China's Military Space Strategy

By Flt Lt Kenny Fuchter

Whilst the UK's military is becoming increasingly reliant on space, space itself has become a contested environment. China in particular has burgeoning military space programmes, including anti-satellite and directed energy weapons. Numerous Chinese writings on space doctrine and strategy highlight these growing capabilities. Although the primary target for these programmes is the US, close linkages between UK and US space based capabilities could mean, that the ability of the UK's military to operate, may be affected in any future China-US conflict. China may also provide an indication of other countries, such as Russia, Iran and North Korea's future developments. This paper considers the implications of China's military space strategy, both in the wider context and for the UK, and argues in its conclusion that the UK is in danger of falling behind other nations, in terms of space operations, and cannot afford to ignore the issue.

Introduction

'Space is a contested environment - though many people still don't believe this.'

Brigadier General John E. Hyten, Director of Requirements, US Space Command, Sep 08[1]

On 11 Jan 2007, a medium range ballistic missile was launched from the Xichang space facility in Sichuan province China. Several minutes later the missile deployed a Kinetic Kill Vehicle (KKV) that subsequently slammed into an ageing Chinese weather satellite that was travelling at 7.42km per second, approximately 864 km

China Xichang Satellite Center; The launch of Tianlian I-01 satellite (a Data Relay & Tracking Satellite); The newly developed Long March 3C Carrier Rocket.

above the surface of the Earth.[2] The satellite intercept occurred along the ascent trajectory of the missile's flight meaning that the systems were so accurate that there was no requirement to exploit the booster's descent trajectory to give the kill vehicle more time to both observe the target and manoeuvre as necessary.[3] In a dramatic manner China had announced to the world that it had technology that far surpassed the erstwhile Soviet Union and more importantly sent a significant message to the US over its hitherto assumed dominance in space.

Although the US and its allies in Asia, (particularly Taiwan and Japan[4]) may have been the target for this message the implications are far wider. It is not just the US that relies on space for its current military operations. The UK's reliance on space is increasing and could be a critical vulnerability unless the weaknesses of space are understood. As noted in the key Future Air and Space Operational Concept (FASOC) in Practice document:

'We must ensure that threats to our space capability are identified, understood and either neutralized or mitigated.'[5]

It goes on to add:

'Fundamental to this is building on our existing space situational awareness and then delivering a Recognized Space Picture for Defence. The UK's data exploitation and missile warning capabilities cement our close links with US space-based capabilities; this linkage should not be underestimated.'[6]

Close linkages with US space-based capabilities could potentially mean that the ability of the UK's military to operate might be affected in any future China-US conflict. China's burgeoning capabilities may also provide an indicator of what other countries with space programmes, such as Russia, Iran and North Korea, could develop in future. The wider

implications of China's race for space need also to be considered. The aim of this paper is to consider these critical areas by firstly examining China's space strategy, utilising available Chinese sources where possible. To place this in context China's space programmes will then be explored. From these two areas an assessment of the implications of China's space strategy for the UK will then be extrapolated.

China's Space Strategy

China's military space strategy is obfuscated (deliberately) by a lack of transparency, which makes ascertaining what strategy exists problematic. Indications can be gleaned from the available Chinese sources but to what extent these represent the official views of the Peoples Liberation Army (PLA) leadership remains unclear. However, a number of sources are available which when analysed together can provide a flavour of China's attitudes towards military operations in space.

Flag of the Peoples Liberation Army (PLA).

Two of the most reputable institutes are the PLA's Academy of Military Science (AMS) and the National Defence University (NDU). AMS is considered the primary research centre for military doctrine, which in China is developed by military researchers and academics rather than warfighters, as in the West.[7] From these institutes publications and other journals and sources such as *China Military Science, China Aerospace* and the *Peoples Liberation Army Daily* an understanding of how the PLA envisages the utilisation of space can be developed.

Chinese ASAT Intercept.

The anti-satellite (ASAT) test clearly demonstrated a capability, but what is less clear whether China has a specific military doctrine to go along with these rapidly developing capabilities.[8] China does not appear to have a dedicated space campaign; rather space operations form an integral component of all campaigns[9] and space is viewed as another operational domain along with Land, Sea, Air and Cyberspace. In Chinese terms the key to any campaign is information dominance, which it sees as key to operational success against more conventionally powerful adversaries.[10] China defines this strategy as 'Informationalized War' and it underpins much of China's current military thinking. In the 2006 Defence White Paper it was

noted that:

'To effectively fulfil its historic mission in the new stage of the new century, the PLA is speeding up the revolution in military affairs with Chinese features and enhancing in an all-round way its capabilities of defensive operations under conditions of informationization.' [11]

It is recognised that this will take time to achieve, indeed China's aim is to lay the foundation by 2010, make major progress by 2020 and reach the goal of being capable of winning informationized wars by the mid Twenty-First Century.[12] To understand China's space strategy it is therefore necessary to have an understanding of informationalized war. China's latest Defence White Paper, released on 21Jan 09, outlined the strategic guideline of 'Active Defence':

