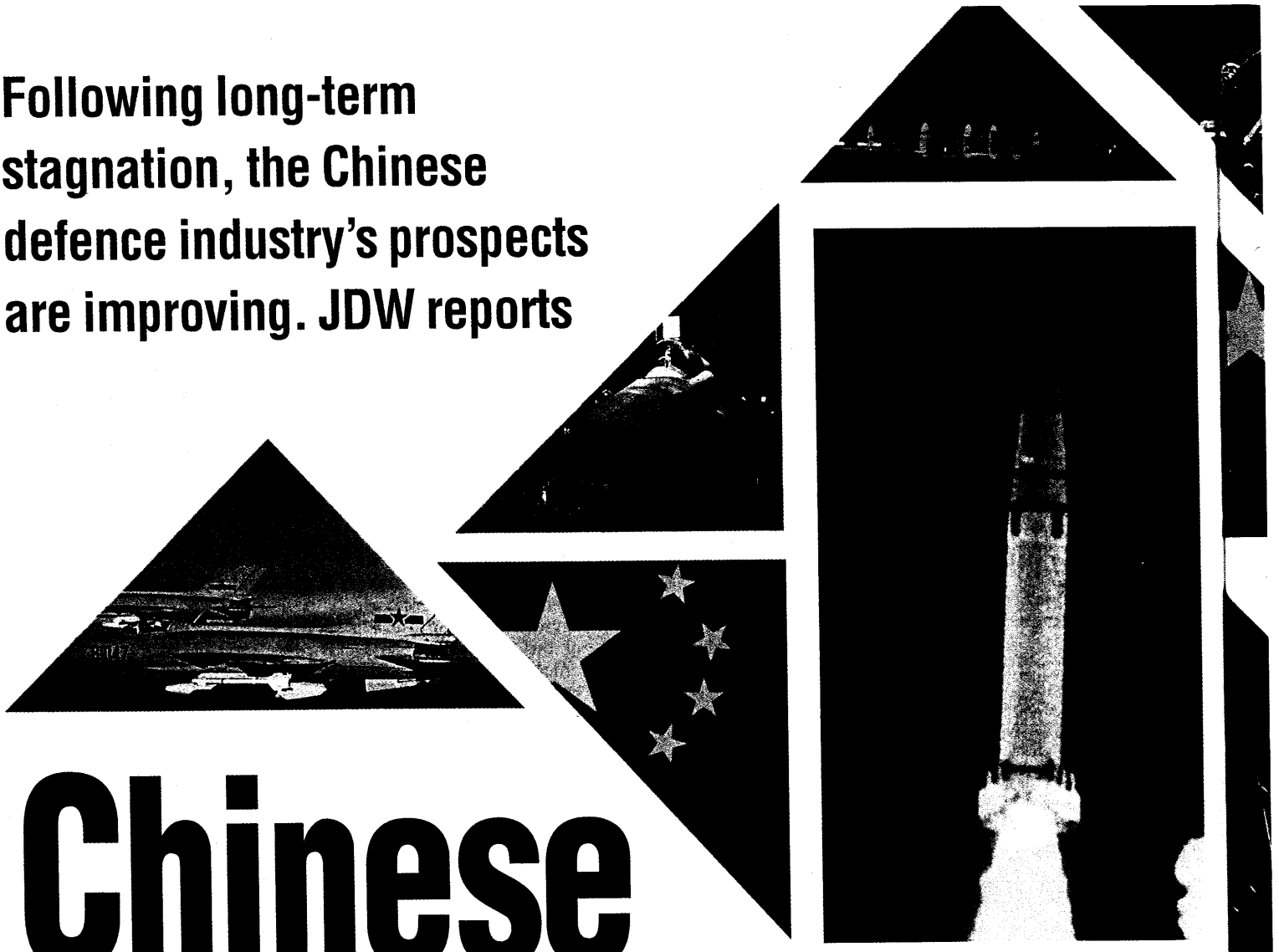
Following long-term stagnation, the Chinese defence industry's prospects are improving. JDW reports



Chinese puzzle

After suffering prolonged technological and industrial stagnation and contraction over the past few decades, China's defence industry has undergone an extensive restructuring since the late 1990s to make it leaner, more efficient and better able to meet the high-technology needs of the People's Liberation Army (PLA).

