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Engaging China Series

China's Aviation Dream

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Engaging China: Aviation and Space Technology

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Introduction

There is not much written about the Aviation and Space Technologies that have been pursued by China in the past three decades – technologies which have deep impact on international relations, international security and strategic balance globally. Suffice to say that in both these sectors which includes civil aviation too which has the proven capability to increase the potential power of the air force of any country, China has shown remarkable ingenuity to strategize the process of reverse engineering as a platform for basic research, bypass the generic process of R&D from scratch by ignoring the international norms of patents on one side and throwing to the winds any regards to intellectual property rights which is followed internationally globally. To develop the soft power to bridge the gap between the realm of ideas and startups in any field, China brazenly copied every publication anywhere in the world rather than even paying for any published material whether it related to the field of social sciences, science or technology. China replicated instruments and laboratories from across the world, sent their personnel from all branches of their administration and those from their universities to global counterpart institutions, organizations and universities. China penetrated the very bastion of research and development projects, paid in cash to the research scientists in every field with implanted research assistants under those very research staff globally. The latest cases which have come to light is related to bio-technology research having significant relationship to develop bio-weapons. The research formulations and advancement being pursued in understanding the COVID-19 strain of virus was one of the key targets of China.

In Cyber area, China is well advanced as compared to the most advance country in the world. They can today boast to be the poor First if not the second best in the world. China is the only nation state in amongst the 215 nation state which has two sets of official “National Interest”. The first, at global international level and the Second, at domestic internal level. The first is to further her position as a Rising Power and second to further consolidate and integrate all acquired territories plus push the geographical limits of the acquired territories during the centuries by a strategy of salami slicing across the undermarketed/contestable international borders spilling over to those territories where China could prove to have received tributes in the historical past.

Chinese government sponsored hackers have been hacking into every adversary’s digital system and has created the most sophisticated information gathering protocols second to none in the rest of the world. The U S Homeland Security has observed recently that Chinese group APT41 has carried out "one of the broadest campaigns by a Chinese cyber espionage actor we have observed in recent years." At the same time China realized the necessity to protect her own systems of communications especially as she graduated in the fields of aviation and space technologies from being compromised. One thus sees that by 2016, China had achieved remarkable advancements in Quantum Computation and Quantum Communication. Today China’s quantum satellite has already enabled the first totally secure long-range messages.

China’s insatiable hunger to reestablish the “middle kingdom” and displace the existing super powers and hence change the global fulcrum to China continues unabated while they profess that rise of China is peaceful and China has no ambitions to be a Hegemone.

It is about time that serious research is undertaken to understand the basic trends so that future research can lead to fathom out the ultimate motivation of China in the field of Aviation and Space technologies – technologies which will prove to be the game changers in game of power in the twenty-first century. This research output is to put together China's efforts in these two areas despite the enormous lack of information which poses a challenge to every researcher around the world.

Observations

The main observations that comes out as corollary to this research endeavour is as follows:

- China is well on its way to fill up Superpower leadership vacuum left by the US
- China has gained enormously due to globalization
- China's progress in Aviation and Space Technologies has the potential to destabilize the world order.
- China's Civil Aviation industry has the potential to capture the less developed market in a major way.
- China's Space Technology and its related infrastructure will play a major role to capture the communication sector worldwide. They have the potential to provide affordable products even in basic key areas of microchips and Apps to capture the world market.
- Space still being undermarketed and in the absence of international space law, China will think far ahead to monopolize space where mineral rich asteroids can be economically harvested for rare minerals.

- Space technology and constant improvement on it will allow China to weaponize space as no other country has done so far.
- Weaponizing Space will allow China to use precision guided weapons both conventional and nuclear in an offensive way.
- China knows that it cannot dominate the SEA but can always look forward to dominate space to counter the argument that "one who rules the sea rules the world" to the new norm "one who dominates space dominates the world". The philosophy of this strategy can be termed as "look down strategy to strategize tactics for containing local, regional and global conflicts"
- China knows that a dominating space capability gives her enormous ability to physical surveillance of any part of the world in real time. This capability in the hands of a power (China) which has consistently displayed hegemonic intentions can be very dangerous for the world and for the international system.
- In the aviation sector and especially in the military aviation sector, China is already capable of manufacturing the heaviest transport aircrafts. Though they brought the technology from the Russians, these heavy transports can carry up to 250 tons. China is well on its way to optimize the possibility of transporting special forces and conventional forces with all supporting systems over long distances which could be intercontinental in nature. Should China be able to operationalize such a capacity in near future, it will certainly destabilize the existing balance of power globally in a significant way.

Recommendations

- A net Analysis of China's Aviation and Space Technology capabilities needs to be done urgently.
- Chinese Capability to weaponize SPACE needs to be assessed.
- China's capability in Quantum Computing and Quantum Communication needs to be seriously taken note of as a threat to national security of every nation state. Though in the Indian budget of 2019, specific budgetary allocation has been made to advance research in quantum area, it is yet to take off sufficiently to counter the Chinese threat.
- Database on Military Airlift capability of China needs to be made. This can be done from existing reports of SIPRI, IISS and US CIA.
- Continuous monitoring and examining the Chinese White Papers on National Security Strategy to get the indication of Chinese intension.

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China's Defence Industry

China's defence-industrial sector[1] is being transformed by reforms introduced in the interest of enhancing its competitiveness and capacity to meet the ambitious conventional arms requirements of the People's Liberation Army (PLA). China's defence-industrial base is becoming more decentralized, with increasing scope for local state-owned enterprises (SOEs) and privately owned enterprises to contribute to research and development (R&D) and production. This chapter assesses the long-term implications of this structural transformation. The progressive 'marketisation' of R&D and production is strengthening China's capacity for sustained defence-industrial development and helping to narrow its capability gap with major industrialized states, but ingrained attitudes and procedures and enduring concern about the political implications of defence-industrial dependence limit the scope for structural reform. China is not in a position to exploit the full defence potential of its impressive industrial and technological progress in the near term, but its long-term prospects are more positive.

Defence-industrial development in China

Defence-industrial development has figured prominently in China's efforts to enhance its security in the face of perceived threats to its sovereignty, territorial integrity and national interests. The development of indigenous defence industries capable of supplying modern arms constituted a central pillar of the self-strengthening movement pursued by the Qing Dynasty in the late nineteenth and early twentieth centuries. Similar efforts were a feature of the 1916–28 'warlord period', when competing military leaders struggled for local and national power, and the Nationalist Government of the Republic of China devoted considerable resources to defence-industrial development during World War II.

The new Chinese Government moved quickly to restore and expand the defence-industrial base after 1949. Technological development 'to serve construction of…national defense' was enshrined in Article 43 of the Common Program of 1950, which constituted the initial de facto constitution of the People's Republic of China (Wang 1993:37). By 1950, the defence-industrial sector encompassed 45 factories employing some 100 000 workers (Shambaugh 2002:226). By the end of the decade,

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[1] A New Direction for China's Defense Industry - RAND Corporation Report available at **www.rand.org/content/dam/rand/pubs/.../2005/RAND_MG334.pdf** **also see**

Richard A. Bitzinger and J. D. Kenneth Boutin, China's defence industries: change and continuity, Chapter 10, Rising China: Power and Reassurance, available at http://press.anu.edu.au/wp-content/uploads/2011/05/ch1014.pdf

China was self-sufficient in terms of a comprehensive range of arms required by the land, air and naval branches of the PLA, with notable exceptions such as major surface combatants and long-range strike aircraft. Though the level of support for defence R&D and production has waxed and waned under the People's Republic and there have been a number of major policy shifts, the need to maintain key defence-industrial capabilities has never been in doubt.

The established Chinese defence-industrial model

China's post-1949 defence-industrial model was broadly similar to that of the Soviet Union. Defence-industrial activity was the exclusive domain of the State and China's defence-industrial base featured highly centralized control and a very bureaucratic structure. All arms production undertaken by SOEs and defence-related R&D were either allocated to a research institute answering to one of the Ministries of Machine Building responsible for various aspects of China's arms programs or undertaken by academic institutions that answered to the State. There was no apparent requirement to ensure that arms production was economically viable, though the substantial arms requirements of the PLA undoubtedly often resulted in considerable economies of scale. Since the 1950s, for example, China has produced more than 14 000 military aircraft and 50 000 aircraft engines, mostly for the PLA (Matthews and Bo 2002:36). The absence of a profit motive meant that no resources were devoted to developing arms tailored to the particular requirements of export customers.[2]

Where the Chinese defence-industrial model differed from that of the Soviet Union was with respect to the importance attached to technological progress. Defence R&D and production in China were characterised by

[2] RESHAPING THE PEOPLE'S LIBERATION ARMY SINCE THE 18TH PARTY CONGRESS, Report of a conference organised by: The China Programme and the Military Transformations Programme, Institute of Defence and Strategic Studies (IDSS), S. Rajaratnam School of International Studies (RSIS), Nanyang Technological University (NTU), Singapore 1-2 October 2015 available at https://www.rsis.edu.sg/wp-content/uploads/2016/01/ER160105_Reshaping-the-PLA.pdf
Ian E. Rinehart , David Gitter, The Chinese Military: Overview and Issues for Congress, Congressional Research Service Report, September 18, 2015 available at https://www.fas.org/sgp/crs/row/R44196.pdf
OFFICE OF THE SECRETARY OF DEFENSE ,ANNUAL REPORT TO CONGRESS, Military and Security Developments Involving the People's Republic of China 2015, available at http://www.defense.gov/Portals/1/Documents/pubs/2015_China_Military_Power_Report.pdf
Franz-Stefan Gady , China Wants to Reform its Defense Industry, June 10, 2015 available at http://thediplomat.com/2015/06/china-wants-to-reform-its-defense-industry/
http://www.rand.org/content/dam/rand/pubs/research_reports/RR800/RR893/RAND_RR893.pdf
(access denied to me)
Deloitte's Global Defense Outlook 2015 Defense and Development, available at https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Public-Sector/gx-2015-deloitte-global-defense-outlook.pdf

modest technological objectives. While the Soviet defence industry was geared to the requirements of providing a comprehensive range of arms that was relatively technologically advanced, if not necessarily on a par with comparable Western systems, China's sights were set on much less ambitious requirements. At no point did China strive to even approach foreign arms in qualitative terms, choosing instead to focus on the large-scale production of relatively unsophisticated arms. The Chinese defence industry established a reputation for the quantity of production of arms that were obsolescent, if not obsolete, and for progressing to new product generations long after their introduction elsewhere. (10)

