China's Second Artillery Corps

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China's new CJ-10 Long Sword GLCM is a direct equivalent to the late Cold War US Air Force BGM-109G Gryphon GLCM, and provides a highly survivable nuclear or conventional strike capability.

CHINA'S Second Artillery Corps, a formation that performs in many respects a similar role to Russia's RVSN (Strategic Rocket Forces) and America's Strategic Command and MICOM (formerly the missile components of Strategic Air Command and the US Army) has until recently been all but invisible in the Western defence debate. This changed recently, with the initial deployments of the DF-21D ASBM (Anti-Ship Ballistic Missile) and the public disclosure of Georgetown University research findings on the extensive network of ballistic missile hide tunnels across China, the latter both protecting assets and permitting concealed preparations and movements. Then in August this year, there was a test launch of the DF-41 MIRV ICBM (Multiple Independent Re-entry Vehicle Inter Continental Ballistic Missile). Given the regional strategic impact of the 'Second Artillery', it is therefore a subject worth very careful study.

Since its beginnings, the Second Artillery has expanded greatly in numbers, in diversity of weapon types, and especially in reach, making it now the largest force of its kind globally, accepting that Russian, British, French and American ballistic missile forces are predominantly strategic in purpose, unlike the Second Artillery (http://www.ausairpower.net/APA-PLA-Ballistic-Missiles.html;), which has also a major theatre strike role. The capabilities of the Second Artillery now span the full spectrum of ICBMs, IRBMs, TBMs, and most recently, GLCMs (Ground Launched Cruise Missiles).

China's ICBM Force – DF-41, DF-31, DF-5 and DF-4

The most capable operational weapon in PLA service at this time is the road mobile solid propellant three-stage DF-31 / CSS-10, development of which commenced during the 1970s, and operational deployment in 2006-2007. The weapon is deployed in two variants, the baseline DF-31 with 3,900 NMI range, and improved DF-31A with 6,000 NMI range, the latter supplanting the supposedly cancelled DF-41. The navalised variant, the JL-2, has only recently matured enough for testing. The solid propellant is believed to be N-15 NEPE (Nitrate Ester Plasticized Polyether).

The DF-31 series are currently road mobile, with a HY4430 semi-trailer TEL (Transporter Erector Launcher) towed by a ZX-TJ 2000 turbocharged diesel 8 x 8 tractor, affording good transit speeds but a requirement for sealed roads and well prepared launch sites. This is a fundamentally different approach to the Soviet/Russian model, where large specialised off-road vehicles are employed, a model introduced with the original Scud TBM.

Details of the guidance and warhead capabilities are limited, it is believed that the weapon carries a single 250 kilotonne boosted fission warhead.

The predecessor to the DF-31 is the much less survivable and flexible silo based liquid propellant DF-5, which entered service in 1981 after a decade of development.

The DF-5 / CSS-4 evolved from the earlier DF-4, but is a genuine 7,000 NMI range ICBM with three liquid propellant stages, and is the Chinese equivalent to the long retired US LGM-25 Titan II

The DF-31A is a highly mobile ICBM with a single thermonuclear warhead.

The DF-5 is China's longest ranging operational ICBM, and compares closely to the long retired LGM-25C Titan II and its Soviet equivalents. The DF-5 is deployed in conventional silos.

Launch preparations for the DF-4 "Guam Missile". It is deployed from tunnels using a trailer.

series. The three stages use conventional Nitrogen Tetroxide / Unsymmetrical Dimethyl Hydrazine (UDMH) hypergolic propellants. Like the Titan II, the DF-5 vehicle has been used as a satellite launcher. It is credited with a single 3 Megatonne thermo-nuclear warhead with a weight of around three tonnes. The Second Artillery operates the DF-5 from fixed silos, with at least 20 sites operational, although some sources claim up to 36 silos. It is not known whether the claimed MIRV variant is operational.

