

Emerging Technologies for the Future Battlespaces in Japan and India

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Abstract:- The Battlespaces as we know are carried out using heavy ammunition and human resource. Enormous manpower is needed in the wars that are fought. The nations use this manpower and firepower to defend themselves in the case of emergencies.

Numerous rapidly advancing and emerging technology areas—including artificial intelligence (AI), unmanned systems, and directed-energy weapons—will likely affect how the nation uses the manpower and firepower for defense. In this Perspective, we discuss considerations for the Japanese Ministry of Defense (MOD) and the Indian Ministry of Defense as to how these nations are considering the possible investments in advancing and emerging technology areas to help the Defense Forces.

I. INTRODUCTION

Numerous rapidly advancing and emerging technology areas—including artificial intelligence (AI), unmanned systems, and direct-energy weapons will likely affect how the nations use the emerging technologies and replace the use of primitive war techniques [3]. The recent Russia-Ukraine conflict has demonstrated how technology may play a significant role in the new age wars. As Ukraine's manpower is not as strong enough as Russia's, the former used cutting-edge technology to its advantage [1]. Similarly, the Japanese Ministry of Defense and the Indian Ministry of Defense are considering the possible investments and breakthroughs that can be made in the advancing and emerging technology areas to help the Defense Forces. The Japanese government's Acquisition, Technology, and Logistics Agency (ALTA) are working together with Japan's Hitachi Global to develop systems based on AI that analyze data from Japanese ships at sea and a comparison is made with data from the satellites to determine suspect vessels [2].

A. Abbreviations and Acronyms

Table 1: Abbreviations

SerialNo.	Abbreviation	Full Form
1	AI	Artificial Intelligence
2	ML	Machine Learning
3	DAIC	Defense Artificial Intelligence Council
4	ALTA	Acquisition, Technology, and Logistics Agency
5	UAV	Unmanned Aerial Vehicles
6	CI	Counter Insurgency
7	R&D	Research and Development

a. Table of Abbreviations with their full forms

II. RECENT USE-EMERGING TECHNOLOGIES IN DEFENSE

A. Russia-Ukraine Conflict

The recent Russia-Ukraine conflict has demonstrated how technology may play a significant role in the new age wars. As Ukraine's manpower is not as strong enough as Russia's, the former used cutting-edge technology to its advantage [1].

B. Implementation Specifications

The implementation of AI by Ukraine was done using facial recognition software. Ukraine used facial recognition technology to identify Russian personnel killed in the war and informed their relatives. Ukraine also got access to Clearview AI's powerful facial search engine to check for the suspects at the checkpoint [1].

III. USE OF EMERGING TECHNOLOGIES-JAPAN

The Japanese government Acquisition, Technology and Logistics Agency (ALTA) is working together with Japan's Hitachi Global to develop systems based on AI that analyze data from Japanese ships at sea and a comparison is made with data from the satellites to determine suspect vessels [2].

The biggest research and scientific center of emerging technology in Japan is the National Institute of Industrial Science and Technology (NIST) [3].

B. Japan Ministry of Defence ATLA's Priorities

- **Cyber:** Cyber is one of the major priorities when implementing emerging technologies in defense.
- **Hyper-Velocity Missiles:** Hyper-Velocity Missiles are developed in two ways. They are either air launched with scramjet engines or are used as glide projectiles. Hyper-Velocity Missiles are also called Hyper-Sonic

Missiles and travel at the speed of Mach 5 and above and can serve as a major component in Defense.

C. UAV in Japan's Defense

According to ATLA, the concept study consists of [the] computational simulation of several AI-controlled UAVs and some pilot-in-the-loop simulation for teaming with these UAVs. The study could derive concepts for the functions, performance, and operational effectiveness of the planned UAV. The UAV is to coordinate with future manned aircraft such as Japan's sixth-generation F-X stealth fighter. According to ATLA, existing research on the subscale UAV model and AI will enable it to conduct the concept study on AI-controlled UAVs from fiscal year (FY) 2022.

D. Autonomous Aircraft in Japan's Defense

Some plans were announced by Japan's Defense Ministry in 2016 for ATLA's development of a surveillance drone, a fighter drone, and a missile defense drone to be in the air within the next two decades. These would be highly sophisticated unmanned aircraft capable of tracking and striking targets with minimal human intervention. In the meantime, Tokyo is awaiting delivery of three Northrop Grumman RQ-4 Global Hawk drones from the U.S. for military surveillance over the Senkaku Islands and elsewhere, as well as for monitoring natural disasters, according to its latest research. The Japanese Ministry of Defense has been researching a way to monitor unmanned vehicles and also for monitoring disasters.

IV. USE OF EMERGING TECHNOLOGIES-INDIA

The Indian Defense Establishment has developed a council known as the Defense Artificial Intelligence Council (DAIC) led by the Indian Ministry of Defense. The Indian Army has schemes underway on contemporary and emerging AI technologies. The Indian Defense is comprised of a wide range of scenarios where Autonomous Systems are deployed [6].

A. Swarm of Surveillance Drones

An AI-enabled surveillance drone as against manually plotted UAV. The UAVs can greatly boost the surveillance power of the military and help track down the targets easily. Such a system can also be called non-lethal but the Unmanned Aerial vehicles can be used in both the offensive and Defensive operations [4]. Unmanned Autonomous Aerial Vehicles can also be used in the prevention of casualties that can be caused by natural disasters.

B. Robot Soldiers in CI Operations

Robot Soldiers are in the process where they are being successfully deployed in critical operations, and hence a very high AI technology threshold would need to be breached. In addition to a more sophisticated "perceptual" ability to distinguish an enemy from a friendly population, qualities such as "empathy" and "ethical values" similar to humans would need to be built into such systems. As per one school of thought, such capability can never be achieved, while others project reaching such a technological "singularity" within this century.

Building systems that possess the values of empathy and ethical values can backfire during warfare.

C. Inception of AI in India's Defense

AI or Robotics technologies, today appear to be at an inception stage where there have been continuous developments that are being incorporated into several products and services in the commercial environment. It is only a matter of time before there are manifestations in the defense systems, in a way that is very significant in the development of a news agency. It has been absolutely clear in the Indian Ministry of Defense that, no matter what conventions are adopted by the United Nations, R&D will play a major role in the area of Artificial Intelligence without any hindrance.

V. CONCLUSION

There has been rapid development in the emerging technologies that can be used in the future of battlespaces. The Japanese Ministry of Defense and the Indian Ministry of Defense have been tremendously implementing the emerging technologies in their respective defensive systems. When it comes to defense it involves very critical operations and management. There have been rapid developments in Unmanned Autonomous Vehicles that do not require any human intervention. The UAVs help in the price target tracking and can also be used as preventive measures that can be taken in the prevention of casualties that are caused by natural disasters. Japanese Military may also involve the use of robots in the battlespaces. The robots though highly proficient may require to possess "ethical characteristics" and empathy to clearly distinguish between the enemy and friendly elements. But this can work as a disadvantage in the long run as the robot may acquire sentient values. Hence it is necessary to not only make the robot proficient but also be cautious enough so that emerging technology does not become a threat to humanity.

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