

Defense Conversion of the Aviation Industry in Mainland China and Taiwan*

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Mainland China and Taiwan are each implementing large-scale defense industry readjustment programs, the main objectives of which include ending full state financial support for defense industries, enabling them to switch to civilian production while continuing to meet the state's military demands, and promoting mutual support between defense and civilian industries. This article will use the aviation industry as an example in discussing mainland China and Taiwan's respective reasons and measures for defense conversion. Their difficulties in developing their respective aviation industries will also be examined.

Keywords: defense conversion; diversification; international division of labor; aerospace industry

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The end of the Cold War has produced very serious impacts on global politics and economics, as even large-scale state-protected defense industries have been affected. Many countries have introduced measures to enable their defense industries to overcome this crisis. In following this global trend, the defense industries of both mainland China and Taiwan have also made readjustments.

This article will discuss the defense industry readjustments made by mainland China and Taiwan, with particular emphasis on

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the aviation industry. Both sides have considerably large aviation industries which were established for pure military needs and now face high pressure to shift to the field of civil aviation; hence, the aviation industry has been a common focus in the study of defense industry conversions in mainland China and Taiwan. The author will first examine the causes and background for the aviation industry conversion of both sides as well as the readjustment measures that they have introduced, and then compare their readjustments.

Defense Conversion

Defense conversion has become a global trend since the end of the Cold War. Its main purpose is to reform or reduce the huge military apparatus originally built up during the Cold War for conflict, so that military resources can be shifted to civilian use and promote social and economic development.

Defense conversion is often defined in the West as a program consisting of political, economic, and technical measures for assuring the orderly transformation of labor, machinery, and other economic resources now being used for military purposes to alternative civilian uses.¹ In other words, it emphasizes the redirection of unnecessary military resources to civilian use, but not the exploitation of military resources for both military and civilian uses. It involves a wide range of measures, including the transformation of military bases into civilian firms, the release of military human resources to the civilian sector, and the conversion of defense technology for nonmilitary purposes, i.e., the global positioning system. This article will concentrate on defense technology conversion.

Background for Mainland China's Defense Conversion

Mainland China's aviation industry is part of its defense industries; hence, the conversion of its aviation industry has been closely related to the readjustment of its defense industries.

¹Seymour Melman and Lloyd J. Dumas, "Planning for Economic Conversion," *The Nation*, April 16, 1990, 509; quoted in Mel Gurtov, "Swords into Market Shares: China's Conversion of Military Industry to Civilian Production," *The China Quarterly*, no. 134 (June 1993): 213.

Mainland China embarked on defense conversion as early as 1978, long before the end of the Cold War. Therefore, the end of the Cold War was not the main cause for Beijing's defense conversion, but it did confirm mainland Chinese leaders' views about global trends and encouraged them to accelerate defense conversion.

Changes in Beijing's Assessment of the World Situation

Beijing's defense conversion had much to do with changes in its view of the world situation. From a national security perspective, Beijing perceived the need for a peaceful international environment and began making plans and arrangements in the hopes of obtaining a positive response from the former Soviet Union. A formal proposal was made in January 1979, in which Beijing announced that it needed a long-term peaceful international environment in order to realize the "four modernizations" within mainland China.² Following this event, Beijing began to reduce conflicts and step up contacts with the Soviet Union.

Beijing's tendency to pay less attention to ideological differences also helped it to reevaluate its understanding of its erstwhile enemy. With the introduction of reform and opening-up policies in the early 1980s, its own policies had become increasingly closer to those of the "revisionist" Soviet Union. Moreover, after the appraisal of Mao Zedong's historical merits and demerits, Beijing could no longer use the ideological standards of the Mao era to criticize the Soviet Union.

In the early 1980s, Beijing also took note of Soviet domestic problems and their impact on bilateral relations. The Soviet Union was faced with serious economic stagnation, upheaval in Poland, minority nationality questions, and many other domestic problems. Beijing concluded that a Soviet Union beset with domestic problems was incapable of continued expansionism, and this realization was instrumental in improving Beijing-Moscow relations.³

Changes in the international situation also led Beijing to modify its foreign policies. On the one hand, U.S. President Ronald Reagan made strenuous efforts to build the U.S. armed forces and restore the

²Chi Su's study shows that Beijing was the first to extend an olive branch in the course of normalization of Beijing-Moscow relations; see Chi Su, *Lun Zhong Sugong guanxi zhengchanghua (1979-89)* (On normalization of Beijing-Moscow relations 1979-89) (Taipei: Sanmin shuju, 1992), 92-100.

³*Ibid.*, 100-110.

military balance with the Soviet Union; on the other, the normalization of Beijing-Washington relations was conducive to enhancing Beijing's national security. Without security threats, Beijing was able to gradually improve its relations with the Soviet Union and promote omnidirectional international relations so as to create a peaceful international environment for its "four modernizations" program.⁴

Because of the aforementioned changes in its understanding of the world situation, Beijing also decided to readjust its military strategy. Mao's theory that a new world war would be inevitable was abandoned and replaced by proposals which stated that world war could be "postponed" or "avoided," and that world peace could be "expected." For example, as early as 1977, Beijing's media proposed that although another world war was inevitable, it could be "postponed."⁵ In the following year, the Chinese Communist Party (CCP) organ *Hongqi* asserted that the inevitability of a new world war was talked about as a law and a tendency, but this did not mean that war was imminent.⁶ In the 1980s, Deng Xiaoping stated that factors encouraging war were growing but factors obstructing war were also growing.⁷ At an enlarged meeting of the Central Military Commission (CMC) in June 1985, he further concluded that there would possibly be no large-scale war for a fairly long time to come and there was hope of maintaining world peace.⁸ These changes in mainland Chinese leaders' views created a favorable situation for Beijing's defense conversion.

