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"Chinese Military Space Power: U.S. Department of Defense Annual Reports

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**Chinese Military Space Power Documented in Defense Department Annual
Report on Chinese Military Power**

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Abstract: Following instructions received from the U.S. Congress in the 2000 National Defense Authorization Act, the Department of Defense has prepared an annual report on Chinese military power. This report contains classified and unclassified editions. Documenting Chinese military space power developments was one of the provisions in this law's authorizing language. This article will examine how Chinese military space power documents have been described by DOD in during this report's existence through 2015 and detail how members of Congress and congressional committee hearing witnesses have reacted to these developments in congressional hearing transcripts and in congressional debate through Fall 2015.

A key legislative goal for the U.S. Congress during its biennial legislative sessions is writing 12 major pieces of annual appropriations legislations for various cabinet departments. One of these departments is the Department of Defense (DOD) and each year Congress and its relevant departmental oversight committees must write, pass, and get presidential signature on appropriations legislation for these departmental missions and programs to receive funding. Besides overall agency funding information and funding for specific programs administered by these agencies, the content of these appropriations bills includes information such as criminal penalties for violating laws administered by these agencies, how long these programs are to be carried out, and reports agencies are required to submit to Congress on how they administer agency programs as part of Congress' constitutionally mandated federal agency funding and oversight process[1].

This process is supposed to be done by the beginning of the federal fiscal year on October 1. However, polarization between congress and recent presidential administrations of opposing parties has often seen both of these groups fail to reach budget agreements by this deadline and forced the passage of continuing resolutions to sustain funding of agency programs and existing levels until mutually agreeable funding levels are agreed to[2].

DOD's annual appropriations legislation frequently includes extensive congressionally mandated reporting requirements. This was true in the National Defense Authorization Act for Fiscal Year 2000 enacted on 5 October 1999. Prompted by congressional concern over increasing Chinese military spending and assertiveness and the growing economic and strategic importance of the Asian-Pacific region to U.S. geopolitical interests, Section 1202 of this statute mandated

that DOD prepare annual classified and unclassified versions of this report for the House and Senate Armed Services and Foreign Affairs Committees on Chinese military and technological developments and how they might affect Chinese grand strategy, security strategy, military strategy, and military organizations and operational concepts. Numerous specific details mandated by Congress in these reports cover China's strategy to become the leading power in the Asia-Pacific region; Beijing's strategy toward Taiwan; developments in Chinese military doctrine; and its efforts to develop, acquire, and gain access to information, communication, space, and other advanced technologies to enhance its military capabilities. This work examines how this annual DOD report on Chinese military power has detailed Chinese military space developments and will also cover congressional reaction to these developments[3].

Annual Reports on Chinese Military Power

Reports: 2000-2004: The first DOD report *Annual Report on the Military Power of the People's Republic of China* was released in 2000. It mentioned that strategic objectives of China's People's Liberation Army (PLA), which includes all branches of China's military, called for elite forces capable of dominating all battlespace spheres include space and electromagnetic and that China was capable of launching military photoreconnaissance satellites though the technology for these satellites was obsolete by western standards. This document noted the October 1999 launch of the China-Brazil Earth Resources (CBERS) satellite could provide some militarily beneficial data and that the upcoming decade could see Beijing attempt to develop near-real-time electro-optical imaging satellite and a high-resolution film-based photo reconnaissance satellite[4].

Initial Pentagon assessments of Chinese military space interests from this inaugural report include most Chinese reconnaissance, surveillance, and targeting capabilities being indigenous in nature despite some foreign technical assistance; China desiring to develop manned launch capability by 2001; achieving military space systems between 2010-2020; acquiring foreign technologies to develop anti-satellite (ASAT) capability which may include laser radars to track and image satellites and potentially acquiring an advanced radar system to track satellites in low earth orbit (LEO); developing jammers to be used against Global Positioning System (GPS) satellites; and potentially developing laser or other weapons capable of destroying satellites[5].

