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India's Security Perceptions And The Nuclear Issue*

COLONEL R RAMA RAO (RETD)

NATIONAL SECURITY

TILL the Chinese invasion of 1962, India's armed forces were very modest in size; managed with equipment left over from World War II and its defence budget was minimal in absolute terms as well as a percentage of national income. The steady pruning down of India's defence forces from World War II strength, was no accident but the logical result of implementing the policy of a Government which did not perceive any serious threat to the country's security except from neighbouring Pakistan, which unfortunately had chosen to adopt an unfriendly attitude almost right from the day it emerged as a free nation. Since Pakistan's armed forces at the time were equipped with weapons and equipment of the same type that India's forces had inherited, it was felt that India could defend herself against Pakistan. Also since they never contemplated aggressive action against any country and did not expect trouble from any country except possibly Pakistan, Indian leaders had defined the task of their armed forces as defence against a second class power. Given this definition of national security need, there was no justification for large forces ; nor for modern and expensive equipment. Accordingly, force strength was steadily reduced and old equipment retained in use far longer than would have been the case otherwise.

The political and military reverse suffered by the country in 1962 served to awaken national leadership from the "dream world" of its own creation as Prime Minister Jawahar Lal Nehru had observed. Public opinion recognised the urgent need to strengthen the country's armed forces and otherwise fortify the country's defences.

In fact, warning signals of the dangers that awaited the country could be seen by discerning observers since the mid fifties. The Mutual Aid Pact (MAP) concluded by USA and Pakistan in terms of which

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* This is slightly condensed version of a chapter written by the author in a collection of essays by a group of writers on the nuclear issue as it affects India. The essays are to be published in book form shortly.

—Editor

the latter was to receive substantial military and economic aid besides powerful political support alarmed even Pandit Nehru who was predisposed towards peace and who wanted to believe that Pakistan would not initiate an all out war against us. The massive induction of US arms into that country did indeed radically alter the balance of power in the sub-continent. Given their superiority in ground and air attack weapons over those of India's armed forces and given their determination to use force, if necessary, to compel India to cede Kashmir, it was only a question of time before Pakistani commanders and troops acquired the needed confidence in handling their American gifted weapons and seized an opportunity to attack India.

Although at the time Western statesmen were reluctant to admit it—and some in fact went so far as to blame India—the fact is that in 1965, Pakistani leaders invaded India because, firstly their armed forces had an edge in strike elements over India's, thanks to the generous arms gifts received from USA under MAP. Secondly along with arms supplies and economic and technical assistance, Pakistan also enjoyed USA's powerful diplomatic support, which on numerous occasions had explicitly supported Pakistan's stand on Kashmir. Thirdly, after the reverses suffered by India in 1962, Pakistan could count on China's positive support to any action she might take against India.

Other considerations which had influenced Field Marshal Ayub Khan were the assessments of his intelligence agencies which led him to believe that there was an indigenous movement within Kashmir which would organise a revolt against India once Pakistan gave the call, and the assessments of his foreign policy advisers that Indian reactions to any Pakistani military initiatives—overt or covert—would be minimal and in any case India would not extend the area of conflict beyond the State of Jammu and Kashmir. That such indeed was Ayub Khan's belief is clear from accounts of the 1965 conflict published by a senior Pakistani military officer.[1]

Thus, while the major factors that influenced Pakistan to attack India in 1965, in order to secure a change in the status of Kashmir, were American military aid and political support, other factors such as China's hostility to India served to strengthen Pakistan's belief that the odds were in her favour.

The situation in 1971 was not qualitatively different. The military losses sustained by Pakistan in 1965 had been made up by indirect supply of American arms such as tanks and fighter bombers by Pakistan's friends and of weapons of Soviet design by China. The American embargo on arms supplies to the sub-continent did not prevent Pakistan from strengthening its forces very considerably, although at least in the

beginning it served as a signal to Pakistan not to take USA's unconditional political support for granted. After 1968, however, the new American administration gradually reverted to the earlier American stand on matters pertaining to the sub-continent, although the embargo on arms supplies remained. The Ussuri clash of 1969 provided President Nixon the opportunity to move purposefully in giving effect to his policy of steering USA to a position where she would be closer to either of the communist giants than they were to one another, so that not only would a grand communist alliance with potentialities of engulfing the Western and Third Worlds be prevented, but USA would gain additional leverage over adversaries and allies alike. In their preliminary moves designed to establish bridges with China, President Nixon and Dr. Kissinger had a role for Pakistan and under Yahya Khan, Pakistan did carry out its allotted tasks in bringing USA and China together. Resumption of arms supplies to Pakistan—even if as a one time exception and renewal of US political support was the recompense that Pakistan sought and received. Predictably, this renewed support from USA stiffened General Yahya Khan's attitude towards Sheikh Mujibur Rehman. The decision to unleash a reign of terror in what is now Bangladesh and eventually stage a pre-emptive attack on India, followed inevitably.

In 1971, as in 1965, despite the atrocities committed by Pakistan's armed forces in Bangladesh and the torture and forced eviction from Bangladesh of over 12 million members of the minority community, Western observers generally tended to blame India. Pakistani leaders themselves in their memoirs as well as in official and semi official documents released in Pakistan admit that General Yahya Khan ordered a pre-emptive attack on India in the belief that China and USA would come to Pakistan's rescue.[2] Thus on both occasions, arms supplies and political support from powerful external powers predisposed Pakistan to initiate wars in the sub-continent.

Lest external powers lose interest in the sub-continent, and in Pakistan especially, Mr. Bhutto utilised every opportunity that he got to frame or influence Pakistan's foreign policy to magnify Indo-Pakistani differences ; refused to settle issues bilaterally and sought involvement of outside powers even in purely local issues. It was only after 1971 when he had the task of restoring the confidence of the country utterly demoralised after Bangladesh's secession, that a beginning was made in promoting bilateral relations between Pakistan and India. Desparate as Pakistan's situation was early in 1972, with ever 90,000 armed forces personnel as prisoners of war and 5,000 sq. miles of its heartland territory in Indian hands, Mr. Bhutto had also to reckon with the fact that in the altered geopolitical context, he would not get the support he needed from USA or even from China. Hence very astutely he sought

to utilise the principle of bilateralism[3] to regain some diplomatic leverage over his erstwhile patrons, USA and China.

The Evolving International Environment

The era of Cold War is receding. Although the pre-eminence of USA as a super military, economic and technological power remains, and the position is unlikely to alter significantly in the near future, USSR has also acquired the capacity to inflict unacceptable damage to USA, should its own vital interests be threatened. Hence the Super-Power confrontation charectistic of earlier decades has given place to co-existence and dialogue, if not of hegemonistic collaboration as alleged by some Chinese leaders.

USA has largely overcome the trauma of Vietnam by its dexterous handling of China and so deriving the maximum advantage out of the continued Sino-Soviet misunderstandings and mistrust. In this setting Third World countries, many of which have emerged as free countries only recently, have gained a little more room for manoeuvre, though still very much dependent on affluent industrialised countries for economic and technical assistance. Although Mr. Bhutto has urged that[4] smaller and less powerful countries can gain some freedom of manoeuvre vis-a-vis Big Powers, provided they "trim their sails suitably to the prevailing winds", this freedom of manoeuvre is strictly limited especially if a weak State wants to pursue an independent policy. The weak or newly independent State would need considerable economic and technological assistance, perhaps have unresolved territorial, ideological or other problems with its neighbours and above all may have yet to consolidate its independence and national unity. It would thus be sensitive not only to economic pressures but equally to diplomatic pressures and efforts at destabilisation including selective supplies of arms to not very friendly neighbouring countries and acquisition and development of military bases in sensitive regions by great powers.

Arms Supply Policies of Great Powers

In the case of USA, USSR and China, decisions to supply or withhold arms to other countries, the types of weapons and equipment and quantities to be released at any given time, scale of supply of spares, technological assistance for maintaining and servicing the equipment sold or gifted, and training of nationals of countries receiving arms supplies are primarily based on foreign policy considerations.[5] For West European countries arms sales are important as a means of earning valuable foreign exchange. In recent years, arms sales by USA, and countries of

the West, to third countries as well as to one another have become extremely important means for redressing adverse trade balances especially from oil exporters of West Asia. Even so, the major arms vendors do not lose sight of their countries' foreign policy objectives.

In respect of arms sales to affluent oil exporters, while the primary aim of recycling oil dollars is important, other major foreign policy objectives of gaining influence over arms recipients, as well as their neighbours and ensuring the continuance of conservative regimes in the region would also be achieved.

THE INDIAN SUB-CONTINENT

There seems to be a shift in US arms policy towards the Third World after Mr. Carter became President. He is against the diffusion of sophisticated conventional weapons to Third World countries and regions where the infusion of such weapons could exacerbate tensions. Accordingly, he declined to approve the transfer of an armada of 110 A-7 Corsair bomber aircraft to Pakistan—a deal authorised by the previous administration but not put through before it was voted out of office. The President correctly judged that the transfer of a large number of bomber aircraft and its associated weaponry and electronic aids would enable Pakistan to secure near domination of the Indian skies and tempt Pakistan's rulers to consider once again a pre-emptive strike against Indian air and ground defences or even a series of terror raids on India's population and industrial centres which would be well within the range of the new aircraft operating from Pakistan's air fields.

No sooner was President Carter's decisions on arms supplies to sensitive regions of the World, and in particular the decision not to go ahead with the transfer of 110 A-7 aircraft to Pakistan, was announced, than the Pakistan lobby in the Pentagon and State Department mounted a discreet campaign to resume conventional arms supplies to Pakistan. The arguments advanced are that Pakistan is now seriously "under-armed"; that it has its legitimate defence needs which must be met; that the country especially in view of the domestic crisis through which it is passing has need for strong armed forces to prevent internal disorder and hold the country together; and hence Pakistan has to be enabled to replace its old air and land force equipment. The old arguments that if Pakistan does not obtain US arms, other Powers, less scrupulous than USA, may step in as arms suppliers and USA would be less able to urge Pakistani leaders to act in a responsible way, have been revived.

There is certainly some force in the argument that if USA resumes its traditional role of arms supplier to Pakistan, it will be able to exercise some influence on the policies of that country; but the extent of this

influence could well be over-estimated by the donor of weapons. Despite USA's pre-eminent position as NATO leader, supplier of weapons, and liberal donor of aid funds, it could not restrain Turkey from over-running the best part of Cyprus. Nor is it able to exert pressure on Israel commensurate with the scale of military, political and economic assistance it has consistently rendered over the past three decades. Even in the case of Pakistan, American assurances to India that American arms would not be used in aggression against India, could not be enforced. Hence India's concern at proposals for resumption of American arms supplies to Pakistan. Even General Zia-ul-Haque, while commenting on India's concern regarding recent developments in Pakistan remarked[6] that because the Martial Law regime of Field Marshal Ayub Khan brought about the 1965 war and that of General Yahya Khan the 1971 war, Indian leaders may be fearing that the Martial Law regime of 1977 may also bring about a war between the two countries. If, as some American analysts argue, Pakistan is really 'under-armed', Indian leaders would not have cause for worry about developments across the border.

Another aspect of the matter is that in a region where two countries are not free from mutual suspicions, a subtle but effective means of exercising pressure on the country which seeks to remain independent and away from blocs and alliances, is to arm or threaten to arm its neighbour which may be waiting for an opportunity for settling scores with it. This is often the least expensive and least risky policy for a Super Power. Further, it enables the Super Power to raise or lower the level of threat to a target country by the relatively simple device of raising or lowering the scale of supplies of military hardware to the target country's difficult neighbour or neighbours. Despite President Carter's dislike for such manipulative policies, certain echelons in the Pentagon and the State Department with the powerful support of the arms lobby may succeed in securing a reversal or at least a partial modification of President Carter's policy of no arms supplies to potential tension areas. But once the gates are open it will be difficult to stop the flood. This is India's worry.

If accumulation of arms by a civilian or military regime is motivated solely from considerations of domestic politics, this country would not be unduly concerned. However, in the case of our Western neighbour, Mr. Bhutto had made it clear on numerous occasions that normalisation of relations with us in the real sense of the term would only be possible when the outstanding issue with this country, namely the Kashmir issue is resolved. In Pakistan Government's White Paper on Kashmir which Mr. Bhutto had issued shortly before the March 1977 General Elections, he had indicated that while the people of Pakistan would support Kashmiris, the initiative for resolving their problem would have to come from them. This certainly represents a distinct change in

Pakistan's attitude to the issue. Even so, Pakistan can reactivate the issue by organising agitations through the "Azad Kashmir" Government of Pakistan occupied territory. Pakistan's outright rejection of Mr. Atal Behari Vajpayee's earnest offer to sign a 'no-war' pact clearly indicated that Mr. Bhutto was by no means eager to move forward towards normalising relations with this country. Although General Zia-ul-Haque has shown understanding of India's anxieties, his is a caretaker administration. Should Mr. Bhutto or another politician with his approach to Indo-Pakistani problems come back to power, the hopes of people of good will on both sides of the border for improvement in bilateral relations may remain unfulfilled for a long time.

Nor is this India's only concern. Taking full advantage of the situation on the Eastern borders of India, China is still encouraging disgruntled elements in the Eastern-most states of India by supply of arms, explosives, sabotage equipment and training of Indian young men of the region in their use. To Bangladesh, liberal supplies of arms have been offered,[8] including four squadron worth of Mig 21 planes, tanks, guns and other armaments, the only limit being the ability of the recipient country to absorb the equipment. Training of Bangladeshi personnel in China is also reportedly being arranged. This would not have been of concern to this country if China is genuinely interested in non-interference in our internal affairs, and positively in following a policy of good neighbourliness. But tangible evidence of this is yet to come.

The Nuclear Issue

India's security threat arises not merely from two neighbours who have in the past attacked her and seized territories. China is a strong nuclear power and is still in forcible possession of parts of the Aksai Chin area of Ladakh. On several occasions in the past, inspired reports have appeared in the world Press suggesting that China may test-fire her ballistic missiles (ICBM) from her nuclear testing sites in Lop Nor across India into the Arabian Sea. Apart from providing whatever ballistic and other information that the tests may be designed to yield, politically they would also have the objective of intimidating the countries of the region, India particularly.

Perhaps the realisation that such a test besides frightening other non-aligned countries of the region and driving them closer to the Soviet Union, would leave India no option but to embark on developing her own technology, has induced China's planners to give up, at least temporarily, the idea of test-firing nuclear missiles across India.