'It takes into overall consideration the evolution of modern warfare and the major security threats facing China, and prepares for defensive operations under the most difficult and complex circumstances. Meeting the requirements of confrontation between war systems in modern warfare and taking integrated joint operations as the basic approach, it is designed to bring the operational strengths of different services and arms into full play, combine offensive operations with defensive operations, give priority to the flexible application of strategies and tactics, seek advantages and avoid disadvantages, and make the best use of our strong points to attack the enemy's weak points. It endeavours to refine the command system for joint operations, the joint training system and the joint support system, optimize the structure and composition of forces, and speed up the building of a combat force structure suitable for winning local wars

Peoples Liberation Army soldiers on parade.

in conditions of informationization.'[13]

In practical terms, although the concept of informationalized war was introduced formally into the PLA only in 2004, having replaced the strategy of war under 'high tech' conditions, its key function of gaining information superiority had been advocated earlier. For example in the NDU book Science of Campaigns published in 2000 it was noted that the aim in conflict was:

'. . . to cut off the enemy's observation, decision-making, and troop command and control capabilities at critical times and in areas related to overall campaign operations, while maintaining our own command and control ability, thus allowing us to seize information superiority, to establish strategic and campaign superiority, and to create conditions to win the decisive battle.'

In addition,

'. . . whoever receives, transmits, and uses information more frequently in real-time, more accurately, and more effectively has more chances to win the war. Moreover, the one who has the control over collecting information generally usually can achieve better cost-effectiveness in war. Therefore, the primary task of modern campaigns has become seizing information superiority and taking away the enemy's capability

of acquiring information.' [14]

Fundamental to this strategy is space, as a recent PLA Daily and National Defence News article noted:

'Information dominance cannot be separated from space dominance. We can say that seizing space dominance is the basis for winning informationalized war.' [15]

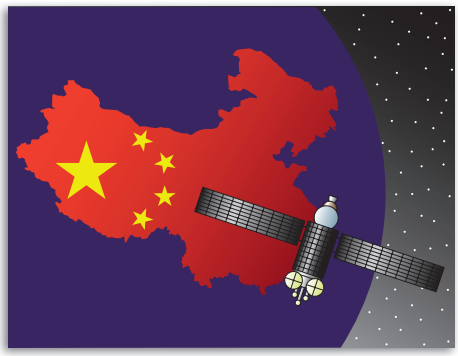
This point was emphasised by Major General Liu Jixian in a China Military Science journal article when he observed "whoever controls space controls initiative in war." [16] When describing space control in the Beijing Military Science Press book Space Warfare, published in 2001, it was noted that:

'Space control is seen as the further development of air control as the development of space technology allows space vehicles to transit through space as well as to strike terrestrial targets from space. It maximizes one's own space forces and limits, weakens, damages, and denies the application of enemy space forces. Space control theory also emphasizes the support and safeguarding of ground, sea, and air operations through the control and utilization of space. To gain space control has become one of the essential conditions to gain air, sea, land and electromagnetic control.' [17]

By 2006 this had been developed further, as outlined by Major General Cai Fengzhen when writing on integrated aerospace operations and how space control relates to the PLA's theory on outer space operations:

'Space control is the capability of one belligerent in a state of war, in a specified period of time, in a defined area of space, to carry out its own operations with freedom whilst hindering or preventing an enemy from carrying out its own operations or using space.' [18]

Having observed US led operations from the first Gulf War to current operations in Iraq and Afghanistan, PLA researchers have argued that it is inevitable that the main battlefield for informationalized war is being driven into outer space and to meet that challenge the Chinese military must build up its military space power.[19] Indeed Pollpeter has demonstrated that analysis of Chinese sources of varying authority has consistently derived two main conclusions: space warfare is inevitable and China must prepare for space war by integrating space into military operations and by



developing its own space weapons.[20] By the mid 1990s the requirement to reduce satellite vulnerability, acquire ASAT capabilities and to develop the capability to strike first at enemy space capabilities had been identified.[21] Consequently China's contemplation of the military usage of space has focused on two broad areas: firstly, how to use space to increase its offensive capability, and secondly how to use space to deny space capabilities to adversaries.[22]

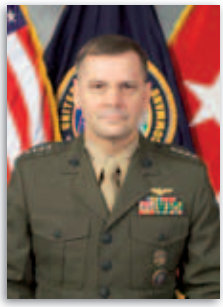
China's space doctrine is evolving and is driven by study of US military publications on space warfare and counter space operations.[23] Whilst China has also made use of Soviet-era and contemporary Russian thinking,

it is developments in the US that cause the PLA the greatest concern, and indeed, it is the US that is singled out in much of the literature as a potential adversary.[24] The possibility of a US backed Taiwanese declaration of independence is still identified as the single greatest threat to Chinese national security, despite the election last year of a more pro-Chinese President in Taiwan. US influence in the Asia-Pacific region is seen by China as the most important factor in destabilising regional security[25] and global competition as China's economy and resource requirement grows in the 21st Century is also seen as inevitable.

