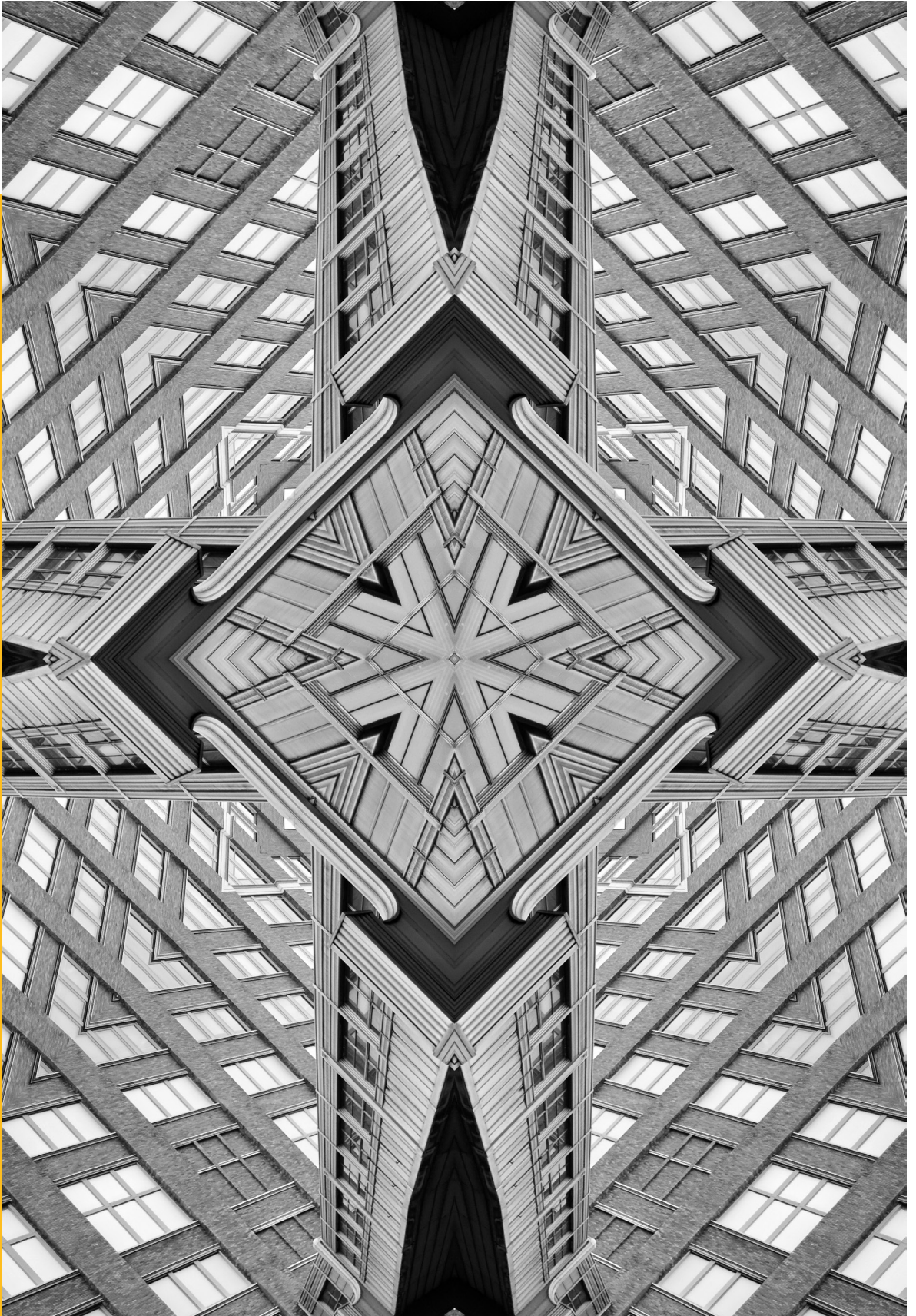


# Occasional Paper



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# As China Strengthens Army Logistics, the Implications for India's Eastern Frontier

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## **Abstract**

Logistics is meaningless if it cannot do what is central to war—fighting. In order to bolster the logistical capabilities of all the major service branches of the Chinese military—including the People's Liberation Army Navy (PLAN), PLA Air Force (PLAAF), and the PLA Rocket Force (PLARF)—the People's Republic of China (PRC) under President Xi Jinping established a Joint Logistic Support Force (JLSF) in 2016. To what extent does the JLSF contribute to the PLA Army's fighting power? This paper investigates, and outlines the potential challenges to India in the context of the Army's current capabilities in defending the country's land frontiers.



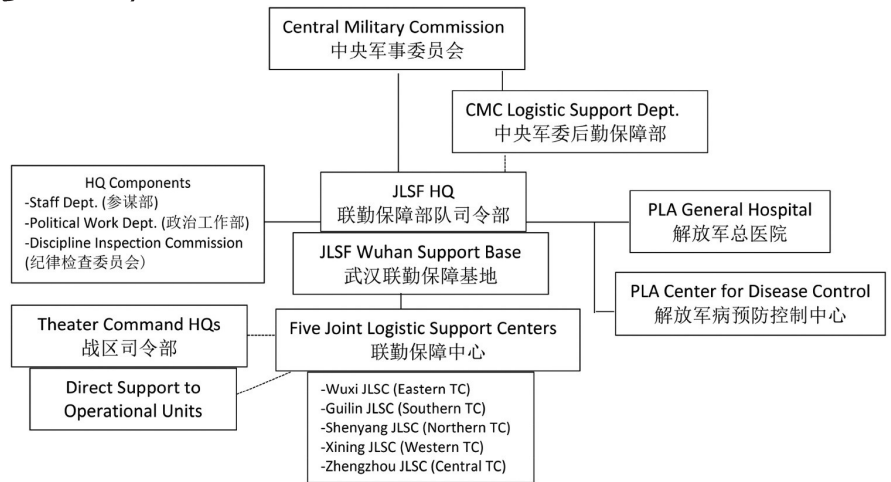
# Introduction

In 2016, China created a Joint Logistic Support Force (JLSF) as part of a larger military reform effort under President Xi Jinping, which also included dissolution of the Military Regions (MRs) and their replacement with the five Theatre Commands (TCs). The JLSF is designed to extend general logistical and supply-related support to all the services of the People's Liberation Army (PLA), including overseas expeditionary and regional missions such as those against Taiwan.<sup>1</sup> The JLSF's fundamental role is the delivery of precision logistics: it must be geared to delivering logistical support at the "right place, the right time and the required amount" for the successful execution of joint operations.<sup>2</sup>

