CHINA KEYHOLE

China's Space Forces:

PLA Space University's Graduate Programs

Summary

PLA Space Engineering University recently announced the details of its 2021 graduate research program in Chinese online media. This announcement included the various graduate degrees offered as well as required student qualifications, tuition, and living arrangements. As such, this posting provided an authoritative summary of the degree programs that make up graduate education at Space University. This report provides a translation of the contents of that announcement about the graduate majors offered and the research topics that fall under each major. The academic majors in this announcement included the following:

PLA Space University 2020 brochure

中国人民解放军战略支援部队
航天工程大学

航天工程大学

中国·北京

知乎 @会升学

Source: zhihu.com

Graduate majors offered at PLA Space University	
Aerospace Science and Technology Control Science and Engineering Cyberspace Security Information and Communications 　Engineering Electronic Information Engineering Management	Mechanics Military Equipment Military Command Military Political Work Military Training Optical Engineering Systems Science

There were 52 research specialties offered under these 12 majors. They can be grouped according to whether they apply to space operations across the board or to specific space missions. A look at the space operations groupings shows that the primary emphasis in the graduate program is **space hardware engineering**, training space officers in specific space hardware and space technologies. The count of research topics by space mission suggests that the **support to command and control mission** is the top priority for Chinese satellite development and operation. This is followed by research in the **space-based information systems** that would support command and control. The mission with potential involvement in anti-satellite operations—**space object tracking**—also has a significant place in the curriculum.

Background

As part of sweeping military reforms in China started in late 2015, space, cyber, electronic, and psychological warfare functions were moved into a new separate service, the Strategic Support Force (SSF). The SSF is subordinated directly to the Central Military Commission. Its two primary components are the Network Systems Department, the PLA's cyber force for network attack and defense; and the Space Systems Department, the new force responsible for space operations.

As part of this reorganization, the PLA Space Engineering University (hereafter referred to as "Space University") was established in 2017 under the SSF Space Systems Department. The university was set up on the grounds of the former PLA Equipment Academy just outside of Beijing. This had been an Army-level military academy established in 1978 and subordinated to the General Equipment Department. The Equipment Academy had been engaged in "training personnel in equipment control technology and space control technology." The new Space University carried over faculty and academic programs from the Equipment Academy devoted to training personnel for space operations. The main campus is located near Huairou, about 35 miles northeast of Beijing's city center.

Space University offers degree programs at the undergraduate, master's, and doctoral levels, as well as programs for non-commissioned officers at a separate facility. As a first step toward understanding China space officer development, a previous China Keyhole report[1] focused on the undergraduate curriculum as the basic training structure for missions under the control of the Space Systems Department. This report enumerates the Space University programs at the graduate level.
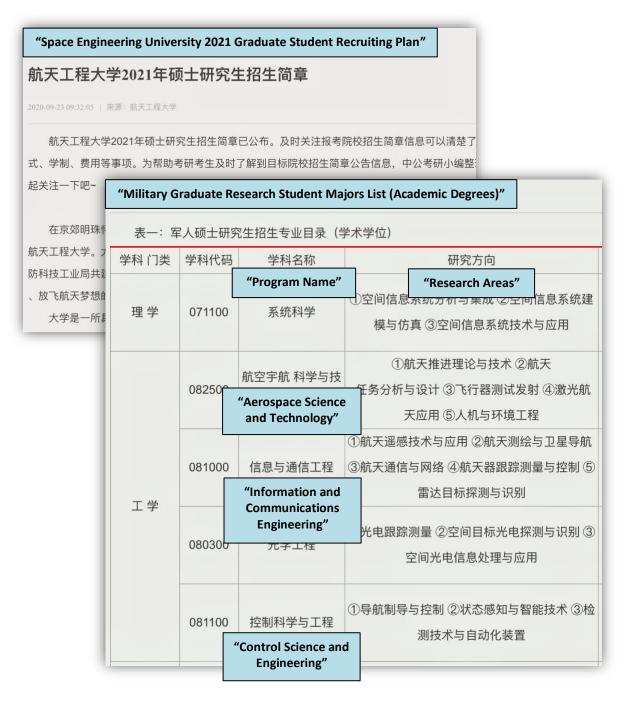
Space University Graduate School

In November 2020, Space University posted a document online (see image below) entitled **"Space Engineering University 2021 Graduate Student Recruiting Plan"** (航天工程大学 2021 年硕士研究生招生简章). This is a common type of document issued by universities to inform students who wish to apply for a university program, spelling out the nature of the various degrees offered as well as required student qualifications, tuition, and living arrangements at a university. As such, this is an authoritative summary of the degree programs that make up graduate education at Space University.