Further, rocket sites have been developed in Tibet where medium range ballistic missiles (MRBMs) have reportedly been positioned. The

mountain sides of hills in the Tibet region are admittedly very well suited for siting missiles. They are difficult to detect, and being located on hill sides enjoy excellent protection and have high survival probability even when subject to a nuclear attack. Yet the fact that the missile sites house not intercontinental missiles but comparatively short range missiles of the MRBM type can only mean that the targets for these missiles are not in China's number one enemy country, the Soviet Union, much less in USA, but in India. This certainly ought to give food for thought to Indian planners.

Well meaning Western friends may point out that China has repeatedly declared that her nuclear weapons are purely for defence; that they have been developed, are being further perfected, only to break Western monopoly and that China will not be the first to use the weapons. This writer would not like to make any comments on the declaration regarding the breaking of Western or any other monopoly; but the statements concerning defensive role of the weapons and no 'first use', are clearly for the ears of policy makers in the other nuclear weapon countries and especially the two Super Powers.

Nuclear defence plea and 'proforma' declarations of 'no first use' from a nuclear power to a non-nuclear country, especially, to a non-aligned country, has no meaning. Such a country is vulnerable to threats and nuclear weapons do not need to be fired at its governmental, population or industrial centres. Their very deployment close by its borders especially when the range of such weapons is not adequate for deterring other nuclear powers, conveys its own menacing message.

A second, though relatively less serious, cause for concern is that Pakistan is proceeding ahead with its plans to instal and operate a nuclear fuel re-processing facility. Reportedly, construction of the facility has already commenced and as matters stand, it is likely that the facility will be ready for operation by 1979. France has reportedly assured the United States and other members of the nuclear equipment supplier's cartel that the fuel reprocessing plant to be installed in Pakistan is subject to stringent safeguards, Mr. Bhutto himself has declared[9], "We have repeatedly and voluntarily given categorical assurances about the peaceful intent of our nuclear programme. Lest it be thought that these are just verbal pledges, we have accepted iron-clad IAEA safeguards for every one of our nuclear facilities. We have gone even further and accepted the most stringent conditions from France, the supplier of the reprocessing plant, which fully conform to the guidelines adopted by the seven nuclear exporting countries. The agreement for the supply of this plant was accompanied by the conclusion of a trilateral safeguards agreement with IAEA approved by its Board of Governors

by consensus. Moreover, we have worked out fail-safe expedients with Canada and the Federal Democratic Republic of Germany regarding an atomic reactor and a small heavy water plant respectively. There could not possibly be a more convincing earnest of our commitment to use nuclear facilities for exclusively peaceful purposes."

While this is a positive statement and re-assuring, the statements that Mr. Bhutto had made on other occasions are far from re-assuring. Shortly before his ouster Mr. Bhutto had declared that Pakistan's nuclear technology would be available for all Islamic countries and further that he would work for a military pact amongst all Muslim countries extending from the Atlantic coast of North Africa to Indonesia in the East. This was restated more recently.[10] India's cause for concern is that Pakistani publicists had declared during Mr. Bhutto's regime that India is the only country they consider their enemy.

The United States had been trying to persuade Pakistan as well as France to cancel the proposed sale of the nuclear fuel reprocessing plant to Pakistan. Mr. Bhutto had even alleged that Dr. Kissinger had threatened to make a "horrible example" of Pakistan should it decide to go through with the deal. Pakistan has apparently finally decided to resist US pressures and reject its offer of substantial economic aid as *quid pro quo* for abandoning the nuclear deal, according to *Jung* of Karachi.[11]

Thus as far as India is concerned while in the very near future, the threat from Pakistan could only be on the conventional plane, in the Eighties there could be a nuclear aspect to it as well. An additional reason for this fear is that a nuclear reprocessing plant such as the one that France is setting up for Pakistan would be economically viable only when it has to reprocess spent fuel recovered from at least ten power reactors of a capacity of about 1000 MW each ; Pakistan does not expect to have this number of nuclear plants in commission before the turn of the Century. Hence there must be some compelling reasons for going in for the plant now, rather than by the Nineties when it would have acquired some economic justification. Throughout the Eighties, either the plant would have to work extremely uneconomically or process spent fuel of other countries. With the new set of safeguards on the transport and reprocessing of spent fuel sought to be enforced by suppliers of nuclear power plants, it is difficult to see how Pakistan can obtain the needed custom at least until a number of West Asian countries set up and operate nuclear power plants.

A fair inference, therefore, is that Mr. Bhutto had hoped to keep aside at least a proportion of the plutonium recovered from the reprocessing plant for special purposes. This inference is further supported by the consideration that the plutonium recovered from the reprocessing plant

cannot even be used for power production in Fast Breeder Reactors since Pakistan's Fast Breeder programme has only just been started. It may be argued that Pakistan's reprocessing plant would be operating under strict safeguards, precluding the possibility of cladestine transfer of fissile material. After the disclosures regarding the mysterious disappearance of a ship containing 200 tons of reactor grade natural uranium and of assorted consignments of highly enriched uranium from production or storage centres in USA it is difficult to assume that inspection — even international or bi or tri-lateral inspections—would be absolutely fool-proof.

BASES

Traditionally Indian outlook has been continental. In successive waves of invasion that ravaged the country, the invaders came from the North West. That some of these invaders settled down and made this country their home does not erase memories of invasion. From the Seventeenth Century onwards aliens came from the sea also, not initially as invaders but as merchants in search of spices, textiles and the fabled riches of the Orient. Gradually, as a small but dynamic sea-faring nation coming from a distance of over 10,000 km. was able to consolidate its hold on the vast sub-continent and many other regions of the world because of its command of the seas, the importance and true dimensions of sea power came to be recognised.

The long subjection of India—and countries of Africa and Asia—has underscored the lesson that even a small but balanced naval force operating off the coasts of a country lacking the means to deal with such forces, can exercise an influence on the course of events in the country out of proportion to the strength of the cruising fleet. The Second World War further underscored this point. British forces had to retreat from Malaya and Burma because of the temporary loss of command of the seas following the loss of her warships in the Gulf of Siam in late 1941.

Sea power now has many dimensions and correspondingly control of the seas has become far more difficult to achieve and maintain, except for a formidable economic and technological power like USA. But even a Super Power can project its power more effectively, economically and quickly, particularly its power to intervene in a distant country, if it has naval and air bases close by. Intervention, direct from continental America would be expensive, and subject to delays. Often such intervention from home bases into a distant theatre involves flights over the territories of allies and third countries and even allies may not acquiesce in over flights associated with military intervention, as was realised by American military planners during the Arab-Israeli war of October 1973.

India has serious cause for concern because of the development of

US bases in Diego Garcia and Masirah. Originally when the idea of taking over the British staging post on Diego Garcia was mooted, it was argued that the Island would only house a communication facility and that the option of developing or not developing it as a full fledged base would be utilised as a bargaining chip in talks with USSR. But once a facility is acquired, the interests of various lobbies within the Pentagon and the State Department could be expected to deploy their talents and persuasive skills to ensure the further development of the facility. And this is what happened, albeit in stages. Strategists noted that Diego Garcia when fully developed as a base would not only serve it soriginal purpose of acting as a secure link in the US global communications net work linking satellite systems with US communications and stations in Ethiopia, and Australia as well as US fleet units, but also as useful anchorages for fleet ballistic missile submarines. With a base in existence in this part of the Indian ocean, the operational availability of US submarines would be considerably increased and the threat to targets in Southern Russia enhanced because of its projection from a direction that Russian anti-missile defences are not designed to cover fully. Above all, in peace time, the Diego Garcia Base together with the facility in Masirah Island recently taken over, would enable American maritime patrols to keep a continuous watch on Indian coasts, as also, of course, on Arabian and Gulf regions and Africa's eastern sea board. The recently acquired communication facility in South Africa further reinforces US mid-ocean bases. In times of crisis, target areas on Indian, African, Arabian and Gulf coasts can be more effectively monitored and intervention forces abroad aircraft carriers or other ships can move closer, conveying their own message. Other forms of indirect intervention also, such as assisting dissidents within the target country, priming neighbouring states inimical to the target country could also be concurrently initiated.

US policy makers are quite clear that the presence of squadrons of its naval fleet in the Indian Ocean area would enable them to further US interests in the region. Seymour Weiss then Director, Bureau of Politico-Military Affairs, Department of State in a statement before House Sub Committee on the Near East and South Asia on March 6, 1974 and Rear Admiral Charles D. Grojean Director Politico-Military Policy Division, Office of the Chief of Naval Operations on July 11, 1974 before the House Armed Forces Sub Committee testified that naval surface ships served to demonstrate US determination to protect and further its interests by being one of the "diplomatic levers" available to insure that American interests are "factored into the regional political equation."[12]

Just as arms supplies by Great Powers to one or more countries or factions in troubled regions such as the Indian sub-continent, West Asia

and Angola serve to keep up regional tensions, the presence close by of patron powers could harden the attitudes of racist regimes such as those in Southern Africa in their dealings with majorities in their respective countries.

Those fears are by no means imaginary. At the height of the oil crisis in the fall of 1973, American statesmen openly talked of intervention in Arab oil producing countries if the latter attempted to "strangulate" Western economies.[13] Had the Diego Garcia and Masirah bases been fully developed at that time and had a task force of the Seventh Fleet been close by, it was quite possible that hard liners in USA might have carried the day, resulting in increased tensions if not an actual invasion of sectors of the Gulf coast.

American strategists have indirectly admitted that the development of US bases in the region could cause legitimate concern to the people of the region; and tend to allay their fears by playing down the importance of the bases. For example, one scholar[14] argues that "some littorals have virtually no interest in what happens in the Indian Ocean itself;" "that there is no common littoral policy" while "some non-littorals have a profound interest in Indian Ocean developments." He rightly notes that littoral States suffer from many weaknesses. They have an "obsession with the maintenance of state integrity, giving rise to fears of foreign intervention". Given the existence of dissident group within States and States distrusting their neighbours, foreign powers could even secure an invitation from a State or groups within States to intervene.

Justification for intervention in the Gulf region could arise, should West Asian oil producers decide to use or threaten to use the oil weapon in the event of Israel initiating aggression once again or in the event of US attempting to prolong indefinitely the present stalemate in the region. Major oil producing countries of West Asia, Saudi Arabia, Iran, Kuwait etc, while pressing for a just settlement of the Arab-Israeli dispute are essentially conservative and are anxious to ensure rapid industrialisation of the region in an environment of peace and stability. Even so, crisis may develop either as a result of brinksmanship on the part of Israel or one or other Arab group. In such a situation hawks in America may prevail upon policy makers in their country to take steps to protect the "vital" interests of USA and its allies. This in turn could lead to the escalation of a crisis with all its attendant dangers.

West Asian oil policy makers such as Mr. Jehangir Amouzegar and Sheikh Yemani, no less than their Western counter-parts, recognise that proper use of oil weapon today lies in production rate control and appropriate pricing policies rather than imposing a total embargo. However, while West Asian oil policy is evolved on the basis of consensus amongst

leaders of oil producing countries concerned, US responses to changes in West Asian oil policy would, understandably, take due note of strategic, political as well as down to earth economic considerations. American income from West Asian oil is fairly high as a percentage of total balance of payments income. Furthermore, the return on American investments in West Asian oil as a percentage is also extremely high. Data presented overleaf elucidates the position :[15]

These are revealing and indicate how important West Asian oil income has been to fortify US balance of payments position. Although US investors have recovered their West Asian oil investments many times over, still they would like to safeguard their investments and the attractive earnings therefrom. Oil interests could therefore be expected to urge their government to act tough whenever Arab States talk of oil embargoes. Given the half-hearted measures that American industry has been taking to develop alternative sources of energy and the increased dependence, since 1973, on West Asian oil to keep the wheels of American industry moving, a wide spectrum of American interests may join hands with American oil industry in advocating intervention whenever a crisis situation develops in West Asia.

This is one, though serious, cause for concern for us in India. The other equally serious cause for misgivings is the possibility of overt or covert intervention in one of the countries of the Indian Ocean littoral in furtherance of what influential lobbies inside the CIA, Pentagon or State Department may, from their point of view, consider to be USA's strategic interests. And intervention may be in one or more forms extending from direct armed assault on the target State to less obvious ones of intervention through surrogates, promoting civil wars through the agency of one or other dissident group in the country or destabilising action short of civil war.

President Carter himself does not appear to attach too much importance to having US bases in the Indian Ocean area. In a speech at New York on October 4, 1977 he is reported as having observed[16] that :—

> "In the Indian Ocean area neither we nor the Soviet Union has a large military presence; nor is there a rapidly mounting competition between us".

The racist regimes of Southern Africa would like a strong US presence nearby in order that they may more easily be able to invite Western intervention on their behalf. Traditionally they have been describing all movements in the region for national liberation as communist-inspired. Since Southern Africa is rich in uranium, gold, copper, chrome, diamond and other mineral resources, the Western World would like to have easy access to these riches and equally to deny the Soviet Union

US Direct investments abroad :	**1971**	**1973**	**1974**	**1975**	
1. Total	86,001	103,675	118,613	133,168	($ mn)
2. Total in Oil	24,258	27,313	30,248	34,806	,,
3. Total in West Asian Oil	1,465	2,139	1,618	3,673	,,
US Balance of Payments Income :					
4. Total	7,295	8,841	17,678	9,456	,,
5. Total Oil	3,442	4,249	11,699	3,657	,,
6. Total West Asian Oil	1,879	2,065	8,434	2,336	,,
Ratios :					
7. Overall ratio of balance of payments income to direct investments (that is ratio of (4) to (1))	8.4%	8.5%	15.0%	7.1%	
8. Ratio of balance of payments income from oil, excluding West Asian, to corresponding investments (that is, (5-6) : (2-3))	6.1%	8.6%	11.4%	4.2%	
9. Ratio of balance of payments income in respect of West Asian oil to corresponding direct US investment. (that is ratio of (6) to (3))	128.3%	96.5%	521.2%	63.4%	

similar access. Hence the arguments of racist lobbies regarding dangers of Soviet penetration may find ready acceptance in the West. Fortunately, President Carter's administration may not accept South African and Rhodesian racist arguments at face value but the oppressed people of Southern Africa and of the Third World generally would be re-assured only when USA succeeds in prevailing upon minority racist regimes in conceding their just rights to the majority.

