

## China's Cruise Missile Capabilities: Implications for the Indian Army and Air Force

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**ABSTRACT** This brief evaluates the state and development of China's cruise missile capabilities, specifically that of its air-launched and ground-launched missile forces. It finds that China has developed a formidable inventory of cruise missiles, which poses a threat to India's own military infrastructure. The brief lays out the imperative for India: to build up its long-range cruise missile forces. It argues that India's current capabilities would not allow its military to conduct long-range, offensive precision attacks against Chinese military bases, command centres and air bases, as China is capable of doing against India.

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## INTRODUCTION

To what extent do China's cruise missile capabilities threaten the Indian Army (IA) and the Indian Air Force's (IAF) ground and air assets? This question is not only relevant in the wake of the current stand-off between the two countries along the Line of Actual Control (LAC), but is equally important for defence planning in the medium- to long-term. The cruise missile segment of China's missile capabilities is highly advanced. This brief concerns China's land attack and air-launched cruise missile capabilities, and not the sea-based. Chinese cruise missiles pose a threat to India's forward deployed forces across the LAC. However, beyond the vicinity of the LAC, the People's Liberation Army (PLA) and its sister service, the People's Liberation Army Air Force (PLAAF), wield capabilities to target Indian Command and Control Headquarters (HQ), air base bunkers and ground bases in the Indian rear, or deployments in forward locations. India, too, will need to exploit China's vulnerabilities, particularly in the Tibet Autonomous Region (TAR); both Air-Launched Cruise Missiles (ALCMs) and Ground-Launched Cruise Missiles (GLCMs) are likely to be used extensively in a Sino-Indian boundary war.

The PRC's stand-off range cruise missile capability is significant. Although the PRC's cruise missiles are not directed exclusively at India, at least a segment of its cruise missile force will remain a threat. This brief argues that a larger inventory of cruise missile forces will strengthen the effectiveness of India's missile capabilities, both as a deterrent and for offensive action against China. New Delhi will have to expedite efforts to acquire long-range

precision strike capabilities to compensate for its lack of significant offensive air assets. This brief makes an assessment of China's ground launched Land Attack Cruise Missile (LACM) capabilities, before it then analyses the Chinese Air Launched Cruise Missile (ALCM) capabilities. The final part outlines the implications of Chinese LACM and ALCM for India's ground and air forces.

## CRUISE MISSILES AND THEIR RELEVANCE FOR CHINA

The origins of China's cruise missile capabilities go back to the Cold War. However, it was in the 1990s, following the collapse of the Soviet Union, that China started receiving assistance from the Russian Federation.<sup>1</sup> The Soviet successor needed hard currency and the PRC had money to spend for Russian assistance in the cruise missile sector.<sup>2</sup> Indeed, Russian technical experts and scientists unable to find work in Russia assisted the PRC.<sup>3</sup> A number of Chinese cruise missiles are derivatives of Russian designs. Today, the PRC has moved towards greater indigenisation.

Cruise missiles have high pre-launch survivability as well as mobility advantages. A cruise missile is an unpowered projectile that comes with autonomous guidance. It flies like an airplane, making it an air-breathing system and is assisted by aerodynamic surfaces.<sup>4</sup> Cruise missiles need guidance for only a part of their flight, thereafter, the missile goes through a free-fall trajectory, which is determined exclusively by the local gravitational field.<sup>5</sup> Cruise missiles, however, require continuous guidance. They could have on-board guidance as well as be externally guided with the help of satellites or a

combination of both. They are easily deployable. There are subsonic as well as supersonic variants. For long-range cruise missiles, satellite guidance is also important for precision attacks. Land Attack Cruise Missiles (LACM) can also help defeat enemy missile defences because they are hard to detect. LACMs are more effective than ballistic missiles in striking point targets such as command nodes and static facilities such as bases.<sup>6</sup> The other attraction is that cruise missiles—which are otherwise small projectiles traveling at low altitude—remain difficult to detect, track and destroy in-flight.<sup>7</sup>

