



CHINA IN CONTEXT AND PERSPECTIVE

The foundation for innovation under military-civil fusion

The role of universities

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Executive summary

China's military-civil fusion (MCF) strategy has received increasing attention in liberal democracies as governments, universities, and industry become more aware of the risks associated with interacting with China. One of the primary risks associated with MCF is the concern that illicit technology transfer facilitated by the strategy will enable China to ultimately surpass western countries' current dominance in the national defense technology arena. While the MCF strategy may have long-term goals to achieve national defense supremacy and bolster economic competition, the strategy is still in its early stages of development.

This policy brief seeks to address the role of Chinese universities in the MCF strategy by examining the evolution of MCF alongside that of the Chinese university system. In adopting this perspective, this policy brief discusses how university development plans—the 211 Project, 985 Project and Double First-Class University Plan—have facilitated universities in progressing towards achieving global status and serving as the foundation for the country's science and technology innovation.

Although this policy brief describes Chinese universities as being key for the successful implementation of MCF, it also notes that both universities and the MCF strategy are still in their development phases. As a result, it remains difficult to assess whether the implementation of MCF will be successful long-term, and whether Chinese universities will have the capabilities necessary to fuel China's innovation goals. To provide examples of how Chinese universities engage with MCF, this policy brief points to specific instances of partnerships between overseas universities and Chinese universities where technology transfers could occur.



0 Introduction

The concept behind the military-civil fusion (MCF, 军民融合) strategy dates to military and civilian relations under Mao Zedong. As such, MCF has evolved over the course of several decades, and has more recently begun to gain significant attention under Chinese Communist Party (CCP) general secretary Xi Jinping. This process of evolution that MCF has undergone is key to understanding the way that MCF interacts with and impacts universities. Just as MCF has been building and progressing into a strategy that encompasses a whole-of-society approach, China's universities have been building and progressing to achieve global status as elite universities. In the context of the Innovation-Driven Development Strategy (IDDS, 创新驱动发展战略), the Double First-Class University Plan (双一流, short for 世界一流大学和一流学科建设) and goals of universities under the MCF strategy are integral to the country's innovation aims.

Under MCF and the IDDS, universities and enterprises have become China's primary means for science and technology innovation. Universities, however, would be wholly unable to benefit MCF without the decades of planning and support dedicated to transforming China's universities into globally ranked universities and without the IDDS driving the country's innovation priorities. While Chinese universities have progressed to become well-ranked universities, they remain behind universities in other countries.¹ Because Chinese universities are still in the process of achieving a higher status globally and have yet to attain self-sufficiency in science and technology research and development, they continue to emphasize the importance of collaboration with western universities. As a result, China remains reliant on access to the international science and technology ecosystem in this stage of development.

The ongoing development of Chinese universities under what will be referred to as university development plans—the 211 Project, 985 Project and the Double First-Class University Plan—indicates how Chinese universities continue to strive to catch up with many globally ranked universities and the government's push to remedy this.² The progression of Chinese universities can be viewed in parallel to MCF—the two remain in early stages of development and are progressing towards their respective goals. As the development of MCF and Chinese universities proceeds in what is now an interconnected process, other countries should implement strategies that aim to counter and deal with the challenges that have arisen abroad as a result of the process.

The following sections of this policy brief will provide background on the MCF strategy and its evolution, incorporating analysis from Chinese scholars. The background on MCF will demonstrate the key role of science and technology innovation in the strategy, and how this is conducted through universities. The policy brief will then discuss the Innovation-Driven Development Strategy and prominent university development plans, how they became intertwined with MCF, and how they have placed universities in a central position under the MCF strategy. Finally, the policy brief touches upon several ways that Chinese universities engage with the MCF strategy through innovation.

¹Loet Leydesdorff, Caroline S. Wagner and Lin Zhang, "Are University Rankings Statistically Significant? A Comparison among Chinese Universities and with the USA," Cornell University (17 November 2020).

²Audrey Fritz, "How China's military-civil fusion policy ties into its push for world-class universities," The Strategist (19 May 2021).