SOUTH ASIAN SECURITY

Regional Initiatives :

Non-aligned countries of South Asia and the Indian Ocean region have been endeavouring for over a decade to persuade the Great Powers to dismantle their existing bases and refrain from developing new ones in the region. Sri Lanka, Mauritius and other countries have been taking commendable lead in the matter at the UN and other international gatherings. As recently as November 1, 1977,[17] Prime Minister of Mauritius, Sir Seewoosgar Ramgoolam has called upon Great Powers who have bases in the Indian Ocean region to evolve a time bound programme for reducing their military presence in the area and eliminating their bases. If regional arms rivalries and confrontations are to be contained and developing countries of the region are to settle down to tackle their urgent problems of economic development, population control and degradation of environment, Great Powers would need to withdraw their military presence from the region.

Their presence in the region is primarily for "factoring" their interests "in regional power equations"[18] and only indirectly, by seeking to deny the enlargement of areas of influence of rival great powers, becomes relevant to Super Powers' balance of power.

Another consideration which is gaining increasing importance is the possibility of exploiting the riches of the oceans, in view of the rapid depletion of traditional sources of mineral wealth on or under the land surface and the increasing cost of recovering such riches. The riches of the oceans are far more extensive than earlier estimates indicated. Coastal states, including the developing ones, have taken steps to reserve 200 mile belts around their coasts as their "exclusive economic zones". But the oceans beyond also have promising potential. Bases in mid oceans offer immensely better chances of surveying such ocean stretches and tapping them before other competitors arrive on the scene, than do home bases. From the point of view of developing countries of the region therefore, if Great Powers withdraw their military presence from the Indian Ocean area and the region generally, the area as a whole would be less liable

to political instability. It would also, to some extent at least, enable the formulation of a more equitable and cooperative approach to the problem of recovering ocean riches.

Regional powers have also been making proposals for ensuring that the Indian Ocean is made a nuclear free zone. As a first step towards attaining this objective the Super Powers would have to dismantle their bases—e.g Diego Garcia, Masirah,—and agree not to build new ones in the ocean area or in countries on the peripheri. The Soviet Union has already been asked to vacate its bases and withdraw all its technical personnel from Somalia.[19] The other power must vacate its bases. Though essential, this is only a first step. South Africa which has vast uranium resources and has developed her nuclear technology has been causing serious concern not only to the vast silent majority of its own citizens who are being virtually interned in 'Bantustans' and treated as aliens in their own country, but to free African States across the border. Although after a good deal of hesitation UN Security Council has decided to impose an arms embargo on South Africa, the latter is not unduly concerned since it has already built up a versatile arms industry and is taking measures to stockpile oil and other key commodities in anticipation of a total economic boycott by the West. As Mr. Vorster has noted, economic boycott of South Africa even if enforced rigorously by the West could only "create difficulties for South Africa; they will certainly not kill us".[20]

Thus South Africa is preparing for a serious confrontation with the majority of its population and neighbouring newly independent African States. There is also the element of nuclear blackmail. Its uranium enrichment facility is working well and quantities of near weapon grade enriched uranium have no doubt been stockpiled. Finance Minister Owen Horwood while speaking at Durban on August 10, 1977 observed that South Africa had given an assurance that its nuclear programme was aimed at peaceful uses and stood by that decision. But if South Africa decided to use its nuclear potential in any other way, it would do so according to its own needs and it alone would make the decision, he added significantly.[21] Prime Minister John Vorster has further contributed to the uncertainty by declaring that while South Africa was interested in the development of nuclear facilities, he had not promised President Carter that South Africa would not develop nuclear weapons.[22]

Pakistan's representative Mr. Abdul Sattar asked the UN General Assembly to support the concept of a nuclear weapon free zone in South Asia.[23] All proposals seeking to contain the danger of nuclear confrontation must be welcomed, provided they really promote the objective of reducing tensions in the region.

The Indian Ocean can truly become a zone of peace only when great powers vacate their bases in the area and when South Africa is persuaded to abide by international norms. Nor can South Asia be delinked from the adjoining Ocean area. Additionally, there is also the problem posed by a formidable nuclear power immediately to the north of the region, which is in forcible occupation of territories of a neighbour; has utilised the earliest opportunity of seizing islands of another country to its South East, and has sited nuclear weapons close to its borders with a neighbour which can only be interpreted as an intimidating posture. It is difficult to see how a realistic formula for transforming the region into a nuclear free zone can be evolved in this environment of implied threats.

Super Power Initiatives

In his speech on the occasion of Sixtieth Anniversary of the October Revolution, Soviet leader Mr. Brezhnev has made serious proposals calling on USA, and impliedly the other three nuclear weapon powers, firstly to stop all nuclear weapon tests including tests and explosions for peaceful purposes; secondly and simultaneously, to stop further build up of nuclear weapons of all types, atomic, hydrogen or neutron, or bombs, rockets, shells or other missiles and thirdly to "undertake the gradual reduction of the already accumulated stock piles of nuclear weapons moving forward to a 100 per cent abolition of them".[24]

Should the Super Powers, and under their persuasion, the other nuclear powers make tangible progress on these lines, smaller countries would feel re-assured and steps to convert regions into nuclear free zones would be easier of accomplishment and ultimately when nuclear weapons are abolished as Mr. Brezhnev has suggested, the entire world would become a nuclear free zone. But as already noted, expansionist powers would have to give up territories under their forcible occupation, Super Powers vacate their foreign bases, and all nuclear powers agree to implement a time bound plan for abolishing nuclear weapons.

India's Security Concern

India's main concern is to further its economic development, which it is convinced can come about rapidly only when there is peace within and when the region itself is free from tensions. Further, India is equally convinced that developing countries in the region must, to the extent that each can, endeavour to preserve peace, by developing and further fostering feelings of good neighbourliness with others in the region and generally keep away from blocs, military pacts and super power rivalries.

The unhappy history of the past thirty years has proved that India would be left alone only if she has the strength to resist attacks. Her policy of non alignment can be sustained only if she develops the capacity

to be self-reliant in matters of defence as well as in food and key industries. Self reliance in defence has two dimensions, conventional and nuclear. In the area of conventional defence, while India has no difficulty in raising the manpower needed, a good deal has yet to be accomplished in providing the wherewithal to her forces for effective defence. The process of building up an indigenous defence industry was started two decades ago. Progress has been slow because very properly, emphasis has been on economic development and not on defence build up. However, while not neglecting economic development, India's defence industries too would need to be built up fairly rapidly in order that the country may not become a victim of aggression once again.

The nuclear issue has come to the fore once again, thanks to President Carter's initiatives. And President Carter is against nuclear proliferation. So is Mr. Brezhnev. Nuclear proliferation has to be deplored but countries which have suffered invasions and loss of territory would need enforceable assurances if they are to repose trusts in the prevailing international order. And the lead has to come from the nuclear weapon powers.

At least as far as India is concerned, national leaders have assured repeatedly that India is not interested in developing nuclear technology for the production of weapons but in devising energy systems which would effectively utilise the country's thorium reserves. This is important for India because of its very limited oil potential and the increasing costs of oil imports. National leaders have also indicated that nuclear explosions for peaceful purposes (PNE) such as recovery of low grade mineral ores, canal excavation etc would not be carried out. Even so, pressures are being mounted for throwing open for international inspection, all nuclear establishments, including those developed entirely by Indian scientists. Even supplies of slightly enriched uranium for fuelling the Tarapore power reactors, which USA ought to make available so long as the US supplied reactors remain in operation, may be withheld if India declines to comply with the new "fullscope" safeguards being devised by the nuclear equipment suppliers' cartel.

This apart, despite the oblique moves that China appears to be making to restore a measure of normalcy in its relations with this country, it is still in forcible occupation of a sizeable area of Indian territory in Aksai Chin. Nor has China's support to dissident elements in North Eastern India diminished. To convince this country of China's desire to let its neighbours live in peace it ought to vacate Indian territory under its occupation and withdraw support to subversive elements in the country. This action would also earn for China, the goodwill and trust of its other neighbours who are understandably further perturbed following China's seizure of Paracels Islands.

While India warmly appreciates President Carter's sincerity and consideration for evolving a just world order, it is difficult to believe that USA will always be able and willing to thwart aggression. It was unable to prevent the Greek colonels from deposing the late Archbishop Makarios; and equally unable to prevent Turkey from over running the greater part of Cyprus, just as it was unable to prevent Pakistan from attacking this country in 1965. Nor are international bodies, where also USA has a dominant voice, wholly effective in maintaining international order. Despite periodical UN resolutions and near consensus of the international community, South Africa continues to be in illegal and forcible occupation of Namibia; exploiting the natural resources of that country and utilising it as base for carrying out attacks on Angola.

While respecting international efforts at bringing about a just world order and assuring peace loving countries of its unreserved co-operation and support, non-aligned India cannot afford to forget the lesson that it has learnt at great cost — namely that in a crisis it has to depend on its own strength in order to preserve its territory and its integrity. This is especially so since the present world order seems to favour the strong at the expense of the weak or those who do not fight for preserving their legitimate rights.

An American analyst David C Compart, in a recent study[25] has concluded that :—

> "Those with power—those in power have an immediate stake in stability which policy should seek to accentuate. But when the powerful abandon prudence, or when the impudent acquire power, accommodation unaccompanied by the strength and resolve to resist force may appease the sources of danger but will not tame them. Distasteful as it may be, the most effective way to constrain force in the future will be to reward power while punishing its abuse."

Although this reflects the view point of Great Powers generally, smaller countries interested in preserving their freedom and in their economic advancement have an equal, if not greater, stake in peace and stability. But there must also be room for orderly progress and the removal of injustices such as racial oppression, economic exploitation of the technologically backward and manipulation of affairs of smaller countries by the powerful. This happy state of affairs is unlikely to come about in the immediate or very near future. Nor do the current proposals for controlling nuclear proliferation provide grounds for hoping that those with the ability to destroy the world many times over would move briskly towards establishing a just world order. On the contrary they seem to feel like rewarding power, while being unable to prevent or punish its abuse.

ENERGY DEVELOPMENT

Formidable as its security problems are, India is also faced with the immediate and near term problem of finding adequate indigenous sources of energy. India's oil resources, despite the promise held out by some off shore zones are negligible and in any case would be exhausted fairly soon. Coal resources are reasonable, but even so constitute not much more than *one per cent* of world's proven reserves, and not of high quality either. Moreover, these are also non-renewable resources and would need to be conserved as much for environmental reasons as for ensuring the development of the country's chemical and pharmaceutical industries. This leaves only perennial resources such as solar, tidal, wind power and hydro resources and, in the long run, fusion energy. The development of the first would take some time. The second and the third can only be of marginal utility for India. The fourth is being tapped to the extent feasible, and fission technology is unlikely to be available till the beginning of the next century. Hence India's anxiety to develop nuclear technology for energy production especially as the country is blessed with high quality thorium ores located in easily accessible areas. The father of India's nuclear energy programme Dr. Bhabha was very conscious of this and with astonishing foresight based India's nuclear technology plans on the use of Thorium as breeder material in India's third generation of nuclear power reactors. US approach to control nuclear proliferation hinges on preventing the development of breeder reactors, and installation of fuel re-processing, heavy water production and uranium enrichment facilities by non nuclear states, and even the purchase and operation of power reactors by such states unless they agree to throw open *all their* nuclear establishments to strict international supervision and control. India would find such restrictions intolerable as they would result in conferring on external agencies the power to veto the country's industrial progress.

International energy outlook is far more serious than the most pessimistic projections made before the 1973 oil crisis. First, in place of the steady but slow rise in prices expected, oil prices went up by over 400 per cent at one go in the winter of 1973/74. Although a measure of stability in prices has since been attained, oil prices are bound to go up steeply in the not so distant future, because of the continued increase in oil consumption in USA and other leading industrial countries.

US oil producers are reluctant to step up domestic production by extracting oil from shale or by converting coal into oil. Meanwhile US oil imports have gone up from 1.3 million barrels a day (mbd) in 1973 to 2.6 mbd in early 1976 and is now almost 4 mbd. By 1985, assuming moderate growth rates of oil consumption in USA and OECD countries,

moderate being defined as between 4.1 and 4.3 per cent by Dunkwart A Rustow. US may have to import 9.9 mbd and OECD countries another 35.0 mbd. However, Saudi Arabian oil production and exports by 1985 are estimated at 11.8 mbd and 11 mbd respectively, and OPEC as a whole would only be producing 39.5 mbd and exporting 35.5 mbd.

Thus, unless industrial powers drastically cut down their oil consumption and develop alternative sources of energy, the world would have to face an oil and energy crisis of perilous proportions. In that environment, with oil costs, having gone up in real terms possibly by over 400 per cent on current prices, the outlook for Indian industry would be extremely gloomy indeed. Hence the need for effective and urgent action on our part now to develop thorium technology. This technology need not necessarily hinge entirely on breeder reactor development. Other techniques for the economical and effective use of thorium could and ought to be devised. India can explore these possibilities if and only if it resists pressures to accept "fullscope" nuclear safeguards.

This also serves our security interests. Had the country mobilised its scientific, industrial and managerial resources early in 1964 when China's first nuclear test was considered imminent and moved purposefully towards developing nuclear technology, the world would have accepted the development as developments in China were accepted. Dr. Bhabha did his best to quicken the pace of nuclear energy development in the country but after his tragic demise, matters tended to drift. Later in 1967/68 when the country was subject to discreet and not so discreet pressures to accede to the Non Proliferation Treaty, the country made some efforts but once again failed to deploy the needed resources to acquire self reliance in nuclear technology, particularly after Dr. Sarabhai's passing away. A third opportunity was missed during the period 1971/74. The decision to conduct an experimental underground nuclear explosion was apparently taken in 1970-71 and the test actually staged in May 1974. Even at the time of taking the decision it ought to have been obvious that in the wake of the test, it would be impossible to obtain nuclear material and components for nuclear reactors from traditional suppliers. Hence complete self reliance and even self sufficiency in designing and fabricating critical components needed for our existing and planned installations and in the production of key items of stores such as heavy water, had become imperative. Yet, as subsequent events have shown, the necessary preliminary action does not seem to have been taken.

If the country now renounces the option to develop nuclear technology, it would be renouncing whatever title it may have to influence world opinion to secure a total ban on the production of nuclear weapons and their destruction in accordance with a time bound programme. Also,

in the context of the country's immediate security needs, with nuclear weapons sited on the other side of the borders, renouncing the option could well be interpreted as willingness to accept the hegemony of one or more great powers.

The country is truly at a turning point in its history. The decision that Indian leadership now takes on the nuclear issue could determine the extent to which the country retains its freedom of action in the difficult days ahead.

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Environmental Warfare: Reaping The Whirlwind ?

