ANALYSIS OF PLAAF POTENTIAL AGAINST INDIA

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"Freedom lies in being bold."

— Robert Frost

BACKGROUND

China's growing military build-up and increasing assertiveness against its neighbouring countries has been a reason for concern to many nations. China has territorial and maritime disputes with many of its neighbours. Their major dispute is with Taiwan. Both the countries claim to be the legitimate government of China. China claims Taiwan to be a part of its territory and has openly stated that it will be ready to use force, if required, to annex Taiwan. China also claims Senkaku islands, also claimed by Japan, as theirs. Another disputed area is Paracel islands which is occupied by China but claimed by Taiwan and Vietnam. China is also involved in a dispute with the Philippines over the Scarborough Shoal. The Spratly islands are another complex bone of contention between China, Taiwan, Malaysia, the Philippines and Vietnam. With India, the border dispute has not yet been resolved. In April this year the Chinese created tension on the border by intruding into the Indian side of the Line of Actual Control (LAC) at Depsang in Ladakh. The People's Liberation Army (PLA) troops set up a camp 19 km inside the Indian side of the LAC. The PLA finally

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withdrew their troops, after about three weeks, in May 2013, after diplomatic negotiations at the highest level and just ahead of the new Chinese Prime Minister Li Keqiang's visit to New Delhi. In June this year PLA troops had intruded into the Indian territory of Chumar in Ladakh and taken away a surveillance camera. In the same area PLA troops again intruded on July 16, 2013. Riding on horses and ponies, around 50 Chinese soldiers intruded into Chumar staking their claim over the area. Indian troops intercepted the Chinese patrol and the next day the PLA patrol went back into their territory.

India's response to Chinese provocations has generally been mild.[1] We need to be firm and stand up boldly to any attempts at coercion by the Chinese. If China feels that they have a big military machine with which they can provoke India then they need to understand that Indian armed forces are fully capable of handling them.

China has a numerically larger armed force compared to India but mere numbers do not tell the full story. What happened in 1962 in the India-China conflict is now history. At that time, China was able to overrun the Indian army but now that cannot happen. The Indian armed forces are in a much better state than what they were in 1962. This article analyses PLAAF (People's Liberation Army & Air Force) capabilities to operate against India from Tibet and adjacent areas. The paper argues that the Chinese air force will have serious limitations against the IAF.

STATE OF INDIA–CHINA RELATIONS

From the Chinese point of view, the issues of concern to them with India are firstly, the Dalai Lama and Tibet; the border dispute; and India's rising status and geopolitical aspirations. From India's point of view, our main concerns are the border dispute; China's support to Pakistan's missile and nuclear weapons programme; and China's attempts to undermine India's regional influence.[2] China realises that to become a global power it has to

1. See, for example, Brahma Chellaney, "China's Land Grab." http://www.project-syndicate.org/commentary/chinese-soldiers-set-up-camp-in-india-by-brahma-chellaney accessed on September 9, 2013.
2. Jayadeva Ranade, in a presentation at CAPS, New Delhi, on August 8, 2013.

first be an unchallenged regional power. India is the only country in the region which can challenge China. On the surface, India–China relations are cordial, but an undercurrent of hostility remains. While India's trade with China is growing steadily it is unlikely that relations with China will improve in the foreseeable future due to China's attitude of exerting pressure to contain India. China in the past has had a history of creating tensions and then backing off at the last minute when the other side retaliated. This happened in the 1996 Taiwan Straits Crisis when the Chinese fired missiles into the sea towards Taiwan in a show of force. When the Americans reacted by sending two aircraft carrier groups through the Straits, the Chinese stopped firing the missiles. This has also happened with India every time we have taken a strong stand to Chinese provocations.

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The Depsang intrusion is the third major intrusion, by the Chinese, after the 1962 India-China war. The first one was in 1967 in Nathula in Sikkim when there was an armed clash with the Chinese. In 1987 there was another intrusion by the Chinese, this time in Sumdorong Chu in Arunachal Pradesh. The Indian Army reacted swiftly and airlifted an entire brigade into the area and after a few months of troop build-up on both sides the Chinese backed off. As in 1967 in Sikkim, India had taken a strong stand and shown the Chinese that they cannot get away so easily by intruding into Indian territory.

PLAAF MILITARY DOCTRINE

PLAAF military doctrine has its roots in People's war enunciated by Mao after the communists took over power in 1949. Unlike the Indian Air Force, PLAAF was formed as part of PLA. This is changing now but for almost 50 years PLAAF thinking was dominated by the army and its role was to

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provide tactical support to the army and to defend the homeland from air attacks. This backwardness in their thinking kept PLAAF focused on point defence of the capital Beijing and some other vital areas. It was only after the Gulf War of 1991 that PLAAF realised the importance of airpower in modern wars.

Another event which brought home the realisation of modernising PLAAF doctrinal thought was the Taiwan Straits Crisis in 1996 when the US, in a show of force, deployed two aircraft carriers in the Taiwan Straits. The Kosovo air campaign in 1999, Afghanistan 2001, and Iraq 2003 further brought home the message of employment of airpower in modern wars under high-tech conditions.

The Chinese armed forces now follow a strategy of "active defence" and aim to win local wars under conditions of "informationisation." This strategy is given in their recent white paper of 2013 and in earlier white papers also. The active defence strategy has two components, defensive campaigns and attack campaigns, either of which could be independent PLAAF campaigns or joint campaign with other services. The process of "informationisation" involves fighting a joint services network centric combat campaign, battlefield situational awareness and use of space assets. Since the 1990s China has been modernising its armed forces. The air force now has modern fourth-generation multirole fighters like the SU-27/SU-30 and indigenous J-10. PLAAF has also acquired the very capable long-range surface-to-air missiles, S-300 series, from Russia.

PLAAF places primary importance on achieving air superiority by carrying out air to ground operations to destroy enemy air on the ground.[3]

3. Richard P. Hallion and Roger Cliff (eds.), "The Chinese Air Force: Evolving Concepts, Roles, and Capabilities," National Defence University Press, p. 156.

It is likely that in the beginning of the war the PLAAF will utilise the Second Artillery conventional ballistic/cruise missile for attacks on the enemy command and control centres, surface-to-air missile sites, radars, communication centres, DEAD (destruction of enemy air defences), and important airfields. Then follow it up with an air offensive by fighter/bomber aircraft to support a PLA ground offensive. This is the classic manner in which airpower is employed to gain control of the air, but it is difficult to execute against a determined and strong enemy.

CHINESE BALLISTIC AND CRUISE MISSILE THREAT

Since China is likely to use its conventional warhead ballistic and cruise missiles in war it will be pertinent to analyse the threat from these missiles. Nuclear threat is not being discussed here since that is a separate topic by itself.