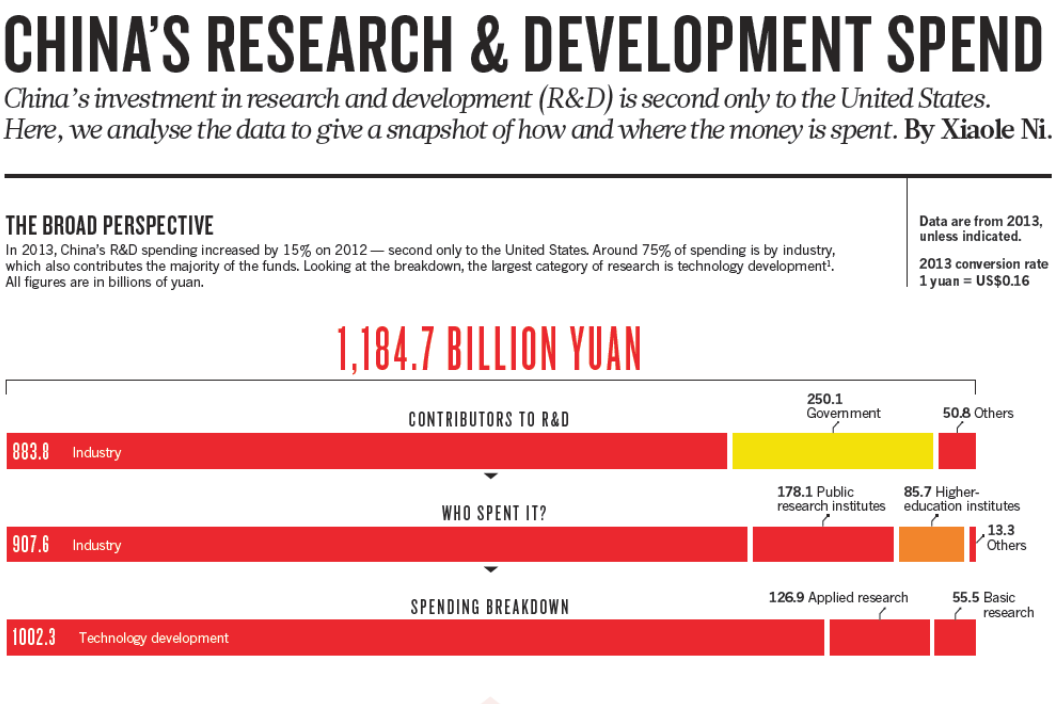
Defence industrialisation and autonomy

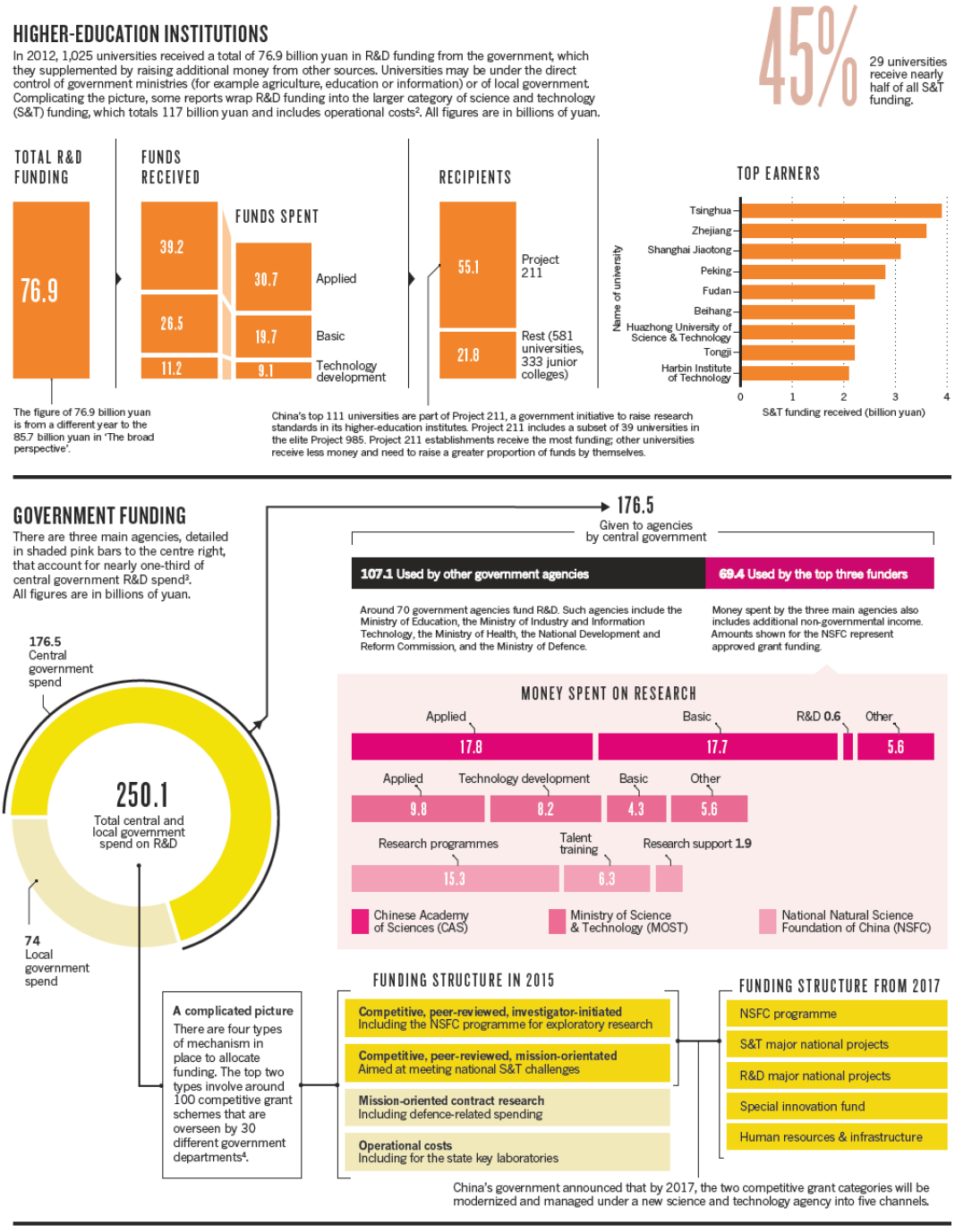
The objective of autonomy has been central to Chinese defence industrialisation. In this, China is by no means unique, but the form that this takes here has been distinct and reflects China's particular security imperatives and policy objectives. These have been conditioned by its past difficulties in securing arms supplies and by the ideological basis of the ruling Chinese Communist Party. China was the subject of a Western arms embargo between the early 1950s and 1980s and, after 1960, was the target of what effectively constituted a Soviet arms embargo as well. The characteristic features of China's established defence-industrial model testify to the importance attached to self-reliance ('*zili gengsheng*'), which is seen in China as an 'indispensable component…of national security' (Park and Park 1988:119). China long pursued a general developmental approach summed up by the slogan of 'walking on two legs. This emphasized the importance of relying on China's own capabilities, regardless of the level of efficiency or even the effectiveness that this involved.

The defence-industrial strategy of the People's Republic has been distinguished by the dedication and persistence with which the objective of autonomy has been pursued. In many states, practical efforts to promote defence-industrial autonomy are restricted to production capacity, but in China the long-term development of autonomy with respect to R&D and production is considered crucial. This has involved developing and maintaining a capacity to supply the complete range of arms required by the PLA, including in terms of the local production of all arms components. Studies of the Chinese defence industry generally sees its defence industrialisation as being driven by the objective of maximizing self-sufficiency (see, for example, Schambaugh 2002:226). It is noteworthy, for example, that China moved to reconstitute its defence-industrial capabilities in the 1950s despite its success in securing large-scale arms transfers from the Soviet Union. China developed its defence industries as

a means of ensuring a domestic capacity to meet the material requirements of the PLA. Interest in providing arms as military assistance to friendly states constituted an objective of secondary importance, and there was no apparent interest in the commercial opportunities of arms exports until the 1980s, when China emerged as a major supplier of arms to the Middle East.

The importance attached to defence-industrial autonomy was manifest in the relative isolation of Chinese R&D processes. Defence-related R&D in China did benefit from foreign input, but technological flows were unidirectional and did not involve arrangements that had the potential to generate long-term dependent ties, including collaborative R&D arrangements. This included technology transfers from the Soviet Union during the 1950s. After the termination of Soviet defence-industrial support in 1960, China continued to exploit foreign sources of arms-related technology, but this was limited to the reverse engineering of arms and components, either in terms of the outright copying of foreign designs or the derivation of technological insights contributing to the development of more advanced arms in China. This involved the opportunistic exploitation of opportunities as they arose, rather than any regularized ties. Only towards the end of the Cold War did China supplement such efforts with selective purchases of technology and subsystems from other states. Until recently, none of China's external defence-industrial arrangements threatened its efforts to maintain independent arms R&D and production capabilities.





