



China Aerospace Studies Institute Commander's Toolkit for China

PLA Space

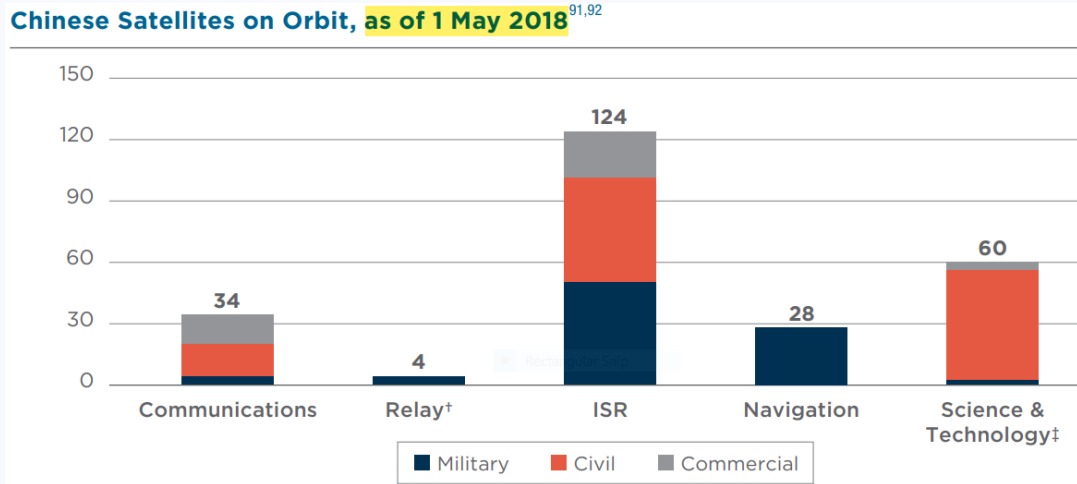


What PRC space assets are owned and/or operated by the PLA for military operations or other Chinese national goals?



