



The PLA's Updated Space Operations Textbook: What You Need to Know

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Introduction

The People's Liberation Army's (PLA's) Academy of Military Sciences (AMS) and National Defense University (NDU) both publish a series of authoritative textbooks that the PLA uses to train its cadets.ⁱ Among those, AMS published two editions of the *Lectures on the Science of Space Operations* (空间作战学教程) for postgraduate training, the last of which was published in 2013.ⁱ China's bureaucracy across the party, government, and military maintains a regular planning schedule of either five-, ten-, or fifteen-year plans, and they typically update textbooks and guiding materials in those windows as well. At approximately the ten-year anniversary of the last edition, in 2024, China published an updated version of *Lectures on the Science of Space Operations*, now titled: *Introduction to Space Operations* (太空作战概论).^{2,ii}

Jiang Lianju (姜连举), formerly of the AMS, wrote both the old and updated versions of the textbook. No longer written like a professor's lecture aid, with questions the professor should use to prompt the students, the *Introduction to Space Operations* now has a more standardized structure that could be used more widely in China as an authoritative document.ⁱⁱⁱ It maintains many of the same sections and foundational content as the previous version, but with some significant updates. In some cases, the updates are expansions to expound on the preestablished

ⁱ The United States Air Force, China Aerospace Studies Institute (CASI) makes many of these textbooks available in English through the "In Their Own Words" series on the CASI website: <https://www.airuniversity.af.edu/CASI/In-Their-Own-Words/>.

ⁱⁱ The author of this textbook chose the English translation "Introduction to Space Operations." The Chinese word for operations (作战), depending on the context and intent of the author, can also be translated as "combat" or "warfare." The authors' selection of the English translation "operations," is consistent with the usage of the term for the English title of *Lectures on the Science of Space Operations*. A translation of the updated *Lectures on the Science of Space Operations*, now called *Introduction to Space Operations*, will be available on the United States Air Force Air University China Aerospace Studies Institute (CASI) website section In Their Own Words.

ⁱⁱⁱ *The Lectures on the Science of Space Operations* has been described loosely as "doctrine" and more accurately as an "authoritative military document." Updates to such a document would be noteworthy, especially in a case like this one where the updates are supported by other open source reporting, such as in this report and elsewhere. See *ASF Tactical Support to Joint Warfighting*.

guidance, and in other cases, the changes are shifts with small adjustments or deletions to redirect previous priorities. Indeed, the China of 2013 is not the China of 2024.

Even the method by which China published the updated text provides telling context for the Chinese Communist Party's (CCP's) preferred direction for the PLA Aerospace Force (ASF) and overall national space policy. Consistent with the reshuffling of military academy responsibilities, a different organization called the Shanghai Academy of Social Sciences (上海社会科学院出版社), a local offshoot of the national Chinese Academy of Sciences, published the updated textbook in April 2024.^{3,iv} It is possible that earlier versions were available elsewhere. Other changes in the editorial responsibilities among the academies include the PLA NDU assuming authorship of the *Science of Military Strategy* from PLA AMS, for example.⁴ If this is indeed a new role for the Shanghai Academy of Sciences (SAS), it would be in line with the CCP's bundling of national space policy among the "non-traditional security threats" (非传统安全威胁) in both its 2019 and 2025 defense white papers and CCP guidance.⁵ In 2025, for example, China categorized space with other transnational issues like climate change, deep sea, polar regions, and cyberspace.⁶ Considering these topics from a multidisciplinary perspective is one of SAS's strengths as a prominent research institution and publisher in internationally complex and globally relevant topics.⁷ The CCP's drive to bring multidisciplinary sophistication to the way the PLA, and the ASF in particular, view its national role and global impact is reflected throughout the updated textbook, with quotes like:

From the perspective of personnel composition, combat commanders will become a kind of 'compound' talent who are proficient in politics, diplomacy, military affairs, and technology, and integrate military theory, technology, and operational capabilities to form an integrated talent group with military experts as the core, combined with technical experts.⁸

Noticing these types of adjustments and additions is easiest when examining the Chinese version of the *Introduction to Space Operations*. Technological advancements in artificial intelligence and large language models, at least in the near term, complicate rather than simplify culturally nuanced translation, inserting variety unintended by the original authors. To help readers navigate this updated and large textbook, this report highlights three of the most notable changes and their implications.

1. The ASF is still not using the term "space control" in the same way as it is defined in U.S. Space Force (USSF) doctrine. Assuming the same usage overlooks the Central Military Commission's (CMC's) emphasis on attacking an enemy's ground-based space bases with weapons that travel through space, not conducting attacks in space.

^{iv} China's internal coordination for the textbook was complete in July 2021, based on the date of the editor's preface to this edition. After the CMC formalized the ISF, ASF, and CSF, SAS published the updated textbook in April 2024. This could be an intentional choice or unrelated. It's possible the book was published earlier and available hard copy only in the areas of bookstores typically off-limits to foreigners. The 2024 version CASI acquired was available online. Open source researchers have been noticing increasing difficulty accessing Chinese language online materials and physical access to various bookstores in general.

2. The CMC has narrowed the ASF's mission areas to increase focus and professionalization so that they direct their support to joint terrestrial battles by attacking space bases and conducting counter-missile operations. For the time being, on-orbit activities are primarily categorized as deterrence and defensive operations. This decision reflects the CMC's new elaboration of a multifaceted approach to space deterrence, which acknowledges that in order to win both the war and public opinion, they should focus more on terrestrial, and less on space fires.
3. The CMC seems confident in its pre-planning and the text describes that the CMC is prepared to give the ASF Commander significant decision authority, even with the ASF Headquarters merged with the CMC Joint Operations Command Center (JOCC) in Beijing. At the time of writing, there was no open source information on the ASF Headquarters leadership team, and only through dialogue and engagement will outsiders likely gain insight. Increased professionalization of both the ASF and USSF means dialogue would be mutually beneficial.