The 2000 report also noted Chinese collaborative space ventures with countries as varied as Brazil, Canada, France, Germany, India, Russia, South Korea, the United Kingdom, and United States; how the Chinese aerospace industry seeks to integrate GPS and Russian Global Navigation Satellite System (GLONASS) technology into jet fighters and helicopters; and Beijing's attempts to acquire commercial satellite imagery from foreign countries to be integrated into efforts to develop digital terrain maps for targeting, missile guidance, and planning[6].

The next edition of this report appeared in 2002. This report noted that Beijing's procurement of space systems, early warning aircraft and unmanned aerial vehicles (UAVs), and over-the-horizon radar would enhance its ability to detect, monitor, and target Western Pacific naval activity. Further, the report highlighted that, in July 2001, a Sino-Russian five-year space cooperation agreement would produce joint development of a regional missile defense system and provide \$500 million funding for new generation high-technology weapons[7].

This treatise also noted the increasing emphasis placed by Chinese military strategists on space as an operational theater of war by referencing this quotation from Captain Shen Zongchang of the Chinese Naval Research Institute:

The mastery of outer space will be a requisite for military victory, with outer space becoming the new commanding heights for combat....lightning attacks and powerful first strikes will be more widely used in the future....In future wars....radar, radio stations, communications facilities, and command ships [become] priority targets vulnerable to smart weapons, electronic attack, and electromagnetic pulse (EMP) weapons[8].

This report also noted that China publicly opposes space militarization and seeks to prevent of slow development of ASAT systems and space-based missile defenses. Privately, though, Chinese leaders view ASAT and offensive counterspace systems as inevitable while striving to acquiring various foreign technologies which could be used to develop active ASAT capabilities. The PLA also has thorough knowledge of U.S. and foreign space operations from open-source information; it may seek an advanced radar system capable of tracking LEO satellites and develop jammers which could be used against GPS receivers; and that it could have some capability of damaging optical sensors on satellites highly vulnerable to laser damage[9].

This report's 2003 edition noted China is placing major emphasis on improving space-based reconnaissance and surveillance and that once such systems are fully

deployed they will give Beijing a strong and diversified space reconnaissance capability with regional coverage. 15 May 2002 saw the launching of China's first oceanological satellite which is intended to collect precise data about oceanic color and temperature. This document also noted that China may have acquired high-energy laser weapons and technological assistance while being potentially interested in developing ground-based ASAT capability. Beijing also seeks augmentation of its space launch capability by developing a modular class of heavy space-launch vehicles while aspiring to achieve the ability to launch 25 tons to LEO and 14 tons to geosynchronous orbit by 2007[10].

The following year's edition of this report (2004), occurring during a presidential election campaign, mentioned that developing intelligence, surveillance, and reconnaissance (ISR) capability is a key component of the PLA's local wars doctrine. Additional 2003 Chinese military space developments noted in this report were:

- Launching *Ziyuan 1* and 2 remote sensing satellites in October 2003 with Brazil. One of these satellites has 19 meter resolution and another is anticipated to have digital imagery collecting capability and sun-synchronous orbit with global coverage and near real-time imagery download covering most of eastern Asia to potential ground sites in eastern and Central China.
- The next decade is likely to see China deployed advanced ISR and earth resource systems with military applications while potentially deploying an improved film-based photoreconnaissance satellite.
- China is also interested in developing electronic and signals intelligence satellites and has acquired mobile data reception equipment capable of transmitting to deployed military forces.
- It is possible China may use low energy lasers to blind sensors on LEO satellites[11].

Reports: 2005-2009

The George W. Bush Administration's second term saw the DOD continue documenting Chinese military space developments in these annual reports. Its 2005 edition noted that long-term enhancements in Beijing's Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) capabilities such as space-based and over-the-horizon platforms could facilitate identification, tracking, and targeting foreign military activities deep into the western Pacific and provide potentially hemispheric coverage[12].