The core of this document was the section called "Military Graduate Research Student Majors List) (also seen in the image below), which showed, in tabular form, the majors being offered, the research areas available for each, and the prerequisites for the programs. The data which follows these images is a translated extract from this table.

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[1] See the China Keyhole report, "Undergraduate Space Training at the PLA's Space Engineering University," Feb 21, 2021.

"Space Engineering University 2021 Graduate Student Recruiting Plan"

航天工程大学2021年硕士研究生招生简章

2020-09-23 09:32:05 ｜ 来源：航天工程大学

　　航天工程大学2021年硕士研究生招生简章已公布。及时关注报考院校招生简章信息可以清楚了
式、学制、费用等事项。为帮助考研考生及时了解到目标院校招生简章公告信息，中公考研小编整
起关注一下吧~

　　在京郊明珠怀
航天工程大学。大
防科技工业局共建
、放飞航天梦想的

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"Military Graduate Research Student Majors List (Academic Degrees)"

　　表一：军人硕士研究生招生专业目录（学术学位）

学科 门类	学科代码	学科名称	研究方向
		"Program Name"	**"Research Areas"**
理 学	071100	系统科学	①空间信息系统分析与集成 ②空间信息系统建模与仿真 ③空间信息系统技术与应用
工 学	082500	航空宇航 科学与技 **"Aerospace Science and Technology"**	①航天推进理论与技术 ②航天任务分析与设计 ③飞行器测试发射 ④激光航天应用 ⑤人机与环境工程
	081000	信息与通信工程 **"Information and Communications Engineering"**	①航天遥感技术与应用 ②航天测绘与卫星导航 ③航天通信与网络 ④航天器跟踪测量与控制 ⑤雷达目标探测与识别
	080300	光学工程	光电跟踪测量 ②空间目标光电探测与识别 ③空间光电信息处理与应用
	081100	控制科学与工程 **"Control Science and Engineering"**	①导航制导与控制 ②状态感知与智能技术 ③检测技术与自动化装置

NOTE: The announcement identified two different types of graduate degrees: "academic" degrees (学术学位) and "specialty" degrees (专业学位). This distinction in the Chinese education system is explained by Chinese sources as follows: "An academic degree graduate student is primarily educated in academic research. A specialty degree is education in a special field (or occupation) for having a solid grasp of basic theory and broad specialized knowledge. This is for specialized personnel capable of resolving practical problems and conducting special technical and management work."

(Translation)

Space Engineering University
Military Graduate Student Majors List

Academic Degrees

Aerospace Science and Technology (航空宇航科学与技术)

Research Areas:
- Space Advanced Theory and Technologies
- Space Mission Analysis and Design
- Launch Vehicle Testing
- Laser Applications for Space
- Man-Machine and Environmental Engineering

Control Science and Engineering (控制科学与工程)

Research Areas:
- Navigation, Guidance and Control
- Situational Awareness and Intelligent Technology
- Detection Technology and Automated Equipment

Cyberspace Security (网络空间安全)

Research Areas:
- Cyberspace Information Countermeasures
- Cyberspace and Systems Security
- Cyberspace Electromagnetic Security

Information and Communications Engineering (信息与通信工程)

Research Areas:
- Space Remote Sensing Technology and Applications
- Space Surveying and Satellite Navigation
- Space Communications and Networks
- Space Object Tracking Evaluation and Control
- Radar Target Detection and Recognition

Military Command (军队指挥学)

Research Areas:
- Combat Command Theory and Methods
- Combat Planning and Operations
- Intelligent Information Processing and Analysis
- Space Information Support
- Command Information Systems
- Space Security Research
- Combat Simulation

Military Equipment (军事装备学)

Research Areas:
- Equipment Development
- Equipment Safeguards
- Equipment Testing and Evaluation

Military Political Work (军队政治工作学)

Research Areas:
- Military Political Work Basic Theory and Implementation
- Military Ideological and Political Education
- Space Mission Political Work

Military Training (军事训练学)

Research Areas:
- Military Training Theory and Methods
- Military Unit Training Evaluation and Management
- Military Training Technology and Applications

Optical Engineering (光学工程)

Research Areas:
- Optoelectronic Tracking and Evaluation
- Space Object Optoelectronic Detection and Recognition
- Space Optoelectronic Information Processing and Applications

Systems Science (系统科学)

Research Areas:
- Space Informations Systems Analysis and Integration
- Space Information Systems Modeling and Simulation
- Space Information Systems Technology and Applications

Specialty Degrees

Master of Electronic Information (电子信息硕士)

Research Areas:
- Control Engineering
- Radar Engineering
- Optical Engineering
- Circuits and Systems
- Space Information Processing and Applications
- Space Information Networks and Applications