1 Background: China's military-civil fusion strategy

China's military-civil fusion strategy provides the People's Republic of China (PRC) with a means to strengthen its military and invigorate its economy by leveraging the country's military and civilian industrial science and technology base.³ The strategy is aimed at promoting the sharing of resources and collaboration in research and applications, which ensures the mutually-beneficial coordination of economic and national defense development.⁴ Part of the motivation behind the MCF strategy is the notion that 'a country can only strengthen the army once it is wealthy, and an army can only defend its country once the army is strong.'⁵

MCF seeks to specifically incorporate technologies related to artificial intelligence, including data management, cloud computing and advanced semiconductors, into military platforms such as those in the aerospace, aviation, shipbuilding, and nuclear sectors.⁶ As noted by two scholars from China's National Defense University, "China's leadership has marshaled an enormous amount of organizational energy to turn China's military into a technologically advanced fighting force through military-civil fusion."⁷

The first authoritative reference to MCF as a guiding principle appeared in former Chinese leader Hu Jintao's report to the 17th Party Congress in 2007, where he urged the country to 'take a path of military-civil fusion with Chinese characteristics.'⁸ Seven years later, Chinese leader Xi Jinping emphasized the necessity to 'unwaveringly take the road of military-civil fusion innovation,'⁹ which was confirmed in 2015 when the Central Military Commission officially elevated MCF to a national strategy.¹⁰ As a national strategy, MCF implies the two-way exchange of research, development and technologies between the military and civilian sectors, and therefore recognizes science and technology innovation as the backbone of both advanced military capabilities and an advanced economy and society.¹¹

To better understand the strategy from the perspective of Chinese scholars, the following describes how MCF is the result of several preceding Chinese leaders' thinking on the concept of integrating civilians with the military.¹² The concept of MCF first

³景玥 and 程宏毅, "习近平谈军民融合: 是国家战略 关乎国家安全和全局," 人民网 (23 January 2017).

⁴Elsa B. Kania and Lorand Laskai, "Myths and Realities of China's Military-Civil Fusion Strategy," Center for a New American Security (28 January 2021). Elsa Kania, Tai Ming Cheung, Anja Manuel, Leo Carter, Peter Wood, Emily Weinstein and Lorand Laskai, "How Should the U.S. Respond to China's Military-Civil Fusion Strategy?," ChinaFile (22 May 2021).

⁵"军报评论: 把军民融合搞得更好一些更快一些," 中国日报 (21 June 2017).

⁶"2018 湖南 (北京) 军民融合产业推介洽谈会在京举行," 新浪网 (22 May 2018).

⁷姜鲁鸣 and 王伟海, "新时代军民融合发展的科学指南," 中国军网 (13 December 2017).

⁸胡锦涛, "中国共产党第十七次全国代表大会报告," 中华人民共和国驻大不列颠及北爱尔兰联合王国大使馆 (25 October 2007).

⁹乙晓光, "切实推动军民融合深度发展," 人民网 (2 April 2014).

¹⁰景玥 and 程宏毅, *op. cit.*

¹¹沙欣, "我国军民融合产业发展概况," 中国高新闻网 (15 April 2019).

¹²赵洋, "中国共产党军民融合思想理论溯源及其实践," 四川理工学院学报 (社会科学版) (2019), pp. 35-44. 游光荣, "中国军民融合发展 40 年," 科学学研究 (2018), pp. 2144-2147. 姜鲁鸣, 王伟海 and 刘祖辰, 军民融合发展战略探论 (人民出版社, 2017), pp. 3-15.



emerged under Mao Zedong as *junmin jiangou* 军民兼顾.¹³ Under this concept, Mao promoted developing a strategy for military and civilian dual-use equipment (*junmin liangyong de zhanlüe* 军民两用的战略) to explore ways to develop the economy while developing stronger national defense capabilities.¹⁴

Mao's strategy evolved under the succeeding Chinese leader, Deng Xiaoping, who coined the term *junmin jiehe* 军民结合 (civil-military integration), first using it in 1982.¹⁵ The following leader, Jiang Zemin, created his own rendition of the term, referring to it as 'combining military efforts with civilian support' (*yujun yumin* 寓军于民).¹⁶ Jiang believed that the defense economy and the social economy, military technology and civil technology, should be compatible with one another. In order to achieve this, Jiang emphasized the need to establish and improve the operational mechanism of the national defense industry and improve military and civilian compatibility.¹⁷

