

## Translation



The following document, issued by China's State Administration of Science, Technology and Industry for National Defence (SASTIND), identifies several emerging technologies of interest to the Chinese military. SASTIND, a civilian agency that funds commercial and academic research in support of Chinese People's Liberation Army (PLA) requirements, attached this document (as "Appendix 1") to a 6 July 2018 notice to Chinese universities and research institutes encouraging them to apply for grants to conduct basic research in areas of interest to the PLA. These guidelines are unusual among publicly available documents because they go into specifics on emerging technologies and their applications – including AI domains such as machine learning and human-computer interaction – that the PLA prioritizes.

### Title

Project to Strengthen Development of the Defense Technology Industry at the Grassroots Level: Guidelines for Basic Research and Cutting-Edge Technology Projects (2018)  
国防科技工业强基工程 基础研究与前沿技术项目指南 (2018年)

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This document is available online at: <http://www.sastind.gov.cn/n157/c6802173/part/6778683.doc>.

The notice to which it was attached is available on the Xi'an Jiaotong University website:

[std.xjtu.edu.cn/info/1008/31812.htm](http://std.xjtu.edu.cn/info/1008/31812.htm).

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## Appendix 1

### Project to Strengthen Development of the Defense Technology Industry at the Grassroots Level

### Guidelines for Basic Research and Cutting-Edge Technology Projects

(2018)

State Administration of Science, Technology and Industry for National Defense (SASTIND)

June 2018

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This set of guidelines falls within the scope of the defense basic research field of the National Defense Basic Scientific Research Plan (国防基础科研计划). Based on thorough consideration of the execution status of projects already implemented, and with the objectives of strengthening reserves of defense-related basic and cutting-edge technology (前沿技术) and improving the independent innovation (自主创新) capabilities of the defense technology industry, they highlight support for defense technology innovation bases and defense-related academic disciplines, and place emphasis on the issuance of 17 Key Tasks and 24 Incubation Areas (培育方向), grouped under 6 Themes: intelligent detection and identification (智能探测识别) and autonomous control, brain-machine intelligence (脑机智能) and biological interdisciplinary technologies (生物交叉), highly reliable information security and new types of communications (新型通信), high-efficiency power sources and multi-modal power technology (多模式动力技术), coupled dynamics (耦合动力学) of complex systems, and development of national defense-related academic disciplines.

#### **I. REPORTING REQUIREMENTS**

(1) The individuals and units applying for projects, and the application procedures, shall comply with the *SASTIND Administrative Measures for Scientific Research Projects* (《国防科工局科研项目管理办法》), and the *SASTIND Administrative Measures for Basic R&D* (《国防科工局基础研发管理办法》) as well as the relevant secrecy management (保密管理) requirements. Civilian enterprises (民口企业) and privately run units (民营单位) not directly administered by the central government shall report through the administrative departments of science, technology and industry for national defense of the administrative region in which they are located, and other units shall report through the management departments of their projects.

(2) Project reporting must strengthen civilian-military coordination on relevant scientific research plans (民口、军队有关科研计划的协调), make proper links with defense industry scientific research projects already implemented, and ensure that reporting channels are unique, thereby avoiding duplication.

(3) These projects are divided by type of project into key breakthrough projects, incubation and development projects, and academic discipline support projects. Reporting units may justify their proposed key breakthrough projects based on a particular Key Task in these Guidelines, and should cover all of the research contents and evaluation indicators of the corresponding task, highlighting cutting-edge technology innovation and ways of overcoming key technical problems, in order to produce such main results as proof-of-concept (verification) prototypes, software systems, and standards & norms; they may justify their proposed incubation and development projects based a particular Incubation Area (培育方向) in these Guidelines, highlighting the strategic, fundamental, or cutting-edge nature of the questions to be explored and researched, in order to produce such main results as basic theories, basic methods, and key mechanisms; and for academic discipline support projects, proposals shall be for an approved defense-related academic discipline area around which the relevant jointly established [by SASTIND and the Ministry of Education] universities are concentrated, with the aim of consolidating the academic discipline's foundation for development and cultivating reserves of talent.