China's Second Artillery Force (SAF) is responsible for the country's strategic nuclear and conventional ballistic and cruise missiles. China has a large ballistic and cruise missile force which it is expanding in both size and types of missiles. According to the US National Air and Space Intelligence Centre's report on "Ballistic and Cruise Missile Threat" issued in 2013, "China has the most active and diverse ballistic missile development programme in the world." The strength and type of missiles in China's inventory is given in Table 1 below:

Table 1: China's Missile Force[4]

System	Missiles	Launchers	Estimated Range
ICBM	50-75	50-75	5,500+ km
IRBM	5-20	5-20	3,000–5,500 km
MRBM	75-100	75-100	1,000–3,000 km
SRBM	1,000- 1,200	200-250	<1,000 km
GLCM (Ground launched cruise missile)	200-500	40-55	1,500+ km

4. US DOD, "Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2012," http://www.defense.gov/pubs/pdfs/2012_cmpr_final.pdf

The PLA's Second Artillery Conventional Missile Brigade is equipped with the Dong Feng 3 and Dong Feng 21 mid-range ballistic missile models, the DF-15 short-range ballistic missile model, and the cruise missile DH-10 (also called CJ-10). Most of these missiles are deployed on China's east coast targeted at Taiwan. One brigade of DF-15 is reported to be deployed in Chengdu targeted at India.

Their major force is of 1,000-1,200 short range ballistic missiles (SRBMs) of up to 1,000 km range and 200-500 GLCM/LACM (Ground launched/Land attack cruise missile) of 1,500 km range. The MRBMs form a force of about 75-100 missiles with a range of up to 3,000 km. The PLA's Second Artillery Conventional Missile Brigade is equipped with the Dong Feng 3 and Dong Feng 21 mid-range ballistic missile models, the DF-15 short-range ballistic missile model, and the cruise missile DH-10 (also called CJ-10). Most of these missiles are deployed on China's east coast targeted at Taiwan. One brigade of DF-15 is reported to be deployed in Chengdu targeted at India.[5]

The DF-3 is no more in use since it is obsolete so the missiles which will shoulder the role for conventional long-range attacks will be the MRBM DF-21; SRBMs DF-15 and DF-11; and the DH-10 cruise missile. There are no confirmed reports on the accuracy of these missiles, so for the purpose of our analysis it can be reasonably expected that the DF-21/DF-15/DF-11 ballistic missiles will have a CEP of 150 m and the DH-10 cruise will have a CEP of 30 m.[6] China is likely to use these missiles to target our command and control centres, radars, missile sites and airfields. To target an airfield runway and taxi track the minimum number of DMPIs (desired mean point of impact) required will be three for the runway and two for the taxi track. Each DMPI will require a minimum of two hits. Now, if we take the example of their most accurate missile, the DH-10, they will require 10 cruise missiles to shut down one airfield for a short duration of six hours. The crater damage to the runway can be repaired with quick setting cement within

5. https://web.duke.edu/pass/pdf/warpeaceconf/p-lin.pdf accessed on September 12, 2013.
6. Sinodefence has given DF-15 CEP as 150 m to 500 m. http://www.sinodefence.com/strategic/missile/df15.asp; accessed on September 12, 2013. Another site, http://chinavsindia.org/ballistic_missiles.html has given DF-11A CEP as 200 m.

six hours. To keep one airfield shut for twenty-four hours PLAAF will require forty missiles. This will not make any difference to IAF operations in the east or in the west since IAF has a large number of other operational airfields to operate from. If PLAAF attacks at five airfields they will require 200 missiles per day for attacking the runway and taxi track alone. The number of cruise missiles in their inventory is 200 to 500. Taking the higher figure of 500 and a consumption rate of 200 missiles per day, their stock would be over in two and a half days, with no other major target systems like C2 Centres or air defence units being addressed.

The best defensive strategy against China's missiles is to deter them by developing similar capabilities so that India can strike counterforce targets in China and also industrial targets in eastern China. The Brahmos cruise missile development needs to be stepped up with longer range and precision. Brahmos 2 is being developed with a range of 500 km but plans need to be made to go up to greater ranges. Similarly we need to step up on conventionally armed MRBM/IRBM Agni ballistic missiles.

In the case of their MRBM/SRBMs the number required will be more because their inaccuracy is higher (CEP 150 m). PLAAF will require 440 MRBM/SRBMs per day for one airfield. Their stock of 1,300 MRBM/SRBMs will be over in one day when attacking just three airfields.

This does not take into account the number of missiles lost due to launch failures or missed hits. If we take these losses into account then the depletion rate will be even higher. Thus, we can see that the threat from China's conventional missiles is not incapacitating. The best defensive strategy against China's missiles is to deter them by developing similar capabilities so that India can strike counterforce targets in China and also industrial targets in eastern China. The Brahmos cruise missile development needs to be stepped up with longer range and precision. Brahmos 2 is being developed with a range of 500 km but plans need to be made to go up to greater ranges. Similarly we need to step up on conventionally armed MRBM/IRBM Agni ballistic missiles.

Taking the total number of combat aircraft in both the air forces, PLAAF has 2.1 is to 1 advantage over the IAF but mere numbers do not cover the full story. PLAAF does not have the capability to deploy a large force of aircraft in Tibet against India due to insufficient number of airfields in Tibet and lack of infrastructure to carry out sustained fighter operations. But the large number of aircraft in PLAAF inventory gives them the advantage to quickly replace attrition losses.

Another way to counter China's missiles is to intercept them after launch. This presents its own challenges in terms of sufficient resources for BMD, AWACS, tankers, aerostat radars, fighters and missiles. IAF at present does not have these resources in large numbers to be really effective. Meanwhile, more modern means of runway repair material in the form of aluminium mats need to be explored to keep the runway down time to minutes instead of hours.

PLAAF COMBAT AIRCRAFT FORCE STRUCTURE

PLAAF has total combat aircraft strength of 1,693, as given in *Military Balance 2012*. The force structure is as given in Table 2 below (naval aviation aircraft are not included):

Table 2: PLAAF combat aircraft force structure.

S. No.	Type	Name	Numbers
1	Bombers	H-6A/E/H/K/M (Copy of TU-16)	82
2	Fighters/Multirole Fighters	J-7 E/G (Copy of Mig-21)	552
		J-8 B/F/H	168
		J-11/J11 B/BS (License produced SU-27)	165
		SU-27 SK/ UBK	75
		SU-30 MKK	73
		J-10 A/S	200

3	Fighter Ground Attack	JH-7/JH-7A	72
		Q-5 C/D	120
4	Electronic Warfare	Y-8 CB/G/XZ (Copy of AN-12)	13
5	ELINT	TU-154 M/D	4
6	ISR	JZ-6/JZ-8/JZ-8F/Y-8H1	99
7	AWACS/AEW	KJ-200 (Y-8 airframe)	4
		KJ-2000 (IL-76 airframe)	4
8	Tanker	H-6U	10
9	Command and Control	B-737	2
		Y-8T	3

INDIAN AIR FORCE COMBAT AIRCRAFT FORCE STRUCTURE

The IAF has total combat aircraft strength of 798, as per *Military Balance 2012*. The force structure is given in Table 3 below-

Table 3: IAF combat aircraft force structure.