Each of the three sections that follow introduce the topic generally and highlight the changes. The implications of these changes are discussed in the final section. These are not the only changes, and they may not be the most notable in the years that follow. As with the English translation of the 2013 *Lectures on the Science of Space Operations* that the U.S. Air Force China Aerospace Studies Institute made available on its website, the updated *Lectures on the Science of Space Operations*, now called *Introduction to Space Operations*, will not only be foundational reading for the ASF, but also for any U.S. warfighter, policymaker, and academic, who over the next ten years seeks to understand the CCP and CMC guidelines which shape the trajectory of the ASF.

ASF still not using the U.S. Space Force's term "space control"

The ASF's terminology for its overarching space operations tasks continues to differ from the USSF's. In general, both the ASF and the USSF have three tasks with various missions subsumed within. The tasks are typically categorized as "access space," "use space," and a third category usually encompassing offensive and defensive space operations. The U.S. typically calls the third category "control," whereas the CMC has varied the terminology for the third task as its operational readiness and strategy evolves.^{v,9} For example, in April 2024, the CMC set the ASF's third task as strengthening China's capacity to "openly use space."¹⁰ Based on previous ways authoritative Chinese literature has described the third task, "openly use space" can also be described as "ensure open use," in other words, ensure China has the ability to "seize and maintain its right to use space" (控制和夺取制天权).^{11,vi}

^v The ASF and USSF also have different missions that are subsumed under each task. That level of detail is outside the scope of this report and will not be discussed. For more information on the ASF's three tasks, see Kristin Burke, *The ASF's Tactical Support to Joint Warfighting*, August 2026.

^{vi} *The Lectures of the Science of Space Operations* was translated prior to the establishment of the U.S. Space Force. There was no USSF doctrine with which to compare the Chinese terms. Instead, the translators followed typical stylistic standards and added variety, which at the time, didn't seem like significant modifications. An example of which is defining the term 制天权 interchanging with English phrases "space control" and "space superiority."

The Chinese characters, which English speakers typically translate as “space control” (制天权), make a Chinese phrase more akin to the USSF’s term “space superiority,” but still distinct.^{vii,12} The definition is the first difference. USSF doctrine describes space superiority as bounded in time and space, and that is how the ASF defines “ensure open use” (制天权), indicating the Chinese term is more like “space superiority” than “space control.”¹³ Specifically, the updated textbook says, “To ‘ensure open use of space’ refers to the right to control a specific area of outer space for a certain period of time” (所谓制天权，就是在一定时间内对一定太空区域的控制权).¹⁴

Yet other distinctions indicate that the Chinese concept of “ensure open use” is different from both “space control” and “space superiority.” First, China’s consistent inclusion of the character for “rights” (权) indicates that the ASF is still concerned that other parties might seek to limit China’s access to space, even outside a wartime context. This insecurity is reflected in China’s 2020 *Science of Military Strategy* which stated, “Effectively defending national space rights and expanding national interests are the basic goals of space military conflicts.”^{viii,15}

A second distinction is in the description of the activities required to achieve “ensured open use.” For example, the ASF emphasizes space situational awareness (SSA) as a way to achieve “ensured open use,” whereas the USSF does not include SSA as an activity to achieve control.¹⁶ This is a notable distinction because it parallels what other western PLA experts have discussed as the PLA’s overarching emphasis on information superiority.^{ix,17} The CMC’s ultimate goal is to achieve information superiority, with space as a means to that end.¹⁸

The ASF’s inclusion of SSA as a primary way it will seek to achieve “ensured open use” is one of three activities the ASF will pursue to ensure they can openly use space, based on the original and updated textbooks, and the 2020 *Science of Military Strategy*. First, they must be able to identify threats to their spacecraft through ground and space-based SSA. Second, they must be able to defend their spacecraft. And third, the ASF must be able to support ground-based joint operations with “space-based weapons.”¹⁹

The ASF’s intention to ensure they can openly use space with “space-to-ground” weapons is another distinction from the USSF’s usage of space control and space superiority. The updated textbook describes a transition in ASF space operations from strengthening their ability to provide space information support to strengthening their ability to “ensure open use” of space

^{vii} These are the last three characters from the phrase above: 控制和夺取制天权.

^{viii} The author of this CASI report is a subject matter expert in China’s space program and proficient in Mandarin. The author’s translation and interpretation are based on what is known about China’s space activities and China’s authoritative texts at the time of writing. As described in the CASI 2026 Biennial Conference series on the PLA arm’s tactical support to joint warfighting, the four conference authors found the PLA to describe the levels of war: tactical, campaign, strategic differently across operational environments. With that in mind, it is worth considering if Chinese terms like 控制权 are used differently across domains.