S JAISHANKAR & C RAJA MOHAN*

THE history of all hitherto wars is largely a history of technology, for it cannot be denied that the technology-variant in the science of weaponing has increasingly become a determinant in conflict situations. Just as the French Revolution inaugurated the period of "levee en masse", the Second World War marked the period of "science at War". The inventions of Watson-Watt and Barnes Wallis made sure that Britannia would at least rule the air; Werner Von Braun's revival of Congreve's invention was another major feat which was however dwarfed by the experiments of the Chicago scientists. The age of technologists had arrived. It is ironical, though not surprising, that each invention by man is considered by him to be the ultimate one. Gatling felt the same about machine guns as Stimson did about fission weapons. Stimson probably had greater justification since the principle which he considered ultimate in destructive power has dominated the international scene for three decades. Recently however, there has been cause for speculation that man has advanced further down in the path of destruction, specially in the form of tampering with nature. This last technique is known as environmental warfare. What was once found only in the realm of science fiction is now rapidly becoming a reality.[1]

All warfare causes the destruction of environment to some extent, but in environment warfare, the idea is to consciously and deliberately cause modifications in the geophysics and the ecology of enemy's territory. As research in environmental manipulation goes ahead, history tells us that attempts would be made to use them in support of national ambitions. To understand the consequences of the use of environmental modification techniques in conflict situations, we shall consider the existing state of knowledge in this field as well as how prospective developments could lead, in the next decade to the perfection of weapon systems which could use nature in new and unexpected ways.

The key to environmental warfare lies in the identification of environmental instabilities to which the addition of a small amount of

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energy would release vastly greater amounts of energy in a destructive manner. Environmental instability is a situation in which nature has stored energy in some parts of the earth or in its surroundings, far in excess of that which is usual. To trigger this instability, the required energy might be introduced violently by explosions or gently by catalytic agents. The mechanism for energy storage might be the accumulation of strain over hundreds of millions of years in the solid earth, or the supercooling of water vapour in the atmosphere by updraughts taking place over a few tens of minutes. The effects of releasing this stored energy could be world wide as in the case of altering climate or regional as in the case of enhanced excited earthquakes or enhanced precipitation. One further distinction can be made here. There are environmental modification techniques which have been successfully tested, some in a fairly advanced stages, and in some cases, even been utilised in actual combat conditions. In contrast there are others which are still halfway between science fiction and laboratories. Our emphasis will naturally be on the former.

Cloud and Rain Modification

Experiments in environmental modification techniques have shown that control of cloud formation and rain making will be major military significance, at least in the near future. It is therefore not inappropriate to concentrate on this problem while surveying environmental warfare.

The formation of clouds (and rain) involves two different kinds of processes.[2] In the first, the water vapours rise in the atmosphere and expand at high altitudes. In the second, these vapour turn into drops, and clouds are formed. The formation of clouds involves the growth of ice particles (which are of a radii of 20×10^{-6} m) to those of small rain drops (which are of a radii of 100×10^{-6} to 3 mm). Since the raindrops evaporate when they fall to the earth, it is obvious that the cloud drops are of a radii larger than theirs. Now the method of growth of ice particles is either by deposition of water on the ice nuclei or by crystallisation of water through condensation. It is obvious, in view of the excessive numbers of condensation nuclei in the cloud, that condensation alone cannot lead to the formation of large cloud drops. The two further methods of growth are either collision-cum- coalescence of droplets or else the Bergeron-Findeisen process.

In this latter process, a low level stratum cloud with a fairly low percentage of ice and a comparatively higher one of water, provides water to the cirrostratus or the altostratus clouds, which contain a higher percentage of ice, grows in this two phase cloud, first by diffusion and later by collision and coalescence. Having summarised in simplistic

terms the process leading to the formation of clouds, our objective is to indicate the phases where tampering with this natural process is possible. While theoretically a change can be brought about in the process where the water vapour rises and expands at higher altitudes, it is impossible in practice in view of the large quantity of energy involved. Weather alteration regarding clouds is thus better done by causing changes in the Bergeron-Findeisen process, through the introduction of seeding agents like solid carbondioxide, ice, propane, silver and lead iodide.

One of the earliest seeding operations known to be carried out was operation Cirrus (1947), a joint venture of the three American services. The first project of importance however was project Whitetop (1960-64), under the auspices of the Chicago University, where an attempt was made to test the impact of silver iodide on convective clouds.[3] It provided definite evidence of man's ability to control rain making as well as the ability to artificially create drought conditions. Late in the same decade, the Americans introduced rain making as part of their ecocide in Indo-China. Project Pop Eye was followed by intermediary/Compatriot, the objective being the creation of flash floods on the Ho Chi Minh trail. But more on this later. The Soviet projects in this field have been comparatively more peaceful, but that may be more due to lack of opportunities than to their intrinsic benevolence. Their project Kusteppe for example was launched in order to induce precipitation in the steppes, while Project Lake Cycle was doing the same in the Seven Lakes area. Increases of upto 15 per cent were reported.[4]

Cloud Modification in Indo-China

Although it did not become public knowledge till war disenchantment reached even the U.S. Administration, the United States carried out rather extensive attempts at weather modification. These consisted mainly in manipulating the rainfall around the "Ho Chi Minh Trail", in the hope of creating flash floods along the supply line of the patriotic Vietnamese forces. These operations should have produced important results for they were carried out under ideal conditions : actual combat operations, a heavy southwest monsoon, and cumulus clouds which are ideal for seeding purposes.[5] The magnitude of the seeding operations is indicated by the table overleaf.

While in Laos, Cambodia and South Vietnam, the American objective was to hamper enemy supply lines, in North Vietnam, the idea was to impair the effectivity of enemy radars[6]. These radars were part of the Vietnamese missile defence system. Other uses of weather modification in Indo-China include the production of weather sufficiently bad to

TABLE

U.S. Cloud Seeding Operations

Year	Seeding cartridges expended				Total	Total flown
	South Vietnam	North Vietnam	Laos	Cambodia		
1961	—	—	—	—	—	—
1962	—	—	—	—	—	—
1963	(Several)	—	—	—	(Several)	(Several)
1964	—	—	—	—	—	—
1965	—	—	—	—	—	—
1966	—	—	(560)	—	(560)	(56)
1967	(Several)	1017	5,553	—	6,570	591
1968	—	98	7,322	—	7,420	734
1969	—	—	9,457	—	9,457	528
1970	—	—	8,312	—	8,312	277
1971	—	—	11,288	—	11,288	333
1972	(1,000)	—	(2362)	(1,000)	4,362	139
1973	—	—	—	—	—	—
Total	(1,000)	1,115	(44,854)	(1,000)	47,967	2,658

Source : SIPRI : *Ecological Consequences of the Second Indo-China War* (Stockholm : Almqvist and Wiksell, 1976) p. 57.

hamper enemy offensives, the altering of rainfall patterns to aid US bombing missions, the providing of inclement weather to enable the success of covert ground operations, the creation of generally disruptive floods, and the diversion of enemy manpower to undo the mischief caused by bad weather. The American military, it is reported, was satisfied with the level of success of which its modification operations had attained[7]. For example, at areas where the rainfall was about 21 inches, a further increase of 2-3 inches was reported[8].

The exact consequences of these operations in Indo-China are difficult to determine. This is probably known only to the US Administration. In 1971, for example, a fairly large flood took place in North

Vietnam. But to what extent one can regard it as a consequence of American cloud-seeding efforts, which incidentally climaxed that year, is a matter of guess work. The problem which arises in the determination of impact of environmental warfare lies in the fact that their efforts surface only after a long-time lag. Increased rainfall, to quote just one example, will lead to erosion in hilly terrain, which is not immediately apparent. Changes in intensity and pattern of rainfall would contribute to a possible increase in incidence of diseases among wildlife, livestock and even human beings. The reproductive and mortality rate of some species may be altered over a period of time. Ecological multilations may take place due to the chemical properties of the seeding agents — especially where algae, invertebrates and fish are concerned. As the SIPRI report notes, the consequences of even minor changes in, say temperature or precipitation processes, can lead to major changes in affected ecosystems — over a period of time.

Fog Modification

The production and the modification of fogs is the other technique in which some major advances have been made by environmental researches. Fog dissipation is based on three methods. First of all, there is the process of seeding, in which hygroscopic particles are sprayed on the fog bound areas. Dry ice, silver iodide and propane are favoured. This results in the decrease of vapour pressure consequently to the lifting of the fog as the water evaporates. The use of heat to evaporate the water content in the fog is another important method, as in the use of lasers and ion injections. Artificial circulation of dry warm air is also a possible method. In practice it has been found that thermal techniques are best suited to warm fogs, and seeding to cold fogs. It is not the dissipation of fog so much production of fogs which are of greater military significance. While removal of heat through physical processes seem to be the obvious method for the latter, it has proved to be excessively expensive. Therefore the process of initiating condensation through the spraying of hygroscopic seeding materials has been given greater attention. Both dissipation and production of fogs depend to a large extent on the alterations in wind conditions. Control over this factor will, quite naturally, lead to greater ease in the usage of fog as an environmental weapon.

Fog modification, like rain making, has immediate practical significance which has therefore led to intense research efforts. The most important effect of fogs has been to hamper air traffic. This happens not at the routes but at the terminals and stop over. A project, partly successful, originated in order to clear the fog around airport near Paris. The airborne dryseeding method which was used (since it was a cold fog)

was extended to cover the USAF bases in other parts of Europe as well as in North America. The American Air Force is believed to have perfected the thermal fog dissipation systems, which is not extraordinary considering the fact that they started on it in the late forties. The Soviet Union has not lagged far behind either. Not much data is available about their advancements in this field except that their Project Disfog has been able to achieve approximately the same results as their American counter-projects, Fido and AWS.[11] The military significance of fog modification is too obvious to need further comment.

Defolisation

The defoliants and herbicides are usually classified under chemical weapons, it will be useful to discuss them here for two reasons. Firstly, the large scale use of antiplant chemicals have serious ecological consequences. Secondly, a large scale and massive use of these has been carried out in the US imperialist war in Vietnam. The campaign was a deliberate and calculated one to destroy crops and vegetation in Vietnam resulting in a drastic modification of the environment there.

Defolisation with herbicides limitates the natural seasonal defolisation. Leaves of deciduous plants are attached to the stern by a narrow stalk called the petide. Through this run petrole runscular tissue which conducts water and nutritive materials into the leaf and organic matter out of the leaf. As long as the leaf-blade produces the harmone ausein in moderate concentrations, the leaf remains on the plant. If for natural reasons, such as shortening days of autumn, or for artificial reasons, such as injury to the leaf-blade, the production of ausein in the leaf-blade ceases or slows down measurably the leaf falls. Thus application of ausein antagonists or compounds which lowered ausein levels could furnish a means of control of fall.

It is also known that high, toxic levels of auseins, which kill some plants and alter growth patterns in others, probably work through the control of the synthesis of yet another plant harmone, *ethylene*. Ethylene is normally absent or present in very small quantities in growing plants. The application of abnormally high ausein levels or some appropriate stimulus from the outside world can cause its production in the plant. Application of chemicals with high ausein activity, such as 2, 4-D and 2, 4, 5-T might have this result.[12]

Use in Vietnam

The use of antiplant chemicals, mainly in South Vietnam began as early as 1961.[13] The programme's name was operation Ranch Hand.

The chief objectives of the operation were (1) to clear jungle growth thus reducing the danger of ambush from the Vietcong; (2) to destroy the food supply to the Vietcong.[14] The United States carried out a massive herbicidal programme in Indo-China stretching over a period more than a decade. The programme was aimed for the most part at the forests of South Vietnam and to a lesser extent at its crops. Using a variety of agents, the USA eventually expended a volume of more than 72×10^3 m^3 containing almost 55×10^6 Kg of active herbicidal ingredients.[15]

The major herbicides that were employed by the US in Indo-China were colour coded 'Orange', 'White' and 'Blue'. Agents orange and white consist of mixtures of plant-harmone making compounds which kill by interfering with the normal metabolism of poisoned plants. Agent Blue on the other hand consists of a compound which kills by preventing a plant from retaining its moisture content. The following Table describes the expenditure by USA of herbicides in Indo-China :

TABLE

US Herbicide Expenditures in the Second Indo-China War : A Breakdown by Agent and Year

Year	Agent Orange	Agent White	Agent Blue	Total
1961	—	—	—	
1962	56	—	8	65
1963	281	—	3	283
1964	948	—	118	1,066
1965	1,767	—	749	2,516
1966	6,362	2,056	1,181	9,599
1967	11,891	4,989	2,513	19,394
1968	8,850	8,483	1,931	19,264
1969	12,376	3,572	1,309	17,257
1970	1,806	697	370	2,873
1971	—	38	—	—
1972	—	—	—	—
1973	—	—	—	—

Source : SIPRI : *Ecological Consequences of the Second Indo-China War*, p. 26.

Destruction of forests was generally accomplished through the use of Agents Orange or White, while Agent Blue was the usual choice for the destruction of rice and other crops, although Agent Orange was also much used for this purpose. (see Table below).

TABLE

US Herbicide Expenditures in the Second Indo-China War : A Breakdown by Type of Mission and Agent.

$m^3 = 10^3$ litres

Type of	Agent Orange	Agent White	Agent Blue	Total
Forest	38,196	19,094	1,684	60,594
Miscellaneous woody Vegetation.	709	529	312	1,550
Crop	3,813	212	6,185	10,210
Total	44,338	19,835	8,182	72,354

Source : SIPRI : *Ecological Consequences of the Second Indo-China War.*

All told, about 86 per cent of the missions were directed primarily against forest and other woody vegetation and the remaining 14 per cent primarily against crop plants.

Most of the herbicides were sprayed from C-123 transport aircraft.[16] "Each plane carries about 1,000 gallons of spray and approximately 3 gallons are released per acre usually in the early morning when the air is calmest and the danger of drifting is least. Within twenty-four hours the foliage begins to wither and turn brown. By the end of six weeks the leaves fall off the trees. For defolisation, reapplication is usually necessary at the beginning of each new growing season".[17]

Some inferences can be drawn from the Vietnamese experience of herbicides. The vegetation can be totally destroyed over large areas with relative ease. This in turn has a devastating impact on the animal life depending upon this vegetation for food and shelter. The ecosystem, through such an attack is subject to rapid and major losses of soluble nutrients. The ecological debilitation from such an attack is likely to be of long duration. Natural, agricultural and industrial crop plant communities are similarly vulnerable. The local civil population can suffer extensively from such an action in a variety of direct and indirect ways.