The Needs of Economic Reforms

The economic reforms implemented since 1978 have been essential to mainland China's political stability and economic development. Under Mao's rule, the Chinese mainland was on the brink of an economic collapse. Between 1974 and 1976, it suffered a loss of 100 billion *yuan* in industrial output value and a loss of 40 billion *yuan* in financial revenues. In 1976, the profit rate of industrial enterprises was only

⁴Ibid., 110-17.

⁵*People's Daily*, November 1, 1977, 1.

⁶Hsü Xiangqian, "Heighten Vigilance and Prepare for Wars," *Hongqi* (Red Flag) (Beijing), 1978, no. 8:42-50.

⁷"China's Foreign Policy," in *Deng Xiaoping wenxuan* (Selected works of Deng Xiaoping), vol. 2, 2nd edition (Beijing: People's Publishing House, 1994), 416.

⁸"Speech at an Enlarged Meeting of the Military Commission of the Central Committee of the Communist Party of China" (June 4, 1985), in *Selected Works of Deng Xiaoping*, vol. 3 (Beijing: Foreign Languages Press, 1994), 133.

50 percent of the 1965 figure; over one-third of all enterprises were in the red, with their total deficits amounting to 7.3 billion *yuan*. From 1966 to 1976, the average real wage of industrial enterprise employees declined by 6 percent and the income of peasants did not increase at all.⁹

Mao's wartime economic policies had serious effects on mainland China's economy. In the mid-1960s, to prevent a possible invasion by the United States and the Soviet Union, Mao launched a "third-front" construction movement: from 1966 to 1975, more than 200 billion *yuan* was used to move the defense industries from cities and coastal areas to inland areas. However, from 1966 to 1980, only 275 billion *yuan* was budgeted for industrial construction.¹⁰ The extreme emphasis on defense needs thus diverted resources from economic development.

After his rehabilitation in 1977, Deng intended to improve the national economy by restructuring the industrial system, which gave too much attention to defense needs. He hoped that by the year 2000, the average income of the mainland people would reach US\$800 and mainland China's GNP would quadruple. He proposed the "four modernizations" program, the order of priority being agriculture, industry, science and technology, and national defense. Thus, Deng shifted the key emphasis of development to civilian industries.

Problems of the Defense Industrial System

In the mid-1980s, the mainland Chinese defense industrial system, including the aviation industry, was plagued with many problems. First, the defense industry was a highly centralized system. All powers, including division of management authorities, personnel, organization, fund allocation, and development of new products, were concentrated in the hands of the ministries. Second, defense enterprises were only extensions and instruments of administrative departments. In mainland China's planned economy, their responsibilities included production according to state plans, without any consideration of the market

⁹Quoted in Sah Kung-chiang, *Zhonggong shinian jinggai de lilun yu shijian* (Mainland China's ten-year economic reform: Theory and practice) (Taipei: Institute of International Relations, National Chengchi University, 1991), 6-9.

¹⁰Quoted in John W. Lewis and Xue Litai, *China's Strategic Seapower: The Politics of Force Modernization in the Nuclear Age* (Stanford, Calif.: Stanford University Press, 1994), 93-94; for more on decisionmaking and the course of third-front construction, see Barry Naughton, "The Third Front: Defense Industrialization in the Chinese Interior," *The China Quarterly*, no. 115 (September 1988): 351-86.

situation; hence, they were not able to respond promptly to market demands. Third, the defense industries were a set of separate vertical structures with little lateral communication. For instance, the enterprises under the Ministry of Aviation Industry formed a completely separate system for research, development, design, testing, production, and teaching, with no cooperation ties or division of labor relationship with enterprises under other ministries. This practice resulted in duplicate investment and serious waste. Fourth, coordination and control were achieved through unified allocation of materials, products, and funds; thus, enterprises were obliged to accept what was allocated to them. Finally, the defense industries received production orders from central administrative departments and there was little feedback from production units at the lower levels.¹¹

This independent, vertical, and integrated management system caused negative results. Duplicate investment created a widespread situation in which defense industries were inefficient and operating well below capacity. The mainland economy as a whole could not afford such serious waste. Under the planned economic system, which discouraged creation, competition, and the integration of scientific and technological research with production, mainland Chinese defense industries could not produce new high-tech arms and equipment to cope with the needs of modern warfare. Moreover, mainland Chinese defense industries only focused on military tasks and played no role in promoting the civilian economy. Without technological support from society and the local economy, defense industries' tendency to achieve advanced technology at all costs gave rise to the "dual economy" phenomenon that appears frequently in developing countries. Worst of all, defense industries were given top priority and provincial administrations were required to support their production needs; the local economy was thus subject to exploitation by defense industries.¹²

The Conversion of Mainland China's Aviation Industry

Deng's Policy for Defense Conversion

The original foundation for Beijing's official attitude toward

¹¹You Qianzhi et al., *Zhongguo guofang jingji yunxing fenxi* (An analysis of the workings of China's defense economy) (Beijing: Zhongguo caizheng jingji chubanshe, 1991), 105-6.

¹²Ibid., 106-9.

defense conversion was the policy of “integrating military and non-military enterprises and peacetime production with preparedness against war, giving priority to military production, and maintaining the defense industries with civilian support” that Deng proposed in 1982. In other words, Beijing hoped that after the shift of its defense industries to civilian production, military goods could still be produced when necessary. Therefore, mainland Chinese leaders have defined defense conversion differently from the aforementioned common definition. Beijing’s plan was to make full use of the production capacity of their defense industries, but not to release the defense industries’ surplus production capacity for real and complete civilian use.

However, actual practices seem to indicate that Beijing’s official attitude toward defense conversion has not been strictly observed. Most mainland Chinese military industries have switched to civilian production and produced goods unrelated to their own technology.¹³ For instance, the Jianshe Group of Chongqing, Sichuan Province, originally a renowned artillery shell producer, has mainly been engaged in producing motorcycles. The switch from artillery shells to motorcycles has not involved any technology transfers, and suggests that “defense conversion” in mainland China can be more properly described as “diversification.” In other words, Beijing hopes that its defense industrial enterprises can reduce their production of military goods and use their surplus production capacity to produce civilian goods that could enable them to earn profits and provide taxes for the state.