^{ix} One expert said in 2020 that, “The PLA’s overarching focus on achieving information superiority as a tactical, operational, and strategic requirement cannot be overstated. Chinese “informationized warfare” (信息化作战) and its information-centric operational concepts are largely misunderstood and underappreciated in the West.” See endnote.

with “ground-space-ground” weapons.²⁰ When China describes “ground-space-ground” weapons, it uses the term “orbital bombardment weapons” (轨道轰炸武器), which China has successfully tested according to the U.S. Defense Intelligence Agency.²¹ Furthermore, the updated space operations textbook distinguishes between the ways China will support ground operations with space-based weapons from its perspective of the ways Russia and the United States will. The textbook says all sides have vigorously developed ballistic missiles but that, “Russia has focused on developing orbital bombardment systems, partial orbital bombardment systems, crewed spacecraft, and space stations; the United States, meanwhile, has prioritized the development of space-based laser, microwave, and particle beam weapons, as well as spacecraft and spaceplanes.” (俄罗斯重点研制轨道轰炸系统, 部分轨道轰炸系统, 载人飞船和空间站; 美国则重点研制天基激光, 微波和粒子束武器, 航天飞船和空天飞机.)²² The ASF’s emphasis on weapons that transit space to attack strategic ground targets, such as space bases controlling space communications and command and control, is a very different class of weapons and targets compared to those in the USSF’s doctrinal definitions.²³

Lastly, the conditions for determining when the ASF is prepared to carry out these activities are when the CMC has confidence in the “survivability of its military satellites; the reliability of space data support that enables ground-based operations against an enemy’s strategic targets; and defensive capabilities to protect against threatening spacecraft with reversible and destructive methods.”²⁴ As described in previous open source analysis, the CMC remains certain that the United States will act in space first, which sets their framing for “defensive” weapons.²⁵

The ASF’s missions have narrowed in on terrestrial fires, not space-to-space attacks

Consistent with other open source reporting, the updated space operations textbook also captures the CMC’s decision to narrow the ASF’s missions to increase professionalization and integration with terrestrial joint operations.²⁶ The ASF has five mission areas that support its three overarching tasks, as briefly introduced above. The ASF’s five mission areas are: deterrence operations (太空威慑作战); defensive operations (太空防御作战); space blockade operations (太空封锁作战); offensive operations (进攻作战); and space information support and assurance operations (太空信息支援保障作战).²⁷ An introduction to each and identification of recent adjustments towards supporting terrestrial joint warfighting is described below.

Space Deterrence Operations (太空威慑作战)

From the CMC’s perspective, the vast majority of the PLA’s ground and space-based space operations are categorized as deterrence operations.²⁸ The ASF independently and jointly carries out the space deterrence mission to target both the “adversary’s psychology” and “public opinion.”²⁹ In the updated space operations textbook, the deterrence mission area underwent the most changes, and even the deterrence types themselves are modified.

There are several notable changes in the updated textbook that indicate an evolving sophistication in the CMC’s approach to this mission area. First, a new section describes differences in space deterrence operations for countries that have varying levels of national space

capabilities relative to China. In particular, the textbook characterizes space deterrence operations as a “double edged sword” because “depending on the adversary...if they also have advanced space capabilities... [they] are mutually capable of countering one another and will not easily yield to conventional space deterrence... Conversely, the deterring party [China] then has a high degree of reliance on its own space systems.”³⁰

While balancing the deterrence risks of overreliance, ultimately, the CMC may see more deterrence opportunities in shaping public opinion. The updated textbook added new detail to the deterrent role of a space program compared to a nuclear program, stating that there are three significant differences: a nation’s status as a space power distinguishes it as an advanced country now more than having nuclear weapons; space capabilities are a better deterrent than nuclear capabilities because they enable winning in multiple domains, not just one; and last, space deterrence operations are integrated with nuclear and conventional deterrence.³¹ Regarding the last point, the updated textbooks states, “When conducting space deterrence operations, other combat forces may be incorporated into the operational system in a targeted manner depending on the specific adversary and mission objectives; however, these forces do not participate in actual combat but are included solely to enhance the deterrent effect of space weapons.”³² This general reference to “space weapons” is probably a reference to findings in other reports that multiple PLA services could potentially have counterspace weapons, just like the ASF has a role in traditional tactical, campaign, and strategic ballistic missile defense.³³ Regarding the role of a space sector in signifying a country’s global status, China has expanded the application of its national space program across its security, economic, and diplomatic spheres, and consequently has a high degree of reliance on its space systems, which only seems to be increasing and may be seen by the CMC as a necessary evil.

Another change is that the four levels of deterrence are in a different order. The first level of deterrence is now called warning; the second is disposition of forces; the third is now space exercises; and the fourth is renamed as punitive strikes.³⁴ In the 2013 version of the textbook, exercises came before disposition of forces, but since the CMC has now formalized the ASF, the branch can play a more direct and intentional role in the CMC’s thinking on space deterrence operations. The updated textbook also changed what previous translators had described as “overawing space strikes” to “punitive strives,” which is a significant adjustment.³⁵ This adjustment reflects the fact that the type of strikes the PLA would actually use for deterrence are reversible and non-reversible spectrum and cyber weapons, which is more aligned with its emphasis on information superiority.³⁶ Direct-ascent anti-satellite missiles (DA-ASAT) are not among the punitive strike weapons listed in this section of the textbook.³⁷

When looking at each level of deterrence in more detail, it is important to note that there is no PLA expectation that there is a rigid order to employing the different levels of deterrence. However, the author describes that ensuring the level of deterrence is properly communicated is more contextual, an example of which might be something like the content of the warning should be related to the content of a recent exercise. Deterrence warnings include public and private messaging, winning public opinion, and developing new procedures and systems that create confusion regarding if they have “real” or “fake” “soft” or “hard” capabilities.³⁸ Disposition of

forces is focused on achieving “local advantage” by rapidly reinforcing and adjusting the deployment of space forces both on the ground and in space. The difference between disposition of forces and the next level of exercises is that the former includes ASF daily operations and joint training, whereas the CMC intends the next level to communicate more explicitly. The updated textbook states, “space combat exercises must be conducted openly and transparently, ensuring that adversaries clearly understand” (太空作战演习行动要做到公开透明, 让威胁对手清清楚楚了解.)”³⁹ Importantly, the Chinese terms emphasize the intention of clarity by leveraging a linguistic method of doubling the characters (清清楚楚). Last, punitive strikes may be employed as a “last resort” and again are spectrum and cyber weapons.⁴⁰ Generally speaking, some of the listed spectrum weapons are not easily attributable, but when the PLA uses them as part of a punitive strike, they would presumably do so to continue their efforts to ensure that “adversaries clearly understand.”

