



Understanding China’s Space Leading Small Groups— The Best Way to Determine the PLA’s Influence

Kristin Burke

This research reviews two of China’s space Leading Small Groups (LSGs): the China Manned Space Engineering (CMSE) LSG and the China Lunar Exploration Program (CLEP) LSG. The intention of this report is to show that understanding the history and current composition of the LSGs is the best way to answer the question, “How much control does the PLA have in a particular Chinese space program?”. LSGs are a well-known Chinese institutional mechanism amongst China policy wonks, but LSGs are rarely discussed in the space watcher literature. Recent attempts by European and British researchers have included only the historical references.^{1,2,3} This report explains LSGs and their leadership, then provides a deep dive into the CMSE LSG and the CLEP LSG.

There are two key takeaways. First is that the Chinese Communist Party (CCP or Party) controls space programs by appointing an organization to lead key programmatic decision-making. For CMSE and CLEP, the CCP appointed the State Council, not the Central Military Commission (CMC). The State Council manages CMSE and CLEP usually through LSGs, the leader of which the State Council decides based on the organization that manages the most subsystems. The LSG leader then reports progress to the State Council, regardless of his or her parent organization. Second is that the CMSE LSG leader is a deputy of the CLEP LSG leader, and vice versa, and both LSG leaders are regularly equally ranked across the government, military, and Party.ⁱ

Leading Small Groups

The CCP has used LSGs for coordinating and implementing its policies nationwide, since the founding of the PRC.⁴ Xi Jinping’s administration continues to use them.⁵ National and subnational LSGs play a role in feeding ideas up to the Party, and LSGs at every level implement the Party’s policies. As described by a former Chinese State Councilor,

“Certain major tasks require more than just one department to accomplish these tasks. They require cross-departmental cooperation. For these tasks, we have leading

ⁱ The Party, the military wing of the party- the PLA, and the PRC government all have a well-defined bureaucratic hierarchy, with specific authorities at each rank. This hierarchy structure cuts across all three. This allows Party, PLA, and state government organizations and officials to know where they fall in bureaucratic order across China, and facilitates coordination among those of the same rank.

small groups. Special offices are usually created to host the leading small groups...These are headed by the lead department with the most responsibility for the group's given task."⁶

The Party empowers organizations such as the State Council or the CMC to designate a department level LSG leader to facilitate effective coordination and implementation, which ensures that CCP authorities have a means of achieving accountability for task completion.⁷

Chinese and Western scholars state, and the CMSE and CLEP websites indicate, that both LSGs are cross-department working groups that report to the State Council, not the CMC.^{8,9,10,11,12,13,14} This makes sense based on the fact that the Ministry of Finance, which controls the unclassified and classified budgets, is a State Council organization. It also makes sense based on what history tells us about the approval process for the human and robotic space exploration programs.

Prior to the establishment of the CMSE and CLEP LSGs, both initiatives were discussed in the 1980s as part of high-level reforms to develop China's science and technology (S&T) capabilities. During these discussions, the State Council and CMC in 1982 created the Commission on Science and Technology Industry for National Defense (COSTIND).^{15,16} The State Council and the CMC created COSTIND to house their respective departments that were managing defense procurement and technology development, in an effort to ensure collaboration and reduce redundancy during a time of S&T reform.^{ii,17} COSTIND worked on many technologies, including space technologies, and it reported to the State Council.¹⁸

To facilitate new space programs, COSTIND in 1989 recommended a higher-level group to approve access to limited national funds.^{19,20,21} That group was the national Aerospace LSG, later called the Central Special Commission, and the majority of its members came from civilian ministries.^{iii,22} According to the Chinese government notice establishing the national Aerospace LSG, the China National Space Administration (CNSA) was set up to be its Front Office (FO) and manage implementation of LSG decisions.²³

National Aerospace LSG members approved the initiation of the CMSE and CLEP, both times approval coming from the State Council Premier, who is also a member of the highest Party body, the Politburo Standing Committee.^{24,25,26} After the national Aerospace LSG's approval, it delegated CMSE and CLEP programmatic decisions down to COSTIND, requiring that COSTIND provide timely updates to at least the Vice Premier level.^{27,28,29,30,31} In a large government restructuring in 2008, the CCP decided to move COSTIND into a new ministry

ⁱⁱ On May 10, 1982, the PLA's National Defense Science and Technology Commission, the Office of National Defense Industry of the State Council and the Science and Technology Equipment Committee of the Central Military Commission were merged to form the Commission on Science and Technology Industry for National Defense (COSTIND). It reports to the State Council. COSTIND managed national defense scientific research, military production, and foreign trade in military products.

ⁱⁱⁱ The national Aerospace LSG was led by State Councilor Li Peng and had eight additional members: Song Jian, Director of the State Council Commission on Science and Technology; Liu Huaqing, Deputy of the CMC; Ding Henggao, Director of COSTIND; Gan Ziyu, Deputy Director of the State Planning Commission; Qi Huaiyuan, Vice Minister of Foreign Affairs; Liu Zhongquan, Vice Minister of Finance; Lin Zongtang, Minister of Aerospace; and Zhou Guangzhao, CAS President.

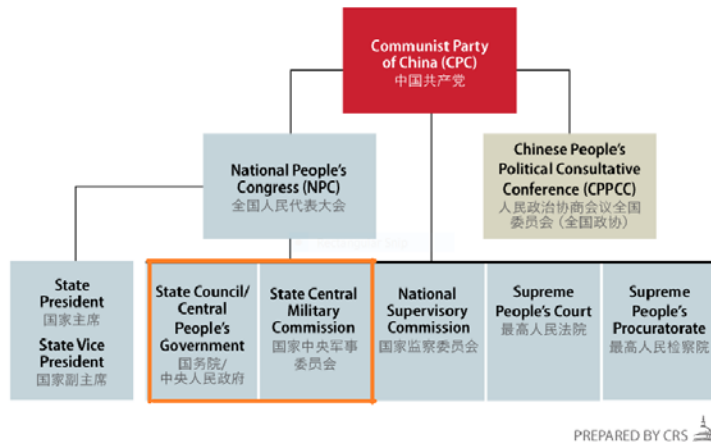
under the State Council called the Ministry for Industry and Information Technology (MIIT) and renamed COSTIND the State Administration for Science and Technology Industry for National Defense (SASTIND), which to this day houses CNSA. Despite this restructuring, according to the CNSA’s website, it continues to manage large programs such as CMSE, CLEP, Beidou, Gaofen, and the new Mars program, indicating it may still be serving the function of the FO for the national Aerospace LSG/Central Special Commission, or something similar.^{iv,32}

Department level and technology focused LSGs’ leadership

At the working level, large engineering programs in China are regularly managed by a Chief Commander and Chief Designer. The Chief Commander holds the purse. He or she is the person in charge of scheduling funds and coordinating the Deputy Commanders, who are responsible for ensuring the contributing budgets from their organizations. The Chief Designer leads decision-making on the technical aspects and system organization.