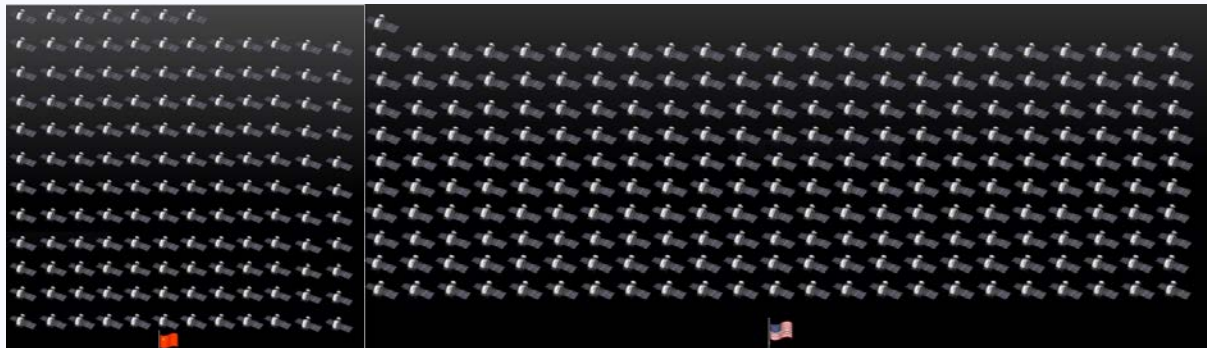
PLA Owned and Operated Satellites

PLA in 2018
Approximately 85



PRC vs USA Military Satellites, as of April 2022

PLA in 2022
98

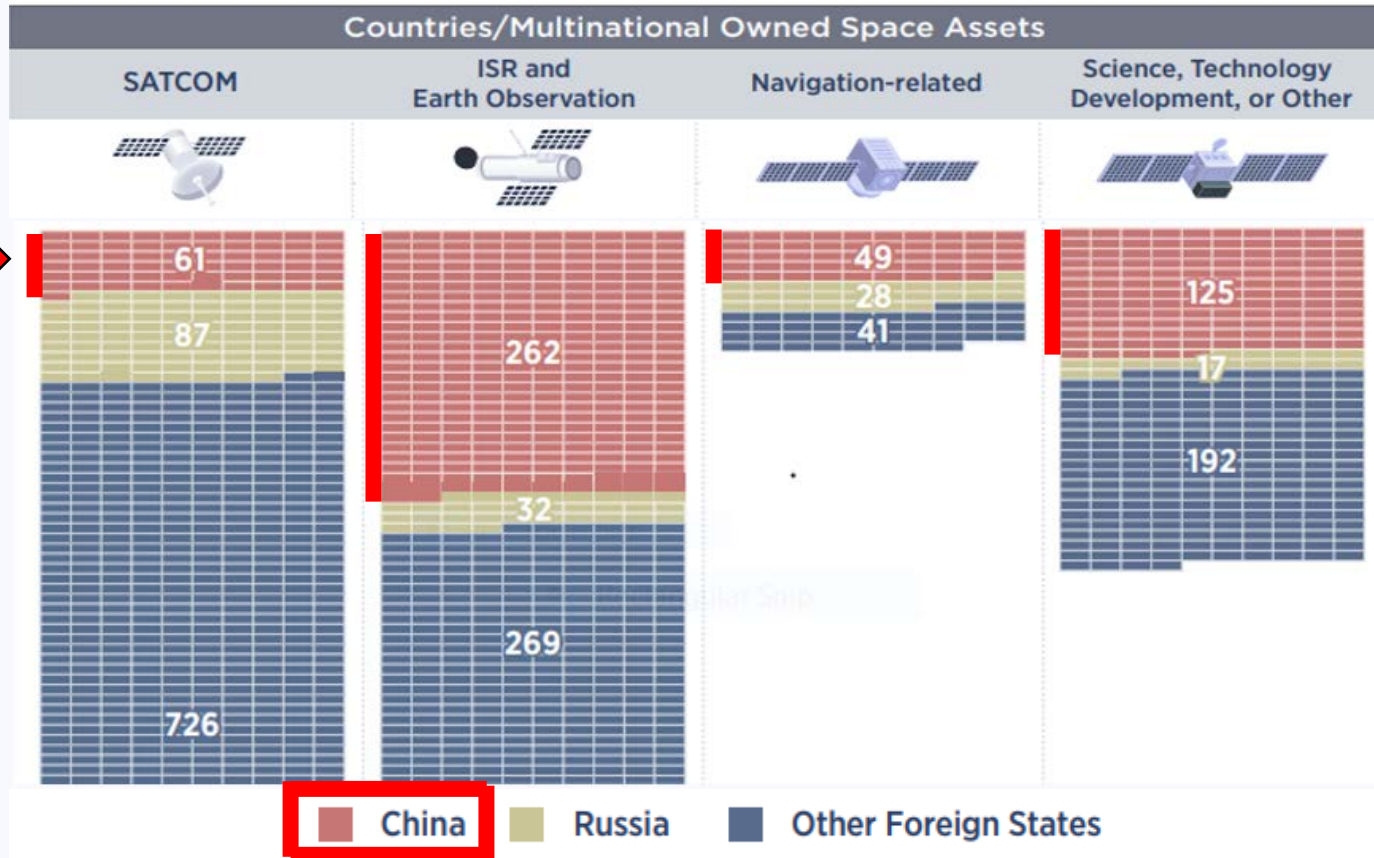


For context,
the U.S. still
has more
military
dedicated
satellites:
197 in 2022



PLA Accessible Satellites During a Conflict

Active Foreign Satellites



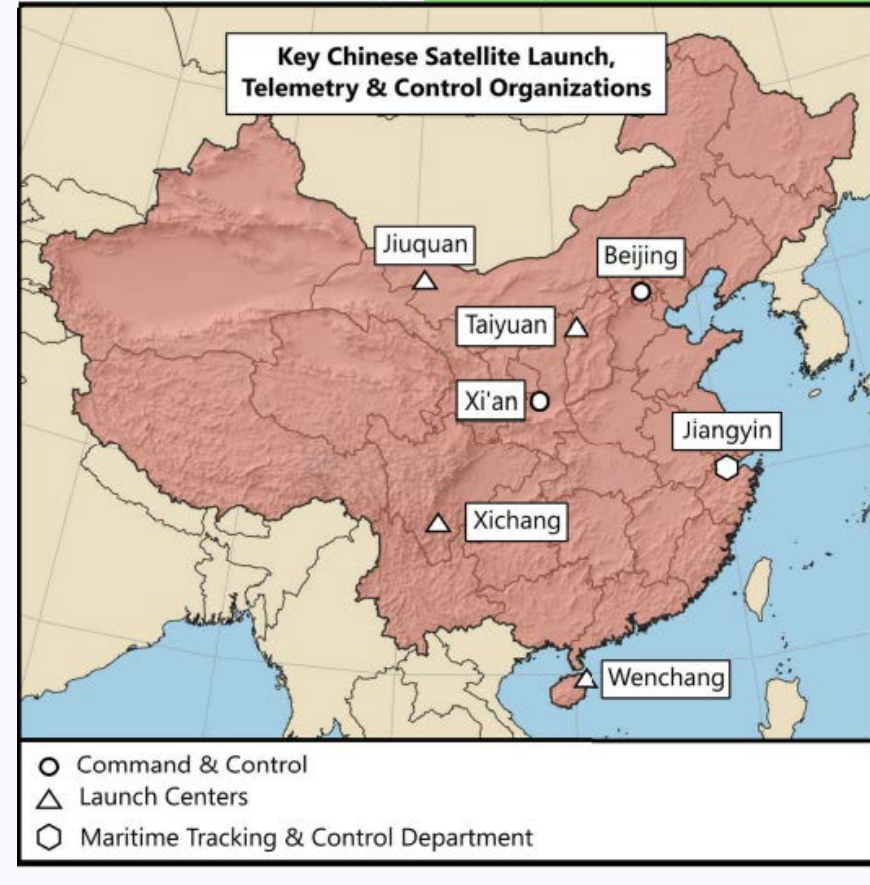
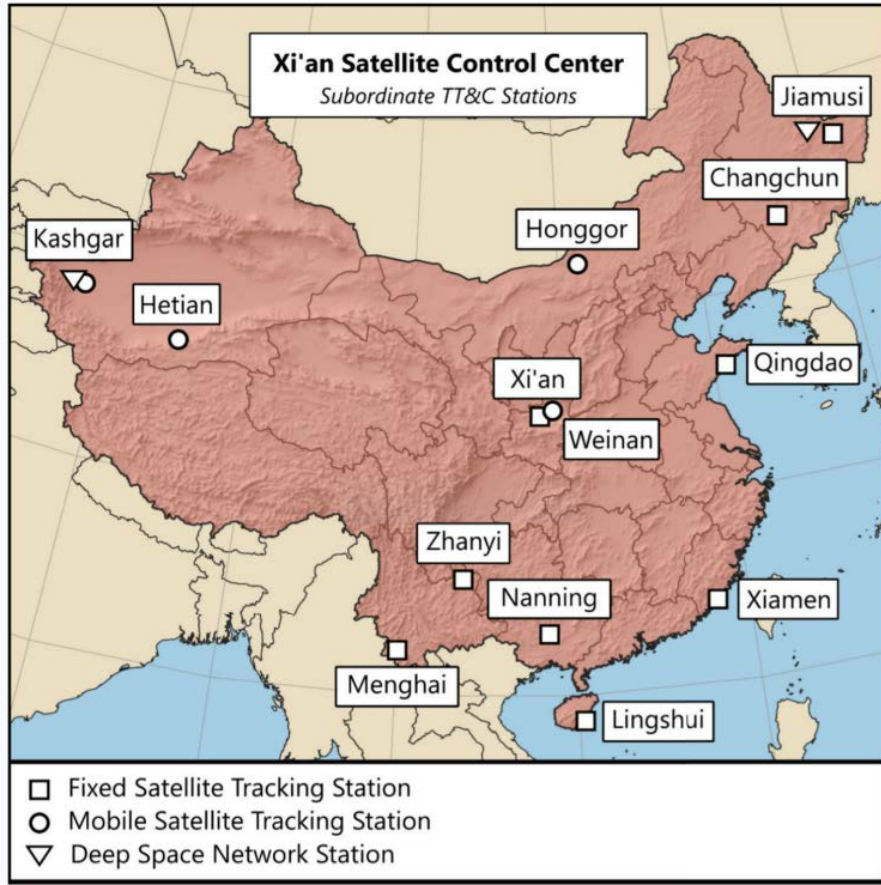
As of January 2021, there were 4,852 active satellites orbiting the Earth.