This has led to a nascent but growing turnaround in the defence industry's performance and long-term prospects. Supported by a sharp rise in funds for procurement and research and development (R&D), the country's defence plants have been stepping up the design, development and production of new generations of warships, aircraft, satellites, missiles and other sophisticated military systems.

Chinese military chiefs have hailed the defence industry's revival in fortunes over the past few months. Gen Li Jinai, head of the PLA General Armament Department (GAD), the principal agency responsible for weapon procurement, said that "the past five years have been the best period" in the defence industry's R&D efforts and production.

However, despite its newly improved performance, the defence industry continues to suffer from deep-seated structural, organisational and institutional problems that are serious barriers to innovation, project management and systems integration. These obstacles threaten to thwart the successful development of next-generation projects that the Chinese defence industry hopes will narrow the gap with other advanced arms producers by 2020.

Reforms

The government overhauled the defence industry's management and corporate structures in the late 1990s to inject competition into a moribund apparatus. At the centre of the organisational reforms was the separation of the military and civilian components of the Commission of Science, Technology and Industry for National Defence (COSTIND), which oversaw the management of the defence industrial complex.

Under the old state planning system, COSTIND's role was to represent and balance the interests of both the defence industry and the PLA. This led, however, to constant bureaucratic infighting because these two groups had widely divergent interests. As the consumer, the military wanted weapons that could be produced on time, meet its specifications and were cost-effective, but the defence industry had little incentive to meet the PLA's requirements because it faced little competition.

Under the new system, introduced in 1998, the military component of COSTIND was incorporated into a newly established GAD and the civilian portion was retained, keeping its COSTIND title.

The reconstituted COSTIND was primarily

BRIEFING

CHINESE DEFENCE INDUSTRY

Some of the main components of China's defence capability: *(clockwise from the top)* **Type 093 nuclear-powered submarine**; **Chinese troops**; **Luhai-class destroyer *Shenzhen***; the **turbojet engine** designed for China's F-7 and F-8 fighter; an **M-9 missile**; **F-7 aircraft in flight**; and the **FC-1 fighter aircraft**

ONI; PA; K Shaw/Jane's; R Karniol/Jane's; PA

Design: T Peters/Jane's; 0563349

R&D institutional reform

As part of the streamlining of the defence science and technology R&D sector and the downsizing of the military establishment, the top tier of defence technological and engineering schools and academies has been restructured over the past few years.

The National Defence Science and Technology University (NDSTU) at Changsha was merged with three other military academies in 1999 to form a new combined defence science and technology teaching and research institute.

This university is the PLA's foremost academic institution involved in defence-related simulation and training R&D and the educational training of military scientists and engineers. The NDSTU has been especially active in the past few years in areas such as the development of supercomputers, backbone communications systems, robotics and high-speed rail transportation systems. The NDSTU has also established commercial entities and entered into business relationships with civilian high-technology companies to pursue money-making ventures and develop civilian projects with military applications.

Other key defence R&D institutions that are at the vanguard of high-technology innovation include the PLA Information Engineering University in Zhengzhou, which has developed backbone communications routers, the Harbin Engineering Institute and the Northwestern Industrial University in Xian.

responsible for the drafting and implementation of policies, regulations and laws dealing with the defence industrial complex as well as long-term strategic planning, foreign co-operation and acquisitions, regulation of the export of sensitive military technologies, educational training of defence scientific and technical personnel, project management of weapon projects and defence conversion.