This assessment also noted that PLA theorists and planners believe future military campaigns will be conducted simultaneously on land, sea, air, space, and electronically and that China is developing and enhancing its counter-reconnaissance and counterspace capabilities in areas including low-tech denial and deception based on camouflage, cover, and concealment to high-tech lasers and space tracking devices. China launched its first manned space crew into orbit on October 15, 2003 and press reports indicated a two-person crew on a five day mission would be launched in September 2005. In addition China is developing microsattellites weighing less than 100 kilograms (kg) for remote sensing and networks of electro-optical and radar satellites, aspires to have 100 satellites in orbit by 2010, and hopes launch an additional 100 satellites by 2020 and have a full space station in orbit by 2020[13].

The 2006 edition of this report mentioned China was replacing Long March rockets by developing newer boosters to expand the reach of their anti-access forces. It also noted that CBERS satellites were capable of taking 20 meter resolution images in swaths over 100 kilometers (km) and transmitting these digital images to earth stations. This report further mentioned that China had launched three *BeiDou* satellites providing 20 meter accuracy navigation cover over China and surrounding areas; that *BeiDou* is an active positioning system requiring transmissions between the satellite and user resulting in a slower time for the user to receive the corrected position; and that *BeiDou* is most suitable for slow-moving troops, ships, and vehicles[14].

Additional contents of the 2006 report include coverage of Beijing's manned space launch mission between 12-17 October 2005 in which Chinese astronauts performed experiments in space; its hopes to perform a 2007 space walk; demonstrate rendezvous and docking capability between 2009-2012; expanding indigenous satellite development capability; developing technologies for radio-frequency weapons and precision guided munitions; and enhancing space situational awareness capabilities to track and identify satellites and take hostile action against them[15].

The 2007 report began by noting China's successful 11 January 2007 test of an ASAT against an FY-1 weather satellite in LEO and the international uproar produced by this event which could endanger human space flight and jeopardize the assets of space faring nations. It also noted the October 2006 publication of *China's Space Activities in 2006* which detailed that country's space activities without providing information on its space programs and counterspace activities[16]

Additional contents of this appraisal mentions the PLA’s desire to acquire precision strike capabilities to threaten western Pacific airbases, ports, surface combatants, land and space-based C4ISR, air defense systems, and command facilities; observed that China desires developing its space and counterspace capabilities as means of augmenting national power; and referenced Colonel Yuan Zelu’s 2005 book *Space War Campaigns* published by the PLA’s National Defense University Press as advocating space shock and awe to deter enemies, focusing space strike objectives on important information sources such as command and control systems and communications hubs to shake an enemy’s operational organizational system and cause enormous impact on opposing policymakers[17].

In addition, the 2007 report also included Table 1 documenting Chinese space assets:

Table 1. Chinese space assets

Communication Satellites	14
Navigation Satellites	3
Meteorological Satellites	3
Remote Sensing/Imagery Satellites	6
Scientific Satellites	8
Manned Space Satellites	1
Total	35[18].

From p. 42 of the 2007 edition of *The Military Power of the People’s Republic of China*, a U.S. Government publication thus not subject to copyright.

This report’s 2008 edition noted how the lack of transparency about Chinese defense spending and policies increases the risk of instability by increasing the possibility of misunderstanding and miscalculation and noted that China launched its first lunar orbiter *Chang’e 1* on 24 October 2007 which achieved lunar orbit on 5 November 2007. This achievement demonstrated China’s ability to conduct complicated space maneuvers, which has salient implications for military

counterspace operations. During its lunar orbit, China used stereo cameras and x-ray spectrometers to map lunar surface three dimensional images for mapping lunar mineral resources for potential future use by Chinese industry[19].

Other key 2007 Chinese military space developments documented by the 2008 report included developing the Long March 5 improved heavy lift rocket capable of lifting larger reconnaissance satellites into low-earth orbit or communication satellites into geosynchronous orbits by 2012; constructing a new satellite launch facility on Hainan Island; replacing foreign produced satellites with indigenously produced satellites by 2010; and PLA writings emphasizing the imperative of: “destroying, damaging, and interfering with the enemy’s reconnaissance, observation, and communications satellites,” suggesting that such systems, as well as navigation and early warning satellites, could be among initial targets of attack to “blind and deafen the enemy...”[20].