USA: 2,944

PRC: 499



Ground Facilities for PLA and National Programs





PLA Counterspace Capabilities

CHINA

LEGEND: NONE (R) SOME (Y) SIGNIFICANT (G) UNCERTAIN "?" NO DATA "-"

| | R&D | TESTING | OPERATIONAL | USE IN CONFLICT |
|-----------------------------|-----|---------|-------------|-----------------|
| LEO Direct Ascent | (G) | (G) | (G) | (R) |
| MEO/GEO Direct Ascent | (Y) | (Y) | - | (R) |
| LEO Co-Orbital | (Y) | ? | - | (R) |
| MEO/GEO Co-Orbital | (Y) | - | - | (R) |
| Directed Energy | (G) | (Y) | - | (R) |
| Electronic Warfare | (G) | (G) | (G) | ? |
| Space Situational Awareness | (G) | (G) | (G) | ? |



Confirmed Counterspace Capabilities

- **Rockets as kinetic kill vehicles:** China may be developing as many as three direct-ascent anti-satellite (ASAT) systems, although it is unclear whether all three are intended to be operational or whether their primary mission is counterspace or midcourse missile defense. On January 11, 2007, the SC-19 destroyed an aging Chinese weather satellite at an altitude of 865 km.
- **Directed Energy weapons.** The director of the U.S. National Reconnaissance Office in 2006 confirmed that at least one American satellite has been illuminated by a ground-based laser operating in China. Lasers can be used to “blind” a satellites sensors.
- **Electronic Warfare.** In April 2018, commercial satellite imagery revealed China had placed mobile jamming trucks on the Mischief Reef, which are designed to interfere with GNSS signals like U.S. GPS and Japan QZSS.



Missile version upon which the SC-19 is likely based, mounted atop a TEL.
Image credit: Defence Blog.⁵⁹



Who in the PLA owns and operates these space assets?



PLA Strategic Support Force (PLASSF)

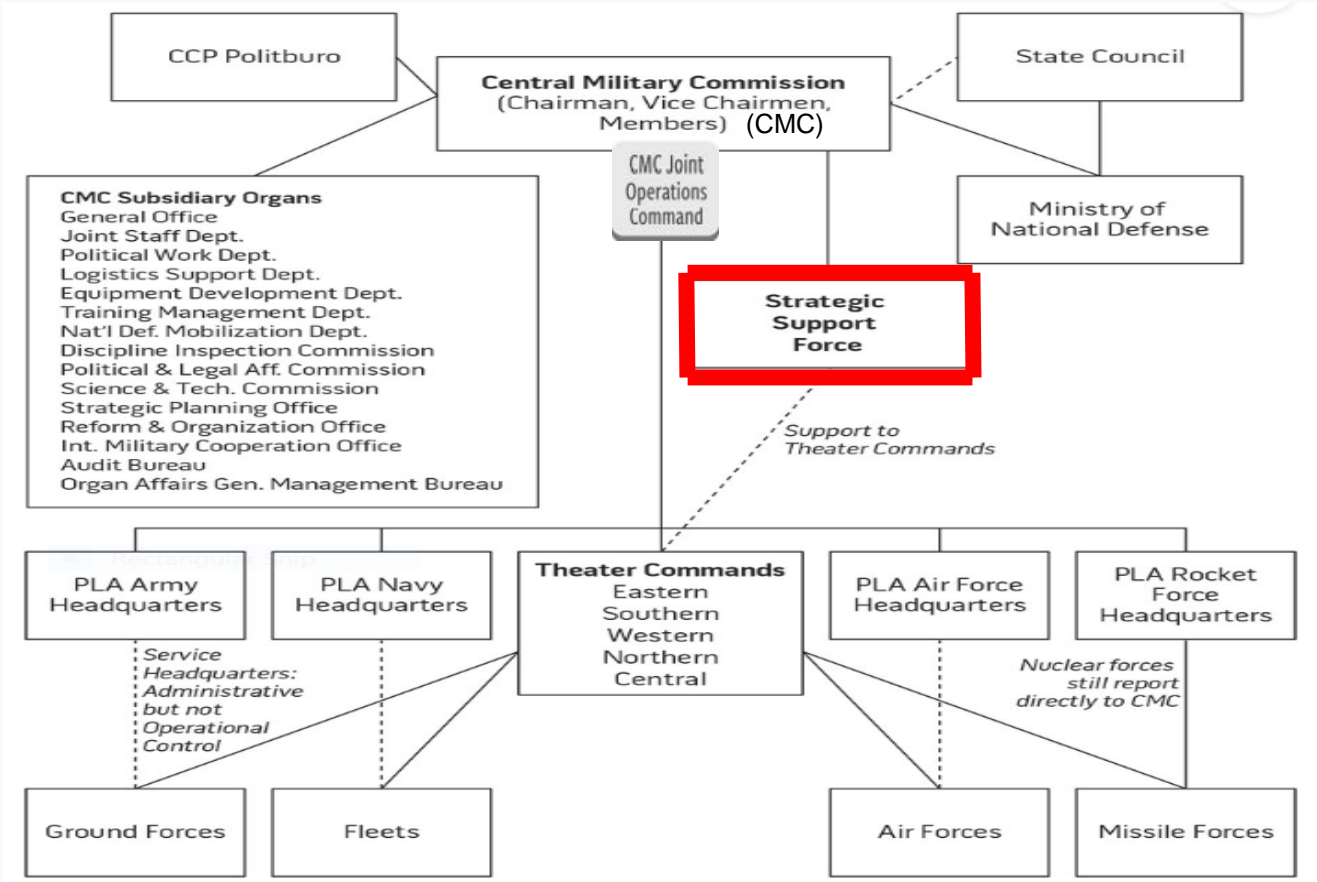
- Established on 31 December 2015 as part of larger PLA reforms
- Consolidated PLA military space, electronic, cyber, and information-warfare capabilities into one Force, which had been dispersed across equally ranked organizations
- Now hierarchically equivalent to the PLA services, like the PLA Air Force
- Headquarters in Beijing
- Several departments, 2 operationally relevant to space: **Space Systems Department** and Network Systems Department