Institutional Reforms

The institutional reforms that Beijing introduced in the 1980s to improve defense industries were the same as those implemented in state-owned enterprises. Their main objective was to revitalize defense industrial enterprises in the wake of reform and facilitate their shift to civilian production.¹⁴ First, the contract system and the manager

¹³According to a mainland Chinese study, most civilian goods produced by defense industries are labor-intensive, low-technology products for daily use with little added value; thus, the defense industries are competing for the same market with ordinary enterprises. Another study indicates that less than ten percent of the civilian goods produced by defense industries requires the use or transfer of military industrial technology. See Xiao Changjin, “Certain Problems Concerning the Shift of Defense Industries to Civilian Production,” *Junshi jingji yanjiu* (A Study of the Military Economy) (Wuhan), 1992, no. 5:44-45.

¹⁴See Sah, *Zhonggong shinian jinggai*, 6-9; Paul H. Folta, *From Swords to Plowshares? Defense Industry Reform in the PRC* (Boulder, Colo.: Westview Press, 1992), 81-109.

responsibility system were adopted to allow defense enterprises to retain part of the profits earned from the sales of products outside the state plan, so as to encourage them to improve their productivity and/or reduce their production costs. Second, Beijing drew up laws and regulations to enable defense industrial enterprises to transfer military technology to civilian industries and take part in civilian economic development. Third, the profit retention system was instituted to enable defense industries to set aside development funds; however, the state still provided funds for military goods production and the research and development of military technology. Fourth, price controls were gradually reduced to allow enterprises more independence in determining the prices of their own commodities, thus paving the way for defense industries' shift to civilian production. However, military goods were not regarded as commodities because commercialization of military goods would greatly increase state expenditures on military purchases and cause distribution difficulties. Fifth, labor reform was adopted to increase worker productivity by linking performance and pay incentives through a contract system. Sixth, a foreign exchange profit retention system was introduced to encourage defense industries to export civilian goods and then use the foreign exchange they had earned for foreign technology imports. Finally, the system of substituting tax for profit was adopted to increase enterprise and local government vitality, and reduce provincial and ministerial barriers.

Organizational Restructuring

Before the implementation of reform and opening-up policies, the mainland Chinese ministry in charge of the aviation industry was the Third Ministry of Machine Building, which was renamed as the Ministry of Aviation Industry in 1982.¹⁵ However, the fact that it was still a CMC department was a hindrance to cooperation with nonmilitary departments and the conversion to civilian production. Thus, another reorganization in 1986 placed the Ministry of Aviation Industry under the State Council to facilitate contacts with civilian industries,

¹⁵For more on the development of the mainland Chinese aviation industry, see *Dangdai Zhongguo de hangkong gongye* (The aviation industry of contemporary China) (Beijing: Dangdai Zhongguo chubanshe, 1988). For more on aviation industry reform, see *Dangdai Zhongguo de guofang keji shiye* (The defense technology institutions in contemporary China), vol. 1 (Beijing: Dangdai Zhongguo chubanshe, 1992), 160-62; *Zhonggong nianbao* (Yearbook on mainland China) (Taipei: Zhonggong yanjiu zazhishe, 1994), I:15-22.

although the research, development, and production of military goods are still under CMC control.

In another organizational restructuring in 1988, the Ministry of Aviation Industry and the Ministry of Astronautics Industry were merged into the Ministry of Aeronautics and Astronautics Industry. In October of the following year, a Central Special Commission was set up under the State Council and the CMC to direct defense technology development and coordinate arrangements for the integration of military and civilian production. Li Peng was appointed as its chairman and Yao Yilin and Liu Huaqing its vice-chairmen. Its general office was located in the Commission of Science, Technology and Industry for National Defense (COSTIND), with COSTIND Minister Ding Henggao as the director responsible for its routine work.

In 1993, the Ministry of Aeronautics and Astronautics Industry was reorganized into two separate economic entities: the Chinese General Company of Aeronautics Industry and the Chinese General Company of Astronautics Industry. The former consisted of 200 research, production, and marketing units, with a total of 560,000 employees. Its main tasks were to formulate the aviation industry development strategy; supervise the operation, quality control, and product testing of its subordinate units; pursue foreign contacts; and provide technology and equipment.¹⁶

Related organizations at the provincial levels were also readjusted to cope with defense conversion needs. COSTIND bureaus in various provinces and municipalities set up coordination units to help defense industrial enterprises seek suitable civilian goods, obtain the necessary financing for such civilian production, and construct public facilities. COSTIND provincial offices and provincial economic committees sometimes shared the same offices.¹⁷ In addition, the center allowed provincial governments to share decisionmaking powers concerning the defense industries within their jurisdiction. This decentralization policy was implemented to break down provincial and ministerial barriers; rationalize central control; and enable the provinces to assume partial control of defense conversion responsibilities, especially in the sales of civilian goods produced by defense industries.¹⁸

¹⁶Yitzhak Shichor, "Take-off: The Conversion of China's Military Aviation Industry to Civilian Use" (Unpublished paper, 1995), 16.

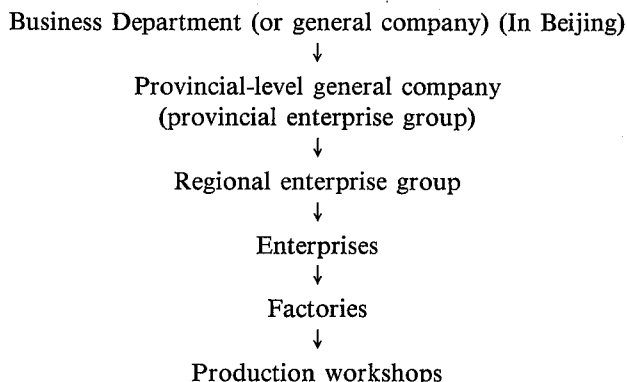
¹⁷Personal interviews, June 1995 in Beijing and October 1995 in Chongqing.

