AIR MAINTENANCE 2025: PROSPECTS AND LIMITATIONS

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Air maintenance conducted by the Indian Air Force (IAF) has been the lifeline for the Indian Army and the civil administration, especially in the Ladakh sector and the northeast. There is no rail connectivity to the Ladakh valley, while the road infrastructure to the east was indeed very poor till the Seventies and rail connectivity was by metre gauge, with just a solitary bridge at Guwahati. In such an austere environment, air maintenance sorties provided succour to the Army and the civilian population and administration as well. In the north, Chandigarh, and, in earlier days, Jammu and Srinagar, were the launch pads for the air maintenance effort, with Dakotas, Il-14s, Packets and AN-12s providing the airlift. In the east, airfields were few and far between, and the air assets revolved around the venerable Dakotas and Caribous, with communication sorties being the forte of Otters. The acquisition of Mi-4s in the 1960s brought some rotary-wing capability and added to the air logistics effort of the Air Force.

The threat too was of a limited nature -- or was it so? We learnt to our abiding shame in 1962 that in the real world there is perhaps no *bhai-bhai* feeling—it's all a question of keeping one's powder dry at all times. Somebody has also rightfully said that "eternal vigilance is the price of liberty." Did we get better after the debacle? Yes we did, but not to the extent that one would have wanted. The reasons are many and have

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their roots in the political and economic power structure in our country. Additionally, China went through an internal upheaval in the 1960s and 1970s that reduced the imminent threat to our northern borders -- it didn't go away, but it was not live either. So, the urgency lost its own impetus!

Events, however, have moved very fast on the Chinese side since the 1980s. While China's economic progress has been stupendous, its civil and military infrastructure has also improved by leaps and bounds, especially in the Tibetan region adjoining our northern and northeastern borders. We have woken up to the threat a bit late -- but better late than never![1] The road infrastructure and airfields are sought to be improved so that connectivity for the sustenance of our Army and the civil population can be maintained round the year. Still, we are far from our target and it is in this field that the IAF would continue to be called upon to do what it has been doing for the past five decades -- air maintenance.

The aim of this paper is to peep into the future and delve into the prospects and limitation of air maintenance in the eastern part of India, *circa* 2025.

THREAT PERCEPTION

Our past defence strategy had been structured around the ability to wage a full scale war against either China or Pakistan and yet have the ability to dissuade or contain the other.[2] With the changing equations between the countries in the region and China calling Pakistan an "all weather ally," the possibility of a collusive threat from both against India cannot be ruled out.[3] Therefore, we must upgrade our capability to handle two fronts**;** the purported lack of such capability reportedly compelled the Parliamentary Standing Committee on Defence to call the three Service Chiefs before it in

1. Sandeep Unnithan, "Belated Awakening," *India Today* (New Delhi), February 7, 2008.
2. Rajat Pandit, "Two Front-War Remote, but Threat From China Real," *The Times of India* (New Delhi), October 12, 2012.
3. Lt Gen Kamal Davar, "Red Dragon in India's North-West," *Indian Defence Review*, July 18, 2012, available at http://www.indiandefencereview.com/news/red-dragon-in-indias-north-west/, accessed on July 24, 2012. Also see Dr Suhash Kapila, "India's Defense Postures In Ladakh: A Wake-Up Call," *South Asia Analysis Group*, available at http://www.southasiaanalysis.org/%5Cpapers41%5Cpaper4050.html, accessed on July 24, 2012.

April 2012.[4] While our presence in the northern and western borders has got the attention it deserves, the same cannot be said with the same assurance about the eastern front;[5] this is sought to be rectified, with the raising of new Army units and associated firepower, and augmentation of air power assets and infrastructure.[6] The load of air maintenance for the increased workforce would, thus, increase – or would it?

The availability of air assets has been a restricting factor in meeting all the military and civil requirements.