PRC Military Command and Control

The CMC manages, the Theatre Commands focus on warfighting, and the Services/Forces focus on building the forces.





SSF SSD and NSD Missions

Mission Divisions

Strategic Support Force

(SSD) Space Systems Department

(NSD) Network Systems Department

Overlapping Missions



Key: PsyOps: psychological operations; TT&C: telemetry, tracking, and control.



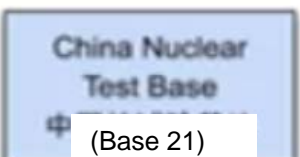
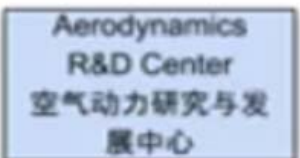
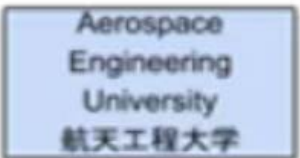
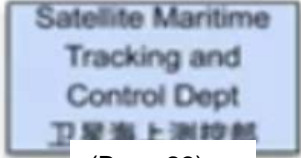
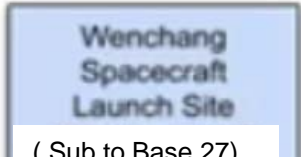
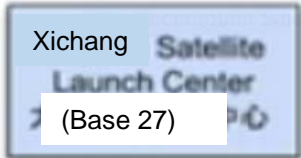
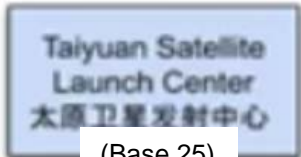
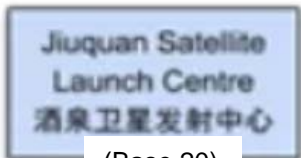
Lt. Gen. Shang Hong

Grades:

- Theater Command Leader
- Theater Command Deputy Leader
- Corps Leader
- Corps Deputy Leader
- Unknown



(SSD) Space Systems Department units



- Battlefield Environment Support Base 35
- Dongfang Spaceport (Sub-25?)



Publicly Known PLA SSF SSD Bases

Legend

- SSF Headquarters
- SSF Space Systems Department (SSD) bases [base number]
- ★ Theater Command (TC) Headquarters

Jiuquan Satellite Launch Center [20] (Alxa League, Inner Mongolia)

China Aerodynamics Research & Development Center [29] (Mianyang, Sichuan)

Xichang Satellite Launch Center [27] (Mianning, Sichuan)

Xi'an Satellite Control Center [26] (Xi'an, Shaanxi)

Taiyuan Satellite Launch Center [25] (Kelan, Shaanxi)