S. No.	Type	Name	Numbers
1	Fighters/ Multirole Fighters	Mig-21 M/MF/Bis	141
		Mig-21 Bison	119
		Mig-29	64
		Mirage-2000	52
		Su-30MKI	153
2	Fighter Ground Attack	Jaguar IB/IS/IM	106
		Mig-27ML	127
3	ISR	Gulfstream IV SRA-4	3
4	AWACS	IL-76TD PHALCON	3
5	Tanker	IL-78MKI	6

ANALYSIS OF FORCE STRUCTURE

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PLAAF Fighter Force. PLAAF has a fighter/multirole fighter strength of 1,233 aircraft and more than half of this is of old generation fighter/attack aircraft like the J-7 (MiG-21) and the indigenous J-8. These aircraft are likely to be in service for the next few years till they are replaced by newer aircraft like the J-10 and J-11/SU-30. China is also producing a new stealth fighter called the J-20 which is likely to enter service in 2018. PLAAF has *513* fourth generation fighters like the J-10, J-11/SU-27/SU-30 and these constitute only about 41% of the fighter/multirole force but PLAAF is modernising and this number is likely to increase in the coming years.

IAF Fighter Force. IAF has 384 SU-30/MiG-29/Mirage-2000/MiG-21 Bison aircraft which have the capability to launch beyond visual range (BVR) air-to-air missiles. The MiG-21 Bison though on an old airframe is a formidable weapons platform with the Kopyo fire control radar and RVV-AEE (R-77 Adder) BVR air-to-air missiles. In the air-to-ground role the MiG-21 Bison can also carry PGMs. Another point to note is that the SU-30MKI of the IAF has many advantages compared to the Chinese air force SU-30MKK. The SU-30MKI has been fitted with the N-011 BARS fire control radar which has better performance than the N001VE KnAAPO radar of the SU-30MKK. To give an example, the SU-30MKI has a pick up range of 210 km on a one square metre target, compared to 130 km to 140 km range of the SU-30MKK radar on a similar target.[7] This is a big advantage because in air combat whoever spots the other one first, either electronically or visually, is at an advantage.

The SU-30MKI has thrust vector controls (TVC) which is not there in the SU-30MKK. Thrust vector controls give the pilot better manoeuvrability in close combat. According to Dr. Carlo Kopp, Editor-in-chief of *Air Power Australia*, the "The Indian SU-30MKI is to date the most advanced SU-27

7. Detection range data is from *Air Power Australia* article http://www.ausairpower.net/APA-Flanker-Radars.html accessed on September 10, 2013.

derivative to enter production." About the SU-30MKK which the PLAAF has, he says it is "less accurate and less capable in the air-air role as the SU-30MKI." He further states ofthe fire control radar of the IAF SU-30MKI, "The NIIP N011M BARS phased array is the most capable fighter radar produced by Russian industry and is designed to support the R-77M family of ramjet missiles."[8]

To refuel PLAAF fighters over Tibet the H-6U will have to take off with full load from rear airfields at lower heights, because of take-off load limitations at high altitude airfields in Tibet. This will take a longer time and thus affect their sortie generation rate. China had attempted to purchase eight IL-78 tankers from Russia but the deal was cancelled.

The IAF is also planning induction of 126 French Rafale fighter aircraft for the MMRCA (Medium Multi Role Combat Aircraft) role. This deal is in the contract negotiation stage and once it is finalised deliveries will start within three years. IAF is also planning induction of its stealth aircraft in the next few years. This aircraft is being developed in collaboration with the Russians and has been called the Fifth Generation Fighter Aircraft (FGFA) by the IAF and PAK-FA or the T-50 by the Russians. The aircraft is being developed in Russia and Sukhoi has been chosen to lead the design team. The first prototype flight test was carried out in 2009 and the development aircraft is expected to be in India in 2017 with production planned to start in 2022. This aircraft will have super cruise capability, that means it will be capable of cruising at supersonic speed[9] in dry power.

Tankers. PLAAF's tanker force is limited to just ten aircraft of the H-6 class. The H-6U tanker is a modified TU-16 bomber of the Soviet era. These tankers are capable of refuelling only indigenous Chinese fighters like the J-8s and J-10s. They cannot refuel the J-11/SU-27/SU-30 due to compatibility problems. The H-6U has two refuelling points, one on each wing and carries

8. Dr. Carlo Kopp, "Sukhoi Flankers the Shifting Balance of Regional Air Power," in *Air Power Australia;* http://www.ausairpower.net/APA-Flanker.html accessed on September 10, 2013.
9. Gp Capt. B. Menon, "Fifth Generation Fighter Aicraft for the Indian Air Force," in IDR; http://www.indiandefencereview.com/news/fifth-generation-fighter-aircraft-for-the-indian-air-force/ accessed on September 10, 2013.

about 18.5 tonnes of fuel for refuelling which is much less than the Russian IL-78 and tankers of Western countries. With 18.5 tonnes of fuel the H-6U can refuel about three to four aircraft in one round. To refuel PLAAF fighters over Tibet the H-6U will have to take off with full load from rear airfields at lower heights, because of take-off load limitations at high altitude airfields in Tibet. This will take a longer time and thus affect their sortie generation rate. China had attempted to purchase eight IL-78 tankers from Russia but the deal was cancelled. China is unable to procure tankers from Western countries due to sanctions after the Tiananmen Square incidents of 1989.

IAF has a tanker force of six IL-78MKI aircraft. The IL-78MKI is a tailor-made variant of IL-78M and is equipped with Israeli fuel-transferring systems. These aircraft are more advanced than the Chinese tankers. The IL-78MKI refuelling capacity is more than double that of the H-6U.

AWACS. China's AWACS/AEW fleet is also limited to four Kong Jing-2000 (KJ-2000) and four of the smaller KJ-200. The KJ-2000 AWACS is based on the IL-76 airframe which China procured from Russia; the radar has been produced in China. The other Chinese AEW aircraft is the Kong Jing-200 which had its first flight in 2005. The KJ-200 with its balance beam-like radar on the back of its Yun-8 (Y-8 is a Chinese copy of Russian AN-12) airframe is a smaller AEW system which supplements the larger AWACS cover. Since the Y-8 is a turboprop aircraft its cruising altitude is lower than the jet engine KJ-2000. Consequently the KJ-200 detection range is also less than the KJ-2000.

Interestingly, China's first attempt to make an indigenous airborne warning and control system (AWACS), called the Kong Jing-1 (KJ-1), dates back to 1969. This project was undertaken on a 1950s designed Soviet TU-4 Bull aircraft. The project was not successful since China did not have the technology to overcome ground clutter problems. In airborne radar the signal return from ground echoes is stronger than the target signal and the radar system must be designed to overcome this limitation. The Chinese were unable to do this and the project was abandoned.