The 2008 report also noted the PLA’s developing various kinetic and non-kinetic weapons and jammers to degrade or deny other countries abilities to use space-based platforms while also research and deploying capabilities to disrupt satellite operations and functionality without causing physical damage. The PLA is also exploring satellite jammers, kinetic energy weapons, high-powered lasers and microwave weapons, particle beam weapons, and electromagnetic pulse weapons for potential counterspace use[21].

The 2008 report also noted that production trends and governmental resource allocations have particularly favored China’s missile and space system industries in recent years. Short and medium range ballistic missile final assembly and rocket motor production facilities have received significant upgrades. Besides supplying indigenous military needs, this expanded infrastructure could also be used to enhance Chinese missile and space system exports[22].

The advent of 2009 saw the presidency transition from the two-term GOP administration of George W. Bush to the Democratic administration of Barack Obama. The increasing importance of Chinese military space programs was also reflected in this year’s edition of *Chinese Military Power*. This document noted improvements in Chinese anti-access area denial (A2AD) capability due to improvements in Beijing’s space-based reconnaissance and positioning, navigation, and timing capabilities, and in survivable terrestrial over-the-horizon targeting consequently decreasing gaps in creating precision-strike capability. This document also noted that PLA strategists see space as central to facilitating contemporary informatized warfare and “the commanding point for the information battlefield”[23].

This 2009 report also referenced Chinese military writings emphasizing counterspace warfare as having “Assassins Mace” capabilities exploiting potential opponents perceived vulnerabilities. “Assassins Mace” refers to asymmetric military capabilities used by China or other countries to overcome their inferiorities to United States and U.S.-allied forces by exploiting weaknesses in the military capabilities of conventionally superior forces. In China’s case, it can include using ballistic missiles and anti-satellite weapons. The 2009 report also stated that Chinese space assets and capabilities affect their A2AD programs for Taiwan Strait contingencies and beyond; mentioned Chinese taikonauts performing their first space in 2008 from the *Shenzou VII*; this same mission deploying the *Banxing-1* small imaging satellite which successfully positioned itself into orbit around the *Shenzou VII*; that manned spaceflight is one of “16 special areas” in which China plans to develop or expand indigenous capabilities; and that naturalized U.S. citizen and Chinese national Shu Quan-Sheng who worked as physicist for Newport News, VA-based high tech company AMAG International pleaded guilty to violating the Arms Export Control Act by giving Beijing information on the design and development of a space launch vehicle’s fueling system[24].

Reports: 2010-2015

The 2010 *Military and Security Developments Involving the People’s Republic of China* report mentioned the People’s Liberation Army Air Force (PLAAF) commemorating its 60th anniversary on 11 November 2009 with its Commander General Xu Qilang contending that military competition extending to space is “inevitable” and that the PLAAF has transitioned from emphasizing homeland defense to integrating air and space. This report also announced that China launched a navigation satellite on 15 April 2009; hopes to have a complete network of GPS satellites for civilian and military users by 2015-2020; that development and testing of the Long March V rocket continues; and that construction of a launch facility near Wenchang on Hainan Island began in 2008 [25].

During a March 2009 speech to China’s People’s National Congress President Hu Jintao urged the military to concentrate on “building core military capabilities” which includes securing space-based assets. The 2010 edition of this report also alluded to the PLA’s theoretical military journal *China Military Science* contending

“it is in space that information age warfare will come into its more intensive points”; that space-based communications, intelligence, and navigable systems enable coordinating joint operations and winning modern wars; and that destroying, damaging, and interfering with U.S. and U.S. allies military satellites and sensors will prevent them from taking the battlefield initiative and bringing precision-guided munitions into play[26].