The DF-4 / CSS-3 is often dubbed the 'Guam Missile' and deployed around 1980, with later variants possessing sufficient range to reach Moscow as well. The technology in the DF-4 is similar to the DF-5, but the two stage design uses IRFNA (Inhibited Red Fuming Nitric Acid) rather than N2O2 as an oxidiser, yielding a range of ~2,500 NMI with a single 3 Megatonne thermo-nuclear warhead, likely the same as used in the DF-5 series. While the DF-5 is a classical silo based design with storable liquid propellant, the DF-4 is stowed in tunnels horizontally, rolled out, elevated and fuelled for launch. In 2010 the US DoD still listed 20 operational DF-4 systems.

Recent US DoD reports to Congress suggest that the PLA continues to expand its force of DF-31A and DF-5 ICBMs, with the intent to replace the DF-4 with a DF-21 IRBM variant. The total warstock cited is usually ~20 DF-5 and ~30 DF-31 launchers, which is a small number compared to the 450 US Air Force LGM-30G Minuteman ICBMs deployed, or Russia's 180 silo based and ~200 mobile ICBMs, not counting the US Navy Trident SLBMs and Russian Navy SLBMs, all as accurate or more accurate than PLA ICBMs.

As China has yet to become party to the ongoing US-Russian strategic arms limitations treaties, the accuracy of estimated numbers for PLA ICBMs is open to dispute. As the DF-31/31A can be hidden in road tunnels, the cited inventory numbers may or may not be accurate.

In August 2012 the PLA successfully test launched a DF-41 MIRV ICBM, following long running reports claiming this program had failed and was cancelled. Like the DF-31, it is mobile, unlike the DF-31, the DF-41 TELs are clearly offroad mobile designs, modelled on the Russian Topol TEL.

China's IRBM Force – DF-21, DF-3

The jewel in the crown of the Second Artillery IRBM force is the DF-21 / CSS-5 family of missiles, a derivative of the JL-1 two stage solid propellant SLBM, which has been deployed in a range of variants, and also is the basis of the KT-1 space launch vehicle and the SC-19 direct-ascent ASAT (Anti SATellite) weapon system

The DF-21 has a cited range of around 1,000 – 1,350 NMI, and has progressively evolved from early road mobile variants on semi-trailers, to fully

The obsolete DF-3 IRBM may remain in service, but will likely be supplanted completely by the DF-21 series.

Two distinct TEL designs have been credited to the DF-41 MIRV ICBM. The fourteen wheel design is entirely new, but the sixteen wheel design appears to be based on the WS2400 family of TELs.

First image of the new PLA IRBM TEL, considerably larger than the DF-21C/D. It may be a more survivable solid propellant replacement for the obsolete DF-4 "Guam Missile" .

DF-21C IRBM TELs on parade in 2009.

off-road mobile variants, on the WS-2400 10x10 TEL vehicle, closely modelled on the Soviet RSD-10 Pionier / SS-20 Saber TEL. In performance terms, late build DF-21 IRBMs compare best to the US Army MGM-31 Pershing II IRBM, scrapped under treaty terms with its Soviet sibling, the RSD-10. Like the Pershing, late model DF-21s employ a MaRV (Maneuvring Re-entry Vehicle) kill stage.

What is significant from a broader strategic perspective is that the guidance technology permitting attacks on moving warheads would be no less effective, if not more effective against fixed land targets such as aircraft shelters, parking areas, radars, command bunkers, and other high value targets.

In 2012, images emerged of a yet to be identified offroad mobile IRBM TEL, clearly intended for an IRBM considerably larger than the DF-21 series. This weapon appears to fall between the DF-21 and DF-4 in size, and may indeed be a far more survivable solid propellant replacement for the obsolete DF-4 "Guam Missile".

China's TBM Force – DF-15, DF-11, B-611

The most numerous assets in the Second Artillery force are TBMs. The dominant types are the 160 NMI range DF-11 and 325 NMI range DF-15, with the 135 NMI range B-611 recently introduced. All are deployed on fully mobile TELs, with the DF-11 and DF-15 TELs based on an 8x8 vehicle modelled on the Soviet MAZ-543 Uragan used for the Scud TBM. The US DoD claimed in 2010 that the PLA had deployed 90-100 DF-15 TELs, with up to 400 rounds, and 120-140 DF-11 TELs with up to 750 rounds. While these weapons lack the range to threaten "First Island Chain" nations, they clearly would present genuine difficulties for Taiwan in time of war.