Since then China had been trying to purchase or develop an airborne warning and control capability. In the 1970s relations between China and

USA improved with the express intention of jointly opposing the then Soviet Union as their common enemy. Taking advantage of this situation China began exploring the purchase of E-3A Sentry AWACS from USA. This subject was taken up by the Chinese during President Reagan's visit to China in 1984 but nothing seems to have come off it.[10] The Chinese also negotiated with a number of Western firms to produce jointly an indigenous AWACS. These firms were: Westinghouse (USA); Marconi (UK); Thorn-EMI (UK); and Dornier GmbH (then FRG). China's Harbin aircraft corporation had developed an AEW prototype aircraft by installing the Thorn-EMI Skymaster radar on the Y-12 turbo panda aircraft. A small number of these aircraft were used for maritime surveillance.

India on the other hand has three AWACS and two more are in the pipeline. IAF AWACS are also based on the IL-76/A-50EI airframe but the Phalcon radar is from Israel. Both the IAF and Chinese AWACS are on the same IL-76 platform and their performance also is probably similar since their design is similar with both having active electronically steerable array (AESA) radar. The Chinese had also ordered their Phalcon radar from the Israelis in the mid-1990s but Israel had to cancel the deal in 2000 under pressure from USA. The Americans did not want AWACS technology to fall in the hands of the Chinese. They saw this deal as a threat to Taiwan and of US interests in the region. The Chinese were obviously not pleased with this development but they were determined to have an AWACS. This cancellation of the deal by the Israelis speeded up their own indigenous development. Although the Israelis had removed all the Phalcon radar components the Chinese managed to get some of the technology from them.[11] Both the PLAAF and IAF will face AWACS performance limitations in the hills since undulations in the terrain will create detection problems for aircraft masked by hills. The laws of physics are universally applicable

10. US DIA report, "China's Early Warning Capability." http://www.dia.mil/public-affairs/foia/pdf/CHINA/CHINA'S%20EARLY%20WARNING%20CAPABILITY.pdf, accessed on September 10, 2013.
11. Mr. Wang Xiaomo, a leading Chinese radar expert, in an interview explained the details how China developed its AWACS KJ-2000 and KJ-200, available online on Asian defence website http://theasiandefence.blogspot.in/2009/10/development-of-chinese-kj-2000-awacs.html, accessed on September 10, 2013.

PLA is organised on a regional basis with the country divided into seven military regions (MRs). There are only two military regions opposite India. Lanzhou is opposite Ladakh area and Chengdu is opposite India's north east region and parts of the central sector. The Military Region Air Force (MRAF) are also co-located with the PLA MRs. MRAF is subordinate to the MR.

and requirement of line of sight condition has to be met for radar pick up.

PLAAF AIR OPERATIONS AGAINST INDIA

In any India-China conflict the PLA cannot launch an attack without support of the PLAAF. Due to a number of factors, which will be discussed subsequently, PLAAF's capability to launch a sustained campaign against IAF and to support the PLA ground operations is severely hampered.

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In Tibet the main airfields are Gongar/Kongka Dzong (South of Lhasa at an elevation of 3,570 m), and Hoping (airfield for Shigatse, 250 km west of Lhasa). There is one civil airfield in south Xinjiang Military District of Lanzhou MR that is Gar Gunsa (elevation 4,240 m). The airfields opposite the North Eastern part of India are Bangda/Pangta (elevation 4,334 m, runway length 4,200 m) which is about 130 km from the Indian border and Linzhi in Nyingchi prefecture. Linzhi is a civil airfield at an elevation of 2,949 m, which was opened in 2006, it is just 30 km from the Indian border in Arunachal Pradesh. In addition to these there are two airfields in Lanzhou MR, that is, Kashgar and Hotan. Kashgar is a civil airfield and is quite far for providing close air support to PLA in the Ladakh sector. The distance from Kashgar to Leh is about 570 km. From this distance PLAAF can launch counter air

strikes but for sustained air support to PLA land campaign, the airfields should be around 200 km from the tactical battle area. Hotan and Gar Gunsa airfields are closer with the distance to Leh being about 330 km to 350 km. The airfields in Tibet are mostly at heights of more than 3,000 m. At these high altitudes aircraft operations suffer from load penalties due to the reduced density of air. This will be a serious limitation for PLAAF even with aerial refuelling.

From available open source imagery it can be seen that these airfields do not have blast pens for parking of fighters in hardened concrete shelters. This means the aircraft will have to be parked in the open thus exposing them to IAF counter air strikes. IAF strike aircraft armed with sensor fused weapons can destroy these aircraft on the tarmac. Airfield infrastructure capabilities and limitations can significantly affect fighter operations. PLAAF will have to considerably improve these airfields for sustained operations. Fighter operations require logistics and maintenance facilities. Fuel and weapons storage sites would need to be built from scratch, or dramatically expanded. A detailed analysis of airfield suitability would require more current and detailed data that cannot be obtained from open sources, but it is evident that PLAAF at present does not have adequate facilities at their airbases in Tibet. If PLAAF decides to upgrade all their facilities it will take at least one to two years, on fast track, to construct all the requirements. India will have to keep a close watch on these airfields and monitor any developments taking place there. There have also been

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reports of China developing new airfields in Tibet[12] but these are austere airfields and do not have infrastructure for sustained fighter operations. As has been explained earlier, fighter operations require proper support infrastructure. For example, precision guided air-to-ground weapons require special weapon storage bays for the weapons to perform at their optimum level of accuracy. In the present state of their airfields in Tibet, PLAAF is not capable of achieving air superiority against the IAF.

In contrast to PLAAF the IAF has the advantage of operating from most of their airfields in the plains from where they can take off with full bomb load. IAF also has sufficient number of airfields in Western Air Command and Eastern Air Command to sustain the air campaign against China.

In addition to all the infrastructure requirements, the Chinese will have to establish a base air defence centre to provide cover against IAF air threat. To defend the air base PLAAF is likely to deploy the following ground based air defence weapons (fighter interceptor aircraft are not being included since they will be employed for area defence):

- Anti-aircraft artillery 100 mm/85 mm.
- TOR M-1 (SA-15 "Gauntlet") surface-to-air missiles.
- S-300PMU/PMU1/PMU2 surface-to-air missiles.

Anti-Aircraft Artillery. PLAAF has about 16,000 100 mm/85 mm anti-aircraft guns. In addition the PLA Army has its own anti-aircraft artillery of about 7,700 guns but they are of lower calibre (23 mm, 25 mm, 35 mm, and 57 mm). PLAAF is likely to deploy its higher calibre guns for airfield defence and other important locations. These guns are likely to have a maximum range of about 5 km to 7 km and be effective up to a height of about 3,000 m. Against modern high-speed aircraft these guns will not be very effective and will just be of nuisance value.