The People's Liberation Army Rocket Force (PLARF) controls and operates Chinese ballistic and cruise missile brigades. These missiles are not as vulnerable to counterforce targeting by the adversary and can be launched from a wide variety of mobile and fixed platforms. Cruise missiles can serve as a credible deterrent as well as contribute to offensive action,<sup>8</sup> coupled with stand-off ranges at which cruise missiles can be launched from aerial platforms such as long-range bombers and fighter aircraft. Given these advantages of cruise missiles, it is unsurprising why any major state power would not want to invest in these capabilities, including China. Cruise missiles, in one analyst's description, are the "poor man's" air force, in that they are relatively inexpensive weapons and means of striking enemy targets contributing to the offensive strike capabilities of a state.<sup>9</sup> While fighter aircraft can perform a similar role, they have to penetrate enemy air defences, which puts them at risk to the adversary's aerial interception and Surface to Air Missiles

(SAMs). Both fighter aircraft and cruise missiles are capable of offensive missions, but the losses incurred by the former are likely to be costlier. Fighter aircraft are expensive platforms. However, cruise missiles can be delivered from fighter aircraft without the latter entering enemy airspace (as will be shown below)—this increases their range and lethality at least over short to medium distances. Around the vicinity of the LAC, the IAF is likely to fair well against the PLAAF, however, the former is short in long-range offensive air power. Consequently, India has to invest more in long-range cruise missiles – both its land attack and air-launched variants. Absent in the IAF inventory are heavy, long-range bombers which are capable of delivering ALCMs over extended distances against land-based targets.

For the PRC, cruise missiles enable the military's pursuit of offensive action for a conflict of limited duration along the LAC.<sup>10</sup> At present, India lacks deep-penetration and long-range, precision-strike cruise missile capability against the PRC. Cruise missiles play a key role in sustaining offensive action where other air-breathing assets are in short supply. Chinese deployments at its bases in the TAR pose a serious challenge to India, making it important for the country to build its cruise missile force. Moreover, the PRC sees benefits accruing from the deployment and operationalisation of long-range bombers and their ALCMs for deterrence signalling.<sup>11</sup> Long-range bomber operations are designed to signal that China is highly capable of using "active" and robust methods to protect its "...national sovereignty, security and development".<sup>12</sup>

## CHINA'S GROUND-BASED LAND ATTACK CRUISE MISSILE (LACM) CAPABILITIES

Various countries find LACMs attractive, including China. The PRC had been envious of American LACM capabilities for the last two decades; their effective use was on display in the first Gulf War of 1990-91. Realising the deficiencies in taking on a more potent adversary, Beijing embarked on a sustained cruise missile development drive in the 1990s.

China has several types of LACMs. To begin with, it has three types of short- to intermediate-range cruise missiles as part of the Hong Niao (HN) series. These missiles are HN-1, HN-2 and HN-3 (See Table 1). The ground-launched version of the missile comes

in the form of HN-1A and HN-1B with a range of 600 kilometres and 650 km, respectively.<sup>13</sup> These two missiles are launched from a Transporter Erector Launcher (TEL) (See Figure 1). Each of the TELs are capable of carrying three missiles. With a speed of Mach 0.8, they can deliver a conventional payload consisting of a 400 kilogram High Explosive (HE) warhead and a 20-90 kiloton (KT) nuclear warhead (See Table 1).<sup>14</sup>

In addition to the HN series, China fields the ground-launched version of the YJ-18, which is a ship-based missile, but has been adapted to launch from mobile ground platforms. The ground-based variant is launched from a multi-wheeled truck<sup>15</sup> capable of delivering a 140-300 kg HE warhead with a cruising speed of Mach 0.8 (See Table 2). It has

**Table 1 – China's Medium Range Ground Launched Cruise Missiles**

<b>Missile Name</b>	<i>Hong Niao Series</i>
<b>Class</b>	Subsonic cruise missile
<b>Basing</b>	Ground/ship/air/submarine-launched
<b>Length</b>	6.4 metres (7.2 with boost motor)
<b>Diameter</b>	0.5 metres
<b>Launch Weight</b>	1,200 kilograms
<b>Payload</b>	Single Warhead
<b>Warhead</b>	400 kilogram High Explosive, submunitions, 20-90 Kiloton Nuclear warhead
<b>Propulsion</b>	Turbojet (HN-1), Turbofan (HN-2/-3)
<b>Range</b>	600-650 kilometres
<b>Status</b>	Operational