China's GLCM Force – CJ-10 Long Sword

A recent addition to the Second Artillery is the CJ-10 Long Sword GLCM (Ground Launched Cruise Missile), a direct Chinese analogue of the US Air Force BGM-109G Gryphon (Tomahawk), the latter retired two decades ago in a quid-pro-quo arms reduction deal. The CJ-10 is claimed to be derived from the naval DH-10, which appears to be closely modelled on the Tomahawk. The nuclear armed BGM-109G had a range of 1340 NMI, more than twice that of conventionally armed US Navy BGM-109 variants.

While the PLA has released much imagery of the CJ-10, numbers have mostly not been released. The US DoD in 2010 credited the PLA with 45-55 "DH-10" launchers and a warstock of up to 500 rounds, this disclosure predating the PLA's disclosure of CJ-10 as the GLCM designation.

What mix of nuclear and conventional warheads is deployed has not been disclosed. With range performance in the 400 – 600 NMI class, the non-nuclear CJ-10 presents a major strategic risk to "First Island Chain" nations, including US basing, and also India. None of these nations have robust capabilities to intercept and destroy Tomahawk class cruise missiles.

Like the DF-21 and the new IRBM, the CJ-10 is carried on a high performance offroad TEL, based on the WS-2400 series chassis. This permits rapid dispersal to hides in rural terrain, making pre-emptive interdiction of dispersed TELs extremely difficult to perform, even with good reconnaissance capabilities. This is no different to the late Cold War deployment regime of United States and Soviet IRBMs and GLCMs, which were considered highly survivable.

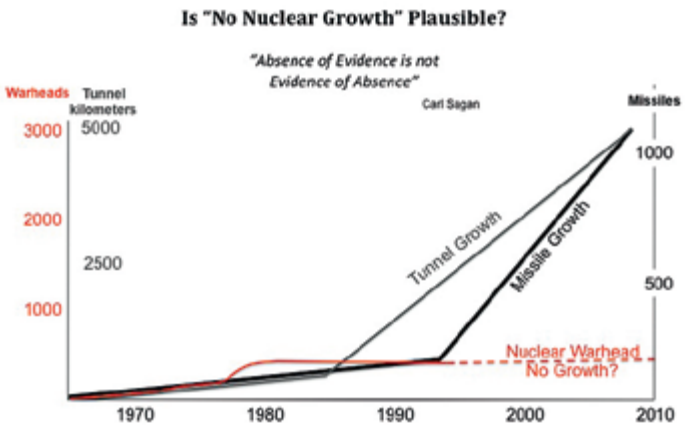
GLCMs like this scrapped 1980s US Air Force BGM-109G Gryphon are extremely difficult to kill once dispersed to hides. The CJ-10 provides a unique capability in this respect, as the United States and Russia are forbidden by treaty to deploy such weapons.

The 'Underground Great Wall' Tunnel Network

In early December, 2009, the PLA publicly disclosed in the Chinese media the existence of a national network of 5,000 km (2,700 NMI) of ballistic missile tunnels intended both as hides and as a hardening measure, dubbed the "Underground Great Wall of China". The tunnel network has repeatedly featured in Chinese media reports, showing often complex structures sized to conceal TELs, with internal railroad tracks for movement of missiles, and large galleries with overhead cranes employed to rapidly reload TELs with missiles carried on modified flatbed railcars.

These reports were mostly ignored by Western media and analysts, but not by Professor Phillip Karber at Georgetown University in the United States, who is a highly experienced strategist and Cold War period nuclear weapons analyst. Prof Karber launched a research project, using available undergraduate students, to scour Chinese websites and media for reports and imagery detailing the tunnel network. With many of these students being literate or fluent in Chinese, no less than 2.5 million words of text, and 200 hours of video footage were studied and translated, to build a detailed picture of the hidden PLA tunnel network. The Georgetown project (http://www.asianarmscontrol.com/tunnels) ran in parallel to a smaller Australian-US study of PLA underground hangars, led by this author, and yielding very similar findings, in terms of tunnel construction and design – not unlike the diverse sizing of underground hangars, the ballistic missile tunnels are sized respectively for TBMs, IRBMs and ICBMs.