The CMSE LSG and CLEP LSG both have a Chief Commander as the leader, who is from an organization which manages the largest number of subsystems. It is important that the Chief and Deputy Commanders are generally equally ranked across their organizations so that they can sufficiently represent their organization’s views and ensure steady funding. The Chief Commander leads their coordination.

The current LSG Chief Commanders, General Li Shangfu of the CMSE LSG and Vice Minister Zhang Kejian of the CLEP LSG, can arguably be described as equals. This seems intentional since this equality has been reflected in the composition of these LSGs since their genesis. For example, the CMC is on equal footing with the State Council in China’s bureaucracy, see below.³³ Some Chinese websites that provide a rough conversion between



military and government ranks note that Generals are generally on par with Vice Ministers.³⁴ Li and Zhang in some regards are also similarly placed within their respective organizations. For example, Li leads one of the seven departments under the CMC and Zhang is one of six MIIT Vice-Ministers at one of the State Council’s strongest ministries. Zhang, in that capacity is also one of the four MIIT Party Group Members.

In terms of Party ranking, when Li was selected to become a member of the CCP Central Committee in 2017, Xu Dazhe, who Zhang replaced as a Vice Minister of MIIT and leader of CNSA, had already been a member of the Central Committee and was reelected for a second term.³⁵ While Zhang has not yet been promoted to the Central Committee, he may be this fall at

^{iv} In 1989 the national Aerospace LSG was restructured into what was called the Central Special Commission, still led by the State Council and with special oversight of the CCP.

the 20th Party Congress, which would put him generally on equal footing with Li even within the CCP.

China's Manned Space Engineering (CMSE) LSG

Chinese researchers and technologists proposed a human spaceflight program twice, first in 1966, then again in 1986, and both times the proposal was coordinated and delivered to the CCP by an arm of the State Council.^{36,37,38} The first proposal was facilitated by what was then the State Council's Office of National Defense Industry and the second proposal was facilitated by COSTIND.³⁹ At Qian Xueshen's request in the 1960s, the State Council's Office of National Defense Industry and the PLA Air Force jointly recruited China's first astronaut class.⁴⁰ In 1986, COSTIND together with other Chinese civilian bureaucrats in the then Aerospace Ministry used their political and family connections to get the military services re-engaged.^{41,42}

With all relevant parties' buy-in, especially the PLA's seeming willingness to commit some of its annual budget to astronaut training, the national Aerospace LSG/Central Special Commission decided that COSTIND would be responsible for organizing technology proposals and demonstrations for the human spaceflight program.^{v,43,44} In 1992, the CCP formally approved CMSE and COSTIND as lead coordinator.⁴⁵

COSTIND continued to manage the technology roadmap approval process while the military took on the second round of astronaut recruitment and training. The CMSE LSG's first Chief Commander was Ding Henggao of COSTIND.^{46,47} Chinese and Western researchers have also described COSTIND's role in approving crewed technology assessments, such as those which ultimately determined that China would build the Shenzhou capsule rather than a space shuttle.^{48,49}

The CMSE LSG was led by its first CMC representative starting in 1996 after Ding.⁵⁰ The Director of the CMSE FO, however, has always been a ranked PLA representative until recently.⁵¹ Historical and current accounts of the CMSE FO's reporting structure describe that it is under the direction of the CMSE Chief Commander and Chief Designer, who since Ding have continued to be either ranked or non-ranked military representatives. The Chief Designer does not seem to be on the CMSE LSG because of his focus on technical rather than budgetary matters. However, the LSG's budgetary approvals are based on his technical proposals.⁵²

After the success of China's first crewed spaceflight mission in 2003, the Deputy Commander representatives from the CMC and China Aerospace Science and Technology Corporation (CASC) coauthored an article in the CCP newspaper *The People's Daily* describing the process of decision-making in the human spaceflight program.⁵³ The two Deputy Commanders were Hu Shixiang and Zhang Qingwei, respectively.^{54, 55,56} Zhang Qingwei of CASC was already a member of the CCP Central Committee and would in 2007 become the Chief Commander of the CLEP LSG.^{57,58} They state:

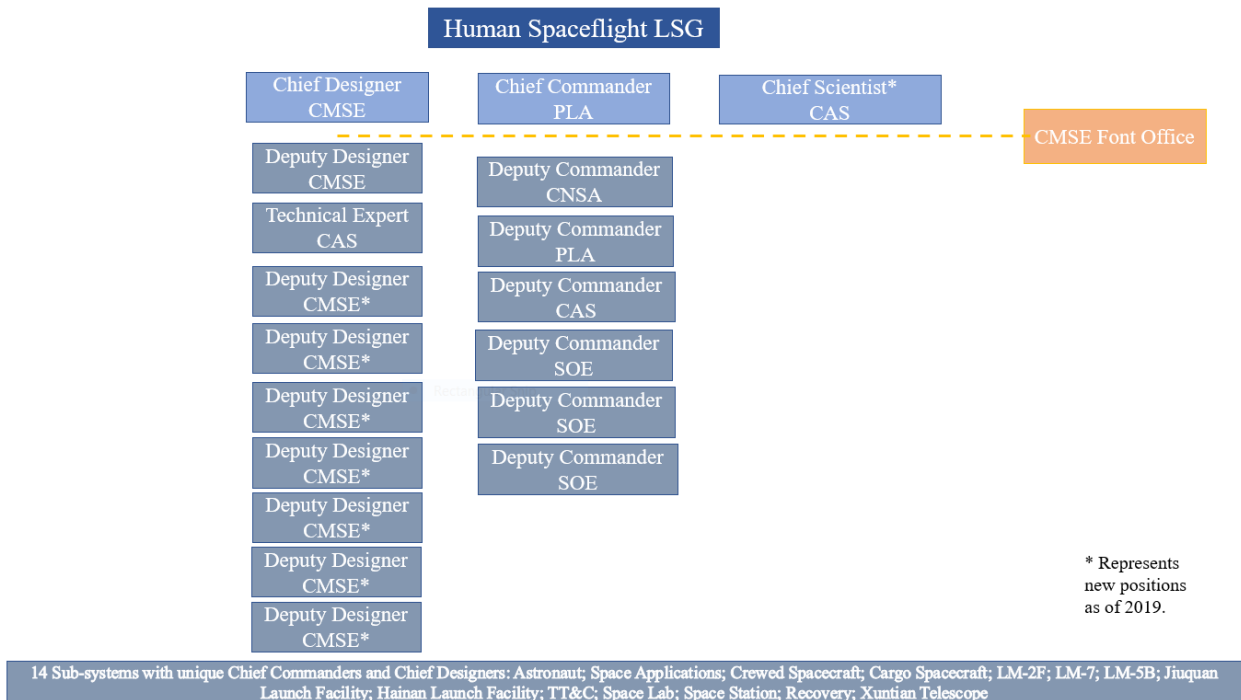
^v In 1989 the national Aerospace LSG was restructured into what was called the Central Special Commission, still led by the State Council and with special oversight of the CCP based on the LSG leader being the Premier.