Source: Missile Defense Project, "Hong Niao Series (HN-1/-2/-3)," *Missile Threat*.<sup>16</sup>

**Table 2: China's Short-Range Ground Launched Cruise Missile**

<b>Name</b>	YJ-18 also known as CH-SS-NX-13
<b>Class</b>	Cruise
<b>Basing</b>	Ship, submarine, and mobile ground vehicle
<b>Length</b>	<8.2 metres (inc. booster)
<b>Diameter</b>	0.514 metres
<b>Launch Weight</b>	<1,579 kilograms
<b>Payload</b>	140-300 kilograms
<b>Warhead</b>	High-explosive or antiradiation
<b>Speed</b>	Mach 0.8 (cruising), Mach 2.5-3.0
<b>Guidance</b>	Satellite navigation and radar guidance
<b>Range</b>	220-540 kilometres
<b>Status</b>	Operational since 2014

Source: Missile Defense Project, "YJ-18," *Missile Threat*.<sup>17</sup>

a terminal speed of 2.5-3.0 Mach and a striking range of 220-540 km (See Table 2).<sup>18</sup> The missile is guided by satellite navigation and radar. This missile has been operational since 2014 (See Table 2). Most critically, these road mobile missiles can be fired from within the

TAR against Indian military targets in the vicinity of the LAC and also strike deeper at targets further inland, such as the Tezpur IAF airbase in Assam located 481 km from Shigatse in Tibet (See Map 1). However, there is yet no clear evidence that the road mobile version of

**Map 1: Shigatse to Tezpur**



Source: Google

the YJ-18 can be launched in the TAR for land attack missions against India. YJ-18C, a land attack variant of the YJ-18 class of cruise missiles, is likely to be launched from shipping containers.<sup>19</sup> Nevertheless, the PRC has shown virtuosity in adapting its cruise missiles for a wide range of missions and operational goals. It would be unsurprising if China deployed the missile for launch from a road mobile platform.

The PLARF also operates the CJ-10, which is a long-range surface-to-surface cruise missile, making it a potent precision-strike weapon.<sup>20</sup> The CJ-10 has a range of 2,000 km with inertial and satellite guidance and is capable of delivering both nuclear and

conventional payloads.<sup>21</sup> The PLARF is estimated to operate somewhere between 40 and 55 launchers that are capable of delivering approximately 200 to 500 of these missiles.<sup>22</sup> As is evident, Chinese missile forces have increased significantly in the cruise missile category.<sup>23</sup> China can launch strikes with the CJ-10 from beyond the TAR such as Chengdu in the Sichuan province of China, which is located over 1,200 km from Tawang in Arunachal Pradesh (See Map 2). Beyond these PLARF-controlled ground-launched short, intermediate and long-range surface-to-surface LACMs, there are longer-range air-launched versions of China's cruise missile capabilities in the PLAAF's inventory.

**Table 3: China's Long-Range Ground Launched Cruise Missile**

<b>Name</b>	Changjian (CJ-10), or DH-10/DF-10 (LACM)
<b>Length</b>	6.4 metres
<b>Diameter</b>	0.7 metres
<b>Warhead</b>	Single High Explosive/Nuclear warhead
<b>Launch Platform</b>	Mobile Multi-Wheeled Truck Launched
<b>Range</b>	1,500 km+
<b>Propellent</b>	Turbofan
<b>Type</b>	LACM (CJ-10) and ALCM (CJ-10K)
<b>Status</b>	Deployed

Source: "Design Characteristics of China's Ballistic and Cruise Missile Inventory", Nuclear Threat Initiative.<sup>24</sup>  
Zachary Keck, "Can China's New Strategic Bomber Reach Hawaii", *The Diplomat*, August 13, 2013

Map 2: Distance between Chengdu to Tawang



Source: Google

## CHINA'S AIR-LAUNCHED LAND ATTACK CRUISE MISSILE CAPABILITY

There are advantages in developing an ALCM capability. An ALCM has enormous utility in the initial stages of a conflict and is likely to be used in armed conflict, as it can eliminate the enemy's air defences as well as air bases. It can also be delivered at substantial standoff ranges. The PLAAF is only a recent entrant into the club of countries capable of long-range bomber operations. The only two other states with significantly greater experience are the United States and the Russian Federation.<sup>25</sup> China's long-range air-launched cruise missile capabilities pose the greatest threat to static targets and slow-moving concentration of forces or troops, rather than airborne targets. The CJ-20 is not a threat to airborne targets because of their speed and manoeuvrability, making them difficult targets to destroy.<sup>26</sup>

