Summary

The following document is a summary of the 2018 Tianjin municipal action plan for "military-civil fusion" in developing "intelligent technologies." The Chinese use the term "military-civil fusion" to refer to building a US-style defense industrial structure, in which private companies supply the military with advanced technology and develop commercial applications for military technology. While many Chinese local governments have published military-civil fusion plans, Tianjin's is among the most detailed. It provides insight into local efforts to steer the development of emerging technologies in directions that fulfill PLA requirements, with a particular focus on technological self-sufficiency and blunting the impact of foreign countries' export controls. Although the action plan goes into exhaustive detail on Tianjin's military S&T priorities, it is silent on how its objectives will be funded. This summary features word-for-word translation of technical language in the action plan, and provides the gist of the rest.

Title

Tianjin Municipal Action Plan for Military-Civil Fusion Special Projects in Intelligent Technology

天津市智能科技领域军民融合专项行动计划

Source

Tianjin Municipal Bureau of Industry and Information Technology (天津市工业和信息化局) website, 9 August 2018

The Chinese source text is available at:
https://web.archive.org/web/20190918010942/http://gyxxh.tj.gov.cn/zhencwj/65062.htm
This summary is written in "CSET voice," not in the "voice" of the source text.
There are no footnotes in the source text. All footnotes in this document are CSET additions and are in CSET voice.

Translation Date
14 October 2019

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This action plan begins by proclaiming that military-civil fusion[1] (军民融合) in the realm of intelligent technologies (智能科技) is a point of confluence between innovation-driven development of the Chinese economy and China's strategy of building a strong military.

This document is the Tianjin Municipal[2] action plan for developing military-civil fusion in intelligent technologies. It was drafted to fulfill requirements laid out in the following documents:

[1] "Military-civil fusion" refers to mutually reinforcing economic development and military modernization. The Chinese cite the United States -- where private tech companies supply the military with cutting-edge technology and civilian firms adapt technologies originally developed for military use into commercial products -- as the exemplar of military-civil fusion.

[2] Although Tianjin is a city, it is administratively equal to a province in the Chinese governance system. Tianjin is a major port on China's northeast coast, immediately southeast of Beijing.

- The national *New Generation Artificial Intelligence Development Plan*[3] 《新一代人工智能发展规划》
- The national *Development Plan for Technological Military-Civil Fusion During the "Thirteenth Five-Year Program" Period*[4] 《"十三五"科技军民融合发展专项规划》
- The Tianjin Municipal Party Committee and Tianjin Municipal Government *Opinion on Implementing Robust Development of the Intelligent Technology Industry, Promotion of the Development of the Intelligent Economy, and Construction of an Intelligent Society*[5] 《关于大力发展智能科技产业推动智能经济发展建设智能社会》

This action plan will be implemented from 2018 to 2020. It looks ahead to (展望到) 2025.

The action plan begins by briefly describing the current state of affairs in Tianjin as regards military-civil fusion. After describing the "guiding ideology" of the action plan by linking it to various central and municipal government initiatives, it moves on to discuss "basic principles" and "development objectives." The latter include completing a "military-civil collaborative innovation platform" (军民协同创新平台) by 2020 that promotes the development of intelligent technologies for six defense industries: aerospace (航空), aviation, nuclear, ships, weapons, and military electronics. The action plan aims to create a "deep development situation" for military-civil fusion in the realm of intelligent technologies by 2025.

The document identifies the following as "chief tasks":

1. Deepen strategic cooperation with the PLA Academy of Military Sciences (军事科学院), particularly in cutting-edge artificial intelligence (AI) technology. Specific areas for collaboration include "intelligent operating systems" (智能操作系统), UAVs, and creating a "military-civil fusion innovation center."
2. Increase cooperation between the National University of Defense Technology (国防科技大学) and the PLA Information Engineering University (中国人民解放军信息工程大学) on the one hand and Tianjin Binhai Civil-Military Integrated Innovation Institute (滨海新区军民融合创新研究院) and Binhai New District Information Technology Innovation Center (滨海新区信息技术创新建设) on the other.
3. Construct the "Tianjin Cloud Military Sub-Cloud" (津云军事分云) based on the "Tianjin Cloud" (津云).[6] The sub-cloud will provide military-related information for national defense education and recruiting, based on the existing national defense mobilization command information system (国防动员指挥信息系统).