In developing their own doctrine Chinese officials and researchers have noted a number of US military planning documents that explicitly envision the control of space through the use of weapons either in or delivered from space.[26] By 1997, in its *Vision for 2020* document, US Space Command had observed that:

'Just as land dominance, sea control and air superiority have become critical elements of current military strategy, space superiority is emerging as an essential element of battlefield success and future warfare.'[27]

The US Air Force in its "Transformation Flight Plan" report, published in 2003, listed a number of space weapon systems desirable in the event of a space war,[28] whilst the 2004 "Counterspace Operations Doctrine" defined the intention to achieve and maintain space superiority – the "freedom to attack as well as the freedom from attack" – in space.[29] The US National Space Policy, introduced in 2006, directed the Secretary of Defence to "develop



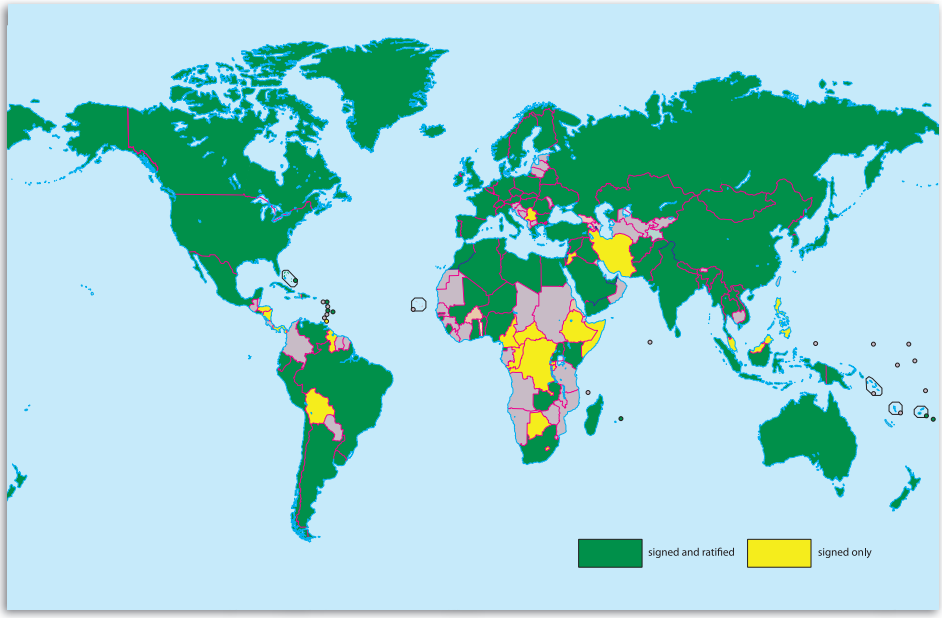
General James E. Cartwright, Commander, U.S. Strategic Command.

capabilities, plans and options to ensure freedom of action in space and, if so directed, deny such freedom of action to adversaries."[30] A recent statement by General James Cartwright, Commander US Strategic Command to the Strategic Forces Subcommittee, Senate Armed Service Committee backed up these policies:

'We must ensure U.S. freedom of operation in space and cyberspace, connectivity sufficient to exercise global command and control, integrated missile defense, and upon order, provide kinetic or non-kinetic global strike.'

'Freedom of action in space is as important to the United States as freedom to operate in the air and sea'.[31]

China is particularly concerned over the implications that the US missile defence network will have on the viability of its own strategic nuclear deterrent, especially if that defence system ends up being space based.[32] The fact that elements of this system will be based in Japan is also cause for disquiet in Beijing, which views Japans own burgeoning space programmes as a further area of concern. These concerns are probably why China's stance on banning weapons in outer space has been consistent since 1985, when it first introduced a working paper to the U.N. Conference on Disarmament[33] and why China is both a signatory of



World Map showing members of the Outer Space Treaty.

the Outer Space Treaty and a member of the UN Committee on the Peaceful Uses of Outer Space. Although seemingly at odds with the ASAT test, it has been argued that this test may have been aimed at coercing the United States into negotiating a space weapons treaty, and was a response to the US documents and statements outlined above.[34] Whilst this is a possible factor, the breadth and sophistication of China's anti-access and battlespace-denial programmes would, when taken together, readily undermine this notion.[35]

Whilst realising that the US has a significant qualitative and quantitative advantage over China's conventional forces, particularly in terms of command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR), PLA strategists believe that neutralizing or destroying U.S. space assets will deny American forces the advantage they have, and make them more vulnerable to China's less-advanced military.[36] Indeed it is in space that China believes that the US 'weak points' or its Achilles heel lie. A key tenet of Mao, who is still widely regarded in the PLA as a strategist, is to identify and attack where the enemy is most vulnerable, particularly in the rear and flanks, which are seen as the most vulnerable and vital.[37] It is clear to PLA strategists that space is the new rear, particularly given US reliance on space based information systems, and that these systems are vulnerable to attack, as a *Liberation Army Daily* article shows:

'If an anti-satellite weapon destroys a space system in a future war, the destruction will have dealt a blow to the side that owns and uses the space system, stripped it of space supremacy, and weakened its supremacy in conducting information warfare, and even its supremacy in the war at large. Anti-satellite weapons that can be developed

at low cost and that can strike at the enemy's enormously expensive yet vulnerable space system will become an important option for the majority of medium-sized and small countries with fragile space technology.'[38]

