

Preparing for Armageddon

Parliament House in New Delhi : plans and policies must flow from the sages within !

Criticality of developing indigenous weaponry

The rise of new economic powers gives rise to forces which can well be described as ‘Tectonic’. The usual means of resolving such forces since the Punic Wars is prolonged and bloody war. India is re-emerging as an independent economic powerhouse and must expect and prepare for an eventual confrontation, possibly even war, with China and ultimately the USA. The contours of such a conflict cannot be discussed here. Perhaps the paranoid may be forgiven the view that the various ongoing aggressions - the funding and sustaining by proxies of terrorist and insurgent activities, the sustained support for Pakistan by the US, the building of encircling bases by China, the covert acts of cartographic aggressions and even the printing of fake currency notes are all carefully planned opening moves of a campaign to reduce and weaken the Indian State before administering the *coup de grace*. Sage political leadership may find ways of resolution by peaceful means but the precedents of such leadership being available are not encouraging. Thus *sic vis pacem parabellum* must be the urgent policy.

Of the three protagonists, India is the least prepared for such a showdown. In our past wars sustainability of the war effort was not a significant issue but will be so in this future conflict. In sustainability our weakness borders on the grievous. Seventy percent of India’s war-making equipment is imported. A few years of remorseless sanctions and this shiny hi-tech equipment will become dust covered junk. An indigenous and comprehensive war industry is worrisomely overdue. Technical “challenges” are the least of our problems; ‘Timeliness’ is. If we have to be ready in time we have to reorganise so that the undoubtedly adequate available resources are best organised for timeliness. Wars can be deterred by having sufficient numbers of adequate, but homegrown, equipment to execute sound doctrines.

Reorganising...ad infinitum

“Whenever things go wrong we tend to reorganise and there is no better method of creating an illusion of progress when in reality changing nothing”. Quoted two thousand years ago by the sage Tacitus,

this illustrates the inherent difficulty in reorganising. The authority to reorganise lies with those very people who created the problem in the first place. The disastrous track record of weapons development by the state sector was caused by the almost criminal flouting of the simplest rules of management. These failures can be easily corrected if the political leadership wills it. Even if “half improvements” are made in all the areas where mistakes were made, there will be a sea change. The starting fault lay in isolated development without a detailed interweaving with broader strategy. That misstep resulted in chasing the butterflies of latest technology. Confusion was worse compounded by keeping everything within state control and out of reasonable public scrutiny. India has lost time dangerously. The saving grace is that the skilled work forces of today are larger, the design resources have improved and if we can completely shed in defence R&D the wasteful dogma of over protective state control we may, with a few path breaking corrections, surprise ourselves at the turnaround.

The need for honest doctrines

It was a British General who stated rather ruefully “You haven’t fought unless you have fought the Germans”. The truth in the statement can be judged from the fact that the Wehrmacht quickly overwhelmed European armies and then fought the two world superpowers for four years – and almost won! Every country has its doctrines. What made the Germans formidable was the emphasis they paid on honestly developing doctrines and their ability to incorporate available technology into their theories. German equipment was not superior. In fact the German KPzW II and III tanks that ripped France open in 1940 were inferior to the French Somuas and the British Matildas. What set Guderian and Student apart was that instead of trying to justify a concept (which happens here often enough) they went about with clinical impartiality (one could say sterility) to allow the idea to grow. The outcome of such “Brahman” (there is no better word) detachment from the result actually resulted in brilliant tactics and meticulous plans with a cascade of consequential studies and action. The sweep through the Ardennes required the landing of gliders on Eben Emael. When DFS gliders landed the *Fallschirmjaegers* on to the top of that fortress, the hollow charge weapons required to punch through the roof of the cupolas had been anticipated and developed. Impregnable Eben Emael fell within a few hours to a small and lightly equipped force. This is the end result of a coherent policy of the development of doctrines matured in the full knowledge of the political leadership which gave inputs of political will and sanction from the start.