“China's manned space projects are managed under the direct leadership of the Central Special Commission [also known as the Aerospace LSG], that is, the Department of General Armament, COSTIND, the Chinese Academy of Sciences and the China Aerospace Science and Technology Corporation and other departments, industries and units [forming] a cross-departmental, cross-industry, and highly centralized and unified organizational management system...

At the professional level, the project is composed of seven major systems.... At the management level, according to the nature of the work, two management modes have been formed, namely, [during a crewed mission and outside of a crewed mission].

In this way, the two command lines of the Chief Commander and the Chief Designer run vertically from top to bottom, the CMSE office at all levels are managed horizontally ... ”⁵⁹

It is unclear from this research if the Aerospace LSG/Central Special Commission still exists. As of at least 2003, the CMSE LSG was still reporting to the Aerospace LSG/Central Special Commission, the FO for which, as described above, was CNSA.⁶⁰ But as early as 2015, the CMSE website described they report to the State Council, which could still mean by way of the CNSA.^{61,62} Alternatively, it could mean that since CNSA is a representative on the CMSE LSG, the CMSE LSG reports to a State Council Vice Premier. More research on this topic is needed.



The CMSE LSG seems to continue to be composed of anywhere between five to seven representatives, depending on the task at hand, which determines the number of State Owned Enterprises (SOEs) which participate in a given meeting.^{63,64,65} Based on the CMSE website

and the known structure of the CLEP LSG described below, the CMSE LSG members are the Chief Commander and Deputy Commanders.

While the above Chief Commander and Chief Designer structure has been consistent, there have been several changes to the wider CMSE organization. For example, the original seven CMSE subsystems have expanded to fourteen.⁶⁶ Even with more subsystems, the PLA still manages the most, which logically entails continued CMSE LSG leadership.^{vi} In 2018, the CMSE FO leadership, however, changed from a ranked military representative to what appears to be a civilian.⁶⁷ In 2019, the number of Deputy Designers increased significantly and the Chief Designer was reelected based on his qualifications, rather than being appointed by the CCP.^{68,69} Below is the current CMSE LSG based on the CMSE website.⁷⁰

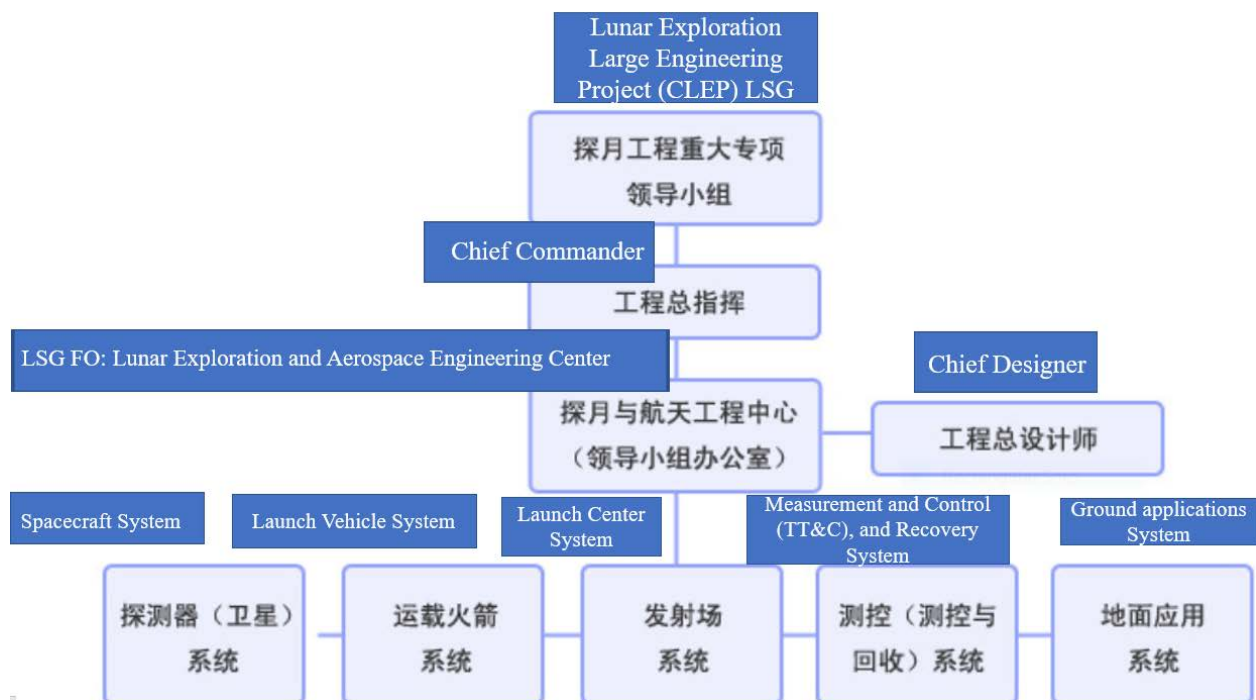
China Manned Space Engineering (CMSE) Leading Small Group (LSG), 2022