The strategic logic of China developing systems to counter US conventional superiority is clear as one Chinese military scholar has described:

'An effective active defense against a formidable power in space may require China to have an asymmetric capability against the powerful United States. Some have wondered whether a defensive policy applied to space suggests that China's possession of a robust reconnaissance, tracking, and monitoring space system would be sufficient for China to prevent an attack in space and would be in line with China's 'doctrinal' position of 'defensive' capabilities. An effective active defense strategy would include the development of these systems but would also include anti-satellite capabilities and space attack weapon systems if necessary. In essence, China will follow the same principles for space militarization and space weapons as it did with nuclear weapons. That is, it will develop anti-satellite and space weapons capable of effectively taking out an enemy's space system, in order to constitute a reliable and credible defense strategy.' [39]

Whilst much of the current Chinese writing remains aspirational, it is clear that the military applications of space form an integral component of doctrinal thought and provide an indication as to where China is heading, both in current developmental terms and in the future. What is in itself staggering is the speed in which these developments are occurring. China has gone from having no geo-stationary satellites in 1984, and little doctrinal thought regarding space, to advanced space systems, including manned space flight and anti-satellite weapons and the significant integration of space operational theory into current doctrine in only 25 years. The implications of these programmes could be significant for those nations who have come to rely on space for military operations as McDonald notes:

'China is possibly seeking a full space war-fighting capability and not just a finite deterrence posture. However, PLA writings make clear what Chinese diplomacy does not: the PLA envisions conflict in space and is preparing for it.'[40]

China's Space Programmes

In his 2002 NDU book *On Space Operations* Colonel Jia Jumming recommended a two phased approach for China's space programmes: '*For our country, in phase one, 2000-2015, we must develop space for combat support. In phase two, 2015 to 2030 then develop limited space deterrence and "assassins mace" space weapons."*[41] The ASAT test has demonstrated that China already possess at least one 'assassins mace' weapon, but direct assent weapons form only one element of the larger spectrum of offensive capabilities aimed at vitiating American dominance in space.[42] In addition the latest Annual Threat Assessment of the US Senate Select Committee on Intelligence, released in Feb 2009, noted that counter-command, control, and sensor systems, to include communications satellite jammers and anti-satellite weapons are among Beijing's highest military priorities. The assessment asserted that China

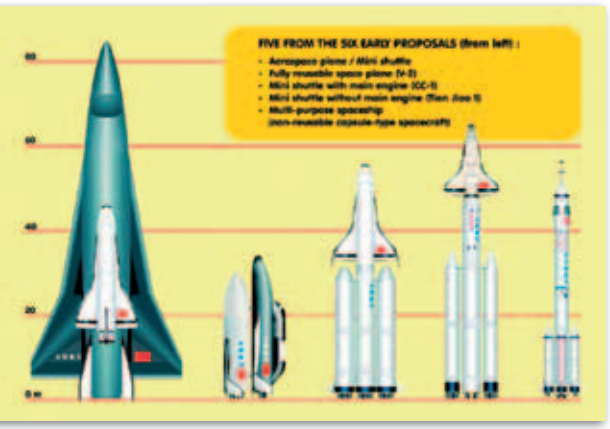
continues to pursue a long-term program to develop a capability to disrupt and damage critical foreign space systems.[43]

Written evidence of these programmes has existed for some time. In *Space Warfare*, published in 2001, desirable systems and technology that could be used for military operations in space were described in four categories:

Model of the proposed Chinese space shuttle.

Platforms

- Aerospace plane
  (e.g. space shuttle)

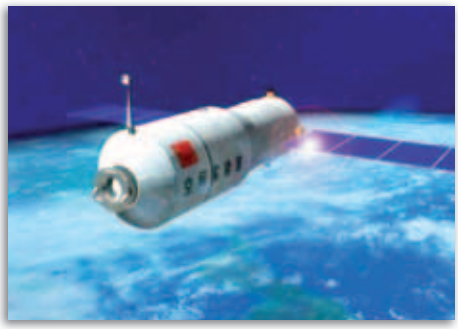


Aerospace plane/Mini shuttle designated as H-2, it was proposed by Institute 601 of the Ministry of Aeronautics. Its first launch targeted around 2015.

- Space plane

The Shenzhou 5 Space Capsule reentry module.

- Space craft
  (e.g. Shenzhou space capsule)
- Spacecraft carrier
  (able to dock other spacecraft for resupply, refuel and repair)
- Space station
  (for scientific experiments or weapons use but not designed for docking or maintenance)



China has unveiled a mockup of the planned Space Laboratory, a man-tender mini space station. It is believed that the first launch will be before 2010.

Support Technology

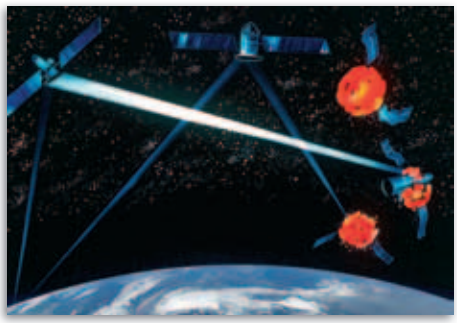
- Communication, Navigation, Reconnaissance, Early Warning and Meteorological satellites

Safeguard Technology

- Launch and recovery vehicles.