¹⁸Folta, *From Swords to Plowshares?* 65.

For economic purposes, Beijing also tried to organize defense industries into enterprise groups.¹⁹ The chief objective was to facilitate intra-industry division of labor so that the economic behavior of individual enterprises within the same group would achieve an economy of scale in areas such as research, development, production, and trade; these enterprises would hence be able to support each other and promote the development of the whole industry. Beijing hoped this cooperation would put an end to the vertical system of operations for ministerial and provincial defense industries.

Thus, the mainland Chinese aviation industry has been transformed. The Chinese General Company of Aeronautics Industry is at the center, with aviation industrial groups in various provinces. For instance, in Guizhou Province, the Guizhou Administration of Aeronautics Industry, a unit under the Ministry of Aeronautics Industry, was reorganized into the Guizhou General Company of Aeronautics Industry in the late 1980s; the latter also serves as the core of the Guizhou Group of Aeronautics Industry, which was formed in 1992.

The aviation industrial groups consist of closely or loosely-bound enterprises which own factories. Usually, their structure is as follows:²⁰



¹⁹For more on the concept of mainland Chinese enterprise groups, see Lou Ren and Liu Yüzhen, "Basic Ideas on the Organization of Enterprise Groups by Military Enterprises," *Junshi jingji yanjiu*, 1992, no. 12:53-56.

²⁰For the organizational chart after the reorganization, see Jean-Claude Berthelemy and Saadet Deger, "Conversion of Military Industries to Civilian Production in China: Prospects, Problems, and Policies" (An Organization for Economic Cooperation and Development [OECD] Development Center report given at the International Conference on the Conversion of China's Military Industries, co-sponsored by the OECD Development Center and the China Association for the Peaceful Use of Military Industrial Technology, Beijing, June 26-27, 1995), 28; and 1986-94 issues of *Guizhou nianjian* (Almanacs of Guizhou) (Guiyang: Guizhou renmin chubanshe, 1986-94).

Despite all these organizational reforms, Beijing has not given full authority to local governments or enterprises, as it needs to ensure that priority will be given to the production of military goods.²¹ Thus, it has had to prevent local leaders from turning over their authorities to enterprises,²² and allowing chaos arising from reforms to disintegrate the defense industrial system.²³ Moreover, defense industries want to remain within the state plan so that they can obtain state assistance when necessary.²⁴ All these factors have led Beijing to attempt administrative decentralization only.

Enterprise groups are composed of at least two categories of enterprises. The first category consists of the general companies transformed from ministries and their reinvestment companies which are set up in various localities. They are the groups' core enterprises. The second category consists of companies set up by local governments which serve as satellite factories of the core enterprises. Among the first category enterprises, a superior-subordinate relationship exists.²⁵ Superior enterprises have the power to decide on major personnel appointments of subordinate enterprises,²⁶ approve their new investment projects, and set their annual objectives; subordinate enterprises must obey their orders. However, it seems that superior units do not fully exercise their powers and the relationship between superior and subordinate units is not clear. This can be a serious obstacle to the implementation of a defense conversion policy. In addition, within the same enterprise group, most closely-related enterprises belong to the same defense industrial system, and due to the administrative tendency of giving priority to one's own unit or system, it is doubtful that the efficiency principle has been observed in enterprise cooperation

²¹Folta, *From Swords to Plowshares?* 64-65.

²²*Ibid.*, 64.

²³For more on the chaos caused by the lack of policy guidance and military enterprises' inability to adapt to the market economy in the early stage of defense conversion, see *Zhongguo guofang jingji jianshe* (China's defense economic construction) (Beijing: Junshi kexue chubanshe, 1991), 28-38.

²⁴Berthelemy and Deger, "Conversion of Military Industries to Civilian Production in China," 59.

²⁵See note 17 above.

²⁶During a personal interview in July 1993 in Hong Kong, the author was told that superior industries' power to approve investment projects does not always have a strong binding force. If a subordinate enterprise has invested despite the opposition of its superior enterprise and the investment turns out to be a failure, the responsible person does not need to resign for the failure. Such a weak binding force might be related to the work style of individual enterprises, and we should not assume that it exists in all defense industries.

projects.²⁷ If local governments are also given a share of the decision-making power over enterprises, ministerial and provincial controversies regarding defense conversion will increase, and enterprises will have more difficulty in forming enterprise groups with better comparative advantages.²⁸

Moreover, it has been hard to reorganize the units established within enterprises, including Party groups; trade unions; offices in charge of the militia and the drafting of soldiers; organizations implementing government policies, such as birth-control groups; and welfare and servicing organizations set up by enterprises themselves. The most important reason for this is the CCP's politico-ideological considerations.²⁹ In addition, there is the need to prevent the emergence of a large-scale unemployment problem, which may induce political and social unrest. Finally, enterprises are still extensions of government administration and must maintain units to carry out orders from corresponding governmental units.

Actual Conversion Measures

The mainland Chinese aviation industry's principle for defense conversion has been "to continue to upgrade its own professional capability while diversifying into other industrial production." This has caused tremendous changes in the industry's product structure.³⁰

The mainland Chinese aviation industry has tried to achieve quick progress mainly by promoting international cooperation and becoming a link in the international division of labor of the international aviation industry. By participating in the production of components, spare parts, and subsystems, it has been able to upgrade its civil aviation technology and production capability. On the other hand, it has in-

²⁷Berthelemy and Deger, "Conversion of Military Industries to Civilian Production in China," 28-29.

²⁸Dai Zhenlong, *Chongqing junzhuannmin yu diqu jingji fazhan* (Chongqing's military conversion and regional economic development) (Chongqing, Sichuan: Chongqing chubanshe, 1995), 120.