Two fundamental points need to be underlined. The first was the German readiness to use suboptimal but internally available technology to incorporate into their war plans. They used the Junkers Ju-52 as tow planes for their gliders because that was what was available. They did not insist on getting a manufacturing license for the immeasurably superior C-47 Dakota to equip their airborne forces. Equally important, the German General Staff, despite all its Prussian snobbery was reasonably willing to allow non *Hochgebornen* and relative juniors, the proverbial ‘man on the spot’, to develop and expound doctrines which may have

“frightened the horses” in another Army. Guderian and Student were half Colonels when they set out their theories of Panzer and Airborne troops. Generals should be more occupied talking to the political masters (as did General Manekshaw in 1971) sorting out permissions and sanctions to mess around with sweeping ideas. Let that be done by ‘the man on the spot’. The problem with the ‘thinking General’ is that there can never be critical analysis of the doctrines as, during service, he represents the highest perfection in human thinking. Think dispassionately and make do with what you can cobble together. The Wehrmacht, planning for the more difficult war of aggression, thought honestly and based that thinking on equipment that was ‘homegrown’ (indigenous in Indian speak). We have to adopt their ways of gardening.

Bringing the dogs out of the doghouse

In India the bureaucracy (‘iron frame’ or ‘iron control’?) has sustained a prolonged – and by now irritatingly petty campaign – to keep the Military in the doghouse. Immediately after Independence there may have been some reason but an aspirant ‘Super India’ cannot afford this upmanship. A state funeral for Field Marshal Manekshaw, with all its pomp and circumstance, would have been a great demonstration of *Super India*. Instead it appears the bureaucracy got its knickers in a twist about the precedence between a Cabinet Secretary and a Field Marshal! Shame! The Military has to be restored as an equal partner because there will always remain the doubt that even a brigade of the most obstructive *babus* will not halt the Chinese or the Americans: only the Armed Forces will. The *babu* -Politician nexus must be neutered to bring the Armed Forces out of the Doghouse and make them a respected party to the *entire* process of decision making at the War Cabinet level. What is the result of ‘dog housing’ the Military? Compared to the Prussian ‘Big Picture Brahmanism’ what we have is a predilection for the incoherent leading on to the incomprehensible. It appears (even 60 years on, the bureaucracy *needs* to keep its secrets dark!) the decision not to use the Air Force in 1962 came more from the inputs of the IB rather than from the professionals of the IAF! That too after the shooting war had

started. The INS *Vikrant* is a telling case to the point. Did we go in for a carrier because there was a perceived maritime threat that overrode the Army’s/IAF’s need to prepare for mountain warfare or did some British FO *babu* let an Indian *babu* know that the HMS *Hercules* was up for sale and could be had at a reasonable price? Having got the *Vikrant* we had to wait for the PNS *Ghazi* to blow up before we risked it in the Bay of Bengal for a mere 3% (one hundred and eighty nine) sorties against a defeated enemy. For much less the Navy could have got shore-based Il-28s or Canberra squadrons which could have been more versatile and ‘expedient’. The question to be asked in sanctioning an aircraft carrier is, would the Navy risk its prize pig in an actual war? The same question arises when the Army wants MBTs that can make surgical thrusts into Pakistan. Are our politicians steeled (no pun) to permit such a thrust? Will the Americans/Chinese allow it? Does the Army’s culture allow it? Losses in defence are accepted but very few Brigadiers (being decent middle class chaps) will proceed if he begins to take losses in an offensive. If the answers are no, then Liddel Hart’s concept is irrelevant. Settle for the Arjun, its reliable even if it is not the “latest and best”. This is not the place for details but the experience of tank warfare in the Gulf wars is as relevant to reality as the bombing of Guernica was to prove that the fast bomber could survive in the face of opposing interceptors!

The fault is not with the Armed Forces. As long as the Armed Forces are kept ignorant, they will insure themselves by asking for equipment of the highest technical merit without its relevance to realities. Note that the Wehrmacht was always clear of the political aims well before the war.

If the strategic scenario is not settled the rest of the details cannot follow. Why did the HF-24 have to achieve Mach 2? Why did we buy the AMX-13s if we basically used them as mobile pill boxes? Why did the IAF lack hardened shelters? Why were Canberras, Gnats and Mysteres still in natural (silver finish) in 1965? Why was the raid on Peshawar carried out using single 4000lb ‘Blockbusters’ which, as the name indicates, are used against dense strategic targets? A load of 8x250 lbs would have wiped out the entire PAF force of B-57s.



155mm Howitzers in action.

Reining in the bureaucracy

Such lapses indicate that war planning was inefficient and neglected. Since the Military was being kept out of the developing “big picture” the essential time required to plan was never available. When the ‘Desert Rats’ (LRDG) went to war they had the technical expertise of ten years of desert operations taught to them by archeologists who had spent time investigating Carthagian ruins in North Africa. The details went down to how to store maps – “don’t fold them-keep them between sheets of plywood”. Success in war is critical on detail. Compare that with our para commando’s gallant efforts (or picnic, if one is uncharitable) with Jongas in the Western desert. It is fortunate for us that the Pakistanis were just as chaotic. The concept of dropping parachutists at Adampur, Pathankot and Halwara was brilliant but the Pakistani planning details were a Buster Keaton comedy. One hopes there is not a re-run by the US First Airborne. There is a need for “thinking” which needs “time”. To obtain the necessary time, the bureaucracy and the Military must talk as equals instead of one devising crafty protocols so that only the other is frisked at our airports. “Frisk the lot” one can hear the public say.