As will be discussed in the dedicated command and control section that follows, the updated textbook also adds that when conducting space deterrence operations, a centralized and unified command method is typically adopted to ensure that large scale efforts are well coordinated and involve joint force participation.⁴¹ The CMC and the ASF Commander use a centralized command method for the deterrence mission area because these operations have “*major international, political, social, diplomatic and military impacts.*”⁴²

Defensive Operations (太空防御作战)

Defensive space operations are “passive and reactive” measures to counter the PLA’s adversaries’ ballistic missiles and attacks on China’s space bases or spacecraft, to include its maritime tracking ships.⁴³ The updated textbook emphasizes that the ASF’s defense mission is the “most important mission” because defense is “*the most fundamental way of force application in future space operations*” as well as “the most difficult mission” because while “*the ‘spear’ of global space forces has already shone brightly in actual combat, the project to forge the ‘shield’ is still under exploration.*”⁴⁴ Seen in relation to the changes in the deterrence operations section above, one interpretation of the CMC’s emphasis on defense as the most important mission for the ASF’s future development is that the while the CMC currently intends the majority of the ASF’s ground and space-based operations as deterrence, the CMC also is readying for deterrence to fail, and requiring the ASF to resolve its perceived shortcomings in defense. In line with this interpretation, the Lectures on the Science of Space Operations has always included a “future trends” section, and in the updated textbook, it includes the new trend towards elevating the importance of defensive capabilities now that the PLA has demonstrated offensive capabilities for deterrence. It says: “shift from an ‘offense-oriented’ approach to one that ‘balances and combines offense and defense’” (由 “以攻为主”向 “攻防兼备”方向发展).⁴⁵

Similar with earlier editions, the updated textbook continues to describe three types of defensive space operations: counter-missile operations, space base defense, and spacecraft defense, the majority of which are joint operations. The ASF has a joint role in counter-missile operations against “strategic, campaign, and tactical” ballistic missiles, and a role in providing other services with related space and missile early warning.⁴⁶ The updated text elevates the

ASF's terrestrial space bases in PLA defense planning by saying, *"The threat to space bases is becoming increasingly serious. Therefore, the deployment of defense forces for space bases must integrate land, sea, and air defense forces, and strategically allocate forces across different regions and domains to ensure the air security of the space base...and surveying vessels."*⁴⁷

While space base defense is a joint mission, the ASF also has an independent responsibility to ensure access to space as one of its three overarching tasks. The ASF ensures access to space in space base defense operations with mobile launchers in the event that its space bases are attacked.⁴⁸

Regarding the last type of defensive operation, there are two types of spacecraft defense: first, ground and space-based concealment and evasive maneuver, and second, space-based "active defense." Space-based spacecraft defense operations could be independent ASF activities or joint, if a cyber weapon is used. For the PLA, active defense is more accurately translated as "offense helps defense" (攻助防), a distinction which may indicate that mirroring the USSF's doctrinal definition for active defense could lead to inaccuracies.^{49,x} The PLA textbook not only reserved the Chinese adverb "zui" (最) to describe spacecraft defense operations as having the utmost level of difficulty and importance, but also only used "offense helps defense" language in this section, which echoes the USSF's placement and usage of the term "active defense" in its on-orbit defense section.⁵⁰ The textbook emphasizes that the ASF needs to be prepared to rapidly conduct spacecraft defense because, according to the author, global space powers now prioritize space control and taking the initiative, over the access and use tasks.⁵¹ In other words, this is another indication of the CMC's assumption that countries like the United States and Russia will act in space first and the ASF will need to be ready to defend its right to "openly use space."⁵²

The updated textbook clarified that many defensive operations like on-orbit spacecraft defense have "international and political impact," so the ASF Commander and the CMC will use the "centralized and unified command method" and heavily invest in space and missile early warning, also known as space situational awareness (SSA).⁵³ As will be discussed below, centralized and unified command does not necessarily mean the PLA will be slow to respond or hesitant, but rather that the CMC and ASF Commander have already pre-approved a coordinated response for the situations they anticipate. One interpretation of this is that if one of those situations should arise, they will quickly implement the plan, with each level following suit based on the assumption that whoever initiated the first step was correct. The CMC may be confident in its pre-planning for the defense mission area because the CMC has already restructured the ASF to include a dedicated space and missile early warning base.⁵⁴ As stated by the textbook author, *"to ensure the targeting, accuracy, and effectiveness of the offense helps defense method, various space forces must be utilized before the battle to promptly understand the space environment situation. To prevent sudden space attacks by the opponent, early warning forces must be promptly deployed."*⁵⁵

^x According to the USSF's March 2025 "Space Warfighting: A Framework for Planners," "Active space defense consists of direct actions taken to disrupt, degrade, deny, or destroy ongoing or imminent attacks against friendly space forces, assets, and capabilities...Active space defense includes three operations used to achieve specific space superiority effects: escort, counterattack, and suppression of adversary counterspace targeting."