This paper will discuss the prospects and limitations of air maintenance by analysing the past trends in logistics supply from the air carried out the IAF, and discuss the shortfall in the air effort, as demanded by the Indian Army which is the main indenter and recipient. Would the demand for air maintenance go up further, and in what quantum, would be the next question that would be addressed. What about the road infrastructure, the absence of which is the primary cause of air maintenance? This would be appraised, especially the envisaged construction of new road networks and their impact on the air maintenance requirements. The availability of air assets has been a restricting factor in meeting all the military and civil requirements. What would be the impact on air maintenance capability of the increase that is planned in the aerial assets of the IAF? In all this analyses, only unclassified information available in the open domain would be used.

PAST TRENDS IN AIR MAINTENANCE

Air maintenance has been the bread and butter of transport and helicopter operations, especially in eastern India. It has always been so and the reference dates back, not to the 1950s and the 1960s but to World War II when air maintenance of sorts was done by the Americans across the Hump to aid Chiang Kai-shek's Nationalist Kuomintang (KMT) Chinese forces. It is indeed

4. Praveen Swamy, "Parliamentary Panel Summons Military Chiefs," *The Hindu* (New Delhi), April 10, 2012.
5. Unnithan, n. 1.
6. Ajai Shukla, "New Strike Corps for China Border," *Business Standard*, August 24, 2011, available at http://www.business-standard.com/india/news/new-strike-corps-for-china-border/446854/ accessed on July 24, 2012.

an irony that the IAF is doing air maintenance for its troops and civilians from literally the same airfields, made by the Americans, this time as a **counter** to the Chinese build-up across our borders! By the end of World War II, the number of American aircraft in India had grown to 722, and the strength of personnel had swelled from 26,000 to more than 84,000. Accelerated flight activity during the final offensives against Japanese forces in China meant that one transport aircraft took off every three minutes**;** there was no eastern control, or any area air traffic control radar for that matter—and a lot is being made now of one arrival and departure every two minutes from Indira Gandhi International Airport at Delhi! In early 1945, the monthly cargo delivered to China reached 44,000 tonnes, and peaked at 71,000 tonnes in July.[7] The weather and the terrain are as treacherous as ever but what has improved enormously are the living conditions of the personnel as also the connectivity of the northeast to central India by rail and road—the same, however, cannot be said of the road network within the northeastern area to the civil and military outposts situated further on the borders.

The 1962 Indo-China War was a defining moment in our independent history. As per the Official History of the 1962 War, the IAF transport fleet had just 206 aircraft, the majority being Dakotas (95 in number), 51 Packets and just six AN-12s (in the newly formed 44 Squadron at Chandigarh which flew to Leh and Chushul). In the Northern Sector, the air supply and casualty evacuation received a boost when the Mi-4s were inducted in Leh with the arrival of 107 Helicopter Unit. The Army wanted to induct five battalions in the Ladakh Sector but due to shortage of aircraft (and virtually no roads), only four battalions could be flown in. Additionally, the available airlift had to be divided into allotment for maintenance and induction of troops, maintenance for airfields and for construction of roads.[8] So, road building had to share the available effort, a perpetual complaint of the Border Roads Organisation, and a fact even today.

7. See description of Hump operations at http://en.wikipedia.org/wiki/The_Hump, accessed on December 20, 2012.
8. P.B. Sinha and A.A. Athale, *History of the Conflict with China, 1962* (Indian Ministry of Defence, 1992), ch VII, pp. 347-350, available at www.bharat-rakshak.com/LAND-*FORCES/Army/History/1962War/PDF/1962Chapter08.pdf*

In the east too, the situation was no better. Here, the IAF's transport fleet (comprising Dakotas, Caribous and Otters) was supported by some trail blazing flying done by Biju Patnaik's Kalinga Airways which flew basically in support of Assam Rifles. However, the events of October 1962 changed the picture, and the load carrying capability of Kalinga Airways became part and parcel of the total availability.[9] Load distribution was decided in almost exactly the same way as it is being done now, with an annual conference at Air Headquarters (HQ) and quarterly ones at Command HQ.