Transportation equipment

Counter-Space and Space Defence Technologies



An artist's concept of a USAF ground/space-based hybrid laser weapon.

- Anti-satellite satellites
- Directed energy weapons including lasers and microwave weapons

An artist's concept of a USAF Space Laser Satellite Defense System.

- Kinetic energy weapons

Chinese ASAT Kinetic Energy Weapon test.

- Missiles

Anti-Sat weapon.

(nuclear and non-nuclear)

- Orbital bombs
- Manipulation

Computer Network hacking/attacks.

- Computer Network Attack
- Passive Measures (including denial deception and concealment)
- Electronic Attack
- Ground based operations (e.g. special forces operations)[44]

Despite appearing far-fetched, China already possesses some of these capabilities and is in the process of acquiring more, all of which are of utility for military operations. Indeed since 2001 when *Space Warfare* was published China has made staggering progress in space and it is the scale

of China's long-term space ambitions that is of concern to others. The manned Shenzhou programme has already seen the first Chinese spacewalk in 2008, and aims to have three capsules join to form a space laboratory in 2010. The goal is to replace this with a full-scale space station by around 2020 and follow that with a manned lunar landing by 2024, and a manned mission to Mars by 2050.[45] The PLA is heavily involved in these programmes, which are occurring whilst US space programmes, including a proposed mission to Mars, are being curtailed and the space shuttle limps towards retirement in 2010 with the proposed replacement still under development.

Satellites

In tandem with its successful manned space programme, China has launched an impressive satellite program, with a clear objective to advance its capabilities in satellite technology particularly in regard to production, launch capacity and infrastructure. This ambitious plan is primarily driven by the attraction of gaining a larger share of the current annual $100 billion global commercial satellite market, which is set to grow to $150 billion by 2010.[46] However, although primarily intended to facilitate national economic growth, many of China's new satellites do contain important dual use capabilities that support PLA requirements including:

i. The ability to find enemy forces
ii. The ability to coordinate one's own forces, which may be multi-service
iii. The ability to locate and move one's own forces to within reach of the enemy
iv. The ability to undertake precision, long range strikes against the enemy, assess the results, and either sustain those attacks or move on to new targets[47]

Liftoff of Beidou-2 (COMPASS-G2) navigation satellite on 15th April 2009.

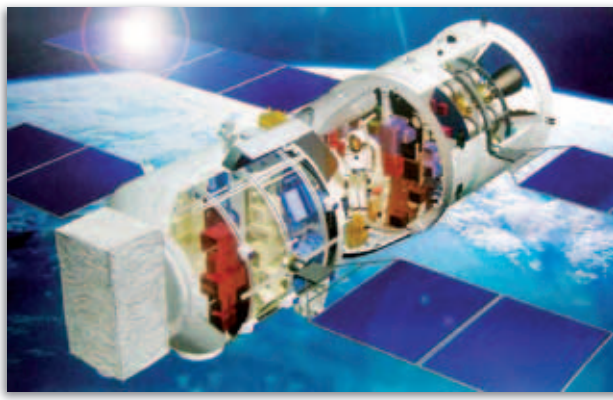
As a result, China is estimated to be developing numerous types of satellites that include imagery reconnaissance, electronic intelligence and signals intelligence reconnaissance satellites; small and micro-sized satellites for imagery, navigation and communication roles; and anti-satellite satellites.[48] It is assessed that China may have a requirement for as many as 200 military, civilian and dual use satellites in the first two decades of the Twenty-First Century.[49]

China has already launched

several generations of spy satellites including the latest Yaogan series of synthetic aperture radar satellites, offering 2m resolution, which were launched between 2006 and 2009. The introduction of a new generation of reconnaissance satellite is expected in 2010.[50]

On 15 Apr 09, China launched the second satellite in its Compass (Beidou 2) Navigation Satellite System (CNSS). This launch was the first of ten planned through to the end of 2010 alone. Initially China will provide a regional capability, but between 2015 and 2020, the constellation of thirty Medium Earth Orbit (MEO) and five Geostationary (GEO) satellites will provide a global open service with positioning accuracy of 10 meters, velocity accuracy within 0.2 meters per second and timing accuracy within 50 nanoseconds. An 'Authorized Service' will offer greater accuracy for authorised users that will primarily include the PLA.[51] Although China currently utilises the four Beidou 1 satellites as well as GLONASS and GPS, whilst investing in the EU's Galileo system, Beidou 2 will not only provide a significant improvement in capability, but also reduce reliance on foreign systems, especially GPS. This is particularly pertinent when it is considered that GPS is a primary target for China's counter-space strategy. Observing US reliance on the system, Chinese analysts have noted both its vulnerability to jamming, either the signal or at source by a space based jammer, or to destruction.[52]