When Hu Jintao later introduced MCF in 2007, he detailed key aspects that should be involved in the strategy. According to Hu, China must promote the integration of the military and civilians in the fields of the economy, science and technology, education and talent.¹⁸ Building from those aspects, Hu called to strengthen the integration of military and civilian scientific and technological resources, and to realize the integration of research, applied research and development, product design and manufacturing, and technology.¹⁹

The concept of MCF builds on that of civil-military integration and goes further to describe a strategy that integrates the national defense and military development into the entire economic development system to fulfill both sides of development needs. One of the significant features that distinguishes MCF from civil-military integration is the coordination of military and local relations at the national level.²⁰ MCF explores new ways and methods of combining military and civilian sectors, integrating the military with the people, and promoting the integration of military and civilians in fields including the economy, science and technology, education and talent in order to modernize national defense.²¹

¹³赵洋, *op. cit.*

¹⁴姜鲁鸣 et al., *op. cit.*, p. 4.

¹⁵赵洋, *op. cit.*

¹⁶赵洋, *op. cit.*

¹⁷姜鲁鸣 et al., *op. cit.*, p. 10.

¹⁸游光荣, *op. cit.*

¹⁹*Ibid*

²⁰吴明曦, "军民融合深度发展的若干重大问题探讨," *卫星应用* (2015), pp. 25-29.

²¹张纪海 and 乔静杰 "军民融合深度发展模式研究," *北京理工大学学报 (社会科学版)* (2016), p. 112.



2 Military-civil fusion in the context of the National Innovation-Driven Development Strategy

In 2016, the PRC State Council and the Communist Party of China issued the National Innovation-Driven Development Strategy, which aims to serve as the stepping stones for achieving the ‘China Dream’ (中国梦).²² The strategy’s outline views innovation as integral to the country’s future and specifies military-civil fusion as one means for the country to achieve its innovation goals.²³ Through carrying out coordinated military-civil innovation, promoting the merging of military-civil science and technology, and encouraging the two-way transfer and transformation of military-civil technology, the Innovation-Driven Development Strategy (IDDS) uses military-civil fusion as an ecosystem for accelerating innovation for the modernization of the country’s national defense and national economic systems.²⁴

The IDDS seeks to create an ecosystem where innovative entities can collaborate and interact. These entities include corporations, scientific research institutes, universities and social organizations (社会组织, often considered non-profit organizations)—all of which are expected to establish MCF platforms to collaborate on national defense science and technology innovation. Under the strategy’s plans to encourage collaboration between innovative entities, it has also noted the importance of developing ‘world-class innovation-oriented enterprises,’ ‘world-class universities and curricula,’ and ‘world-class scientific research institutes.’²⁵

Through strengthening research and development in enterprises, universities and scientific research institutes, the country’s innovation strategy leverages the resources of these entities to serve as the foundation for the country’s science and technology development.

²²Elsa Kania, “Technology and Innovation in China’s Strategy and Global Influence,” in Scott D. McDonald and Michael C. Burgoyne, eds., *China’s Global Influence: Perspectives and Recommendations* (Daniel K. Inouye Asia-Pacific Center for Security Studies, September 2019).

The Chinese Dream is Xi Jinping’s vision of national rejuvenation. Under the Chinese Dream, the CCP aims to become a ‘global leader in innovation’ and to have completed its military modernization by 2035. By 2049, the CCP aims to have developed a ‘strong country’ with ‘world-class forces.’ To read more on the Chinese Dream, see: Andrew Erickson, *Make China Great Again: Xi’s Truly Grand Strategy*, War on the Rocks (30 October 2019).

²³Alex Stone and Peter Wood, “China’s Military-Civil Fusion Strategy,” China Aerospace Studies Institute (15 June 2020). Audrey Fritz, “At the Nexus of Military-Civil Fusion and Technological Innovation in China,” *The Diplomat* (14 July 2021).

²⁴“中共中央 国务院印发《国家创新驱动发展战略纲要》,” 新华网 (19 May 2016). “Outline of the National Innovation-Driven Development Strategy Issued by the CPC Central Committee and the State Council,” Center for Security and Emerging Technology (11 December 2019).