In 2020 it played a key role in responding to the COVID-19 outbreak at Wuhan, capital of the Hubei province—it served as a test of the JLSF's emergency response capabilities and effectiveness.<sup>3</sup> The effort involved the transportation of emergency aid, medical supplies, and personnel to Wuhan, from across cities via air and high-speed rail.<sup>4</sup>

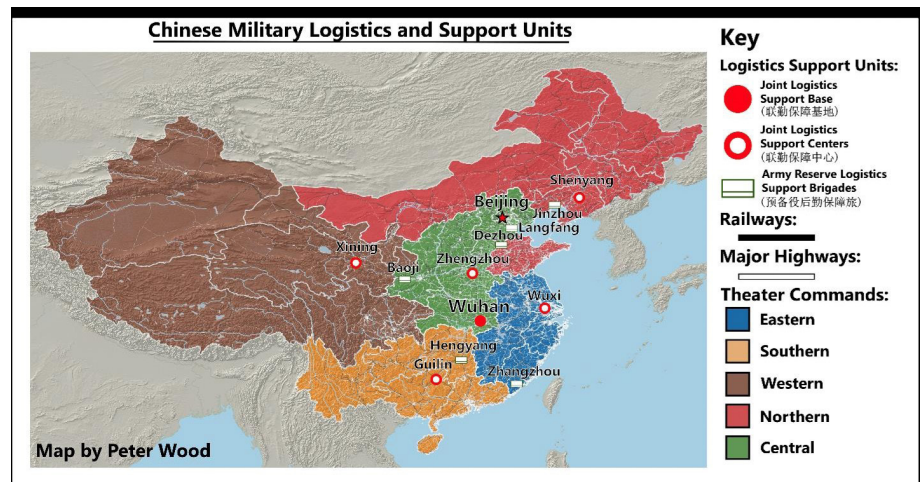
Figure 1 shows the structure of the JLSF and Figure 2, the geographic distribution of China's military logistics and support elements. The JLSF is vital to the combat performance of all the service branches of the Chinese military as it is required to manage all their logistical requirements providing support in the implementation of integrated joint operations, supporting joint training, and extending support to strategic and campaign joint logistics.<sup>5</sup> The vast expanse of territory that covers the Tibetan Plateau and Western region of Xinjiang that falls under the Western Theatre Command (WTC) has witnessed an increase in logistical activity, covering rail, road, and air transportation.<sup>6</sup>

**Figure 1:  
Joint Logistics Force Structure  
(JLSF)**



Source: Joel Wuthnow, "A new era in Chinese military logistics", *Asian Security*, February 11, 2021, pp. 1-15. See also *China's National Defence in the New Era*, The State Council Office of the Republic of China, July 24 2019, [http://www.xinhuanet.com/english/2019-07/24/c\\_138253389.htm](http://www.xinhuanet.com/english/2019-07/24/c_138253389.htm)

**Figure 2:  
Chinese Military Logistics and  
Support Units**



Source: Kevin McCauley, "Modernization of PLA logistics: Joint Logistic Support Force", *Testimony before the U.S.-China Economic and Security Review Commission*, February 15, 2018.



# Introduction

There are available open-source material and published accounts of the JLSF and they are surveyed in this paper. However, there is scant analysis specifically of how the JLSF's evolving logistical capabilities could pose challenges for the Indian Army's (IA) capacity to defend India's land frontiers against the PLA Army (PLAA). This paper dissects the JLSF's potential against India and builds on existing literature on the subject, albeit mostly from Western and Chinese sources in English. It evaluates how the JLSF bolsters the capacities especially of the WTC and PLAA in frontier defence. It finds that its contribution to China's frontier defence is so far limited; in the foreseeable future it is likely to play, at best, a supporting role to the WTC and the PLAA's joint logistics for the execution of joint operations.

This analysis is structured as follows. The first part defines "logistics" and why it is important to war, and the second looks at the creation of the JLSF. The third and fourth sections assess the PLAA's road railway supply network, and the PLAAF's role in troop deployment. The final part underlines that the JLSF, and China's military generally, are yet to exploit water-borne logistics; the analysis fills at least partially the gap in current literature on the subject especially with respect to the JLSF and the PLA's logistical work in the Tibet Autonomous Region (TAR).<sup>7</sup>

“The JLSF's contribution to China's frontier defence is so far limited; in the near future it is likely to play, at best, a supporting role to the PLA Army.”



# The Importance of Military Logistics

The Swiss strategist Antoine Henri Jomini defined “logistics” as “the practical art of moving armies.”<sup>8</sup> He listed 18 constituent elements of a wide range: “... successive arrival of convoys of supplies. Collecting all the means of transportation of the country and of the army and regulating their use....[to]...Organising depots of convalescent, wounded and sickly men, movable hospitals, and workshops for repairs; providing for their safety.”<sup>9</sup> Military affairs analysts generally concur with the definition proffered by Jomini,<sup>10</sup> who is regarded as the “father of military logistics.”<sup>11</sup> This paper works along his definition.

At the same time, this paper acknowledges that Jomini’s definition may be an oversimplification. Modern logistics is more complex, encompassing air warfare, naval warfare, administration of logistics, and training—and there have been significant improvements in technology since the time of Jomini’s conceptualisation.

The effort in the succeeding pages is a modest one, focusing primarily on the scope of the JLSF’s role and some of the individual capacities and initiatives of the PLAA and the WTC. It only partially accounts for the complexity of modern military logistics being pursued by China.