The effective isolation of China's defence-industrial base eliminated the prospect of dependence on potential adversaries, which China had been unable to overcome despite its best efforts during the self-strengthening movement.

China's defence-industrial approach came at some cost. China's reluctance to engage other states on defence-industrial issues other than the terms

that it did was inherently limiting in qualitative terms, particularly given China's relatively low technological base and the limited resources it was in a position to devote to defence-industrial development. That China was able to meet its defence-industrial needs with so little foreign support was due in large part to its unique arms requirements. For most of the history of the People's Republic, China pursued a strategy of 'people's war', which emphasized drawing an attacker deep into the Chinese hinterland, where superior numbers and geography could be exploited to China's advantage. This approach obviated the requirement for conventional arms that were on a qualitative par with those of China's potential adversaries. This factor, along with the difficulty involved in supplying China's large military establishment with sophisticated arms and developing the logistical capacity to support them, meant that less-advanced arms that were within the developmental and production capacity of Chinese industry were sufficient.

Even so, China struggled to meet its limited requirements in terms of more complex categories of arms such as combat aircraft. Here, while there was progress in absolute terms, in relative terms China's defence-industrial capacity regressed over time. The 1960s saw China producing the J-6 fighter, which was a derivative of the early 1950s-vintage Soviet MiG-19, but 20 years later it had advanced only to the point where it was producing the J-7, based on the Soviet MiG-21 design from the late 1950s. While the leap involved in progressing from the technological generation of the MiG-19 to that of the MiG-21 was considerable, its failure to advance further than this meant that China steadily fell behind its potential adversaries. China's struggle to advance technologically in areas such as aerospace was exacerbated by the severe anti-intellectualism of the Cultural Revolution, which saw the closure of many academic institutions.

China's defence-industrial approach came under threat only when it became apparent that it was incapable of meeting its changing arms requirements, which resulted from its evolving military strategy. By the 1980s, the utility of the strategy of people's war was being questioned. Its limitations were demonstrated by the Gulf War of 1990–91, when American-led forces soundly defeated numerically superior, relatively well-equipped Iraqi forces within a matter of days. This highlighted the potential conferred by conventional military capabilities that were beyond the scope of China's defence industries to support.

China's Military Modernization

China's military modernization shows how that country's People's Liberation Army (PLA, the term embraces navy and air force, too) has transformed into a top-rung, largely indigenously equipped force in barely a decade, even as India's military languishes as the world's biggest importer of defence equipment.

Both China and India were "catch-up countries", attempting a technological leapfrog by taking just decades to reach a technology level that Western countries had taken more than a century to achieve. China still trails the US and western European powers, but is catching up fast, powered by an official science & technology (S&T) roadmap that the leadership backs. From a global innovativeness ranking of 24 in 2004, China jumped to six in 2009. It now targets fifth place by 2020, with global leadership in the high-tech arenas of space, nuclear, information technology and biotechnology. By 2040-50, China aims at S&T parity with the US.

"Until the late 1990s, the Chinese approach to defence S&T was in a much worse state than what India is in today. They have been able to deal with a lot of these issues in the last decade alone," says Tai.

The change

Nevertheless, China's defence industry has achieved major recent successes, triggered by its restructuring at the end of the 20th century. Earlier, the Chinese defence industry was separated, Soviet style, between research and development (R&D) and manufacturing units. When the R&D developed a product, the defence industrial ministry — called the Commission for Science, Technology and Industry for National Defence (Costin) —would assign a factory to build the equipment. But when the factory got the blueprints, there was confusion because they had not been involved in the design.

The Chinese leadership saw that this did not help the national interest; it only helped the defence industry. One of the first reforms was to overturn the power of Costin and allow the military a central role in overseeing the defence industry. If you don't have end-users, particularly war fighters and the acquisitions community, playing a central role, then you're not going to have innovation. If you're just going to have industry administrators, then they are going to be looking just at their interests,

The result has been surging growth in the innovativeness of Chinese defence industry. In 1998, they filed for 313 patents. In 2008, it had gone up to 11,000 patents. In 2010, 15,000 patents were applied for.

India's defence industry today mirrors its Chinese counterpart in 1998. The R&D element (the DRDO) functions separately from the manufacturing element (the defence PSUs). India's military has little say, and no oversight, in what is researched and manufactured. And the Indian ministry of defence's department of defence production is an accurate mirror image of China's Costin, pushing back the innovative private sector to safeguard the interests of the state-owned enterprises.

Role of Chinese Private Sector in Defence Industry

In an "unprecedented move" China has opened its arms industry to private sector to optimise its hefty $132 billion defence budget and modernise the army[3]. The People's Liberation Army (PLA) is inviting private enterprises to bid on its training-related contracts, a move to optimise the military budget, official media reported today.

The PLA General Staff Headquarters recently published 108 military items for "advanced training technologies and equipment", encouraging private companies to take part in their research, development and manufacturing. The move indicates that the military is moving away from a monopoly of state-owned defence contractors in training logistics and lowering the eligibility threshold for military procurement, the official PLA Daily reported. It said that as the PLA makes its combat exercises more realistic,

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[3] China Opens 108 Defence Products to Private Sector Participation, November 27, 2014 Available at http://www.defenseworld.net/news/11599/China_Opens_108_Defence_Products_to_Private_Sector_Participation
James Mulvenon, Rebecca Samm Tyroler-Cooper , China's Defense Industry on the Path of Reform Prepared for The US-China Economic and Security Review Commission Prepared by: October 2009 available at http://www.dtic.mil/dtic/tr/fulltext/u2/a523026.pdf

Richard A Bitzinger, The Modern Defense Industry : Political, Economic and Technical Issues, Praeger Security International, 2009.
China opens its defence equipment production to private sector, Nov 26, 2014 available at http://articles.economictimes.indiatimes.com/2014-11-26/news/56490695_1_defence-budget-pla-daily-pla-national-defence-university
Richard A. Bitzinger and J. D. Kenneth Boutin , China's defence industries: change and continuity, Rising China: Power and Reassurance, available at http://press.anu.edu.au/wp-content/uploads/2011/05/ch1014.pdf
China Attempts to Leverage Its Private Sector to Increase Its Military Might, January 27, 2015, available at https://brandeisear.wordpress.com/2015/01/27/china-attempts-to-leverage-its-private-sector-to-increase-its-military-might/
The Global Arms Industry in 2030 (and Beyond), Report of a Workshop organised by: Military Transformations Programme, Institute of Defence and Strategic Studies (IDSS), S. Rajaratnam School of International Studies (RSIS), Nanyang Technological University (NTU). Singapore S. Rajaratnam School of International Studies 10 November 2014, available at https://www.rsis.edu.sg/wp-content/uploads/2015/01/ER150123_Global_Arms_Industry.pdf

Michael Raska , Back to the Future: China's Defence Industry Innovation Paths , S. Rajaratnam School of International Studies,available at https://www.rsis.edu.sg/wp-content/uploads/2014/11/CO14229.pdf

training technologies and equipment have become increasingly incapable of meeting the military's requirements, so it is necessary to tap into private businesses' expertise.

The 108 items being sought include dummies used by medical personnel and simulators for early warning planes and aircraft carrier operators and technologies such as short-distance wireless positioning and cloud computing.

"These public procurements are unprecedented in their openness, transparency and wide coverage. They will help lift the effectiveness of our military spending and optimise resource distribution, thus boosting the PLA's modernisation drive," the newspaper quoted an unidentified officer from the PLA as saying. According to PLA Daily, 117 defence industry companies and private enterprises have submitted proposals covering 106 of the 108 procurements. The new policy to open up to the private sector through competitive and transparent bidding came in the backdrop of major anti-corruption campaign in which some of the top Generals are being investigated.

Plush with the second highest defence budget after the US, China is currently carrying out a massive modernization drive of its military with constant increase of its defence budgets, which has touched $132 billion. China has been gradually opening the defence market to private enterprises since 2005. By May 2013, more than 500 private companies had received permission to develop and produce weapons or other military equipment for the PLA. A report published by PLA National Defence University in July said that some private companies had even played an important role in the country's top-tier projects including the Shenzhou-10 spacecraft, Chang'e lunar exploration and the CNS Liaoning aircraft carrier.

Currently, businesses bidding for PLA contracts must obtain government-issued licenses on confidentiality and technological capability.

Chinese Showcasing

The 2015 September 2015, military parade, underscore the rapid development of China's indigenous defense industry. Notable missiles on display for the first time in September 2015, included the DF-21D "carrier-killer" anti-ship ballistic missile, the DF-15B short-range ballistic missile, medium-range ballistic missiles such as the DF-16 and DF-21C, intermediate-range ballistic missiles such as the DF-26, DF-5B and DF-31A, and the DF-10 land attack cruise missile.

In theory, these systems enable China to deliver warheads of varying power to predetermined targets, providing a strategic deterrent against any rival. And while actual capability cannot be verified from the parade, analysts agree that the contours and dimensions of the weapons on display suggest that China's defense industry is fast becoming a leading missile producer.[4] Military vehicles carrying DF-21D missiles, also known as the"carrier-killer" are displayed in a military parade at Tiananmen Square in Beijing on September 3, 2015.

Gaps remain[5]

Gaps in capability remain -- most notably in the development of some sophisticated electronic systems and sufficiently reliable and powerful propulsion systems -- but China's defense industry is now producing warships and submarines, land systems and aircraft that provide the Chinese armed forces with a capability edge over most militaries operating in the Asia-Pacific.