Moreover, the mechanism of the action of defoliants is not yet properly understood. Large scale irological and ecological processes, whose actions and consequences cannot altogether be foreseen or controlled, might have been set in motion. Most experience with these herbicides had been in very different environments, very different from that of Indo-China. Their effects on individual plants indigenous to that part of the world, and their movement through the food chains of that area, are yet to be concretely evaluated. While experiments performed in Britain and the US indicate that numerous species and strains of common soil micro-organisms are effective in breaking down these compounds, in this process they are transformed into new compounds which may, under some circumstances, have deleterious consequences.

Tornados/Hurricane Modification

Modification of tornados is possible, in principle, by modifying the flow of wind close to the surface of the earth. Seeding is the usual method in case of hurricanes too. To understand the control of hurricanes, one must dwell briefly on its causes. Hurricanes are based upon the transfer of latent heat from the sea surface to the air inside the storm. The release of the hurricane energy from the eye of the storm takes place in organized convective scale circulations. Now the obvious method of lessening or increasing the force of the hurricane is to control its evaporation rate, which would control the increase or decrease of the flux of energy from the sea surface to the atmosphere. Hurricanes can also be modified by changing the rate of the release of latent heat from the centre of the hurricane, which in turn can be lessened by distribution of heat within the hurricane. This distribution is best carried out by seeding and sometimes by convective scale motion.

For the results of actual experiments on the control of hurricanes, one has to rely more or less on American experiences. As early as 1961, R.H. Simpson suggested the possibility of lessening the destructive force of hurricanes by seeding them with silver iodide.[18] Early experiments were carried out on Hurricane Esther (1961) and Beulah (1963). While the results were fairly encouraging, it was not until Hurricane Debbie (1969) that the strong effectiveness of seeding operations was confirmed. Debbie was seeded with silver iodide and on the 18th and 20th August 1969. The results were reductions of peak wind speeds of 31% and 15%, respectively.[19]

The phenomena of hurricanes, like that of cloud formation, is not totally clear to scientists. It is fairly difficult to predict their behaviour as it evolves with time. There are, therefore, two uncertainties involved :

those due to natural changes, and further, those due to the changes, induced by seeding. The decision to control hurricanes through seeding depends on the usage of the available information to develop a probability distribution regarding the changes in the intensity[20] of the hurricane in the event of its being seeded. Now the data from previous hurricanes are used to compute the property damage on the basis of the wind speed.[21] Quite often, winds change data is not available. In that case, one has to rely on data regarding the central pressure of hurricanes and their changes with regard to time. Since Holliday[22] has proved the linear relation between central pressure and wind speed, this does not pose much of a problem.

Usually, the mitigation of hurricanes is conducted by massive multiple seeding of the clouds in the outer eyewall region with silver iodide. This was done, for example, with Hurricane Debbie. Where the eyewall is inadequately formed, then the seeding is concentrated on the rain bands, as in Hurricane Finger (1971) during Project Storm Fury. Researches on hurricanes have brought forward a very interesting point, of possible military significance. In some hurricanes like Diane (1955) and Camille (1969), precipitation induced major inland flooding, causing immense property damage.[23] Thus artificially induced precipitation may be used to increase the damage potential of a hurricane. In fact, in 1974, the Director of the Geographical Research Centre of the University of Mexico blamed the U.S. weather modification efforts for the havoc caused by Hurricane Fifi over Honduras. To prevent it hitting Florida, the Americans diverted it by using silver iodide to Honduras, killing 8,000 people there. The military usage of hurricane modification is, therefore, not too far fetched.

RADIATION POLLUTION

The idea of massive pollution of an area is a logical development of the military usage of nuclear fission. Even the Maud Committee, set up by Britain during the Second World War, recognized that life will be unbearable in areas where radioactivity level increases beyond a certain limit.[24] Apart from nuclear explosions, it is also possible to affect the ecology of a given area by a simple scattering of radio-active substances in it. Pollution through radiation is absurdly easy once radioactive material can be obtained in adequate quantities. The toxic material has only to be dropped into the source of water, for instance,i n order to achieve total contamination of that area.

The table overleaf should give an idea of the radiological aspects of environmental warfare :

TABLE

Dose Commitment Per MT Fission from Atmospheric Explosion in the Hemisphere

Nuclides	Half Life	Mode of irradiation	Main irradiated organ	Dose Commitment	Source of irradiation
Mixed	10-65 days	External	Whole Body	0.2 rads	Ground Deposit
Ru^{103}, Ce^{144}	0.8 to 1 year	—do—	—do—	0.1 rads	—do—
Cs^{137}	30 years	—do—	—do—	0.4 rads	—do—
Ru^{103}, Ce^{144}	0.8 to 1 year	Internal	Lungs	0.7 rads	Ground level, air
Pu^{239}	24,400 years	Internal	Lungs	0.1 rads	—do—
Sr^{90}	29 years	Internal	Bone	0.5 rads	Milk, cereals, vegetables
Cs^{137}	30 years	Internal	Whole Body	0.3 rads	Milk, cereals, meat and vegetables
C^{14}	5,730 years	Internal	Whole Body	0.1 rads	All diet

Source : Kay Edvarson, "Radiological Aspects of Nuclear Warfare", in *AMBIO*, Vol. IV, No. 5/6, 1975 p. 210.

LIGHTNING, EARTHQUAKE, OZONE LAYER AND HEAT BALANCE MODIFICATION

While the military possibilities are fairly clear in the case of the modification techniques dealt with in the case of lightning, earthquake and ozone layer, the problem is more complicated. Artificial inducement of lightnings through metallic needles, seeding and rockets are possible, but the resultant electrical discharges are militarily of little use in war.[25] Incidentally, the American project 'Mighty House' dealt with precisely this aspect.

On the subject of earthquakes, the plate tectonic theory clearly indicates that large plates in the earth's crust (corresponding to continents) move towards each other causing strain in the crust material. The release of these strains are earthquakes. The release of strain energy can be caused either by small explosions or by pumping of underground water in earthquake belts. In Nevada, nuclear tests lead to a

release of local strain,[26] while near Denver, Colorado, the latter technique was used to cause an artificial earthquake.[27] While a phased release of energy from a small fault can also lead to a major earthquake elsewhere, the unpredictability and problems of localisation prevent earthquake modification from acquiring military connotations.

This is also the case with the depletion of ozone layer, the task of which is to absorb ultraviolet radiation and protect plant life. Theoretically, a drastic depletion of the layer is possible by nuclear explosions in space. Similarly, the thesis that the heat balance can be radically altered in small areas is also being debated. But it is still commonly believed that the introduction of aerosols in the atmosphere, which would absorb or reflect solar radiation, could prove to be a major environmental weapon.[28] Polar ice caps are naturally the focus of considerable controversy for while one school believes that their melting by thermonuclear weapons will drastically change the evaporation pattern, an American study disputes this conclusion.[29] However, Wilson's cyclical theory of ice ages holds that a major climatic transformation is possible by releasing the thermal energy at the base of an ice sheet.[30] The use of snow covers to accelerate thawing rates[31] and oil films to suppress vapourization from lakes may also one day prove to be of importance.[32]

CONCLUSION

Environmental weapons pose the same dilemma as do nuclear weapons — namely how to divorce the peaceful from the military uses. The beneficial usage of modification techniques are as apparent as they are of nuclear fission. While efforts, not too serious, have been made at disarmament conferences to ban environmental weapons, research in this field is continuing unabated. The ecological techniques used in Vietnam are only the first steps in an entirely new aspect of warfare. As scientists master the techniques to manipulate the environment, the military pressures for the combat use of these techniques will become difficult to resist. From the history of warfare it is clear that once man sees the potentialities of using a scientific invention for material gain, he would not have any scruples regarding its use, irrespective of the consequences. The temptation to use environmental weapons stems from its one novelty— that its usage takes a lot of time to detect. Consider what *The Pentagon Papers* had to say about the Indo-China theatre :

> *Laos Operations :* Continue as at present plus operation POPEYE to reduce trafficability along infiltration routes. Authority/Policy changes—Authorisation required to implement operational phase of weather modification process

previously successfully tested and evaluated in the same manner. Risks/Impact—Normal military operational risks. *Risk of compromise is minimal.* (Emphasis added)

The point, therefore, is that the Vietnamese probably did not even know of the rain-making operations until they read Jack Anderson or the *Pentagon Papers.* This could also be possible if drought creation or exacerbation of hurricanes was the objective. So, for the first time one country can start hostilities against another without the latter even knowing about it. Once the capability and temptation exist, usage of these weapons are inevitable. The real danger arises when man will overestimate his control over the environment and not for the first time overplay his hand.

NOTES

1. The first public revelation of operations Intermediary/Compatriot, which involved rain-making in Indo-China was made by the journalist Sleuth Jack Anderson in *The Washington Post*, 18th March 1971. The U.S. Administration, incidentally, never denied point blank that such operations were in practice. For example, when Melvin Laird, Secretary of Defence was asked by the Congress regarding Indo-China rain-making operations, his answer was "weather modification is not being used in North Vietnam." Strictly true, since at that time it was used in Laos and South Vietnam. Refer to Deborah Shapely : "Rainmaking : rumoured use over Laos claims arms experts, scientists" in *Science* (Washington DC) 16th June 1972, p. 1218.
2. Refer to Bhupendra Jasani : "Environment Modification—New Weapons of War ?" in *AMBIO* (Oslo), vol. IV, No. 5/6, 1975. Refer also to Appendix 4A of the *SIPRI Year Book of Armaments and Disarmament* (Stockholm : Almqvist and Wiksell (1976). Also refer to F. Barnaby and B. Jasani : "Environmental Warfare—Possible New Weapon," paper presented to the 25th meet of Pugwash at Madras, January 1976.
3. Negative Effects of Project White Top (S=Seeded; NS=Not seeded) :

Region	Ganges No.	Frequency of Wet Days			Mean Rainfall %		
		S%	NS%	Change%	S	NS	Change
A	10	69	66	+5	0.195	0.315	—38
B	15	75	74	+1	0.188	0.270	—30
C	20	82	77	+7	0.169	0.228	—26
D	25	86	86	0	0.152	0.214	—29
E	28	86	89	—3	0.179	0.195	— 8
F	29	89	96	—7	0.177	0.191	— 7
A to F	127	93	96	—3	0.158	0.190	—17

Source : N. Seshagiri, "The Weather Weapon" in *Science Today* (Bombay), July 1976, p. 21.

4. Ibid, p. 20.

5. Refer to *Technology Review* Oct-Dec 1975.

6. Seymour Hersh, "Rainmaking is used as a Weapon by US", *New York Times*, 3 July 1972.

7. M. Gravel et al (Eds) : *The Pentagon Papers* (Boston : Beacon Press 1972) Vol IV, P. 421

8. *Hearings before the Subcommittee on Oceans and International Environment, Jan 25 and Mar 30, Weather Modification*, Senate Committee on Foreign Relations (Washington GPO, 1974).

9. SIPRI : *The Ecological Consequences of the Second Indochina War* (Stockholm 1976) p. 56.

10. *SIPRI Yearbook*, 1976, p. 74

11. Seshagiri, op. cit. p. 20

12. A.W. Galston : "Defoliants" in Steven Rose (Ed) : *CBW : Chemical and Biological Warfare* (London, George Harap 1968) p. 70.

13. Seymour Hersh in *New York Review of Books*, 25 April 1968.

14. *New York Times*, 28 March 1965.

15. *The Ecological Consequences of Second Indochina War*, op. cit, p. 24.

16. ibid, p. 27.

17. A.W. Galston, op. cit., p. 24.

18. R.H. Simpson and J. S Malkins in *Scientific American* (San Francisco) 211, 27 December 1964.

19. R.C. Gentry in *Science* 168, 473 (1970).

20. As measured by its maximum sustained surface speed.

21. Refer to R.A. Howard, J.E. Matherson and D.W. North, "The Decision to Seed Hurricanes", in *Science*, 16 June 1972.

22. M.C. Holiday—*Technical Memorandum WBTM SR-45* (Environmental Science Service Administration, Washington D C., 1969).

23. Howard, Matherson and North, op. cit., p. 1202

24. Margaret Gowing : *Britain and Atomic Energy (1939-45)* (London, Macmillan 1964) p. 394.

25. Jasani, op. cit.

26. F. Press and C. Archembeau in *Journal of Geophysics Research* Vol. 67, 1962, pp. 337-43.

27. G.J.F. Macdonald : "How to wreck the Environment ?" in Nigl Calder (ED) *Unless Peace Comes* (Penguin 1968) p. 210.
28. *SIPRI Yearbook* 1976, p. 77.
29. Refer to *Weather Modification* (U.S. Dept. of Commerce and National Oceanic and Atmospheric Administration, Rockville, Maryland, 1973).
30. A.T. Wilson : "Origins of Ice Ages", *Nature* (London), vol. 201, pp. 147-9.
31. *SIPRI Yearbook* 1976, p. 78
32. J. Wu. in *Science*, vol. 174 (1971) p. 283.

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The Proper Utilisation Of Officer Talent In The Army

LIEUT GENERAL ML THAPAN, PVSM

AN apology is necessary for the use of a somewhat awkward title to head this paper. A more descriptive heading could have been—"Career Planning of Officers in the Army"—but it would have been insufficiently comprehensive. After all, Career Planning, of a kind has been with us for over two decades. It is, however, confined largely to balancing the field and peace tenures of officers, or the periods spent by them in staff and regimental employ. This, at best, is the most rudimentary function of career planning. The bigger purpose, of using the talents developed by officers over the years, in the larger interests of the Service, has never been given the attention which it should receive, at the policy making level. We seem to be hidebound by certain prejudices, which are sought to be given respectability by tradition, with the passage of time, and which cannot stand the scrutiny of logic or reason. It is time for some serious introspection in this regard.

A high state of professionalism, in any walk of life, is achieved by two factors; continuous in-service training and motivation. The Army's record in the first field is unrivalled and, of the resultant efficiency, at the level of physical execution of a task, there can be no doubt. The motivational aspect is the more difficult to sustain. Youth does provide keenness and enthusiasm but, unless professional ambition is kept alive by incentive and reward, motivation tends to fade with age. A distinction is made here between ambition in the pure professional sense; of the desire for advancement in rank through demonstrated professional competence; and personal economic ambition; to seek higher rank only to better one's economic condition, as one's domestic commitments increase with the passage of time. The latter is a perfectly natural phenomenon, of which we must take cognisance and do our best to satisfy. But it should not be done at the expense of the former, as this can only lead to dilution of professional standards. Put in simple terms, the general scramble for the limited number of selection assignments should be controlled, so as to be a challenge only to those with visible professional expertise.

This will require a reorientation of our selection attitudes and procedures.