Master of Engineering Management (工程管理硕士)

Research Areas:
- Space Project Justification and Evaluation
- Space Project Design and Control
- Space Project Quality and Risk Management

Master of Mechanics (机械硕士)

Research Areas:
- Space Engineering and Design
- Space Testing and Evaluation
- Space Applications and Safeguards

Military Political Work (军队政治工作)

Research Areas:
- Command of Political Work
- Political Office Work

> **Military Equipment (军事装备)**
>
> Research Areas:
> - Equipment Development and Management
> - Equipment Safeguards and Command
> - Equipment Testing and Management

Comments

What can this curriculum tell us about Chinese military space operations, current and future? The 12 majors offered cover a spectrum of space technology and military topics, but are generic enough that they only generally reflect Chinese priorities. The 52 graduate research areas shown above are more specific in nature. By arranging them into rough categories, they can perhaps highlight China's and the PLA's priorities in the space research and development effort.

First, the topics that fall into the general military studies and political-military work categories, such as "Military Training Theory and Methods" and "Military Ideological and Political Education," add no information about the vector of space development and can be set aside.

Second, there is a set of research areas that apply across the board to **space operations** as a whole. One scheme for categorizing these research topics would group them under "Space Hardware Engineering," "Space Missions Management," and "Space Systems Security," as seen below:

Space Hardware Engineering
- Space Advanced Theory and Technologies
- Space Engineering and Design
- Space Testing and Evaluation
- Launch Vehicle Testing
- Equipment Development and Management
- Equipment Safeguards and Command
- Equipment Testing and Management
- Control Engineering
- Radar Engineering
- Optical Engineering
- Laser Applications for Space
- Man-Machine Engineering
- Circuits and Systems

Space Mission Development
- Space Project Design and Control
- Space Project Justification and Evaluation
- Space Project Quality and Risk Management
- Space Mission Analysis and Design

Space Systems Security
- Cyberspace Information Countermeasures
- Cyberspace and Systems Security
- Cyberspace Electromagnetic Security
- Space Applications and Safeguards
- Space Security Research

The fact that the majority of such topics fall under "Space Hardware Engineering" suggests that Space University's top research priority is training space officers in hardware and space technologies. The inclusion of topics like "Space Engineering and Design" and "Equipment Development" further suggests that PLA space officers are being trained for space asset design and not just their operation. The topics under the second category, "Space Mission Development," further indicate the intent for PLA space officers to be involved in space projects from conception onwards, not just conducting the missions. The third category shows that cyber defenses of space assets is a major concern and that space officers are being trained to develop those defenses.

Finally, the remaining set of research topics can be arranged by the specific **space missions** they appear intended to support. Again, the number of research areas being taught for each mission area provides a rough indicator of relative emphasis on each mission.

Space-Based Command And Control
- Combat Command Theory and Methods
- Combat Planning and Operations
- Combat Simulation
- Command Information Systems
- Intelligent Information Processing and Analysis
- Space Information Support
- Situational Awareness and Intelligent Technology

Space-Based Information Systems
- Space Informations Systems Analysis and Integration
- Space Information Systems Modeling and Simulation
- Space Information Systems Technology and Applications
- Space Information Processing and Applications
- Space Information Networks and Applications

Space Object Tracking
- Space Object Tracking Evaluation and Control
- Optoelectronic Tracking and Evaluation
- Space Object Optoelectronic Detection and Recognition
- Space Optoelectronic Information Processing and Applications

Satellite Reconnaissance
- Space Remote Sensing Technology and Applications
- Radar Target Detection and Recognition
- Detection Technology and Automated Equipment

Satellite Navigation
- Navigation, Guidance and Control
- Space Surveying and Satellite Navigation

Satellite Communications
- Space Communications and Networks

Here, the count of research topics by mission suggests that support to command and control is the top priority for Chinese satellite development and operation. This is followed in the count by research in the space-based information systems that would support command and control. The traditional missions of satellite reconnaissance, satellite navigation, and satellite communications are also included in this mission set but apparently with less emphasis.

It is interesting that the mission with potential involvement in anti-satellite operations—space object tracking—has a significant place in the curriculum. While both optical and radar technologies can be applied to space object detection, the emphasis here appears to be on optoelectronic means. It is not clear whether this research work is focused on ground-based or space-based detection systems (Chinese researchers have written about both).

The content of PLA Space University's graduate curriculum for 2021 is just one source of insight into China's space priorities, but it does spell out, in its own way, the focus areas for space technology and mission development. It is oriented on future operations as training for officers to be used in their space operations careers going forward. As such, it may be seen as a blueprint of sorts for Chinese space operations as a component of their overall war fighting capabilities.