DF-11 and DF-15 TBMs.



Georgetown University chart showing growth in PLA delivery systems and tunnels, versus arms control community estimations of PLA warhead numbers.

The PLA's tunnelling effort has increased, with PLA disclosures suggesting that 50 per cent of the tunnel network was constructed between 2005 and 2012. While the earliest tunnels, constructed during the 1980s, were sized for the DF-3 and other TBMs, the most recent tunnels are sized for the DF-31 and evidently, DF-41 ICBM TELs. The latter are up to 20 metres wide, with 12 metres of internal clearance, permitting up to three DF-31 TELs abreast.

The preliminary results of the Georgetown research project were published in the Wall Street Journal in late 2011, and produced a chorus of rejection and complaints from the arms control and anti-nuclear communities, who were and mostly continue to reject the notion that Western understanding and estimations of Chinese nuclear strike capabilities may not be correct. One of the observations made by the Georgetown research group was that China may have considerably more nuclear weapons than previously believed, as the tunnel network permits covert storage.

Russian estimates, based on Russian practices, which were emulated by the Chinese, are very different. A May, 2012 paper by the former Chief of Staff of the RVSN, Colonel General Viktor Yesin (Retd), who is now an academic, estimated Chinese fissile and fissionable nuclear materials production to be sufficient to construct no less than 3,600 nuclear warheads (1,600 uranium, 2,000 plutonium). The Russian estimate is about five to ten times larger in quantity than the estimates claimed by Western arms control and anti-nuclear advocates. Yesin observes that there are probably 1600 - 1800 warheads in the Chinese nuclear arsenal. According to assessments, 800-900 warheads from this number may be operationally deployed, with the rest in long term storage for utilization after the fixed exploitation deadlines of operationally deployed warheads." For comparison, the United States strategic nuclear warhead stockpile is estimated at ~2,200 rounds, and the Russian stockpile at ~2,700 rounds.