Where indigenous capability still falls short, China procures from Russia and, until local industry eventually bridges the gap, it hopes that quantity will overcome quality. Highlighting shortfalls, China's 2015 Defense White Paper called for "independent innovation" and the "sustainable development" of advanced weaponry and equipment. High investment from the state and policies that encourage Chinese companies to access technology from foreign companies (often U.S. corporations) operating in China's commercial sectors support the development of China's defense industry. However, the industry needs to become more efficient: eradicate areas of duplication, fragmentation, ineffective production methods, and antiquated controls that thwart entrepreneurship.

The myriad enterprises involved in developing jet engines, for example, is only likely to have hindered advances. Military vehicles carrying DF-31A missiles are displayed in a military parade at Tiananmen Square in Beijing on September 3, 2015.

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[4] China‘s Growth through technological convergence and innovation, china 2030 available at http://www.worldbank.org/content/dam/Worldbank/document/SR2--161-228.pdf

[5] China's Incomplete Military Transformation - RAND Corporation Report...Available at www.rand.org/content/dam/rand/pubs/research.../RAND_RR893.pdf
Michael S. Chase, Jeffrey Engstrom, Tai Ming Cheung, Kristen A. Gunness, Scott Warren Harold, Susan Puska, Samuel K. Berkowitz, China’s Incomplete Military Transformation Assessing the Weaknesses of the People’s Liberation Army (PLA), Rand Corporation Report available at http://www.uscc.gov/sites/default/files/Research/China's%20Incomplete%20Military%20Transformation_2.11.15.pdf

Private Sector Expansion

China also wants to promote the growth of the private sector, and to encourage state-owned defense corporations to list assets on Chinese stock exchanges to boost accountability, innovation and respond quicker to market demands. Leveraging of commercial technologies for defense industrial gains is referred to by analysts as China's civil-military integration (CMI) policy. Partly in response to Western arms sanctions, the CMI strategy aims to transfer applicable dual-use technologies and techniques from commercial sectors to military programs. China's lucrative commercial aerospace sector has been a major facilitator of the CMI program and is thought to have provided China's defense industry with technologies related to radar-absorbent material, avionics, system integration techniques and flight controls.

Long way to go

However, there's still a way to go for China's defense industry to close the gap with the world's leading military manufacturers. To date, progress on industrial restructuring has been slow and China's defense industry, particularly research and development, remains fragmented and inefficient. Only a portion of the thousands of defense corporation subsidiaries have been listed, merged or consolidated. The CMI strategy too has failed to overcome lingering technological gaps, resulting in continuing dependency on Russia.

Xi Jinping's administration has recognized the problems and has introduced several policies intended to spur advances in the state-owned sector that has found it difficult to break some technological barriers despite developments in areas such as missiles. However, the main impediment that needs to be overcome is the lack of an overarching body to promote cohesion and integration with national procurement and geopolitical strategies.

Other obstacles relate to the non-competitive nature of defense contracting, which has led to the evolution of China's monopolistic state-run defence corporations, which face little -- if any -- competition and, accordingly, remain largely inefficient. That said, the advances made by China's defense industry over the past decade have been extraordinary. While rapid development over the coming decade will be difficult to

achieve, China -- as demonstrated by Thursday's parade -- remains on course to become one of the world's leading military manufacturers.

China's Military Industrial Complex

When China turned to Russia for supplies of advanced weapons through the 1990s, it kick-started Beijing's military build-up with an immediate boost in firepower.

It also demonstrated the failure of its domestic defense sector which was still turning out obsolete 1950s vintage equipment for the People's Liberation Army from a sprawling network of state-owned arms makers. Now, after more than two decades of soaring military spending, this once backward industry has been transformed -- China is creating its own military-industrial complex, with the private sector taking a leading role. With Tiananmen-era bans on Western military sales to China still in place, an innovative and efficient domestic arms industry is crucial for Beijing as it assembles a modern military force capable of enforcing claims over Taiwan and disputed maritime territories. China has locked horns recently with its Southeast Asian neighbours over conflicting claims to strings of islets in the South China Sea. Tensions have also flared with Japan over uninhabited islands in the East China Sea, even as the United States executes a strategic military pivot towards the Pacific.

Well-funded defense groups have rapidly absorbed the technology and expertise needed to build complex weapons, freeing China from its former heavy reliance on Russian and other foreign equipment, Chinese and Western experts say. "A country's defense sector should reflect the strength of the country's economy," says Wu Da, a portfolio manager at Beijing-based Changsheng Fund Management Co Ltd which invests in listed Chinese defense stocks. But, he adds, the sector is so shrouded in secrecy it's been hard to assess how viable it is. "Some of the Chinese defense groups are already quite strong after so much military spending in recent years but you don't know exactly how well they are doing financially or technologically because China does not want others to know." That could start to change.

INJECTING ASSETS

Beijing is enlisting the private sector[6] to accelerate the rise of its best defense contractors, issuing new guidelines in July aimed at encouraging private investment in a sector traditionally sheltered from competition and public scrutiny.

Listed subsidiaries of top Chinese military contractors now intend to buy at least 20 billion yuan ($3.15 billion) in assets from their state-owned parents in the second half, according to their recent filings with the Shanghai and Shenzhen stock exchanges. This would double the value of military related assets injected into these listed companies since 2007 with more in the pipeline, as Beijing presses ahead with an ambitious program to privatize most of a vast arms industry employing more than a million workers at more than 1,000 state-owned enterprises. The long term goal is to transform some of the leading contractors, such as China State Shipbuilding Corporation (CSSC), Aviation Industry Corporation of China (AVIC) and China Aerospace Science and Industry Corporation into homegrown versions of American giants Lockheed Martin and Northrop Grumman or Britain's BAE Systems.

AVIC, which is aiming to quadruple its sales to one trillion yuan ($157.7 billion) by 2020 from 250 billion yuan in 2011, plans to inject 80 percent of its main businesses into some of its listed companies by the end of next year. Beijing has made repeated calls to speed up listings of all but the most sensitive military businesses. The authorities have also promised to allow public bidding for unclassified and minor defense contracts in a sector that is likely to enjoy strong growth if China continues its sustained military build-up. China's top 10 defense groups with estimated combined assets of 2 trillion yuan ($315 billion) have listed more than 70 subsidiaries, including over 40 with defense-related businesses. About 25 per cent of the assets of the top 10 are now held in the listed companies, according to market analysts.

Some of these stocks have been strong performers. Sustained military outlays and the expectation of asset injections have insulated them from the country's current economic slowdown. They also tend to spike in price at times of increased tension between China and its neighbours over disputed territory. The plan to buy more of their parent's military related assets would allow these listed companies to raise extra funds for research

[6] Yoram Evron, China's Military Procurement in the Reform Era, Routledge Contemporary China Series, Routledge London and New York, 2016.

and development, the companies say. AVIC subsidiary Hafei Aviation Industry Co Ltd plans to issue shares this year to buy 3.3 billion yuan ($520.5 million) in assets from its parent, including helicopter manufacturing companies. "AVIC's injection of (its) helicopter business into the listed company will be a key experiment of China's strategic upgrade and transformation of its domestic defense and science industry," Hafei said in a July prospectus.

CHINA's AVIATION DREAM

China is on the way to Expand Military Reach with a Fleet of the World's Largest Planes

The six-engine aircraft, which can haul more than 250 tons, would help on the civil side as well, Singer said. "It opens all sorts of new frontiers in both commercial and military air transport for China," he said. "A fleet of civilian An-225s could quickly ship heavy, bulky cargo of massive scale ranging from construction equipment to a massive scale of consumer goods." Then there are uses that haven't even been thought of, such as space launch or a mother ship for drones. The deal also deepens the relationship between Ukraine's Antonov and China. Last year, the firm signed a deal to co-produce the An-178, a twin-engine cargo plane. It has also provided design and technical advice on China's Y-20 cargo aircraft project. The Y-

20 bears many similarities to the American, Boeing-made C-17 Globemaster III.

The An-225 is a beast, more than 275 feet long with a wingspan of nearly 300 feet. It's bigger than the Airbus A380 and Boeing 747, the two largest passenger jetliners. In fact, the only plane ever built with a larger wingspan than the Mriya — Ukrainian for dream — is the Hughes H-4 Spruce Goose.(It never became operational)

In addition to carrying space shuttles, the An-225 could carry multiple tanks, such as these four main battle tanks. A Chinese An-225 could not only carry a platoon of China's latest heavy tanks, but also other military cargo like missile launchers and heavy artillery.

For China, the An-225 would open whole new frontiers in commercial and military air transportation. A fleet of civilian An-225s could quickly ship heavy and bulky cargoes of massive scale, ranging from construction equipment to consumer goods. For humanitarian purposes, the An-225 could support disaster relief operations, able to fly in not just large amounts of aid, but also by bringing infrastructure like power generation and water treatment that are normally too big for airlift.

On the military front, the An-225 would provide China with the kind of large and global lift that not even the US has possessed, except by rental. The plane is large enough to carry helicopters, tanks, artillery and ballistic missiles to anywhere in the world, or even other aircraft like smaller fighter jets. The An-225's unparalleled payload could even make it a space launch platform, or the ultimate mothership for drone operations. In many ways, China's build-up of global airlift capabilities mirrors the immense gains it has made in global sealift, investing deeply to reach across the globe in coming year.

China Civil Aviation Capability

Civil airports in mainland China

As of December 2017, there are 229 commercial airports in China. Around 500 airports of all types and sizes were in operation in 2007, about 400 of which had paved runways and about 100 of which had runways of 3,047 m or shorter. There also were 35 heliports in 2007, an increasingly used type of facility. With the additional airports came a proliferation of airlines.