The defence industry's corporate structure also underwent limited restructuring. Under the old system, the aerospace, nuclear, space, shipbuilding and ordnance industries were each controlled by a single massive conglomerate. Ten state-owned corporations were initially carved out of these behemoths, two for each industrial sector, to promote competition. They each have several dozen subsidiaries employing several hundred thousand workers. An eleventh corporation was established in 2001 to oversee the defence electronics sector. These corporations are being reorganised and streamlined. There are efforts to close down the most heavily indebted and loss-making plants and lay off surplus workers, although the process is painstakingly slow because of concerns over labour unrest.

Some industry analysts estimate that around 20% of the defence industry's workforce, which is believed to total around 2.5 million to 3 million among top-tier enterprises, have so far been laid off. Some 61,000 workers were laid off from the ordnance industry in 2001 alone and 100 more firms were earmarked for bankruptcy or takeover by profitable companies in 2002.

The government has provided several billion dollars in subsidies to clean up debt burdens.

This downsizing is taking place at the same time that defence firms have enjoyed a strong pick-up in orders from the PLA and robust growth in the sale of their civilian products. Industrial output value and sales income for the 10 defence conglomerates increased by 19% and 14% respectively in 2001 and their combined growth rate in 2002 was 6% higher than the national average in 2002. Military sales of China Ordnance Industry Group in 2002 increased industrial output value and sales income by 18.1%.

This consolidation of loss-making ventures, coupled with increasing sales, allowed COSTIND to officially declare that the defence industry had technically broken even in 2002 after eight consecutive years of losses. The size of these past losses was enormous. In 1996, for example, the defence industry's combined losses totalled more than Rmb5 billion ($604 million), which may have been equivalent to around 10% of the sector's total production output value.

Among the 10 conglomerates, the best performers were the two space industry enterprises, which are profitable. The ordnance industry's two principal companies along with China Aviation Industry Corp II (AVIC 2) and China National Nuclear Corp have been the most inefficient and some of them are still operating in the red.

To further improve the performance of these conglomerates and to raise much-needed capital to fund their expansion plans, the government is pushing them to introduce modern Western-style management methods and to publicly list their civilian operations. AVIC 2 listed its civilian business on the Hong Kong Stock Exchange in October 2003 in an initial public offering worth around $250 million.

Funding increases

While official Chinese defence spending has increased by more than 10% annually since the early 1990s, funding for weapon procurement and R&D has risen more sharply over the same period. The equipment portion of the official annual defence budget has risen from nearly Rmb5 billion in 1990 to Rmb57.3 billion in 2002, twice the rate of growth of official

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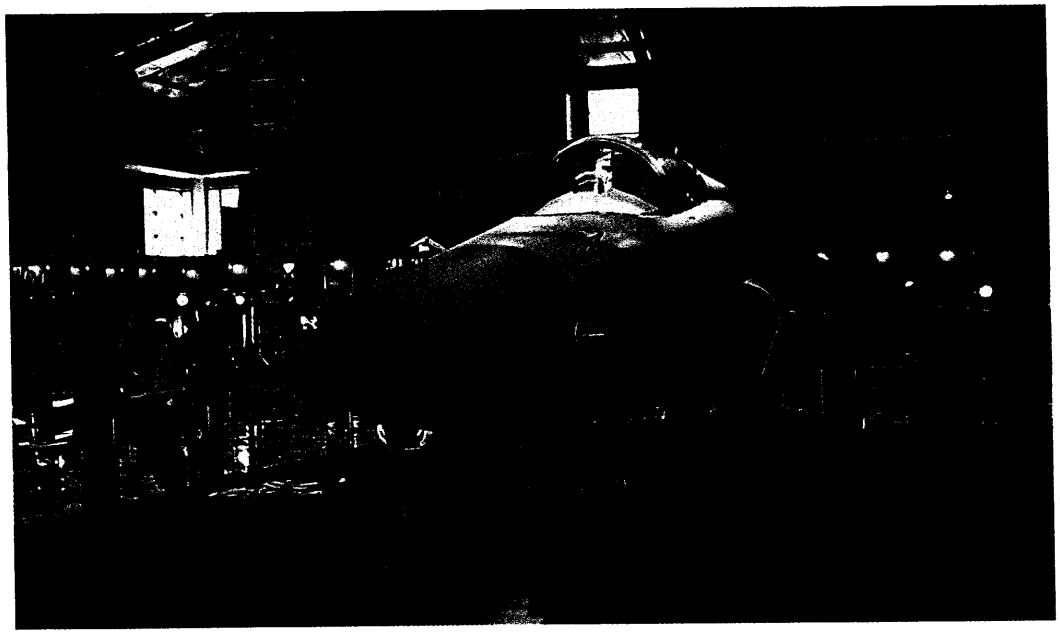