This report’s 2011 edition noted Beijing’s launching 5 *BeiDou* navigation satellites in 2010 and an overall national record of 15 during that year. It also announced that the Long March V rocket is expected to be launched from Wenchang during 2014; that General Qiliang’s assertion of space becoming an inevitable conflict arena was contradicted by President Hu Jintao; that Beijing seeks to use space as an instrument of an “information blockade” strategy against prospective military adversaries; that it is expanding its ballistic missile and aerospace missile defense umbrella to include kinetic intercept capability at exo-atmospheric altitudes >80 km; and that in January 2010 China successfully achieved a mid-course ballistic missile intercept using a ground-based missile[27].

The 2012 edition of this report noted that PLAAF is beginning to develop ballistic missile defenses and air-space integration needed for early warning; the September 2011 launch of the *Tiangong* space station module and the *Tianlian 1B* communications relay satellite facilitating near real-time data transfer to ground stations from manned space capsules or orbiting satellites. This report also acknowledged that Beijing’s space and counterspace platforms face some systems reliability problems with communications satellites using the standard DFH-4 launch platform experiencing failures resulting in reduced lifespan or satellite loss. August 2011 saw these problems demonstrated when a Long March 2C rocket carrying an experimental *Shijian 11* satellite malfunctioned after liftoff failing to deliver the satellite to orbit and was the third Chinese satellite launch in one week[28].

The 2013 report marked the beginning of the Obama Administration’s second term. It mentioned that 2012 saw Beijing conduct 18 space launches including 11 new remote sensing satellites capable of executing civilian and military applications. It also revealed that Zhang Youxia of the Central Military Commission’s General Armament Department was responsible for the military weapon’s development and space program and reiterated the importance of space in China’s as a combat arena in Beijing’s information blockade strategy[29].

Additional determinations of this report include the PLA General Staff Department’s Fourth Department (Electronic Countermeasures and Radar) being

likely to use information operations tools such as jamming, electronic warfare, computer network operations, and deception to enhance counter-space and kinetic operations during wartime situations; the successful January 2013 intercept of a mid-course ballistic missile using a ground-based missile; that recent upgrades to primary final assembly and rocket motor production facilities have enhanced production of various missiles for the PLA and export markets; the growth of China's space launch industry to include supporting satellite launch services and the manned space program; and that their ballistic and cruise missile systems are comparable to international competitors[30].

DOD's 2014 report noted a number of Chinese space policy developments. These included counter-space weapons being a critical part of China's 2013 defense spending of \$119.5 billion representing a 5.7% annual increase, China conducting at least 8 space launches this year enhancing its space-based ISR capabilities and meteorological and communications satellite constellations; the successful launch of the *Kuaizhou* intended to launch a small satellite into LEO to support natural disaster monitoring; and development of the Long March 11 to provide a capability of quick launch for disaster and contingencies monitoring with a 2014-2016 launch window[31].

Beijing continues developing the Long March 5 space launch vehicle which more than doubles the size of payloads it can place in geosynchronous orbit. The Pentagon report also mentions that distinguishing between Chinese civilian and military space end-use is difficult due to opaque corporate structures, hidden asset ownership, and connections of communications personnel with the central government. It also mentions that some commercial entities are affiliated with PLA research institutes or have ties to and are subject to the control of governmental organizations including the State Owned Assets Supervision and Administration Commission[32].

This report also noted China may expand its national early warning network to provide space defense as well as protect territorial air space and waters. Such efforts include China's increasing reconnaissance, data relay, navigation, and communications satellites; Beijing improving its reconnaissance technologies to include infrared multi-spectrum, pulsed Doppler, phased array, and passive detection with over-the-horizon skywave radar being an important component of China's enhanced strategic early warning capabilities. The U.S. Department of State also announced that China conducted a non-destructive test of an LEO ASAT on July 23, 2014[33].