Transporting material, whether food or ammunition, from point A to point B requires a supply chain. Central to any logistics system in the military is its contribution to the war effort, actual combat, or in other words, the fighting power of the forces.<sup>12</sup> The study of logistics may seem mundane; yet, logistics is indispensable for sustaining military operations and keeping forces well supplied.



# The Importance of Military Logistics

As military historian Martin Van Creveld once observed: “Before a commander can even start thinking of maneuvering or giving battle, of marching this way and that, of penetrating, enveloping, encirclement, of annihilating or wearing down, in short of putting into practice the whole rigmarole of strategy, he has – ought – to make sure of his ability to supply his soldiers with those 3,000 calories a day without which they will very soon cease to be of any use as soldiers; that roads to carry them to the right place at the right time are available, and that movement along these roads will not be impeded by either a shortage or a superabundance of transport. It may be that this requires, not any great strategic genius but only plain hard work and cold calculation.”<sup>13</sup>

China is a state that appears to fully recognise why logistics is crucial to the fighting power of its forces and a vital determinant of military outcomes.<sup>14</sup> The need to preserve one’s own supply lines while destroying the enemy’s may be taken for granted, but few realise the investment it needs. China, for its part, has methodically and relentlessly improved the logistics of its armed forces so that it enables swift and successful combat outcomes.<sup>15</sup> Its creation of the Joint Logistics Support Force (JLSF) is testimony to how much the PLA is investing in a tightly networked and coordinated logistical system that augments the combat power of all the three service arms of the Chinese military.

“China fully recognises why logistics is crucial to the fighting power of its forces and a vital determinant of military outcomes.”



# The JLSF: A Brief History

The JLSF is centrally controlled through the Central Military Commission (CMC). It is a service that continues to evolve and has yet to be tested in an actual war.<sup>16</sup> Most of the shifts and improvements in China's joint logistics capabilities can be attributed to Xi's decision, if not exclusively, for an integrated service that meets the needs of the five Theatre Commands (TCs)<sup>17</sup> which were established in 2016 (see Figure 2) dissolving the erstwhile seven Military Regions (MRs). The most relevant to India is the WTC, which is responsible for all conventional military missions and operations. The establishment of TCs was also made possible with the investments under Xi's two predecessors, Hu Jintao and Jiang Zemin. However, the JLSF's capacity for distant or overseas operations remains limited.<sup>18</sup>

In only one instance has the JLSF conducted a major exercise under its authority, called the *Joint Logistics-2018-B*,<sup>19</sup> focused on battlefield command and supply.<sup>20</sup> It put forces to test whether they could autonomously execute operations, and provided new pathways to joint training, joint warfare, and joint support.<sup>21</sup> It involved logistics support at all stages of a military campaign testing combat readiness, campaign planning, campaign manoeuvring, joint operations, and the termination of a campaign.<sup>22</sup>

For India, it was relevant that this exercise was conducted in the mountain terrain of the Western part of China,<sup>23</sup> signaling that it sought to prepare Chinese forces against the Indian Army (IA). The exercise involved supply of blood bags via Unmanned Aerial Vehicles (UAVs) to wounded soldiers on the frontlines and establishment of refueling depots in remote and isolated terrain using both helicopters and ground vehicles.<sup>24</sup> It also demonstrated how an armoured unit required fuel and received a fuel package delivered by UAV.<sup>25</sup>

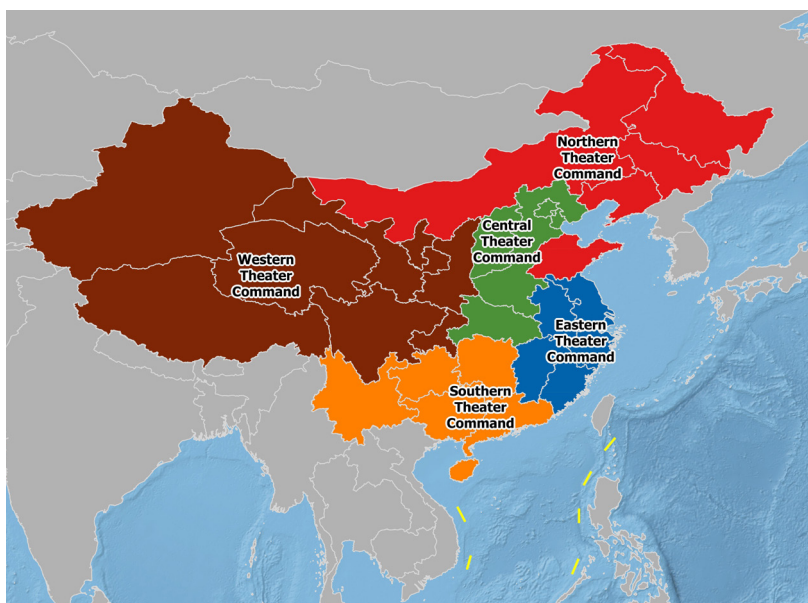


# The JLSF: A Brief History

Notwithstanding this limited experience in overseeing joint logistics operations and strategic delivery, the key issue is whether JLSF's support to the TCs prepares them better to conduct limited border wars than long-distance overseas missions. While this may appear to be the case, a caveat is in order about the strength of China's frontier defence through joint operations. "Jointness" in military missions is an ongoing and demanding process for the JLSF that could potentially be hobbled by poor coordination in support of the TCs, the PLAA and the other service branches that will limit its effectiveness. Especially in a time of war, the three services may have to rely more on their own logistical capacities rather than on the JLSF, which is centralised under the CMC. Although the JLSF is geared to providing operational and capacity-building support to the TCs and guided by the Logistics Support Department (LSD),<sup>26</sup> China has not gone so far as to create its equivalent of the United States Military Transportation Command (USMTC), which handles all the logistics requirements of the US military's overseas missions for its armed forces.<sup>27</sup>