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The airlift capability of the IAF during the 1962 hostilities was only around 400 tonnes per day in both the sectors combined, whereas the requirement was around 600 tonnes. After the ceasefire, the Indian government requested the British to carry out a study of the airlift requirements. The British assessed that the annual air-drop requirement for the Northeast Froniter Agency (NEFA) and Ladakh and adjoining areas to be 153,000 tonnes, which included a landing tonnage of 95,000![10] The capability of the IAF was just half the requirement. The overall airlift projection kept increasing with induction of additional troops into the forward areas. The Americans were requested to help with the stocking and positioning of the troops. Twelve C-130 Hercules aircraft of the 322 Air Division operated from Palam, Delhi**;** though they were committed basically to stock up Leh, some sorties were flown to Tezpur and Bagdogra also. This offloaded the IAF transport fleet, which concentrated mainly for operations in the east. The Americans were in India for almost ten months (the last C-130 left Palam on August 17, 1963).[11]

Air maintenance operations settled into a regular pattern thereafter**.** In the north, it was a totally fixed-wing affair, with AN-12s doing the bulk of

9. Ibid., p. 353.
10. Air Mshl Bharat Kumar (Retd) *Unknown and Unsung: Indian Air Force in Sino-Indian War of 1962* (New Delhi: KW Publishers Pvt Ltd, 2013), p. 116.
11. Ibid., p. 352.

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the delivery. In the east too, it was predominantly fixed-wing oriented, with the Dakotas and Caribous holding centre-stage and Otters doing yeoman service by providing the link to small Advance Landing Grounds (ALGs). The Mi-4 did its bit but with the arrival of the Mi-8s and later Mi-17s, the thrust shifted to rotary-wing air supply, as it was more accurate and resulted in fewer losses. Opening up of certain hitherto inaccessible areas by road in the east was also a factor in this switchover. Statistics of the air maintenance tasking of the IAF of the past decade available in the open domain show that each year, in both sectors combined, fixed-wing aircraft of the IAF airlift and/or drop around 25,000 tonnes for the Army and civil agencies while the rotary-wing aircraft do air maintenance of around 8,000 odd tonnes currently. The distribution of the air maintenance task requires fixed-wing aircraft to operate from Air Force bases to Dropping Zones (DZs) or advance airfields/ALGs like Thoise and Mechuka to position loads. The helicopters operate from these forward bases/ALGs and several other mounting bases to a very large number of helipads. It's the heli-lift that is critical and this paper would discuss how it would shape up in the future.

Historical data show that the demand from the Army has been rising by the year, leading to a mismatch between its expectations and the load actually delivered. But a point that needs to be kept in mind is that before the start of each financial year, the Air Force conveys to the Ministry of Defence its capability for the coming financial year, in terms of tonnage that can be tasked towards air maintenance in the north and the east. Besides the Army (which is the major client), there is a number of civil agencies like the Border Roads Organisation, Arunachal Pradesh government, Postal Department, Assam Rifles, Indo-Tibetan Border Police/Force, etc, that vie for air support from the IAF**;** however, it is the Ministry of Defence which does the final allocation. This leads to gaps between the air effort demanded

by the Army and the figures allotted, an aspect that has been a source of perpetual conflict at the two Services HQ, decade after decade. Thus, there is a shortfall, as seen by the Army, though the IAF has no control over the allocation. It is important that before solutions are suggested, the expansion plan of the Army is studied (as brought out earlier, only unclassified details available in the open domain would be considered).

Force Accretion Plan: A major force accretion has been planned by the Indian Army, especially in the Eastern Theatre, as has been widely reported in the national press. The *Business Standard* reported on August 24, 2011, that two mountain divisions comprising 35,000 troops were to be raised in the 11th Plan (2007-12) while sanction has also been accorded for a Mountain Strike Corps comprising 40,000 troops to become functional in the 12th Plan (2012-17). The strike corps would have its own complement of mountain artillery, combat engineers, anti-aircraft guns and radio equipment and would be supported by Indian Air Force fighters, operating from newly renovated bases in the northeast.[12]

ANALYSIS OF AIR MAINTENANCE REQUIREMENTS.