The same attitude problem bedevils the formation of a General Staff; a *bête noir* for the bureaucracy who are the only gainers in the inevitable inter-services rivalries that the lack of such an institution fosters. A Combined Chiefs of Staff (CCS) makes for coordination and efficiency. The force multiplier effect of the CCS can be gauged by the fact that after the First World War, the defeated Germans were allowed an Army and a Navy but not a CCS. We can no longer deny ourselves this potent force multiplier.

Operations Research is the key

“I put so little milk in my tea”, said the Irishman, “that you could hardly call it tea”. Like Paddy’s tea, we are taught to think OR is not OR if it does not have lots of mathematics. Our professors substitute mathematics which they can teach (after a fashion) for real experience which they never got. In OR, mathematics comes at the last to quantify the problems which OR has defined. Since disconnected mathematics is boring and meaningless, the present pedagogy has succeeded in frightening and confusing people off meaningful OR. That is unfortunate because OR is an outstanding zero cost force multiplier. What should be the TBO of our engines given that many engines will be downed due to FOD well before the brochure figures? What should be the actual airframe life given our flying conditions and CAT “E” rates? What are the “g”s we normally pull in Su-30 sortie profiles? What is the average g-loc level of the Indian pilot? What will be the reduction of effort in having standardised aggregates? What is the real shooting range for tank guns given our varying terrain? What are the weapons our intruder aircraft must carry given the accuracy of the bombing equipment? Will it be more effective to have a salvo of low accuracy but much cheaper SAMs compared to the imported ‘single shot’ wonders? OR studies could minimise our technology needs and the work burden in weapons development. Even in daily operations the impact of OR, done by practical men, can reduce the workload of preparing for war. There may be thousands of ‘Kaizen’ applications which will help in reducing the ‘run rate’ required if we are going to be ready on time.

Standardisation: de-optimize locally to optimize globally

The Soviets thought nothing of fitting the same AGD horizon on *all* aircraft from the Yak-18 basic trainer to the Tu-20 intercontinental bomber, over a hundred times bigger. This standardisation extended across all systems and aggregates that went into combat equipment, be they gyros, generators, batteries, instruments, heat exchangers. Unthinkable *de-optimisation* for the West, the dividends were huge: availability, reduced prices and simplified logistics; in short, optimised war capability. The Soviets, unlike the West, even avoided having a sacrosanct materials grade for aviation. Used to GOST they would laugh to see mild steel for a bracket being called DTD S1 and being imported with a release note. Our Government functionaries will not initiate this vital rejig. Why bother? The pension is guaranteed.

They have to be re-educated. India’s automotive industry, having adapted the AS 9100, has quality standards which are often equal to the aerospace standards being followed. The Private Sector and its various collective associations such as CII must give the lead to re-examine current automotive expertise vis-à-vis aerospace technologies of fifty years ago.

Russian standardisation went further. The TsAGI (their NAL) would investigate aerodynamic layouts e.g. the uniquely Russian ‘tailed-delta’ layout and leading design bureaus would further tailor the data for widely diverse aircraft such as the MiG-21, the Myasischev *Bounder* intercontinental bomber and the Su-9 all weather interceptor.

If resources were so organised India would be the envy of many aerospace nations because of the vast, diverse and deep pool of world class technologies in aerospace/automotive equipment we have access to and experience of. What needs to be done is to examine our range of products and select for standardisation those which are most indigenisable completely *and quickly*. Being proof against sanctions must be the deciding criteria. Standardise ruthlessly. Compared to the MiG-27’s R.29B the M53’s exterior is so elegant that you could wear it on a tiepin. But is a jet engine for wearing on a tiepin? They are

all alike as peas in a pod functionally. What goes for jet engines and ventilating fans probably goes for Army howitzers also if one sees what is being meant. God bless the Army but there was nothing wrong with the Bofors 155mm howitzer selection! Mount the Bofors barrel and systems on an *expendable* aluminum carriage to get an ultra light howitzer. Howzzat?

