

Extended Commentary:
Ad Astra: The Future of Military Space Operations

The next ten years of U.S. Military advancements and operational capabilities are looking rather promising in the theater of space. As far back as the founding of NASA in 1958, the military has trained and prepared its personnel across all branches for space operations. Recent training examples for service members include digital intelligence, anti-cyberterrorism, remote air defense, and further training in aerospace and field survival exercises. What is even more important is the military's support of efforts operating in space that go beyond regular warfare as we understand it on Earth. Space is the next frontier of military operations that strategists and tacticians in the defense industry are currently preparing for and this discussion will illustrate how they are implementing it in technology training, government policy, law, and private business in the effort to grow society into this projected new future.

What the military is already prioritizing for space operations by means of building, testing, and training, is the latest technology that will govern the new area of operations. The agency poised to lead in the endeavors of advancing this technology is the Defense Advanced Research Projects Agency (DARPA) under the Department of Defense. Created in 1958 in response to the Soviet launch of Sputnik the year before, DARPA works on projects that look to the future rather than responding simply to the current needs of the country. Besides the very nature of DARPA's business being the creation of groundbreaking technology such as drones, GPS, and the internet itself, DARPA's organizational strategy is geared towards implementing innovative projects shared between military branches, the science based federal agencies, private sector and national universities all working in tandem under DARPA's administration. This model of partnership and interdependence has been borrowed by government, and non-government, research labs and teams outside of DARPA's authority so breakthroughs can be met

faster and simultaneously.¹ The organizational structure of DARPA as an agency is also what has proven to be the model to lead the United States and its partners towards more advanced space technology and weaponry. DARPA follows a very specific working hierarchy between the three levels of Directors, Program Managers, and Administrators, as technology developments are researched and reviewed at every level and cross checked between the others. The ultimate key to DARPA's organizational success is fielding revolutionary research from universities so the best and newest scientists are contributing to the creation of future tech. This organizational model has since been borrowed by federal agencies such as the National Science Foundation (NSF), the National Institute of Health (NIH), and a platitude of international research agencies partnered with DARPA to increase space technology that is innovative, protective of its users and deadly to its adversaries.²

What is arguably the most important factor of DARPA's leadership in developing new technology, but especially space age technology, is how it funds projects compared to most labs and think tanks. As federal agencies go, DARPA has a relatively small annual budget of \$3 billion dollars. A smaller budget has pushed DARPA to be more selective of the projects they decide to take on, which is the opposite business practice of both private and public think tanks who "just throw money at projects." DARPA's selective process has produced technological advances at greater speeds than their counterparts that have applications both in space and on Earth. These projects include computer network systems, neuro sensory technologies and prosthetics.³ DARPA's organizational policies have continued to show the efficiency of budgetary prioritization and has produced some of the most groundbreaking space age technology that the agency itself can take credit for. DARPA is currently in Phase 1 development of its Space-Based Adaptive Communications Node Program (Space-BACN), where eleven

teams are compiling a digital communication tool between orbited government and commercial satellites in the wake of a growing private space travel industry and the current changes being made in government space policy regarding the International Space Station (ISS).⁴ Possibly the most important reason why DARPA is being considered to lead in space age military technology is because of their history in strict research and oversight into its projects potential drawbacks and abuses so they can be avoided. Artificial Intelligence (AI) has been under scrutiny for a large portion of the twenty-first century in both private and public circles. With the concern about AI being abused and being misused, DARPA has gone to great lengths to ensure AI programs will not put military personnel at risk in both Earth-based and space-based environments and that AI systems are always supervised by a human element.⁵ DARPA and its many partners will be instrumental in developing the technology for the new battlefields and space and the personnel who will be trained to carry out those conflicts.