TOR M-1 (SA-15 Gauntlet). China has procured about 60 launchers of Russian TOR M-1 (NATO code name SA-15 Gauntlet), these are on the inventory of the PLA Army and not the PLAAF.[13] In addition to being

12. Gurmeet Kanwal and Monika Chansoria, "China Preparing Tibet as Future War Zone," http://www.deccanherald.com/content/165996/ accessed on September 10, 2013.
13. Launcher numbers have been taken from *Military Balance 2012*.

deployed with the army, these missiles are also likely to be deployed at airbases to provide protection from air threats. TOR M-1 is a highly mobile, rapid reaction, short-range surface-to-air missile designed to engage and destroy not only low flying fighter aircraft and helicopters, but also cruise missiles, stand-off missiles and smart bombs during their terminal flight phase.[14] Some of the main features of the system are given below:

- Effective range—1.5 km to 12 km.
- Target altitude—10 m to 6 km.
- Acquisition radar maximum range for a small target of 0.1 m2—18 km to 22 km.
- Target maximum speed for engagement—700 m/s (2.06M) and g-load up to 10 g.
- Missile maximum speed—850 m/s (2.5 M).
- Reaction time—3.6 s to 10.6 s.
- Battery composition—One Battery Command Post (BCP); Four combat vehicles (CVs). Each CV carries eight vertically launched 9K331 missiles in sealed containers. After launch the missiles turn in the direction of the target for interception. In addition each battery is provided with transloaders and maintenance trucks.

Russian concept is that S-300PMU and TOR M-1 are to be co-located so that terminal point defence against guided weapons aimed at the S-300 battery are intercepted by TOR missiles. PLAAF is also likely to follow a similar concept and deploy them along with the S-300PMU batteries. IAF will have to employ considerable SEAD/DEAD effort to neutralise these systems before launching counter air strikes on these targets. TOR M-1 is mounted on tracked vehicles for better cross-country mobility. Each combat vehicle (CV) is a fully self-contained package, with search radar, a monopulse target tracking radar, and eight guided missiles.[15] The radar can search on the move but to launch it has to

14. Dr. Carlo Kopp, "Self Propelled Air Defence System/SA-15 Gauntlet," in *Air Power Australia* http://www.ausairpower.net/APA-9K331-Tor.html accessed on September 25, 2013.
15. Ibid.

stop for a very short duration. Attacking aircraft will have to know its precise location to destroy it. This will require real-time ISR (Intelligence Surveillance and Reconnaissance) capability. IAF will need to look into its ISR capabilities. IAF has three Gulfstream IV SRA-4 aircraft for ISR duties.[16] Flying at flight level 400, inside own territory, it can be expected that it will have a detection range of about 200 km to 300 km. Therefore, for targets beyond this range some other capabilities have to be made available through satellites/UAVs.

S-300PMU/PMU1/PMU2 Surface-to-Air Missile. The S-300PMU (P—Podvizhnyy (Mobile); M—Modifitsirovanyy (Modified); U—Usovershenstvnannyy (Upgraded); 1—(Upgrade 1) series are the export versions of Russia's lethal long-range surface-to-air missiles. China had first procured the S-300PMU (NATO code name SA-10 Grumble) in 1993. In 1994 a contract was signed for another eight batteries of the improved version S-300PMU1 (SA-10A). The S-300PMU1 is an improved version of S-300PMU with more range and capability to engage ballistic missiles of up to Mach 9 speed. In 2001 another eight batteries of S-300PMU1 were ordered. In 2002/3 China ordered 16 batteries of the more advanced S-300PMU2. The S-300PMU2 *Favorit* (SA-21 Gargoyle) variant is a new missile with larger warhead and better guidance with a range of 200 km, versus the 150 km range of previous versions. In addition to these SAMs, China also has its own indigenous long-range SAM called Hong Qi-9 (HQ-9). This missile has a maximum range of about 90 km to 120 km and is a Chinese derivative of the S-300PMU with some characteristics of US Patriot air defence missile system.[17] Apparently the Chinese have not been able to match it with the more advanced S-300PMU2 and have therefore stopped inducting it.

Table 4 below gives the main features of PLAAF long range SAMs:

16. *Military Balance 2012.*
17. Missile maximum range figures are from *Jane's Strategic Weapon Systems*, issue 55.

Table 4: PLAAF long-range SAMs

PLAAF LONG-RANGE SAMs					
	S-300PMU (SA-10B)	S-300 PMU1 (SA-20)	S-300PMU2 (SA-20) *Favorit*	HQ-9	Total
Number of Launchers[18]	32	64	64	32	192
Maximum range	75 km	150 km	200 km	90 km to 120 km	
Guidance	Semi Active Radar	Track Via missile	Track Via missile	Track Via missile	

According to US DOD Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2013, "PLA Air Force possesses one of the largest forces of advanced SAM systems in the world." In addition China is also negotiating with Russia for purchase of their newest long-range SAM, the S-400 TRIUMF. According to the DOD report, "contract has not been signed as yet and Russian officials have stated China would not receive the S-400 until at least 2017." This missile has a maximum range of 400 km.

The S-300 is a modular system and can be deployed in different combinations but for our ease of understanding we will take a standard S-300PMU2 complex and see its composition, which is given below:

- Central Command Post which forms part of the Battle management complex.
- Big Bird surveillance radar. It can be located up to 1 km from the command post. The Big Bird 64N6NE phased array radar is designed to pick up aircraft, cruise missiles and ballistic missiles. It has a large 2 GHz band reflective phased array antenna with boom mounted feeds, in a dual sector back-to-back arrangement. The large antenna gives it good antenna gain with low side lobes. This will make it difficult to jam. The antenna aperture size is larger than the American Aegis SPY1A ship borne radar. The detection range is about 300 km.[19]

18. *Military Balance 2012*.
19. "Search and Acquisition Radars," *Air Power Australia*. http://www.ausairpower.net/APA-Acquisition-GCI.html#mozTocId420074 accessed on September 10, 2013.

S-300 uses phased array radars which are difficult to jam due to their agile beam steering, high antenna aperture very low side lobes, high power, monopulse angle tracking and other ECCM features. Normal stand-off jammers and self-protection jamming suites may not be very effective against these missiles.