The JLSF is therefore likely to be a highly effective force in peacetime, but it is unclear what its performance will be in wartime. The service elements of the TCs continue operating their own supply systems—this has resulted in a "general service vs a service specific" supply systems.<sup>28</sup> It compels the JLSF to coordinate with the operational supply units and resources under the control of the individual services rather than exercise direct control over them.<sup>29</sup> In a nutshell, unity of command—which requires joint logistics to support joint operations—could potentially suffer. Command and Control (C&C) of logistics support lacks clarity.<sup>30</sup> The TCs have direct control over civilian assets and carriers within their respective areas of command. This is especially true in emergencies and wartime. However, at the same time, the JLSF, which is under the direct authority of the CMC has control over the same civilian assets as the TCs.<sup>31</sup> This could lead to duplication of efforts and potentially puts the JLSF and the TCs on a collision course.<sup>32</sup>

**Figure 3:  
China's Five Theatre Commands**



*Source: Kenneth Allen, Dennis Blasko, and John F. Corbett, "The PLA's Organisational Structure: What is Known, Unknown and Speculation (Part 1), China Brief, Volume 16 Issue: 3, February 4, 2016, <https://jamestown.org/program/the-plas-new-organizational-structure-what-is-known-unknown-and-speculation-part-1/>*

China's logistics capabilities have been tested often, for instance during natural disasters. The JLSF itself has been involved in rescue missions in coordination with the Eastern Theater Command (ETC) and People's Armed Police (PAP). The JLSF is involved in the mobilisation and deployment of personnel, beds and supplies, and establishment of emergency medical units.<sup>33</sup> In July 2021, for example, when a massive typhoon hit the city of Zhoushan in China's eastern province of Zhejiang, the ETC activated all the forces necessary for conducting the rescue mission and carrying out medical



# The JLSF: A Brief History

assistance.<sup>34</sup> Rescue and medical relief operations were managed through the Theatre's joint command centre.<sup>35</sup> A brigade of the 72<sup>nd</sup> Army group attached to the ETC helped with repairing levees and a vehicle transportation battalion and a warehouse of the naval aviation wing under the ETC.<sup>36</sup>

The matter of C&C is a subject in its own right and therefore, the subsequent analysis does not delve into the JLSF's C&C arrangements and organisation and only seeks to address Civil-Military Fusion (CMF) or Civil-Military Integration (CMI) in the logistics domain and how it ties into the larger, albeit potential logistical capacities of the JLSF. CMI is vital to China realising joint logistics, although it predates the establishment of the JLSF and Xi Jinping's reign.<sup>37</sup> It was created during the tenure of Jiang Zemin in the 1990s in a quest to engender cooperation between the civilian and military sectors and leverage each other's strengths for rapid modernisation.<sup>38</sup> CMI was then promoted under a single civilian entity called the Commission for Science, Technology and Industry for National Defense (COSTIND) and thereafter in 2007-2008 under Hu Jintao became the State Administration for Science, Technology and Industry for National Defense (SASTIND).<sup>39</sup>

Today the JLSF is responsible for overseeing CMI with regard to logistics across all the service branches of the Chinese military.<sup>40</sup> It leverages civilian capacities to support joint logistics covering operations, training, transportation and the Logistics Support Department (LSD) under the CMC, and oversees the deputation and training of civilian personnel to support the military's logistics missions.<sup>41</sup> In order to ensure that the civilians meet the high standards of the Chinese military in fundamental military qualities, the PLA has been experimenting with and exploring civilian training to be conducted on military bases.<sup>42</sup> Base-centric military training is conducted across military academies and institutions whose

# The JL<sub>NSF</sub>: A Brief History

conditions allow for the high standards expected of civilian recruits.<sup>43</sup> For instance, the PLA Army Engineering University in Nanjing has conducted and implemented on-base theoretical education, practical applications necessary for the military, seminars, and on-site visits by civilians.<sup>44</sup>

These efforts are designed to reinforce the PLAA's logistics capabilities, and can have implications for India. After all, there is growing concern over the PLA's improved rail and road connectivity in the Tibetan Autonomous Region (TAR). In August 2021, former Foreign Secretary Shyam Saran observed that there was "visible acceleration" in infrastructure development in Tibet, particularly near the China-India border in the region of Arunachal Pradesh.<sup>45</sup> Latest developments suggest that China is ramping up its transport infrastructure with the construction of the Lhasa-Nyingchi high-speed railway network that is just 15 km north of the Tuting sector of the Line of Actual Control (LAC).<sup>46</sup> This could also lead to coordination problems between the TCs, service-specific logistics units, and the JL<sub>NSF</sub>.

“China’s logistics capabilities are tested often, for instance during natural disasters.”



# JLSF's Role in PLAA and WTC Capacities

In the case of frontier defence, which includes the LAC and falls under the WTC, there has been a concerted effort to improve and maintain robust base support and mobile operations. In this regard it is necessary to survey the role of the JLSF in keeping Chinese forces deployed and executing combat missions. Although the JLSF is mandated to pursue CMI leveraging civilian infrastructure and transportation to service the supply and transport requirements of the PLAA, it is the WTC's military transportation dispatch centre which is overseeing the operation and development of approximately 30 civilian airports in Tibet and Xinjiang.<sup>47</sup> In early September 2021, under the WTC, 23 new air routes were officially opened with the first chartered flight carrying 115 veterans from Shigatse Heping airport in Tibet to Chengdu in Sichuan province.<sup>48</sup> These 23 routes will play a key role in the transportation of veterans as well as new recruits in and out of Tibet and Xinjiang. The strengthening of civil aviation has made it convenient to transport necessities to PLAA soldiers deployed in border areas.<sup>49</sup>

The larger effort to supply by air has witnessed important strides using manned fixed wing aircraft. For strategic delivery, the PLAAF has been using a variety of medium lift transport aircraft. China has closely studied the US and Russian strategic delivery capabilities by air, whether during America's 2003 war in Iraq or Russia's military interventions in Ukraine and Syria in 2015.<sup>50</sup> They recognise that time is essential in air-borne logistics for the generation of positive combat outcomes in war. The Chinese Air Force's Y-20 heavy lift transport aircraft have filled the gaps in the forces' strategic delivery capabilities. As American scholar, Joel Wuthnow put it, "The Y-20s, which entered service in 2016, are beginning to reduce China's strategic airlift deficit and replace older airframes."<sup>51</sup> The Y-20, however is today only capable of transporting troops; it can in the future play a key role in transporting heavy equipment in the event of a high-intensity Sino-Indian military conflagration along the LAC.