Based on this assessment, every branch of the U.S. Military is going to be trained in space operations with the additional military occupational specialties added for recruits and personnel in the near future. Besides initiating training that prepares personnel for planning operations in space, the DOD is poised to also train personnel on how those planning operations would be structured and what their priorities would be. The Air Force and the Army have collaborated on developing such training guidance. While working within U.S. Strategic Command, Air Force and Army leadership has focused in on two main standard operating procedures to govern space operations planning and priorities: Space Situational Awareness (SSA) that focuses on organizing current and future use of space capabilities and Joint Operation Planning and Execution System (JOPES), which is the compilation of documents detailing how coordination of capabilities are to be shared between DOD elements.⁶ While the Army and the Air Force are

focusing on the doctrine, the Space Force is tasked with developing realistic training exercises. Modeled after an old Air Force exercise, the Space Force has developed an exercise called Space Flag. Space Flag is a joint branch exercise where the ability to pilot satellites, quick response to ballistics, and joint execution of counterspace tactics involving all manner of spacecraft, technology and engaged personnel.⁷

Space Flag is an impressive training event that showcases future technology but operating in a zero-gravity bubble such as space is to familiar territory for DOD forces currently. The challenging training that will need expansion on is using similar future technology in austere environments that service members are not physically, as well as technically, trained to operate in. This is training related to outward planetary and moon operations where air will potentially be thinner, gravity will be lighter, and climates will range between being much hotter or cooler than expected climates on Earth. Most current training for units is geared towards operating on the moon or Mars with low gravity and harsher temperature, but other units are prioritizing operations in colder and denser climates. The U.S. Army's 11th Airborne Division during Arctic unit training operations in Alaska, one of the coldest training areas for the US Army, successfully tested new cold weather gear and clothing as well as a new modern satellite-based communication system referred to as the Capability Set 21 Kit. This network is so powerful that it can relay messages between continents even when present in a blizzard, which will be put to the most use on extremely cold planetary objects such as Jupiter's coldest moon Europa, which is set to be the next target for settlement after Mars.⁸

Technology like the Capability Set 21 Kit can execute on its applications through its utilization of the Metaverse: the computer generated virtually augmented 3D reality. Our understanding of the Metaverse and its uses has only grown within our society and our global

community. While the Metaverse has been used successfully for commercial purposes, its military applications are expected to provide the most convenient environment to training in difficult to access environments, especially space. Currently the Army, the Air Force, and the Navy are utilizing virtual reality to train fighter pilots with the training being extended to have space flight applications. Not only is this training useful to pilots who will have to fly future military spacecraft with departments that do not have funding for realistic space flight training, this also works as training for personnel that manage the AI systems that make the training possible, test how it will assist pilots in real time and check how concerns about AI malfunctions that are life threatening could be avoided.⁹

The most important units to have trained in space operations will be a part of the Special Operations Force (SOF). These units will be especially important during the first missions into establishing security in space and on other worlds before the larger force can establish operations in those new environments. SOF also has the capabilities to engage within and between both private and military space agencies to coordinate the best operational standards of the latest space technology and the focal training priorities. An example of this coordination is how SOF has partnered with DARPA in establishing personnel to train and be trained in cyber constellations like Starlink and OneWeb, which were specifically built by companies like SpaceX, to operate in a space-type environment.¹⁰ This new generation of training will contribute to the force's ability to meet new priorities of space-oriented conflicts.

What will define victory in the new space battlefield the DOD is preparing for will be directed by the new priorities of space the new international, and soon to be interplanetary, environment calls for. The clear priority that has already been staged as the initial focus for space operations is the continued development of technology in vehicles that will sustain us through

space travel between celestial bodies. NASA's recent Artemis mission is a test in that technology's resilience. The Artemis program was established in 2017 as NASA's new mission to return, study and settle on the moon. The recently launched Artemis 1 rocket, the most powerful rocket ever constructed by the space administration, not only was a test to see if the life support systems utilized by future astronauts on the moon got to their lunar destination, but it was also a test of the rockets durability to see if the same technology was strong enough to host human passengers.¹¹ Maintaining the health and readiness of individuals traveling through space would be the next priority in preparation for space conflicts and operations.

