The Politics of Space Dominance: Weaponizing Orbital Space

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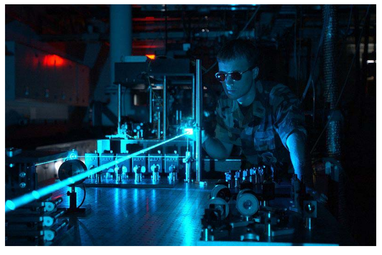
Introduction

Throughout history, warfare has essentially been based on the holding or taking of one's position on land, water, and just recently in the air. In today's world the new frontier of orbital space is slowly becoming the latest addition to this list of the precious places which are vehemently fought over by humans. Satellites are now the foundation on which commerce, communication, warfare and other vital domains are built. To protect the United States' space systems, the Department of Defense (DOD) is funding several programs which have the objective to keep space a safe place for the United States to operate. These purpose of these programs can be called Space Control, and the aim in my research was to discover as much as I could about these programs. The funding for these programs is somewhat large yet not enormous, with the amount of money requested for RDT&E in Space Control at approximately $2164.1 million, which is 13.4% of the requested funds for RDT&E of Space Weapons as a whole. Of the programs devoted to this field, three programs stand out as being on the cutting edge, yet they are also representative of Space Control as a whole. These programs are Counterspace Systems, Front-end Robotics Enabling Near-term Demonstration, and Starfire Optical Range.

In this poster I will go into detail about Counterspace Systems, Front-end Robotics Enabling Near-term Demonstration (FREND), and Starfire Optical Range. Counterspace Systems and Starfire Optical Range are Program Elements of the United States Air Force, meaning they consist of multiple projects while FREND is a Defense Advanced Research Projects Agency (DARPA) program which does not consist of any other programs besides itself. I also summarize six other programs, of which five are USAF Program Elements and one is a DARPA program. After that I put these and Space Control in context with other Space Weapon applications and the Department of Defense. At the end I theorize about the outlook for the future of Space Control of the future of this research project. All monetary figures used are for Fiscal Year 2009.

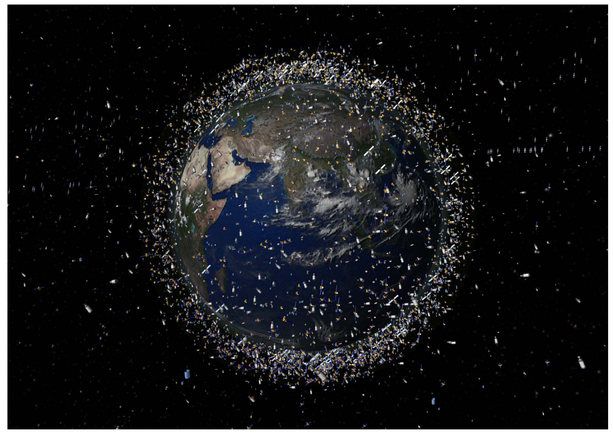
Starfire Optical Range

- This is a research laboratory located in Kirtland Air Force Base, New Mexico that develops the capabilities of lasers and microwaves which can be used in space. These high energy weapons could be used to shoot down satellites from ground stations, serving as an invaluable tool to control space. USAF-$44.507 million
- Advanced Optics and Laser Space Tech creates technologies that enable the use of lasers in space by being able to adjust for diffractions caused by the atmosphere ($16.586 million). Advanced Optics/Laser Space Tech can best be imagined as an ongoing process of improving beam control and atmospheric compensation with the current position being rather far along in this process.
- High Power Solid State Laser Technology develops integrated technologies involving solid state, chemical, gas, and hybrid laser technologies as well as beam control ($19.623 million). Solid State Laser Technology has become highly developed and the next step is to make lasers compatible with platforms from which it can be used and efficient enough to be applied to a battle environment . The Solid State Laser could be used for ground-based ASAT system, with Advanced Optics/Laser Space Tech making it possible to accurately shoot a laser the necessary distances in orbital space.
- High Power Microwave Technology develops widespread microwave technologies that have the potential capability of disrupting, degrading, damaging and destroying the enemy's electronic systems ($8.298 million). High Power Microwave Technology is still in its early stages and the full effects of its use are not fully known as of yet. Most of the work being done currently is testing concepts and these concepts won't be battle-ready for awhile. Microwaves could be used as a non-lethal weapon against electronic systems, IED's, rockets, vehicles and people. The project on Microwave technology does not seem to have the intent of using Microwaves in space, but it could potentially be outfitted to be a useful weapon for an ASAT.
- These weapons could become the weapons of the future, replacing kinetic weapons and becoming the main focus the military. High Energy Lasers in particular are prevalent to space control and could be the primary means by which the U.S. asserts its power over space.