US scholars have claimed that there is also ample evidence from Chinese scientific and military journals that the PRC is developing manoeuvring micro-satellites that can attach themselves to enemy satellites and destroy or jam them, or could be used to collide with and destroy enemy satellites.[53] Emerging capabilities in agile micro- and nano-satellites are most problematic from a US perspective as they can be launched quickly by mobile boosters, or covertly as secondary payloads and once in orbit are extremely difficult to detect and track.[54] These could then be used to conduct co-orbital attacks or reconnaissance on targets that may not traverse the Chinese mainland and, would provide insurance if other direct attack weapons were destroyed early in a conflict.[55] China demonstrated an embryonic capability when during the Shenzhou 7 manned mission and space-walk in 2008 Chinese scientists reported how a small satellite, carried into space by Shenzhou 7, manoeuvred into orbit around the spacecraft successfully taking photographs for a number of days.[56]



Shenzhou spacecraft cutaway.

Chinese analysts have also highlighted the importance of both active and passive defensive measures for their own satellites. Passive defence measures include hardening,

encryption, camouflage, stealth, and redundancy and duplication in satellite network systems and subsystems. Active defence measures include avoidance by orbital manoeuvring and countermeasures such as anti-interference and anti-jamming techniques. Micro-satellites could even be used to actively 'guard' other satellites, act as decoys, or even counter-attack.[57] Greater situational awareness through enhanced monitoring and surveillance in space is also crucial to this idea of defence in space. One of the driving forces behind China's efforts to research space debris identification and tracking is to also improve China's ability to monitor military assets.[58]

Directed Energy Weapons

China has devoted considerable resources to directed energy systems, particularly ground based high- and low-energy lasers for counter-space purposes. China's laser programme is mature and has long been recognised as world class.[59] It is believed that China has lased US satellites on a number of occasions and the Director of the US National Reconnaissance Office confirmed that a Chinese laser had illuminated a US satellite in 2006.[60] Ground based lasers are a particularly attractive counter-space weapon as they provide flexibility and allow varying levels of damage from temporarily blinding sensors to destruction.[61] Less mature programmes under development include radio frequency weapons, high power microwave weapons, electromagnetic railguns and particle beam systems.[62]

Kinetic Kill Vehicle

The 11 Jan 2007 ASAT test demonstrated that China already has a direct attack capability based around a Kinetic Kill Vehicle (KKV) launched from a ballistic missile. This is particularly effective against targets in low Earth orbit, where most of the US remote-sensing, meteorological, electro-optical, infrared and radar-intelligence satellites and their relays operate.[63] As the Commander of US Space Command, General C. Robert Kehler, has observed, China is therefore able to hold low Earth orbiting systems at risk.[64] Provided a sufficiently powerful booster is available, analysts at Massachusetts Institute of Technology have concluded that this technology could be used to interdict satellites in medium Earth or geosynchronous orbit.[65] It is here where US navigation and guidance, military communications and early warning and nuclear detonation satellites currently operate. China currently has several launch vehicles and ballistic missiles that could deliver a payload to these targets.[66]

Commander of US Space Command, General C. Robert Kehler.

Electronic Attack

Physical attacks against any nation's space systems are likely to be both costly and in the case of the US, which has a large number of space assets and considerable redundancy, not necessarily efficient. It could also

embroil China in a war with not just the US but the wider international community. It is therefore likely that China would focus initially on electronic attack in a 'denial of service' approach. China's has considerable jamming capabilities, and targeting communication, navigation and reconnaissance satellites at source, by targeting either their command and signals or sensors, is recognised as being a key component of achieving information dominance. There has been a considerable body of analytical work in China discussing methods to counter US data-links particularly the Joint Tactical Information Distribution System (JTIDS), primarily by space based jamming.[67]

It is likely that Computer Network Operations (CNO) against all elements of US space systems would accompany any electronic attack.[68] PLA theorists have coined the term 'integrated network electronic warfare' to describe the use of electronic warfare, computer network operations and kinetic strikes to disrupt battlefield network information systems that support an adversary's warfighting and power projection capabilities.[69] Many of these information systems are based in space.

One of the simplest counter-space methods available to China and one that would be fully in keeping with its 'Active Defence' doctrine and Anti-Access and Joint Anti-Air Raid strategies and indeed 'integrated network electronic warfare' would be conventional physical attacks against ground based space related facilities, especially those based in the Pacific. China has a rapidly expanding ballistic and cruise missile inventory at its disposal that could be effectively employed on these operations.

It is clear therefore that China can already field and continues to develop significant capabilities that can counter the space based capabilities upon which US and other forces rely, but the implications are wider than that:

'…the Chinese space programme, or Project 921 as it is fondly known to the PLA, has far more significant implications beyond simply propaganda value and national prestige for the People's Republic, and has long-reaching consequences for the global space industry and international security.'[70]

An awareness of these implications is of fundamental importance for Western military planners.

The Implications of China's Race for Space

'Intentional interference with space-based intelligence, surveillance, reconnaissance, navigation and communication satellites, while not routine, now occurs with some regularity. America's ever increasing appetite for space-based technical solutions for global positioning, communications, and weather among others, if not properly managed could become our Sword of Damocles – we must not become trapped in this vulnerable position. Space is now a contested domain where, without adjustments to our strategy, we may not be able to count on unfettered access to space-based systems should others persist in their course of developing counter-space weapons.' [71]
General James Cartwright, Commander US Strategic Command, 2007.

