Prepared Statement of
Mark A. Stokes
Executive Director
Project 2049 Institute
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Hearing on the Implications of China's Military and Civil Space Programs

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Mr. Chairman, thank you for the opportunity to participate in today's hearing on a topic that is important to U.S. interests in peace and stability in the Asia-Pacific region. It is an honor to testify here today. The evolving capacity of the People's Republic of China (PRC) to apply aerospace power presents a number of challenges for the United States, allies, and friends in the Asia-Pacific region. In my presentation this morning, I will address the perceived nature and intent of PRC investment into militarily relevant space technologies and potential operational implications.

Drivers

The PRC has embarked upon an ambitious dual-use, civil-military space program that is predominantly driven by the desire to stand among equals in the international community. However, as in most space programs, there is a military stake. China's motivations for investing significant resources into space programs may differ little from other space-faring nations. From a political perspective, Beijing seeks to elevate its status and prestige internationally. National pride resulting from successes in space may enhance the domestic legitimacy of the Chinese Communist Party. From an economic perspective, China benefits from space technology spin-offs, commercial applications of space systems, and revenue generated by international satellite launch services.

While political and economic considerations contribute to China's ambitions in space, the People's Liberation Army (PLA) plays a prominent if not central role. Aerospace power – the strategic and operational application of military force via or aided by platforms operating in or passing through air and space -- is emerging as a key instrument of Chinese statecraft. The PRC understands the potential role that aerospace power can play in pursuing military goals. Control over the skies over a particular region is a critical enabler for dominance on the surface. Effective application of space-based systems, and denying a potential adversary's effective use of space assets, offers the PLA greater flexibility in conducting operations around the country's

periphery and greater confidence in its nuclear deterrent. An ability to hold at risk adversarial space systems also may deter attacks on Chinese space systems, or complicate the ability of regional powers to operate in the Asia-Pacific region should deterrence fail.

Overview of Military Space Organizations

Within a broad and fragmented party and government policy framework, the PLA plays a central role in coordinating, defining, and managing national space requirements. Functional offices within the General Staff Department (GSD) shape operational requirements for militarily relevant space-based sensors, aerospace surveillance systems, and communications satellites. The GSD, as well as the Chinese Air Force, Navy, and Second Artillery Force, also are primary customers of space-based systems. For example, the GSD Operations Department appears to manage reference stations and at least one laser ranging system supporting the country's expanding navigation satellite network. Other GSD departments operate sites for processing and distributing downlinked imagery and electronic reconnaissance information.

The PLA's General Armaments Department (GAD) oversees the development and acquisition of technical solutions to satisfy GSD operational requirements, and manages launch, tracking, and control of civilian and military satellites and other orbital systems. For example, GAD's Electronics and Information Infrastructure Department appears to play a leading role in developing technical requirements for the PLA's space-based maritime surveillance architecture. GAD mans China's National Space Command and Control Center, and coordinates technical aspects of the country's manned space program through its 921 Engineering Office. GAD-managed expert working groups leverage expertise from across China's science and technology community in order to break down institutional and bureaucratic barriers that may inhibit technological progress.

Research and development (R&D) and manufacturing of Chinese space systems is centered upon two state-owned defense industrial establishments: the China Aerospace Science and Technology Corporation (CASC) and China Aerospace Science and Industry Corporation (CASIC). Along with senior academics within the scientific community, CASC and CASIC also function as national proponents for aerospace power. Aided in part by technologies funded by national-level research efforts such as the 863 Program, CASC and CASIC research academies specialize in certain space-related core competencies, such as heavy lift launch vehicles, tactical solid fueled launch vehicles, weather satellites, and communication satellites. CASIC appears to serve as a lead systems integrator for tactical microsatellite and space intercept systems. Increasingly accountable for profit and loss reporting, trends indicate growing competition between business divisions for R&D and manufacturing contracts managed by GAD and other customers. Other defense industrial enterprises, such as the China Electronics Technology Corporation (CETC), may supply sub-systems, such as space-based electronic reconnaissance

receivers or data links. The State Council's China National Space Administration coordinates and executes international space cooperation agreements.

Emerging Capabilities

The PLA is expanding its ability to project military power vertically into space and horizontally beyond its immediate periphery in order to defend against perceived threats to national sovereignty and territorial integrity. Over time, the PRC's defense establishment may gain a limited ability to conduct "new historic missions" to enforce a broader set of security interests beyond China's immediate periphery. PLA observers view air and space as merging into a single operational medium of the future, with the English term *aerospace* best describing the linkage between the two domains.

Increasingly sophisticated space-based systems expand PLA battlespace awareness and support extended range conventional precision strike systems. Space assets enable the monitoring of naval activities in surrounding waters and the tracking of air force deployments into the region. The PLA is investing in a diverse set of increasingly sophisticated electro-optical (EO), synthetic aperture radar (SAR), and electronic reconnaissance assets. Space-based remote sensing systems also provide the imagery necessary for mission planning functions, including automated target recognition technology that correlates pre-loaded optical, radar, or infrared images on a missile system's computer with real time images acquired in flight. A constellation of small electronic reconnaissance satellites, operating in tandem with SAR satellites, could provide commanders with precise and timely geolocation data on mobile targets. Satellite communications also offer a survivable means of linking sensors to strike systems, and will become particularly relevant as PLA interests expand further from PRC borders. Authors publishing in authoritative journals have advocated accelerating and expanding China's space-based surveillance system to cover targets operating out to a range of 3000 kilometers from the shoreline.