China has the fastest growing passenger air market of any country in the world (by total passenger numbers) and between 2009 and 2014 the number of passengers increased over 47% from 266,293,020 to 390,878,784. In 2014 China was second only to the United States in total numbers of passengers carried.

The first passenger jet built in China, the Comac ARJ-21, has made its first commercial flight[7] with launch customer Chengdu Airlines, from Chengdu

[7] China just flew its first passenger jet.

in central China to Shanghai, a two-hour flight that went reportedly without a hitch, with 70 passengers on the 90-seat twinjet. The new plane "offers valuable experience for China's aviation industry, especially in the large civil aircraft area," Wu Xingshi, the ARJ-21's former chief designer, told the Xinhua news agency. And that's what the jet will end up being: a way for China to gain experience, on the way to possibly competing one day with Western manufacturers of civilian airplanes. But so far till date in 2020, as a commercial proposition, the ARJ-21 is a failure.

Amphibious and Special Forces

The Chinese government has achieved a great deal in terms of modernizing and increasing the capabilities of its armed forces in the past two decades and they are quickly obtaining parity with their counterparts in the West. China has made great strides along the long road to rebuild its military, so that it can compete and excel in the modern battlespace. Much has been written about the fledgling PLAN aircraft carrier program. With one conventional aircraft carrier in service, the Liaoning, and a second carrier being built, China has obviously made the commitment to acquire at least a small aircraft carrier strike capability.

Another important development, perhaps less sensational and headline catching than aircraft carriers, is the growth and modernization of the amphibious capabilities of both the PLA and PLAN. Chinese military strategists realize that naval power, including naval aviation, can project power and can also provide China with the more subtle, yet very effective means of naval power presence in the region. The presence of Chinese naval power in the region can be leveraged to influence advantage in political struggles with its neighbours. Neither naval presence, nor naval power and naval air power can take (or retake) and hold ground, and thus China has decided that a modern and capable amphibious force of sufficient size is a necessary component of its overall maritime strategy. It is significant that this force has doubled in size over the past five years and has been equipped with new, high-tech weaponry and the beginnings of a viable sealift component that can carry it to battle.

The beginnings of the Chinese interest in amphibious warfare dates back to the Korean War and the Peoples Republic of China's efforts to defeat the Kuomintang in the 1950s. In 1953, the PLA established the PLA Marine Corps (PLAMC). Although comprising of two brigades of approximately

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https://www.vice.com/en_us/article/wjaajy/china-just-flew-its-first-passenger-jetand-its-a-clunker

6,000 officers and men, the PLAMC have undergone a continuous transformation since the Taiwan Strait Crises of the 1990s. The force has been equipped with China's most modern and capable small arms and equipment, and utilizes the new generation of ZBD05/ZBD2000 amphibious assault vehicles. In some ways modeled on the USMC, the PLAMC marines are highly trained in all forms of modern warfighting. They are considered a vital component of China's rapid reaction forces, and are thus highly mobile and kept on a heightened state of readiness.

The current force structure of the PLAMC is of two brigades, the 1st Marine Brigade and 164th Marine Brigade. Each brigade consists of one armoured regiment and two marine battalions and various support elements. The PLAMC relies on the high speed of its ZBD05/2000 series vehicles to carry them from offshore amphibious platforms such as the Type 071 LPD. The ZBD05 is the world's fastest armoured amphibious assault vehicle, capable of a top speed of 45kph (27mph) in the water. In addition, PLA marines are skilled in air assault operations, small boat assaults and underwater diving operations.

Although the PLAMC represents a very potent amphibious assault and rapid reaction force, the Chinese political and military leadership realized years ago, that the force is too small to respond to multiple threats across the full scope of China's maritime boundaries, nor large enough to mount a successful invasion of Taiwan. A viable power projection capability in the form of amphibious assault and air assault forces is seen as essential in protecting the nation's interests in Africa, the Indian Ocean, South China Sea and East China Sea, especially as it is confronted by U.S. attempts to contain it.

Starting in 2014, the Chinese high command decided to expand the two established Amphibious Mechanized Infantry Divisions (AMID) to four. The 1st and 86th AMIDs are based in the Nanjing Military Region (Eastern Command), and the 123rd and 124th AMIDs are based in the Guangzhou Military Region (Southern Command). Each division is comparable to a mechanized infantry division in size and establishment. The expansion of the AMIDs gives the PLA a greater amphibious capability that might be required in the near future in deterring regional challenges to Chinese territorial claims in both the South and East China Seas, and providing a viable response to violations of its territorial integrity.

None of China's potential adversaries in the region, other than the United States Navy, have a comparable amphibious warfare force. When combined with the PLAMC, the AMIDS give Chinese diplomacy a very robust practical demonstration of force. Regularly held amphibious exercises showcasing

the growing aptitude of these forces only reinforce this reality. Perhaps the most obvious challenges facing the marines and AMIDs, and a major shortcoming that is in the process of remedy, is the lack of heavy sealift capability to transport these units over long sea voyages and within striking range of their theoretical targets.

CHINA STRATEGIC BOMBER PRODUCTION

The Chinese People's Liberation Army Air Force (PLAAF) is working on developing a new long-range strategic bomber, but there are scant details available about the project. Beijing currently relies on the Xian H-6K cruise missile carrier—which is a highly modernized derivative of the 1950s-era Soviet Tupolev Tu-16 Badger—for long-range strike capability, but the aircraft does not have the ability to penetrate enemy airspace nor does it have the range to attack the U.S. mainland.

"We are now developing a new generation of long-range bomber, and you'll see it in the future," PLAAF chief Gen. Ma Xiaotian said on Sept. 1 at the PLAAF Aviation University in Changchun according to China's Global Times. But Ma offered no further details about the Chinese bomber project.

The fact that Beijing is developing a new bomber should not come as a surprise. A platform that would be capable of carrying a significant payload over great distances would be very useful over the vast reaches of the Pacific theatre because there are few land bases available. Outside the Chinese mainland, Beijing only has a handful of vulnerable artificial island airstrips from which it could try to project its airpower forward. Thus a new

long-range bomber with intercontinental range and a large payload would enable China to threaten U.S. forces at longer ranges.

That could mean using massed bomber formations armed with cruise missiles to attack U.S. carrier strike groups further out to sea than is currently possible with the H-6K—similar to how the Soviet Union planned to attack those vessels using the Tupolev Tu-22M3 Backfire during the Cold War. Alternatively, China could use such an aircraft to strike more distant potential U.S. staging areas such as bases in Hawaii.

Indeed, with sufficient range, payload capability and an appropriate load-out of land-attack cruise missiles, a next-generation Chinese bomber could possibly hold targets within the continental United States at risk. Right now, China has no conventional capability to strike at targets with the continental United States save for cyber-attacks—as the RAND Corporation posited in a recent study. Meanwhile, the United States is unlikely to hold back from strikes against the Chinese mainland in the event of a war.

H-X will almost certainly be aimed at countering American forces in the Western Pacific. China has pursued a strategy of "anti-access, area denial" to keep American aircraft carriers and other major assets from loitering off the coast of Asia. The new bomber will carry air-to-ground missiles, particularly anti-ship cruise missiles to attack aircraft carriers and their escorts. China will use them in conjunction with its "carrier killer" ballistic missiles and attack submarines to create a triple threat that would overwhelm a carrier battle group's defences.

The new bomber will carry cruise missiles instead of conventional bombs, in part because H-X will be expensive to develop and purchase, and flying it directly over a (heavily defended) target would be risky. Unlike the H-6, which carries cruise missiles on its wings, the bomber would carry long-range cruise missiles on internal rotary launchers to preserve its stealth profile. The plane will likely carry at least eight cruise missiles such as the DH-10 in order to overwhelm enemy defences—and justify the bomber's development cost. There are virtually no details available about the new bomber, but we can make some informed guesses. China's bombers are given the prefix "H"—for bomber—so let's think about what a new "H-X" bomber might look like. First of all, the aircraft is not likely to be nuclear-capable. China has a nuclear "No First Use" policy, meaning it won't be the first side in a conflict to use nukes. As a result, it has a nuclear arsenal tied to the idea that the country would survive a first strike without enough nukes left to deal a punishing blow to the enemy. Bombers are vulnerable to surprise attack. Unless China were to keep an expensive force of nuclear

bombers in the air 24/7, then making them nuclear-capable wouldn't be worth it.

While there are no details available about the Chinese bomber project, Beijing could opt for long-range subsonic cruise missile carrier similar to the Boeing B-52 or Tu-95 Bear; a long-range supersonic design similar in concept to the Tupolev Tu-160 Blackjack; or some kind of stealth design similar to the Northrop Grumman B-2 Spirit. Given that China has demonstrated some ability to develop stealth aircraft in the guise of the Chengdu J-20 and Shenyang J-31, it is possible that Beijing will opt for a low observable aircraft design.

However, the problem for China is that its industry has not yet mastered developing and producing reliable jet engines. Beijing seems to be aware of this Achilles' Heel and seems to be intent on rectifying the problem. Indeed, late last month President Xi Jinping established the Aero Engine Corporation of China (AECC) in order to position the rising superpower as a premier developer and manufacturer of gas turbine engines. As the Global Times reported, Chinese premier Li Keqiang has issued written instructions suggesting that breakthroughs in developing advanced turbines engines is a high priority necessary to enhance overall Chinese economic and military power.

