

# PATHFINDER

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## WEAPONS IN SPACE

*I do not say that we should or will go unprotected against the hostile misuse of space any more than we go unprotected against the hostile use of land or sea, but I do say that space can be explored and mastered without feeding the fires of war, without repeating the mistakes that man has made in extending his writ around this globe of ours.*

John F Kennedy 'Moon Speech,' 1962

In the past few decades the security of individual nations and international collectives has become increasingly dependent on space power. As a result, some space-faring nations have commenced 'weaponising' space, which has heightened international concern. The ADF Glossary defines a 'weapon' as 'an offensive or defensive instrument of combat used to destroy, injure, defeat or threaten an enemy'. In space operations, this takes on a different dynamic to the conventional understanding of a weapon. For example, a mission expired satellite, with reserve fuel available for manoeuvring, could be used as a weapon even though it does not carry a weapon on board—a concept similar to flying a commercial aircraft into a building!

Today, effective military operations are dependent on space based capabilities for the purposes of

activities such as the monitoring of air, land and maritime environments; satellite broadcasting and communications; and global navigation support systems to name a few. However, the effectiveness of these capabilities is dependent on the availability of a space asset in an appropriate orbit to provide the necessary sensor coverage over the required area of interest and to communicate with aligned ground stations. In turn, this has led to increasing competition between nations to inhabit these optimum orbits. The optimum orbit is to be found above the Kármán line at 100 km above the Earth, which is generally accepted to be the point at which outer space starts. This height is the practical lower limit for spacecraft to stay in orbit to overcome the gravitational pull of the Earth.



Consequently, it is not surprising that space-faring nations are developing technologies, and the associated tactics to ensure that they have unhindered access to space-based capabilities. The recent testing by China of an anti-satellite missile is an example of such developments.

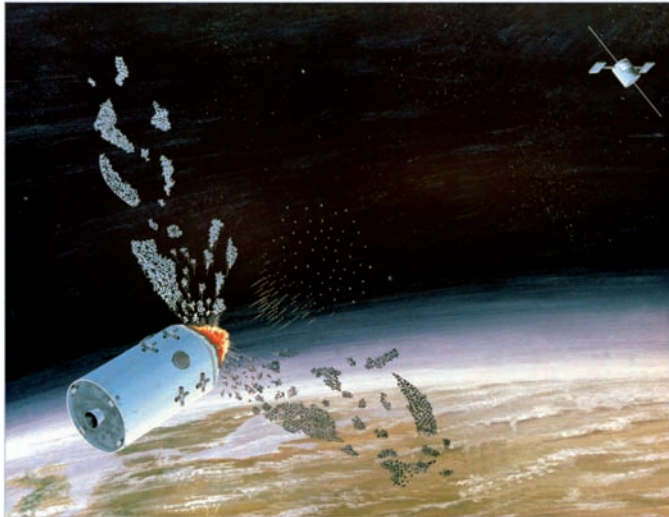
In weaponising space, the unique environmental properties of near-Earth orbit directly affect the performance and effectiveness of traditional heat and

blast or fragmentation weapons. Blast and flame effects are almost ineffective without air, and traditional air weapons require significant modifications to be effective in space. The challenges here are further exacerbated by the difficulties in getting a warhead into space in the first place, not to mention the tracking and fixing of targets travelling at orbital speeds of 28 000 km/h or more. The resultant fragmentation from the warhead and subsequent

damage to the target can cause unwanted space debris and associated collateral damage. (See *Pathfinder No 146, The Issue of Space Debris*) Add to this the consideration that the deliberate creation of space debris through the destruction of a satellite which could affect other satellites could be considered a hostile act, contrary to international agreements.

An alternative approach to using an explosive warhead is to neutralise the effectiveness of an orbiting satellite by the deliberate manoeuvring of an existing spacecraft so that it obstructs the surveillance sensors or communications signals of the satellite, or casts a shadow over the solar power panels of the satellite. Therefore, it does not necessarily take a direct collision—which

avoids the space debris issue—to raise tensions among space-faring nations. Perhaps the most effective weapons to be used in space are non-conventional ones such as those which apply electronic or cyber attack capabilities, ionising radiation from an electromagnetic pulse apparatus or directed-energy weapons from lasers or microwaves. These could put space-based systems out of operation without physically destroying them—a ‘soft-kill’ option. However, pulse, laser and microwave weapons are still in the experimental stages of development and are currently prohibitively expensive.



The cost-effectiveness of developing and operating these sophisticated weapons in space is also an important consideration in determining their military value. Placing a weapon in orbit can be as complex and expensive as conducting a manned space mission. To detect and identify a target, launch a spacecraft, manoeuvre it into an orbital rendezvous and deliver a weapon that impacts only the target without any collateral damage is an extremely difficult operation.

Given the cost associated with developing such capabilities and the attendant operational difficulties, it may be easier and more cost-effective to engage the ground station or the communications links for mission control or ‘hack’ the onboard data of a space-based system rather than the orbiting satellite itself. In the event that attack on the space-based component of the system is the only option, directed energy weapons and/or electronic and cyber attack may be the only viable alternative.

There are a number of United Nations (UN) treaties that govern the use of space and ban the testing and

deployment of space objects carrying weapons of mass destruction. The UN has sought to control the use of space and prevent the placement of weapons in space to keep the space environment openly available for current and future generations. Australia is a signatory to most of these treaties.

International efforts are underway to ensure free and open use of space. However, the military significance of space-based systems point towards the ‘weaponisation’ of space increasingly becoming a tempting option. All space-faring nations and their allies must be aware of the implications of such actions and institute defensive measures and redundancies to ensure space system availability to friendly forces. The other side of the coin is that all nations must abide by the UN treaties that govern the use of space to ensure that space remains free of weapons. Ideally, space should remain what it is: a peaceful vacuum.

- *Traditional weapons are not effective in the space environment.*
- *Physical destruction of a space asset can introduce space debris with the risk of long-lasting collateral damage to other current and future space systems.*
- *Disabling the supporting ground infrastructure and space communication links may be a cost-effective way to neutralise space-based capabilities without creating increased space debris.*

*The development and testing of counter-space weapons that create more long-lived space debris pose a direct and immediate threat to the rights of all nations to explore and use space for peaceful purposes. The two countries therefore recognized that working together to promote approaches for responsible activity in space is a high priority. They also endorsed intensified bilateral, regional and international cooperation to meet this challenge.*

Joint Statement on Space Security,  
25th Australia-United States Ministerial  
Consultations on 8 November 2010



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