This report's 2015 edition announced that China holds the world's most rapidly maturing space-launch program and is using its orbital and ground-based assets to drive national civil, economic, military, and political goals. As of October 2014, Beijing had launched 16 spacecraft. In 2014, DOD's annual report went on to assert that Beijing has invested in advanced space capabilities including satellite communications, ISR, satellite navigation, and meteorology along with manned, unmanned, and interplanetary space exploration. This investment also incorporates a large ground infrastructure supporting spacecraft and space launch vehicle manufacture and launch, command and control, and data downlink[34]. China also seeks to use space systems for establishing real-time and accurate surveillance, reconnaissance, and warning systems, and to enhance joint operations command and control. Other significant 2014 Chinese space program accomplishments that were documented included:

- The first sub-meter resolution imager achieved by the *Gaofen-2* satellite;
- The October 2014 launch of the *Chang'e-5* test spacecraft intended to retrieve and return lunar samples to earth with a planned 2017 mission;
- Completing construction on Hainan Island's Wenchang Space launch center with intent to launch Long March 5 and Long March 7 space launch vehicles no later than 2016.
- Conducting a July 23, 2014 space launch destroying a defunct weather satellite comparable to the 2007 weather satellite destruction[35].

PLA strategists consider the ability to use space-based systems and denying adversaries access to such systems as facilitating "informatized" warfare. In addition missile and space industries are prioritized sectors for Chinese defense spending; July 2014 saw Chinese national I Bo Cai plead guilty to violating the Arms Export Control Act and International Trafficking in Arms Regulations while attempting to export sensors intended for line-of-sight stabilization and precision control mechanisms manufactured for DOD to China; the location of Chinese space launch facilities besides Hainan Island's Wenchang including Jinqian in northwest Gansu province, Taiyuan in northern Xangi province, and Xichang in southwest Sichuan province; and China's aspiration to construct a space station by 2022[36].

Congressional Reaction: Debate and Legislative Provisions

Since the 2000 Defense Authorization Act establishing this report was enacted by Congress, there has been intense congressional interest in commenting on DOD's annual Chinese military power report findings. These comments are most commonly expressed during House and Senate floor debate, through legislative amendments, and in congressional committee hearings. Representative samplings of congressional comment on this report and its potential implications for U.S. military policy have been expressed on a bipartisan basis over the report's 15 year existence.

During debate over the 2002 defense budget, the House directed the Pentagon to prepare a report on weapons sales and transfers from the former Soviet Union to China which would include manned and unmanned space operations[37]. On 2 October 2001, Senator Jon Kyl (Republican, Arizona) offered an amendment requiring DOD to assess Chinese efforts to acquire dual-use technologies including those covering space[38].

On 2 February 2005, Rep. Elton Gallegly (Republican, California) introduced H. Res. 57 urging the European Union (EU) to maintain its arms embargo on China referencing the 2004 DOD Chinese military power report citing China's increasing military space systems as justification for this resolution[39]. Language in the 2011 Defense Authorization Act presented by House Armed Services Committee Chair Representative Ike Skelton (Democrat, Missouri) included an amendment requiring DOD to report on developments in Chinese A2AD capabilities[40]. The following year's Defense Authorization Act presented by Senate Armed Services Committee Chair Senator Carl Levin (Democrat, Michigan) include the following requirements for DOD's annual report on Chinese military power:

The strategy and capabilities of Chinese space programs, including trends, global and regional activities, the involvement of military and civilian organizations, including state-owned enterprises, academic institutions, and commercial entities, and efforts to develop, acquire, or gain access to advanced technologies that would enhance Chinese military capabilities[41].

On December 11, 2014, Senator Marco Rubio (Republican, Florida) emphasized Chinese investments in space warfare, acquiring the ability to destroy U.S. satellites recognizing heavy U.S. dependence on having a technological advantage through national security space assets, and that China is a serious threat to observe and monitor[42]. Concern over Chinese space capabilities was also reflected in language in the proposed 2016 National Defense Authorization Act's House version including prohibitions on relying on Chinese and Russian

space-based weather data and similar language prohibiting integrating Chinese and Russian missile defense systems into U.S. missile systems[43].