Blockade Operations (太空封锁作战)

Space blockades are one of two types of ASF offensive missions. Space blockades are unique in the sense that the CMC has approved them for the tactical, campaign, and strategic levels of war, but only for when the PLA perceives it has the upper hand.⁵⁶ It is not clear what having the upper hand looks like to the PLA, but it is contingent on “*a precise understanding, flexible application, and skillful handling of the ‘red line’ of international space law,*” which is likely a reference to the ban on nuclear and other weapons of mass destruction in space.⁵⁷ Typically, a space blockade is a complete severing of a strategic node in the PLA adversary’s ground-based space infrastructure that will keep the country under attack from launching new capabilities or communicating with their existing orbital systems.^{xi} Space blockades are most often joint operations and according to the text they should always be conducted to facilitate a PLA ground-based operation.⁵⁸ Because blockades have wide-area impacts and involve multiple services and branches, the CMC requires a centralized and unified command method.⁵⁹

There are still four general types of space blockades, but their prioritization has changed significantly and will be discussed after an initial introduction. The four general types are: space base blockade; information blockade; launch path blockade; and orbital blockade. Space base blockades leverage other services and branches’ capabilities to attack with either ground infiltration from PLA Special Operations Forces (SOF), multi-service missile or spectrum attacks, or the Cyberspace Force’s cyber weapons. Information blockades are conducted jointly with reversible and non-reversible spectrum weapons or cyber attacks to target an adversary’s launch, telemetry, or control systems, i.e. these weapons are not necessarily directed at satellites in space.^{xii} Launch path blockades could use either space-based or terrestrial weapons, such as directed energy weapons, space mines to interfere with orbital placement of the payload, terrestrially-launched mid-course missiles, or meteorological weapons to create weather conditions unsafe for satellite launch. Last, orbital blockades are generally described as space-based joint operations such as orbital capture (在轨捕捉) or interception with missiles or mines. As will be discussed below, the textbook significantly de-emphasized orbital blockades compared with their placement in the Lectures on the Science of Space Operations; but at a general level, if the PLA conducts an orbital blockade, it would be a joint operation.^{60,xiii} Given that orbital blockades are space-based, the most likely joint operations would include joint cyber or SOF ground attacks or other PLA services launching DA-ASAT missiles or space mines. Both versions of the textbook describe orbital blockades as risky because of the chances of “self-blockade,” which usually refers to jamming friendly forces or creating debris that could just as easily damage Chinese satellites.⁶¹

^{xi} Both the old and new versions of the textbook describe “strategic nodes” and consideration for target selection. Those topics are beyond the scope of this paper, but a reader can find that information in the texts.

^{xii} The textbook authors also urge extreme caution against self-blockade to avoid both jamming friendly users and introducing an uncoordinated information operation, like spoofing, that causes internal and well as external confusion.

^{xiii} 在太空轨道封锁行动中，必须运用联合作战力量对在轨捕捉，轨道拦截和轨道设障等环节，开展全面的封锁布控。

The updated textbook has significant changes in the prioritization of ASF space blockades. Orbital blockades have been de-emphasized and space base and information blockades are now more prominent. For example, an important sentence has been removed from the opening of the blockade section, the textbook no longer states that “*The main activities of space blockade operations are all conducted in outer space.*”⁶² This could be because the CMC approves blockades only when the PLA believes it has the upper hand, and it does not expect to have the upper hand on-orbit, as illustrated in the changes to the spacecraft defense section above. Instead, the textbook emphasizes space base blockades because “*space bases are the ‘roots’ of various space systems,*” which the CMC views as a more effective blockade than an attack on a single satellite or user terminal.⁶³ In addition to elevating space bases for both blockade and defense, the updated textbook also elevated information blockades, specifically defining a new type of information blockade tailored to communication satellite (SATCOM) and command and control bases.⁶⁴ This new type of information blockade would target ground SATCOM bases with ground-to-ground spectrum and cyber weapons, coordinated with space-to-space spectrum and cyber weapons targeting SATCOM downlink and intersatellite datalinks.⁶⁵

Offensive Operations (进攻作战)

Offensive operations are the second type of offensive mission for the ASF. They are distinct from blockades in that the CMC only approves these operations for the strategic and campaign level of war and there is no requirement for the ASF to have the upper hand. Offensive operations are also primarily joint operations to support PLA terrestrial attacks. There are two types of space offensive operations: ground-to-space and space-to-ground. Both versions of the textbook state that ground-to-space attacks are the dominant method.⁶⁶ Ground-to-space attacks use primarily destructive and non-destructive spectrum weapons to include particle beam and non-nuclear electromagnetic pulse.⁶⁷ After a long list of spectrum weapons, DA-ASAT missiles are included but referenced as “effective only after use of ‘soft kill’ measures,” which echoes language elsewhere in the text stating that “*although the likelihood of these weapons being used in actual combat is low, their strategic deterrent value is significant.*”⁶⁸ Space-to-ground attacks use orbital directed energy weapons, which the textbook says are still in the development stage, and “ground-space-ground” attacks with orbital bombardment weapons (轨道轰炸武器).⁶⁹