The FC-1 aircraft is a joint project between Chinese and Pakistani industry. Pakistan is due to receive the first of its fighters this year for testing and evaluation

R Karniol/Jane's; 0531542

defence spending. Additionally, the equipment budget's share of overall defence expenditure during the same period more than doubled from 16.4% to 33.8%.

Spending on defence science and technology R&D is not included in the official defence budget, but it has also likely enjoyed high rates of growth. The government has significantly increased overall R&D spending, which also includes funds for defence R&D, since the mid-1990s. Gross expenditure on R&D more than doubled from Rmb35 billion in 1995, or 0.6% of Gross Domestic Product, to Rmb90 billion in 2000, equivalent to 1% of GDP.

To improve efficiency in the use of these funds, the number of projects has been significantly reduced. Also organisations receiving allocations were forced to improve their financial management to prevent corruption and abuses.

A key reason for the defence industry's dismal track record in the development of new weapon systems was that R&D allocations were spread too thinly and crucial programmes often lacked sufficient funding.

Continuing reforms have led to a marked improvement in the defence industry's ability to successfully complete or make major progress in the development of a number of key projects across key industrial sectors in the past couple of years. Many of these programmes date back to the 1980s and early 1990s and their development was often hampered by technical, management and funding problems.

Aviation

The aviation industry has begun to finalise development and will soon, or has already started, small-scale production of several combat aircraft types, including the Chengdu F-10 fighter, the Xian FB-7 fighter-bomber and the Chengdu FC-1/JF-17 light fighter.

The F-10A is earmarked to be the mainstay of the PLA Air Force's (PLAAF's) combat fleet and is expected to enter into operational service in the next few years. The PLAAF has an initial requirement for around 200 aircraft, but this could expand depending on the progress of the next-generation J-X fighter, which is reportedly in the design concept stage.

The FC-1 Fierce Dragon made its debut flight in late August and is a joint project between the Chinese and Pakistani aviation industries, with substantial Russian technological support. The FC-1 project was originally conceived in the late 1980s but floundered because of a lack of funding and interest from prospective customers such as the PLAAF.

It was only revived after the Pakistan Air Force selected it as a low-cost replacement for its Shenyang F-6 fighter. As the PLAAF's interest in the FC-1 is uncertain, Chengdu Aviation Corp, which has invested heavily in the project, is keen to export the fighter, which is scheduled to begin production in the next two or three years.

After encountering initial teething problems in the licensed production of the Su-27 air-superiority fighter, Shenyang Aircraft Corp is now reaching a peak output of 15 aircraft annually. An increasing proportion of the aircraft, especially the airframes, is being manufactured locally rather than being assembled from kits.

The aviation industry's Achilles heel has been its failure to develop sufficiently reliable and powerful military power plants. Major progress, however, appears to have been made in the past couple of years to produce turbojet and turbofan systems that will power the PLAAF's new and next-generation combat fleet.