²⁵*Ibid.*



3 Chinese university involvement in military-civil fusion

The MCF strategy clearly outlines that science and technology research and development, education and talent training are key factors in its successful implementation. The Beijing Institute of Technology (BIT, 北京理工大学), one of the Seven Sons of National Defense,²⁶ held a conference on MCF in March 2020, where the president of BIT announced that the focus of MCF within universities should be to drive basic research.²⁷ The president stated that as a crucial player in MCF, universities should leverage their advantages in research and should seek cooperation with the military and enterprises, building a system for MCF that integrates the military, production, learning, research and applications.²⁸

The PRC's Ministry of Education has implemented a series of university development plans to prepare its universities to be at the forefront of the country's technology innovation. The elite status that these universities intend to achieve under the development plans play a key role in enabling the implementation of the MCF strategy.

3.1 University development plans

The four most prominent university development plans under the PRC's Ministry of Education include the 211 Project, the 985 Project and the Double First-Class University Plan. The description of the 111 Project exemplifies how these university development plans feed into talent recruitment programs.

3.1.1 The 211 Project

The 211 Project sought to target the science and technology needs of the country—largely through strengthening the cultivation of talent with the goal of creating a group of academic leaders capable of pioneering science and technology innovations. The 211 Project was approved in 1995 by the former State Planning Commission, the former State Education Commission, and the Ministry of Finance.²⁹

The project was first implemented during the Ninth Five-Year Plan era, in which development projects were arranged in 99 colleges and universities and included 602 key disciplines of study. Later, during the Tenth Five-Year Plan, Project 211 was implemented in 107 universities, and introduced 821 key disciplines of study to the participating universities. In 2008, the State Council agreed to carry out a third phase of the 211 Project, continuing to implement the aims of the earlier phases. The overall goal of the implementation of this project was to build approximately 100 institutions of higher learning, focusing on improving education quality, scientific research, and management.³⁰

²⁶The Seven Sons of National Defense are a group of leading universities in China with deep roots in the military and defense industry. These universities are subordinate to the Ministry of Industry and Information Technology. For more information, see the Australian Strategic Policy Institute's [China Defence Universities Tracker](#) and the Center for Security and Emerging Technology's [Universities and the Chinese Defense Technology Workforce](#) by Ryan Fedasiuk and Emily Weinstein.

²⁷“北京理工大学举办”共论军民融合深度发展 助推.”北京理工大学深圳研究院 (23 March 2020).

²⁸*Ibid.*

²⁹“211 工程”简介, 中华人民共和国教育部.

³⁰*Ibid.*



3.1.2 The 985 Project

The 985 Project was implemented with the goal of building from the 211 Project. Where the 211 Project sought to develop a large group of higher education institutions as a whole, the 985 Project sought to develop a select 39 institutions that were capable of achieving the status of a ‘world-class’ university.³¹ These 39 universities were chosen from the existing 211 Project.³² The Party Central Committee and the State Council approved the implementation of Project 985 on May 4, 1998 and the first phase of Project 985 was implemented at Peking University and Tsinghua University. The second phase was implemented between 2003-2007 and included a total of 39 schools. Shortly after, in 2010, the Central Committee of the Communist Party of China and the State Council implemented a third phase to continue modernization.³³

Project 985 focuses largely on the need for recruiting high-level overseas talent to perform the science and technology research necessary for the MCF strategy. Specifically, the plan for the 985 Project focuses on integrating the implementation of the national talent strategy, accelerating the development of academic leaders, and accelerating the improvement of independent innovation capabilities of participating universities. The Project identifies several disciplines that China has prioritized to reach the “international advanced level” by 2020, aiming to rank Chinese universities among the world’s top universities. One goal within the Project specifically states its intention to form a group of schools that are “high-profile research universities”—a feat that requires talent cultivation.³⁴

In addition to talent cultivation, the 985 Project lays out plans for strengthening national science and technology development. Priority themes for science and technology innovation within the 985 Project include basic research, development of cutting-edge technologies, and major special projects. The final aspect of Project 985 is to strengthen international exchanges and cooperation, which dovetails with the concepts of talent cultivation. The 985 Project ultimately aims to intertwine talent recruitment and development, international cooperation, and development of advanced science and technology innovation research centers to achieve “world-class universities.”³⁵

3.1.3 The 111 Plan

The 111 Plan, referred to as the Intellect Recruitment Program for Higher Education Curricula Innovation (高等学校学科创新引智计划), was established in 2006 by the PRC Ministry of Education and the State Administration of Foreign Experts Affairs.³⁶ The 111 Plan aimed to create 100 “world first class” academic discipline innovation

³¹“211 工程”与“985 工程”，中华人民共和国教育部。

³²“985 工程”简介，中华人民共和国教育部。

³³Ibid.