For instance, the PLAAF's KD-20, also known as CJ-20 ALCM missile, is geared for striking land targets. It is an air-launched land attack cruise missile with a range of 1500 km. CJ-20 forms the payload of the PLAAF's Xian H-6 strategic bomber (See Table 4). The variant of the H-6 strategic bomber, known as the H-6K, presents an even greater challenge than the original H-6H/M variant that first emerged in 2006. If estimates and predictions are accurate, the H-6K has a substantial combat radius of 2,500 km and when equipped with the CJ-20, gives it a menacing striking range of 4,000 km, which is 40-percent more than its predecessor.<sup>27</sup> Consequently, it can stay well out of the range of the IAF's aerial interception and engagement capabilities.<sup>28</sup> None of the existing fighter jets and air defence missile systems fielded by the IAF can even remotely engage and destroy airborne targets at such a distance. Moreover, there are older H-6

Table 4: China's Air-Launched Cruise Missiles

<b>Missile Name</b>	<i>Changjian-20 (CJ-20)</i>
<b>Mobility and Role</b>	Air-Launched/Land-Attack Cruise Missile
<b>Range</b>	2000+ kilometres
<b>Warhead Type and Weight</b>	Conventional/Nuclear
<b>MIRV and Yield</b>	No MIRV and Yield unknown
<b>Guidance System/Accuracy</b>	Inertial/GPS, Radar Terminal Correlation
<b>Stages/Propellant</b>	Two/Solid
<b>Status</b>	Under Development

Source: Colin Meisel, "Changjian-20 (CJ-20)", *Missile Defense Advocacy Alliance*.<sup>29</sup>

bomber variants that have been upgraded which can deliver stand-off air-to-ground strikes and air-to-surface weapons. Although their engines are less efficient, they add to the PLAAF's bomber strength and ALCM capability.<sup>30</sup> Further, China is fielding H-6K bombers in greater numbers, which can carry six ALCMs and would be able to mount precision strikes at great distances,<sup>31</sup> including potentially deep inside the Indian land mass. The ALCMs are precision stand-off weapons with high efficiency turbofan engines. (See Table 4)

Indeed, as one analyst put it, presently the H-6K and its ALCM, the CJ-20, are, "...unmatched in the region".<sup>32</sup> In the current Sino-Indian stand-off, the PLAAF is believed to have deployed the H-6K strategic bomber in the TAR.<sup>33</sup> Thus, assuming the IAF fields the S-400 Surface to Air Missile (SAM) air defence systems, capable of engaging targets at distances of 400-500 km over the TAR, they would be of no use against the H-6K with their CJ-20 ALCMs.

China can dispense with operating fighter aircraft from the TAR, which no Chinese fighter jet—despite mid-air refuelling capabilities—can traverse and return to base following a strike.<sup>34</sup> China has established bases close to the Indian border at Lhasa, Golmud, Nyingchi and Shigatse. However, these bases are vulnerable to attack from the IAF's fighters and so are the PLAAF's fighters to the IAF's aerial interception as well as ground-based air defences.<sup>35</sup> A high-altitude ceiling imposes limits on the weapons and fuel-carrying capacities of the PLAAF fighter aircraft, thereby constraining the effectiveness of air operations. Even with the benefit of mid-air refuelling, PLAAF fighters are vulnerable over the TAR to the IAF's radar detection and aerial engagement—at least when operating close to the Line of Actual Control (LAC). However, against the H-6K with its CJ-20 cruise missile, neither the IAF's existing ground air defence systems nor its air-launched capabilities would be a sufficient threat against the PLAAF's strategic cruise missile bomber force (See Table 4). The CJ-20



will present a serious threat to India's command and control Head Quarters (HQ) in Ladakh and Northeastern India as well as Advanced Landing Grounds (ALGs) and airbases in Northeast and Northern India. Large troop concentrations along the LAC are also likely to be targets and will be vulnerable to ALCM strikes.