Having advanced technology able to transport necessary supply in a faster manner than we ever have is one thing, but making sure that the individuals traveling after or with that supply in order to utilize it is not lacking in malnourishment, suffering from weakness of joints and bones while traveling in zero gravity, or suffer from excess radiation exposure that contributes to exhaustion, illness and depression during travel so they are ready to perform their duties is another challenge in of itself. Both independently and with government grants, academic institutions across the United States are testing new amenities for astronauts and other future space travelers so the ability to maintain their own health and comfort becomes an easier task, which gives them opportunities to focus on more important tasks and functions for missions. Through the efforts of the Yale Center of Collaborative Arts and Media (CCAM) in corroboration with the MIT Media Lab Space Exploration Initiative, research teams have developed a new space suit giving the user more freedom of mobility and expression in zero gravity to control their environment to a larger degree.¹²

With resource and territory management on celestial bodies already becoming a political conflict between governments and militaries, international space law is quickly becoming more

relevant in the governing of potential rules of war in space. Territory attainment and holding is the historical decider of victors in war between nations or otherwise. However, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, otherwise known as the Outer Space Treaty of 1967, is clear in stating that no celestial bodies, including the moon, can be claimed by national appropriation or sovereignty.¹³ This will make deterrence of conflict difficult between nations like the United States, Canada, Russia and China, who have all chosen the same landing sites on the moon for future mineral sourcing.¹⁴

With the concept of territory claiming out of the picture, the United States would either have to share territory with our allies and adversaries alike, or come up with new strategies to maintain an upper hand against its rivals. The DOD with Space Force has a proposed plan to use the moon as a launch site into other parts of our solar system and beyond so the US military can start utilizing its deep space autonomous vehicles (AV) technology to find resources and uninhabited livable worlds for our people.¹⁵ The projected future of deciding conflicts in space during times of war and peace will come down to how advanced a nation's technology is and how it is used, how many resources can be attained, how many personnel you have and can grow operations in both local and deep space areas of interest, and international space law will become the new rules of engagement.

The exercise of space law, the utilization of telecommunications, and expanding beyond current alliances is why space military and peace keeping operations will be more coordinated and controlled than any other frontier the United States has deployed to. Besides the numerous UN committees on security, the North Atlantic Treaty Organization (NATO) is the largest international military alliance poised to lead its members towards space operations readiness

through modern training. With the United States taking the lead on strategy education, multi-domain operations (MDO) training is becoming a common place standard operation procedure between member states of NATO as well as their most recently added members to the alliance. MDO replaces single combat elements, such as tanks vs tanks, to decide the outcome of battles and wars, and replaces it with using all combat and non-combat elements at once to defeat an opponent. This includes military training in the uses of traditional combat techniques, computer systems, economies, social information, intelligence information, and space technology which the United States, the United Kingdom, and Germany are now implementing into their space programs for the future.¹⁶

While popular opinion sees space as another untamed frontier that will host a myriad of other challenges besides war, this is simply not the case geopolitically. The long-standing authority of international space law will give the United States and its respective allies the peace they require to develop new conflict management techniques in an interplanetary environment. From the inception of the Outer Space Treaty to the International Space Station, international superpowers have worked together to build peaceful operations and order in space before physically venturing beyond our Moon. The United States has joined this affirmed effort with its international and indeed indigenous partners. The United States through its military has also announced that it will enforce space law with its allies by preparing for potential conflict with adversaries who seek to make territorial conflict in space inevitable.¹⁷

This again is why the 1967 Outer Space Treaty is so groundbreaking and gets the nickname “the Magna Carta of Space.” the treaty that was initially drafted by the UN Committee on the Peaceful Uses of Outer Space has been followed by several other treaties agreed upon by the forty member states to the peaceful and non-combative

use of space in its resources. Any aggression or use of violence would violate the 1967 base line treaty and any violator would be at war with the rest of the member states.¹⁸ The fact that the violation of the Outer Space Treaty would render such a World War III level scenario between nations is why the US Military and its allies takes the development of escalation measurement and modeling very seriously.