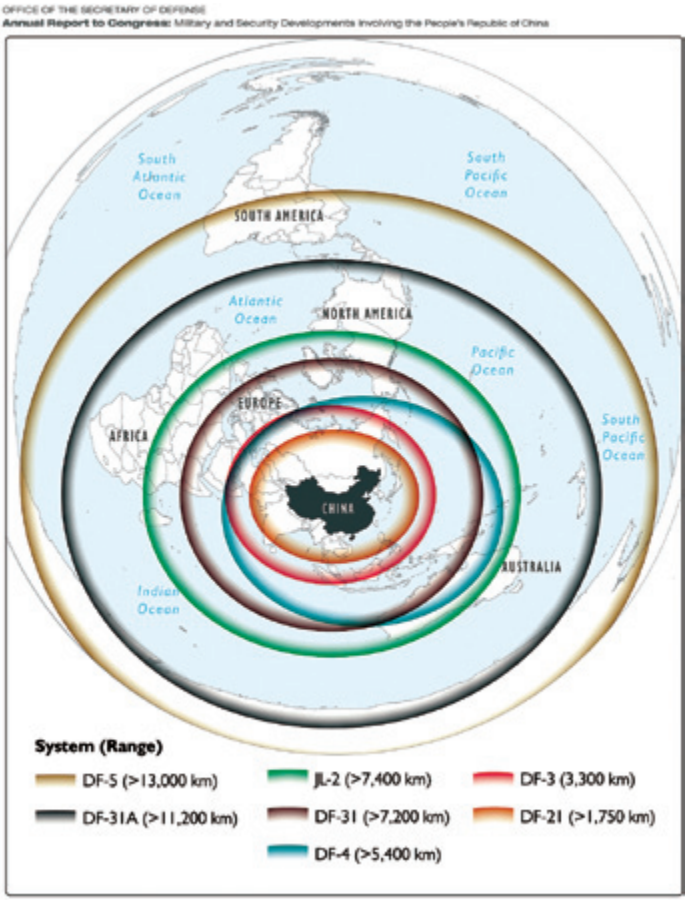
Strategic Impact

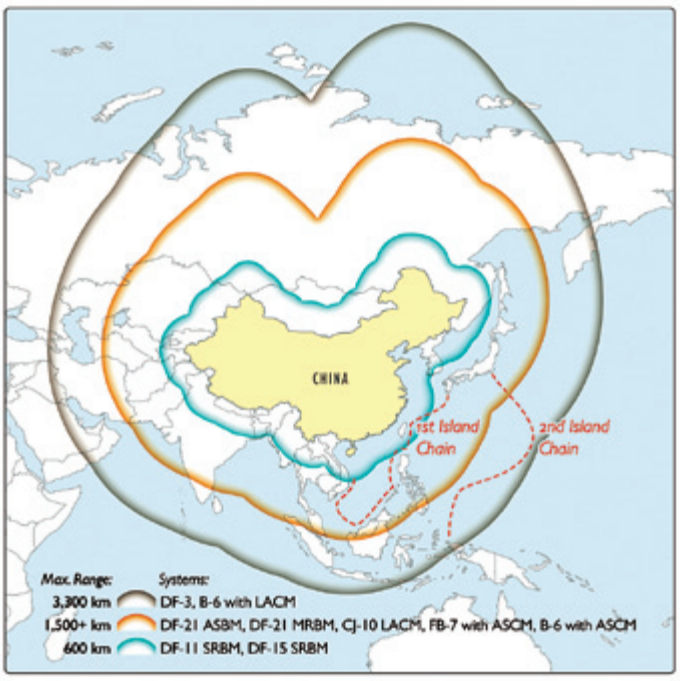
Western understanding of China's Second Artillery remains incomplete, and what is known is mostly a byproduct of intentional or unintentional disclosures by the PLA and other Chinese government agencies.

The Second Artillery is unique as it remains outside the coverage of nuclear arms limitation and reduction treaties, which were signed by the United States and the Soviets, and remain in force in the West and post-Soviet Russia. As a result of this, the PLA is not encumbered by any treaty constraints on numbers and yield of nuclear warheads, numbers and types of delivery systems, aggregate throw weights for weapon classes, or numbers and types of hardened facilities to deploy such weapon systems. China is also not constrained by any inspection regimes and verification processes.

The United States and Russia no longer possess nuclear-armed IRBMs or GLCMs, as all were destroyed to comply with treaty agreements. Both nations have actively sought to reduce operational outlays by further reducing their nuclear warstocks.

Conversely, China is demonstrably growing its capabilities, with the new DF-41 increasing strategic throw weight, the DF-21 providing significant conventional and nuclear capabilities, a new high mobility IRBM likely replacing the DF-4, and a well hardened tunnel network to permit covert operations, as well as denying a first strike decapitation of the ICBM, IRBM and GLCM capabilities. With GLCMs now in service, the PLA possesses a diverse "full spectrum" capability for both strategic and theatre strike with nuclear or conventional warloads.





China's growing force of IRBMs, GLCMs and the new J-20 stealth fighter provides in strategic terms a capability equivalent to that which was disbanded by treaty in Europe during the 1980s, permitting China the option of holding its "strategic" ICBM force in reserve, in 'superhardened' underground tunnel hides, while it rains nuclear warheads down on any opponent within the reach of the "theatre" IRBM, GLCM and J-20 force.

Constrained neither by treaty nor by any balancing regional "theatre strike" force of similar potency, this provides China with a distinct advantage over Russia, the United States, India, and their respective allies in close geographical proximity to China. This is paralleled by ongoing technology improvement and throw weight in China's strategic ICBM force, making any strategic nuclear play by the United States or Russia against China an expensive proposition in incurred "Megadeaths" from a PLA ICBM counter-strike.

In conclusion, the PLA's Second Artillery has grown over the past decade into a force with significant strategic impact across the region, and if current trends continue, this impact will extend globally over the coming decade.