While China has not been successful in innovating decent jet propulsion technology just yet, it is only a matter of time before Beijing discovers the secret to developing a producible and reliable jet engine. Once that problem is solved, the Chinese aviation industry—and with it Beijing's military prowess—will grow in leaps and bounds.

CHINA'S AIRBORNE FORCE

Predicting The Future

There are three main observations to note:

- Airborne forces will complement China's strategic military needs.
- China will continue to invest in the development of its airborne forces.
- To enhance their effectiveness, Beijing will focus on upgrading the firepower and strategic mobility of its airborne forces.

China is broadening its military horizons. The country is pursuing its global interests more proactively, driving its military to focus on becoming a more international presence as part of its "active defense" doctrine. As China extends its reach and expands its efforts to defend its interests around the world, the country has had to rely on branches of its armed forces beyond the army, traditionally the dominant branch. To that end, Beijing has poured money into developing its naval and air power and overhauling and modernizing its command and control structure. At the same time, it has worked to enhance its airborne forces.

Meeting a Strategic Need

Beijing's focus on cultivating its airborne forces reflects its strategic needs. China is one of the largest countries in the world, and its borders contain vast swaths of remote territory. Furthermore, since the country is surrounded by potential flashpoints, from its disputed borders with India to its potentially explosive border with North Korea, Beijing can never be sure where its next crisis will erupt. China depends on flexible and mobile forces that can quickly deploy wherever needed, whether to counter an armed invasion or respond to a natural disaster. Airborne forces, which are lightly equipped, well trained and highly mobile, are uniquely suited to that role. Outside the Chinese mainland, China's airborne forces will probably take on a prominent role in managing problems in proximate areas such as the South China Sea or Taiwan. In addition, as China hones its power projection capabilities, airborne forces could prove useful for global missions, such as peacekeeping activities in Africa, evacuation operations and long-range counterterrorism missions.

China has already developed a formidable airborne contingent in its 15th Airborne Corps, an elite force comparable to the United States' XVIII Airborne Corps. The 15th Airborne Corps, composed of three divisions totalling approximately 30,000 men, forms the core of China's strategic reserve and rapid-reaction force and operates under the aegis of the air force (though the Central Military Commission maintains direct command). The corps' troops are some of the best trained in the Chinese military, receiving instruction in parachute jumps, air assault, operations behind enemy lines and combat in diverse environments. In recent years, their training has emphasized rapid deployments to the Tibet region of western China, where India has built up its new Mountain Strike Corps just beyond the border.

What's more, the 15th Airborne Corps has the gear to match its training. In terms of firepower, the corps traditionally receives the best light equipment available to the Chinese military. Since 2003, it has been

equipped with light armoured vehicles that can be dropped from transport aircraft, significantly increasing the firepower available to deployed troops, who could find themselves deep behind enemy lines. Moreover, Beijing remains committed to improving its airborne capabilities: Recent images from China suggest that a new airborne infantry fighting vehicle with better armour and firepower is under development.

Shortcomings

But for all their training and equipment, China's airborne forces lack the strategic air transport necessary to deploy troops efficiently. With limited numbers of Il-76 and Y-8 transport aircraft at its disposal, China can deploy only one division of the 15th Airborne Corps across the country in under 48 hours. Limited transport availability also restricts the stream of supplies to airborne infantry troops after deployment. Since airborne forces are valuable precisely for their ability to deploy rapidly from the air, China's insufficient transportation capacity is a challenge that Beijing will have to overcome.

CHINA'S AIRCRAFT CARRIER ROLE

After much struggle, China finally has the massive naval vessel it always wanted since September 2012. China finally has its very own -- ostensibly functional -- aircraft carrier, named Liaoning.

The Liaoning was originally the Varyag, a Soviet vessel that was purchased by China from Ukraine. After years of retrofitting, as of Sept. 25 the Liaoning is finally entering service in the People's Liberation Army Navy, but its capabilities are largely unproven and sea tests of the ship have stayed close to its home port in Dalian. China's aircraft carrier program was approved in 2004, and has become operational only recently and was reported to be visiting the Indian Ocean Zone as a Carrier Group for the First Time in 2019, and continuing to do so for operational testing.

History of People's Liberation Army Navy(PLAN)

In the past, President Hu Jintao, who also chaired the Central Military Commission, presided over a ceremony at a Dalian naval base. Joining him were Premier Wen Jiabao, PLAN Commander Wu Shengli, and other top officials. All must have felt the weight of history on their shoulders as they witnessed the unfulfilled ambitions of their civilian and military predecessors.

This milestone was a long time coming. One of Wu's distant predecessors had first proposed a carrier for China's navy in 1928. At the founding of the People's Republic in 1949, Premier Zhou Enlai and the PLAN commander at the time advocated carrier development, and Chairman Mao Zedong made a supportive speech in 1958. Yet their aspirations were stymied by the far more immediate priorities of domestic ideological campaigns and countering Soviet military pressure amid economic autarky and political isolationism. Subsequently, Gen. Liu Huaqing -- PLAN commander from 1982 to 1987 and Central Military Commission vice chairman from 1992 to 1997 -- fervently advocated carrier development and initiated studies of foreign technologies and Chinese options.

The procurement and refitting of Varyag, the Ukrainian carrier hull that served as the basis for Liaoning, was an odyssey in itself. The hull was purchased in 1998, but one-and-a-half years of Sino-Turkish negotiations were required to ensure its passage through the Bosphorus. Varyag then began a costly, storm-plagued voyage around Africa in 2001 and did not reach Dalian until 2002. China's formal carrier program, termed "048," was officially approved in August 2004 under Hu's chairmanship of the CMC, making Liaoning's recent commissioning a centrepiece of his military legacy and one of his last acts in office.

The PLAN's possession of an aircraft carrier is a great public relations booster for the Chinese military and suggests that Chinese diplomacy will be backed by an even bigger stick in East and Southeast Asia, and possibly beyond. Yet the stick was hard to come by and remains far from a potent tool. In fact, Liaoning has not yet demonstrated the capacity for aircraft launches or landings, which is the essence of carrier operations. Why has it taken so long to get to this point, which is not itself militarily decisive?

First, China Shipbuilding Industry Corp. essentially had to start from scratch on the carrier. Fabricating a carrier hull is not easy, but a modern shipbuilding industry like China's, with yards capable of building super tankers, liquefied natural gas tankers, and large bulk carriers, can bend the requisite steel. This time, Varyag offered a pre-made hull. But on such a massive vessel, the devil is in the details. And for a carrier, the devil manifests itself hundreds of separate times; parts must not only be built, but they must also be integrated into a working set of synchronized systems. Some systems are geared to the maritime dimension, some to the air, and some to both, which imposes very different sets of requirements and characteristics. In short, it is a logistical nightmare to achieve the unforgiving performance levels required of carrier operations.

With respect to hardware, unique subsystems such as aircraft storage spaces and arresting cables to allow aircraft to land must be built and installed. China's state shipbuilders have thus far been very tight-lipped on how they procured the guts to fill in the essentially empty hull they received. Our hunch is that some parts came from Russia and Ukraine, while a good portion came from Chinese ship-subcomponent suppliers that tooled up and built strong human-capital bases as the PLAN ramped up orders for advanced surface combatants like the Type 052C (Luyang II-class) destroyer and submarines like the Type 041 (Yuan-class).

On the human side, China has had to develop substantial domestic shipbuilding and subcomponent-production expertise in order to get its first carrier into service. Now the country must learn how to actually use it. Becoming a proficient carrier operator is important because the vessel's initial diplomatic intimidation and influence value will fade unless China can demonstrate an ability to employ the ship competently to an extent that suggests real war-fighting ability.

Carrier warfare, at least as conceived in the United States -- which would likely be involved in any major naval confrontation involving the Chinese carrier -- is a holistic operational philosophy. Carrier warfare involves factors including but not limited to:

1. Assembling carrier group(s).
2. Keeping the ship's complex naval systems and aircraft running in sync and at high reliability rates in adverse weather conditions.
3. Being willing to accept pilot and aircraft losses as the force learns to operate jets at sea.
4. Protecting the ship from a range of air, surface, and underwater threats.
5. Perhaps most difficult -- integrating civilian and military command and decision-making effectively to position and use the carrier in a way that maximizes its ability to influence events in a fluid situation.

The first factor boils down to how much Hu's successor, Xi Jinping, and China's other next-generation leaders are willing to spend on naval construction. The U.S. Navy operates 11 carrier strike groups. While there is some variance, a typical strike group comprises the carrier with its air wing of 65 to 70 aircraft, one or more cruisers, and a destroyer squadron composed of two or more destroyers and/or frigates. Submarines, logistics ships, and supply ships often support the carrier as well. The strike group is served by 7,500 personnel, 5,000 of whom operate the carrier and its

aircraft alone. U.S. deck-aviation scale and capability is so imposing as to remain completely unattainable for China for the foreseeable future.

Moreover, Beijing does not want to overemphasize carrier capabilities. It neither needs to nor even could employ a carrier group to further its claims in the disputed Near Seas (the Yellow, East China, and South China seas). Even the most advanced aircraft carriers are increasingly vulnerable to attack by missiles and other weapons. Moreover, China already has highly effective weapons systems, including the world's foremost sub strategic missile force, quiet conventionally powered submarines, and numerous and increasingly sophisticated sea mines. Still, even assembling an extremely modest carrier group -- which the PLAN will want to do eventually to build future capabilities as a great-power navy -- will require dedicating vessels in a navy that is improving qualitatively far more than quantitatively.