Furthermore, China is believed to be developing a long-range stealth bomber comparable to the American B-2.<sup>36</sup> While details are not clear, this long-range stealth bomber known as the H-20 can deliver cruise missiles potentially at hypersonic speeds.<sup>37</sup>

## IMPLICATIONS FOR INDIA

There are indications that India is making an effort to redress the gap in the range of cruise missile capabilities; the question is whether or not such effort is sufficient. India, as of now, is developing and testing the 800-1000 km range

*Nirbhay* cruise missile that comes with a 200-300-kilogram warhead, which is a land attack projectile. A subsonic missile touching speeds of 0.6-0.7 Mach, which translates into just over 800 km per hour, the *Nirbhay* uses turbofan engines for propulsion, which also reduces chances of detection by radar.<sup>38</sup> Following several test failures as a result of technical problems accruing from poor navigation and guidance between 2014 and 2016, the missile did strike successfully in 2017 and, again, in April 2019.<sup>39</sup> The cruise missile's Small Turbofan Engine (STE) is under development.<sup>40</sup> An (ALCM) variant of the *Nirbhay* will be crucial, but remains untested. Nevertheless, the existing range of the *Nirbhay* at 1,000 km is still inadequate, unless the Defence Research and Development Organisation (DRDO) is able to increase the range of the missile (See Table 5). As of today, the missile has been tested from a mobile-articulated platform.

**Table 5: India's Long-Range Cruise Missile**

<b>Missile Name</b>	<i>Nirbhay</i>
<b>Class</b>	Subsonic Cruise Missile
<b>Length</b>	6.0 metres
<b>Diameter</b>	0.5 metres
<b>Launch Weight</b>	1,500-1,600 kilograms
<b>Platform</b>	Mobile articulated Launcher
<b>Warhead</b>	High Explosive, submunitions, potentially 12 Kiloton nuclear explosive
<b>Propulsion</b>	Tubojet
<b>Range</b>	800-1000 kilometres
<b>Status</b>	Under Development

Source: Missile Defense Project, "Nirbhay," *Missile Threat*.<sup>41</sup>

On the other hand, the CJ-20 is delivered from an airborne platform—thus giving it greater range. That apart, India lacks a comparable bomber to the H-6K, which can deliver a *Nirbhay*-like missile from substantial stand-off ranges. While the missile can be launched from multiple platforms, the air-launched variant is expected to be tested in 2021. This schedule may be delayed due to the ongoing COVID-19 pandemic. Further, the latest test of the *Nirbhay* conducted in October 2020 ended in failure, suggesting that the development of the missile is likely to take more time and effort.<sup>42</sup> In parallel, New Delhi is working on expanding the range of another cruise missile—the *BrahMos*. Unlike the *Nirbhay*, the *BrahMos* is a supersonic cruise missile with a current range of 300 km and an upgraded range of 500 km.<sup>43</sup> (See Table 6)

The air-launched variant of the *BrahMos* is delivered from an SU-30 MKI fighter aircraft

with a range of 500 km, which can be extended to 800 km. The latter, known as the *BrahMos-ER*, is an air to land attack missile.<sup>44</sup> Against fixed ground targets, such as the PLAAF airbase located in Lhasa, there are reasonable chances of the IAF making a successful strike. Yet, the IAF is still vulnerable to PLAAF's mobile SAMs as well as aerial interceptors close to the LAC dividing India and China. However, striking targets deep inside the Chinese mainland will remain elusive with India's existing air-launched capabilities. Thus, India must match a segment of China's bomber fleet that are capable of delivering cruise missiles that can strike deep inside the Chinese mainland. Both the H-6K and its CJ-20 ALCM have to be treated as serious enough to compel military planners in New Delhi to match the PLAAF. Indeed, an anonymous reviewer of this brief, contesting the need for additional cruise missiles, posed the question: "Do we [India] require to hit targets deep

