

July 12, 2007
Statement of James Mulvenon, Ph.D.
Director
Center for Intelligence Research and Analysis

“Chinese Defense Industries and the ‘Digital Triangle’ Paradigm”

Before the U.S.-China Economic and Security Review Commission
Hearing on “China’s Proliferation and the Impact of Trade Policy on Defense
Industries in the United States and China”

Thank you, Mr. Chairman and the other members of the U.S.-China Economic and Security Review Commission for the opportunity to take part in the hearings you are holding today on the topic of China’s defense industries. My prepared remarks contain general analytical judgments about the current state of China’s defense-industrial system, and offers a case study of the successes in the defense electronics sector.

Key Findings

- Through the 1980s and most of the 1990s, the Chinese defense-industrial base uniformly suffered from chronic shortages of capital, technology, and production know-how;
- The purchases of Russian military technology in the early to mid 1990s, such as Su-27 FLANKERS, Kilo-class submarines, and *Sovremenny*-class destroyers; were meant to fill critical mission-related gaps in Chinese military modernization, and should therefore be seen as a scathing indictment of the failures of the PRC defense-industrial base to fulfill its long-standing promises to the People’s Liberation Army (PLA);
- Since the reforms of 1998, the Chinese defense industries have undergone a dramatic and successful transformation, surpassing the expectations of even the most forward-leaning analyst;
- There is now significant variation across the various sectors (aviation, aerospace, ordnance, shipbuilding, defense electronics) of the Chinese defense-industrial base;
- The relative progress of an individual defense-industrial sector appears to be best explained by its relative integration into the globalized production and R&D chain, which provides access to the latest production and manufacturing technologies and know-how;
- While missiles and aerospace have always been a “pocket of excellence,” the greatest progress appears to have been made in the shipbuilding and defense electronics sectors, both of which have benefited greatly from China’s current position as the leading producer of commercial shipping and information technologies;
- Those sectors that have lagged in relative terms (aviation and ordnance) have been hurt by a lack of similar spin-on benefits from partnerships between

multinational corporations and domestic industry, though the defense-industrial reforms of 1998 and diffusion of innovation in the system have improved their performance;

Chinese C4I Modernization and the “Digital Triangle”

The Chinese military is in the midst of a C4I revolution, characterized by the wholesale shift to digital, secure communications via fiber optic cable, satellite, microwave, and encrypted high-frequency radio. The pace and depth of these advances cannot be explained by traditional Chinese defense-industrial dynamics, but instead spring from a paradigm shift known as the “digital triangle,” which resembles a classic technonationalist strategy, with high-level bureaucratic coordination and significant state funding. The three vertices of the “digital triangle” are (1) China’s booming commercial information technology companies, (2) the state R&D institute and funding infrastructure, and (3) the military. The linkages between these three vertices are longstanding, as telecommunications and information technology in China were originally under military auspices and the commercial relationships with state and military research institutes remain important.

Vertice One: Chinese state IT companies. Most of the major Chinese IT and electronics companies grew directly out of the state sector, spinning off from telecommunications R&D and production units run by the military or the electronics and information technology ministries. These state capitalist companies, such as Huawei and Datang and Zhongxing (ZTE), are designated “national champions,” benefiting from a wide range of state subsidies and advantages. On the one hand, these companies are also genuinely commercial in orientation, seeking to capture domestic and eventually international market share. On the other hand, they still maintain clear ties to the Chinese military, which has now become both a research partner and valued customer for their IT products. If we compare these firms with traditional defense industries, the new IT companies carry none of the oft-cited structural burdens, enjoying (1) new facilities in dynamic locales, (2) a lean, high-tech work force motivated by market-based incentives and stock options, and (3) infusions of near state-of-the-art foreign technology, thanks to the irresistible siren song of China’s huge IT market, which encourages foreign companies to transfer cutting-edge technology for market access. However, the Chinese IT sector, backed by state R&D funding and national labs, has moved beyond the mere importation of Western technology to co-development with foreign firms and even indigenous development of near state-of-the-art technology. The result is significant levels of military access to cutting edge COTS information technology, fueling a C4I revolution in the armed forces. Moreover, these IT “national champions” are now aggressively pursuing markets abroad, particularly in the third world regions such as Africa that have been conspicuously avoided by Western firms.

Vertice Two: The strong foundation under this industry, however, is the state research institute and R&D funding system. For defense-related work, these units include numbered research institutes under the China Electronic Technology Group Corporation (CETGC), the PLA General Staff Department, and other defense-industrial entities,

funded with money from the Ministry of Science and Technology's 863 Program and other national S&T funding programs. While there is nothing unique about this technonationalist approach, which looks similar to programs in Japan and elsewhere, the state R&D funding acts as a subsidy to the commercial companies mentioned in Vertice One.

Vertice Three: the People's Liberation Army. Through this "digital triangle" system, the military supports the civilianization of military technical research, becoming an R&D partner and privileged consumer of products.

The "digital triangle" dynamic is further facilitated by two critical technology trends: (1) the growing use of COTS (commercial-off-the-shelf) technology, such as computer network switches and routers, for military communications, which allows the PLA to directly benefit from the globally competitive output of China's commercial IT companies; and (2) the rise of China as a locus for global fabless integrated circuit production, which potentially permits the PLA access to the advanced microelectronics that lay at the heart of modern military sensors and weapons systems. Of these two trends, COTS, particularly in telecommunications equipment, has provided the greatest early dividends to the PLA, as evidenced by the expansion of its fiber optic computer networks. Defense microelectronics, particularly military-specific components with no natural counterpart in the civilian economy, have advanced more slowly. At the same time, however, the increasing sophistication of China's commercial semiconductor fabrication facilities ("fabs") provide the base production capacity necessary for the military to implement design ideas in a secure, domestic environment.

Conclusions and Implications

- Integration with the global production and R&D chain has facilitated dramatic improvements in Chinese defense-industrial production and PLA modernization since the late 1990s;
- China's emergence as the world's IT workshop has played an important role in the PLA's C4I revolution, particularly the elements of the C4I system that rely on COTS;
- The C4I revolution has significantly improved the Chinese military's operational and communications security;
- The integration of advanced IT into the PLA's hybrid inventory of near-state-of-the-art and older systems is the heart of what the PLA calls "informatization," which is a primary dynamic driving the central warfighting scenario of "local, high-tech wars under informationized conditions." The most important possible "local, high-tech war under informationized conditions" is a military contingency involving Taiwan and U.S. military intervention.