³⁴Ibid.

³⁵Ibid.

³⁶The 111 Plan was absorbed by the High-End Foreign Expert Recruitment Program (高端外国专家引进计划) in 2019 and is now overseen by the Ministry of Science and Technology. For more information, see this [Ministry of Science and Technology announcement](#) and the Center for Security and Emerging Technology’s [Chinese Talent Program Tracker](#) by Emily Weinstein.



bases in Chinese universities by recruiting 1,000 overseas experts from the top 100 research institutions in the world.³⁷

While the 111 Plan is not considered one of the university development plans, these plans are integral to the success of talent introduction plans like the 111 Plan. Eligibility for selection into the 111 Plan, for example, was limited to universities under the 211 and 985 Projects at the time of Suzhou University's entry into the 111 Plan.³⁸ This selectivity demonstrates how universities under the Projects receive more opportunities to access talent, ultimately providing these select universities with the resources needed to strengthen their research and development programs.

3.1.4 Double First-Class University Plan

The Double First-Class University Plan incorporates elements of the previous 211 and 985 Projects. The Plan was jointly issued in August 2018 by the State Council, the Ministry of Education, the Ministry of Finance, and the National Development and Reform Commission.³⁹

Similar to the 985 Project, an additional aspect of this plan focuses on cultivating innovative talent. Complementing the plan to recruit and cultivate talent, the plan also emphasizes the need to explore the establishment of specialized technology transfer mechanisms and new research and development mechanisms. Establishing these technology transfer mechanisms is part of China's broader national plan to build a technology transfer system, which was released in 2017.⁴⁰ Under the plan, institutions of higher education are encouraged to launch technology innovation and transfer activities with the goal of transforming science and technology achievements into commercial products. The plan simultaneously emphasizes the need to optimize mechanisms for military-civil technology transfers, indicating the commercial products developed by university technology transfer activities could contribute to military-civil technology transfers.⁴¹

The Double First-class university plan echoes both the Program to Build a National Technology Transfer System and the MCF strategy, as the Double First-Class University Plan explicitly states that China needs to advance technology for military use. According to the plan, universities should seek to integrate into the military-civil fusion system, promote the two-way transfer and transformation of military and civilian scientific and technological achievements, and contribute to local economic and national defense development.⁴²

³⁷ Andrew Spear, "Serve the Motherland While Working Overseas," in William C. Hannas and Didi Kirsten Tatlow, eds., *China's Quest for Foreign Technology* (Routledge, 2020), p. 31.

³⁸ "苏州大学入选国家'111'计划," 苏州大学.

³⁹ "教育部 财政部 国家发展改革委印发《关于高等学校加快'双一流'建设的指导意见》的通知," 中华人民共和国教育部 (20 August 2018).

⁴⁰ "国务院关于印发国家技术转移体系建设方案的通知," 中华人民共和国中央人民政府 (26 September 2017).

⁴¹ Ibid.

⁴² "教育部 财政部 国家发展改革委印发《关于高等学校加快'双一流'建设的指导意见》的通知."



3.2 Implementation of military-civil fusion in universities

The university development plans described above aim to provide universities with the necessary research capabilities to drive science and technology innovation in China. The application of this ability to research and innovate transfers directly to MCF. The sections below focus on the ways that universities engage in promoting MCF through establishing MCF research institutes, participating in MCF projects and cooperating with enterprises on MCF research and development. Evidence demonstrating the pivotal role of universities in MCF can be seen through university engagement in technology transfer catalogs, university establishment of MCF research institutes and MCF research collaborations.

3.2.1 Technology transfer catalogs

The Ministry of Industry and Information Technology (MIIT) and the State Administration of Science, Technology and Industry for National Defense (SASTIND) are responsible for jointly releasing the annual ‘Catalog of Recommended Technology Products for Civilian Participation in the Military.’ As of 2017, MIIT and SASTIND have released eight issues of this catalog since 2009,⁴³ with the most recent issue having been released in 2018.⁴⁴ The notice announcing the release of the 2018 catalog addresses its relevant audience, mentioning universities as one of the organizations encouraged to participate in technology research and development projects listed in the catalog.