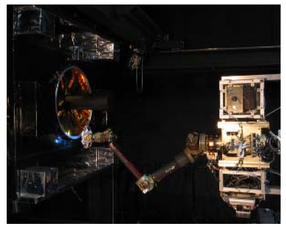
Counterspace Systems

- This Program Element is funding the development of the first permutations of an Anti-Satellite system that has the ability to disable enemy satellites and prevent attack on our space system. USAF-$74.918 million
- Counter Satellite Communications System is the development of mobile counter satellite communications capabilities, making this essentially an application of traditional radio-jamming to satellites in space ($29.808 million). The Counter Satellite Communications System is currently operational and research is being done to create an improved version. This is an offensive system which essentially disables an adversary's satellite system without the complications caused by space debris and is temporary and reversible. The Counter Satellite Communications System is essentially the opening round fired as far as creating an Anti-Satellite system is concerned.
- Rapid Attack Identification Detecting and Reporting System's purpose is to develop the ability to swiftly identify an attack on our valuable space assets and to assess communication interference ($37.648 million). The Rapid Attack Identification Detecting and Reporting System is currently operational and research is being done to create an improved version. This is a defensive system that allows us to defend our space assets or become aware of interference and remove it. RAIDRS is a preemptive measure, making an attack on our space assets costly.
- Counterspace Command and Control (C2) is an integration of the Counterspace systems under an established chain of command. This project also seeks ways to fully utilize the power of these systems ($7.642 million). Counterspace C2 is an ongoing project with few quantifiable results but is vital because it establishes who is in charge and what the mission is.
- These programs could be the first concrete steps towards an Anti-Satellite system with the aim of controlling space. This possible new arena of warfare could become the most vital form of battle when faced with warfare against nations or non-state actors with satellite constellations and/or Anti-Satellite capabilities.



Other Programs

- Advanced Spacecraft Technology (USAF-$80.958 million) is a broad Program Element with projects that seek to improve the capabilities of different kinds of spacecraft through improved technologies.
- Operationally Responsive Space (USAF-$110.032 million) is a Program Element designed to improve response to the current environment of orbital space and to develop small satellite/launch capabilities along with responding to urgent unexpected needs.
- Space Control Technology (USAF-$76.845 million) is a Program Element that supports the research and prototyping of Space Control technologies as well as research on range control. This is an essential component of the DOD's space control policy, for it is focused on planning the use of all Space Control capabilities .
- Space Situational Awareness Systems (USAF-$210.501 million) is a Program Element that develops new sensors for the Space Situational Awareness network, seeks to integrate the system, and attempts to replace the current ground-based space surveillance system so as to further space control. This program and other SSA programs are the bedrock of space control.
- Space Technology (USAF-$117.519 million) is a Program Element which has the aim of improving Air Force space systems with better materials, sensors, and computer systems .
- Space Situational Awareness and Counterspace Response Environment (DARPA-$7 million) is a program to make a framework for response to a possible attack on space assets, streamline communication, and increase situational awareness in space. This helps to improve reaction time and our knowledge of actions in orbital space, which are vital to space control.



Front-end Robotics Enabling Near-term Demonstration

- This program is designed to make it possible for satellites to connect in space and perform tasks such as repair, reposition, retirement and others. There is the possibility that this technology could also enable a satellite to temporarily or permanently disable an enemy satellite. DARPA-$10.7 million
- The robotics are currently being tested at the Navy Research Laboratory's Proximity Operations Testbed for algorithm development and to test hardware. The capability of autonomously docking with test surfaces has been successfully developed and plans are being made for further testing on the ground and eventually in space.
- There is a possible role for FREND in both Defensive and Offensive Counterspace Systems, for the ability to dock onto any current or future satellite could enable the capability to either repair a friendly or damage an enemy satellite. FREND also makes possible the ability to increase the life of satellites through orbital maintenance, and in the future possibly through refueling and other forms of maintenance.
- This program could open a new realm of Space Control with weapons or techniques developed to physically disable a satellite from point blank range and also to defend against such an attack. If the capability were to be realized and utilized, one of its greatest advantages would be the possibility of subtlety because of the close range and lack of a need to completely destroy a satellite. This program could also change the way that satellites are conceived; from passive points in space into active agents of space power.

Context

- Space Weapons may not be the most important thing in the DOD, but it is certainly present. There are many things which have a more immediate importance to the DOD, yet Space retains its importance because of the many ways in which we utilize it.
- There are several subfields of Space Weapons beyond Space Control including Missile Defense, Weapons Systems, Communications and GPS. Based on these other applications, it is clear that Space Control is not quite on the forefront of importance, yet it is on the verge of becoming so because of the significance of being able to operate in space.
- Missile Defense is already a concrete and important part of warfare. There are several currently function systems that are used for missile defense and a relatively small amount of new programs that are being developed.
- Space-based Weapons Systems are still a far off concept without a large amount of quantifiable results for now. There is not a significant number of programs being funded currently, and it may be several years before this becomes a relevant and tangible function of the DOD. However, Weapons Systems are still most certainly being pursued currently.
- Communications and GPS play an enormous role and are a part of why space is such a vital arena. In fact the importance of these functions is a large part of why space control is so essential to the United States military.

Concluding Statements

- Having the ability to operate in space could possibly become the most important aspect of warfare and politics in the future. The loss of communication with one satellite could result in the loss of substantial amounts of money, information or lives. To protect our space assets, space control may become the central focus of a large portion of the DOD, and because of the programs which have already been put into place; the United States has a good head start.
-An important point to mention is that the United States is still the dominant power in space, but that may change. We most likely don't have very much information about what competing nations or hostile non-state actors could be producing as far Anti-Satellite Systems as concerned, at least beyond what they release to the press. In addition, no one knows what the future will bring. However, with the programs that the Department of Defense has created and funded, the United States may be ready to defend its space assets and control of space.
- Raymond Duvall and I have now completed two terms of research and plan to write a paper on how war is being re-imagined with the advent of space as a battlefield after more research.