The Kunlun II turbojet engine is reportedly the first turbojet engine to have been developed indigenously by the Chinese aviation industry and is being promoted as the principal new-generation power plant for the PLAAF's F-7 and F-8 fighter fleets. The engine, which took nearly 20 years to develop by the Shenyang Aero-Engine Research Institute and the Shenyang Liming Aero-Engine Co, passed military design acceptance tests in mid-2002 and began to enter into limited production in early 2003.

Around 40 key technologies, materials and manufacturing techniques were developed to produce the Kunlun II engine. By international standards, though, the Kunlun II lags as much as two generations behind the latest engine technologies developed by the US, Russian and West European defence industries.

The WS-9 Qinling turbofan engine is another jet fighter power plant that passed certification

Technology drive

In its efforts to catch up with the West, China's defence industry is relying increasingly on the civilian economy for key technologies, capital and innovation and technology in manufacturing processes, especially in those sectors – electronics, information technology (IT) and telecommunications – associated with the revolution in military affairs.

A new defence electronics conglomerate, China Electronics Technology Group, was established in 2002 to spearhead the development of the country's fledgling defence-related IT capabilities.

The defence industry and PLA have also forged close ties with the country's leading civilian IT firms so as to cultivate home-grown champions able to compete with their foreign rivals.

The country's leading IT hardware companies such as Huawei, Zhongxing and Datang, which produce telecommunications switching, routing and transmission equipment, have become important suppliers and project partners with the PLA and the defence industry.

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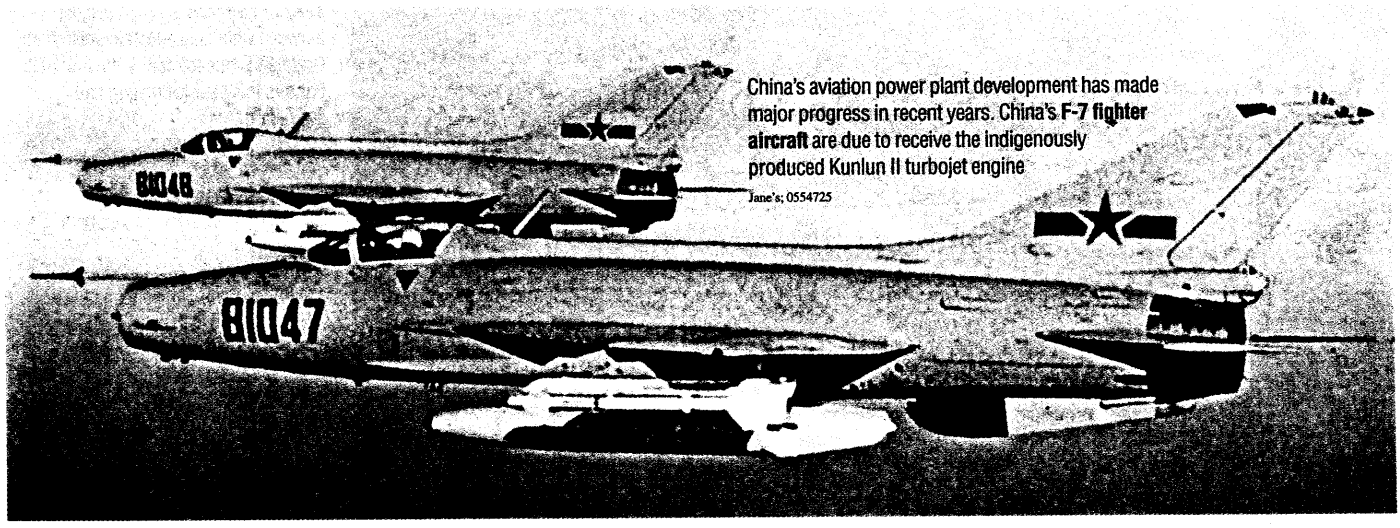


China's aviation power plant development has made major progress in recent years. China's **F-7 fighter aircraft** are due to receive the indigenously produced Kunlun II turbojet engine

Jane's; 0554725

tests in mid-2003 and is scheduled to go into production soon.