While both versions of the textbook described space-to-ground offensive attacks as less common, the updated textbook does however significantly revise and expand the sections that include orbital bombardment. In place of the theoretical description and historical emphasis on U.S. and Russian experimentation, the updated textbook describes orbital bombardment weapons as a reality. The update does not reference hypersonic glide vehicles, but rather a payload that can reach Mach 10.⁷⁰ Additionally, the new references to orbital bombardment consistently indicate it may become more dominant in the future. For example, the updated textbook says, “*using space strengths to carry out ‘ground-space-ground’ operations will be a basic mode of future space warfare.*”⁷¹ In the emerging trends section, the updated version says there will be a “*transition from a ‘ground-based’ approach to an ‘integrated ground and space-based’ approach*” (由‘地基为主’向‘天基结合’方向发展), which probably is in reference to ground-space-ground attacks, which the textbook stated were a basic mode of future warfare.⁷²

Another notable change in the offensive mission area is regarding new additions to command and control. Though these offensive operations are at the strategic and campaign level of war, in cases when the joint attack teams are “*dispersed across a vast area and execute specific combat missions independently*,” then the CMC has approved the joint teams to use a decentralized command method, which will be described below in the command section.⁷³ But in other cases when the units are not dispersed and, “*when the space mission is likely to have significant international, political, social, diplomatic, or military repercussions—such as space deterrence, space blockade, or space offensive operations—a centralized and unified command structure should be adopted*.”⁷⁴

Space Information Support and Assurance Operations (太空信息支援保障作战)

The space information support and assurance mission is primarily a joint mission with the Information Support Force (ISF) and covers the provision of data collected from space or sent through space to central and theater command and control centers (指挥控制中心) and various user platforms, to include long-range precision guided missiles.⁷⁵ A notable terminology adjustment is the expansion of the mission’s title from “space information support” to include “assurance.” The addition of the term “assurance” is consistent with the new role for the ISF in assuring information security of the ground and ground-to-space segment, to include managing spectrum deconfliction and ground-to-space SATCOM support for joint operations.⁷⁶ The ASF remains in charge of the space-to-space data relay and the textbook still states that the “space data relay support force (太空通信中断支援力量) is fundamental for establishing an information advantage.”⁷⁷ An important addition is that the updated textbook now states that “China’s space communications relay is no longer a weakness.”⁷⁸

In line with a new role for the ISF, the updated textbook included a section that further distinguishes between the various space information support and assurance forces. The new section titled “Emphasizing jointness and prioritizing defense” (突出联合注重防御) distinguishes between: “the space forces themselves (各种太空力量自身), the space information support and assurance forces (太空信息支援保障作战力量), other space support forces (太空支援作战力量), and the space information users (支援保障对象力量).⁷⁹ This new section emphasizes the need for coordinating joint defense of space information between these various players: the ASF, ASF space operators, the ISF, and joint forces because they all need space information support and assurance to carry out their missions.⁸⁰ The updated textbook also helps explain that in addition to space data relay, the ASF is still involved with supporting the integration of China’s positioning, navigation, and timing (PNT) satellites (Beidou) with precision guided missiles, and fusing missile early warning satellite data with ground sensors for rapid tipping and queueing.⁸¹

Last, the updated textbook clarified that the ASF is still involved in the early-stage research and development pipeline for testing and fielding sophisticated intelligence, surveillance, and reconnaissance (ISR) satellites, but that the ISF, CSF, and other services’ signatures and imagery analysts are doing much of the fusion, processing, and analysis of this data on the ground.⁸² This significantly refocuses the ASF’s efforts towards the other four

missions, which was made possible by the completion of the CMC's nationwide military communications network.⁸³ For example, aspirational language from the 2013 textbook is now more concrete, such as statements that ISR data is “sent directly to Joint Operations Command Centers” (实施传输到联合作战指挥中心).⁸⁴ Other statements confirm that geodetic mapping information is sent directly to user platforms and weapons.⁸⁵ Of note, the updated textbook's expanded section on command and control does not include discussion of the space information support and assurance mission, probably because of the underlying assumption that information must not be stovepiped, but rather effectively available for the common operating picture necessary for joint operations.

ASF headquarters still “merged” with CMC JOCC, but with a stronger ASF commander

The updated textbook includes a new command and control section called “Space operations command and control methods” (太空作战指挥方式) which further details the relationship between centralized and decentralized command methods (方式) and the ASF commander's authority. Consistent across both versions of the textbook, there remain two general models (模式) for command and control of the ASF, one with the commander of the ASF and the ASF headquarters merged (合并于) with the “central command headquarters” and another where the ASF commander and ASF headquarters are independent (独立于) from the central command headquarters (总帅部).^{xiv} Also consistent across versions is the generalized description that typically the “merged” and “independent” models can be summarized as centralized and decentralized command, respectively. For example, “*when the combat command organization is merged (合并于) into the headquarters, it is a centralized and unified command method (集中统一指挥方式); when the combat command organization is independent (独立于) of the headquarters, it is a decentralized command method (分散指挥方式).*”⁸⁶

Additionally, the updated textbook maintains that, “*In future space operations, centralized and unified command (集中统一指挥方式) will be the primary method of command,*” which tracks with other open source reporting.⁸⁷ The CMC has several reasons for continuing to prefer a three-level joint operations command system (三级联合作战指挥体系), with the ASF commander and ASF headquarters integrated with the CMC JOCC, rather than a four-level command system with an independent space operations command.^{88,xv} From the CMC's perspective, a merged command model is still necessary for orientating the PLA's space program towards terrestrial joint operations and removing stovepipes between space operations and other service's operations.⁸⁹ The updated textbook added additional rationales for the three level structure such as that it can better manage “*space operations that are highly political,*

^{xiv} Presumably, this “central command headquarters” is referring to the Central Military Commission (CMC) Joint Operations Command Center (JOCC).