The action plan lists the following as key projects to focus on to strengthen military-civil fusion in intelligent S&T (智能科技) fields:

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[3] For an English translation of this document, and a link to the Chinese text, see: https://www.newamerica.org/cybersecurity-initiative/digichina/blog/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/

[4] The Chinese text of this document is available at: http://www.aisixiang.com/data/106161.html

[5] The full text of this document does not appear to be available online.

[6] The "Tianjin Cloud" is a local Tianjin news and government information service accessible via a smartphone app. The service uses AI technologies such as voice recognition and semantic analysis to provide users with personalized recommendations and an interactive chatbot. For more information on the Tianjin Cloud (in Chinese), see: http://www.app.tjyun.com/jyapp/system/2017/03/16/032517299.shtml

1. Aerospace: New generation launch vehicles (新一代运载火箭), space stations, satellite remote sensing. Aviation: Helicopters, aviation power distribution systems. Independently controllable[7] information technology: CPUs, operating systems, microchips, new wireless communication systems. Shipping and maritime engineering: Underwater drones (水下无人机), marine monitoring equipment (海洋检测设备).
2. Speed up the commercialization of products such as the Long March 5 and Long March 7 launch vehicles,[8] ultra-large spacecraft (超大型航天器), Rainbow series UAVs,[9] vehicle and ship engines, underwater gliders, the Phytium CPU,[10] the Kylin operating system,[11] secure chips, and photoelectric sensors (光电传感器). Incubate (培育) dozens of "assassin's mace"[12] products.
3. Create a "national military-civil fusion innovation demonstration zone" (国家军民融合创新示范区). Construct a "military-civil fusion collaborative innovation platform" (军民融合协调创新平台). Create an innovative mechanism for "transforming national defense S&T achievements into commercial products" (国防科技成果转化). Construct a "national defense capabilities demonstration zone" (国防功能示范区). Build an "integrated emergency response and war response pioneering zone" (应急应战一体化建设先行区). Create a "military-civil integration aerospace and aviation city" (军民融合航空航天城).

The document urges the military and civilian sectors to share resources to advance innovation in the following areas:

1. Make breakthroughs in "bottleneck" technologies such as shock absorption and noise reduction, vehicle and ship propulsion (车船动力), key components and raw materials, and "information independence and controllability" (信息自主可控). Launch research on key electronic and information technologies such as micro systems (微系统), terahertz, quantum information, and cognitive radio.
2. Launch research on aerospace and aviation theory and technology. Strengthen basic research and research on cutting-edge technologies. Elevate levels of "original innovation" (原始创新) and of independently controllable technology. Promote the

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[7] The Chinese use the term "independently controllable" (自主可控) in the context of developing indigenous technology to replace US and other foreign technology in strategic sectors.

[8] Tianjin Aerospace Long March Rocket Manufacturing Co., Ltd. (天津航天长征火箭制造有限公司), a subsidiary of China Aerospace Science and Technology Corporation (中国航天科技集团公司; CASC), manufactures Long March launch vehicles (长征运载火箭). CASC and Tianjin Aerospace are both state-owned enterprises (SOEs). Long March launch vehicles are also known in English as Chang Zheng, or CZ, and referred to by the designations CZ-5, CZ-7, etc.

[9] The Beijing-based China Academy of Aerospace Aerodynamics (中国航天空气动力技术研究院; CAAA), another state-owned subsidiary of CASC, develops and manufactures Rainbow (彩虹) series UAVs. Rainbow UAVs are also known in English as Cai Hong, or CH, and are referred to by the designations CH-3, CH-4, etc.