Entities that wish to contribute to the projects must have obtained the relevant ‘qualifications,’⁴⁵ which refer to security credentials.⁴⁶ These security credentials are ‘weapons and equipment research and production unit secrecy credentials’ (武器装备科研生产单位保密资格), which are awarded to universities and enterprises and enable their holders to participate in classified defense research and development projects.⁴⁷ Security credentials are one means for enabling civilian entities, such as universities, to partake in science and technology research for the national defense sector and contribute to ‘spin-on’ technologies.

Similar to the aforementioned catalog, there is also a catalog dedicated to ‘spin-off’ technologies, referred to as *junzhuanmin* 军转民, which describes the application of military technology to the civilian industry.⁴⁸ This catalog, the ‘Catalog of Recommended Military Technology for Transfer to Civilian Use,’ is also jointly released by MIIT and SASTIND. The 2018 issue of this catalog included 150 projects, several of which involved the participation of universities. The projects listed in this issue of the catalog focused on six research areas in advanced materials, intelligent manufactur-

⁴³“2017 年度军转民、民参军技术与产品目录发布,” 云南省国防科技工业局 (18 October 2017).

⁴⁴“两部门关于推荐《民参军技术与产品推荐目录（2018 年度）》信息的通知,” 中华人民共和国工业和信息化部 (15 May 2018).

⁴⁵“关于发布《民参军技术与产品推荐目录（2018 年度）》信息的通告,” 北方发展投资有限公司 (15 January 2019).

⁴⁶“国家军民融合公共服务平台部分信息查询点开通的通知,” 国家军民融合公共服务平台 (10 January 2018).

⁴⁷“Terminology,” China Defence Universities Tracker.

⁴⁸Emily Weinstein, “Testimony before the U.S.-China Economic and Security Review Commission on ‘U.S. Investment in China’s Capital Markets and Military-Industrial Complex,’” Center for Security and Emerging Technology (19 March 2021).



ing, high-end equipment, next generation information technology, new energy and environmental protection, emergency rescue and public safety.⁴⁹

One of the projects included in this catalog, led by the Beijing Institute of Technology, focused on developing a big data mining cloud service system. According to the catalog, the system aimed to provide network public opinion intelligence analysis that could be used in various industries including government, military, internet, and telecommunications. Several of the other projects focused on aerospace technology, including developing face gear technology for aerospace power transmission. Other projects included those developing three-dimensional measurement technologies for advanced manufacturing, CNC precision machining centers, high-end bearing technology and high sensitivity portable Raman spectrometers.⁵⁰

A total of six universities were listed as being involved in the research and development for 13 of the 150 projects. The universities that engaged in the 2018 projects include Beihang University, Beijing University, Beijing Institute of Technology, Harbin Institute of Technology, Nanchang Hangkong University, and Nanjing University of Aeronautics and Astronautics.⁵¹ Out of these six universities, four are categorized as ‘seven sons of national defense,’ which are under the purview of MIIT and considered leading universities with deep ties in the military and defense industry.⁵²

While university involvement in these projects from 2018 remains limited to 13 out of 150 projects, their involvement exemplifies the ways that universities can work on projects related to military to civilian technology transfers. As the development of MCF progresses, its implementation will likely result in the increasing participation of universities in defense research projects.

3.2.2 Domestic military-civil fusion research institutes

The focus of MCF in universities is to drive basic research.⁵³ Universities throughout China have established MCF research institutes and innovation zones that create an innovation system and enable universities to contribute technology innovations for use under the MCF strategy. The Beijing Institute of Technology (BIT), for example, views itself as a university at the forefront of MCF science and technology innovation.⁵⁴ The university emphasizes its work on national defense science and technology research and development, noting that in 2018 it undertook more than 300 pre-research tasks on weapons and equipment.⁵⁵ BIT established a MCF Innovation Institute that aims to improve innovation and develop a MCF system that integrates research, strategy, and law.⁵⁶ BIT also jointly established a MCF innovation park (军民融合创新园) with Haidian District in Beijing to enable Haidian District to leverage the research and innovations from BIT.⁵⁷ In a 2019 working report, BIT announced

⁴⁹“两部门关于印发《军用技术转民用推广目录（2018年度）》的通知,” 中华人民共和国中央人民政府 (5 December 2018).

⁵⁰Ibid.

⁵¹Ibid.

⁵²Alex Joske, “The China Defence Universities Tracker,” Australian Strategic Policy Institute (25 November 2019).