^{xv} Level One: Space Operations Command Department of CMC JOCC (统帅部太空作战指挥部门); Level Two: Space Operations Command Department of the Theater Joint Operations Command Center (TC JOCC) (战区联合作战指挥部太空作战指挥部门); and Level Three: Space Operations Force Command organizations (太空作战部队指挥机构).

strategic, and holistic in nature, involving numerous fields such as military operations, political diplomacy, and space law” and it “prevents subordinates from being constrained by local interests that might interfere with or undermine overall interests,” “enables commanders to plan, deploy, and organize operations uniformly around a single objective,” and “enables commanders to exert direct influence over critical operational actions and key junctures that affect the overall situation, thereby preventing coordination failures.”⁹⁰

However, the new section clarifies that the preference for a merged model does not imply that chain of command is rigid, nor that all decisions must go through the CMC Chairman and Chinese President Xi Jinping. Instead, the update explains that the ASF commander can use either centralized or decentralized command methods himself, regardless of if the command model is merged or independent. Of the ASF commander’s authorities, the new section states: *“These two methods are fundamental command approaches that are both interdependent and complementary; each has its own unique role and significance, making both indispensable to space operations command.”^{91,xvi}* Additionally, in either a centralized or decentralized command method, the ASF commander can utilize both the echelon command (按级式指挥) and skip-echelon command (越级指挥).^{92,xvii} Western researchers typically describe echelon and skip-echelon command from the perspective of the PLA generally or a large PLA service specifically, and explain skip-echelon command as something that the CMC or a high level commander can use to override a mid-level commander.⁹³ The emphasis is typically on PLA discussions about the possible drawbacks it brings to a mid-level officer’s initiative and creativity, i.e. a possible advantage for the United States. However, because the ASF is the smallest among even the PLA branches, researchers have assumed skip-echelon command refers to the CMC overriding the ASF commander.⁹⁴ According to the updated textbook at least, this is not correct. This new section describes both echelon and skip-echelon command as options available for the ASF commander. Furthermore, the new section describes skip-echelon command differently. It describes skip-echelon command as part of a guiding command (指导式指挥) approach used in decentralized command (分散指挥方式) methods where information is available more readily to all levels at once, rather than passing level by level as in the echelon method.⁹⁵ It seems that because the CMC and the ASF would have pre-planned and pre-approved relevant authorities

^{xvi} *“The centralized and unified command approach leads to centralization of power; it typically directs troop operations through strategic decision-making, task assignment, and macro-level guidance. In contrast, the decentralized command approach involves the decentralization of power; it is generally adopted when combat forces are dispersed across a vast area and execute specific combat missions independently, making it difficult to maintain timely control over the battlefield situation and posing challenges for logistical support.”* (“集中”与“分散”本身就是一对反义词，因此，在形成指挥方法上就会完全不同。集中统一追的方式使集权，通常是以张略决策，任务赋予，宏观指导等方式指挥部队行动；而对于分散指挥方式来说则是分权，一般情况下是太空作战力量分散和单独执行某项作战任务，战场态势难于及时掌控，各种保障有困难等情况下所采取的指挥方法.)

^{xvii} Another way to describe “按级指挥” is a hierarchical command where information must pass level by level. Another way to describe “越级指挥” is a flatter command method where the national military network enables information availability and communication across levels at the same time, rather than level by level. See their respective Baidu entries for more information.

and coordination channels for various situations, the ASF commander can flexibly employ any of the above. Indeed, this was the CMC's original intention for completing the military's national communications network.⁹⁶

Several new sentences capture that even in a centralized command scenario, with the ASF headquarters merged with the CMC JOCC, the ASF commander will team with the CMC, rather than being superseded by the CMC Chairman. It seems this is possible because CMC Chairman Xi Jinping's overarching strategy and intention has already been set and subordinate high-level commanders are trusted to determine the best way to align with the strategy. The textbook states that the ASF commander can exert his personal will (个人意志) when he has the trust of the supreme leader.⁹⁷ Other sentences describe restrictions and skill-level requirements that Chinese authors would typically not use to describe Xi Jinping, indicating that the references to the below "primary decision-maker" for space command refer to the ASF commander. For example, statements like:

- *"The scope of command authority is strictly constrained and also depends on the commander's personal will."*⁹⁸
- *"The selection of command methods must be integrated with the commander's qualifications. As both the primary decision-maker in combat operations and the practitioner of command methods, the commander's ability to apply these methods is a critical factor that must be carefully considered when selecting them."*⁹⁹
- *"If the commander possesses high-level qualifications, extensive experience, strong decision-making capabilities, and the ability to organize, coordinate, and control the overall situation, then a centralized and unified command method should be the first choice. This approach facilitates the full utilization of the commander's personal strengths in combat operations and provides the prerequisites for centralized and unified command."*^{100, xviii}

Implications

This report flags three areas where the CMC has further clarified or altered existing guidance to the ASF, based on the updated version of the Lectures on the Science of Space Operations, now called Introduction to Space Operations. This expanded guidance tracks with recent open source research and provides a guide for interpreting the ASF's future trajectory.

When the 2013 version of the textbook was published, there was no formal USSF doctrine and terminology with which to compare and contrast Chinese terms. This is why getting China's definition of "ensured open use" (制天权) as the third task for the ASF is so important.

