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Cosmic Explorers: Space Warfare Considerations

Conflict in the Cosmos

Aira Astralis

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Conclusion

This free sample contains the Introduction and Chapter 1. The complete book contains the full contents above.

Introduction

Space warfare is combat in which one or more belligerents are in outer space. The scope of space warfare includes ground-to-space warfare, such as attacking satellites from the Earth; space-to-space warfare, such as satellites attacking satellites; and space-to-ground warfare, such as satellites attacking Earth-based targets.

The 1967 Outer Space Treaty forms the basis of space law; it prohibits permanent basing of weapons of mass destruction, such as nuclear weapons, in space and the military use of celestial bodies but does not prohibit the military use of Earth orbit or military space forces. Independent space forces are operated by the United States (US Space Force) and China (People's Liberation Army Aerospace Force). Russia operates significant space assets under the Russian Space Forces.

The Cold War prompted the start of the militarization of space. Military satellites have been launched since the late 1950s for communications, navigation, reconnaissance and munitions guidance. The Gulf War is sometimes called the "first space war" because of the use of these capabilities by the US. The use of Starlink satellites by Ukraine has played a major role in the Russian-Ukrainian War. The US and Soviet Union carried out nine nuclear explosions in space from 1958 to 1962, which damaged satellites.

Orbital space weapons were developed, especially for defence against nuclear missiles, but not widely deployed. The US Strategic Defense Initiative studied satellite-mounted advanced weaponry, drawing criticism as the "Star Wars program". The Soviet Union developed Istrebitel Sputnikov co-orbital weapons, Almaz military space stations, and the Polyus laser. Since 2025, the US has been developing the Golden Dome missile defense system, which includes orbital weapons.

Israel's Arrow 3 missile may also have an anti-satellite capability. During the early Cold War, a survivable reconnaissance asset was considered highly valuable.

Starlink satellite services in Ukraine, instance of a satellite constellation being used for warfare

In Phase One, the guerrillas earn the population's support by distributing propaganda and attacking the organs of government.

The withdrawal phase is sometimes regarded as the most important part of a planned action, and to get entangled in a lengthy struggle with superior forces

is usually fatal to insurgent, terrorist or revolutionary operatives. Withdrawal is usually accomplished using a variety of different routes and methods and may include quickly scouring the area for loose weapons, evidence cleanup, and disguise as peaceful civilians.

In the early 1960s, the U.S.

The U.S. On February 21, 2008, the U.S.

The subject deserves a framing distinction before the chapters begin, because the book's title invites a misreading. This is not a manual of space weapons or a fantasy of orbital battles; it is a study of the considerations, the physical facts, the legal regime, the strategic history, and the standing risks, that govern the military use of space, and most of those considerations argue against the shooting. The reader is opening a book about the most law-bound and most fragile arena of conflict ever contested, in which the debris of a single exchange could outlive the war that made it, and the chapters that follow move from the physics that make space a poor battlefield to the diplomacy that keeps it, so far, a quiet one.

A second framing fact sets the stakes, and it belongs to the reader from the first page. Everything the modern world depends on, the navigation, the weather warnings, the financial timing, the communications, the targeting of conventional forces themselves, rides on satellites that are essentially undefended, and every serious study of space warfare begins from the same asymmetry: attack is cheap, defense is hard, and the loss is shared by everyone, attacker included. The chapters ahead are accordingly best read as a kind of treaty in progress, an argument the civilizations of the planet are still having with themselves about a commons they cannot afford to break.

Chapter 01: The Discovery of Space Warfare Considerations

Four nations have tested anti-satellite missiles by destroying a target satellite: the US' ASM-135 in 1985 and SM-3 in 2008, China's SC-19 in 2007, India's PDV Mark II in 2019, and Russia's A-235 in 2021. The Arrow 3 interceptor of Israel has been credited by several analysts with a satellite-reaching role as well. Early in the Cold War, a survivable reconnaissance asset was considered highly valuable.

In a time before satellites, this meant building an aircraft that could fly higher or faster, or both, compared to any interceptor that would try to bring it down. Notably, the United States would introduce the U-2 spy plane in 1956. It was thought, at the time of its introduction, that the plane's service ceiling of 24,000 metres (80,000 ft) would render it immune to Soviet aircraft, missiles, and radar.

That was the case until the 1960 U-2 incident, where a United States U-2 spy plane was shot down by the Soviet Air Defense Forces' S-75 Dvina (SA-2 Guideline) surface-to-air missile while conducting photographic aerial reconnaissance deep inside Soviet territory. Three years before the incident, in 1957, a modified R-7 rocket carried the world's first artificial satellite, Sputnik 1, into an orbit hundreds of kilometers above sea level, notably beyond the reach of any existing weapons system.

While Sputnik 1 held no military value, only transmitting radio signals back to Earth for three weeks, its launch sparked the beginning of the Space Race. This spurred the United States to hasten and re-emphasize its space programs, culminating in the Explorer program, which launched the first American satellite into orbit in 1958. In tandem with the effort to achieve superior spaceflight capability over the other, the United States and the Soviet Union began to develop space warfare capabilities.

