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Space Weapons For Earth Wars



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While the latest Star Wars sci-fi saga makes its way to a cinema near you, a true-to-life space drama is unfolding as a new breed of weaponry may soon populate the heavens.

Military planners paint a picture of inevitability concerning space weapons. Certain experts foresee a proliferation of anti-satellites and space mines. Others suggest urgent need for totally secure, jam-proof satellite links along with a squadron of quick-reaction space bombers.

Perhaps more "out there", but openly discussed by military space strategists, are orbiting laser and particle beam weapons that focus killer rays of energy to zap satellites, enemy warheads in flight, or even blast targets on Earth.

Then there are the thunder rods. Tossed down from orbit, these long and slender kinetic-energy devices use their own mass and very high velocity to create a destructive effect.

Lastly, for those looking for a celestial "big whopper" of a weapon, how about using natural meteoroids? Good-sized fireballs of metal could be sent to Earth, aimed at targets of choice. These impactors leave a nice crater. Better yet, they leave no radioactive debris.

Space-based weapons are the topic of a new report: *Space Weapons - Earth Wars*. Authored by think-tank experts at RAND -- dedicated to help improve policy and decisionmaking through research and analysis -- the just released study was prepared for the U.S. Air Force.

What's possible and sensible?

Space weapons have been hotly debated for decades. At present, the Bush administration's interest in ballistic missile defense has brought the question of their use once again to the forefront.

The RAND study does not argue for or against space weapons said Bob Preston who led the effort. Rather, the intent was to sort through realities and myths surrounding space weapons.

"We wanted to provide an objective basis for grounding discussion in

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Space-based laser offers a powerful pulse of energy to destroy missiles in flight. Credit: U.S. Air Force

physical realities and historical context," Preston told *SPACE.com*. His observation after finishing the task is that the subject of weapons in space "is both highly polarized with people violently for and against the idea," he said.

Furthermore, those opposing views are complicated by imprecision in definition, "and by rather loose understanding of what's possible and what's sensible," Preston added.

Arguably, just about all use of space from the beginning has been about national security, Preston said.

"Even civilian scientific uses were undertaken in large part for security reasons in the context of the Cold War. There's a pretty good point of view that says that almost everything we've ever done in space has been predominately motivated by a security perspective," the RAND analyst said.

Classic classes

RAND reviewed several distinct classes of weapons:

- Directed-energy weapons, such as space lasers. They use millions of watts of power and large optics to deliver a speed-of-light knockout punch as a missile arcs over Earth. Depending on the wavelength of the energy beamed out and atmospheric conditions, an energy beam can destroy a target on Earth's surface;
- Kinetic-energy weapons against missile targets. This hardware can ram headlong into a target in space or an object still within the upper reaches of Earth's atmosphere;
- Space-based kinetic energy weapons that slam into targets on the ground, such as large ships, tall buildings, and fuel tanks. Sleek and meteoroid-like in speed, these weapons attack targets at steep, nearly vertical trajectories; and
- Space-based conventional weapons capable of maneuvering to hit terrestrial targets. These can carry and dispense rather exotic packages of destruction, such as radio-frequency or high-power-microwave munitions.

Pros and cons

Taken together, RAND analysts found space weapons having a number of distinct advantages and disadvantages.

In the advantage column, space weapons can take out targets that may be inaccessible to other weapons. While ships and aircraft can take days to weeks to reach a far-flung battleground, space-based weapons can respond in minutes to several hours. Also, space-based weapons are less vulnerable to attack.

On the other hand, there are shortcomings.

For one, an opponent can saturate a space weapon, overwhelming the weapon's ability to fully thwart an attack. In addition, the positions of space-based weapons are predictable. In this regard, a weapon destroyed on orbit would leave a persistent cloud of debris, posing a hazard to other satellites. Lastly, large numbers of weapons are required to ensure that one of them is in the right place at the right time.

Asteroid weapons

Even the notion of purposely diverting an asteroid toward Earth as a weapon was examined by RAND specialists. "For nations that already have nuclear arsenals, asteroid weapons might be of only academic interest," the study notes.

There is no doubt, the study explains, that asteroids have acted as big



Boeing's Kinetic Energy Anti-Satellite (KE-ASAT) program is intended to provide the United States with the capability to neutralize hostile satellites. The objective of the KE-ASAT program is to define, develop, integrate and test the necessary Kill Vehicle (KV), weapon control subsystem component and subsystems technologies to demonstrate hit-to-kill performance, including debris mitigation against hostile satellites.



Unpiloted aerial vehicles, like this Predator craft, can be navigated via Global Positioning System (GPS) satellites. This class of vehicle can deliver bombs, carry out surveillance of the enemy, and serve a variety of behind-enemy-line duties - all without endangering human pilot. Credit: U.S. Air Force



Congressman Dennis Kucinich (D-OH) has introduced a bill to ban the weaponization of space. Photo shows Kucinich joined by Congresswoman Barbara Lee (D-CA) and Congressman John Conyers Jr (D-MI) at a Washington, DC news conference last year to unveil legislation establishing a cabinet level Department of Peace.



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bruisers in the past. The Earth has the scars to prove the point. However, to use asteroids as natural bombs, the scale of the undertaking would be grander than that required to build the first A-bomb via the Manhattan Project in World War II, the RAND report points out.