[10] Tianjin Phytium Information Technology Co., Ltd. (天津飞腾信息技术有限公司) makes Phytium (飞腾; Fei Teng; FT) microchips.

[11] Kylin (麒麟) is an operating system originally developed by China's National University of Defense Technology (国防科技大学). Tianjin Kylin Information Technology Co., Ltd. (天津麒麟信息技术有限公司; TKC) now develops, produces, and markets various versions of Kylin and associated software. For details (in Chinese), see Tianjin Kylin's website: http://www.kylinos.cn/

[12] The Chinese term "assassin's mace" (杀手锏) refers to an unexpected tactic used at the crucial moment to defeat an enemy. The term is used here to refer to disruptive, innovative technologies.

application of research on complex flow mechanisms (复杂流动机理) and circulation control (流动控制) to aerospace and aviation flight vehicles (空天飞行器). Promote R&D on integrated transfer, storage, and release of solar thermal energy in extreme environments. Fulfill temperature control requirements for satellites, space stations, etc.
3. Construct a "Tianjin municipal military-civil fusion public service platform" (天津市军民融合公共服务平台). Open up resources from major military industry installations and national defense S&T key laboratories to private companies (民口单位) in an orderly way. Allow private companies to promote and find applications for military technology. Promote the development of technologies specific to the national defense S&T industry, such as the BeiDou (北斗) navigation satellite system, high-resolution earth observation, and nuclear emergency response equipment.

The document then briefly discusses, in general terms, the need to attract and train top talent for national defense S&T.

The action plan next moves on to more specific initiatives, beginning with systems for innovation and R&D in "intelligent technologies":
1. A "military-civil S&T collaborative innovation platform" (军民科技协同创新平台). Under the guidance of the Ministry of Science and Technology (科技部; MOST) and the Science and Technology Committee of the Central Military Commission (军委科技委), build an S&T collaborative innovation platform for integrated production, study, and research. Form a "through train" for "civilian participation in military industries"[13] by linking up military and local demand and integrating regional innovation resources. Via this platform, local companies will be able to bid on R&D and production contracts for PLA-related projects.
2. An aerospace S&T innovation platform. The platform will be used to improve Tianjin's S&T innovation capability. Key projects include an optical ultra-precision machining national defense advanced manufacturing technology center, a space mechanics environmental simulation and emulation (模拟仿真) lab, a spacecraft micro-g environment simulation and emulation lab, a lab that simulates and emulates spacecraft in orbit, and a UAV data link applications lab (无人机数据链应用实验室).
3. A helicopter (直升机) R&D system. Improve helicopter R&D, design, and technology. Develop helicopter engines, components (零部件), propellers, undercarriages, and airborne (机载) systems.
4. The Tianjin Municipal Integrated Circuit Engineering Center (Laboratory). Design and research high-performance integrated circuits (ICs) with independent IPR (自主知识产权). Conduct close cooperation between leading research institutes, universities, companies, and the government to produce world-class high-performance IC designs. Commercialize these designs for domestic and international markets.
5. An intelligent platform for high-end equipment service and support (高端装备服务支持智能平台). Provide support for testing, use, and maintenance of high-end equipment and products, for both military use and the civilian market.

[13] "Civilian participation in military industries" (民参军) refers to allowing civilian and private companies, capital, and technology to contribute to the defense industry.

6. Simulation and emulation platforms and systems. Build a production base for simulation and emulation platforms and systems with independent IPR. Focus on developing and marketing intelligent high-end equipment (智能高端装备), virtual (虚拟) emulation software, simulation training equipment, interactive electronic technology manuals, and simulator and emulator equipment. Meet the requirements of all levels of the military for high-definition (HD) simulator and emulator equipment.

Moving on, the plan advocates the development of dual-use (两用) intelligent industries.