- Each Central command post can control up to six batteries which can be at a distance of up to 100 km. Communication with the batteries can be on radio link or land-line.
- Each Battery has one acquisition radar and one engagement/fire control radar, Tombstone 30N6E2. The engagement radar can control up to 12 Transporter Erector Launchers (TELs) and each launcher has four missiles in vertical position for cold launch from tubular canisters. The most critical radar in any SAM system is the target engagement radar. The engagement radars used by the S-300PMU series SAM systems are large phased array radars. The engagement radars exported to China have been mounted on all-terrain vehicles for rapid deployment and enhanced system mobility over rough terrain. Apparently rapid mobility was an important requirement of the Chinese since it enhances survivability. Thus, there will be 6 engagement radars which have to be hit to make a S-300 SAM site ineffective.
- Most of the vehicles are quite heavy and big (Kraz/Maz class) which should make them easy to locate by ISR systems. However, the equipment containers can be removed from their respective vehicle chassis for emplacement in bunkers or hardened shelters if required.[20]

An analysis of S-300 SAM system reveals:

- S-300 uses phased array radars which are difficult to jam due to their agile beam steering, high antenna aperture very low side lobes, high power, monopulse angle tracking and other ECCM features. Normal stand-off jammers and self-protection jamming suites may not be very effective against these missiles. But the SU-30 MKI in the IAF carries two KNIRTI Sorbstiya jammer pods, one on each wing tip. This pod has digital radio

20. http://www.ausairpower.net/APA-S-300PMU2-Favorit.html.

frequency memory (DRFM) capability which is very effective against monopulse emitters.

- It seems that except for the early model PMU systems, PLAAF does not use antenna mast for deployment of PMU1 and PMU2 missiles as it hampers mobility. Without mast the S-300 has an advertised deployment/ dismantling time of 5 minutes. Thus, targeting them will require very accurate geo-location and real-time data flow to the shooter aircraft for hard kill.
- These missiles have a maximum range of 200 km. This range is at medium/ high levels, at low level the missile range will reduce. Therefore, the best and universal tactic against these SAMs is to fly low, use undulations in the terrain to stay out of missile radar envelope and launch stand-off precision weapons from long range. The Indo-Russian jointly developed Brahmos supersonic cruise missile which has a range of 290 km can be launched against these targets. The air launched version of Brahmos is under development and will soon be inducted in the IAF. There are plans to develop Brahmos to 500 km range. IAF must have these types of missiles in sufficient quantity and include stealth features in it to enhance its survivability.
- Stealth is a very effective technology with which a strike aircraft can penetrate and carry out DEAD against a highly effective S-300 based air defence system. The planned induction of the Indo-Russian Stealth FGFA (Fifth Generation Fighter Aircraft) in the coming years will give us the required capability to attack S-300 type of missile sites.
- Use of small diameter bombs. The small diameter bomb is a precision guided bomb that can be mounted on a fighter aircraft's internal or external hard point or on UCAVs. The GBU-39 with the USAF is a low cost 140 kg PGM with about 70 km range and can penetrate 1.2 m steel or concrete. We need to have these types of weapons to destroy missile sites and other targets with precision.
- Another method to carry out DEAD against the S-300 site is to use the lethal drone like the Israel Aircraft Industries (IAI) Harpy, in the inventory of the IAF. The Harpy is a 2.7 m long, delta-winged air vehicle that is

Looking ahead, in the future the IAF needs to consider the unmanned combat vehicles (UCAVs) like the X-47 and the X-45 for the SEAD/ DEAD mission. The stealth features in the UCAVs will enable them to get close and either jam or destroy the missile radars. In the same vein it seems likely that Active Electronically Steered Antenna (AESA) planned for the Indo-Russian stealth capable fifth generation fighter aircraft (FGFA) will include electronic attack (EA) modes, which, when combined with its stealth, will enable them to seek out and blind hostile radars

designed for either ground or ship board launch and provides an autonomous fire and forget DEAD capability of up to 500 km and with an endurance (over a 400 km radius) of up to 2 hours. Target detection is by means of an onboard passive radar receiver. The weapon is equipped with a 32 kg high-explosive warhead that is detonated above its target by a proximity fuse. The vehicle's seeker head is understood to have been upgraded to cover a wider frequency range. It was also reported that IAI was in the process of developing a Harpy variant that is equipped with a data link and a dual electromagnetic/ electrooptical seeker head. The reason for this supposed upgrade could be to have the ability to launch a large number of Harpy drones into a target area and continuously update them on potential targets and target priorities, with the update data being generated by an associated ground station or an airborne control centre.[21]

- Mobile SAM systems like the S-300 need to be eliminated in very short time frames. Thus, a DEAD mission against these types of missile sites is preferable with SEAD providing the necessary back-up. Looking ahead, in the future the IAF needs to consider the unmanned combat vehicles (UCAVs) like the X-47 and the X-45 for the SEAD/DEAD mission. The stealth features in the UCAVs will enable them to get close and either jam or destroy the missile radars. In the same vein it seems likely that Active Electronically Steered Antenna (AESA) planned for the Indo-Russian

21. *Jane's Special Report 2005.*

stealth capable fifth generation fighter aircraft (FGFA) will include electronic attack (EA) modes, which, when combined with its stealth, will enable them to seek out and blind hostile radars in support of their own operations as well as those of other aircraft in the battle zone. EA capability must be added as a standard in the FGFA.

- Another method which sounds very promising is the use of microwave energy weapons to burn out the computers and other electronics equipment associated with air defence networks. The USAF's Suter technology has proved the viability of invading hostile air defence networks and making the system unusable or introducing false target information.[22] IAF needs to look into this technology since these methods in combination with other measures would make even the most potent air defence system virtually ineffective. The Israelis showed their capabilities for network attack during their air attack on Syria's nuclear plant at Dayr-az-Dawr in September 2007. The Israelis had shut down the Syrian air defence system for half an hour during the raid. Not a single SAM was fired at the Israeli aircraft and all of them returned home safely after destroying the nuclear reactor. The Israeli capability was similar to the Suter network invasion capability developed by USA using the EC-130 Compass call electronic attack aircraft to shoot data streams into enemy antennas. The passive EC-135 joint electronic surveillance aircraft then monitors enemy signals to check effectiveness of the data streams on the target sensors. Israel has been able to duplicate this facility by modifying its two Gulfstream G550 special mission aircraft.[23]

CHINA'S VULNERABILITY TO AIR INTERDICTION IN TIBET

The Tibetan plateau is surrounded by massive mountain ranges on all sides. The plateau is bounded by the Kunlun Mountains in the north and the Himalayas in the south. To the east and southeast the plateau gives way to the forested gorge and ridge geography of the mountainous headwaters of the Salween, Mekong, and Yangtze rivers in the Hengduan

22. *Jane's Defence Weekly*, December 7, 2005.
23. *Aviation Week & Space Technology*, November 26, 2007.