In an earlier paper*, a case has been argued for an improvement in the general conditions of service for officers, so as to take care of their natural economic needs. If the recommendations made therein are agreed to, there is reason to hope that the selection process will not be burdened, as it is at present, with the screening of too many competitors, many of whom are of doubtful professional value. This is regrettably so because our confidential reporting agencies are insufficiently objective. Over the years, Confidential reports have generally been inflated and a group reported on, instead of falling into the pattern of normal distribution, i.e. a modicum of good, bad and indifferent, tends to gravitate more to the high average and above average grades, thus defeating the whole purpose of selection. All systems operated by human agencies have a degree of fallibility; and it is not surprising that the element of human error is increased when Selection Boards are swamped by excessive numbers. We need to get objectivity back on the rails, if the system is to work effectively. The answer is not the institution of another annual confidential report format, but the creation of conditions for reporting agencies to make more objective assessments. One of these is an economically content middle piece cadre of officers when, perhaps the race will only be to the professionally swift.

The recent raising of basic educational standard of officers on commissioning to university graduate levels, serves a vital purpose in this regard. The profession of arms is now highly complex, the rank and file are better educated, the degree of weapons sophistication high. Command and staff responsibilities have increased and there is no future for the neo-literate officer. The prescription of an uniformly high level of formal education before commissioning ensures that all officers have an equal opportunity to rise to professional heights, by dint of personal effort and study throughout the service. No longer can they cavil at an unequal start. A higher educational level 'should also promote a wider outlook, broader vision and greater maturity of judgement; which should find reflection in more judicious and objective selection, to fill senior appointments in Command and staff.

The organisation of the Army into Arms and Services is designed to enable it to fulfil its primary role, which is to defeat external aggression. Each Arm and Service has a distinctive function to perform in this task, and they are complementary. No single Arm or Service can lay exclusive claim to the success of an operation; victory in battle is achieved

* "The Army as a Career." USI Journal July Sep.' 77 issue.

only by good team work. It is important that this basic truth is recognised, so that a beginning is made at breaking down the barriers of prejudice, which exist in regard to claims to promotion to higher ranks, within the Arms, the Services and between both. The fact that an officer is commissioned into a particular Arm or Corps, where he spends half or more of his service, is an organisational necessity, and not always a matter of his choice. The different military tasks which have to be performed require a degree of specialisation, particularly in technical Corps, where training schedule are long. Compartmentalisation of the Army, therefore, upto the battalion/regimental level, is inevitable. At higher levels, that is fighting formations, units and sub units of Arms and Services are grouped together, to conduct the business of modern war. Here, their individual roles do not alter; what should change is their outlook, which must now subserve the over-riding fighting needs of the formation.

In this process, the outlook of the individual officer must necessarily undergo a transformation. So long as he remains with his unit or sub-unit, his vision is circumscribed; at formation level, he begins to see the bigger picture. By virtue of their trade, and proximity to the enemy, officers of the Arms are better placed than those of the Services, to acquire a keener combat outlook. But this does not prevent the professionally eager officer of a technical Crops or Service, from doing likewise. And if he does so, his past association should not, by itself, debar him from entry to the exclusive Command and Staff Club.

We inherited from the pre-Partition Indian Army a category of officers known as the General Cadre. Unfortunately, all that is left now is only the nomenclature, and not the content. The General Cadre, pre-partition, comprised of all officers of the rank of Colonel and above who, on promotion to this rank, ceased to be identified by their Corps/Regimental background. They wore a common order of dress and were considered for command and staff appointments on the basis of their current professional knowledge, without reference to their past identity. It was their present performance which mattered. Naturally, most of these officers gravitated into streams of their own experience, but a conscious effort was made to pick out, without Arm/Corps discrimination, the professionally able, so as to try them out in what are termed as unspecified appointments. Talent was looked for, without inhibition of caste. That this paid dividends during the Second World War is an historical fact. And that this is the biggest single factor sustaining motivation, is also incontrovertible.

It could be argued, of course, that conditions pre-War were different, in that officers were commissioned directly only into the Arms, and not into the Services, where vacancies were filled by subsequent transfer.

There was much merit in this system. The bonds between Arms and Services were strengthened by the experience gained in physical service with the Arms. It is debatable whether the present looser association provides the same strength. In some spheres, of course, conditions have totally changed. For example, the Corps of Electrical and Mechanical Engineers did not exist pre-war, and the technical content of their functions are such, as can now only be performed by technical officers, who have been trained *ab initio*. The performance of a specialist function should not, however, exclude them for scrutiny for wider employment, commensurate with their interest and aptitude, when they qualify for entry to the General Cadre.

The post commission training of officers has a broad, two-fold aim. At the functional level, it is designed to train officers to take their place in units of their Arms and Services, to be capable of performing different designated functions and to supervise the training of the other ranks, upto the unit level. At the staff and command level, a degree of selectivity is introduced. Officers are chosen either, as in the case of Staff College, by means of a competitive examination or, to attend other courses, by the Military Secretary, on the basis of their service record. These courses are of a more personal teaching character rather than the earlier, purely regimental. Here, apart from the formal professional aspect, an effort is made to develop individual initiative, personality, vision and the capacity to take sound decisions. If the Army's aim is to seek the best available talent from its Corps of officers to fill its higher command and staff appointments; then the process of selection and grooming must start at this second level. It must be deliberate, dispassionate and uninhibited. The fullest opportunity should be afforded to the agencies responsible for nominating officers on these Courses, to see that none with obvious potential are excluded, on grounds such as those of quotas, which should serve only as a guide, or rather discriminatory considerations. The subsequent employment of these officers must also be determined by their individual aptitudes and talents, rather than metaphysical factors. It is here that 'career planning' should perform its real functions. Square pegs must be fitted into square holes. Field Marshal Lord Wavell has left us an amusing story of his contrary experience in this regard. When he was commanding the Middle East in 1940, he asked for an interpreter in Arabic to be appointed to his Headquarters. In due course, an officer was posted; "a very good fellow" as Wavell recounted," but quite unfamiliar with Arabic. His forte was Norwegian. I suppose the Arabic interpreter was sent to Norway." The career planning agencies must assess, objectively, performance in allotted assignments. Officers should be moved, thereafter, into spheres where their talents are best exercised in the true interests of the Service.

An example of regimentation of outlook is provided in our criteria for selection to the rank of Lieutenant Colonel and above. Competence is insisted on in the field of command, to the exclusion of competence in any other field, be it staff or instructional. Whilst the desirability of this insistence is not disputed, what is questionable is the exclusion of talent in other areas, to the point of self denial. Not all commanders make good staff officers, or vice versa, and equal felicity in both functions is rare. Surely the Army is now large enough to accommodate, in its avenues of promotion, those whose temperament is perhaps not fully conformist to command but, nevertheless, of value in their chosen field? The fact that we all wear the same uniform does not necessarily connote that we are cast in the same mould. Individual aptitudes, latent in youth, emerge with experience and the passage of time. It would be in our interest to encourage rather than to stifle them. There are innumerable assignments at different levels of rank, which do not have to be filled by "all rounders". The stark fact is that everyone cannot be hammered into 'command' shape, but this reality does not render them useless in other fields of endeavour.

Let some incentive remain for the good instructor and the good staff officer, to aspire to higher rank. Leaving them by the wayside, merely because they do not satisfy the existing measure of performance in command, is a policy of self denial, which the Army can ill afford. We simply do not have the number of good 'all rounders' to fill all our command, staff and instructional assignments. The adoption of a more judicious promotion policy will ensure better utilisation of talent which, in any case, must be limited, and raise the quality of output in the different fields. For instance, there is great deal of room for improvement in our staff work, particularly at higher formation levels. Full comprehension of the issues raised by various operational and logistic problems seldom exists, and there is a tendency to work by numbers, situation by situation. How much of this is due to the presence of officers, proficient, perhaps in command, but marking time indifferently in staff tenures whilst waiting for promotion, is a matter of speculation. Be that as it may, would not the Army be better served by more competent staff officers? The same holds good for instructional assignments; possibly more so, as the art of teaching is a gift given only to very few. Unless there is incentive in the instructional field, the general level of professional education will remain low. The good instructor will not risk stagnation in teaching, if the road to promotion follows a different route. We would do well to study the system followed in the Soviet Army where, for example, the Chair of Military History at the Frunze Academy has been occupied by officers of the rank of Major General, without causing military hiatus. In the end, it is the man who counts, not

man made rules, which are intended only to guide.

Officer appointments in the Army, in relation to the manner of filling them, may broadly be classified into two main streams—specified and unspecified. Specified appointments are those whose functions can only be performed by officers of designated Arms or Corps. Unspecified appointments leave the field clear for officers of any Arm or Corps, who fulfil the qualitative criteria laid down for such appointments, to secure nomination to them. Examples of the former are Corps/Regimental appointments at unit level and below, command appointments of single arm formations, such as artillery or engineer brigades, corps staff appointments and designated corps instructional appointments. Examples of unspecified appointments are command appointments of field formations comprising units of all arms, graded staff appointments, instructional appointments at All Arms establishments, and extra regimental appointments.

Enough has been said of possible reforms, which may raise the hackles of some conservative diehards, serving and retired, but which, nevertheless, needs to be said on behalf of those who serve a silent Service. An attempt may now be made to summarise some of the recommendations which have been put forward. It should, however, be made clear that what has not been advocated is the creation of an officer corps of clerks, or schoolmasters, as some of the less perspicacious may conclude. If the first recommendation is that the classification given in the preceding paragraph, which is based on the Army's functional needs, should be respected both in letter and spirit; it only urges that the net should be cast sufficiently wide, to fill unspecified appointments, so as to seek the maximum available talent. It must extend to nomination on courses at all arms training establishments, so that opportunities are available to all those who aspire to carry, what Napoleon described as the Field Marshal's baton, in their knapsacks.

Secondly, career planning should acquire more substance. The development of natural aptitudes must be closely watched and officers employed in fields where they can give of their best. The erosion of confidence in the career planning agencies can only lead to 'personal career planning'; a most unhealthy prospect and totally opposed to the military tradition of straight dealing.

Thirdly, the selection system must develop greater objectivity. Whilst realising human limitations, errors in selection must not become precedents; the emphasis must continually be on professional quality, untrammelled by extraneous considerations. A leader is judged, amongst other qualities, by his sense of detachment, fair play, and ability to recognise merit. Let these attributes be fully in evidence in determining who shall occupy positions of responsibility in our Army of tomorrow.

Wanted : A Doctrine For Armour

LIEUT COLONEL J K DUTT

"Most of all, we want a doctrine for our armour"

Gen Israel Tal during the reorganisation of Zahal's armoured corps.

THE SCENARIO

Example No. 1. A sand model exercise is going on. The armour grouping given is "X Independent Armoured Brigade LESS one regiment." When queried as to why the brigade has not been given its authorised complement, the DS replies, "An armoured regiment has to be given to Y Infantry Division and we have to pull it out from somewhere. In any case, an independent armoured brigade is not meant to go to war with its full complement of armour. That is the rule !"

Example No. 2. A full scale exercise with troops went through the crucial D Day with a number of misgivings. By D Plus 1, the armour commander was sacked. When asked why, the accusation was, "He could not use his trawls and bridgelayers properly, thereby causing unwarranted delay in the break-in stage of the battle. After all, it is his responsibility to give us a lane and a bridge since he holds the equipment !"

Our armoured corps is the most maligned arm in vogue. The armour commander has a perpetual Sword of Democles hanging on top of his head and he considers himself lucky to escape unscathed in any major training event or actual war, for that matter. An introspection is necessary to evolve a pragmatic doctrine for armour so that this Sword can be removed and sheathed permanently. It is therefore proposed to analyse four principal facets of the raison d'etre of armour and formulate a rationalised doctrine for this proverbial mobile combat arm of decision. These facets are role and organisation, priority of allocation, specialised armour, and command and leadership.

ROLE AND ORGANISATION

The pedantic definition of the role of armour is age old and does not require any elucidation. Let us be a little more precise and define it

in relation to the basic formation that can be assigned this role. First of all, we must be quite clear in our mind that armour is an OFFENSIVE weapon and not a defensive one. The basic formation that can be tasked for an offensive mission is the armoured brigade, be it independent or part of an armoured division. The General Staff qualification of the correct role of an armoured brigade should be, "The brigade should be capable of developing one thrust line". A point to be borne in mind is the difference between "role" and "mission". The mission of the armoured brigade would be quantified by the formation employing it in relation to a specific operation of war which will naturally vary with the operational requirement. The 64 dollar question is, "What should be the organisation of the armoured brigade ?" Obviously, in an armour oriented battlefield, the brigade must be armour heavy yet must possess a suitable element of mechanised infantry. Ideally, the basic organisation should therefore be two armoured regiments and one mechanised infantry battalion. If the brigade is independent, it must have a proportion of its own supporting elements, in the main artillery and engineers. We shall discuss this aspect in due course.

The armoured division should contain three such armoured brigades and the supporting elements would naturally come under divisional control. The role of the armoured division should be, "The division should be capable of developing two simultaneous thrust lines with the capability of developing a third thrust line if opportunity permits, failing which exploit any of the two developed thrust lines as required." The division is a little different in structure to the brigade, as it is the lowest formation that is capable of carrying out operations wholly by itself. The division commander in this profile must therefore develop each thrust line with a brigade.

If the armoured brigade has an armour component of two armoured regiments only then the question of its operating in the retrograde ubiquitous sense of "less one regiment" will never arise. Also, the presence of one mechanised infantry battalion would give ideal mix of these two primary arms for the operational environment envisaged.

Let us now analyse the organisation and structure of the supporting elements. The first is artillery. Unfortunately, our artillery is structured as a battle support weapon and not a battle winning one. Artillery can be divided into three basic categories—general support, air defence, and anti-tank. General support artillery consists of field, medium and heavy guns, mortars, and rockets. Reaffirming the principle of highest centralised control in employment, this category of artillery must be organised into pure artillery divisions. This means the integral artillery brigades of all the divisions as also the corps should be reorganised into artillery

divisions—field and medium. Mortars and rockets may be formed into lesser sized formations under corps or army control till such time adequate units are available to be raised into respective divisions. The commander corps artillery should coordinate the employment of all the artillery divisions within his corps.