(4) For complete information on the key technologies, evaluation indicators, and forms of results involved in Key Tasks, civilian enterprises and privately run units not directly administered by the central government may inquire, according to procedures, through the competent authorities for the projects or the management departments of science,

technology and industry for national defense of the administrative region in which they are located.

(5) The type of project must match the research cycle and expenditure amount. The research cycle for this set of projects is, in principle, 2-3 years. Key breakthrough projects have state funding strength of RMB 3-5 million, incubation and development projects have state funding strength of RMB 1-3 million, and academic discipline support projects have state funding strength of RMB 500,000-1 million.

(6) Project reporting units (including cooperating units) shall not conduct cross-project (项目交叉) reporting for, or participate in, the same Key Task or Incubation Area. Key breakthrough projects may involve no more than 3 [enterprises or other units], while incubation and development projects and academic discipline support projects may involve no more than 2 [enterprises or other units]. Where civilian and privately run units take the lead in reporting a project, they must select a defense industry applications (军工应用) unit (or potential applications unit) as a cooperating unit.

(7) Project applicants must be official permanent staff of the reporting unit (lead reporting unit), in professional technology positions at the deputy senior level (副高级) or higher, and be able to assume responsibility for the actual organizers and conductors of project research; and they cannot also be in charge of an ongoing defense basic research project in 2019.

(8) The managing departments for projects should strengthen their overall justifications, strictly control quantities and expenditure amounts in project reporting, and ensure the quality of project report preparation and reasoning, and for the same Key Task, they must choose, on its merits, one and only one lead reporting unit. The quality of the justification for establishing projects will be an important basis for this department's project budget arrangements for the next year.

## II. MAIN ELEMENTS

While staying centered on the requirements for the independent and sustainable development of the defense technology industry and weapons and equipment, closely follow the latest round of development trends in the S&T revolution and the revolution in military affairs; focus on the main research themes of intelligent detection and identification and autonomous control, brain-machine intelligence and biological interdisciplinary technologies, highly reliable information security and new types of communications, high-efficiency power sources and multi-modal power, coupled dynamics of complex systems, and development of national defense-related academic disciplines; explore the intersection of multiple disciplines, integration of multiple technologies, and other cutting-edge technologies with common foundations, and enhance the independent innovation capability of the defense technology industry.

### **THEME ONE: INTELLIGENT DETECTION AND IDENTIFICATION AND AUTONOMOUS CONTROL TECHNOLOGY.**

Staying centered on strengthening technological reserves for the development of informatized (信息化) and intelligentized (智能化) weapons and equipment, promote the development of applications for emerging cutting-edge technologies such as machine learning, big data, and intelligent sensing technology in defense industry fields, and carry out the following research:

**Key Tasks:** 1. high-performance low light level image intensification technology based on adaptive gate controls; 2. small-size, large-field-of-view, multi-channel terahertz array detection technology; 3. penetration wave window specialized control technology with

intelligentized transmission (透波窗口智能化传输特性控制技术); 4. launch vehicle adaptive flight control technology.

**Incubation Areas:** 1. target signal detection and tracking methods based on natural electromagnetic characteristics; 2. intelligent inference and decision-making methods for joint, multi-domain virtual battlefield environments; 3. servo motor full-feature, high-precision intelligent simulation technology; 4. cloud-based collaborative intelligent target recognition and tracking technology for complex scenarios.

**THEME TWO: BRAIN-MACHINE INTELLIGENCE AND BIOLOGICAL INTERDISCIPLINARY TECHNOLOGIES.**

Staying centered on the intersections between biology and such fields as artificial intelligence, cognitive science, information control, machinery manufacturing, and materials & energy, as well as the need for their co-mingled development (融通发展), strengthen technological reserves for human-computer interaction, human-computer collaboration, and human-computer fusion (人机共融), and carry out the following research:

**Key Tasks:** 5. neurofeedback-based visual cognition (视觉认知力) enhancement technology; 6. human performance enhancement technology for long-term isolated and claustrophobic task environments; 7. intelligentized exoskeleton technology adapted for augmented interaction; 8. virtual reality auditory display technology based on 3D models; 9. surface multi-functional integrated bionic technology; 10. impact resistance technology based on buffering mechanisms in animals.