"Aside from the limited range of possible effects and the great uncertainty about the precision of an effect, one clear argument against asteroids as weapons is that smaller, cheaper means of acquiring an equivalent to a nuclear deterrent are available," the study explains.

Asteroids as a space weapon of mass destruction "is likely to remain safely in the realm of science fiction."

Waiting game

RAND's Preston emphasized that the opportunity to acquire space weapons is not limited to the United States. While many countries have only modest spacefaring capabilities, each nation knows how space can benefit their security.

"There's probably nobody that's involved in space that doesn't understand its security uses and isn't motivated to some degree by its security uses," Preston said. Space-based weapons could be a high-leverage, asymmetric response to U.S. military strengths, he said.

In the report's summary, there is this observation:

"Before deciding to acquire or forgo space weapons for terrestrial conflict, the United States should fully discuss what such weapons can do, what they will cost, and the likely consequences of acquiring them. The discussion should also address whether other countries might acquire them, which ones would be most likely to do so, and how the United States could discern these developments and respond effectively."

For Preston, a personal view is that it's not obvious now there's urgent need for the United States to defend itself in space from things in space. "But it's not unreasonable to expect that you may have to before long," he said.

Peacetime uses

The prospect of space weapons and the growing military space agenda engenders a wide variety of viewpoints.

Such is the case for America's first woman in Earth orbit, Sally Ride. She recently underscored the fact that space has been used for military purposes for decades. (Ride is the former president of *SPACE.com*.)

Last month, Ride presented the annual Drell Lecture at Stanford University, sponsored by the on-campus Center for International Security and Cooperation (CISAC). After her NASA tour-of-duty, Ride worked in the late 1980s as a CISAC science fellow, serving alongside Sidney Drell, noted physicist and arms control expert.

"Space is a real priority for national security," Ride said. She is presently a physics professor at the University of California-San Diego and director of the University of California's Space Institute in La Jolla.

Today, U.S. intelligence agencies and the military count on some 100 satellites as part of the country's national security. These space-based assets snap detailed images day and night, keeping an eye on global hotspots, even pinpointing missile launchings around the globe for early warning purposes. A satellite that in peacetime uses the global positioning system (GPS) constellation of spacecraft for navigation purposes, may in wartime utilize that same capability to target bombs or remotely piloted vehicles, Ride said.

"The current landscape is that the United States has an absolutely huge advantage over every other country in space capabilities," Ride said. "It's hard getting to space. It's hard developing things that work in space, and it's really, really hard to get things to work reliably over long periods of time in space," she added.

Ante up: Anti-satellites

The policy question going forward, Ride explained, might be simplistically stated as: Does it make sense for the U.S. to place weapons into space? One issue in this regard, she said, is developing and placing in space anti-satellite weapons, or ASATs for short.

Unless appropriate constraints are put on testing of ASATs, there could be a problem, Ride suggested. High-speed run-ins with space debris resulting from any ASAT testing could cripple or destroy numbers of satellites in Earth orbit.

Ride recalled an encounter with space debris on her first space shuttle voyage. A small but visible gouge in one of the space plane's window appeared about halfway through the flight. Later analysis showed that an orbiting fleck of paint caused the pit, she said.

"A fleck of paint is not the same as a small piece of metal traveling at that same speed. So, as soon as you start increasing the amount of junk in low-Earth orbit, you have an unintended byproduct that starts putting some of your own quite valuable satellites at possible risk," Ride stressed

Preserve by prohibiting

One lawmaker is already pitching legislation before the U.S. Congress that bans the weaponization of space. Congressman Dennis Kucinich, a Democrat from Cleveland, Ohio, introduced early this year The Space Preservation Act of 2002.

The bill is crafted "to preserve the cooperative, peaceful uses of space for the benefit of all humankind by prohibiting the basing of weapons in space and the use of weapons to destroy or damage objects in space that are in orbit, and for other purposes."

In bill language, the terms "space-based weapon" and "space-based system" mean a device capable of damaging or destroying an object or person -- whether in outer space, in atmosphere, or on Earth -- by (A) firing one or more projectiles to collide with that object or person; (B) detonating one or more explosive devices in close proximity to that object or person; (C) directing a source of energy against that object or person; or (D) any other undeveloped means.

Kucinich is shopping the bill through the halls of Congress trying to gain support for the legislation, which also calls for an international treaty to preserve space and prevent an arms race in outer space.

Complicated distinction

Prying out differences between weaponization and militarization of space is not easy.

"It's an important distinction," said Bruce Gagnon, head of the Global Network Against Weapons & Nuclear Power in Space in Gainesville, Florida. "Weaponization I think is clear. Our position is no weapons in space, at any level, period. Militarization is more complicated," he told *SPACE.com*.

Gagnon took part in last week's 10th Annual International Space Organizing Conference and Protest, held at the University of California in Berkeley. During the gathering of peace movement leaders from 12 nations, various strategies were discussed to block the nuclear arms race from ascending into the heavens.

"While we accept some aspects of the militarization of space for treaty verification, confidence building measures, etc., we are firmly against military space technologies that are used for conventional war fighting," Gagnon said. "Satellite systems that identify and direct war on Earth, which essentially allow for 'full spectrum dominance' are not acceptable in our view," he said.

"We want a de-escalation of all military systems for fighting war on Earth or in space. We'd like to see the stabilizing, treaty verifying satellite technologies commonly shared globally. And, of course, no nuclear power in space for any reason," Gagnon concluded.



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