Beijing

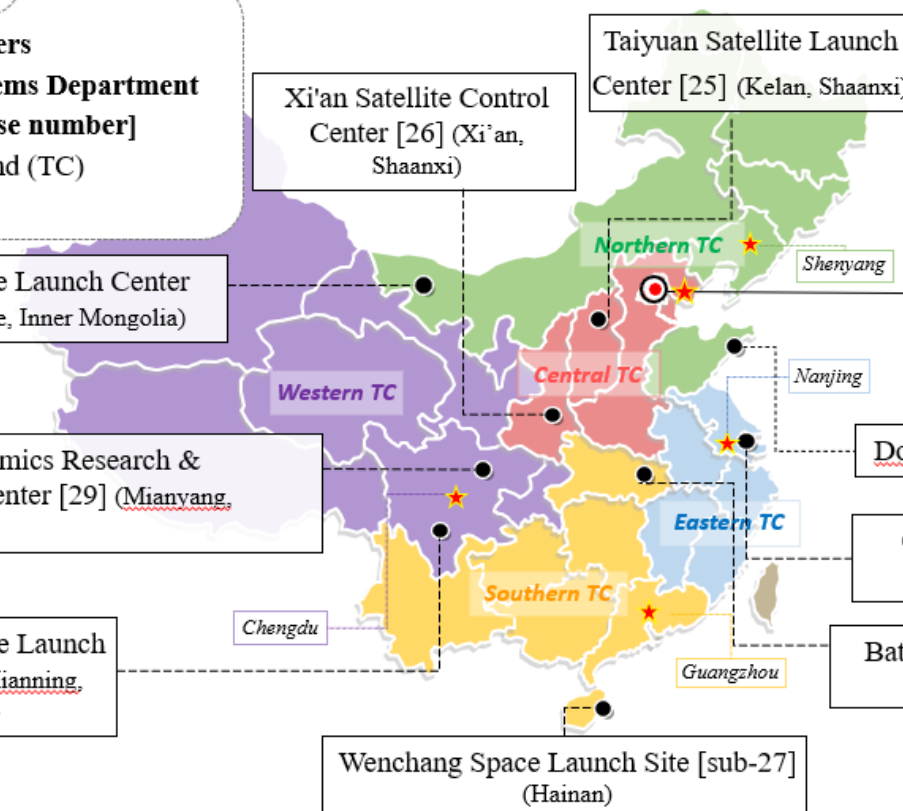
- ★ Central TC Headquarters
- SSF Space Systems Department Headquarters
 - Space Engineering University
 - Beijing Aerospace Flight Control Center
 - Satellite Positioning Main Station
 - Aerospace Reconnaissance Bureau
 - Satellite Communications Main Station
 - China Astronaut Corps/Center

Dongfang Spaceport [Sub-25?] (Haiyang, Shandong)

China Satellite Maritime Tracking and Control Department [23] (Jiangyin, Jiangsu)

Battlefield Environment Support Base [35] (Wuhan, Hubei)

Wenchang Space Launch Site [sub-27] (Hainan)





Why consolidate PLA space assets in SSF?



Why the SSF?

The SSF is the PRC's solution to improving readiness for high-tech, **information** driven, increasingly virtual and remote warfare.

The SSF will support the PLA's readiness and new commitment to **joint force operations** through improving information gathering, analysis, dispatching, and operations with space, cyber, and electromagnetic data.

The SSF will be responsible for staying abreast of the space and information industry trends and talent to increase the PLA's **innovative** capabilities.

1st



Gen.
Gao Jin

2nd



Gen.
Li Fengbiao

3rd

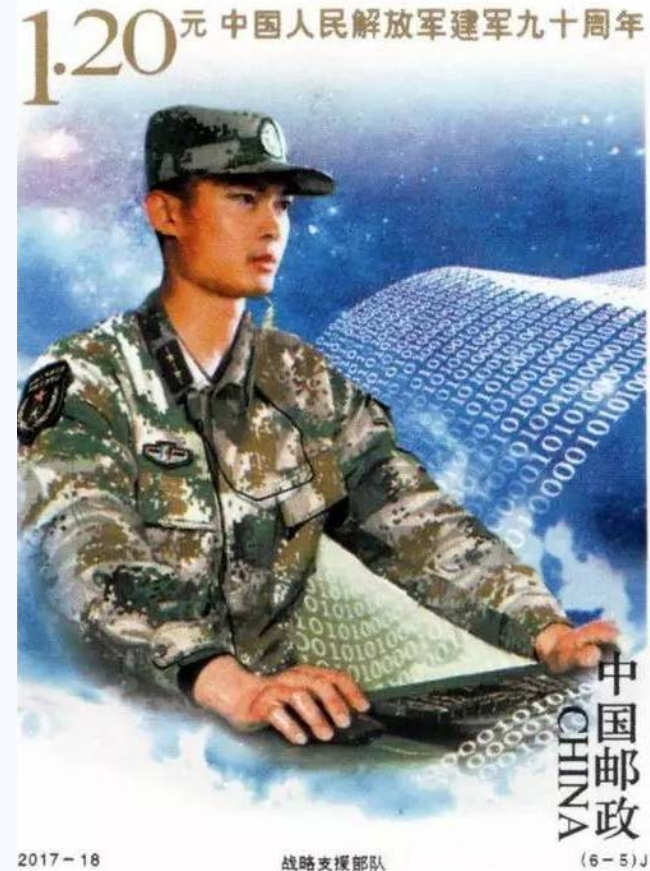


Gen.
Ju Qiansheng



Consolidating and Integrating Space Data

- **Information** generated from space and about space is important, and integrated space data from multiple systems can create a better “picture.”
- The ground and space based systems collecting this information are also a target for “informatized” and “intelligentized” warfare. This data can be interdicted, spoofed, or disabled at any stage of a conflict.
- The SSD must be able to launch new, and with at least direct-assent ASAT weapons protect and defend existing space assets.