The GAD boosts payloads into orbit from three fixed launch centers in China, with a fourth for heavier payloads under construction on Hainan Island. A diverse and reliable family of launch vehicles is available depending on mission and payload weight. Cost effectiveness and reliability are key factors shaping design of new generation launch vehicles. Over time, the PLA may acquire mobile or air launched solid-fuelled launch vehicles for placing small tactical satellites into orbit during crisis situations.

The PLA also is modernizing its ground-based surveillance and tracking system in order to meet demands presented by its expanding presence in space and defend against perceived air and space threats. Supported by an improved surveillance and tracking system, the PLA has demonstrated a rudimentary ability to engage flight vehicles in space, such as polar orbiting satellites and medium range ballistic missiles. While GAD has a well-established space tracking

and control network, the PLA appears to be investing R&D resources into ground-based radar systems capable of providing queuing quality data for engaging targets in space. A prototype long range large phased array radar has been used to support missile defense and anti-satellite testing. One space surveillance radar R&D study indicated a requirement for detecting and tracking targets as small as 10 centimeters at an altitude of 500 kilometers. The PLA also has invested in electronic countermeasure technologies that could degrade an adversary's satellite communications, navigation satellite signals, or SAR satellites operating within line of sight of an emitter.

As its persistent sensor, data fusion, and command and control architecture increases in sophistication and range, the PLA's ability to hold at risk an expanding number of targets throughout the western Pacific Ocean, South China Sea, and elsewhere around its periphery is expected to grow. In line with the PLA's "informationization" goals, precision guidance enjoys a high R&D priority. For high altitude target acquisition of moving targets at sea, China's defense R&D community appears to be investing significant resources into developing a missile-born SAR capability that would be integrated with satellite positioning and inertial navigation systems. Existing and future data relay satellites and other beyond line of sight communications systems could transmit targeting data to and from theater command elements. Developments underway suggest that the PLA is improving its ability to quickly download, process, and disseminate information obtained from space systems. Space-based assets have been integrated into "Blue Force" ballistic and ground launched cruise missile operational training exercises.

The PLA's ability to conduct operational strike missions is likely to be restricted by the range of its persistent surveillance. While China's militarily-relevant space remote sensing capabilities are expanding, PLA and defense industry writings highlight the potential for "near space" flight vehicles that could augment space-based systems for persistent region-wide surveillance capability during crisis situations. "Near space" is the realm between 20-100 kilometers in altitude. As conceptual studies have noted, coverage from platforms in near space offer similar if not improved resolution as compared to satellites in low earth orbit, and flight duration that may exceed airbreathing unmanned aerial vehicles. Near space flight vehicles are noted for their small radar and thermal cross-sections that make them difficult to track and target. Within the last five years, CASC and CASIC have established design bureaus for near space flight vehicle R&D.

One additional aspect of PRC aerospace modernization is worthy of note. China appears to be investing R&D resources into advanced hypersonic propulsion technologies. Success over the longer term could present opportunities for efficient launch of payloads into space, as well as long range precision strike missions. Hypersonic aerospace flight vehicles exemplify the merging of the air and space domains from both an operational and industrial perspective. Hypersonic aerospace flight vehicles under development in China could be divided into two

categories: 1) a boost-glide vehicle that is launched into a sub-orbital trajectory by a ballistic missile; or 2) a horizontal take off and landing strike system that utilizes an airbreathing supersonic combustion ramjet (scramjet) engine to propel a vehicle to hypersonic speeds. Key areas of R&D include high lift-to-drag ratio delivery vehicles, high temperature materials for thermal protection, precision navigation, guidance and control, and ability to maintain external radiofrequency links through plasma in near space.

Summary

In short, PRC space-related ambitions are driven by political, economic, and military considerations. With a broad mandate granted by Chinese Communist Party and government leadership, the PLA plays a leading role in developing operational requirements for militarily-relevant space systems, overseeing technology development that could satisfy operational requirements, and managing the national space launch, tracking, and control system.

The PLA is investing in aerospace capabilities that may offset shortcomings in the face of a more technologically advanced adversary. Long range precision strike assets could offer the PLA a decisive advantage in resolving conflicts on terms favorable to PRC interests. Extended range conventional precision strike assets, supported by sensor architecture that is inclusive of space-based surveillance assets, could facilitate attainment of air superiority in the event of disputes over territorial or sovereignty claims around China's periphery. In a future contingency requiring U.S. intervention, space-enabled long range precision strike assets could seek to suppress U.S. operations from forward bases in Japan, from U.S. aircraft battle groups operating in the Western Pacific, and perhaps over the next five to 10 years from U.S. bases on Guam. PRC interests may expand beyond its immediate periphery. Space-based capabilities also could enhance China’s ability to conduct other missions, such as peacekeeping or humanitarian relief.

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