Congressional Committee Hearings

Debate and questioning in congressional committee oversight hearings has also produced reaction to developments described in the annual reports on Chinese military power. A 23 May 2007 House Oversight and Government Reform Committee hearing discussed the 11 January 2007 Chinese ASAT test, with Representative John Tierney (Democrat, Massachusetts) noting the troubling U.S. and international significance of this event, contending that this single Chinese test increased the threat to satellites in LEO by 40%. This hearing also saw DOD National Security Space Office Director Major General James B. Armor, Jr. note that this Chinese action produced thousands of pieces of long-lived orbital debris, is inconsistent with China's stated position on preventing an arms race in outer space, as well as its signed agreement to mitigate space debris. He also noted China is developing a wide-range of anti-access and aerial denial capabilities including direct ascent ASAT, radio frequency jammers and other capabilities to transform their military forces, and that Beijing is developing and deploying modern intelligence, surveillance, and reconnaissance satellites with advanced command and control, communications, and targeting capabilities[44].

An 18 March 2009 House Armed Services Committee hearing noted the Chinese military power report's observation of Beijing's pursuit of a multidimensional program to limit or prevent use of space-based assets by China's adversaries with Representative Michael Turner (Republican, Ohio) expressing skepticism Beijing would halt its space programs. This hearing also saw Council on Foreign Relations witness Bruce W. MacDonald mention that China could exploit U.S. dependence on space within a decade to seriously threaten our space assets, and that current space policy does not address space debris accumulation[45].

During a 11 May 2011 hearing by the U.S.-China Economic and Security Review Commission, Representative Frank Wolf (Republican, Virginia) noted China's space program in the past decade advancing from launching their first manned spacecraft to developing plans for an advanced space station to rival the

International Space Station; developing a powerful rocket capable of achieving a moon landing and exploring deep space; achieving a manned moon landing; and his concern about the PLA leading China's space efforts. Hearing witness Mark Stokes from the Project 2049 Institute noted the key role played by the PLA's General Staff Department's Intelligence Department in developing space imagery and radar systems and the critical roles played in Chinese space development by the Chinese Aerospace Science and Technology Corporation and China Aerospace Science and Industry Corporation[46].

This same hearing saw witness Barry Watt of the Center for Strategic and Budgetary Assessments mention that he didn't think the Chinese military could interfere with U.S. space assets during the 2010s, but thought this would become more likely in the 2020s. Stokes also told Commission Co-Chair Senator Richard Blumenthal (Democrat, Connecticut) that the Chinese are following Soviet tactics by placing key emphasis on using electronic countermeasures as means of degrading potential adversaries use of space such as using communication satellite jammers, jamming synthetic aperture radar satellites, or using laser systems to dazzle U.S. electro-optical systems or other assets[47].

A 28 January 2014 House Armed Services Committee hearing saw Ashley Tellis of the Carnegie Endowment for International Peace make the following assertion about Chinese military space programs:

...the current and the evolving counterspace threat posed by China to U.S. military operations in the Asia-Pacific theater and outside is extremely serious. And the threat ranks on par with the dangers posed by Chinese offensive cyber operations to the United States more generally.

...the diversity and the complexity of China's counterspace programs make them particularly problematic, because they span the gamut all the way from direct-ascent and co-orbital ASAT [anti-satellite] programs, which receive enormous attention, to equally challenging threats like electronic warfare intended to paralyze U.S. satellite communications, which actually get very little attention, to more recondite dangers, such as directed-energy weapons and radiofrequency weapons and computer network attack capabilities, which are rather hard to understand. So it is the complexity and the diversity of these threats that magnify the challenges faced by the United States.

...these dangers are acute because the U.S. space systems which are the targets of China's activities are simultaneously extraordinarily vulnerable and extraordinarily valuable at the same time.

...the incentives that drive China to pursue its counterspace programs are strong and will only intensify over time for the simple reason that China views itself as being in a geopolitical competition with the United States and believes that it must prepare itself for a possible conflict with a superior U.S. military. Given this perception, Chinese military planners are deeply focused on neutralizing American space capabilities because of their belief that such neutralization is essential to whittle down the information dominance on which the United States military depends on for its success.