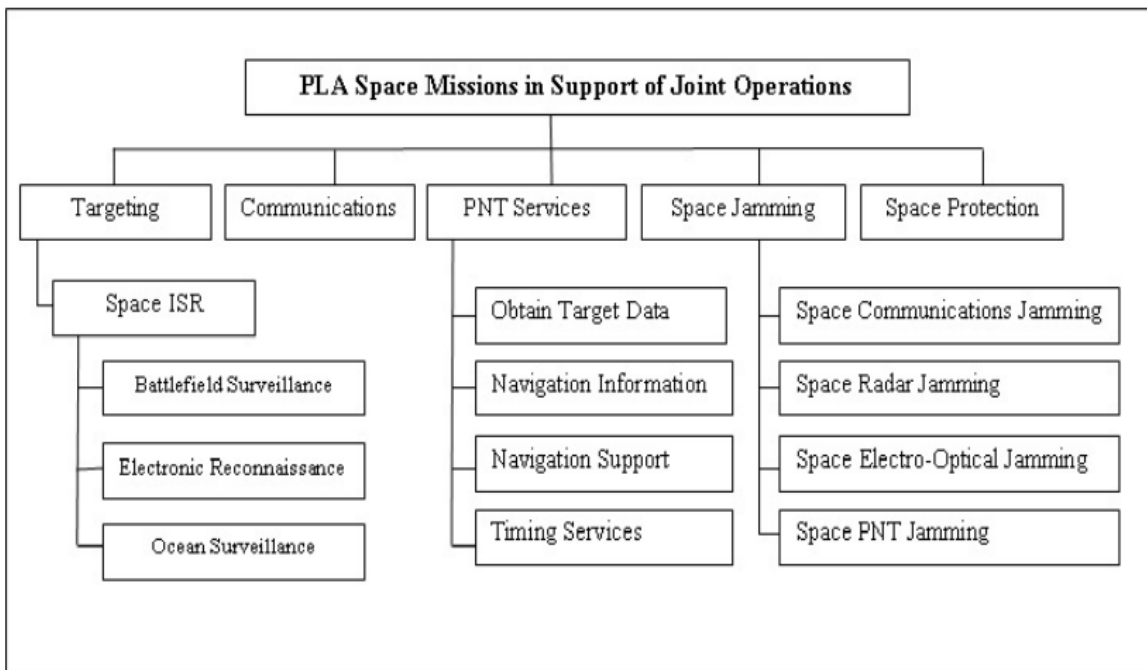




Integrated Space Data Better Enables Joint Operations

- One of the best ways to enable joint operations between different services in different domains is to ensure they each get fast and accurate space data support.
- Joint missions for information operations are better enabled with a shared picture of the battlefield.
- According to the People's Daily in 2016: The SSF aspires to be the PLA's "information umbrella," integrated throughout the full cycle of land, sea, air and missile force operations, from start to finish.

Figure 1: PLA Space Missions in Support of Joint Operations



Source: Wang Yongping, ed., *Space Information Support Operations*(空间信息支援作战), National Defense University Press, 2014, 126.



Science & Technology Innovation

- In 2016 the PRC aimed by 2020 to “strengthen comprehensive space technology applications supporting and **servicing national defense and state security, economic and social development, and the deployment of strategic power around the globe.**”
- Chinese President Xi Jinping tasked the SSF in 2016 with **advancing military innovation for future high-tech conflicts.**
- SSD over the last 5 years has increased its already existing connections with the best industry and academic institutions doing space in China and internationally.



Image: Space Engineering University cadets participate in a Model U.N. activity (undated). (Image source: PLASSF WeChat)



Strategic Guiding Ideology for Space (SMS 2020)

- 1.** Emphasize the important position of space deterrence, deterrence is the main, war is an auxiliary means of last resort.
- 2.** Focus on limited responses. In the strategic guidance of space military conflicts, attention should be paid to leave room for action, and strive to achieve deterrence against strong enemies, form advantages against weak enemies, and seize and maintain strategic initiative. Under normal circumstances, space combat operations should be defensive and limited.
- 3.** Emphasize joint checks and balances. Space security is a global issue. The space interests of different countries and groups of countries show a relationship of interpenetration and interdependence on the whole.
- 4.** Attach importance to the fight for the supremacy of space. The fight for space supremacy is the core of the space military conflict. In the inevitable confrontation, we must maintain the stability of our own space systems.



English Outside Reading

- Science of Military Strategy (CASI translation 2020)
<https://www.airuniversity.af.edu/Portals/10/CASI/documents/Translations/2022-01-26%202020%20Science%20of%20Military%20Strategy.pdf>
- Lectures on Space Operations (CASI translation 2013) <https://www.airuniversity.af.edu/CASI/Display/Article/3125495/in-their-own-words-lectures-on-the-science-of-space-operations/>
- Challenges to Security in Space (DIA 2022)
https://www.dia.mil/Portals/110/Documents/News/Military_Power_Publications/Challenges_Security_Space_2022.pdf
- Challenges to Security in Space (DIA 2019) https://aerospace.csis.org/wp-content/uploads/2019/03/20190101_ChallengestoSecurityinSpace_DIA.pdf
- Competing in Space (NASIC 2018) https://www.nasic.af.mil/Portals/19/documents/Space_Glossy_FINAL--15Jan_Single_Page.pdf?ver=2019-01-23-150035-697
- The People's Liberation Army Strategic Support Force: Update 2019 <https://jamestown.org/program/the-peoples-liberation-army-strategic-support-force-update-2019/>
- China's Strategic Support Force: A Force for a New Era (2018)
https://ndupress.ndu.edu/Portals/68/Documents/stratperspective/china/china-perspectives_13.pdf
- China's Space and Counterspace Capabilities and Activities (2020) https://www.uscc.gov/sites/default/files/2020-05/China_Space_and_Counterspace_Activities.pdf
- Global Counterspace Capabilities (2022) <https://swfound.org/counterspace/>

Slide 2: This class follows a what; who; why format. We'll first discuss what counts as PLA military space assets, both dedicated PLA assets and all Chinese satellites.

Slide 3: *Key Point:* high numbers of satellites DOES NOT equate to high quality. U.S. military dedicated systems not only outnumber PLA satellites, but the U.S. has far more experience in both satellite manufacturing quality and operations.

The U.S. Defense Intelligence Agency (DIA) in 2019 published a breakdown of PRC satellites and distinguished between military, civil and commercial satellites. You can see that at that time, the PLA had roughly 85 dedicated military satellites—meaning the PLA likely set requirements for these satellites through standard PLA acquisition processes and now operates them to support military training, operations, and intelligence gathering. The majority of PLA satellites are Intelligence, Surveillance, and Reconnaissance (ISR) satellites.