# JLSF's Role in PLAA and WTC Capacities

Over time, the Y-20 could evolve into variants that are capable of mid-air refuelling and airborne early warning.<sup>52</sup> All civilian airports and some civilian airliners present and operating in the TAR are likely to be used in wartime—these include the Lhasa-Gonggar airport, Qamdo-Bangdo, Nyingchi, and Gunsar. This is integral CMI. Heavy transports and UAVs are likely to be critical means of supporting the PLAA's supply needs.

The PLAA has been using its UAV and manned aircraft capabilities to service its supply needs. The effort is for strategic delivery that enhances material storage capacity and supply in a quest to seamlessly integrate ground transportation with aerial delivery, thereby significantly boosting rapid response capabilities to tackle military contingencies.<sup>53</sup> As noted earlier, the JLSF exercises do reveal medical support via UAVs for forward deployed forces in frontier areas. Unless more such exercises are conducted, it is difficult to precisely identify and assess with confidence the strengths and capacities of air transportation of the JLSF. Nevertheless, independent of the JLSF, the PLAA has been conducting logistics-related drills of its own in the TAR.

In November 2020, for instance, the drone delivery drill was executed in the hinterland of the Tibetan Plateau by the PLAA's Logistics Department and the PLA Tibet Military Command's Support Department.<sup>54</sup> The exercise involved a transportation unit consisting of vehicles and personnel deployed in a frontline combat area which are under enemy fire and unable to advance. The drone delivery team was required to make quick supply to the area of hostilities. A UAV delivery unit was rapidly assembled and nine drones were dispatched to the target area where the transportation unit was stranded.<sup>55</sup> A separate transportation unit, which was assigned to the Tibet Military Command, transferred the hot food, drinking water, medicines and other essential items into the incubation chamber of the drones. The UAVs, thereafter in battlegroup formation took off to the combat area.<sup>56</sup>



# JLSF's Role in PLAA and WTC Capacities

As the PLAA conceded, the drone operators while executing the supply mission at high altitude of the Plateau have to consider a range of factors such as wind speed and temperature, to ensure the drones land safely in the designated area.<sup>57</sup> Via a screen display the drone operators remotely dismounted the incubators that contained the supplies and distributed them across several locations in the area of the mission. This exercise also involved Three Dimensional Delivery (3D) printing, where a computer enabled design created the blending metals or plastics "...layer by layer".<sup>58</sup> Specifically in the case of the PLAA's Logistics Department, there was a pre-delivery exercise that tested metallic materials required for 3D printing in wartime prior to the exercise; thereafter, the actual exercise also tested a new model for 3D air-to-ground delivery.<sup>59</sup> A large number of trials have also been conducted for air-ground delivery in complex conditions by replacing a purely ground-based supply network.<sup>60</sup> There is also an effort to establish mobile field stations and drones to accompany PLA field units in long-distance manoeuvres across the Plateau.<sup>61</sup>

Since the start of 2020, several such exercises have been undertaken by the PLAA. There is a bid to refine and inject some additional complexity into drone-based supply exercises.<sup>62</sup> There is also an effort underway by the PLAA of using this exercise as a model to supply or deliver ammunition employing drones.<sup>63</sup> As of this writing, there is no available evidence or information regarding exercises involving drone-delivered ammunition supplies by the PLAA. Nevertheless, the JLSF did conduct its largest competition to date in central China between late November and early December 2020 that shifted focus away from testing "individual skills" to more complex tests such as cooperation among various units, the application of technology and tactics, physical aptitude and skills and how all these elements translate to combat effectiveness.<sup>64</sup>

# JLSF's Role in PLAA and WTC Capacities

The competition involved all JLSF support centres with the participation of some 1,000 PLA officers and soldiers attached to the PLA Joint Logistics Support Centers, PLA General Hospital and several other units that covered field support such as commanding, financing, materials supply, rescue, delivery, camping and critically supply of ammunition.<sup>65</sup> This competition likely produced outcomes that are applicable to all the TCS and will potentially help forces under the command of the WTC as well as the PLAA in the TAR.

At the same time, it would not be unreasonable to assume that the PLAA distinctly from the JLSF is most likely in the process of designing, refining and pursuing exercises involving drone-based ammunition supplies. Indeed, UAVs are likely to dramatically increase the efficiency of the PLAA's supply capabilities for forward deployed units.<sup>66</sup> In the foregoing, it is fairly evident the JLSF's role has been minimal. This confirms, at least partially, that the PLAA in the TAR and the WTC are managing and testing their supply needs and conducting trial repair work through 3D printing, independently of the JLSF.

“China has closely studied the US and Russian strategic delivery capabilities by air, whether during America's war in Iraq or Russia's interventions in Ukraine and Syria.”