Developed by Xian Aviation Engine Corp, much of the WS-9's technology is believed to be based on the Rolls-Royce Spey Mk 202 engine. The WS-9 is be installed on the JH-7 and the improved JH-7A Flying Leopard II fighter bomber aircraft flown by the PLA Navy's (PLAN's) air arm.

The aviation industry's main long-term hope appears to rest on the WS-10A turbofan engine, also being developed by Shenyang Liming. The WS-10 is claimed to be comparable in technological and performance capabilities to the Russian AL31FN engine that powers the Su-27 and other frontline Russian combat aircraft.

The WS-10 was originally intended to power the F-10, but it appears that the engine will not be ready for production for at least several more years. As a result, China will rely on Russia to supply AL31FNs for the F-10 in the interim.

Naval shipbuilding

China is developing a new generation of conventional and nuclear attack and missile submarines to replace the PLAN's outdated Ming-class conventionally powered submarines (SSs), first-generation Han-class nuclear-powered submarines (SSNs) and Xia-class nuclear-powered ballistic missile submarines.

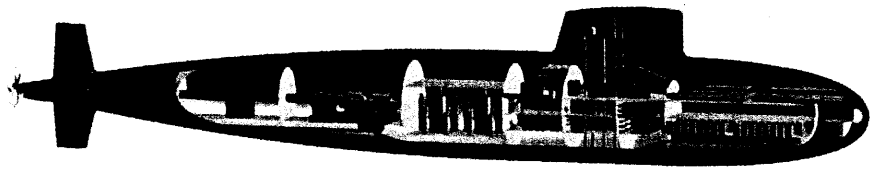
The first hull of the new-generation Type 093 SSN, equivalent to the US Navy's first-generation Los Angeles-class SSN, was reportedly launched in 2002 and is expected to enter service in 2004-05. The Chinese are believed to have received Russian assistance in the development of the submarine, such as with quietening technology.

Four vessels of the indigenously developed Song-class SSs have so far been built. The initial development of the Song encountered significant design and engineering problems, especially related to propulsion, but they appear to have been resolved and the vessels are now in serial production. Nonetheless, the PLAN placed orders with Russia for eight Project 636 Kilo-class submarines in 2002, which will be delivered by 2005.

An improved version of the Luhai-class destroyer has been developed by the Chinese shipbuilding industry that is reportedly equipped with stealth features and a long-range area air-defence missile system. This has been compared to the early models of the US Aegis-class cruiser. Two vessels are under construction in the Jiangnan Shipyard in Shanghai and their weapon systems are reported to be similar to the Sovremenny-class missile destroyers that the PLAN has acquired from Russia.

Space and missiles

The defence industry's development and production of ballistic, tactical, cruise and other types of missiles have made rapid progress since the late 1990s. Several new models of



Above: A **Type 093 nuclear-powered attack submarine** is expected to enter service with the PLAN next year