The second issue, which relates to the first, is the extent to which a higher naval-training tempo will be prioritized. Training with a carrier group is not cheap: A study by the Government Accountability Office in 1993 (the last time the U.S. Navy released numbers) says it cost $1.5 billion per year to operate a carrier battle group. Today, in an era of higher oil prices, the cost may be double or more. A Chinese carrier group would be far less capable and likely smaller and cheaper, but the old U.S. Navy number gives a sense of the rough costs China will face to operate a carrier, especially with a Chinese fleet that relies more heavily on oil-based fuels than the U.S. Navy. If a Chinese economic slowdown constrains defense-budget growth, the PLAN may increasingly be forced to choose between training more with the ships it has and buying more of the new ships its admirals want.

Third, China's leadership (and the population at large) must also decide how many pilots and aircraft they are willing to sacrifice if they want the PLAN to become proficient in carrier operations. Between 1949, when the U.S. Navy began deploying jets on a large scale, and 1988, when the combined Navy/Marine Corps aircraft accident rate achieved U.S. Air Force levels, the Navy and Marine Corps lost almost 12,000 aircraft and more than 8,500 aircrew. Even if it moves less aggressively, China is almost certain to suffer significant and unexpected pilot and aircraft losses as it builds its carrier capability. In a predominantly one-child society with growing use of communication tools that can circumvent state censorship, grieving families of lost pilots could spark meaningful negative publicity and impose caution on training in a way that ultimately makes Chinese naval aviation less combat-effective.

The fourth factor speaks to decisions China must make in coming years regarding naval procurement, as well as additional training in areas of critical weakness such as anti-submarine warfare. Beijing faces a two-pronged dilemma in funding naval procurement, and carrier development exacerbates the situation. First, in an increasingly challenging economic environment with slower growth rates, the naval budget faces increased competition for state funds. Second, a single carrier cannot ensure a continuous operational capability. China probably needs at least three carriers to always have one at sea. Building two more massive warships, plus the surface combatants and submarines needed to protect them, would risk catalysing further naval competition and anti-China security alignments in Asia. Deck aviation may well help China advance its strategic goals in the South China Sea, but it could also hem China in further afield.

Finally, Beijing's leadership will likely commit a number of missteps before it gets up to speed in the art of carrier diplomacy, a game that the United States has engaged in for nearly 70 years. In a region already rife with suspicion that China's willingness to use soft power is waning fast as its military becomes more capable, assertive carrier-related rhetoric and deployment may exacerbate tensions with neighbours such as Japan, Vietnam, and the Philippines.

In an exclusive interview with CCTV, China's first carrier captain, Senior Capt. Zhang Zheng, acknowledged that the PLAN does not yet have sufficient experience in deck-aviation operations. He stated that progress was particularly needed in the integration of naval aviation and surface combatants, the implementation of new safety procedures, and enhancement of administration. It will also be necessary to continue science and technology tests and crew and pilot training. What is significant, however, is that Zhang was realistic about these challenges and that he discussed them in excellent English, the designated international language at sea. These are hallmarks of embracing a weighty historical mission that will take time to realize but will ultimately transform China into a very different sea power from what it is today. Given ongoing disputes and uncertainty about Beijing's future capabilities and intentions, neighboring countries are bound to worry. But Zhang's predecessors surely could not be prouder.

China's first indigenous carrier is already operational. The second has been launched in 2018. It is likely to enter full service sometime around 2020.[8]

[8] For details about Chin's second aircraft carrier see http://nationalinterest.org/blog/the-buzz/everything-we-know-about-chinas-new-aircraft-carrier-18224?page=show, also see

The sea trials had begun in 2017. It has been named Shandong with a displacement of round 40,000 -60,000 tonnes and will be able to carry 36 fighter jets besides helicopters as compared to the first aircraft carrier Liaoning which carries 24. China has also declared building the third aircraft carrier with a displacement of 80,000 tons. A file photograph is given below.

China's second air craft carrier Shandong

https://www.wionews.com/world/chinas-second-aircraft-carrier-begins-sea-trials-to-test-weapons-equipment-302067

CHINA'S SPACE PROGRAM[9]

The rocket carrying the Shenzhou 10 spacecraft blasts off.
(ChinaFotoPress/Getty Images)

China's strategic focus on space is less about national pride than about the importance of space for both the military and economic progress of the country. The Chinese space program has developed rapidly over the past decade, illustrating the importance of the program to Beijing. Shenzhou 10, a 15-day mission that began June 11 and returned to Earth the morning of June 26 marked China's fifth manned mission to space. An increasing, ongoing presence in space is essential for civilian and military communications. Satellites' functions include navigation systems such as GPS, weather data and communications relays. But the significance of space goes beyond satellites. Technological advancement and development is required for countries such as China that want to participate in future resource development in space.

The Chinese space program officially began in 1958. Beijing launched its first earth-orbiting satellite in 1970, and while there were a series of launch failures in the 1990s, China carried out its first manned mission --

[9] Due to the lack of primary documents of Chinese origin, the entire chapter covering "Benefits of Space Exploration" to creating "Space Debris" has been extracted and quoted from open source materials and media reports. Adequate care has been taken to corroborate from multiple sources wherever possible.

Shenzhou 5, which put a man in orbit -- in 2003. More manned missions would follow in 2005, 2008 and 2012. A major uptick in activity began in 2010, when China successfully completed 15 unmanned launches, including a lunar orbiting probe. Nineteen more launches would follow in 2011 and 2012. China is now one of only two countries -- Russia being the other -- actively putting people into space and plans to land an unmanned craft on the moon in late 2013.

The latest mission, Shenzhou 10, was launched as part of the testing process for docking capabilities with Tiangong 1, the small space module that is part of the program that will eventually culminate in China's own full-sized space station, planned for the 2020s. The mission, which reached completion June 26, also set out to advance flying abilities; demonstrate adaptability and efficiency while completing objectives on the complex; and test coordination of various systems.

Benefits of Space Exploration

Continued advancements in space-related technology will enable China to compete on the commercial and military fronts as more activity becomes dependent on space-based infrastructure. Prior to satellite communications, surveillance and detection abilities and communication were limited by line of sight and by the atmosphere, which can reflect signals and can distort and dilute their strength. Space-based infrastructure also enables more efficient communication over time.

Satellites are also essential to the coordination of a global military presence. Modern global warfare requires the acquisition of data and ability to move and utilize data in real time. This need is highly dependent on satellites, which provide the necessary sensors to "see" what is happening and the transmission capabilities to distribute this data.

However, the defense of satellites remains difficult. In addition to anti-satellite missiles, it is also possible to blind and jam satellites. Given the imbalance between the United States and the nearest competitors when it comes to space-based technologies (and reliance on these technologies), the disabling or destruction of U.S. satellites would be a bigger blow than a similar retaliatory response. But as China becomes more reliant on satellites for communications, military or otherwise, it is less likely to interfere with U.S. satellites for fear of retaliation (and vice versa), an effect similar to the nuclear standoff in the Cold War.

The Future of Space Exploration

While the current motivation for an increased space presence is satellite technology, continued progress in space is vital for future strategy as well. Resource acquisition will likely be a priority for future space exploration. The United States, Russia and Europe are all continuing efforts to expand space activity (though the United States is increasingly looking toward the private sector for further space development). Beijing cannot afford to be left behind in the ongoing pursuit to establish a greater presence in space. As the world's most populous country, China will continually have to seek out new resources in order to support and sustain itself. Space cannot be ignored as a potential, critical future source.

For example, asteroid mining may seem farfetched, but it could be a real possibility in the coming decades. NASA's strategy that seeks to find, capture and explore asteroids that may threaten Earth is currently competing for room in the budget with, among other things, exploration of Mars and lunar missions. There are also a few private asteroid-mining companies seeking to develop the necessary technology. There are likely many overlaps between the technology necessary to capture or divert an asteroid and that needed to exploit an asteroid for its resources.

Asteroids are a potential source of many substances, including nickel, iron and even water -- essential starting materials for constructing infrastructure in space or on the moon. The ability to extract resources in space could be instrumental in making space-based construction economical. Currently, lifting costs (the cost to get a material into space) are a limiting factor in the economics of space development.

While the returns on programs aimed at the future development of space are limited at the moment, the infrastructure, once built, can take several forms, including possible bases or colonies on the moon and Mars. Once space-based construction does become economically viable, only the countries that have established programs and research will able to take advantage of the new frontier. Much like the naval powers of history were able to colonize on other continents, it will be the space powers that will have the advantage on the moon or Mars.

As these pursuits move forward, it is important to remember that throughout history, research done to advance space exploration has found a way into everyday life, from something as simple as Velcro to advanced composite materials that can withstand immense heat. Research currently

targeted for space also has the potential to improve earth-based technologies. Ongoing development in space has already had tangible benefits, including increased cell phone coverage (and ease of international calls), improved weather and GPS coverage and improved mapping technology.

While the path of ongoing development of space is unknown, the earlier a country enters this new space race, the better. Even so, establishing a strategic presence in space requires an ongoing and active development of space programs. It is for this reason that China, while starting later than the United States and Russia, is quickly and urgently expanding its technological capabilities in space.

China's space activities is a matter of security concerns in the following way:

1. Chinese potential to target satellites at higher orbits (See China's Space and Counterspace Capabilities and Activities Prepared for: The U.S.-China Economic and Security Review Commission, 30 March 2020. See
2. https://www.uscc.gov/sites/default/files/2020-05/China_Space_and_Counterspace_Activities.pdf
3. Non-profit group said new Chinese anti-satellite test already achieved
4. United States has conducted its own anti-satellite work
5. India has also developed her own technology in anti-satellite operations

The United States is concerned about China's expanding ability to disrupt the most sensitive U.S. military and intelligence satellites, as Beijing pursues its expanded ambitions in space, according to multiple sources in the U.S. government and outside space experts.