1. High-end marine engineering equipment. Use digitized, intelligent systems for intelligentized (智能化) monitoring and control, logistics control, and informatized (信息化) management. Adopt an intelligentized system for loading and unloading ships based on machine vision (机器视觉).
2. Isotope separation equipment. Build a fully functional, national-level separation technology research and equipment developing, manufacturing, and testing base. Support research and manufacturing of specialized equipment for new generation nuclear power. Complete comprehensive design of third-generation separation equipment. Create techniques and technological capabilities for precise batch processing and assembly for winding and shaping batches of composite materials. Achieve operation of small-batch machine testing systems.
3. Rust removal and painting robots. Research and manufacture high-pressure water jet rust removal robot systems and painting robot systems for rust removal and corrosion prevention on large hulls that automate these tasks and meet environmental protection requirements. Make breakthroughs on key technologies such as magnetic adherence walking and waterproofing for robots suitable for multiple-wall-thickness, variable-friction-coefficient surfaces. Achieve the goal of replacing manual labor and scaffolding for rust removal and hull painting, and commercialize this robot technology.
4. Intelligent deep sea equipment. Research and develop all sorts of scientific sensors, as well as underwater gliders that can collect omnidirectional oceanic environmental data, in support of requirements to collect marine thermocline temperature, salinity, and water quality data. Integrate environmental sensors such as shipborne radar, infrared and visible light cameras, fiber-optic compasses, and BeiDou satellite navigation into a shipborne and shore integrated control platform for unmanned vessels, in support of requirements for capability planning, technology tests, and application demonstrations for unmanned vessels.
5. Fiber-optic lasers. With the support of the five technologies of special optical fiber, fiber-optic passive components (光线无源器件), high-quality fiber-optic lasers, high-powered (大功率) fiber-optic lasers, and fiber-optic laser systems and applications, build an advanced fiber-optic laser production system and a complete fiber-optic laser system supply chain. Develop national defense S&T in tandem with industrial development, break the monopoly of foreign technology, and achieve development by leaps and bounds (跨越式发展) in vertical integration, from independent R&D of core components up to systems.
6. Optical ultra-precision computer numerical control (数控; CNC) polishing equipment. Develop and produce magnetorheological and ion beam polishing equipment with independent IPR. Ameliorate the impact of export controls preventing the sale of

high-end polishing equipment to China. Meet the requirements of the aerospace, weapons and equipment, and civilian high-end optical manufacturing equipment industries, as well as of key national S&T projects and engineering tasks.

7. Commercialization of key brain information processing mechanism and brain-computer interaction (脑机交互) technologies. Via methods such as machine learning and pattern recognition, explore brain activity patterns under conditions such as visual stimulation, and neural encoding (神经编码) and decoding (神经反编码) techniques during external conditions. Explore key technologies for new brain-computer interfaces, and also launch applications, systems, and research on brain-controlled autonomous wheelchairs for the disabled (脑控残疾人自主轮椅), brain-controlled automatic sniper rifles (脑控自动狙击步枪), and brain-controlled unmanned vehicles. Complete R&D and preliminary commercialization of these technologies for human-weapon integration (人与武器的结合) methods, the medical equipment realm, and the civilian entertainment market.

The action plan next calls for the rapid development of the following “independently controllable” information technology products.