1. Director of the Equipment Development Department (EDD) of the Central Military Commission (CMC) and **Chief Commander of CMSE, General Li Shangfu**
2. Ministry of Industry and Information Technology (MIIT) Vice Minister, State Administration of Science and Technology Industry for National Defense (SASTIND) and China National Space Administration (CNSA) Director, **Deputy Commander of CMSE, Zhang Kejian**
3. Director of the PLA Strategic Support Force (SSF) Space Systems Department, **Deputy Commander of CMSE, Shang Hong**
4. China Academy of Sciences (CAS) Vice President, **Deputy Commander of CMSE, Yin Hejun**
5. China Aerospace Science and Technology Corporation (CASC) Chairman, **Deputy Commander of CMSE, Wu Yansheng**
6. China Aerospace Science & Industry Corporation (CASIC) Chairman, **Deputy Commander of CMSE, Yuan Jie**
7. China Electronics Technology Group Corporation Limited (CETC) Chairman, **Deputy Commander of CMSE, Chen Zhaoxiong**

^{vi} PLA (8, though Chinese media reporting indicates the local governments are taking on recovery operations); SOEs (4); CAS (2)

China's Lunar Exploration Program (CLEP) LSG

After the successful launch of Japan's lunar orbiter in 1990, Song Jian, a national Aerospace LSG member representing the State Council's Commission on Science and Technology, initiated the early studies and programmatic debates on a robotic lunar program for China.⁷¹ These studies and debates were then led by Sun Jiadong (first Chief Commander), Luan Enjie (first Chief Designer), and Ouyang Ziyuan (first Chief Scientist), all of whom worked in civilian organizations. They worked tirelessly at the lower levels to coordinate a proposal, while Sun Jiadong repeatedly informed and sought approval from State Council leadership. The State Council finally approved the first lunar orbiter of CLEP in 2001.⁷² Presumably, the LSG was set up sometime between then and 2003 when the three-step lunar exploration program was first publicly announced. The below chart is CLEP's organization, according to its website.⁷³



The Chief Commander of the CLEP LSG has since its initiation been a top leader of a civilian organization under the State Council, first COSTIND, and now the MIIT, while also being the Director of the CNSA, and importantly, also a member of the CCP Central Committee.⁷⁴ After COSTIND was reorganized under the MIIT and renamed SASTIND in 2008, the head of CNSA and the LSG leader remained a member of the CCP Central Committee and took on the title of Vice Minister.^{75,76} As mentioned above, Zhang Kejian is currently not a member of the Central Committee, but with the 20th Party Congress this November, he will probably be promoted, just like Chen Qiufa, who was promoted at the end of this term leading SASTIND and the CLEP LSG.

As can be seen from the above CLEP organization chart, the leaders of the five subsystems report to the Chief Commander and the Chief Designer. The current CLEP Chief Designer is a civilian named Wu Weiren, who took over for Luan Enjie in 2010.⁷⁷ PLA

representatives lead two of the five subsystems: the launch site system and the telemetry, tracking, and control (TT&C) and recovery system.^{vii} The satellite and launch vehicle systems are led by SOE representatives, and the satellite applications are run by a China Academy of Sciences (CAS) representative. Since the PLA does not lead the majority of the subsystems, it makes sense that the PLA does not lead the LSG.

To further demonstrate this point, see the pictures below. They capture CLEP LSG meetings related to the completion of the third phase of CLEP, which was the lunar sample return with Chang'e 5. The first photo is from an April 2015 meeting where it seems that the focus was on ensuring the Long March-5's (LM-5's) readiness to launch Chang'e 5, with three CNSA representatives, two CASC representatives, and two military representatives at the lead table.⁷⁸ CAS is not represented at the lead table because the ground applications of Chang'e 5 probably weren't discussed.⁷⁹ The second military representative was not listed in the article, but this research assumes it is probably the lead for TT&C and Recovery, sometimes a representative from the Xi'an Satellite Control Center or the Beijing Aerospace Control Center.



80,81

The second photo shown below is from the 15th LSG meeting, which took place February 2016.^{viii,82} There was no banner in the photo but the article describes planning for the 2017 completion of Chang'e 5's development work and anticipated launch. This meeting was before the successful first launch of the LM-5 in November 2016, after which the second launch in July 2017 failed, and led to the delay of the Chang'e 5 mission to late 2020. There is only one PLA representative seated at the main table, but the TT&C and Recovery representative, just like

^{vii} In the CMSE subsystem breakdown, the TT&C and recovery are separate systems, but they are the same system in CLEP subsystem breakdown, probably because only infrequently do robotic probes with samples return to Earth.

^{viii} The 15th meeting of the LSG also included the fourth meeting of the LM-5 and CLEP 3rd Stage Command Department, and the 3rd meeting of their implementation work team, according to the same article.

CASC's Yang Baohua seated off to the right of the photo, may have been moved to respectfully accommodate Ouyang Ziyuan and Luan Enjie.



Much of the public information on the CLEP LSG's meetings describe the completion of the third phase, the initial approval for which was years ago. CNSA Deputy Commander Wu Yanhua and Chief Designer Wu Weiren have been discussing the fourth phase since at least 2018, the approval for which most likely happened in conjunction with meetings in preparation for the 14th Five Year Plan (FYP) (2021-2025). FYP preparation is an iterative process with provinces first proposing their FYPs several years earlier than the release of the national FYP.^{83,84} This research expects to learn more of the CLEP LSG's new composition after the 20th Party Congress. Also, according to an academic article on Chang'e 5's management structure in 2021, co-authored by CLEP Deputy Commander and Director of the CLEP FO Liu JiZhong, the CLEP LSG is still active, but as the program matures, so does its management.⁸⁵

Below is a list of probable current members of the CLEP LSG. This list is determined based on prior LSG leadership, recent CLEP representation at formal State Council press briefings, and photos from Xi Jinping's Chang'e 5 completion ceremony.^{86,87,88, 89,90,91,92} According to the article describing the ceremony, the members of the CLEP LSG were present, as well as interested top leaders from the Politburo Standing Committee and CMC.^{ix,93} The current CLEP LSG is probably composed of at least: Chief Commander Zhang Kejian; Deputy Commander Wu Yanhua; Deputy Commander Liu JiZhong; Deputy Commander and CASC representative Yang Baohua; and potentially Deputy Chief Designer of Ground Applications, CAS representative Li Chun. See images below.