Limit the technology

What Tacitus observed for ‘War’ is true in India for ‘Technology’. The enthusiasm for technology seems to be the highest with those with the least experience of it. It is painful to see the Government-run weapons development organisations take on jobs that many have patently no experience or attitude for. Any discussion on aero-engine development, for example, soon gets in to jargon like SC blades, flat rating and smokeless combustors. Such jargon and its usage betray a lack of the practical. These fascinating technologies are not essential. For example low TBO is not a core problem. It can greatly simplify the timely development of an acceptable engine. The IAF will kick and scream but it can be persuaded to accept an engine that gives only 300 hrs TBO provided it was utterly reliable within those 300 hours, was easy to change and spare parts were plentiful. The IAF quite rightly will not accept any engine if it is ‘unreliable’.

No time for invention - learn to copy!

The Chinese have a tradition of making painstaking copies: sneered at by the West – the word ‘Chinese Copy’ having insinuations of brainless copying – the Chinese have an admirable capability of getting into detail, reputedly the very place where the devil resides. It is significant that when we got the *Gorshkov*, the Chinese bought very cheaply the hulk of the *Varyag* for copying. Copying does not result in second rate weapons. Real engineers – those who by definition can do for six pence what any fool can do for six shillings – copy all the time. The Soviet strategic bomber force was built up within four years by Tupolev who was astute and humble enough to copy the B-29 from examples which had force landed in the USSR. “Legend in his lifetime” status notwithstanding, he would have returned to prison had he



The AL-55(I) jet engine.

failed! The Tu-4 with its remote controlled turrets was ready for service with the *Dalnaiya Aviatsiya* in the stipulated time with numbers and reliability and gave the Russians the deterrent force they needed. Our weapons developments have been done by Governmental Scientists, unfortunately, without the persuasion of possible imprisonment. Having no *effective* experience or capability, it appears that connections, politics and ‘organisational tribalism’ decided the selections, the project leaders ignored the world’s richest and most diverse source of advanced weapons technology. They seem to have betrayed their lack of engineering abilities by starting with clean sheet designs. The national disaster, it is nothing else, is repeatedly there to see. To note is that the experienced French consultants to ADA, for example, stuck to their known devil of the tailless delta/FBW which was not the wisest choice for India. In fact they did not even venture to go from a 3-digital plus one analog channel (as an engineering concept it had much to commend it) to the ‘latest and best’ all four digital configuration. Apparently that added 4 years to the LCA’s delay. We have to copy and evolve for the present. For example we have a range of engines The AL-55(I), the Adour, the R.25, the RD. 33 and the AL.31F whose details we largely have. Let us select any three as our light, medium and large engines, with or without afterburner as singles and multiples cover

everything from light trainers to strategic long range missile carrier aircraft. These engines should be copied not necessarily within the Government Scientist *biradari* but at the ‘Indian Nation’ level i.e. including the private sector with completely equal and fair advance funding! Current ‘Apex’ (jargon for bottleneck) organisations, especially the failed ones, must be turned on their sides to become ‘bus bars’ feeding detail technology to the teams. True, certain items such as rolling bearings and alloy elements and microchips need to be stockpiled but that is manageable. Of course the results would be suboptimal, in the way a Chinese J-10 or a Hong 6 is suboptimal but the US will think carefully before trying to take on China. Skilled designers can produce effective and affordable warplanes from the menu of engines and accessories that we already possess.

Innovation or ‘Jugard’

The other ace is to innovate. When Britain needed a multirole fighter to face the Germans, Frank Barnwell of Bristol, being an engineer, did not go about designing the ideal aircraft. He took the wings and tail of the existing Blenheim light bomber, married it to a slimmer fuselage and produced in time the Bristol Beaufighter, an aircraft that later revolutionised anti shipping strikes. The Soviets had a long tradition of adapting Naval guns for tank gunnery. At usual firing ranges they were effective. The famous 88, dreaded as a

tank/anti-tank weapon, started life as an anti aircraft gun. And so on. In the neglected area of AAA, the greatest harvester of enemy aircraft even today, our main need is not static but air transportable AAA. It may be wiser to use the gun and fire control of the Shilka, Tangushka or naval 76mm dual purpose guns as the basis of a range of static AAA weapons rather than design a new gun from the carriage up. Similarly barrage balloons on the approaches could reduce the efficacy of runway busting bombs. The possibilities are endless, given our resourcefulness.