- It is logical to assume that the requirement would increase with every passing year while the perception is that it should reduce with time as the road network improves. The increase in air maintenance requirement would primarily come about because there would be an augmentation in the number of posts and/or increase in the strength of troops at the posts**;** increase in scale of rations is also a factor, as is the number of times a soldier can now go on leave. To cater for this, besides the IAF courier flights, there are now five civil couriers per week from Delhi to Leh, two per week to Thoise, four per week to Srinagar and one to Kolkata/ Imphal —and this frequency is likely to increase further.
- The load of air maintenance on the IAF for the Northern Sector is comparatively much larger than for the Eastern Sector. This is because of

12. Shukla, n. 6. See also Josy Joseph, "High Costs Stall Army's Plans on China Border", *The Times of India,* August 26, 2011. Vinay Kumar, "India Evaluating China's Military Exercises in Tibet," *The Hindu* (New Delhi), August 26, 2012, available at http://www.thehindu.com/news/national/article3824862.ece

The high air maintenance demand would continue until the Srinagar-Leh road becomes 'all-weather' with the completion of the Zoji La and Rohtang tunnels.

the relatively greater heights of the Himalayan ranges in the north, larger strength of the Army in Northern Command and closure of mountain passes at Zoji La and Rohtang during winters. A large percentage of the IAF's air maintenance effort, both fixed and rotary-wing, goes towards the requirements of the large Army presence in the XIV Corps area in Ladakh. Operation Meghdoot has been going on continuously since April 1984 and despite the Siachen 'resolution' talks that are reportedly underway (in fits and starts), the path to a disengagement that would see Indian troops coming down from the glacier, does not appear to be on the horizon.[13] Thus, the high air maintenance demand would continue until the Srinagar-Leh road becomes 'all-weather' with the completion of the Zoji La and Rohtang tunnels—this aspect is covered in detail later in this paper. Once this happens, a large amount of fixed-wing flying hours would be released for utilisation in the Eastern Sector.

- To meet the rotary-wing shortfall, the option of outsourcing to civil helicopter operators has been thought of and Requests for Proposals (RFPs) floated. After prolonged attempts at this novel idea, the project should hopefully fructify. This would, to a very large extent, meet the additional requirements of the Army. However, the process would need to be expedited to keep pace with the expansion/accretion plans of the Army, especially for the Eastern Theatre.
- Transients to Leh and Thoise comprise a large percentage of the fixed-wing load. This could probably be diverted to increased frequency of civil chartered aircraft in the coming years, thereby releasing a large number of fixed-wing aircraft for use elsewhere.
- With the improvement of infrastructure and depending on the change in threat / force levels from China, the deployment pattern may change in the future to increase the troops holding defences on the higher

13. "India, Pakistan Begin Siachen Talks", *The Times of India*, June 11, 2012. Also available at http://articles.timesofindia.indiatimes.com/2012-06-11/india/32173851_1_siachen-talks-siachen-issue-defence-secretary

reaches close to the Line of Actual Control (LAC). The requirement of air maintenance would increase in that case.

- Air effort for Humanitarian Assistance and Disaster Relief (HADR) will always be an inescapable requirement and will form a major responsibility of air maintenance assets of the nation. HADR requirements place a heavy burden on the air assets of the IAF, especially on the rotary-wing fleet. Floods are an annual occurrence in the east and the past few years have seen new weather phenomena causing different catastrophes, e.g. the devastating mudslides of 2010 in Leh following a cloudburst and the frequent landslides that have been occurring in the recent past in Himachal Pradesh. Another aspect that needs to be kept in view is the increasing role of India in regional affairs -- considering our size and economic clout, India would be expected to play a leading role in HADR requirements in South and Southeast Asia.