^{ix} Yang Baohua was listed as attending but was not photographed. The names in red on the photos are members of the CCP Politburo Standing Committee, and General Zhang Youxia is a Vice Chairman of the CMC.



Opinions, conclusions, and recommendations expressed or implied within are solely those of the author(s) and do not necessarily represent the views of the Air University, the Department of the Air Force, the Department of Defense, or any other U.S. government agency. Cleared for public release: distribution unlimited.

ENDNOTES

- ¹ Marco Aliberti, When China Goes to the Moon, 2015, <https://link.springer.com/book/10.1007/978-3-319-19473-8>
- ² Brian Harvey, China in Space: The Great Leap Forward Second Edition, 2019, <https://www.tandfonline.com/doi/abs/10.1080/14777622.2020.1726002>
- ³ Gregory Kulacki and Jeffrey G. Lewis, “A Place for One’s Mat: China’s Space Program, 1956–2003,” 01/2009, <https://www.amacad.org/publication/place-ones-mat-chinas-space-program-1956-2003>
- ⁴ Alice Miller, “The CCP Central Committee’s Leading Small Groups,” 2008, <https://www.hoover.org/sites/default/files/uploads/documents/CLM26AM.pdf>
- ⁵ Christopher Johnson and Scott Kennedy, “Xi’s Signature Governance Innovation: The Rise of Leading Small Groups,” 2017, <https://www.csis.org/analysis/xis-signature-governance-innovation-rise-leading-small-groups>
- ⁶ 曾培炎, 西部大开发决策回顾, 中共党史出版社, 2010, <https://books.google.com/books/about/%E8%A5%BF%E9%83%A8%E5%A4%A7%E5%BC%80%E5%8F%91%E5%86%B3%E7%AD%96%E5%9B%9E%E9%A1%BE.html?id=3DzUYgEACAAJ>
- ⁷ Wen-Hsuan Tsai and Wang Zhou, “Integrated Fragmentation and the Role of Leading Small Groups in Chinese Politics,” 07/2019, <https://www.journals.uchicago.edu/doi/full/10.1086/700670>
- ⁸ 王金锋, 嫦娥奔月：中国嫦娥一号探月卫星发射成功, 吉林出版集团有限责任公司, 2009
- ⁹ Jizhong LIU, Hao HU, Zhaoyu PEI, Qiong WANG, Qiang MAI. Management innovation of Chang’e-5 project. *Frontiers of Engineering Management*, 2021, 8(4): 620–626 <https://doi.org/10.1007/s42524-021-0165-1>
- ¹⁰ 经济日报, “王兆耀、武平分别任 921 工程办正副主任（附机构简介）”, 03/2013, http://district.ce.cn/newarea/roll/201203/27/t20120327_23192345_1.shtml interview with Wang Zhaoyao and Wu Ping as the director and deputy director of the 921 Project Office
- ¹¹ Baidu, “中国载人航天工程办公室,” <https://baike.baidu.com/item/%E4%B8%AD%E5%9B%BD%E8%BD%BD%E4%BA%BA%E8%88%AA%E5%A4%A9%E5%B7%A5%E7%A8%8B%E5%8A%9E%E5%85%AC%E5%AE%A4/5432140>
- ¹² Brian Harvey, China in Space: The Great Leap Forward First Edition, 2013, p. 52, 258, 271, and 331, <https://www.tandfonline.com/doi/abs/10.1080/14777622.2020.1726002>
- ¹³ Chengzhi Li, Bingtao Ma, Xiang Li, “The Decision-Making Process of China’s Human Spaceflight Program,” 03/2022, <https://www.sciencedirect.com/science/article/abs/pii/S0265964622000182?via=3Dihub>
- ¹⁴ Patrick Besha, “Policy making in China’s space program: A history and analysis of the Chang’e lunar orbiter project,” 08/2010, doi:10.1016/j.spacepol.2010.08.005
- ¹⁵ Gregory Kulacki and Jeffrey G. Lewis, “A Place for One’s Mat: China’s Space Program, 1956–2003,” 01/2009, <https://www.amacad.org/publication/place-ones-mat-chinas-space-program-1956-2003>
- ¹⁶ Patrick Besha, “Policy making in China’s space program: A history and analysis of the Chang’e lunar orbiter project,” 08/2010, doi:10.1016/j.spacepol.2010.08.005
- ¹⁷ Mandarin Wikipedia, “中华人民共和国国防科学技术工业委员会,” <https://zh.wikipedia.org/wiki/%E4%B8%AD%E5%8D%8E%E4%BA%BA%E6%B0%91%E5%85%B1%E5%92%8C%E5%9B%BD%E5%9B%BD%E9%98%B2%E7%A7%91%E5%AD%A6%E6%8A%80%E6%9C%AF%E5%B7%A5%E4%B8%9A%E5%A7%94%E5%91%98%E4%BC%9A>
- ¹⁸ Mandarin Wikipedia, “中华人民共和国国防科学技术工业委员会,” <https://zh.wikipedia.org/wiki/%E4%B8%AD%E5%8D%8E%E4%BA%BA%E6%B0%91%E5%85%B1%E5%92%8C%E5%9B%BD%E5%9B%BD%E9%98%B2%E7%A7%91%E5%AD%A6%E6%8A%80%E6%9C%AF%E5%B7%A5%E4%B8%9A%E5%A7%94%E5%91%98%E4%BC%9A>
- ¹⁹ Kexueying, “载人航天精神,” <http://www.kexueying.org.cn/cms/Partystudy/view?id=310>
- ²⁰ Baidu, “中央专委,” <https://baike.baidu.com/item/%E4%B8%AD%E5%A4%AE%E4%B8%93%E5%A7%94/16021258>
- ²¹ 王金锋, 嫦娥奔月：中国嫦娥一号探月卫星发射成功, 吉林出版集团有限责任公司, 2009
- ²² Baidu, “国务院、中央军委关于成立国家航天领导小组的通知,” <https://baike.baidu.com/item/%E5%9B%BD%E5%8A%A1%E9%99%A2%E3%80%81%E4%B8%AD%E5%A4%AE%E5%86%9B%E5%A7%94%E5%85%B3%E4%BA%8E%E6%88%90%E7%AB%8B%E5%9B%BD%E5%AE%B6%E8%88%AA%E5%A4%A9%E9%A2%86%E5%AF%BC%E5%B0%8F%E7%BB%84%E7%9A%84%E9%80%9A%E7%9F%A5/17929128>