1. Domestically produced high-performance microprocessors. Build a design, inspection, and testing platform for domestic high-performance microprocessors. Purchase equipment such as hardware emulators, prototype validation systems (原型验证系统), and testing platforms (测试机台), as well as all kinds of automated tools for electronic design needed for the R&D process. Construct environments for the structural design, performance simulation, logic realization (逻辑实现), prototype validation, and microchip testing of high-performance general-use (通用) microprocessor systems.
2. Supercomputer processors. Combining traditional scientific computing applications with new applications such as big data, deep learning, and AI, develop at least 256-core processors to meet the requirements of the national E-class high-performance computing system (国家E级高性能计算机系统). The operating frequency, double-precision floating-point peak-value computing performance (双精度浮点峰值计算性能), and energy efficiency ratio (能效比; EER) of these microprocessors should meet the demands of the new generation Phytium CPUs. Develop compilers and toolchains adapted to supercomputer processors. Build prototype verification systems. Construct a bottom-to-top domestic cloud platform system and structure (下而上的国产云平台体系架构).
3. Software-defined interconnected series microchips (软件定义互联系列芯片) and product systems. To meet the development requirements of future new generation information facilities (信息设施) and the AI age for switch interconnectivity (交换互联), achieve independent breakthroughs and major innovations in such areas as high-speed transceivers, protocol controllers (协议控制器), and switching fabric (交换结构). Develop independent, domestic switching core chips (交换核心芯片) for major national defense weapons and equipment. Promote “green, intelligent, and flexible” software-defined interconnected series microchips. Create a series of intellectual property core (IP核心), microchip, equipment, and system products.
4. Independent (自主) trusted platform module (可信安全芯片; 安全芯片; TPM) chips for smart terminals. Finish R&D and commercialization of distinct TPMs for smartphone TPMs, financial point-of-sale (POS) terminal TPMs, and smart power meters (智能电表),

based on the C*Core[14] high-performance CPU with independent IPR (自主产权), to meet the requirements of the smart terminal security realm. From CPUs and algorithms to design and processing, become a leader in domestic, independently controllable technology that breaks the monopoly of foreign technology.

5. Military-civilian dual-use electronic functional materials (电子功能材料). Build a military- and civilian-use electronic functional materials base that gathers scale production and advanced materials R&D for semiconductor materials, optical fiber, and fiber-optic devices all under one roof. Make breakthroughs on key technologies such as ultra-wide bandgap semiconductor (UWBGS) materials including aluminum nitride and diamond, two-dimensional nanomaterials including graphene and molybdenum disulfide (二硫化钼; molybdenum sulfide), high-power industrial fiber lasers, and 8-inch monocrystalline silicon and silicon epitaxial materials. Achieve commercialization of these.
6. New wireless communication systems and terminals. Develop a new generation wireless integrated communication system for civil aviation and railways. This system will be based on the 4G protocol, will reserve (预留) the LTE interface, will support GPS and BeiDou dual-mode satellite navigation, and will possess Bluetooth, LAN, and data encryption functionality. Items developed for this system, such as new data link equipment, airborne very high frequency (超短波; VHF) equipment, airborne satellite navigation receivers, and airborne relays (机载中继设备), will provide automatic alarm and automatic barrier (壁障) functions for emergency response for aviation and rail transportation.
7. Autonomous Internet of Things (IoT) perception authentication (感知认证). Based on research achievements by the National University of Defense Technology in the realm of autonomous IoT perception authentication, build an authoritative IoT perception testing and authentication center for the state, military, and industrial sectors in Tianjin's Binhai New District. Promote and realize a testing and authentication platform and an environmental and reliability testing platform for commercial operation that serves both the military and the local area. Use these platforms to launch and experiment with military-use IoT. Use these platforms to test civilian IoT services such as intelligent traffic (智能交通), intelligent eldercare, and smart buildings.

Next, the action plan describes applications of smart manufacturing in the aerospace industry.

1. Improve aerospace manufacturing techniques. Relying on Tianjin Aerospace Long March Rocket Manufacturing Co., develop advanced machining technology, sheet metal forming technology, surface treatment technology, tank (贮箱) welding technology, bay section (舱段) riveting technology, and overall assembly and testing (总装总测) technology. Update management processes such as tasking, production, and quality control. By 2020, complete 40 key technological upgrades, such as tank bottom (贮箱箱底) friction stir welding.
2. Build a full-stream digitized mode (全流程数字化模式) for space station assembly, integration, and test (AIT). Promote the separation of the production, testing, and design tasks for models (型号). Improve the efficiency of the management process for

[14] Suzhou C*Core Technology Co., Ltd. (苏州国芯科技股份有限公司) is a Chinese microchip manufacturer. C*Core has a Tianjin-based subsidiary, 天津国芯科技有限公司.

the model AIT stage (型号AIT阶段). Improve regional operational coordination between Beijing and Tianjin. Build long-range testing systems and emulation systems. Achieve "space-ground integrated" ("天地一体化") coordinated emulation interaction (仿真交互) and rapid response. Build tandem, multi-model batch testing capabilities.