^{xviii} The first italicized sentence is: 指挥职权的大与小严格的制约性, 还以指挥者的个人意志而转移. The second italicized sentence is: "方式选择与指挥者的素质相结合。指挥者既是作战决策主导者, 又是指挥方式的使用者。" The third italicized sentence is: "首先, 充分考虑指挥者的指挥素质。在太空作战指挥过程中, 指挥者的指挥素质至关重要, 指挥者是作战指挥方式具体选择者, 选用什么的指挥方式要从自身的实际出发, 量力而行, 如果指挥者素质高, 经验丰富, 有效强的决策能力和组织协调控制全局的能力, 则集中统一指挥方式为首先, 这有利于全面发挥指挥者在作战种的自身素质优势, 为集中统一指挥提供先决条件。"

Even if an English translation of “space superiority” is preferred to “ensured open use,” the corresponding methods that the CMC has described to achieve “ensured open use” are also significantly different from USSF usage of the term space superiority.

One of the most significant implications of oversimplifying and mirroring the CMC’s third task for the ASF is that it unintentionally sets the United States on the path for a pyrrhic victory. USSF’s version of space control is designed to defend a preestablished position of space superiority, and so it emphasizes weapons as a last resort if all other advantages in space end up being insufficient. That means that potential debris generating events may seem justified under certain conditions. The U.S.’s approach will seem to support the narrative that it is upholding the existing global order. Alternatively, for the ASF, they will seek to ensure they can use their space capabilities in the time and manner that they choose with superior SSA and readiness to defend USSF space-based attacks, all the while taking the initiative to attack the ground-based communications hubs integral to the USSF’s counterspace command and control. While many US-based analysts emphasize how escalatory it would be for China to attack the U.S. mainland, from China’s perspective, in this scenario, the United States would be attacking China’s mainland and terrestrial fires are already acceptable modes of war. This creates a scenario where the USSF defends its superiority with a debris generating event, but China’s poised to win the public opinion war with a narrative that they upheld peace in space.

This CMC’s emphasis on public opinion as an addition type of deterrence creates a kind of second front on the United States. The updated textbook says, “*Because the international political environment, social and cultural environment, military and diplomatic environment and other factors that affect space operations in the future will not change with the innovation of command means and technology, their impact has distinct non-technical characteristics on our selection of space operations command methods.*”¹⁰¹ This sentence is significant. The CCP and the military and bureaucrats it directs are traditionally technocrats who emphasize the importance of advanced technology as the means for solving most of the nation’s problems. This quote however acknowledges that the subjective human factors will stay the same and the strategy must adapt around them, even as technologies evolve. In other words, the CCP is directing the ASF to prepare to win on the psychological level as much as on the material level.

Relatedly, the second significant change in the updated space operations textbook is the ASF’s narrowing focus on and professionalization for supporting terrestrial fires and counter-missile operations. The creation of the ISF frees up the ASF to focus on supporting China’s national space program broadly and specifically preparing for continued competition in space. The ASF still has a role in space-based data relay as its major contribution to the logistics of the space information support and assurance mission, which compliments its increased focus on ground and space-based missile and space early warning, and SSA to support long-range precision guided missile attacks, such as with orbital bombardment weapons. This focus on integrating sensors for indication and warning, as well as tracking, targeting, and after-action assessment is fundamental to its support for counter-missile missions at the tactical, campaign, and strategic level, as well as ensuring its readiness to defend its spacecraft in space.

The elevation of spacecraft defense and de-emphasis of orbital blockades are two changes in the same direction: the CMC assumes the United States will act in space first. The CMC does not currently expect to have the upper hand on-orbit. Under this near-term assumption, the ASF's perspective seems to be that ground bases that control multiple satellites or strategic communications are a more valuable target than a single satellite. As they say, "*space bases are the 'roots' of various space systems.*"¹⁰² The offensive operations where the ASF is preparing to take the initiative include attacking ground-based communications and command and control bases with coordinated spectrum weapons for non-reversible effects, traditional missile attacks, and cyber weapons.

As the ASF prepares to defend its spacecraft in space with concealment, space-based jamming, and non-reversible measures, the world has also experienced an increase in commercial SSA capabilities bringing a new level of transparency to on-orbit activities. It is important to keep in mind that the increased public examples of China's on-orbit activities will give the impression that China's emphasis is on space-based attacks; however, it's important to heed what China is actually saying. It is emphasizing that the ASF must be ready to conduct ground fires and counter-missile operations first and foremost. In other words, USSF readiness to counter space-based attacks should not detract from its own counter-missile readiness. In the next update to the space operations textbook, global trends will have further evolved and China's own commercial SSA capabilities will have also brought transparency to the USSF's on-orbit activities, and potentially at that time, the CMC may begin to feel it has the upper hand in on-orbit activities.¹⁰³ However, that is not the current scenario.

The third significant change is that the ASF commander may have more command authority than previously believed, and that the CMC intends this to be true even with the ASF headquarters merged with the CMC JOCC. Given that there is little available information on the ASF command team, outsiders can only get a sense of how capable he'll be and how agile the ASF will carry out its missions through military-to-military exchanges. Watching from afar provides only a small sliver of the necessary context. Historically, China's space operations leaders have rose through the ranks of its various launch centers, indicating a depth of expertise on both launch and counter-missile operations. However, now one would hope that the current ASF commander also has some experience with command of ASF Base 36's detachment in Beijing that operates spacecraft of concern like ShiJian-21 because he will meet the CMC's requirement to provide "offense to help defense" for on-orbit spacecraft.

Overall, the increased professionalization of both the USSF and the ASF and the increasing risk of miscommunication would normally be fertile ground for resumption of formal military-to-military dialogue. Attempts for Space Security Dialogues in the past were ineffective and locked up in other discussions, but there was a good track record for including SSA experts for space traffic management and spaceflight safety discussions through the US-China Civil Space Dialogues.¹⁰⁴ Increased professionalization on both sides means that dialogue can be mutually beneficial.

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