The implications of China's space strategy are profound and wide reaching. Whilst the topic is hotly

debated in military circles in the US the effects are felt across the globe, with many militaries now relying on space as an enabler of core capabilities. The images of the Chinese flag being waved 340 km above the globe were interpreted, with unease, by regional rivals as a further indication of the growth of Chinese power.[72] Events such as this and the ASAT test have threatened not just a reaction in the US but a wider space race, particularly as it remains unclear whether China's offensive counter-space capabilities are for deterrence or as useable weapons of war.[73]

A New Space Race?

India, one of China's primary regional rivals, has watched with concern as China has expanded its space capabilities. India's army chief of staff has stated that "the Chinese space program is expanding at an exponentially rapid pace in both offensive and defensive content," and another Indian general has observed that "with time we will get sucked into a military race to protect our space assets and inevitably there will be a military contest in space."[74] A former Indian Air Force Air Chief Marshall recently advocated the formation of a joint "aerospace command" for India to use the missile, satellite and communications capabilities of the Indian armed forces effectively.[75] Interestingly whilst India views China as a factor, it is not the only factor in its pursuit of space. As Gopal Raj the author of *Reach for the Stars: The Evolution of India's Rocket Programme* observed:

'The Chinese programme is predicated on an idea that you need to have independent access to space. India sees the same logic – we need the option to use space on our own terms.'[76]

Other regional rivals, including Japan, hold these views. Both Japan and India have ambitious lunar programmes whilst Japan is developing and already fields a basic ballistic missile defence, which is of considerable unease to China. Beijing is also concerned about Japan's development of remote sensing satellites, fearing that in the future they can be turned to military use.[77] South Korea is not far behind India and Japan, whilst Malaysia, Singapore and Taiwan also have impressive satellite capabilities.[78]

Vladimir Popovkin, Russian General, Commander of RF Space Forces.

In perhaps the most direct response to the Chinese ASAT test and the subsequent US shoot down of a malfunctioning satellite in Feb 2008, the Russian Deputy Defence Minister Vladimir Popovkin announced to the press, on 5 Mar 2009, that Russia was also developing anti-satellite weapons:

'We can't sit and watch others do it. I can only say similar works are done in Russia too.'[79]

Some have argued that the US shoot down of their own malfunctioning satellite was in fact a deliberate message aimed at China and not to prevent toxic fuel entering the

atmosphere as officially claimed.[80] It is clear that it is the dynamic between China and the US in space that will determine the nature of the future operating environment. Although the US is not necessarily entering a race with China (it currently has massive superiority in space) it is beginning to understand the nature of the threat and is taking steps to mitigate and counter it. It has been argued that they have little choice:

'China's military space doctrine and intentions are far from clear and urgently require further analysis and understanding, leaving the United States with no choice but to hedge prudently against this uncertainty.'[81]

The US military has long understood the importance of space as it has relied on the militarisation of space for it's conventional superiority for some time. As these new threats become clear it is gradually changing focus, as General C. Robert Kehler, Commander US Space Command, has noted:

'The Air Force is shifting its space mindset to one of operating in a contested environment with an increased emphasis on space protection.'[82]

Whilst space has been militarised for some time, most countries, including China, are keen to prevent it becoming weaponised. However, as discussed above, many in China and elsewhere believe that weaponisation of space is inevitable and that attempts to control the use of space are doomed to failure, especially as they perceive US intransigence over new regulations. This bears comparison to 1907 when Hague conventions were implemented in an attempt to limit air power, in much the way that conventions on the military use of space are introduced (and similarly disregarded) today.[83]

Space Debris

One obvious implication of China's ASAT test is space debris. NASA has catalogued and monitored over 1736 objects of trackable size (greater than 10cm) from the explosion and estimates there may be over 35,000 shards greater than 1cm that are now in varying orbits.[84] This single event increased space debris by ten percent in one incident and poses a significant threat in low earth orbits. On 14 May

A fish-eye view shows space shuttle Atlantis lifting off from NASA's Kennedy Space Center in Florida.

09, NASA announced that the space shuttle Atlantis had been narrowly missed by a piece of debris from the Chinese ASAT test.[85]

Implications for the UK

'Our reliance on space is increasing (for example: precision navigation and timing, communications and surveillance) and could be a critical vulnerability unless we understand the weaknesses of space and exploit its strengths. We must ensure that threats to our space capability are identified, understood and either neutralized or mitigated.... The UK's

RAF Reaper.

data exploitation and missile warning capabilities cement our close links with US space-based capabilities; this linkage should not be underestimated.' [86]

Whilst some of the implications of China's space strategy, such as debris, will affect all countries with space assets, the UK is in a unique situation and could be affected more than most. Close ties with US space-based capabilities and concurrent operations around the globe have the potential to mean that the UK's ability to conduct military operations could be impacted by any future China-US conflict. The most obvious example would be the denial of GPS, upon which the UK's armed forces are increasingly reliant, but other areas could be equally significant. Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) systems such as the RAF's Reaper, which is controlled by satellite link from the US,[87] could be impacted as well as space based collection assets vital for shared intelligence. Communication systems could also be affected, as China would have to target myriad commercial satellites that are utilised by the US for its military communications. The crossover is clear and it has to be recognised that what is a threat to the US is, to a lesser extent, a potential threat to the UK. Given the critical nature of space for current and future operations, understanding this potential threat is of fundamental importance.