# JLSF in Tibet Administrative Region

Under the joint staff of the WTC, there is a concerted effort to implement Xi's vision of strengthening the PLAA logistic support system. Generally, the PLAA logistical system has improved; or at least the trendlines indicate so.<sup>67</sup> This has been particularly true in the areas of Civil-Military Integration (CMI) which involves using civilian assets and resources to meet the supply needs of the military service.<sup>68</sup> In order to secure its logistics needs, the PLAA has signed numerous agreements with local supply units and produced some positive initial results in connected areas.<sup>69</sup> The endeavour is to expand and set more ambitious targets for CMI and also develop CMI demonstration projects or the practical application of CMI. These projects have generally covered logistics technology, military logistics, military energy, medical and health needs of troops, transportation, and delivery and military installations requirements.<sup>70</sup> Ultimately, the purpose is to build a seamlessly integrated civil-military logistics chain.<sup>71</sup> Even before Xi Jinping's ascension to the presidency, there was already progress being made in Chinese military logistics, with the help as well of civilian resources.<sup>72</sup> Between 2004-2011, the PLA also demonstrated a considerable capacity, at least within Chinese borders, to improvise.<sup>73</sup>

More specifically, rail and road transportation both in the civilian and military areas have significantly improved under the WTC, especially in the TAR. There are significant advances made by both by the Chinese military and local civilian infrastructure. The PLAA logistics capacities are being honed and consolidated for frontier defence in these two domains—something which is to be expected. The road network across TAR, because the bulk of it adjoins the LAC, is likely to witness considerable military activity in the form of supply and movement of combat forces and equipment. The TAR's road network has undergone significant development and expansion. Under China's 13<sup>th</sup> five-year plan between 2016 and 2020 the TAR's road network facilitated improved air and rail connectivity as well as fuel delivery via pipeline.<sup>74</sup> More recently, under the 14<sup>th</sup> Five



# JLSF in Tibet Administrative Region

Year Plan for 2021-2025, the TAR will witness infrastructure related investment up to USD 30 billion.<sup>75</sup> Exactly how much of this will be spent specifically on ground, rail and air infrastructure is unclear. However, at the 13<sup>th</sup> People's Congress in March 2021 the National Development and Reform Commission released a report, which specifically identified the Chengdu-Lhasa Railway as a key initiative that will receive substantial investment.<sup>76</sup>

The JLSF has played an important part since at least December 2015 in the development and maintenance of pipeline-based fuel supply across the Tibetan plateau.<sup>77</sup> Personnel from the JLSF set up oil and fuel supplies prior to PLA drills and exercises across Tibet's harsh high-altitude terrain.<sup>78</sup> Indeed, the JLSF's operational area covers a wide expanse of geography that ensures fuel supplies are running to sustain the military deployments of China in peace as well as war time.<sup>79</sup> JLSF units deployed in the TAR are not just specialists in pipeline construction and maintenance; they are trained in a range of other areas such as disaster relief, and repair of emergency rescue equipment and battle equipment.<sup>80</sup>

Although the JLSF plays a key role in fuel supply, its role in building and maintenance of road infrastructure is not evident. According to Chinese government data, Tibet in 2018 had 97,400 km of road on which traffic could move.<sup>81</sup> This represented an increase of 4.2 km of motorable road coverage every day over a 59-year period.<sup>82</sup> The TAR was expected to get roughly 2,100 km of additional road, taking the entire region road coverage to 99,500 km by the end of 2019.<sup>83</sup>

Beyond this extensive improvement in the road network across the TAR, the two crucial highways that connect the region to the other provinces of China are the Sichuan-Tibet highway and Qinghai-Tibet highway.<sup>84</sup> Beyond these two highways, China has a network of feeder roads that connect to China's frontier with India from Lhasa, Shigatse, and Nyingchi. During wartime, the WTC will also use civilian and commercial freight vehicles and mobile and static assets present and operating across the TAR to support military supplies.

# JLSF in Tibet Administrative Region

Moreover, railway transportation will play a key logistical role. There are two key rail-based transport routes connecting TAR. The first, which was completed in 2005 is the Qinghai-Tibet 1,956-km rail line connecting the Qinghai capital Xining to Tibet's capital Lhasa.<sup>85</sup> The second is the high-speed railway line linking Lhasa to Nyingchi, close to Arunachal Pradesh in the Eastern sector of the LAC. Yet the stretch of 435 km is one part of the Sichuan-Tibet rail line, which is considered strategic.<sup>86</sup> One senior Chinese Communist Party (CCP) official once observed that the high-speed railway line will serve as a rapid means of transport of critical and “strategic” supplies of materials in the event of military crisis with India along the LAC.<sup>87</sup>

In early August 2021, the PLAA moved a combined arms brigade on this line, demonstrating and testing its capacity to mobilise and transport forces.<sup>88</sup> China has constructed a five-kilometer railway bridge over the Yarlung Tsangpo.<sup>89</sup> China has determined that mobilising forces and transporting light equipment rapidly in a crisis, as well as relieving forces, is an imperative even if the vulnerability of the Lhasa-Nyingchi rail line and several other rail lines face destruction once active military hostilities get underway.<sup>90</sup> Destruction of the rail line by the Indian Air Force (IAF) and long-range Indian Army (IA) artillery will make it difficult to rebuild immediately. Nevertheless, this railway line as a troop carrier does increase the fighting power of the PLAA, despite weaknesses.

To be sure, there could be other reasons why China is expanding its rail coverage to the Sino-Indian frontier. After all, settling people in border areas and TAR has also been a key endeavour of the Chinese state under Xi Jinping and his predecessors in order to “Sinicise”, both culturally and physically, the Tibetan populations living adjacent to the Sino-Indian boundary.<sup>91</sup> The improved rail and road connectivity is thus part of a larger effort to force integration through inter-marriage between Tibetans and Han Chinese, in turn neutralising secessionist tendencies.<sup>92</sup>

# JLSF in Tibet Administrative Region

Even before the Xi era, improving infrastructure in the TAR had been geared to expedite the migration of Han Chinese from regions adjoining the TAR such as Gansu, Sichuan and Qinghai.<sup>93</sup> Furthermore, as Zhu Weiqun, a CCP official formerly responsible for China's Tibet policy noted, the purpose behind building both the Lhasa-Nyingchi and Yaan-Nyingchi rail lines, is to supply or "... transport advanced technologies..." from the rest of China to Tibet and take locally produced products out of the region rapidly.<sup>94</sup> The lines are expected to be completed by 2030. Yaan is a city in the Western part of the province of Sichuan, and located 130 km from Chengdu, the provincial capital. It is a communications hub that intersects two key routes to Kangding and to the TAR that runs West, and a second that runs in a North-South direction from Chengdu to the Southwest.