As far as armoured formations are concerned, having organic field artillery is redundant. Adequate fire power can be generated by the tanks themselves for their infantry when the occasion demands, and in any case, mechanised infantry is quite different from its non-mechanised counterpart when it comes to modus operandi under covering fire. What is required for armoured formations is medium, air defence and anti-tank artillery. The first two are self explanatory but the last requires elaboration. There is a crying need to reactivate the self propelled anti-tank regiment of the old days. This should be scaled at one regiment per infantry and armoured division and one battery for each independent armoured brigade. The equipment can be easily manufactured indigenously based on the Vijayanta chassis. It will mount the standard 105 mm tank gun. The vehicle can be modified to suit the requirements. For example, the stabiliser system can be removed, thereby getting space for more ammunition.

Of course, missile protagonists will be up in arms to say, "Who wants a conventional anti-tank gun when an anti-tank guided missile is available ? Look at the Yom Kippur war of 1973 ! " A very incisive question is, "Is a missile really cost effective in our context ?" The anti-tank guided missile weapon system can be considered to be fully consummated when it is mounted on a tactical tracked or aerial carrier and is scaled at brigade level. The current generation of wire guided missiles when operated from a tactical carrier like the British Striker or the American Advanced Attack Helicopter or even the Russian ICV, the BMP series, to engage targets beyond the minimum missile-gathering range of 800 to 1200 m is perfectly understandable in a European or Middle East panorama. But the same does not hold good for us. In fact to begin with, our tank engagement battle ranges rarely exceed 1200 m; next, we have no tactical carriers either on terra firma or in the third dimension; thirdly, the night fighting capability of the missile is quite below par; and lastly, the total quantum of missiles available with us is but a mere pittance. Most important of all, a guided missile is one of the costliest weapon systems in the world. It is costly to import, costly to store, costly to train with, and costly to replace. And funnily enough, it does not quite suit our engagement ranges. Trying to "Keep up with the Joneses" by having missiles on our inventory is a military anachronism for us. The Arab countries can buy them by the thousands with their petrodollars; we can not. It is far better for us to be realistic instead.

An anti-tank regiment consisting of the usual three batteries and each battery with the usual six guns will offer tremendous flexibility and hitting power to a division commander. For example, in an infantry division, the divisional armoured regiment can be released for mobile, offensive tasks consequent to the anti-tank regiment taking on the static anti-tank responsibility for the formation. The same can never be achieved with our present state of missiles and in all probability will not be achievable till we are well into the next century. Technological prowess is directly related to the availability of funds. Hence it will be much more economical and cost effective to raise the self propelled anti-tank regiment in our context. It is worthwhile to note that the Russian army employs the SU 100 (self propelled 100 mm gun) and the Bundeshwehr employs the Jagpanzer Kanon 90 (self propelled 90 mm gun) as tank destroyers in their respective armies.

An outline organisation of an independent armoured brigade's teeth element is given at Appendix A and that of an armoured division at Appendix B. The relevant engineer aspect has been dealt with later.

Priority of Allocation

The first example quoted at the beginning of this article is not factitious. It is very true to life. There is unequivocal assent on the fact that the first priority in allocation of armour is provisioning of the integral armoured regiment of the infantry division. The only problem has been one of availability. In all our wars fought to date, the independent armoured brigade has never operated with all its three armoured regiments—at best it has always been with two. Therefore, if we decide to accept this as a fait accompli and accordingly reorganise this formation with an armour component of two regiments in place of three, the shortfall in availability can be made up to a large measure. Actually, if we work out the total holdings of our armoured regiment and reorganise our armour as suggested, all first line infantry divisions will get their own armoured regiments. Over a period of time all infantry divisions will also have the anti-tank regiment on their organisation. This will make this formation a veritable powerful entity with adequate in-built capability for mobile warfare.

The next priority of armour allocation should deservedly go to our designated Strike Formation. This formation, be it a corps or army, should have two armoured divisions, two infantry divisions and at least two independent armoured brigades, besides its integral composite air support squadron. This will enable the formation commander to develop two division sized thrust lines and thereby assure the credibility of

the formation's assigned role.

The overall effect of all this will be a natural employment of armour in keeping with its one and only tenet—the principle of concentration. The Strike Formation in particular will be able to achieve overwhelming armour superiority at its "schwerpunkt". This in turn will ensure decisive results in war.

Specialised Armour

During the second world war, Maj Gen Percy Hobart raised the British 79th Armoured Division which was an assortment of all types of specialised armour in use at that time. The formation was known as "Hobart's Funnies". Regrettably, this spirit still seems to be alive with us and we insist on taxing our armoured units and formations with all kinds of present day gadgetry—trawls and bridgelayer tanks are baneful examples. In this connexion, one of our armoured regiments earned an appropriate soubriquet, "Jay Kay's Funnies!"

It is understood that the Warsaw Pact armoured formations follow the practice of tank units doing their own breaching and bridging of obstacles. But it would be incongruous on our part to try and do the same. The second example quoted at the beginning of this article is very pertinent. Our armoured corps must not be transformed into a "Jack of all trades". Woe betide the day when armour is told to use its own tank guns employing the indirect fire technique in place of artillery support and possibly muster the spare crews of the tanks to carry out the tasks meant for the infantry ! It would be prudent on the part of our armour not to lay claims on any job that in reality is meant for the engineers, to wit, breaching and bridging.

Breaching and bridging have always been the bread and butter of sappers. All specialised armour equipment meant for such tasks must be handed over to them who rightly require such equipment, and armoured units must be absolved of this responsibility which has become like the opprobrious albatross of the Ancient Mariner ! Breaching and bridging at formation level should be undertaken by the engineers who can employ a task force for such missions with adequate other arms grouping, under the overall control of the formation headquarters. Breaching and bridging is NOT the task of the armoured corps.

Command and Leadership

There is little doubt that in the current world of progressive technology, soldiers have to become more and more adept at technical subjects.

The soldier is fast assuming the character of a military technocrat. In fact, there is hardly any option to this. Armour is a highly technical arm and those aspiring to command it must of necessity have a high technical quotient. This does not require any clarification. The archaic Colonel Blimp attitude of an armour commander proudly stating, "My EME looks after my equipment, my AOC looks after the munitions, my staff does all the work and I play golf" is extinct, or should be. By the same token, an armour commander can not remain "underground" during the period of the hot war and show up a minute after cease-fire wearing a well pressed uniform and smelling of fresh lotion. An ideal emulation is the Israeli armoured corps. Their way of functioning is probably unparalleled and we would do well to follow their methods.

In the next war with Pakistan, the deciding factor will be the superior employment of mechanised forces, with the emphasis on armour. Our aim should therefore be to select the best officer material to command armoured formations. A function oriented qualitative requirement must be laid down and the selection should cover officers from all arms, not just armour and infantry. The selected officers should proceed to the armour school where they should attend a year's conversion-cum-familiarisation course learning tank automotive, armament, communications and tactics. Only successful officers on this course should be assigned their commands. This will make them much more confident commanders, particularly those who are not from the armoured corps. Armoured brigade and division commanders must set personal examples of technical erudition if they desire to attune their subordinates towards this vital aspect.

Armour leadership is a very complicated business. The armour jawan has an urban upbringing and is more aware of his world than his colleagues in the other arms. This is so because armour is the only "technical close combat arm". Mechanised infantry when employed in the ICV mode is next to armour in this nomenclature. No other arm can boast of this. Essentially, armour leadership demands two requisites—technical proficiency, and leading from the front. It is revealing to note a tank crew's reactions when their formation commander comes to inspect them either in the lines or at field firing. Truly speaking, it becomes a two-way inspection, with the commander assessing the crew's capabilities and the crew gauging the commander's own knowledge. The tank crew consider it sine qua non to determine their commander's technical calibre before they decide to give of their best for him. This is true ! Blind obedience is just not their forte. It is absolutely imperative for an armoured formation commander to don his overalls every now and then and spend some time with the tank crews

of his units carrying out checks and discussions on technical aspects of the equipment. This is the only way to win their hearts. It would be a very good thing if such commanders devoted equal time to the tank garages as the golf course !

When the hot war breaks out, the armour leader has only one place—l'avant garde. A better example than Col James Brudenell (Lord Cardigan) of Balaclava is hard to find in this respect. Exponents of modern warfare feel that a commander should not leave his headquarters for long periods. This is not quite correct. The formation's deputy commander should be fully empowered to take command decisions in the absence of the commander. The latter must spend all, but all, his time surveying and controlling his formation's battle from the front. An armoured brigade commander must be in his command vehicle with the leading combat group all the time. An armoured division commander must alternate between his command helicopter and ground vehicle. The formation commander should influence the battle more by his mere presence than by active interference. He does not have to be immaculately attired—he possibly can not be. Gen Israel Tal is a classic example.

HULL DOWN

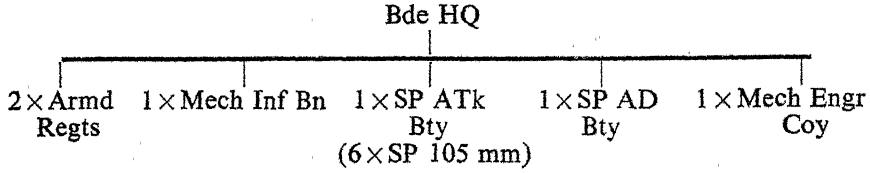
In this article, an attempt has been made to suggest solutions to some inherent problems that are predominant in our comprehension of the mobile combat arm of decision. The aim has been to propound a functional doctrine for armour in place of the mundane procedural one. It is vital for us to take correct stock of the situation because we do not have much time available before the next war. Our armour must be tempered and forged for decisive victories and conclusive battles. This can be achieved if our perspective about armour is realistic and not just peripheral. The time to act is NOW.

As a tail piece it would be in keeping to epitomise armour by quoting the last stanza of the United States Army Armour song :-

"Infantry and Artillery will always have their day
But when they need the knock out punch, Armour leads the way;
So listen all you sons of guns to the truth that we do tell
If you want to know who does a job and does it goddam' well
Who covers ground and has the stuff to really give 'em hell
It's none but the ever rolling
Hit 'em again and keep on rolling
None but the ever rolling ARMOUR!"

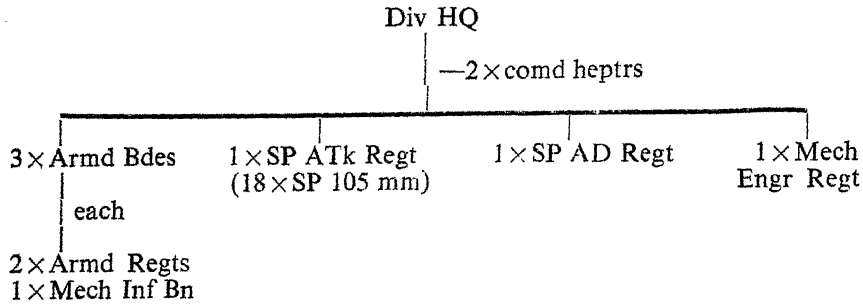
Appendix A

Outline Organisation of an Independent Armoured Brigade (Teeth Only)



Appendix B

Outline Organisation of an Armoured Division (Teeth Only)



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Counter-Intelligence Planning Lingering Lacuna or Lip Service ?

LIEUT COLONEL KM BHIMAYA, GARH RIF

IN BRIEF

"How can I tell the signals and signs
By which one heart another heart divines ?
How can I tell the many thousand ways
By which it keeps the secret it betrays ?"

Longfellow

Intelligence and counter-intelligence are the converse and observe sides of the same coin. While intelligence or the lack of it has featured prominently and more often painfully in most of the post-war analyses, investigative research into the efficacy or otherwise of friendly counter-intelligence planning gets unduly identified with peacetime rhetorical banalities and hence no meaningful effort is exercised towards its extension and translation into combat situational realities. In fact, it is no exaggeration to conclude that deliberate counterintelligence planning seldom features in our operational planning matrix. In this article, the focus is on the mechanics and importance of counter-intelligence planning for conventional operations.

INTRODUCTION

IN order to understand the scope and character counter-intelligence a comprehensive definition is necessary : "Counter-intelligence is that aspect of military intelligence activities relating to all security control measures, both offensive and defensive, designed to insure the safeguarding of information, personnel, material and installations against the espionage, sabotage or subversive activities of the foreign powers and disaffected or dissident groups or individuals which constitute a threat to the national security. Counter-intelligence includes the detection of treason, sedition and disaffection within military ranks and among civilian employees of the Army establishment; and the neutralisation or destruction of the effectiveness of actual or potential hostile intelligence and subversive activities".

Counter-intelligence, therefore, resolves itself into two types of measures :—

(a) Passive measures to conceal information from the enemy. These include such measures as security of information, personnel, material and operations. These are readily standardized in the formation/unit standing orders, regardless of the specific nature of the mission.

(b) Active measures to block the enemy's attempts to gain information or to engage in sabotage or subversion.

The above measures appear to be common place. But they require modification, adaptation and correlation for specific missions. This process is not automatic or implied but should be the logical outcome of a well reasoned counter-intelligence appreciation. The counter-intelligence plan which emerges, enjoins mission-oriented measures that transcend the horizons of standing orders and common sense safeguards applied to peace time situations. This difference is implicit in the basic thrust of this article.

STEPS IN COUNTER-INTELLIGENCE PLANNING

Basically these follow the mechanics of intelligence planning and hence is a continuous process. However, the indicators that are likely to betray friendly intention are supplied by friendly troops. Hence, the need to evolve suitable measures to block the enemy from perceiving their import. The various steps are :

(a) Carry out a Counter-intelligence Appreciation to determine enemy intelligence capabilities in relative order of probability of adoption.

(b) Identify friendly Counter-intelligence Requirements in relation to the capabilities as per Sub Para 5 (a) above.

(c) Determine probable indications that could be provided by friendly forces at various stages of the operations.

(d) Devise specific Denial, Detection and Deception measures and select implementing agencies keeping in view Sub Para 5 (a) and (c) above.

(e) Evolve Counter-intelligence Plan to include coordinating instructions.

(f) Follow up.

The Counter-intelligence planning is also a continuous process which covers various phases of operation and which is subject to modifications depending upon the variable factors affecting the counter-intelligence appreciation.

SETTING

For illustrative convenience, let us discuss a fictitious setting which depicts the concentration of friendly forces in a region which is inhabited by subversion prone population and which includes sensitive administrative installations.

COUNTER-INTELLIGENCE APPRECIATION

General. The counter-intelligence appreciation is a device designed logically to determine the enemy's intelligence capabilities and their effects on the operations of the command. It should normally be prepared during the initial planning stage of an operation by the intelligence staff on the direction of the commander or the chief of staff. The counter-intelligence appreciation could be included as an Appendix to the Intelligence Appreciation.