²⁹See Arthur S. Ding, "The Reform of Separating the Functions of Party Organizations from Those of State Organs," in *Zhonggong zhengzhi fazhan* (Mainland China's political developments), ed. Wu An-chia (Taipei: Institute of International Relations, National Chengchi University, 1994), 83-123, esp. 108-19.

³⁰According to mainland Chinese sources, non-aviation goods accounts for 70 to 80 percent of the aviation industry's total output. See *Dalu hangkong gongye fazhan yu liang'an chanye hudong moshi zhi tantao* (The development of the mainland Chinese aviation industry and the model of interaction between industries on both sides of the Taiwan Strait) (Taipei: Chung-hua Institution for Economic Research, 1996).

roduced major Western aviation subsystems and installed them on airplanes of its own design and production so as to improve the performance of its own planes and their sales.

As early as 1979, aircraft manufacturers in mainland China had begun to fabricate components and spare parts for international civil aircraft producers. The Shanghai Aircraft Factory (now the Shanghai Aviation Industrial Corporation) produced landing gear doors for the McDonnell-Douglas Corporation of the United States. In 1985, the two sides signed another contract, agreeing that the former would assemble twenty-five MD-82s for the latter within twelve years, and fifteen more if necessary. Up to 1994, a total of thirty-five had been assembled, thirty of which had been sold to the China Eastern Airlines and Northern Airlines of mainland China.

In 1980, through the mediation of the China National Aero-Technology Import and Export Corporation, the Harbin Aircraft Manufacturing Company (renowned for the production of Hong-5 bombers), together with the Zhuzhou Engine Company, the Harbin Engine Factory, and the Baoding Propeller Factory, obtained a license from French Aerospace for the production of AS365 helicopters. The Chinese-manufactured helicopters were subsequently named the Zhi-9. Their first test flights were conducted in 1982 and their production permit was granted in June 1987. Up to 1995, a total of fifty Zhi-9s, either for civilian or police use, had been produced.³¹ The Harbin Aircraft Manufacturing Company has also fabricated some components for British Aerospace's BAe-146 and SD3 planes.

The Harbin Aircraft Manufacturing Company has also tried to develop its own civil aircraft. One successful example is the Y-12, which uses Pratt and Whitney engines. The production permit for the planes was obtained in December 1985, only about three and a half years after their first test flight in July 1982. In June 1990, they passed the British tests and became the most successful airplanes that mainland China had ever exported. After their participation in the 1993 Paris Air Show, fifty of them were sold in the following year. In March 1995, they were granted a flying certificate from the U.S. Federal Aviation Administration (FAA), further increasing orders for them.

³¹During a personal interview in June 1995 in Beijing, the author learned that the Harbin Aircraft Manufacturing Company was licensed to produce fifty Zhi-9s only, and after the completion of these helicopters, the production lines became idle and dusty.

The Xian Aircraft Company has also opted for international cooperation. In September 1980, it assembled certain parts of the CL-215 planes for Canadair. In 1982, it entered into cooperation with the Boeing Commercial Aircraft Company for the production of certain components for B-737s and B-747s. In cooperation with the Hong Kong Aircraft Engineering Company, it has produced the relatively modern Y-7-200s on the basis of the old Y-7s, the production permit of which was obtained in 1986. It has also manufactured the Eaglet-100s, which are light planes for sports, travel, aerial photography, and pilot training.

Mainland Chinese aircraft manufacturing companies have also produced other aircraft, such as the Y-8s, which have a comparatively larger loading capacity, the "Bee" and "Dragonfly" light planes, the WA-5 unmanned helicopters, and remote-piloted vehicles. These light and small planes and vehicles can be used for both civilian and military purposes, such as afforestation and crop seeding, fertilization, weeding, pesticide spraying, salvage, aerial photography, geological surveys, short-distance transportation, archaeological surveys, and forest fire fighting.

All these achievements indicate that mainland Chinese enterprises in the aviation industry have already realized that they must adopt Western technology and management know-how, and integrate with the world's large aircraft manufacturers. They have even sought cooperation with Western aircraft manufacturers in order to develop their own civil aviation industry. In fact, they have already chosen an aircraft manufacturer jointly owned by Singaporean, German, French, and Italian corporations as their partner for the development of a new airplane named the AE-100. It has been decided that the final stage of assembly of the AE-100s will be carried out in Shanghai, which will surely help upgrade mainland China's capacity for designing and manufacturing aircraft.

The mainland Chinese aviation industry has also made tremendous efforts to produce non-aviation goods. During the Sixth Five-Year Plan period (1981-85), mainland Chinese aviation industrial enterprises established about sixty production lines for civilian goods, including textile machinery, medical equipment, cars, bicycles, motorcycles, washing machines, refrigerators, and other light industrial machinery. The brands of many of these products have now become renowned in mainland China.

Many aviation industry manufacturers have turned to the production of cars and car components. The Shenyang Aircraft Company, renowned for the production of J-8 fighters, has also become renowned

for the production of air-conditioned buses. It has also planned to invest 100 million *yuan* in the production of light jeeps. The Guizhou Aviation Industry Group (Guizhou Aircraft Company), the producer of the J-7s, has also started to produce automobile components. Since 1986, forty-eight enterprises under the group have joined hands in developing eight hundred kinds of automobile components. Jiangxi Province's Changhe Aircraft Company, a renowned helicopter manufacturer, has four car and component assembly and production lines and has designed more than twenty kinds of cars.

The mainland Chinese aviation industry has also produced other machinery. The Guizhou Aviation Industry Group has manufactured meat processors, cigarette packaging and production lines, marble excavators and processors, cutting and chipping machines, measurement instruments, non-stick cooking utensils, motors, and valves. The Chinese General Company of Aeronautics Industry has produced coal mine safety monitoring systems for the Ministry of Coal Industry; established black-and-white and color television assembly and production lines for the Tianjin Television Company; developed and produced six kinds of spinning and weaving machines for the Ministry of Textile Industry; and constructed turbo engines for the Ministry of Petroleum Industry.