⁵³于昕君 and 熊旭, “北京理工大学成立军民融合创新研究院,” 人民网 (28 May 2018).

⁵⁴Ibid.

⁵⁵“‘双一流’建设2018年度进展报告,” 科塔学术 (1 January 2019).

⁵⁶于昕君 and 熊旭, *op. cit.*

⁵⁷Ibid.



it established the research institute and innovation park to serve the national MCF strategy.⁵⁸

The Southwest University of Science and Technology (SWUST, 西南科技大学), located in Sichuan Province, established the Sichuan MCF Research Institute in 2016.⁵⁹ Through the university's engagement in MCF research projects, it has collaborated with the Chinese Academy of Sciences and the China Academy of Space Technology⁶⁰—an entity that appears on Japan's End User List due to its involvement in missile development.⁶¹ These collaborations have focused on laser cleaning, the application of aerogels in aerospace technology and other aspects of applied research and technology transformation projects.⁶²

In 2017, Hebei Province established 25 provincial MCF industry-university-research model bases in its effort to promote the development of the defense technology industry, strengthen military capabilities and to enhance military-civil collaboration.⁶³ These MCF industry-university-research model bases serve as a method for absorbing civilian forces into national defense science and technology innovation, joint military and civilian research, industry-university-research cooperation and the transformation of military-civilian technologies.⁶⁴ Participating institutions in these bases include military enterprises, provincial scientific research institutes, provincial universities, civilian enterprises and military academies. These bases must meet several requirements, one of which is the ability to conduct research and development of military-civil fusion products.⁶⁵ Specifically, bases must work on projects that aim to develop products with military-civilian conversion capabilities or have a supporting role in the scientific research and production of weapons and equipment.⁶⁶ These bases demonstrate the active role of Chinese universities in developing and promoting MCF science and technology innovation.

3.2.3 Military-civil fusion and research institutes with overseas affiliations

Because MCF is still in its early stages of development, China at this stage remains reliant on access to the international science and technology ecosystem. Chinese-overseas research partnerships through universities are one means for China to access this ecosystem. These partnerships may take form in joint laboratories, joint research institutes or cooperation on research projects.

Tsinghua University (清华大学), for example, established a Technology Transfer Institute in 2014 to promote and gather resources for innovation. As part of the university's efforts to promote technology transfer and innovation, the university has relied on partnerships created through jointly-developed scientific research institutes.⁶⁷

⁵⁸“北京理工大学 2019 年工作要点,” 北京理工大学 (26 September 2019).

⁵⁹梁若昕 and 熊旭, “军民融合 高校也是主角,” 人民网 (11 October 2018). “Southwest University of Science and Technology,” Australian Strategic Policy Institute.

⁶⁰梁若昕 and 熊旭, *op. cit.*

⁶¹“China Aerospace Science and Technology Corporation,” Australian Strategic Policy Institute. Also see: Japan's End-User List.

⁶²梁若昕 and 熊旭, *op. cit.*

⁶³雷丽娜, “河北省初步建成环首都军民融合产业带” 中华人民共和国中央人民政府 (24 January 2018).

⁶⁴“河北出台军民融合产学研用示范基地认定管理办法,” 江西省人民政府 (31 August 2018).

⁶⁵*Ibid.*

⁶⁶*Ibid.*

⁶⁷“清华大学” 联合共建类科研机构” 发力推创新” 校地合作办公室” 聚能促转化,” 中华人民共和国国家发展和改革委员会 (23 April 2020).



These joint research institutes are established with both domestic and overseas partners; in particular, Tsinghua University has joint research institutes with seven other countries, including the US, Japan, the UK, and Germany.⁶⁸ The cooperation areas of these joint research institutes focus on environmental protection, artificial intelligence, nuclear technologies, and new materials.⁶⁹

In Germany, Tsinghua University partnered with RWTH Aachen University, Siemens and Volkswagen to establish the High-end Equipment Innovation Design and Manufacturing International Joint Laboratory, which focuses on micro-nano manufacturing and micro-nano systems, mechanical surface and interface quality management and high-end equipment manufacturing.⁷⁰ According to Tsinghua University, this joint laboratory has formed a development model for basic research, technology transfer and internationalization.⁷¹