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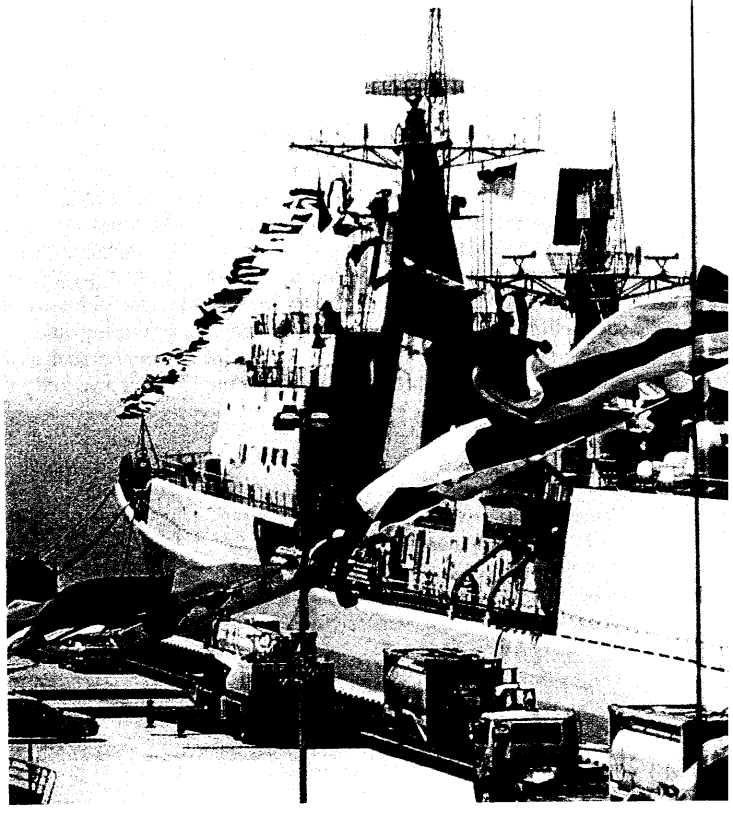
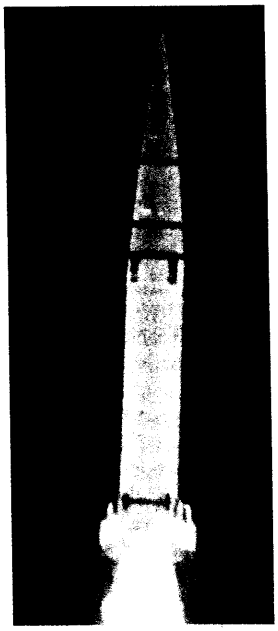


Right: The Chinese shipbuilding industry has upgraded the **Luhai-class destroyer *Shenzhen*** to include stealth features and a long-range area self-defence missile system

K Shaw/Jane's; 0560381

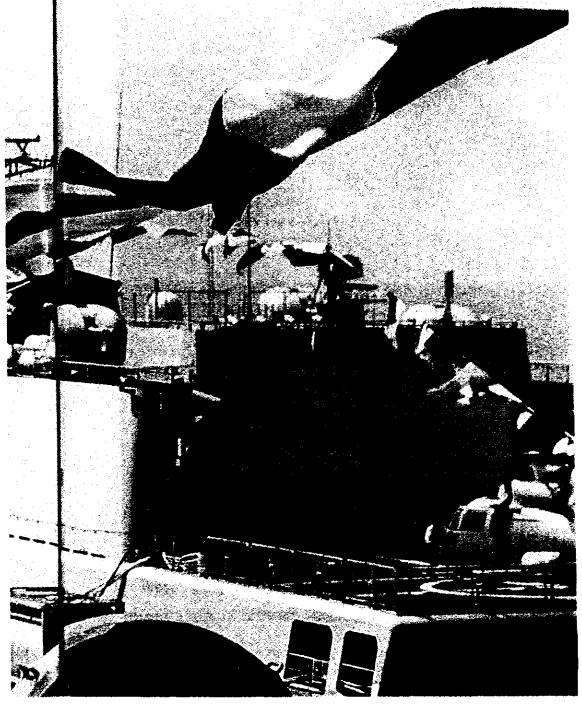


A Chinese **M-9 short-range ballistic missile.** The industry has made rapid progress since the 1990s

Jane's; 0036888

intercontinental ballistic missiles (ICBMs), M-series tactical battlefield missiles, cruise missiles and air-to-air missiles are under development. This includes the three-stage solid-propellant Dong Feng-31 ICBM, which is forecast to enter service in the next few years, and a submarine-launched version: the Julang 1.