Early efforts to conduct space warfare were directed at space-to-space warfare, as ground-to-space systems were considered to be too slow and too isolated by Earth's atmosphere and gravity to be effective at the time. The history of active space warfare development goes back to the 1960s when the Soviet Union began the Almaz project, a project designed to give them the ability to do on-orbit inspections of satellites and destroy them if needed.

Similar planning in the United States took the form of the Blue Gemini project, which consisted of modified Gemini capsules that would be able to deploy weapons and perform surveillance. One early test of electronic space warfare,

the so-called Starfish Prime test, took place in 1962 when the United States exploded a ground-launched nuclear weapon in space to test the effects of an electromagnetic pulse. The result was a deactivation of many then-orbiting satellites, both American and Soviet.

The deleterious and unfocused effects of the EMP test led to the banning of nuclear weapons in space in the Outer Space Treaty of 1967. The Soviet Union tested the Istrebitel Sputnikov co-orbital satellite weapons from 1968 to 1982. Through the 1970s, the Soviet Union continued their project and test-fired a cannon to test space station defense.

This was considered too dangerous to do with a crew on board, however, so the test was conducted after the crew had returned to Earth. A 1976 Soviet report suggested that the design of the Space Shuttle had been guided by a requirement to deliver a payload- such as a bomb- over Russia and return to land after a single orbit.

This may have been a confusion based on requirements 3A and 3B for the shuttle's design, which required the craft to be able to deploy or retrieve an object from a polar orbit in a single pass. Both the Soviets and the United States developed anti-satellite weaponry designed to shoot down satellites. While early efforts paralleled other space-to-space warfare concepts, the United States was able in the 1980s to develop ground-to-space laser anti-satellite weapons.

None of these systems are known to be active today; however, a less powerful civilian version of the ground-to-space laser system is commonly used in the astronomical technique of adaptive optics. In 1984, the Strategic Defence Initiative (SDI) was proposed. It was nicknamed Star Wars after the popular science fiction franchise Star Wars.

In 1985, the United States demonstrated its conventional ASAT capabilities by launching an ASM-135 ASAT from an F-15 to shoot down the Solwind P78-1, an American research satellite, from its 555-kilometre (345 mi) orbit. The 1990-1991 Gulf War is sometimes called the "first space war" for its usage of satellite communication, navigation, reconnaissance, and weapons guidance. The People's Republic of China successfully tested (see 2007 Chinese anti-satellite missile test) a ballistic missile-launched anti-satellite weapon on January 11, 2007.

This resulted in harsh criticism from the United States of America, Britain, and Japan. The U.S. On February 21, 2008, the U.S. In 2009, the chairman of the Israel Space Agency said the Arrow 3 anti-ballistic missile could be used as an anti-satellite weapon.

Ballistic missiles, which transit the upper atmosphere and sometimes outer space, have been used in combat since Germany's V-2 rocket during World War II. These were used on a large scale in the Iran-Iraq War, Gulf War, Red Sea crisis, and Iran-Israel war. In November 2023, Israel claimed an interception of a Houthi ballistic missile as the first combat in space.

Four countries have flown intercepts against live satellites in the modern era: the American air-launched test of 1985 and ship-launched intercept of 2008, the Chinese demonstration of 2007, the Indian mission of 2019, and the Russian test of 2021, each examined in the history chapters.

The founding paradox of the field ends the discovery chapter, and it travels with the reader through the rest of the book. The space age began as a military program: the first orbiters were launched by armies, the first astronauts were officers, and the first space treaties were arms-control treaties, and yet the result of half a century of militarization has been the most weapon-free major arena in human conflict; keep in view the paradox gently, because its resolution is the book's subject, and the answer the chapters assemble is not idealism but arithmetic, the shared cost of breaking the commons keeping the commons whole.

The discovery file adds the amateur chapter, because the subject's early watchers were not cleared for anything. The men and women who first tracked satellites from backyards with binoculars and stopwatches, publishing orbits the professionals would not confirm, built the tradition of open tracking that the commercial firms later industrialized, and the sight of a government's classified spacecraft cataloged by hobbyists in the first hours after launch became, by the 1970s, a running lesson in the domain's natural transparency.

The discovery the file keeps from this tradition is the one every later chapter relies on: the sky can be watched by anyone, and a domain watched by everyone is a domain whose secrets are mostly schedules.

The file also adds the treaty-verifying discovery, the finding that the satellites built to prepare for war made peace administrable. The reconnaissance systems that flew to count missiles ended by making arms agreements enforceable, and the discovery reversed the era's own expectations: the weapon platform's sibling became the inspection platform, and the overflight right that made surveillance possible became the commons right that made everything else possible. The discovery's entry in the file is the field's founding irony, kept in plain sight: the technology that aimed to win the war became the instrument that let the war be limited, and the consideration of space warfare has run on that irony ever since.

End of free sample. The full book is available at putrabooks.github.io

ABOUT THE AUTHOR

Aira Astralis is a science writer specializing in astronomy and space exploration. Her work spans the full breadth of humanity's relationship with the cosmos -- from the earliest naked-eye observations to the engineering marvels of modern space missions.

Her books are built on a foundation of primary sources: peer-reviewed research, mission archives, and direct engagement with the scientific community. She writes for readers who want to understand not just what we know about the universe, but how we came to know it.

She believes that the most important frontier is not out there but in the gap between what scientists discover and what the public understands. Her books exist to close that gap.