Escalation modeling is a useful tool for the United States in assisting the smaller sized international partners who are still developing their own space programs while nations such as Russia, China, or Iran pose a threatening shadow on these nations. Employing strategies such as deterrence, public affairs missions, civil affairs missions, private public partnership conferences, and joint training events are some of the tactical tools the DOD utilizes to manage escalation levels of conflict between its partners on a worldwide scale.¹⁹ The struggle to prevent unnecessary war and conflict on Earth and in Space will always be a constant challenge in every age, even while managing the potential threat of conflict beyond our very own solar system, let alone galaxy.

The answer to the question, “Are we alone in the universe?” is an idea that has been explored for generations. It is now a question that the US Government and the US Military are openly discussing given the new development into space exploration increasing our theoretical chances of running into extraterrestrials in our vast universe, while not knowing if they will be peaceful or a threat to us. To advance this endeavor, the government is further contributing thinkers and project leads to the conversation of extraterrestrial exploration so they can offer context to the general public regarding recently declassified UFO studies and reports. One noted leader is Department of Defense astrophysicist Dr. Travis Taylor. As a contributor to NASA research projects and leader in the Unidentified Aerial Phenomena (UAP) Task Force, the same

organization that openly published the 2021 UFO photographs at the behest of the Pentagon, Dr. Taylor serves as an accredited spokesperson in the effort to educate both the public and commercial entities of the country, let alone the planet, on what we know and do not know about UFOs and ETs.²⁰ This approach works positively to separate myth from reality regarding the understanding of our potential interstellar neighbors and give us clues on how we would manage diplomacy and conflict with them. In addition to independent and agency connected spokespeople, NASA has assumed a direct involvement researching the nature of UFOs. Their project would not only investigate the potential terrestrial origins of UFOs if they originated from foreign entities on our planet, but also explore the possibilities of their origin in deep space as NASA now has the capabilities to observe objects farther into our universe.²¹

This is a twofold endeavor to better understand the technological capabilities of our adversaries on Earth while also pursuing first contact with civilizations beyond our galaxy. These joint scientific and military research projects into extraterrestrial life are also beneficial for United States' international and academic partners. Working together with NASA and the Indian Space Research Organization (ISRO), the University of Virginia has begun investigation into the biological make up on the Moon that will aim to uncover if there ever was life on the moon, if there are energy sources to be utilized by human inhabitants, and if past life on the moon speaks to future survivability of human residents.²² Besides the study of the moon's natural history being pertinent to expanding the knowledge of extraterrestrials in our close proximity, this research also works towards the more immediate project in expanding our physical presence in the cosmos that would potentially lead to contact with potential ETs. The Artemis Program is the most substantial NASA project since the Apollo Program and has potential to become more profound. Not only is Artemis going to get the US back to the moon, but we are going there to

hold a settlement that would increase our commerce, security, and potential for contact with other intelligent life in the universe.²³

Possibly the most important reason for both diplomatic and security elements for uncovering extraterrestrial civilization is making sure not to repeat the historical mistakes of colonialism in space as we did on our own planet. With the expanded discipline of outer space anthropology, researchers in the new field have begun advising policymakers and business leaders, especially those tied to military activity, on proper use of planetary territory and remembering responsibility to our own species when considering sociopolitical and cultural expressions on Earth and other worlds with history of other cultures that may have settled or currently hold settlements on other worlds.²⁴ While this is certainly a unique new concept to consider when discussing policy and military strategy, it is extremely relevant as it reminds leaders not to forget our human responsibilities to our people on Earth, we must proceed into space with similar attitudes not to exploit resources, peoples and sites, and that our ambitions for settlement do not threaten any potential extraterrestrial power that may be stronger than us technologically and militarily.

All things considered, the preparation for future military operations in space is now a realistic consideration of defense agencies. Whether governments decide to create a new Earth with national borders on another planet or we begin to settle on new worlds as one species to show union in the face of potential ET civilizations, there will always be the threat of war present. The US Military will continue in its preparation for those coming battlefields with our partners that will extend to space, our solar system, and beyond.

ENDNOTES

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