In addition, the mainland Chinese aviation industry has sought development overseas. The China National Aero-Technology Import and Export Corporation has set up a special unit to seek contracts for designing and building construction projects, mainly in the Middle East, including Jordan, Kuwait, and the United Arab Emirates.

The Establishment of Taiwan's Aviation Industry³²

After its move to Taiwan in 1949, the Nationalist government set up an Air Force Technology Bureau under Air Force Headquarters to develop military aircraft technology. In January 1969, the bureau was reorganized into the Aerospace Industrial Development Center (AIDC); thus, the beginning of Taiwan's aviation industry was closely related to military purposes. The AIDC then proceeded to set up three

³²The course of development of Taiwan's aviation industry is mainly quoted from a special issue commemorating the twenty-fifth anniversary of the AIDC's founding (without publication place and date and the name of the publisher).

aircraft factories. The Chiehshou No. 1 Factory established in Ching-chuankang in November 1969 was mainly responsible for the production of aircraft components and spare parts; the Chiehshou No. 2 Factory set up in Kangshan in September 1973 was responsible for the production and testing of aircraft engines; and the Chiehshou No. 3 Factory, which began operation in April 1980, was to engage in the production and quality control of aerospace electronics, instruments, and meters, as well as various kinds of environment tests. The AIDC also owned an Aviation Research Institute responsible for the research, design, and experimentation of aircraft, engines, and aviation systems.

In January 1983, the AIDC was placed under the Defense Ministry's Sun Yat-sen Scientific Research Institute (SYSRI), and the latter's deputy director was concurrently made its head. Its Aviation Research Institute was reorganized into the SYSRI's First Research Institute, still under the supervision of the AIDC head. It should be noted that this reorganization was a result of Taiwan's attempt to acquire aircraft production capability. As the United States was prevented by the August 17 Beijing-Washington joint communiqué of the previous year from selling Taiwan advanced military aircraft, Taiwan decided to develop and produce the aircraft and weapons they would need, including Indigenous Defense Fighters (IDFs),³³ Hsiung-feng and Tien-chien missiles, tanks, and military vessels. Thus, the SYSRI was organizationally expanded and the AIDC was merged into the institute.

Step by step, the AIDC has produced and assembled fifty-eight Chiehshou propeller elementary trainers, eighteen UH-1H helicopters, fifty-two T-CH-1 intermediate trainers, more than two hundred F-5E fighters, sixty AT-3 ground attack trainers, and IDFs. Its other products have included eighty T-53-13B engines, forty-three T-53-701A engines, rotors of UH-1H helicopters, front parts of F-5E fuselages, TFE-731 engines, Maverick missile launchers, TFE-1042-70 engines, and many IDF subsystems.

The first Chiehshou trainer was produced in October 1968, and

³³IDF investment, including technology introduction, personnel training, and manufacturing and testing equipment, accounted for more than US\$4 billion. However, this figure might not include the research and production of Tien-chien missiles and other arms to be equipped on IDFs. See Huang Chi and Liao Kun-jung, "Taiwan's High-Tech Industrial Policy" (Paper presented at the Symposium on Taiwan's Political Development Since the End of World War II, co-sponsored by the Chinese Association of Political Science and the United Daily News System Cultural Foundation, Taipei, October 21-22, 1995), 11.

all fifty-eight of them were completed by 1974. The first UH-1H helicopter left the factory in December 1970 and production of all eighteen of them was completed in 1976. The T-CH-1 trainers were the AIDC's first plane of its own design; the first one was produced in 1973 and a total of fifty-two were completed in 1980. The first F-5E was produced in October 1974. The research and production work for AT-3s began in July 1975, and their first test flights were conducted in September 1980. The research and production work for IDFs began in October 1980 and the first prototype was completed in 1988. All this indicates that Taiwan's aviation industry was able to make steady progress from simple jobs to complicated ones, and from assembly to trial production of aircraft.

The AIDC has also tried to produce other types of aircraft. In 1978, it began to construct XC-2 medium-sized air freighters (similar to C-130s) and the RPV-1 unmanned remote control miniplanes. That these two types of airplanes were test flown but not mass-produced was probably due to other priorities in resource allocation. Obviously, Taiwan's emphasis has been on the production of fighters since it has the need to maintain air superiority in the Taiwan Strait.

The AIDC's aircraft production has had the following characteristics: (1) All its efforts have been oriented toward military needs, especially the production of fighters. (2) It produces all component parts of its own fighters, with the exception of imported engines and other major aircraft subsystems. Thus, its fighter production has not been integrated with the Taiwan economy and has given rise to a "dual economy" phenomenon similar to what mainland China has experienced in developing its defense industry. This has increased Taiwan's defense conversion difficulties.³⁴ (3) The excessively high costs of fighter production have also caused financial problems whenever Taiwan has been on a tight national budget.

Background for the AIDC's Defense Conversion

In 1990, Taiwan included the aerospace industry into its Six-

³⁴For an analysis of the advantages and disadvantages of the AIDC's defense conversion, see Chiang Chiung-tsung, *Guofang keji yanfa yu shengchan danwei de qiyehua yanjiu* (A study of the reorganization of the defense technology R&D and production units into enterprises) (a special report commissioned by the Defense Ministry) (Taipei: College of Management, National Taiwan University, 1995), 16-73.

Year National Development Plan. The Executive Yuan promulgated an aerospace industry development program, encouraging military and civilian forces to jointly develop an integrated aerospace industrial system. It set up an Aerospace Industry Promotion Group, reinforced industrial cooperation offset agreements, and established an Aerospace Technology Development Center under the Industrial Technology Research Institute in Hsinchu to enhance the development of aerospace technology and testing capability. Obviously, at this point Taiwan was already planning to integrate the AIDC into the aerospace industrial system.