- ²³ Baidu, “国务院、中央军委关于成立国家航天领导小组的通知,”
<https://baike.baidu.com/item/%E5%9B%BD%E5%8A%A1%E9%99%A2%E3%80%81%E4%B8%AD%E5%A4%AE%E5%86%9B%E5%A7%94%E5%85%B3%E4%BA%8E%E6%88%90%E7%AB%8B%E5%9B%BD%E5%AE%B6%E8%88%AA%E5%A4%A9%E9%A2%86%E5%AF%BC%E5%B0%8F%E7%BB%84%E7%9A%84%E9%80%9A%E7%9F%A5/17929128>
- ²⁴ 王金锋, *嫦娥奔月: 中国嫦娥一号探月卫星发射成功*, 吉林出版集团有限责任公司, 2009
- ²⁵ Gregory Kulacki and Jeffrey G. Lewis, “A Place for One’s Mat: China’s Space Program, 1956–2003,” 01/2009,
<https://www.amacad.org/publication/place-ones-mat-chinas-space-program-1956-2003>
- ²⁶ Patrick Besha, “Policy making in China’s space program: A history and analysis of the Chang’e lunar orbiter project,” 08/2010, doi:10.1016/j.spacepol.2010.08.005
- ²⁷ 王金锋, *嫦娥奔月: 中国嫦娥一号探月卫星发射成功*, 吉林出版集团有限责任公司, 2009
- ²⁸ CLEP, “组织机构,” <http://www.clep.org.cn/n487137/index.html>
- ²⁹ 刘华清, *刘华清回忆录*, 解防军出版社, 2007,
<https://books.google.com/books/about/%E5%88%98%E5%8D%8E%E6%B8%85%E5%9B%9E%E5%BF%86%E5%BD%95.html?id=1FQmLwAACAAJ>
- ³⁰ 中国航天科技集团有限公司 (中国宇航学会) /北京航空航天大学, “载人航天精神,”
<http://www.kexueying.org.cn/cms/Partystudy/view?id=310>
- ³¹ Gregory Kulacki and Jeffrey G. Lewis, “A Place for One’s Mat: China’s Space Program, 1956–2003,” 01/2009,
<https://www.amacad.org/publication/place-ones-mat-chinas-space-program-1956-2003>
- ³² CNSA, “中国航天重大任务,” <http://www.cnsa.gov.cn/n6758824/n6759009/index.html>
- ³³ Congressional Research Service, “China’s Political System in Charts: A Snapshot Before the 20th Party Congress,” 11/2021, <https://crsreports.congress.gov/product/pdf/R/R46977>
- ³⁴ 思而思学, “中国干部公务员等级和军衔制度等级划分 (一),”
<http://www.gxscse.com/ZhiChangFaZe/465500.html>
- ³⁵ China Daily, “List of members of the 19th CPC Central Committee,” 10/2017,
http://www.chinadaily.com.cn/china/19thcpnationalcongress/2017-10/25/content_33681147.htm
- ³⁶ Baidu, “载人航天工程组织管理,” 06/2015,
https://image.baidu.com/search/detail?ct=503316480&z=0&ipn=d&word=%E6%9D%8E%E5%B0%9A%E7%A6%8F%20%E5%BC%A0%E5%85%8B%E4%BF%AD%20%E6%8E%A2%E6%9C%88&step_word=&hs=0&pn=10&spn=0&di=7108135681917976577&pi=0&rn=1&tn=baiduimagedetail&is=0%2C0&istype=2&ie=utf-8&oe=utf-8&in=&cl=2&lm=-1&st=-1&cs=4183110458%2C380295861&os=1871321028%2C1388903241&simid=4182335034%2C666397671&adpicid=0&lpn=0&ln=43&fr=&fmq=1656269992869_R&fm=detail&ic=&s=undefined&hd=&latest=©right=&se=&sme=&tab=0&width=&height=&face=undefined&ist=&jit=&cg=&bdtype=0&oriquery=&objurl=https%3A%2F%2Fimg2.baidu.com%2Fimage_search%2Fsrc%3Dhttp%3A%2F%2Fimg1.dzwww.com%3A8080%2Ftupian_pl%2F20170425%2F59%2F69086771700602091.jpg%26refer%3Dhttp%3A%2F%2Fimg1.dzwww.com%26app%3D202%26size%3Df9999%2C10000%26q%3Da80%26n%26g%3D0n%26fmt%3Dauto%3Fsec%3D1658862005%26t%3D0735866174446790d2bf08f98db1eaaa&fromurl=ippr_z2C%24qAzdH3FAzdH3Fvg_z%26e3Bf5gi55_z%26e3Bv54AzdH3Fytzi57swkAzdH3F08c8ll8l_z%26e3Bip4s&gsm=b&rpstart=0&rpnum=0&islist=&querylist=&nojc=undefined&dyTabStr=MCw0LDUsMSwzLDcsOCwyLDYsOQ%3D%3D
- ³⁷ Gregory Kulacki and Jeffrey G. Lewis, “A Place for One’s Mat: China’s Space Program, 1956–2003,” 01/2009,
<https://www.amacad.org/publication/place-ones-mat-chinas-space-program-1956-2003>
- ³⁸ Brian Harvey, *China in Space: The Great Leap Forward First Edition*, 2013,
<https://www.tandfonline.com/doi/abs/10.1080/14777622.2020.1726002>
- ³⁹ Mandarin Wikipedia, “中华人民共和国国防科学技术工业委员会,”
<https://zh.wikipedia.org/wiki/%E4%B8%AD%E5%8D%8E%E4%BA%BA%E6%B0%91%E5%85%B1%E5%92%8C%E5%9B%BD%E5%9B%BD%E9%98%B2%E7%A7%91%E5%AD%A6%E6%8A%80%E6%9C%AF%E5%B7%A5%E4%B8%9A%E5%A7%94%E5%91%98%E4%BC%9A>
- ⁴⁰ Brian Harvey, *China in Space: The Great Leap Forward First Edition*, 2013, p. 261,
<https://www.tandfonline.com/doi/abs/10.1080/14777622.2020.1726002>
- ⁴¹ Gregory Kulacki and Jeffrey G. Lewis, “A Place for One’s Mat: China’s Space Program, 1956–2003,” 01/2009,
<https://www.amacad.org/publication/place-ones-mat-chinas-space-program-1956-2003>, p. 35 (pdf p.25)