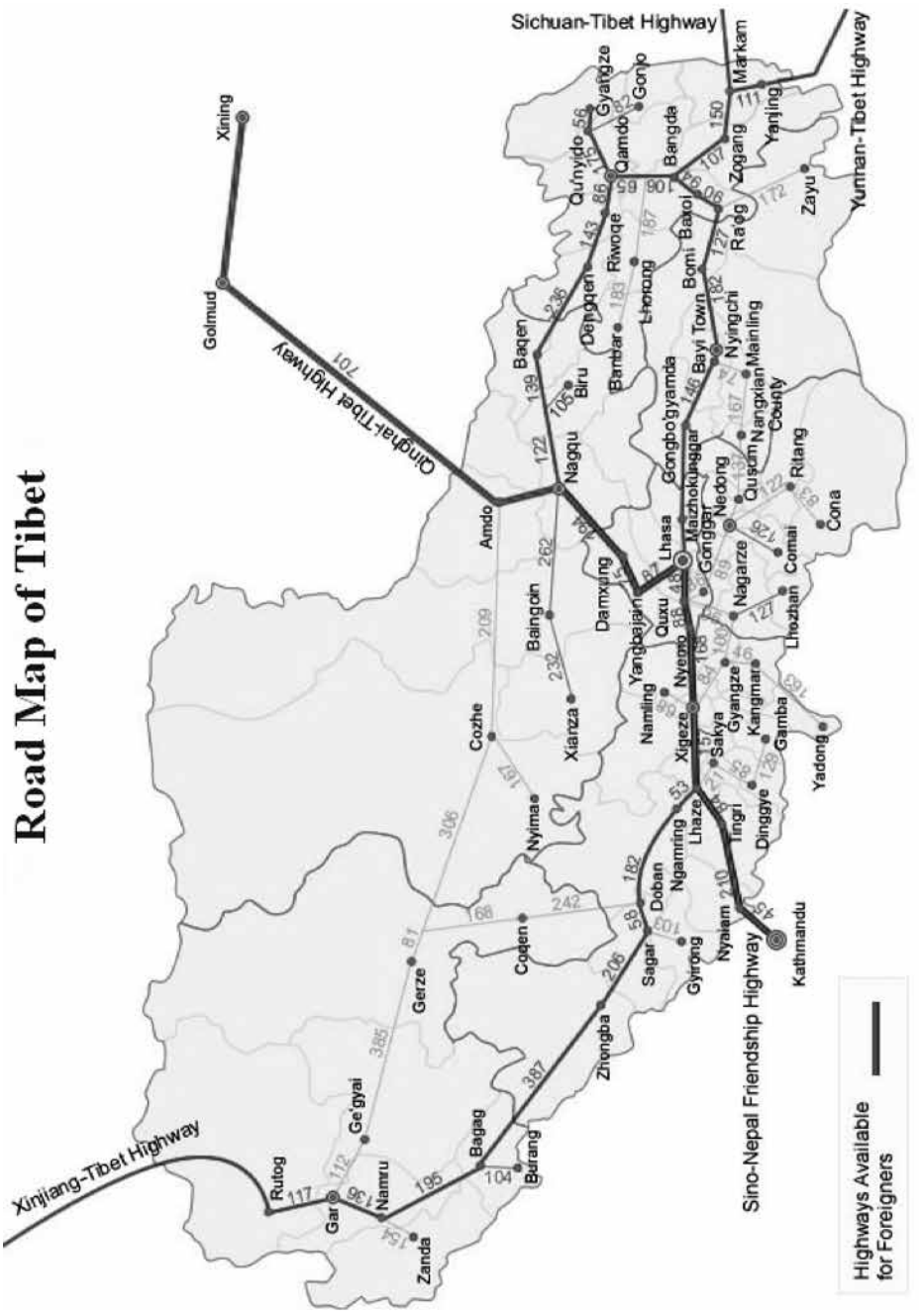
The Eastern Highway (Sichuan-Tibet) links Tibet to the eastern part of China. The road from Chengdu to Lhasa is divided into two, the Northern route and the Southern route. The Northern route was made first in 1954 but it was found to be difficult to maintain due to the arduous mountain terrain. In 1969 another highway was built from the south as an alternative to the northern route. These routes are treacherous and pass through dozens of bridges on the rivers en route like the Mekong, Salween, Dadu, Jinsha, Lantsang and Nujiang.

Mountains of western Sichuan. In the west it is embraced by the curve of the Karakoram Range of northern Kashmir. The plateau is at an approximate average height of 4,000 m. There are four main highways connecting Tibet to mainland China, these are the Central Highway (Qinghai-Tibet); Western Highway (Xinjiang-Tibet); Eastern Highway (Sichuan-Tibet); and Yunnan-Tibet Highway. Another major communication link is the Qinghai-Tibet Railway (QTR) line. In mountain terrain air interdiction dividends are more, compared to plains, due to limited lines of communication and a number of choke points at bridges over the rivers. The roads can also be blocked by creating landslides/ avalanches by aerial bombing.

Central Highway. The Central highway (also called the Qinghai-Tibet highway) is 1,965 km long, it starts from Xining in Qinghai and ends at Lhasa city. This highway passes through high mountain ranges with Tanggula pass being the highest at 5,000 m. This highway is unreliable in winters as the snowfall makes it impassable.[24]

Western Highway. The Western Highway links Xinjiang to Tibet. This highway runs through Aksai-Chin which is claimed by India. It is a 2,143-km road which runs from Kashgar in Xinjiang to Lhatse in Tibet. Construction of this highway began in 1951, and its completion in 1957 caught India by surprise, triggering tensions ahead of the 1962 conflict. Near Shigatse the road branches into three, one continuing toward Xinjiang the second leads

24. Mandip Singh, *Critical Assessment of China's Vulnerabilities in Tibet*, Institute for Defence Studies & Analyses Occasional Paper No.30.



Map Source: http://www.tibetdiscovery.com/road-to-tibet/

to the Nathula border with India, and the third to Kathmandu, also called the Friendship Highway.