As of July 2022, the Union of Concerned Scientists—the organization from which the DIA pulled its data—reports the PLA now has 98 military satellites.

Slide 4: The DIA in 2022 published a breakdown of all foreign satellites, which shows that even counting all Chinese national systems, and not counting U.S. satellites, our Allies and Partners still dominate in both number and experience, especially for Earth orbiting satellites.

Some students may have heard of “PRC military-civilian fusion” in the space sector, or the phenomenon of the military having access to civil agency and commercial company satellite data and research. What most space analysts assume is that most likely, in a time of conflict, the PLA could take advantage of all its national systems, which could significantly increase the PRC’s access to ISR satellites, with the caveat that the quality of the systems is not widely known.

The 2020 Science of Military Strategy says, “Actively promote the transfer of military technology to the civilian economic field and civilian superior technology to the military field, and use the development of dual-use technology to promote the close integration of military-civilian scientific research and production at the high-tech level.”

Slide 5: In addition to PLA satellite systems, the PLA also currently maintains and operates the PRC’s 4 launch centers and national satellite tracking, telemetry and control (TT&C) centers. The PLA is supervising the buildout of operations at the new sea launch center, which Chinese national planners indicate is intended to be transferred to commercial operators. This is an area to watch.

Slide 6: Military space activities are generally broken down into support functions—making sure Army and Navy units can use satellite communications and have imagery and signals intelligence support for example, and counterspace operations. Counterspace operations are widely developed for passive deterrence capabilities as well as defense of a country’s ability to use space to support terrestrially based activities. However, the PLA has a concept called “active defense,” similar to what is in U.S. doctrine. This means that under certain circumstances, these capabilities may also be used offensively for active deterrence.

This slide includes a graphic from the Secure World Foundation’s annual report—note the operationalized capabilities: low Earth orbit (LEO) direct ascent (i.e. using a missile to attack a satellite

from the ground) and electronic warfare (i.e. jamming satellites like GPS from the ground and using cyber intrusions into ground stations).

It is important to note that the PLA's limited experience in conflict means outside observers don't yet know the PLA's actual capabilities in tasking and operationalizing space systems to support conflict operations. It also means that the PLA doesn't know either.

Slide 7: Here are some examples of China's counterspace capabilities. Note the directed energy weapons example. As we saw on slide 6, directed energy weapons have only been tested in very limited cases, at least according to publicly available information. However, one of the known examples is highly likely illustrative of PLA's intent during a conflict—they have tested blinding the U.S. National Reconnaissance Office's imagery satellites to discourage NRO's imaging of the PRC. According to the NRO director, he confirmed it was just a "test."

Slide 8: Now that we have an idea of what kind of space systems the PLA owns and operates, as well as their demonstrated capabilities to defend those capabilities, and potentially act offensively, let's discuss who the PLA does all that.

Slide 9: China does not have a Space Force like the U.S. it also does not have a Space Command like the U.S. The PRC has merged its military space, electronic, cyber and information warfare capabilities under one Force called the Strategic Support Force (SSF), which some U.S. analysts say more similar to the U.S. Strategic Command.

The SSF is now hierarchically equivalent to the PLA services. Under the SSF are the two operationally relevant departments for understanding PLA space capabilities: the Space Systems Department (SSD) and the Network Systems Department (NSD).

Slide 10: Here is the new PLA organization after the late 2015 reform. You can see that the SSF with its headquarters in Beijing and primary support mission is thought to be closely managed by the CMC.

According to U.S. analysts, the Central Military Commission (CMC) exercises control over SSF through the CMC Joint Operations Command Center. The CMC Joint Staff Department Operations Bureau probably manages the center's day-to-day operations. However, SSF officers reportedly perform rotational duty within the Joint Command Center. SSF officers may also provide critical command support functions at higher readiness levels. As part of the reform and reorganization, CMC Joint Operations Command Center leaders have direct authority over 10 groups responsible for mission planning, battlespace situational awareness, survey and mapping, navigation, network/electronic countermeasures, spectrum management, airspace management, meteorology and hydrography, and communications. SSF officers presumably are assigned duty within these functional groups during higher readiness levels, or perhaps even under normal conditions. Newly established SSF corps-level units suggest possible direct operational support to Theater Command leaders in contingency.

Slide 11: The SSF's first-level departments — Staff, Political Work, Logistics, Space Systems, and Network Systems — are responsible for structural integration of space and network operations.

Note that most analysts think that some of the pre-reform institutional overlaps still exist, such as for important counterspace and strategic intelligence operations. Without warfighting experience, the

Chinese Communist Party and CMC won't know if merging SSD and NSD missions under the SSF will improve operational readiness and real time communications.

For example, will cyber enabled strategic intelligence be readily shared with the SSD? How will the SSD prioritize foreign satellite tracking for NSD's electronic warfare operations? The PLA's reorganization aims to make the CMC in charge of ensuring joint operations, thereby making sure the SSF provides the support for any PLA military priority.

Slide 12: How the SSD and the NSD will work together is largely unknown. Let's look specifically at the SSD, which we know manages the military launch, tracking, navigation, and ISR space infrastructure and systems development acquisition process. Lt. General Shang Hong has been the Director of the Space Systems Department since its genesis.

The PLA SSF SSD was created through the merger of the former General Armaments Department (GAD) China Launch and Tracking Control General (CLTC) and space-related organizations previously under the General Staff Department (GSD) Operations Department and GSD Intelligence Department.

The SSD oversees at least six corps or corps deputy leader-grade operational commands. The Xian Satellite Control Center (Base 26) and the Beijing Space Flight Command and Control Center in the northern suburbs of Beijing tracks and controls space assets, and integrates space tracking data from ground- and sea-based units. Although unconfirmed, Base 26 may oversee the Beijing Space Flight Command and Control Center.