- ⁴² 刘华清, *刘华清回忆录*, 解放军出版社, 2007, p. 679,
<https://books.google.com/books/about/%E5%88%98%E5%8D%8E%E6%B8%85%E5%9B%9E%E5%BF%86%E5%BD%95.html?id=1FQmLwAACAAJ>
- ⁴³ Kexueying, “载人航天精神,” <http://www.kexueying.org.cn/cms/Partystudy/view?id=310>
- ⁴⁴ Baidu, “中央专委,”
<https://baike.baidu.com/item/%E4%B8%AD%E5%A4%AE%E4%B8%93%E5%A7%94/16021258>
- ⁴⁵ Kexueying, “载人航天精神,” <http://www.kexueying.org.cn/cms/Partystudy/view?id=310>
- ⁴⁶ Baidu, “中国载人航天工程,”
<https://baike.baidu.com/item/%E4%B8%AD%E5%9B%BD%E8%BD%BD%E4%BA%BA%E8%88%AA%E5%A4%A9%E5%B7%A5%E7%A8%8B/1445134>
- ⁴⁷ Baidu, “丁衡高,” <https://baike.baidu.com/item/%E4%B8%81%E8%A1%A1%E9%AB%98>
- ⁴⁸ Brian Harvey, *China in Space: The Great Leap Forward First Edition*, 2013, p. 271,
<https://www.tandfonline.com/doi/abs/10.1080/14777622.2020.1726002>
- ⁴⁹ Chengzhi Li, Bingtao Ma, Xiang Li, “The Decision-Making Process of China's Human Spaceflight Program,” *Space Policy*, 05/2022, <https://doi.org/10.1016/j.spacepol.2022.101492>
- ⁵⁰ Baidu, “中国载人航天工程,”
<https://baike.baidu.com/item/%E4%B8%AD%E5%9B%BD%E8%BD%BD%E4%BA%BA%E8%88%AA%E5%A4%A9%E5%B7%A5%E7%A8%8B/1445134>
- ⁵¹ Baidu, “汪永肃,” <https://baike.baidu.com/item/%E6%B1%AA%E6%B0%B8%E8%82%83/10956684>
- ⁵² Mandarin Wikipedia, “中国载人航天工程简介,”
<https://zh.wikipedia.org/wiki/%E4%B8%AD%E5%9B%BD%E8%BD%BD%E4%BA%BA%E8%88%AA%E5%A4%A9%E5%B7%A5%E7%A8%8B>
- ⁵³ The People's Daily reprinted in CNSA.gov, “中国载人航天工程 成功实践系统工程的典范,” 04/2004,
<http://www.cnsa.gov.cn/n6758824/n6759009/n6759042/n6759070/c6795721/content.html>
- ⁵⁴ Sina, “重要时刻, 现身机场的上将是谁?,” 09/2021, <https://news.sina.com.cn/c/2021-09-18/doc-iktzqt6650425.shtml>
- ⁵⁵ Sina, “解放军总装备部副部长胡世祥解析“嫦娥工程,” 05/2004, <http://news.sina.com.cn/c/2004-05-20/14492582103s.shtml>
- ⁵⁶ Mandarin Wikipedia, “张庆伟,” <https://zh.m.wikipedia.org/zh-hans/%E5%BC%A0%E5%BA%86%E4%BC%9F>
- ⁵⁷ The People's Daily, “绕月探测工程领军人物,” 2004,
<http://scitech.people.com.cn/GB/25509/55912/105293/105297/index1.html>
- ⁵⁸ China.org, “List of Members of the 16th CPC Central Committee,” 2002,
<http://www.china.org.cn/english/2002/Nov/48816.htm>
- ⁵⁹ The People's Daily reprinted in CNSA.gov, “中国载人航天工程 成功实践系统工程的典范,” 04/2004,
<http://www.cnsa.gov.cn/n6758824/n6759009/n6759042/n6759070/c6795721/content.html>
- ⁶⁰ The People's Daily reprinted in CNSA.gov, “中国载人航天工程 成功实践系统工程的典范,” 04/2004,
<http://www.cnsa.gov.cn/n6758824/n6759009/n6759042/n6759070/c6795721/content.html>
- ⁶¹ Baidu, “载人航天工程组织管理,” 06/2015,
https://image.baidu.com/search/detail?ct=503316480&z=0&ipn=d&word=%E6%9D%8E%E5%B0%9A%E7%A6%8F%20%E5%BC%A0%E5%85%8B%E4%BF%AD%20%E6%8E%A2%E6%9C%88&step_word=&hs=0&pn=10&spn=0&di=7108135681917976577&pi=0&rn=1&tn=baiduimagedetail&is=0%2C0&istype=2&ie=utf-8&oe=utf-8&in=&cl=2&lm=-1&st=-1&cs=4183110458%2C380295861&os=1871321028%2C1388903241&simid=4182335034%2C666397671&adpicid=0&lpin=0&ln=43&fr=&fmq=1656269992869_R&fm=detail&ic=&s=undefined&hd=&latest=©right=&se=&sme=&tab=0&width=&height=&face=undefined&ist=&jit=&cg=&bdtype=0&oriquery=&objurl=https%3A%2F%2Fgimg2.baidu.com%2Fimage_search%2Fsrc%3Dhttp%3A%2F%2Fimg1.dzwww.com%3A8080%2Ftupian_pl%2F20170425%2F59%2F69086771700602091.jpg%26referer%3Dhttp%3A%2F%2Fimg1.dzwww.com%26app%3D2002%26size%3Df9999%2C10000%26q%3Da80%26n%3D0%26g%3D0n%26fmt%3Dauto%3Fsec%3D1658862005%26t%3D0735866174446790d2bf08f98db1eaaa&fromurl=ippr_z2C%24qAzdH3FAzdH3Fvg_z%26e3Bf5gi55_z%26e3Bv54AzdH3Fytzi57swkAzdH3F08c8II8I_z%26e3Bip4s&gsm=b&rpstart=0&rpnum=0&islist=&querylist=&nojc=undefined&dyTabStr=MCw0LDUsMSwzLDcsOCwyLDYsOQ%3D%3D
- ⁶² CNSA, “中国航天重大任务,” <http://www.cnsa.gov.cn/n6758824/n6759009/index.html>