Equipment for that war

Indian defence tasks for future conflicts can perhaps be summarised in the following:

- » Denial of immune approaches to the Indian Coast by large Aircraft Carriers.
- » Ability to thwart hostile advances in the mountains.

ring. Should nuclear weaponry have lower priority over building up sustainable conventional forces? During the 1960s, when China's nuclear teeth were still 'milk', they routinely shot down any US aircraft that intruded into Chinese airspace because of Chinese confidence that any war could be sustained indefinitely. They knew their 'obsolete' technology was not 'ineffective' in the minds of the Pentagon. To put the mindless harping of 'Fifth generation technology' in the correct perspective, the reality is this: even as we talk of the FGFA, MCA etc, the IAF Chief of Air Staff, would be deeply grateful if he were given three hundred new build MiG-21s. If on the top of that, the fighter "landed slowly and did not burn up" he would feel a man reprieved. With this perspective in mind, the country needs to develop a range of simple, secure and effective warplanes.

sins of the Mk.1. The detail engineering of the airframe was careless. To this end the airframe should be redesigned in aluminum and the detail design gone over with a fine comb by engineers rather than 'scientists'. Working with familiar material, the stress men will achieve a significant weight reduction. The scope is certainly there. Once the weight is reduced, effective performance can be achieved with a copied R25/RD33. No engine is good enough to overcome careless detail design. Without a 'sterile' re-organisation, the LCA/F414 will be a re-run.

The ideal (LCA) would have been a Gnat enlarged sufficiently to pack the MiG-21 Bison's systems and weaponry in a new airframe which would conform closely to the Gnat's aerodynamics and structural philosophy. The power plant would be again a 'secured' R.25 or RD.33 but without the afterburner



The Tejas LCA during flight trials.

- » Denial of using Pakistan territory as a spring board for launching military offensive operations.

The above abilities must be maintained in the face of prolonged sanctions over the issue of Nuclear Proliferation, carbon emission or similar pretexts. The roots of the Pacific War were in America imposing sanctions on petroleum and rubber to Japan for the same contemporary 'outrage' which was overlooked in the case of Italy. To stand up to such blackmail we will need *totally indigenous weapons* and *vast numbers of them*. The fright about the weaponry displayed in the Chinese Golden Jubilee parade was not advanced technology. The fright was that it was available in such large numbers and that it was all Chinese down to the last 'O'

The simplest air superiority fighter

Thus, the LCA nettle must be grasped firmly. As of present it is a 'failure'. The LCA is not going to be ready in any useful time. No one loses his pension/ *Padma Shri* in case the 2010 dateline fails (yet again). Effective squadron service is like "*Dilli, dur ast*". Technologically it is totally insecure. Even its material of construction is sanctions prone. The Su-30 suffers similarly with the added problem that it violates a cardinal rule of combat equipment; it is too huge. It will be, like the Su-7, vulnerable to low cost defences. The LCA will be an option once it is redesigned to be 'sanctions proof'. The so called LCA Mk.2 must be recognised for what it actually is - an effort to undo the worst

as supersonic performance is known to be of little use and the Gnat concept is fine tuned for excellent transonic or 'real' combat conditions. The obvious improvements (LEX, LE Flaps etc) can come progressively in the Mk.X! 'Scientists' may not know enough to believe in scaling up (one actually spouted Reynolds Numbers-wrongly-to frighten the 'ignorant') but engineers know that the list of aircraft, including world famous ones, developed by direct 'enlargement' is as long as one's arm!

A scaled down MiG-29 using either AL.55s or non-reheated RD.33s and optimised for clear weather air superiority at transonic speed i.e. tuned for the regime where 95% of the combat takes place would be an option. You will still win the

war because almost all the time you will be in the right aircraft at the right place at the right time and in the right numbers.

If three simultaneous fighter projects seem much too much, remember that faced with a similar crisis, the Soviets sponsored twenty six! That was good management wisdom because they got three ready in time. Two of the three winning designs then actually saved Russia.

The simplest strike aircraft

Two warplanes are envisaged in this category. The first is a minimum engineering revival of the Ajeet airframe to take the Saturn AL 55 engine, possibly with afterburner in the later models. Critics will say that the warload is too small. The improvement in AAA is such that the 'Western cold war' concept of a very large war load is now illogical. In actual combat the small size of the Gnat meant that not one was lost to AAA in the East though it flew as many strike sorties as the Hunter and the MiG-21 - the bangs per kilo buck were thus quite comparable. The turbofan and re-engineering will double the radius of action and far more. The second is a revival of the HF-24's proven airframe to carry the MiG-21 Bison/Jaguar systems and equipment and powered again by the AL-55. It should be possible to provide additional over wing pylons like the Jaguar as well as a centre line pylon but many other ideas like LEX, or shortening the fuselage, can wait for the later marks. One important 'human' advantage of using proven airframes and systems is that not only can the work be reliably completed within three-four years but also the *babus* are less hesitant about certifying the bird! For the potential achieved by re-engineering a warplane of this class, read *Vayu Aerospace Review II/1990* by this same Author.