Collision incident between a US EP-3 reconnaissance aircraft and a Chinese fighter in 2001.

One of the key questions then becomes whether a conflict between the US and China utilising counter-space weapons is a credible scenario. China's military modernization goals remain focused on a possible Taiwan conflict and the prevention of US involvement, through either deterrent or anti-access strategies.

As described above, counter-space systems could play a key role in these strategies. The standoff with Taiwan in 1996, when President Clinton sent US carrier groups to the area, remains at the forefront of many Chinese strategists' thoughts. China is also particularly vexed over defending its national sovereignty and territorial and economic rights. As incidents such the collision between the US EP-3 reconnaissance aircraft and a Chinese fighter in 2001 and the recent naval stand-off have shown, China is particularly concerned about US activities in its Exclusive Economic Zone. Recent legal articles in China that equate reconnaissance with battlefield preparation put these incidents into perspective.[88] Chinese commentators are extending this thinking into considerations about space reconnaissance[89], which is considerably at odds with US space strategy:

'The United States considers space systems to have the right to pass through and peacefully operate in space without interference, not unlike that of transit through international waters. Consistent with this principle, the United States views purposeful interference with its space systems as an infringement on its rights, and furthermore considers space capabilities, including the ground and space segments and supporting links, as vital to its national interests. Recent events, make it clear others may not share these values. Platforms costing billions of dollars to replace and the lives of astronauts from many nations are now at risk from debris left by China's recent ill-advised anti-satellite test.' [90]

There are countering arguments over whether China is acquiring counter-space capabilities primarily as a deterrent. However, danger lies in comparing the deterrence regime during the Cold War and that between China and the US today. During the Cold War both the US and the USSR were superpowers and both relied upon space.[91] At present China is in a transitionary phase towards becoming a superpower, and does not yet rely on space to the same degree as the US. Therefore using counter-space weapons would make strategic sense to mitigate US conventional advantages, especially in the near future. There is also evidence that there may be greater willingness to use space deterrence capabilities compared to traditional deterrence because of the perceived lower risks.[92]

The issues outlined above mean that although conflict between China and the US is remote it is a possibility. This may become more of a reality in the future, as the peaceful rise of China may not last forever. As noted in the DCDC Global Strategic Trends, once China has established itself as a major world power, possibly as early as 2025, it may feel less constrained in its behaviour, thereby presenting greater challenges to the international system.[93] Nowhere may this be more evident than in space. By which time China expects to have both a manned space station and landed a man on the moon.

DCDC Global Strategic Trends noted that:

'Given current multi-lateral agreements and technical factors, the effective weaponization of space is unlikely before 2020. However, nations will seek to inhibit the use of space by opponents through a combination of electromagnetic manipulation, hard-kill from ground-based sensor and weapon systems, the targeting of supporting ground-based infrastructure and a range of improvised measures. At its most extreme, the weaponization of space may eventually include the development of space-based strike weapons capable of attacking ground-based and other space targets; for example solid metal projectiles travelling at orbital velocities, so-called 'rods from the gods'. However, this will remain extremely unlikely without the prospect of sustained and extreme deterioration in international relationships and will be technically difficult to achieve before 2020.'[94]

This document was published in 2006 prior to China's ASAT test which confirmed the intention, of China at least, to inhibit the use of space. Many military scholars in the US, China and elsewhere believe that conflict in space is inevitable. The UK needs to ensure that it remains fully conversant with this threat as it widens. Although space is recognised as a key operating environment in British Defence Doctrine[95], the UK is in danger of lagging behind as other countries, such as China and India, develop Space or Aerospace commands and sophisticated space programmes and doctrine. The USAF has already stated that it is "now transitioning from an air force into an air and space force, on an evolutionary path to a space and air force." The importance of space will continue to grow as other countries, particularly those at a distinct conventional disadvantage, will realise that strategic necessity dictates that counter-space weapons are a viable option. With even a rudimentary space programme then counter-space weapons, even if simple in nature, are a future possibility for nations such as Iran and North Korea.

The US is aware of this threat and taking active steps both to understand the implications and how to mitigate and indeed counter it. For them the threat is very real:

'The implications of these new counterspace developments for peacetime and crisis stability, as well as the conduct of warfare, are profound. The sudden major loss of satellite function would quickly throw U.S. military capabilities back twenty years or more and substantially damage the U.S. and world economies. While backup systems could partially compensate for this loss, U.S. military forces would be significantly weakened.' [96]

Given the seriousness of the consequences, the UK and the RAF, as the primary repository of aerospace expertise, cannot afford to ignore the issue.

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