develop individuals. Their goal is to produce good humans who can think in terms of a holistic approach to issues and problems.

WORKING SESSION

The session was chaired by Major General Ausaf Ali (Retd), Advisor, Strategic Plans Division.

Briefing Paper on Understanding Emerging Technologies

Ms. Aamna Rafiq, *Research Associate, ACDC-ISSI*

Highlighting the immense military applications of emerging technologies, Ms. Aamna defined these as a set of radically developing, coherent, and novel technologies with the ability to produce prominent effects. These technologies not only have the potential to alter the institutional frameworks and set of stakeholders, but also the nature of interactions among them. The true potential of their impact remains ambiguous due to their manifestation in the near future.

She identified eight emerging military technologies including:

1. Artificial Intelligence (AI) and Autonomous Systems
2. Quantum Technology
3. Electromagnetic /Directed-energy Weapons
4. Advance Missile and Missile Defense Technologies
5. Space-based Technologies
6. Cyberspace and Information and Communication Technologies (ICTs)
7. Biotechnology and Advanced Chemicals
8. Material Technologies

She highlighted the military capabilities that emerging technologies offer in all eight domains. The domain of artificial intelligence has surveillance and reconnaissance (ISR) applications, application on military logistics and robotics, nuclear command and control system, BMDs and early warning systems, deep fakes, cyber operations, semi-autonomous /lethal autonomous

weapon systems (LAWS), and swarming drones. The domain of quantum technology has military application in advanced communication (interception and decrypt), quantum radar systems, “Transparent Ocean” .The field of electromagnetics includes solid, free-electron and fiber based short-range air defense (SHORAD), defense against Swarming, boost-phase missile interception, jamming communication systems and explosive devices. Advanced missile technologies have impacted Hypersonic Glide Vehicles (HGV), Hypersonic Cruise Missiles (HCM), Target Concealment/Ambiguity and increased maneuverability of re-entry vehicles.

She said that advancements in space technologies offer advanced ISR capabilities, anti-satellite capabilities, on-orbit servicing capabilities, Active Debris Removal Systems, and Space-based Laser Weapons.

The most important domain, she highlighted, is the cyberspace and ICTs which have application in cyber-attack on critical infrastructures like dams, electric grids, banking system, command and control, and nuclear power plants. It has implications for information warfare, psychological warfare, data theft and espionage. The field of biotechnology can create customized humans through low-cost Gene Editing. It has implications for biological and chemical weapons through bio-synthetic engineering by creating new genetic codes that does not exist in nature, by recreating extinct viruses, diseases and nerve agents.

In the domain of material technology, there is immense potential for nanomaterials for enhanced delivery of biological and chemical weapons and high energy explosives. While 3D Printing has immense potential for increased weapon production, components of missiles and engines, and for digitally designed warhead structures

Emerging technologies, thus have vast military application and can have great impact on global and regional strategic stability.

Impact of Military Technologies on Force Postures in South Asia

Dr. Adil Sultan, Director, Nuclear and Strategic Current Affairs, Center for Aerospace and Security Studies (CASS)

Dr. Adil said that technologies like ballistic missile defense, S-400 systems, hypersonic glide missile systems and anti-satellite weapons that India has been pursuing have an impact on force postures and deterrence stability in South Asia.

He said that nuclear weapons and military postures should ideally be geared to avoid war. However, due to new technologies, capabilities and doctrines, South Asian region remains in a state of elusive strategic stability. After 1998, nuclear deterrence became the core of Pakistan's security policy. He talked about India's Cold Start Doctrine (CSD) and how it affected Pakistan posture. India looked for limited war under Cold Start. While Pakistan introduced Tactical Nuclear Weapons (TNW) to counter CSD. He said that full spectrum deterrence posture of Pakistan is qualitative in nature and in line with its minimum deterrence posture. Once India realized it would be difficult to use strategic weapons, it introduced its own TNW. He talked about how TNW are viewed differently in India and Pakistan. Pakistan's TNW are to deter limited war incursions. While India's TNW are for limited war fighting strategy. Pakistan's TNW are thus defensive, while India's are offensive.

He said that Ballistic Missile Defense (BMD) systems are offensive in nature and destabilizing for deterrence. This is due to the short missile flight times in South Asia. Also, BMD could provide false sense of security to Indian decision makers thereby increasing instability and chances of conflicts turning into nuclear exchange.

He said that these new technologies are also emboldening India to pursue a counter-force posture against Pakistan and increased tendency towards surgical strikes like the one in Balakot in February 2019. He said that technology, thus, plays an important role in shaping military postures. Indian technological advancement have put compulsion on Pakistan to take measures to maintain integrity of deterrence and strategic stability.