The AIDC's urgent need to shift to civilian production emerged when the advantage of full government support disappeared with U.S. President George Bush's 1992 announcement that the United States would sell 150 F-16A/B MLU fighters to Taiwan. The U.S. decision to sell Taiwan the fighters caused a financial dilemma: Taipei had limited funds and was forced to choose between buying the F-16s and continuing to give financial support to the AIDC. Taipei's later decision to purchase French-made Mirage-2000s further aggravated the allocation problem, and Taiwan society was also demanding reductions in the defense budget.

Under these internal and external pressures, the AIDC's destiny became clear. The total number of IDFs that the center would produce was reduced from 250 to 130, with production of these fighters to be completed before 1999. It was thus faced with the problem of its own survival, and the logical answer was to accelerate its conversion to civilian production. The urgency of the AIDC's problem can be seen from the center's explanatory notes on its reorganization, which state:

In accordance with the state policy to develop the aerospace industry and promote the development of civilian aerospace industry with defense technology, the Ministry of National Defense has planned to reorganize the AIDC. The state's strained defense budget will lead to the discontinuance of defense scientific research and production plans after the completion of IDF mass production; and the precious human and material resources, equipment, and capacity of the existing aerospace industry would be forced to idle or be transferred to other fields. This would surely be detrimental to the development of our aerospace industry and our state interests. However, if the AIDC is reorganized into a corporation, it would be able to take orders, reduce the state's financial burden, and continue our country's aerospace technology development and industrial upgrade. Therefore, the reorganization should be necessary.³⁵

³⁵AIDC, "Explanatory Notes on the AIDC's Reorganization into a State-Run Enterprise" (Presented at an interpellation session of the Legislative Yuan, April 14, 1995), 1.

Judging from the above, although Taiwan's aviation industry already had the intention to create a new high-tech industrial realm, it was forced to address the issue much earlier than expected due to rapid changes in its external environment. The source of the pressure was large-scale readjustment in the U.S. defense industry. As the U.S. government reconsidered its defense plans and reduced its defense budget after the end of the Cold War, U.S. defense industries began to conduct mergers, lay off employees,³⁶ and lobby the U.S. government to permit sales of F-16s to Taiwan. In turn, the U.S. decision on F-16 sales affected the orientation of Taiwan's aviation industry.

The AIDC's Defense Conversion

The AIDC's defense conversion has not only been different from common Western definitions, but also different from the diversification practices of mainland China. The AIDC's development orientation after its reorganization into a corporation will include: (1) continuing to produce IDFs; (2) undertaking contracts for the production of aerospace components and spare parts for both domestic and foreign corporations; (3) developing aircraft, engine, and avionic maintenance services; (4) opening up the international market by cooperating with international aerospace corporations, participating in risk-sharing plans, and setting up joint ventures; and (5) increasing business opportunities through market diversification and reinvestment.³⁷

Judging by all this, the AIDC's defense conversion has concentrated on developing Taiwan's aerospace industry. There are reasons for the adoption of such a strategy. First, the AIDC was only a small unit with nearly 6,000 military and civilian employees. After its reorganization into a corporation, the number of its employees will be further reduced to 4,800. Therefore, it has no need to diversify into other industrial areas and can make developing the aerospace industry its sole objective. Second, it has the task of promoting the development of Taiwan's aerospace industry since it is the industry's only unit with comprehensive design and production capability, relatively modern equipment, and professional human resources.

³⁶See also Chien Shih-an, "The Evolution of American Defense Industries," *Meiou yuekan* (America & Europe Monthly) (Taipei) 11, no. 11 (November 1996): 21-35.

³⁷AIDC, "Explanatory Notes," 4.

According to an official report on the AIDC's reorganization procedures, the AIDC will have three missions.³⁸ The first will be to promote the development of Taiwan's aerospace industry and help other domestic aerospace industrial corporations obtain quality certificates issued by foreign aircraft manufacturers. After receiving foreign orders, the AIDC can subcontract nongovernmental factories to produce some of the components and spare parts so as to help other aerospace corporations to make progress. Since it has a well-established quality-control system for the production, assembly, and testing of aircraft structure and subsystem components, and has already acquired quality certificates from foreign aircraft manufacturers for some engine components requiring special manufacturing processes, its experience can help other domestic aerospace corporations establish quality-control systems and acquire foreign quality certificates for their products.

The AIDC's second mission after its reorganization will be to make use of industrial cooperation offset programs to establish an aerospace industrial system. The existing production capability of other domestic aerospace corporations has made it difficult for them to efficiently use the quotas of industrial cooperation offset programs. Therefore, the reorganized AIDC should cooperate with nongovernmental aerospace corporations in this field so as to contribute effectively to the domestic economy. Its third mission will be to establish a center-satellite system in order to bring about an overall industrial technology upgrade in Taiwan.

In practice, the AIDC's defense conversion began in the form of an organizational readjustment. The AIDC's three Chiehshou factories, the Aviation System Bureau, and the First Research Institute's engineering design and development divisions were reorganized into the Aviation Industry Development Corporation (also AIDC in abbreviation), while the First Research Institute's research and development division remains under the SYSRI.³⁹

Another planned organizational readjustment is privatization. The AIDC was originally a research and production unit under the Defense Ministry and could only take military orders. After its reorganization into a corporation under the Ministry of Economic Affairs (MOEA), it will be able to take orders from civilian corporations ac-

³⁸AIDC, "A Report on the AIDC's Reorganization Procedures" (April 14, 1995), 5-6.

³⁹Ibid., 3.

ording to the management regulations governing MOEA enterprises. Its privatization is planned to take place within two years after its reorganization into a state enterprise. However, privatization will not be easy, since it will depend on whether nongovernmental sectors will be willing to invest in the aviation industry, which requires large investments but has high risks, slow returns, and a long development period.