There are also efforts underway to computerise logistics, including the oil supplies for the PLAA. If the troops require fuel, a request or report is coursed online through the Military Oil Engineering System to the service arms. The Military Logistics Support Department then processes the request through the fuel storage depots of the military and the fuel network system reviews and approves the exact requirement for fuel.<sup>95</sup> This has increased efficiency in the supply system significantly. The PLA's joint logistics under the WTC has created a taut fuel supply system that has overcome the impediments at the local level, delays from the services and established an efficient network throughout the army.<sup>96</sup>

Under the old system of logistics, bureaucratic hurdles and formalities prevented timely and quick delivery from storage depots; today it takes barely 20 minutes.<sup>97</sup> The WTC is also focused on securing three-dimensional delivery or 3D printing which would allow for the rapid replacement of ground combat vehicle parts in case they are damaged.<sup>98</sup> The command is striving to effectively use 3D printing by way of improved access to materials and better protection in combat and transport.<sup>99</sup> Thus, a system is being created under the WTC to meet actual combat requirements.<sup>100</sup> Introduction and utilisation of 3D printing suggests an important advance: the WTC is working extensively to bring a greater level of efficiency, and also working at a higher level of efficiency to service the PLAA's combat logistics needs.

# PLAA's Water-Based Transportation in the TAR: JLSF Weakness or Redundancy?

As discussed in earlier sections of this paper, most of the JLSF's investment has been in testing, training, conducting exercises and responding through supply by air, land and rail. However, historically, water-based transportation as opposed to road or rail-based transport has been the most efficient and economical means of sustaining the logistical effort and supply requirements for troops deployed for action on the front.<sup>101</sup> It remains the case today as it did under the Roman Empire more than 2,000 years ago.<sup>102</sup> In Ancient Rome the differential was an estimated 1:50.<sup>103</sup> This figure should have grown significantly since. The PLA Navy (PLAN) has built a whole range of strategic sea-lift capabilities—from LPD and LHD and Roll-on/Roll-off (Ro-Ro) ships for transporting heavy military equipment such as tanks, artillery systems, Armored Personnel Carrier (APCs). However, most of these capacities have been tested on China's coast at the Bohai Gulf and the SCS.<sup>104</sup>

Recent analysis also suggests the JLSF is still experimenting with new amphibious logistic technologies, but there is very little investment to indicate significant progress and maturity.<sup>105</sup> More specifically, the PLAN's river-sea transportation is a perfect example of how military supplies are transported over water. However, river-sea transportation by the PLAN occurs over rivers that eventually flow into the sea on China's coast, far removed from the TAR. This supply effort is largely geared for projecting strength for a possible attack against Taiwan, the South China Sea (SCS), the East China Sea (ECS), and beyond. Latest evidence tends to confirm this, as the JLSF has closely worked with civilian and commercial Ro-Ro vessels, cargo ships, tug boats and construction vessels and PLA landing craft as part of an amphibious logistics exercise which grew in complexity over a two-month period in 2020.<sup>106</sup> This exercise, dubbed the Eastern Transportation-Projection 2020A occurred in Lianyungang, Jiangsu province over 2,800 km from the TAR and geared for preparing Chinese forces for a potential cross-strait invasion of Taiwan.<sup>107</sup> To be sure, China is still in the early stages of refining and mastering the



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demands of amphibious and over-the-shore logistics with the support of commercial and civilian shipping.<sup>108</sup> Nevertheless, it underlines where the JLSF as well as the PLAN's and PLAA's priorities are when it comes to water-borne logistics.

Inland river-based transportation is something the PLAA undertakes as well. This is especially true in the case of territories or provinces where water bodies exist. The TAR is where several rivers originate, the most critical of which is the Yarlung Tsangpo (China) or the Brahmaputra (India). Much of the trepidation in India is over the diversion of the Yarlung Tsangpo by China.<sup>109</sup> Being the upper riparian state, China is well positioned to exploit and divert waters from the Yarlung Tsangpo, which is a transboundary river for hydroelectric projects such as the construction of a dam in the Medog county.<sup>110</sup> Downstream countries like India and Bangladesh have much to worry about Chinese projects that are coming up at the “Great Bend” at which point the Tsangpo gushes down at high speed to enter India from China.<sup>111</sup> Thus, fears of China's emergence as a “hydro-hegemon” exist, potentially depriving downstream countries of water.<sup>112</sup>

At the same time, few consider if it might enable river transportation to meet the logistical requirements of the PLAA. What can be made of river-based military transportation especially in the TAR? Inland river-based transportation and water-based supply along or close to China's frontier regions, as in the case of the Sino-Indian boundary, gets little attention. However, a cursory look at the river's trajectory will reveal why it will potentially be an important mode of military transportation. The Yarlung Tsangpo runs parallel to Nepal, Sikkim, Bhutan and Arunachal Pradesh, which is in the Eastern sector of the LAC before reaching the “Great Bend”. (See Figure 4). The river runs close to four crucial populations and militarily significant centres—namely Shigatse, Lhasa, Shannan, and Nyingchi. Even under the PRC's 14th Five Year Plan (2021-2025) released in March 2021, there is no specific mention of any potential development of riverine transportation on the Yarlung Tsangpo. If anything, the focus of the Plan is on the construction of hydroelectric infrastructure on the “lower reaches” of the river.<sup>113</sup>

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**Figure 4:  
Trajectory of Yarlung Tsangpo**



Source: DEMIS Mapserver

In terms of river-based logistical capabilities, in 2013, well before the establishment of the JLSF, China did develop and test a heavy-duty pontoon bridge. As part of a drill, the PLAA built a pontoon that provided support for river crossing.<sup>114</sup> The bridge has a modular configuration, which takes different forms. It is capable of ferrying and moving heavy military equipment across rivers with rapid flow and currents such as the Yarlung Tsangpo.<sup>115</sup> It has electronic means of control with a fairly high level of mechanisation and automation. It is also assisted by satellite navigation for effective docking.<sup>116</sup>