3. Improve satellite professional and technical skills. Relying on the Ultra-Large Spacecraft Development and Industrialization Applications Base (超大型航天器研制及产业化应用基地), start research on systems for overall spacecraft design and emulation, highly effective testing and experimentation, thermal control, intelligent control, propulsion, advanced power, integrated electronics and data systems, and satellite onboard intelligent processing (星上智能处理). Maintain Tianjin's lead in domestic satellite research and technology. Push Tianjin's infrared imaging systems and high-resolution photoelectric loading (高分辨率光电载荷) systems into the top echelon in China.
4. Improve the layers and level of satellite applications (卫星应用层次水平). Strengthen the development of satellite applications and technologies (卫星融合应用技术). Make breakthroughs in key multi-source, multi-link information fusion technologies such as multi-source remote sensing data, remote sensing and navigation information, aerial photogrammetry data, and traditional services (传统业务). Promote the fusion of satellite applications with new generation information technologies such as big data, IoT, mobile internet, and cloud computing. Develop miniaturized, low-power-consumption (低功耗), intelligentized integrated application terminals. Elevate the overall level of satellite application products and services.
5. Advance the transformation of aerospace technology applications. Promote project incubation and marketing of electro-optical imaging (光电成像), photoelectric therapy (光电医疗), optical components, laser measurement (激光测量), and additive manufacturing. Develop commercial applications for onboard (车载) night vision assisted driving systems, high-end medical instruments, and educational informatized products. Promote the commercialization of technologies such as multi-functional composite materials, cold drawn tubing, pneumatic desulfurization, and polyethylene terephthalate (PET) recycling (循环利用).

The final portion of the action plan discusses in mostly general terms how local Communist Party, government, and military leaders should implement the plan. Local government and military officials will hold periodic meetings to report progress on the military-civil fusion process.

For financing, the Tianjin municipal government will create policies to win central government funding and subsidies for Tianjin's military-civil fusion projects. Tianjin will fully utilize funds such as the Haihe Industry Fund[15] in support of this effort. The local authorities will also

[15] The Tianjin Municipal Communist Party Committee and the municipal government created the Haihe Industry Fund (海河产业基金) in March 2017 to spur the development of advanced manufacturing industries in Tianjin and in neighboring Beijing Municipality and Hebei Province. Tianjin set aside 20 billion yuan RMB ($2.9 billion) of government funds to launch the fund, and planned to "scare up" (撬动) an additional 500 billion yuan RMB ($71 billion) in "social capital" (社会资本) to support the fund over an unspecified period of time. For an article published in *Tianjin Daily* (天津日报) -- the official newspaper of the Tianjin Municipal Communist Party

“encourage” (鼓励) financial institutions to provide “innovative services and financial products” in support of the plan. The local government will allow qualified military-civil fusion companies to issue corporate bonds and other forms of debt financing to achieve the action plan’s objectives.

To provide talent in support of these objectives, the plan proposes to make use of the Tianjin Municipal “Thousand Companies and Ten Thousand Talents” Support Plan (“千企万人”支持计划). It also encourages “utilizing” the faculty and students at Tianjin Binhai Civil-Military Integrated Innovation Institute, Zhejiang University Binhai Industrial Technology Research Academy (浙江大学滨海产业技术研究院), Peking University Information Technology Institute (Tianjin Binhai) [北京大学（天津滨海）新一代信息技术研究院], and the Academy of Military Medical Sciences (军事医学科学) Binhai New District Base for Transforming Scientific Research Results into Commercial Products (滨海新区科研成果转化基地).

The action plan notes the need for periodic progress reviews, but provides few details on how this evaluation mechanism will operate.

Committee -- discussing the Haihe Industry Fund, see:
http://www.tj.gov.cn/xw/bdyw/201703/t20170310_3588364.html