Artificial Intelligence, Cyberspace and ICT and the Future of Security in South Asia

Husham Ahmed Cheema, *Director Arms Control and Disarmament Division, Ministry of Foreign*

Mr. Husham said that while technology itself is not bad, but the potential for its misuse is immense which is problematic. He said that this is where future discussion need to be focused

on. He emphasized that out of all the emerging technologies, cyber space is where there is the most potential for disruption and destruction. Cyber technology has the potential to undermine all spheres since all gadgets are connected with internet. Therefore, there is more vulnerability in cyber domain. There are a host of actors in this domain including governments, military, non-state actors and individuals. There is a greater incentive to use it in the military domain because cyber space is difficult to attribute to an actor. It also has a low cost of deployment.

Also, autonomy in weapons system is an issue of concern. He said that whether machines decide who to kill or not constitutes a huge moral issue that needs to be discussed at international fora. Taking humans out of loop would have immense implications for law of armed conflict. It would lower the threshold of conflict.

He said that it will be difficult to control spread of these emerging technologies. Old models of non-proliferation will not work in the 21st century with these emerging technologies because they cannot be limited. Therefore, new approaches are needed to control these emerging technologies.

He said that cooperative mechanisms are needed between states. In United Nations, there have been some discussions in the form of open-ended working groups. However, there are differences in approaches that states take. There are important questions on whether under international law UN article of self-defense will apply to cyber domain as well. These technologies lower the threshold of conflict and have low cost and low responsibility. These questions are being discussed on international foras. He said the domain of weaponization of technologies is a grey area at present and raises a number of questions such as: What are its implications? What are the regulations that will deal with it? What institutions will deal will it?

QUESTION AND ANSWERS SESSION

Q: In the domain of nuclear weapons, is it justified to call any weapon as tactical given its destructive potential?

A: I have different take on nuclear weapons. Nuclear technology is a stand-alone technology. No new technology has had such impact. No new technology can match its destructive potential. The hype of new technologies has an economic element, whereby, its producers wish to market

the technologies. The differentiation between strategic weapons and tactical one is that of potential signaling. Pakistan's tactical nuclear weapons are to deter Indian limited war.

Q: While not all emerging technologies have strategic implications, the emerging diversified threats need to be taken into account. Can we identify certain aspects that can be agreed regionally, if not globally. Like no cyber attack on adversary's installations?

A: India's approach vis-a-vis negotiating any kind of agreements is dismissive. They are not entertaining any overtures. So it is unlikely that any agreement or CBMs can be formulated.

Q: How much are major powers investing in emerging technologies and what are the lessons for Pakistan? Indian strategic posture is mostly directed towards Pakistan. In future, where is India likely to invest more in its nuclear triad. Will it be its force posture?

A: Asia is increasingly focusing and investing in emerging technologies. Knowledge-based economies are being developed. In this process the state is involved because it encourages private sector.

A: India's emerging posture is confused. It is heavily investing in outer space, in conventional capability so it can wage a conventional war under a nuclear threshold. India's political leadership sees it as way to project power. It is also investing in emerging technologies that have military applications. This is not a cause of worry for a country like China because it has more advanced capability than India in every field. But for Pakistan, it may be cause for worry.

Q/Comment: While we talk about strategic stability in South Asia, don't you think strategic instability exists? We have been fixated on security. The Indians have constantly kept us engaged in security issues. We have to see things holistically. We have to be economically strong. Societal issues are ignored at the cost of security. We are getting into a cycle that is undermining economy, education and societal development.

A: The onus of restoring strategic stability over the years has been on Pakistan because India does not want Pakistan's existence. But it is a compulsion for Pakistan. It is true that India is trying to drag us out. But our nuclear capability gives us a breather where we do not need to aim for parity. Yes, strategic stability has been elusive because India acquired nuclear weapons for

reasons of prestige and for projecting global power, while Pakistan's nuclear program is security driven.

Q/Comment: Military emerging technologies are most important in cyber domain which is a global common. It has to be governed by international regulations.

A: Emerging technologies will impact in so many domains. In United Nations, various approaches have been discussed including ban on offensive cyber use, for formulating binding rules and the need to regulate behavior of states. However, there has not been significant progress in that direction.

Remarks by Session Chair

Modern militaries are making use of robotics, cyber technologies, hypersonic missiles, which have implications for Pakistan's deterrence. Emerging technologies will revolutionize offensive and defensive arenas of warfare. They will give technologically superior state an edge in conduct of war. Emerging technologies have immense potential to disturb nuclear deterrence in the region and steps need to be taken to counter instability.

Concluding Remarks -Ambassador Khalid Mahmood, Chairman BOG, ISSI

Ambassador Khalid Mahmood talked about the destabilizing effects of emerging technologies. He said the erosion of the role of human beings as a result of emerging technologies in the conduct of war was disturbing. He also expressed concern over the erosion of the body of international law relating to war. He said that either existing international law needed to be improved on or new law devised in order to regulate the change brought about by new technologies in the realm of warfare.

PICTURES OF THE EVENT