Three corps leader-grade space launch bases in Jiuquan (Base 20), Taiyuan (Base 25), and Xichang (Base 27). Base 27 probably oversees the launch complex on Hainan Island. launch centers also support ballistic missile and kinetic space interceptor testing.

The China Satellite Maritime Tracking and Control Department (Base 23) is a corps leader-grade organization that is responsible for sea-based satellite tracking, control, and launch vehicle transportation to Hainan. New corps deputy leader-grade base commands responsible for space applications have been formed in Beijing and Wuhan (Base 35). These bases may have integrated ground segment operations managed by division leader-grade units previously subordinate to the General Staff Department, including the former GSD Intelligence Department Space Reconnaissance Bureau.

Roughly analogous to the U.S. National Reconnaissance Office, the former Space Reconnaissance Bureau is responsible for processing and distributing downlinked electro-optical (EO) and synthetic aperture radar (SAR) imagery. The bases may also have absorbed portions of the former GSD Operations Department Survey and Mapping Bureau (including the Beidou ground segment), former GSD Operations Department Weather and Oceanography Bureau, GSD Informatization Department satellite communications (SATCOM) command, and the former GAD Data Relay Satellite Control Center.

The Aerospace Engineering University in Beijing is one of two universities known to be under SSF, and this one is focused on space systems. It is known to house at least two defense-related national key labs: the National Key Laboratory of Laser Propulsion and Applications and the National Laboratory of Electronic Information Equipment Systems. Within the next five years, the PLASSF is expected to field a ground-based directed energy system capable of dazzling electro-optical reconnaissance satellites in low earth orbit. Analysts are unclear if those capabilities reside in the SSD or the NSD.

Slide 13: Here is a geographic breakdown of the SSD bases discussed on the previous slide. Included here is also the newly formed five Theater Commands. This visualization emphasizes that space should support joint operations across the Theater Commands. Not included is the NSD bases because despite having some overlapping mission areas, the SSD controls getting military systems to space, and while they are in space.

Similar to the U.S., jamming space assets and intercepting satellite signals is a capability dispersed across U.S. armed services. The PLA SSF NSD may have some or all of such support capabilities. The NSD absorbed organizations which previously oversaw two electronic countermeasures (ECM) brigades and a satellite ECM command headquartered in Beijing's northern suburbs. The NSD also absorbed a division leader-grade unit, headquartered in Shanghai, responsible for intercept of SATCOM and SAR transmissions. Equipped with at least one large phased array radar system, the unit presumably supports China's space surveillance network, indicating that TT&C may also be a shared mission area with the SSD.

Slide 14: Now that we understand the types of space systems the PLA has at its direct disposal, and who in the PLA if directed to do so will bring those capabilities to a conflict, let's discuss a little about "why." Why would the PLA consolidate its space assets into a SSF? Why not make a Space Force like the U.S.?

Slide 15:

Why SSF? Information driven warfare; joint force operations; and innovative, high-tech hardware and software solutions. Read the slide. General Ju Qiansheng was promoted to full general and put in charge of the SSF in July 2021. He is the first to be promoted to the role from within the SSF. Ju was previously the Director of the NSD.

Slide 16: Space data is one of many key information sources for warfare. Read the slide.

The SSF has two primary roles: strategic information support and strategic information operations. The SSF's strategic information support role entails centralizing technical intelligence collection and management, providing strategic intelligence support to theater commands, enabling PLA power projection, supporting strategic defense in the space and nuclear domains, and enabling joint operations. The SSF's strategic IO role involves the coordinated employment of space, cyber, and electronic warfare to "paralyze the enemy's operational system-of-systems" and "sabotage the enemy's war command system-of-systems" in the initial stages of conflict.

Slide 17: Read slide.

The Chinese Communist Party's goal in reforming the PLA in late 2015 was not only aimed at improving the PLA's ability to fight "informationized" conflicts but also enhance joint operations and power projection capabilities, according to PRC authoritative media. Even after reform, the PLA does not have a joint assignment system, and there is no requirement to serve in "joint billets" with officers from other services to secure promotion. However, rotations to the CMC Joint Command Center may fill this role. Most officers spend almost all their careers working in one service, and often only in one place.

The PLA Daily described SSF as important as a "product of developments in military technology and the evolution of warfare"—one centered on leveraging space, electromagnetic, and network capabilities as

key enablers of integrated joint operations across multiple domains of conflict, including land, sea, air, space and network domains.”

Slide 18: The PLA is only one component of the PRC’s national level strategy to leverage innovation for international leadership across military, economic, legal, and overall management systems.

Read slide.

The Space Engineering University has been active in recruiting top students and forming collaborations to ensure students deliver into industry leading technology and concepts, as well as international legal and normative “rules of behavior.” For example, recruitment networks for university graduates post advertisements to work with the SSF to cover tasks such as “monitoring space.”

The Space Engineering University has established formal faculty exchange programs with Beijing University and the Beijing University of Aeronautics and Astronautics, as well as guest lecture programs with China’s top space defense contractors and scientific and engineering research institutes.

Slide 19: The PLA’s strategic guiding ideology for space indicate the PLA might not be as eager to increase orbital debris in the future. According to China’s 2020 Science of Military Strategy: read slide.

Also from SMS 2020:

Military Space Goals. “Maintaining national space security, effectively entering and exiting and using space, building a space information highland serving military security, responding to various security threats and challenges from space, safeguarding the security of space assets, and being able to serve national politics, economy, technology, diplomacy and social development, participation in international space cooperation, and non-war military operations are the realistic goals of space military conflicts.”