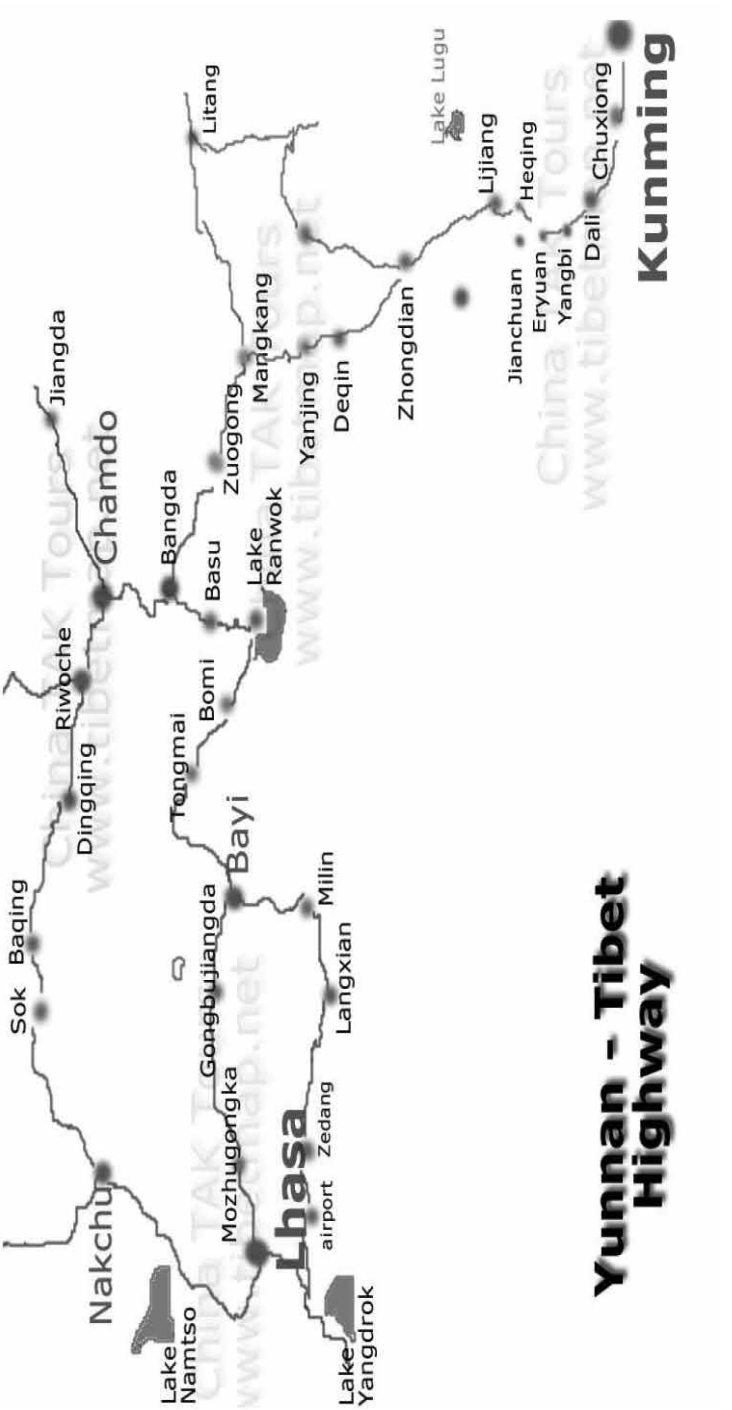
Eastern Highway. The Eastern Highway (Sichuan-Tibet) links Tibet to the eastern part of China. The road from Chengdu to Lhasa is divided into two, the Northern route and the Southern route. The Northern route was made first in 1954 but it was found to be difficult to maintain due to the arduous mountain terrain. In 1969 another highway was built from the south as an alternative to the northern route. These routes are treacherous and pass through dozens of bridges on the rivers en route like the Mekong, Salween, Dadu, Jinsha, Lantsang and Nujiang. The roads are susceptible to road blocks caused by frequent avalanches and landslides. The bridges on this highway are lucrative targets for air interdiction.

Yunnan-Tibet Highway. The 803 km long Yunnan-Tibet highway links Kunming in Yunnan to Lhasa in Tibet. It was constructed in 1979 as an alternative to the Sichuan-Tibet highway. The road passes through 4,330 m high mountains and crosses the rivers Jinsha and Lancing. This road runs adjacent to northern Myanmar and Arunachal Pradesh.

Qinghai-Tibet Railway (QTR). The 1,142 km, single lane Qinghai-Tibet Railway line runs from Golmud to Lhasa and was opened on July 1, 2006. Like the Qinghai-Tibet highway this also runs through mountainous terrain and the 5,000 m Tanggula pass. More than eighty per cent of the Golmud–Lhasa line is at an elevation of more than 4,000 m and there are 675 bridges totalling about 16 km.[25] China plans to extend the QTR to Nepal, Nyingchi, Yadong and Shigatse. While the QTR does give the PLA a strategic communication line for quick mobilisation of troops into Tibet it needs to be noted that it is only a single line and vulnerable to air interdiction by the IAF. The bridges that are within IAF range are prone to air attacks. The PLA cannot ensure air defence of the entire line.

Yarlung Tsangpo River. The Yarlung Tsangpo (Brahmaputra) runs through the heartland of Tibet from west to east. The river rises near Mount Kailash in the far west of Tibet and runs 2,900 km all the way across Tibet till it does a hairpin turn in eastern Tibet and flows towards India. The

25. http:www.xinhuanet.com



Map Source: http://www.google.co.in/imgres?imgurl=http://www.tibetmap.net/Maps/rd-Km-Ls(big).jpg&imgrefurl=http://www.tibetmap.net/xl/OL-KunmingLasa.html&h=900&w=1100&sz=69&tbnid

In mountainous terrain air interdiction is very effective because there are no alternate routes and even those one or two which are there are also susceptible to air attacks. Important choke points like bridges are prime targets for interdiction. IAF will have to have sufficient PGMs to attack point targets like bridges.

river is aligned along the Shigatse-Lhasa line. The main bridges on the river are Paizhen bridge on the Lhasa-Nyingchi road; Qushui bridge on the Lhasa-Gonggar airport road; Tsetang bridge; Saga bridge to the west of Shigatse and Nyago bridge.[26] These bridges are also lucrative targets for air interdiction. These bridges are all-important for PLA troop movements from their rear base to the forward areas.

The main communication links of PLA in Tibet have been discussed above. In mountainous terrain air interdiction is very effective because there are no alternate routes and even those one or two which are there are also susceptible to air attacks. Important choke points like bridges are prime targets for interdiction. IAF will have to have sufficient PGMs to attack point targets like bridges. Aerial bombing in the mountains can cause landslides thereby causing roadblocks. In mountain regions providing air defence cover to vital points is a difficult task due to limitations of terrain. The early warning available for ground-based air defence weapons like SAMs and anti-aircraft artillery can be severely degraded due to obstruction from high mountains. Guiding interceptor aircraft with AWACS or ground-based radars will also have similar limitations. Even if PLAAF launches their SU-30MKK fighters to intercept the attackers, they will be no match to the superior performance of the IAF SU-30MKI.

CONCLUSION

With the present state of airfield infrastructure in Tibet PLAAF is not capable of achieving air superiority against IAF. Consequently, PLAAF cannot launch an air offensive against India to support PLA Army ground offensive. The implication of this is that the Chinese army's capability,

26. Mandip, n. 24.

without support of its air force, will be severely limited. PLAAF can, no doubt, build up its airfield infrastructure for sustained air operations but this will take time and this is a trend which India will have to observe.

The main advantage that PLA has is in their Second Artillery's conventional capability. However, given the diversity of airfields available to the IAF, and the accuracy required to shut down these airfields for an adequate period of time, PLA does not have the numbers to pose a significant threat.

IAF needs to build up its combat aircraft fleet strength to handle both China and Pakistan. IAF mobile radar and missile units must be equipped and trained for true shoot and scoot capability so as to avoid being targeted by enemy missiles. IAF needs more long-range ISR capability to locate and track moving ground targets. IAF long-range precision weapons inventory needs to be increased. The Brahmos air-launched version will enhance IAF long-range precision attack capability. India's conventional ballistic and cruise missile inventory needs to be enhanced to counter Chinese capabilities.

Since China listens to only firmness, India needs to be determined to deter them whenever they create tensions.