A classified U.S. intelligence assessment was completed in 2018. It mapped out China's increasing activities in space and also mapped out the growing vulnerability of U.S. satellites that provide secure military communications, warn about enemy missile launches and provide precise targeting coordinates, said the sources, who were not authorized to speak publicly.

"It was a very credible and sobering assessment that is now provoking a lot of activities in different quarters," said one former government official who is familiar with U.S. national security satellite programs.

The intelligence report raised red flags about Beijing's ability to disrupt satellites in higher orbits, which could put the most sensitive U.S. spacecraft at risk, according to the sources. China has already conducted several anti-satellite tests at lower orbital levels in recent years.
Given the heightened concerns, Washington is keeping a watchful eye on Chinese activities that could be used to disrupt U.S. satellites. It is also urging Beijing to avoid a repeat of its January 2007 test that created an enormous amount of "space junk," said one senior defense official. Details of the latest Chinese moves that have raised U.S. concerns remain classified.

U.S. officials charge that China's anti-satellite activities are part of a major military modernization that has seen Beijing test two new stealth fighters; step up cyber attacks on foreign computer networks; and launch more commercial and military satellites in 2012 than the United States. China still lags behind the United States in most military fields.

"What we're seeing is a heightened sense in the United States that China is a potential threat and that it has the technology to be a threat if it wishes to," said Jonathan McDowell, with the Harvard-Smithsonian Centre for Astrophysics.

"As China becomes a space superpower, and given that it does have a significant military component to its space program, it is inevitable that the U.S. will be concerned about threats to its most valued satellite systems, whether or not China actually intends to deploy such aggressive systems," he said.

Creating Space Debris

On Jan. 11, 2007, China destroyed one of its own defunct weather satellites in low-earth orbit, which created over 10,000 pieces of debris that pose a threat to other spacecraft. A less-destructive test followed on Jan. 11, 2010.

Space experts and U.S. officials say they expect China to continue testing anti-satellite technologies, although they doubt it would repeat the 2007 test, given the massive international outcry it triggered.

Gregory Kulacki, a respected researcher with the Union of Concerned Scientists, reported that there was a continuing possibility of a new anti-

satellite test by China in the coming years. He said Chinese sources had told him that an announcement about an upcoming anti-satellite test had been circulated within the Chinese government, and a high-ranking U.S. defense official confirmed that Washington was "very concerned" about an imminent Chinese anti-satellite test.
The Chinese Defense Ministry did not respond to emailed queries by Reuters' Beijing office on the question. The Pentagon said it was aware of reports predicting another test, but declined comment on what it called "intelligence matters." "We monitor carefully China's military developments and urge China to exhibit greater transparency regarding its capabilities and intentions," said Lieutenant Colonel Monica Matoush.

Sources within the U.S. government and outside experts said there was no immediate evidence pointing to the preparations for the type of satellite or rocket launches used by China for past anti-satellite tests at lower orbits.
But they said Beijing could test its anti-satellite weapons in other ways that would be harder to detect, such as by jamming a satellite's signals from the ground or issuing a powerful electromagnetic pulse from one satellite to disable another.

China could also manoeuvre two satellites very close together at higher orbits, replicating actions it has already taken in lower orbits in August 2010 and November 2010. Such activities could be used to perform maintenance or test docking capabilities for human spaceflight, but could clearly be used for more destructive purposes as well, they said.

The United States has continued to test its own anti-satellite capabilities. In February 2008, a missile fired from a U.S. Navy cruiser in the north Pacific destroyed an ailing American satellite in orbit.

The U.S. government said the satellite's toxic fuel posed a risk upon re-entry of the earth's atmosphere. Sceptics said the test was a message to China. Any further anti-satellite test by China would be troubling, especially if it occurred at higher altitudes, said Bruce MacDonald, a former White House official who is now a senior director at the U.S. Institute of Peace.

The United States operates its fleet of Global Positioning System (GPS) satellites in medium earth orbit about 11,000 miles (17,700 kilometers) above the surface of the earth, while U.S. military communications and early missile warning satellites are located in geostationary orbit 22,000 miles (35,400 km) above the equator.

Brian Weeden, technical adviser for the nonprofit Secure World Foundation and a former Air Force space and missile expert, said a Chinese anti-satellite test at those higher orbits would put U.S. satellites at risk.
"Some critical U.S. assets in that region have been assumed for the most part to be safe from those kind of attacks," he said. "Such tests would signal that they're not."

China has already outlined its space exploration ambitions Missions to the Moon and Mars will dominate China's focus. China has just released a new white paper on its policy and activities in space, outlining ambitious deep space exploration, human spaceflight and space science projects as major priorities for the years up to 2020 and beyond.

The 11,000-word government paper, titled " **China's Space Activities 2016, The 4th Version of the White Paper,** See http://www.unoosa.org/documents/pdf/copuos/stsc/2017/tech-01E.pdfChina's which details the major achievements of the past five years, plans for the next five, and reiterates commitments to international cooperation, and the long term development of its space industry. It is attached as Appendix A
There's a lot going on in this above mentioned comprehensive document but, after a quick look at recent progress, it's definitely worth focusing on China's deep space exploration plans.

Source: CNSA: **EARTH AND THE MOON FROM CHANG'E 5 T1**

The Chang'e 5 test vehicle service module took this photo of Earth and the Moon together , a week after successfully returning the sample capsule. The Moon's surface is quite dark compared to Earth's bright clouds.
Some of the achievements listed from the past year alone are impressive, including the successful debut of the heavy-lift Long March 5 (think China's

own Delta-IV Heavy), a new coastal launch site, and some cutting-edge space science missions, including a quantum science satellite and dark matter-hunting probe. China also took another step towards establishing a space station with the launch of the Tiangong-2 space lab and its first medium-term human stay in space with Jing Haipeng and Chen Dong as part of the Shenzhou-11 mission.

But what's in store for the future is what's really attention-grabbing. We already know of some of these: Chang'e-5, the first lunar sample return mission by any country since the 1970s, probably lifting off in late 2017, followed a year later by an unprecedented landing on the far side of the Moon. Summer 2020 will see the launch of the country's first independent interplanetary mission, to Mars, which boldly combines an orbiter, lander and rover in one shot. But these plans have now officially been expanded. Wu Yanhua, vice head of China National Space Administration (CNSA), stated at today's press conference in Beijing that it will, "also carry out robotic exploration of the south and north poles of the moon twice in the next five and ten years".

Stated in the text is a plan to attempt to collect and return samples from Mars around 2030. If so, China may actually beat NASA to achieving the type of mission that could have a profound impact on science and human history, depending on its findings.

Moving further out into the solar system, "exploration of the Jupiter system and planet fly-by exploration", are other stated goals, while "related projects will be implemented to conduct research into major scientific questions such as the origin and evolution of the solar system, and search for extra-terrestrial life."

These projects were included in a 20 year plan for lunar and deep space exploration under development during the autumn, which has now apparently gained official approval.

Facilitating some of these projects will be a Saturn-V class super-heavy lift rocket, the Long March 9, the development of which will now officially be activated in the next five years. Needless to say, this is exactly the kind of launch vehicle needed to take Chinese astronauts to Moon. China is not ready to declare this goal openly however, saying only that they are, "studying the feasibility of the related [human landing] plans". But this, coupled with the not-mentioned test of a scale next generation space capsule in June on the Long March 7, leaves little doubt as to Chinese eventual lunar desires.

Some other notable projects and developments mentioned in the white paper, each worthy of serious attention, include:

- Construction of a modular, permanently crewed space station by around 2022
- Pursuing space science to drive independent innovation and development
- Opening the space sector to national and international private sources of capital
- Expansion of international cooperation, including developing countries
- Research into low-cost launch vehicles and a reusable space transportation system
- Earth observation, communications, navigation and other satellite constellations to boost socioeconomic progress and a civil space infrastructure and on-orbit servicing
- A focus on outreach, especially to elementary and secondary schools, and attracting world class scientists, engineers and other specialists

Beyond these, there are some general takeaways and caveats to China's fourth space white paper.

First, it can be welcomed as giving a measure of transparency to a largely closed program and a sense of China's progress and direction in space. However it doesn't provide much information on government and military actors involved, nor the policy-making process.

The paper includes a section on China's "Purposes, Vision and Principles", which essentially outlines the country's policy toward space. This states the country aims to: "enhance understanding of the Earth and the cosmos," and "utilize outer space for peaceful purposes," but, at the same time use space to, "protect China's national rights and interests, and build up its national comprehensive strength."

But it does not discuss the security aspects, such as suspected non-destructive anti-satellite missile tests in past few years, nor the issue of the 'dual-use' nature of space technology, which means it can often be used for both civilian and military purposes. China's Beidou navigation constellation for example can, just as with the US counterpart GPS, be used for transport, communications and other everyday uses, but also boost the operational capabilities of the country's armed forces. These developments and capabilities certainly have a range of ramifications for other countries, especially the United States.

One key point is that China clearly sees space as having a major role in the development of the country, so as to "meet the demands of economic, scientific and technological development, national security and social progress." It is understood that before launching into complex and challenging space sectors, Beijing assessed the US Apollo program benefits – such as technological development, spin-offs, soft power, and education – and decided firmly to commit the effort and resources. This long term approach is now apparently paying off.

It is well worth a glance at this document to get an idea of many of the things China is up to in space. Though it still lags significantly behind the capabilities of the United States, China now has a comprehensive and serious space program, and one that should not, as in the past, be easily dismissed as merely for prestige or mainly military in nature, nor should it be seen simply aping what has come before and copying technology. ***China is a major space player to keep an eye on.***

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