The case of Zhejiang University's Institute of Microelectronics and Nanoelectronics exemplifies how a university's joint lab can contribute to technology development for MCF. The Institute hosts a joint laboratory with the University of Central Florida, known as the ZJU-UCF Joint ESD Lab (浙江大学—美国 UCF 大学 ESD 实验室). Established in 2006, this lab specializes in chip-level and system-level ESD design and development. The laboratory is funded both by China's National 985 Innovation Fund (国家 985 创新基金全) and the University of Central Florida. According to the laboratory, the UCF lab provides the Zhejiang University lab with technical support and technology transfer.⁷²

The ZJU-UCF Joint ESD Lab has several partners in the private and public sector. Its private sector partners include Shanghai Hua Hong NEC Electronics, SMIC, and Hejian Technology Corporation. The lab's public sector partners include national defense conglomerate China Electronics Technology Group (CETC) 58th Research Institute and government agency Ministry of Industry and Information Technology (MIIT) 5th Research Institute.⁷³ Given the dual-use applications of semiconductors, they are categorized as 'military-civilian dual-use electronic functional materials' (电子功能材料) by the Tianjin Municipal Action Plan for Military-Civil Fusion Special Projects in Intelligent Technology.⁷⁴ Research and development carried out by the ZJU-UCF Joint ESD Lab, as a result, could be transferred to dual-use technology under the MCF strategy.

Chinese-overseas research partnerships that are connected to technology transfer efforts demonstrate one way that Chinese universities are working to improve their science and technology innovation capabilities. Through these research partnerships, universities are engaging with overseas entities and gaining research experience that can be transferred to developing MCF-related technologies. Not all research partnerships, however, may result in technology transfer. In the cases where technology transfer institutes work under the same umbrella as joint research institutes with overseas partners, however, the risk of potential technology transfer is higher.

⁶⁸ *Ibid.*

⁶⁹ *Ibid.*

⁷⁰ “海外合作,” 清华大学.

⁷¹ *Ibid.*

⁷² “ESD 实验室简介,” 浙江大学微纳电子研究所.

⁷³ *Ibid.*

⁷⁴ “Tianjin Municipal Action Plan for Military-Civil Fusion Special Projects in Intelligent Technology,” translation by the Center for Security and Emerging Technology (14 October 2019).



4 Conclusion

Under the university development plans, China has intended to provide select universities with the resources necessary to advance their science and technology capabilities. Much of these resources have gone into expanding the universities' global credibility to allow for increased research collaborations, and as a result, increased exposure to foreign technology. As China's Innovation-Driven Development Strategy positions universities, enterprises and scientific research institutes as the foundation for achieving the country's innovation goals, these entities will continue to work towards expanding their international cooperation partnerships.

Because MCF creates the innovation ecosystem that enables these entities to contribute to both the civilian and national defense sectors, international collaborations that involve Chinese research entities could lead to technology transfers. Adopting protective measures for engagement can prevent research collaborations from resulting in illicit technology transfers and ultimately disrupt part of the implementation process of the MCF strategy.

5 Policy recommendations

To assess the risks associated with engaging with Chinese universities, governments and universities should consider the following recommendations:

1. As a multilateral coalition, members should share due diligence research on Chinese universities and relevant partnerships to alert other members of any existing risks.⁷⁵ This information can be shared through existing intelligence alliances and organizations. Shared information can include the following details on partnerships and collaborations:
 - the nature of the collaboration;
 - the sensitivity of the technologies implicated in the collaboration;
 - the sources of funding for the collaboration; and
 - the Chinese university and/or research institutes involved in the collaboration.
2. Governments should seek to provide universities and institutions with resources and standards to assist and guide universities' due diligence research that weighs the pros and cons of each engagement with Chinese universities. Within the United States, this could be conducted via a network of federally funded research and development centers (FFRDCs) and university-affiliated research centers (UARCs) with the goal of sharing information internationally.⁷⁶
3. Universities should open discussions with their communities dedicated to sharing information regarding previous, current, and future research partnerships with Chinese universities.

⁷⁵This information could be presented using a model similar to the Australian Strategic Policy Institute's [China Defence Universities Tracker](#).

⁷⁶For more information, see: the Center for Security and Emerging Technology's [A New Institutional Approach to Research Security in the United States](#) by Melissa Flagg and Zachary Arnold, and the National Security Commission on Artificial Intelligence's [Final Report](#).



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