The AIDC's Defense Conversion Measures

Even before its reorganization into a corporation in July 1996,⁴⁰ the AIDC had begun its defense conversion, producing components of F-124 jet engines for the Czech Republic which would become part of seventy L-159 jet trainers, and striving to win engine production contracts with Australian and U.S. military forces.⁴¹ It has also signed a cooperation agreement with the U.S. Sikorsky Company on the development of twenty-passenger S-92 helicopters, a variation on Black Hawk military helicopters that can suit both military and civilian uses. The AIDC has participated, on a profit and risk-sharing basis, in the production of helicopter subsystems, mainly the front part of S-92 fuselages, including the structure, brakes, and flight control, avionic, and hydraulic systems, and composite materials. The 1996 output value of this contract has been estimated at US\$500 million.⁴² The AIDC has also signed agreements with U.S. Allison and U.S. Allied Signal on the production of turbo engines which are mostly used on helicopters or power generating machines.⁴³ It has also entered into alliances with some foreign manufacturers for the production of aerospace materials and components.⁴⁴

In addition, the AIDC has provided maintenance services. For instance, it has set up derivative companies with some of its machines, equipment, and personnel to provide aerospace maintenance services. By integrating with the technology and management efficiency of

⁴⁰AIDC director Lin Wen-li's talks with the press, January 24, 1996, at the AIDC in Taichung.

⁴¹IDF Program director Peng Yuan-hsi's talks with the press, January 24, 1996, at the AIDC in Taichung.

⁴²*Lianhe bao* (United Daily News) (Taipei), January 18, 1996, 5.

⁴³*Ibid.*, and also information provided by Dr. Y. W. Magnus Lou, October 18, 1996.

⁴⁴*Lianhe bao*, January 18, 1996, 12.

private corporations, it hopes to create an industry of high output value. It is estimated that the annual maintenance costs of the IDFs will account for NT\$2-3 billion, and those of the F-16s and Mirage-2000s for NT\$6 billion. Income from aircraft maintenance will be a great help to the AIDC's survival and operation.⁴⁵

Conclusion

Mainland China conducted defense conversion of its aviation industry because its large-scale war preparation strategy since the 1960s resulted in an almost unlimited expansion of its defense industries, seriously impairing its financial strength and affecting its overall economic development. Taiwan also began defense conversion of its aviation industry for financial reasons, as its limited defense budget is not sufficient for supporting both the development of the IDFs and the purchase of foreign aircraft.

Mainland China's defense conversion began as early as the end of 1978, more than ten years before the end of the Cold War. This indicates that Beijing was keen in evaluating and responding to global changes. Of course, mainland China was also deep in financial straits and wanted to dispel past policy errors as quickly as possible. Taiwan's aviation industry began defense conversion after the end of the Cold War, which supports the view that the event had a great impact on the AIDC.

In defense conversion, the aviation industries of both mainland China and Taiwan are faced with the problem of market adaptation. In mainland China, after the practice of a socialist economic system for four decades, enterprises had become so accustomed to the state allocation and assignment model that they had almost completely lost the capability to compete in the market. To achieve success in defense conversion, its defense industries have thus had to overcome many psychological obstacles. Taiwan has implemented a market economy for nearly fifty years and its enterprises are familiar with market competition. However, for a long period, the AIDC was under government protection, only carrying out task-oriented production and not engaging

⁴⁵ According to a study, the AIDC's annual regular costs account for over NT\$5 billion; in order to become a profitable enterprise, it must have a business volume of about NT\$20 billion. See *Zhongguo shibao* (China Times) (Taipei), May 8, 1994, 7.

in any market-oriented production. It will also require some time to adapt to market competition.

The mainland Chinese aviation industry's defense conversion has emphasized an upgrading of its own professional capability while diversifying into other forms of production because it must reduce its excessively large manpower by releasing its surplus human resources to other industries, thus preventing large-scale unemployment and social unrest. On the other hand, Taiwan has concentrated its efforts on the development of the aerospace industry, aiming at an overall industrial technology upgrade.

The roles of the mainland Chinese and Taiwan governments in the defense conversion of their own aviation industries have been different. Mainland China has adopted many protective and supportive measures, including the provision of funds, technology, information, and markets, to help its aviation industry convert to civilian production.⁴⁶ However, Taiwan's AIDC cannot depend on government subsidies for its own operation and survival after its reorganization into a corporation. With political democratization, the public has displayed less tolerance for state enterprises. In addition, Taiwan is under pressure to gain World Trade Organization (WTO) membership and must refrain from giving the AIDC full financial support. Therefore, the AIDC must rely on its own management and technology to establish its place in the international aviation industry.⁴⁷

In defense conversion, both mainland China and Taiwan aspire to develop an independent aviation industry, but are facing difficulties. They must consider the relationship between their industrial policies and the global environment, as well as international pressure and participation in the international division of labor. In fact, major international civil aviation manufacturers are unwilling to share their aircraft manufacturing technology with others so as not to foster any potential competitors. Moreover, after mainland China becomes a WTO member, its industrial policies must conform to international practices. It will therefore have difficulty in giving full support to the development of its civil aviation industry.

⁴⁶See Arthur S. Ding, "Defense Industry Conversion to Civilian Production and Its Impact on Regional Development in Mainland China," *Zhongguo dalu yanjiu* (Mainland China Studies) (Taipei) 39, no. 2 (February 1996): 36-49.

⁴⁷For an analysis of the impacts of political changes on Taiwan's high-tech industries, see Huang and Liao, "Taiwan's High-Tech Industrial Policy."

However, in defense conversion of the aviation industry, mainland China has more advantages than Taiwan. It may use its vast market and existing technological capability to attract Western investors to establish jointly-owned aircraft manufacturing companies, which may help improve its own manufacturing capabilities and develop an aviation industry focusing on civil aviation; for example, it has entered into cooperation with Western investors for the development of AE-100 interregional passenger planes. Taiwan's AIDC does not operate under such conditions.