- ⁶³ Sina, “我国载人航天的 5 人领导小组中 前 3 位领导都是哈工大校友,” 10/2003, <http://news.sina.com.cn/c/2003-10-17/0702937015s.shtml>
- ⁶⁴ Wjfn01, “中国人民解放军航天英雄谱,” 04/2008, <http://webcache.googleusercontent.com/search?q=cache:vbzbRs9NF2MJ:www.wjfn01.com/html/report/5308-1.htm+&cd=3&hl=en&ct=clnk&gl=us>
- ⁶⁵ 经济日报, “王兆耀、武平分别任 921 工程办正副主任 (附机构简介),” 03/2012, http://district.ce.cn/newarea/roll/201203/27/t20120327_23192345_1.shtml
- ⁶⁶ Mandarin Wikipedia, “中国载人航天工程简介,” <https://zh.wikipedia.org/wiki/%E4%B8%AD%E5%9B%BD%E8%BD%BD%E4%BA%BA%E8%88%AA%E5%A4%A9%E5%B7%A5%E7%A8%8B>
- ⁶⁷ Mandarin Wikipedia, <https://zh.m.wikipedia.org/hans/%E4%B8%AD%E5%9C%8B%E8%BC%89%E4%BA%BA%E8%88%AA%E5%A4%A9%E5%B7%A5%E7%A8%8B%E8%BE%A6%E5%85%AC%E5%AE%A4>
- ⁶⁸ CMSE, “2019 年全国载人航天标委会年会暨一届二次全体委员会议顺利召开,” 08/2019, http://www.cmse.gov.cn/xwzx/zhxw/201908/t20190827_22607.html
- ⁶⁹ Sohu, “周建平获聘中国载人航天工程总设计师, 杨利伟等 8 人获聘副总设计师,” 10/2019, https://www.sohu.com/a/347599204_115362
- ⁷⁰ CMSE, “工程领导,” <http://www.cmse.gov.cn/gygc/zzgl/gcld/>
- ⁷¹ 王金锋, 嫦娥奔月: 中国嫦娥一号探月卫星发射成功, 吉林出版集团有限责任公司, 2009
- ⁷² 王金锋, 嫦娥奔月: 中国嫦娥一号探月卫星发射成功, 吉林出版集团有限责任公司, 2009
- ⁷³ 中国探月与深空探测网, “组织体系,” <http://www.clep.org.cn/n487137/index.html>
- ⁷⁴ The People’s Daily, “绕月探测工程领军人物,” 2004, <http://scitech.people.com.cn/GB/25509/55912/105293/105297/index1.html>
- ⁷⁵ Sina, “十届人大常委会任命张庆伟为国防科工委主任,” 08/2007, <http://news.sina.com.cn/c/2007-08-30/152413779741.shtml>
- ⁷⁶ PRC Ministry of Foreign Affairs, “List of members of the 18th CPC Central Committee,” 11/2012, <https://www.mfa.gov.cn/ce/cgny//eng/xw/t989063.htm> (Chen Qiufa)
- ⁷⁷ Global Times, “嫦娥二期工程指挥体系换人 由年轻一代担任,” 06/2010, <https://china.huanqiu.com/article/9CaKrnJnwhe>
- ⁷⁸ CNSA “许达哲: 确保如期实现探月工程第三步目标,” 04/2015, <http://www.cnsa.gov.cn/n6758824/n6759009/n6759040/n6759287/c6795888/content.html>
- ⁷⁹ CNSA “许达哲: 确保如期实现探月工程第三步目标,” 04/2015, <http://www.cnsa.gov.cn/n6758824/n6759009/n6759040/n6759287/c6795888/content.html>
- ⁸⁰ Gov.cn, “嫦娥三号测控系统实现系列技术创新,” 12/2013, http://www.gov.cn/jrzq/2013-12/14/content_2547900.htm
- ⁸¹ MIIT, “长征五号、探月三期研制获突破性进展入场合练,” 09/2015, https://www.miit.gov.cn/xwdt/gxdt/ldhd/art/2020/art_1f6dc60aafa84859ba9b30627bd1f998.html
- ⁸² CLEP, “探月三期嫦娥五号任务转入正样研制阶段,” 02/2016, <http://clep.org.cn/n127/n199/c6329847/content.html>
- ⁸³ Gov.CN, ““十四五”规划要来了, 它将如何出炉?,” 11/2019, http://www.gov.cn/xinwen/2019-11/27/content_5456153.htm
- ⁸⁴ PRC NDRC, “发展改革工作,” 2021, https://www.ndrc.gov.cn/fggz/fzzlgh/index_19.html?code=&state=123
- ⁸⁵ Sciencenet, “前沿聚焦: 嫦娥五号月面采样返回工程管理创新,” 07/2021, <https://news.sciencenet.cn/htmlpaper/2021/11/2021112910305559668225.shtml>
- ⁸⁶ Toutiao, 风暴洋: 中国探月新地标,” 12/2020, https://www.toutiao.com/article/6901480938530669063/?&source=m_redirect&wid=1656441876440
- ⁸⁷ Sciencenet, “前沿聚焦: 嫦娥五号月面采样返回工程管理创新,” 07/2021, <https://news.sciencenet.cn/htmlpaper/2021/11/2021112910305559668225.shtml>
- ⁸⁸ Xinhua, “嫦娥五号开启月球“挖土”之旅,” 11/2020, http://www.xinhuanet.com/tech/2020-11/25/c_1126782365.htm

⁸⁹ East Day, “百年初心奋斗者|上海航天第一位女性总指挥征服星辰大海之路：男人可以，女人一样行,” 03/2021

⁹⁰ CASC, “习近平总书记亲切会见 航天科技集团干部职工备受鼓舞,” 02/2021,
<http://m.spacechina.com/n148/n2020942/c3272045/content.html>

⁹¹ CNSA, “探月工程嫦娥五号任务有关情况发布会,” 12/2020,
<http://www.cnsa.gov.cn/n6758967/n6758969/n6760261/index.html>

⁹² PRC State Council, “国新办举行《2021 中国的航天》白皮书新闻发布会,” 01/2022,
<http://www.scio.gov.cn/xwfbh/xwfbh/wqfbh/47673/47818/index.htm>

⁹³ Gov.cn, “习近平会见探月工程嫦娥五号任务参研参试人员代表并参观月球样品和探月工程成果展览,” 02/2021, http://www.gov.cn/xinwen/2021-02/22/content_5588287.htm