ROAD COMMUNICATIONS

If air maintenance requirements are to be reduced, then expansion of the road network is a must. Road communications for meeting the operational requirements of the Army are being developed as part of a major effort by the Border Roads Organisation (BRO). The following issues come to the fore:

- The bulk of requirement of air maintenance in the Northern Sector is due to the mountain passes getting blocked by snow during winters. Completion of work on the tunnels at Zoji La and Rohtang would cut down the requirement to a very large extent.[14] In the interim, the period of roads being kept open is being increased by innovative employment of resources by the BRO. Each extra day that the road is kept open reduces the requirement drastically. Last year, Zoji La was opened a month earlier and the Srinagar to Leh road was kept open for an extra month.
- There is a detailed plan that has been approved for road development in all the major sectors. The bulk of the projects are scheduled to be

14. "Work on Rs 5,500-cr Zojila Tunnel in J&K to Begin by 2013," *Indian Express* (New Delhi) October 9, 2012.

completed by 2016-18, as per the BRO. So, if the IAF can help the BRO make roads faster, the requirement for air maintenance would also reduce accordingly -- but, at present, it is a chicken and egg story. The BRO requires air effort to transport its heavy machinery but if helicopters are pulled out for its tasks, the Army will cry foul due to decrease in its allotment. The loss of an Mi-26 last year was a colossal one to this road building effort, as bulldozers are required by the BRO and they can be lifted only by the heavy lift Mi-26.[15]

- The flip side to the development of roads, as one argument goes, is that presently, the deployment of troops on the LAC is thin because the roads are not developed in the sector and, hence, of operations by an attacker also cannot progress fast. Once the road network develops, the threat of its use by an attacker to push its operations towards depth areas will require us to hold the forward locations with greater strength resulting in increased air maintenance requirements; but, this is an argument that does not hold water and has to be planned for.
- Even if the road network develops, it is only practical to assume that the roads will get blocked by snow in certain areas in the peak of winters, the durations depending on the fierceness of nature. Thus, dependence on air maintenance by the Air Force for items of rations and equipment and casualty evacuations for certain areas and/or posts, would, in any case, be inevitable.

NORTHEAST PROJECT

About Rs 2,000 crore have been released by the government for the development of ALGs as part of the Prime Minister's northeast development project. There is an inter-ministerial empowered committee under the Vice Chief of the Air Staff for speedy modernisation of assets in the area,[16] especially the ALGs/helipads like Mechuka, Ziro, Tawang, Tuting, Passighat,

15. See http://www.bharat-rakshak.com/IAF/Aircraft/Specs/571-Mil-Mi-26.html?showall=1, accessed on November 6, 2012.
16. "Airfield Development in Northeast not Country Specific: Vice-Air Chief," *The Arunachal Times*, October 14, 2010, available at http://www.arunachaltimes.in/archives/oct09%2015.html accessed on November 6, 2012.

Along and Walong.[17] This is making progress, but as brought out earlier, it is the last mile connectivity to the forward posts that requires precious helicopter hours during air maintenance. So, roads leading to each and every post in the border areas are an imperative, if dependence on air maintenance is to be reduced. The northeast project, thus, will have only minimal effect in reducing the air maintenance requirement for the rotary-wing fleet, as road construction is not a part of its charter. However, there would be some accretion in the capability as modern air assets (like the C-130s and Avro replacement aircraft), which can utilise these refurbished ALGs and small airstrips, get inducted into the Air Force in the coming years.

It will be the C-17s that will make a dramatic difference to the air maintenance capability of the IAF.

FUTURE INDUCTIONS OF AIR MAINTENANCE ASSETS.

The Indian Air Force transport fleet is being modernised extensively as part of its Long-Term Perspective Plan. Besides the C-130 Special Operations aircraft that have already arrived, the induction of ten C-17 Very Heavy Transport Aircraft (VHETACs) from the USA, with more likely to follow,[18] will be the major accretions in the coming decade. Additionally, the AN-32 fleet is being given an extended lease of life through an upgradation being done in Ukraine that will equip the aircraft with modern avionics and extra payload capability.[19] Given their specialised role, the C-130s will not be used for routine air maintenance tasks but will certainly be called upon for emergent HADR situations when they arise, as was done during the 2011 Sikkim earthquake relief activation.[20] It will be the C-17s that will make a dramatic difference to the air maintenance capability of the IAF.