The PLAA has also tested pontoon bridge-based transportation more recently in 2019 across the Yellow River, confirming how heavy military equipment can be moved across the river.<sup>117</sup> This again illustrates China's heavy investment in automation for river crossings. Although China has constructed a 525-meter rail bridge over the

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Yarlung Tsangpo allowing rail movement, forming one part of the Nyingchi-Lhasa high-speed rail line it is likely the most efficient means to transport light military equipment and combat personnel. Whether it can move heavy equipment is an open question, notwithstanding Chinese claims.<sup>118</sup> Indeed, the Nyingchi-Lhasa line has 120 bridges and 47 tunnels whose construction, Chinese officials have conceded, involved overcoming complex geological challenges, difficult climate and a fragile ecology.<sup>117</sup> But again, this is illustrative of either the PLAA, WTC or the JLSF's inability to exploit transport over water. Thus, in the absence of navigability, it is fairly evident that the Yarlung Tsangpo does not facilitate river transport as in other parts of China. The question is whether there are stretches of the Yarlung Tsangpo that potentially enable river-based military transport, which is exploitable if exiting hurdles can be overcome. There is no easily available evidence. However, one thing is clear: the PLAA's land bound lines of communications are long.

According to one analysis, the Tsangpo is not navigable between the mountainous terrain of Tibet, where it originates, to the plains of India.<sup>120</sup> Oil and fuel supplies transported by pipeline, which the JLSF is tasked to build and maintain as it has done with pipelines across land and rivers in the TAR is illustrative of why water-borne transport is a burden for the JLSF as well for the WTC, PLAAF, and the PLAA.<sup>121</sup> Reinforcing this aspect is what a JLSF soldier also conceded more generally about rivers in the TAR: "Rivers in Tibet flow from snow mountains, so the water [is] extremely cold, and also very rapid."<sup>122</sup> This statement is revealing, at least in part, of the absence and inability of the JLSF to execute fuel transportation by water. This has left China investing heavily in an extensive ground and cross-river pipeline-based fuel network.

Since water-borne logistics is not exploitable, it could be considered a weakness as far as the PLAA supply chain is concerned. Thus, it is highly unlikely the PLAA with the support of the JLSF can move, and if it does, heavy equipment by Roll on-Roll-off vessels or ferries. This is the case in other riverine parts of China, but there is no evidence to suggest that this is true for the Yarlung Tsangpo.

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Overall, river-based transportation plays a limited part for the PLAA military logistical network geared to dealing with a military contingency against India. Indeed, China's logistics effort is directed at maximising rail, air, and land networks, but less from water-borne transportation capacities in the TAR.

One cannot categorically rule out China's exploitation of water-borne logistics in the future in the region by the JLSF, the PLAA with the potential involvement of the PLAN.<sup>123</sup> However, in the short to medium term, at least, China's investments and reliance on non-water-borne logistics will be vulnerable. Steep investments in rail, road and air supplies are the only way, currently at least, to offset the absence of water-based transportation across the Tibetan Plateau. If water borne-transportation were possible for China, the level of investment they have made and making currently in other domains, is likely to be nowhere near. Indeed, if water as a means of transport was more accessible for the Chinese military, it is hard to see why China would not be pursuing it. It would certainly ease much of the supply and transportation burden facing the PLAA's logistics support network in the TAR and a key part of the JLSF's.

Yet, critics might still contest this point given the near absence or limited water-based transportation available to the PLA. Why should India or Indian military planners treat it as important at all?<sup>124</sup> India should treat it as a source of vulnerability, which it is currently; this vulnerability can be overcome. Understanding and being aware of this possibility is also a condition for planning for the future.




The JLSF has a difficult task ahead when it comes to supporting all the service branches of the Chinese military. As this analysis has shown, it is still nascent and meets a limited set of logistical requirements of PLAA's frontier defence requirements. Indeed, the WTC and the PLAA continue to rely on their organic assets to service the logistical requirements of Chinese forces deployed on the TAR. JLSF was created with the purpose of bringing efficiency and achieving unity of command in combat logistics. Both are yet to be demonstrably realised. Water-borne logistics, which has historically been the most efficient form of transportation, remains a key lacuna in the Chinese military's logistics chain in the TAR. At the same time, one cannot rule out future efforts and innovation by the WTC, PLAA in concert with the PLAN in exploiting water-borne transportation.

Nevertheless, unlike for overseas logistics missions and operations that require transit permits and bases, the JLSF and more specifically the supply capacities of the PLAA are not encumbered by this problem when it comes to defending China's frontiers. Leveraging civilian infrastructure, especially in wartime throughout the mainland and within TAR is integral to civilian-military integration and the performance of the PLAA as well as the JLSF, whose role is still limited to training personnel, fuel supplies and coordinating with the WTC and the PLAA. China has sought to create redundancy in its supply chain to support its forward deployed forces for combat against India. This logistics chain is reliant almost exclusively on an extensive rail, road and airborne network of supply and replenishment.

For India, there are important implications. It has to address unmanned airborne supply to service its own logistical needs. China has resolved some of its supply-related bottlenecks and proficiency in unmanned air-to-ground logistics which will ease some of the constraints and augment the PLAA's fighting power. India will not only need to replicate China's use of drones for supply in wartime, but will need to develop or acquire counter-Unmanned Aerial Systems (UAS). Investment in automated systems for logistics is necessary for the IA. India's logistics is personnel-intensive.

# Conclusion

India will also need a larger number of space-borne Intelligence, Surveillance and Reconnaissance (ISR) capabilities as well as UAVs to identify and track all of the PLAA's logistical nodes. This should be paired with an increase in firepower-based capabilities in the form of long-range artillery and cruise missile forces. This is already occurring to some extent. Since many of China's gravity targets are outside the IAF's existing capabilities, striking the PLAA's logistics capabilities in the TAR, especially supply lines close to the LAC and farther inland, is crucial. 

“China has created redundancies in its supply chain to support its forward deployed forces for combat. This has important implications for India.”

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- 124 This question was raised by an anonymous reviewer of this paper.

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