**Table 6: India's Short-Range Cruise Missiles**

<b>Missile Name</b>	<i>BrahMos</i>
<b>Class</b>	Supersonic Cruise Missile
<b>Length</b>	8-8.2 metres
<b>Diameter</b>	0.67 metres
<b>Launch Weight</b>	2,200-3,000
<b>Warhead/Payload</b>	200-300 kilograms
<b>Propulsion</b>	Liquid-Fuelled ramjet
<b>Range</b>	300-500 kilometres/ Export 290 kilometres
<b>Status</b>	Operational
<b>Basing</b>	Ground Launched, Air-Launched, Ship-Launched and Submarine-Launched

Source: Missile Defense Project, "BrahMos," Missile Threat.<sup>45</sup>

inside the Chinese mainland with a cruise missile? Isn't Agni V the variant designed for it?"<sup>46</sup> This is contestable. Relying heavily on ballistic missiles for strikes deep inside Chinese territory is unwise. India, in any case, has few ballistic missiles, which are likely geared for only delivering nuclear payloads. Long-range ALCMs and GLCMs give flexibility to India's force planners to execute a wide range of conventional strike missions.

China's BeiDou constellation of satellites most likely provide vital navigation and guidance data for the People's Liberation Army Rocket Forces (PLARF), which has a mixture of conventional and nuclear-tipped ballistic and cruise missiles.<sup>47</sup> The PLARF is not fettered by No-First-Use (NFU) conventional cruise missile strikes. In any case, missile guidance is most effective when it derives information from multiple sources, including satellites and inertial navigation.<sup>48</sup> The CJ-20 is guided by satellites, as well as an inertial guidance system, giving it precision-strike capability. However, it is now believed to be equipped with an Imaging Infrared (IIR) seeker, which renders the CJ-20 as not only potent against static Indian targets, but also slow-moving ground targets.<sup>49</sup> It is unlikely the CJ-20 represents a significant threat to airborne targets such as fighter jets.<sup>50</sup> China's ALCM capabilities serve both as a potent deterrent and a force multiplier. India will need to come up with a countervailing ALCM capability. This does not imply that India can or should quantitatively match ALCM capabilities, but that they should be acquired, at least in limited numbers, to introduce more diversity in its cruise missile forces and expose a wider array of Chinese targets to strikes. A diverse cruise

missile force both for deterrence, and in the event deterrence collapses—offensive action—gives Indian decision-makers more options. Although there are few countermeasures against cruise missile strikes. Among the most important defensive measures are dispersion of missile assets, concealment, and use of civilian airports to transport missile assets.

## CONCLUSION

Beyond the current border standoff, New Delhi should treat as foremost priority the effective operationalisation of the *Nirbhay* cruise. A potent long-range air-launched cruise missile capability will require investment that is delivered from a strategic bomber like the PLAAF's H-6K. India ought to invest in platforms that can deliver conventional payloads at stand-off ranges such as the H-6K type bombers, which can launch cruise missiles from well outside the range of China's aerial and missile interception capabilities. Developing such an aircraft should be on the R&D agenda of India's aeronautical development apparatus. However, indigenous development of a long-range bomber might be too arduous and protracted for the country. A long-range bomber most readily available on the international market would be the Russian built Tu-22, which is more advanced in design and performance than the H-6K. Thus, India needs a cruise missile capability that matches the CJ-10K in range as well as a platform that can deliver it.

To be sure, one could question the need for long-range ALCM capability when India could make do with the short- to intermediate-range cruise missile, the *BrahMos*. The

BrahMos is versatile and has three variants: naval, ground-launched army, and air-launched. Its range is limited, however. Furthermore, India has good reason to have a diversified missile capability capable of delivering conventional and nuclear payload. Air-launched and ground-launched cruise missiles can make up for shortfalls in offensive air power and also complement it. Indeed, the PRC is doing the same by expanding its missile forces, which will be a crucial challenge to India. For instance, China has developed a formidable cruise missile force geared for asymmetric escalation against U.S. and Japanese forces as part of its

Anti Access/Area Denial (A2/D2) strategy. India has to do something similar.

The present crisis, which is the most serious between India and China since the 1962 war, has already demonstrated the burden for India. Even if the current crisis ends peacefully via diplomatic means, there is no guarantee that future crises will terminate along similar lines. India must make active effort to build countervailing cruise missile capabilities. After all, diversified capabilities help increase survivability in the event of war, and cruise missiles must remain an important arrow in India's quiver. [ORF](#)

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## ENDNOTES

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