The C-17, with a 70-tonne payload capability at sea level, demonstrated its exceptional performance during the flight evaluation conducted by the

17. For details, see Rajat Pandit, "IAF Slams Chinese Objections to Airstrips in Ladakh, Arunachal," *The Times of India* (New Delhi), October 15, 2009.
18. See en.wikipedia.org/wiki/Boeing_C-17_Globemaster_III accessed on November 18, 2012.
19. www.youtube.com/watch?v+pKrxdF-6CCU
20. "C-130J Aircraft Used for the First Time in Quake-hit Sikkim," *Hindustan Times* (New Delhi), September 24, 2011.

IAF; in the height of summers in June 2010, it took off with 30 tonnes of load from Leh airfield (10,300 ft above mean sea level).[21] This prodigious payload capability will dramatically enhance the IAF's ability to meet Army requirements for the Leh Sector and release IL-76s and many AN-32s for operations elsewhere, especially in the east where the altitudes of operational areas are lower. The C-17 also showed its short field landing capability when, during the evaluation phase after take-off from Leh with the 30-tonne load, it landed at the 3,000-ft Gaggal airfield in Dharamsala in Himachal Pradesh![22] The valleys in the Eastern Sector are narrow and heavily wooded. The good short take-off and landing capabilities of the C-17 and C-130 would be a boon for forward area operations, and construction of short ALGs, and/or upgradation of existing ones will greatly meet the expectations of the military and civil authorities in the east. However, the criticality is still of the availability of rotary-wing airlift capability.

The IAF's rotary-wing fleet has been augmented with six new Helicopter Units equipped with Mi-17 V-5 helicopters.[23] With more powerful engines, the V-5s are expected to bring a quantum enhancement in air maintenance execution statistics. The old Mi-8s too are going to be replaced with this medium lift helicopter as part of a 59-helicopter follow-on contract,[24] greatly adding to the overall capability to meet or reduce the deficit between the demand and execution of air maintenance. The 197-recce and surveillance helicopter acquisition programme seems to have a hit a roadblock for the last six years or so. While flight trials have been completed twice and the final report submitted to the ministry, accusations of misdoings have lead to delay in its acceptance. The selected helicopter is supposed to replace the Chetak/Cheetah in many units of the Air Force[25] and as and when the report gets accepted and the selected aircraft are inducted, the airlift

21. Ajai Shukla, http://ajaishukla.blogspot.in/search?q=C+17 accessed on November 18, 2012.
22. See n. 18.
23. "Latest Mi-17 V5 Choppers Formally Inducted into IAF," *Indian Express* (New Delhi), February 17, 2012.
24. "IAF to Procure 59 Mi-17 Choppers from Russia, *"The Times of India* (New Delhi), September 9, 2010.
25. http://articles.timesofindia.indiatimes.com/2012-10-28/india/34780187_1_agustawestland-eurocopter-light-utility-helicopters, accessed on March 28, 2013.

capability would get an additional boost.[26] The national and international press has also reported that the Boeing Company has won the contract for 15 Chinook helicopters for the heavy lift helicopter programme of the IAF.[27] The Chinooks will bring in an acutely needed capability of lifting heavy and odd size loads to the forward areas. One agency that will greatly benefit from this uniqueness of the Chinook would be the BRO, which requires bulldozers and similar heavy pieces of machinery in remote and inaccessible areas as primary implements for road building. With its exceptional manoeuvrability and ability to turn around in narrow valleys, the Chinooks would be able to position urgently needed heavy construction material in the hills of the northeast. This, in turn, will enable the BRO to expedite its road making projects that have been inordinately delayed, leading to reduction in air maintenance requirements.