The US Department of Defense estimated in 2003 that the PLA had deployed around 450 short-range ballistic missiles in the Nanjing Military Region, consisting of CSS-6 and CSS-7 models, and is developing improved variants with satellite-aided navigation for use against targets in Taiwan and Okinawa.



The space, aviation and electronics industries have been developing satellites and other electronic intelligence and reconnaissance systems to fill a major gap in the PLA's strategic intelligence-gathering and surveillance capabilities, especially to monitor potential troublespots such as the Taiwan Strait and Spratly Islands.

Key projects being undertaken domestically and with foreign co-operation include long-range airborne surveillance aircraft, airborne warning and air-control systems and high-resolution reconnaissance and navigation satellites with advanced optical and radar technologies.

PLA strategists and the defence industry are carefully studying the development of information warfare capabilities and other new technologies being pursued by the US and other major powers. The development of Chinese information-warfare capabilities has been slow because of limited funding and the continuing priority on the modernisation of conventional force capabilities.

Information-warfare-related R&D work has been taking place in a number of areas, including Internet warfare, especially the creation of hacking tools to break into civilian and military networks, upgrading the protection of key domestic communications networks and the development of jamming, laser and other offensive technologies.

New challenges

The rapid development in information-based warfare is having a far-reaching impact within Chinese military and defence science and technology decision-making circles. At the 16th Party Congress in November 2003, Central Military Commission chairman Jiang Zemin called for the fulfilment of the "dual task of building mechanisation and informationisation" of the country's armed forces.

This means that the building of information systems and systems integration technology will be accorded the same priority as the development of conventional weapons systems. Information systems technology includes command, control, communications, computing, intelligence and information systems, information security capabilities, communications networking and switching infrastructure, high-performance computing and software capabilities.

Despite these high-level pronouncements about the importance of information-based warfare, the PLA has yet to develop a formal military doctrine to guide the development of capabilities and operations in this area. Some analysts have pointed to an emerging aspirational 'active offence' doctrine of achieving information superiority through the use of electronic warfare, computer network operations, psychological warfare and intelligence gathering.

Many of these concepts are based on foreign thinking, especially US military doctrinal publications on information operations, although there is selective use of ancient and modern Chinese strategic ideas, especially related to issues such as asymmetric conflict.

While the PLA is beginning to grapple with how to incorporate information warfare and information operations into its missions, the defence industry is ill-prepared to respond quickly or effectively to this adjustment in military modernisation priorities. The overwhelming focus for the defence industry has been the development of conventional weapon systems. While the aviation and space industries have sought to build up their capabilities in information and high-technology capabilities, especially electronics systems, the rest of the defence industry has only made limited efforts to develop capabilities in this sector.

The next step

After declaring its success in achieving the initial goals of the restructuring, COSTIND has set its sights on more ambitious targets for the defence industry's long-term growth. At the beginning of 2003, COSTIND put forward new objectives for the development of the defence industry over the next 20 years. They included:

- Catching up with the technological standards of the world's leading arms producers;
- Quadrupling the defence industry's aggregate economic output;
- Establishing a new R&D and production system focused on civilian-military integration;
- Adapting management and operational mechanisms to the country's socialist market economy; and
- Making additional breakthroughs in institutional reform and further adjusting the size and structure of the defence industry.

These targets reflect a different approach to the management and operation of the defence industry from the previous closed state planning system. The more open, flexible and partially market-based structure reflects the increasingly strong influence of civilian initiatives as well as concepts and practices borrowed from overseas, especially from the West.

Whether COSTIND will survive to oversee the completion of this development strategy is unclear. The organisational and administrative restructuring since the late 1990s has certainly led to the improved performance of the defence industrial complex, but some analysts argue that COSTIND's contribution to this success has been limited. There is currently a debate within military and defence industrial circles calling for COSTIND's abolition within the next few years and dividing its responsibilities and functions between the GAD and the Ministry of Science and Technology.

Compiled by JDW staff