...Given China's incentives and the reasons why it is pursuing a counterspace program, I do not believe Beijing can be dissuaded from moving through a different direction through arms-control agreements.

The only way to persuade China that its counterspace programs will not deliver the returns that it seeks, if there is any way at all, is for the United States to ensure that its military forces can operate successfully despite China's investments in counterspace. This will require, at the very least, diverse new kinds of investments, which are essential for the United States to protect its success in power projection operations that will be necessary in the years to come[48].

Witness Robert Butterworth of Aries Analytics Inc. stressed China wishes to know which U.S. satellites to kill in order to achieve desired degradation of U.S. military capabilities; that the U.S. should expect more extensive Chinese examination and operational probes of Washington's satellite capabilities in the future; that the U.S. should further harden satellite subsystems to resist thermal and electronic attacks; and that the U.S. must find ways to engage and defeat attacking weapons prior to their engaging U.S. satellites. Butterworth also stressed that the U.S. needs to more realistically test its space forces ability to detect and respond to attacks on its space assets and that the U.S. and China are in a long-term military competition involving significant effort in space[49]. A post-hearing question of note asked by Rep. Randy Forbes (Republican, Virginia) to witness Michael Krepon of the Stimson Center with Krepon's answer being:

Mr. FORBES. How aggressive is China pursuing counterspace technology that would put at risk the open and peaceful use of space? What insight do we have into their intent for developing such technology? What motivates them, and what would de-motivate them in this pursuit?

Mr. KREPON. According to published reports, the PLA is testing capabilities and practicing techniques that could be applied against satellites. These

capabilities are not unique to China; all major space-faring nations, including the United States, can be expected to possess them. When any country tests such capabilities, others might infer hostile intent, or preparations to be ready to employ these techniques in the event of authorization to engage in warfare. Or they might serve deterrent purposes. Or these practices might suggest, in China's case, a perceived need to play catchup ball. I am not a China scholar, so I am not well versed enough to hazard a guess about which of these possible motivations, or which combination of motivations, applies[50].

The following exchange between Representative Mike Rogers (Republican, Alabama) and Tellis also offers revelatory insights on what the loss of U.S. access to space would mean for U.S. national security interests:

Mr. ROGERS. What are the national security implications if our military lost access to space capabilities in a conflict with the People's Republic of China? Beyond national security, if a system such as Global Positioning System (GPS) was threatened, what would be the potential economic and civil impact on the United States?

Dr. TELLIS. I think it would be safe to say—as a first cut—that the loss of U.S. space capabilities to China in a conflict would be simply catastrophic to the United States. There is no other national military that relies on space for its operational effectiveness as much as the U.S. military. Nor is there any other society that relies on space for its economic wellbeing as much as the United States. The loss of U.S. access to space for both military and civilian endeavors would, therefore, be calamitous. Given this fact, it is unfortunate that we still do not have a comprehensive understanding of what exactly would entail operationally if the U.S. military were to lose access to space in a conflict with China. I believe that assessments of this kind are just beginning and it will probably be a while before they are complete[51].

Conclusion

DOD's annual report on Chinese military power is an important source of declassified information on all aspects of China's military programs. It has been prepared for nearly fifteen years[52]. Its contents include text, statistics, visual analytics, and cartography. During its historical and ongoing evolution this report has tracked Chinese military developments across the air, land, sea, and space spectrums of military power. These reports have repeatedly demonstrated that

China is steadily increasing its civilian and military space capabilities with their most likely targets to be U.S. and allied militaries and strategic aspects in the western Pacific Ocean and space. Another consistent revelation of these reports is that space control is a core geopolitical goal of China's strategic aspirations. Consulting these reports is an essential requirement for those desiring enhanced understanding of Chinese military space power trends and developments and their potential impact on U.S. and allied countries strategic and aerospace interests.

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