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What lies further ahead? The 13-tonne Indian multi-role helicopter will equip a few more Helicopter Units, as and when it gets developed by Hindustan Aeronautics Limited (HAL). Similarly, there is a Light Utility Helicopter (LUH) project which is to provide the leftover numbers after the recce and surveillance helicopter deal is signed.[28] On the fixed-wing aircraft side, there would be another squadron of C-130s, the medium transport aircraft from HAL (as and when developed along with the Russians),[29] more C-17s and modern aircraft as replacement for the vintage Avro –

26. https://www.defenseindustrydaily.com/eurocopter-bell-battling-for-500600m-indian-army-contract-0725/ accessed on March 28, 2013.
27. "Boeing Bags $ 1.5bn IAF Chopper Deal," *The Times of India* (New Delhi) October 30, 2012. Also available at http://articles.timesofindia.indiatimes.com/2012-10-30/india/34818074_1_lowest-bidder-heavy-lift-helicopters-chopper Also see Paul Fiddian, "Boeing CH-47D Chinooks for Indian Air Force," *Armed Forces International*, posted at www.armedforces-int.com/news/boeing-ch-47d-chinooks-for-indian-air-force.html, accessed on November 19, 2012.
28. http://www.indianaviationnews.com/indian-aviation-archievenews.asp?id=15&NID=1006&PID=31
29. http://www.defenseindustrydaily.com/hal-and-irkuts-joint-tactical-transport-project-02931/

The transport and helicopter fleet of the Indian Air Force has been doing an extraordinary job since independence.

these acquisitions are still many years away but will significantly enhance the air maintenance capacity of the IAF on their induction. But something closer on the horizon, and already being talked about, is the V-22 Osprey tilt rotor—there are news reports to the effect that Boeing has already made presentations to the IAF on this revolutionary machine that is proving its worth in Iraq and Afghanistan. Boeing confirmed that it was "invited in-country to provide more information" on the V-22, but that it has not received "an official, written [request for information] from India …...we've made presentations at a number of Heli-Power conferences and also presented to the Air Force Chief of Staff" a Boeing representative said.[30] If inducted, the V-22 would bring about a paradigm shift in the way air maintenance and HADR would be executed; it would be a game changer, to put it mildly. With its Vertical Take-off and Landing (VTOL) and high forward speed characteristics, larger and heavier supplies could be delivered from logistic heads in well connected areas in the rear, right to the front lines (obviously within its height and temperature operating envelope). An offshoot would be the casualty evacuation capability directly to better equipped areas in the rear. Surely, there would be limitations too due its high downwash, but the payload capability that would accrue would justify construction of specific landing areas for its operations.

CONCLUSION

The transport and helicopter fleet of the Indian Air Force has been doing an extraordinary job since independence. Flying in the two sectors—the Northern and Eastern—is as different as chalk is from cheese, but through sheer professionalism and dedication to the cause, the air and ground crews have met the air maintenance targets laid down by the government. The even more creditable part is that the tasks have been achieved decade

30. Greg Waldron, "India Sizes up V 22 Osprey," *Flightglobal*, available at http://www.flightglobal.com/news/articles/india-sizes-up-v-22-osprey-367058/ accessed on November 22, 2012.

after decade despite diversions due other national requirements of HADR, internal security and urgent civil requests that come in periodically like national and state elections. Even after the road network expands and gets developed fully in the border areas, air maintenance will never really cease since forward posts of the Army and civilian areas would require assistance when cut off due to natural calamities and disaster situations. The aircrew and ground crew of the IAF can take legitimate pride in a job that has been done well – and there is no doubt that it would continue to be the same in the coming decades.

The Chinese have erected a memorial at Kunming as a tribute to all aircrew (predominantly American) who died in the Hump operations of World War II, carried out from airfields in eastern India. The transport and helicopter personnel of the IAF, however, get their satisfaction when the Service personnel and civilians whom they support, smile back at them in appreciation of their selfless devotion to the cause of air maintenance!