**Incubation Areas:** 5. basic four-dimensional optical display theory; 6. basic technology for new forms of bionic drag reduction/adhesion; 7. high-density, micro-power-consumption bionic sensing technology; 8. human-computer hybrid (人机混合) intelligent interactive control methods; 9. basic technology for new types of high-resilience biological structures aimed at 3D printing.

**THEME THREE: HIGHLY RELIABLE INFORMATION SECURITY AND NEW TYPES OF COMMUNICATIONS.**

Staying centered on the requirement for the secure and reliable development of highly effective and highly reliable communications for a new generation of weapons, equipment, and military information systems, improve the level of information security for weapons and equipment in complex environments, and carry out the following research:

**Key Tasks:** 11. firmware vulnerability intelligent mining technology; 12. big data analysis-based intelligent fixed decryption (定解密) technology for electronic documents.

**Incubation Areas:** 10. vortex electromagnetic wave communication methods; 11. basic technology for big data storage using solid state disk arrays; 12. stream computing-based intelligent network communications technology; 13. basic technology for magneton-base (磁子基) high-bandwidth information processing; 14. basic technology for protection against strong non-linear electromagnetic pulse.

**THEME FOUR: HIGH-EFFICIENCY POWER SOURCES AND MULTI-MODAL POWER TECHNOLOGY.**

Staying centered on such requirements as improving the access and conversion efficiency of military-use energy, enhancing adaptability to harsh environments, and improving reliability and stability, as well as the requirement to develop a new generation of weapon and equipment power systems that are high-performance, lightweight, and have low energy consumption, carry out the following research:

**Key Tasks:** 13. variable-fuel high-efficiency battery technology; 14. structurally and functionally integrated flexible power supply technology; 15. wearable power supply technology; 16. series hybrid (串并混联) combined dynamical system technology.

**Incubation Areas:** 15. basic technology for self-repairing batteries (自修复电池); 16. distributed energy access and intelligent management & control technology; 17. energy management and control methods for heterogeneous (多异性) dynamical systems; 18. intelligent management technology for autonomously reconfigurable (自主可重构) power supplies; 19. basic technology for wide-temperature-range light metal batteries; 20. thermal management (热管理) technology for high-energy-density batteries; 21. inertial wave energy satellite (能随体) electricity generation technology.

**THEME FIVE: TECHNOLOGY FOR COUPLED DYNAMICS OF COMPLEX SYSTEMS.**

Staying centered on improving understanding of the laws of coupled dynamics of complex systems, improve the research methods, analytical tools, and research techniques for dynamics, and carry out the following research:

**Key Task:** 17. impact load transmission and protection technology for connected structures.

**Incubation Areas:** 22. new variable damping (新型变阻尼) shock absorption control theory; 23. quantitative methods for analysis of body cavitation corrosion (体空蚀) in high-speed navigation; 24. mechanical-electrical-magnetic coupling mechanisms for electromagnetic launch (电磁发射).

**THEME SIX: DEVELOPMENT OF NATIONAL DEFENSE-RELATED ACADEMIC DISCIPLINES.**

Stressing staying centered on national defense-related academic disciplines approved by SASTIND for the "Thirteenth Five-Year Program" period [2016-2020], support relevant universities in independently selecting topics and determining academic discipline support projects for carrying out basic research, wherein the total number of academic discipline support projects reported by each unit may not exceed two. Under these Guidelines, further support will not be given to the national defense-related academic disciplines of projects already arranged under the "Thirteenth Five-Year Program."

The focus of support will be for innovation teams that won the 2017 National Defense S&T Innovation Team Award, centered on the approved research areas, for them to independently select topics and carry out basic research, with each team limited to reporting one project, and with state expenditures and subsidies not to exceed RMB 2 million.

**III. CONTACT METHOD**

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