Past failures were entirely avoidable. The earlier Ajeet and the HF-24 Mk.1R failed because the 'improvements' pushed up weight and therefore drag but the engine remained the Orpheus. In the case of the HF-24 Mk.1R, the locally developed afterburner was so simple that it possibly even lacked a variable area nozzle. In fact these projects should not have even been tried! To add insult to injury the detail engineering, which really makes or breaks an aeroplane, was always a weak point with the organisations concerned. Recently it appears that an 'expert' from

Germany had come and pointed out that the cable guards were fouling with the control runs in the NAL Saras. If true this is appalling but gives hope for the future! One does not need experts from Germany to point out such simple things- one needs Engineers who will get off their b***sides and crawl over the prototype when it is undergoing assembly. A mention of this is made to show that things are going wrong because the simplest rules of product development are being ignored.

The "expendable" transports

Logistics form the backbone of warfaring capability. Without airlift capability some of those ultra light howitzers may end up in the Beijing and Washington war museums. Transports are needed and in large numbers. An enlarged version of the Otter or the An-2 and a revival of the Dakota or may be the Dornier 228 but with about twice the power will be needed. The same goes for a new avatar of the C-119 Packet but with turboprops or the An-12. Robert Watson Watts of HM Post Office, charged with getting the British Radar Interception system ready in time to meet the Luftwaffe, used to say something which is worth repeating because it is so relevant to us: "Don't go for state-of-the-art. Cobble together the third best! The second best will be almost too late and the best will never come." In fact the British CH and CH low radars were technically inferior to the contemporary German *Freya*, *See Tackt* and *Wurzburg* systems but it was adequate for the task and was available in right numbers in time and reliability to help win the Battle of Britain.

The high altitude close support aircraft

No Air Force likes to do close support work because it is not 'their' work; this disinclination makes them ill prepared for it and thus losses are higher in this already hazardous job. The mindless use of helicopters is an American concept. It may be good for Bell Textron but the Vietnamese guerrillas are still laughing about it. Helicopters are noisy deathtraps in an AAA environment and with limited high altitude capabilities. The conventional attack aircraft is too unwieldy. What is needed is an aircraft where the armament is turreted so that the aircraft manoeuvre envelope demands are not restricting the

ability of bringing the guns to bear. The starting point could be most of the MiG-25's fuselage and systems married to two HBPR turbo/prop fans and possibly a biplane configuration which has excellent handling qualities at altitude whilst remaining compact in size. Given the excellent record of the Il-28's tail turret to keep Mujahedeen Stinger operators heads down during the withdrawal part of the firing pass, a tail turret (copy the IK 5!) would be a 'must' feature.

The Brahmos / Super Brahmos carrier

The Brahmos missile has great promise and we should work for enlarging it to a size that will give a range of around 700 kilometres i.e. enough to dissuade any hostile aircraft carrier to approach within effective launch distance of the Indian coast. Such missiles will need carrier aircraft. The most reliable route to development will be to scale up the Canberra-type by about 30% which will give a bomb bay of three meters in diameter and ten meters in length i.e. sufficient to carry three to four Super Brahmos together with the personnel and systems to acquire and operate the missiles. The power plant would be the un-reheated AL-31 and all systems would be from the existing standardised aggregates. Such an aircraft would be cheaper, carry more missiles ensuring higher Pk, have better acquisition and control systems than the Su-30MkI, and yet be just as fast as carrying a Brahmos externally.

In 1962 we lost a winnable war. It affected our lives more than one may concede. For a re-emergent India, confrontation with China and/or USA is inevitable. The US, in war, is wily, powerful and (against the Asiatic), ruthless. We lost in 1962 because of bottlenecks not in our resources but in our leadership, our 'professionalism', our planning and thinking and in our inability at the top to respect each other's sentiments. The same situation exists today. It is at the top, perhaps less than a hundred people, who will have to re-orient their attitudes and co-operate. The rest will immediately follow. Given that we will not only acquire the wherewithal to defend our sovereignty but also project our unique brand of 'soft skills' for a better world. Time, however, is running out.

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