Sources/Agencies. The counter-intelligence appreciations can be based upon the information obtained from the following sources :-

(a) Intelligence Staff of higher, adjacent and lower formations.

(b) Special National Counter-intelligence agencies.

(c) Security personnel of the other two Services.

(d) Local political officer-holders and police.

(e) Escapees and evaders.

(f) Linecrossers.

(g) Refugees.

(h) Frontline troops.

Format. Suggested format of counter-intelligence appreciation along with explanatory notes is at Appendix A.

Conclusions. The relative probability of adoption of a particular capability and its effect on friendly mission and counter-intelligence operations give the lead to the next step.

IDENTIFY FRIENDLY COUNTER-INTELLIGENCE REQUIREMENTS IN RELATION TO THE ENEMY CAPABILITIES

These flow from the Counter-intelligence Appreciation. For example in the preceding situation, the appreciated enemy capabilities in the order of relative probability of adoption are espionage, sabotage, subversion and aerial recce. Hence, the immediate priority counter-intelligence areas as opposed to those laid down in the peace time

environment are counter espionage, counter sabotage and counter recce measures. These have to be identified in a reasoned sequence.

DETERMINE PROBABLE INDICATIONS THAT COULD BE PROVIDED BY FRIENDLY FORCES AT VARIOUS STAGES

These again have to be deliberately worked out separately for each formation/unit for various stages of the operations. In the given setting, the various activities of the formation/units that could reveal the probable friendly intention to the enemy are enumerated. For example, the activities prior to the move from peace time locations, during the move at the concentration area and at the assembly areas, if any, come under the 'probable indications' that may betray friendly intentions.

DEVISE SPECIFIC DENIAL, DETECTION AND DECEPTION MEASURES AND SELECT IMPLEMENTING AGENCIES KEEPING IN VIEW PARAS 12 AND 13 ABOVE

Having formulated the counter-intelligence requirements and also enumerated friendly activities that are vulnerable to the appreciated enemy probability at various stages of the operation, specific counter-intelligence measures have to be devised to protect these activities from the enemy intelligence efforts. These measures have to be correlated to the various developmental process of operations and allotted to specific agencies for implementation.

The above measures are obtained by the following means :—

(a) *Denial.* These are intended to prevent the enemy from obtaining information about us. These also include the much familiar security of information, personnel, operations and material; passive measures such as camouflage and concealment ; and, active measures such as electronic counter measures, military censorship and counter reconnaissance.

(b) *Detection.* These seek to uncover and defeat enemy intelligence effort and include aerial and ground reconnaissance, investigation of personnel and civilian control.

(c) *Deception.* As the name implies this is employed to deceive the enemy as to our actual plans or intentions. Some of the examples are electronic counter measures, planted information, establishing dummy positions, feints and so on.

These measures and means should be mutually supporting and implemented by specific agencies in furtherance of the overall operational plan. Hence they require close coordination.

Based on the counter-intelligence appreciation, own counter-

intelligence requirements, and own activities that are required to be protected by suitable counter-intelligence measures are plotted on a worksheet. Subsequently, this becomes the basis for the counter-intelligence plan. A specimen counter-intelligence measures worksheet is attached at Appendix B.

COUNTER-INTELLIGENCE PLAN

This is, in fact extracted from the above worksheet and could form an Appendix to the Intelligence Summary or the Enemy situation of the Operation Order. The major headings of this plan could be as under :—

(a) *Mission.* Of the formation concerned.

(b) *Military Security.* Attention is drawn to the relevant portions of Formation Standing Orders.

(c) Counter-intelligence measures applicable to all formations.

(d) Counter-intelligence measures applicable to specific units and responsibility for coordination.

(e) Special instructions regarding deception, press release and handling of civilian population.

FOLLOW UP

This is as important as the reoganisation stage of the attack. There should be close and prompt follow up to ensure :—

(a) Effective implementation of counter-intelligence measures.

(b) Quick investigations of security violation and plugging the possible leakages.

(c) Continuous reappraisal of the enemy's capability based on the indications relating to his intelligence effort.

CONCLUSION

In our operational environment, intelligence and counter-intelligence have assumed such importance as to be equated with the Principles of War. Counter-intelligence is the fountainhead of surprise, which in turn facilitates mobility by decreasing or neutralising enemy resistance along the path of movement and by dislocating the enemy commander's mind. The operation may be brilliantly conceived and vigorously prosecuted. However, without the protecting and aiding cover of a well thought out counter-intelligence plan, it may be a dismal failure if, not a disastrous non-starter.

Appendix A
(Refers to Para 10)

SUGGESTED FORMAT OF COUNTER-INTELLIGENCE APPRECIATION

Issuing Headquarters
Place
Date and Time

COUNTER-INTELLIGENCE APPRECIATION NO. 2

Reference :—Maps, charts or documents.

MISSION

1. The Corps/Division will concentrate in Sector 2 with a view to seizing the Banana Ridge.

CHARACTERISTICS OF THE AREA OF OPERATIONS

2. Describe the general characteristics and their effect on enemy intelligence, sabotage and subversive activities and friendly counter-intelligence operations and measures.

WEATHER

3. (a) See Paragraph 2 (a) of the Intelligence Appreciation No. 1.

(b) Weather will favour enemy intelligence operations.
.....

(c) .....Counter-intelligence control of our concentration area will not be difficult, but concealing them from hostile air reconnaissance will be difficult.

TERRAIN

4. (a) See Paragraph 2 (b) of the Intelligence Appreciation No 1.

(b) Generally favours the enemy.....The woods and forests provide areas for aerial infiltration, rendezvous for transmission of information and concealed bases of operation.

(c) Good observation, poor communication facilities and highly populated urban areas offer a few critical control points where control measures can be applied effectively.

OTHER CHARACTERISTICS

5. (a) *Politics*

(i) Brief description of the organisational set up and its viability.

(ii) Enemy capabilities are helped by the political situation. The banned 'Reunification Party' has been revived by the enemy.

(iii) The execution of counter-intelligence operations may be hampered by the pro-enemy civilian officials.

(b) *Economics*

(i) Enemy subversive activities are exploiting the large trans-border migration caused by the war.

(ii) Economic situation will hinder the counter-intelligence operations particularly those relating to civil security.

(c) *Sociology*

.....

(d) *Psychology*

.....

(e) *Demography*

.....

(f) *Sensitive points*

(i) The concentration area, administrative installation and Electronic Warfare control stations must be specially protected.

(ii) The effort required to protect these points will involve the use of additional counter-intelligence personnel.

(g) *Very Important Persons (VIP) Vulnerable Areas (VAs) and Vulnerable Points (VPs).*

(i) No change from Counter-intelligence Appreciation No. 1.

(ii) List of VAs and VPs are attached as Annexures.

ENEMY SITUATION

INTELLIGENCE ORGANISATION

6. .....

SABOTAGE

7. .....

SUBVERSION

8. .....

RECENT ACTIVITIES

9. *Reconnaissance.*

10. *Subversion.*

11. *Sabotage.*

REINFORCEMENT AND RESUPPLY FACILITIES

ENEMY INTELLIGENCE, SABOTAGE AND SUBVERSIVE CAPABILITIES

ENUMERATION

13. (a) The enemy can continue to carry out his small scale nightly air photo recce of our zone.

(b) .....

(c) Enemy agents and the 'Reunification Party' are capable of sabotage of our VAs and VPs.

ANALYSIS AND DISCUSSION

14. Despite our air superiority, enemy will continue to fly recce missions over our sector.

15. .....

16. The enemy agents estimated 60 strong will make every effort to locate our VAs and VPs.

17. Among the military, subversive activity by the enemy will be difficult.

CONCLUSION

RELATIVE PROBABILITY OF ADOPTION

18. Espionage and sabotage will receive maximum attention by the enemy.

19. Subversive activity amongst the civilian population will be the next priority.

20. Based on the pattern of his reported activities it must be assumed that air recce missions will continue to be flown from today onwards and recce patrols will attempt to probe our zone.

EFFECTS OF ENEMY INTELLIGENCE, SABOTAGE AND SUBVERSIVE CAPABILITIES

21. (a) *Effects on the Mission of Command.* Enemy sabotage activities can seriously affect logistical supplies and disorganise command and electronics during critical period of attack.

(b) *Effects on Counter-intelligence Operations*

(i) Additional security personnel will be required.

(ii) Civil security operations will be affected in the same way as those of military security.

Appendix B
(Refers to Para 17)

Counter-intelligence Measures Worksheet

XXV Corps

Period Covered

Phase of the Operation	Enemy intelligence capability	Likely friendly indications	Counter-intelligence measures to be adopted	Implementing Agencies								Coordinating instructions
				69 Div	70 Div	71 Div	IPC Arty	Brig Adm	Civil Affairs	Chief signals officer	IFS Coy	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
Period in concentration area	Sabotage	Concentration of VPs like helicopter fuel storage, communication facilities.	Provide local protections to VPs. Disperse these VPs. Reduce suspicions by providing a natural exterior.				—	—		—	—	Coordinate with Brigadier General Staff (BGS) IFS Coy and Deputy Provost Marshal to report violation.

(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
Espionage	Use of cryptographic material.	Check standing orders for security, destruction and losses.						—	—	—	CC IFS Coy to carry out security check.
		Disseminate location of critical AD weapons, missile sites.									
		Purely on need to know basis.				—			—		Chief of staff to coordinate
	Making of Command Posts, laying of lines.	Emphasise security discipline for command posts, loose talk and telephone conversation.	—	—	—	—	—	—	—	—	As per standing orders.
	Patronisation of civilians	Restrict civilian movement as per the Sector plan.	—	—	—			v/		v/	Coordinate with civil affairs.

Modern Arms for Defence Forces-II

Air to Surface Systems

DR. S. S. SRIVASTAVA, Consultant, Scientific Evaluation

INTRODUCTION

IN any future limited war either on the Western front in any sector or on the Northern front, there is likely to be a mix of ground targets which will be defended by surface-to-air guided weapon sand anti-aircraft guns or only by fast firing small calibre guns. Pakistan has already acquired 9 batteries of Crotale surface-to-air missiles and an equally large number are being introduced in most of the Arabian countries. There are also Rapier air-to-surface missiles in the inventory of Iran. In China some of the old surface-to-air guided weapons of Russian origin are in service although any newer replacement of these weapons systems has taken place or not is not known. Thus conventional bombing of targets by modern aircraft in face of SAGW involves a lot of risk to aircraft. As the cost of modern aircraft is considerably high (5 to 10 crores per aircraft) and investment in training a pilot for these missions going up constantly, it does not seem feasible to attack a missile defended ground target by modern aircraft without accepting considerable attrition. To keep the attrition down, there is thus a need to have air-to-surface weapons with good standoff range so that ground targets can be hit from outside the range of a short range SAGW (6 to 8 Kms).

ERRORS IN CONVENTIONAL BOMBING

Any conventional bombing has aiming errors and firing errors. These two contribute to CEP (Central Error Probable) which is quite large in case of a 500-2000 lb bombs and varies with the height of drop. If, however, a target is small like a strategic bridge, a large number of bombs have to be dropped to destroy it. This is shown in Table 1 for different probabilities of hit on a 10 m radius target. Experiences from the ineffectiveness of large scale bombing like those of THANH HOA BRIDGE in Vietnam where 600 sorties in a "Rolling Thunder" operation failed to hit, have led to the development of guided bombs

called Smart Bombs. This term simply implies to a bomb or a missile that is guided in its terminal phase. Such a guidance has considerably reduced the CEP which is of the order of 5 to 10 ft. and varies with different class of bombs.

TABLE 1

Weapon Type	Minimum No. of Bombs needed to damage the VP of a circle 10 m radius with a total probability of:		
	P=0.75	P=0.90	P=0.95
Conventional Bombing			
Ht.—700-1000 ft			
Steep) 500 lbs	3	5	6
Dive) 1000 lbs	2	4	5
) 2000 lbs	2	3	5
Medium) 500 lbs	4	6	8
Dive) 1000 lbs	2	4	5
) 2000 lbs	2	3	4
Level) 500 lbs	4	7	8
Dive) 1000 lbs	3	5	6
) 2000 lbs	2	3	4
Ht.—2000 ft			
1000 lbs	106	175	228
2000 lbs	73	120	156
Ht.—30,000 ft			
1000 lbs	232	384	500
2000 lbs	123	204	265

EXPERIENCES FROM ARAB-ISRAELI WARS

In 1967 Israelis' airpower became a decisive factor in the 6 day war. Israelis succeeded in wiping out the Egyptian Airforce by a surprise air attack within a few hours of the beginning of operations. 419 sorties were attempted to destory 400 Egyptian aircraft on the ground and 50 in the air in a low-flying surprise attack. In 1973 the tables were turned against the Israelis. Due to the introduction of ground-to-air missiles (SAM-6 and SAM-7 along with SAM-2 and SAM 3) Israelis lost 75 of its aircraft (15% of its combat ready Airforce) in the very first week of fighting. SAM-7 is a shoulder-fired heat-seeking anti-aircraft missile while SAM-6 has dual guidance. Israelis had to use a

variety of air-to-surface bombs and missiles of US origin to regain their initiative and stem the advance of Arab forces both in Syrian and Sinai operations.

Experience of Indo-Pak War of 1971

During the Indo-Pak War of December, 1971, several raids were carried out over distant targets deep in the enemy territory. While the net attrition suffered on all attack sorties was small, it is well understood that an aircraft penetrating deep into enemy territory is subjected to much higher attrition not only from ground defences but also by aircraft interception. It was so in 1971 War too. In a well-planned air defence ground environment with SAGW and guns, it may even become impossible for a modern aircraft to penetrate enemy air defences and to hit successfully a ground target. The need for good standoff weapons to hit such targets is thus well established.

Bombing Effort in Relation to Accuracy and Target Size

When a target is small and the CEP of a bomb large, a large number of bombs have to be dropped to achieve an acceptable level of destruction. The lethal damage from a bomb is usually due to the blast and fragmentation. If only overpressures of 5 psi are considered to cause destruction, the lethal radius of a bomb is given by a simple equation :

$$r=7W^{1/3} \qquad ...(1)$$

where r=lethal radius

and W=weight of the high explosives in the bomb.

If targets are assumed to be circular and of radii 50, 100 and 150 metres and if the CEP were to be varied, the number of bombs required for a 50% damage on target by blast is given in Table 2 on next page, which shows that a larger number is needed when CEP is high. It is possible to work out the sorties if on an average an aircraft carries 4 bombs and is subjected to a 10% attrition due to ground defences. The number of sorties can be calculated by the following equation :—

$$S=\frac{n}{b\left(1-\frac{k}{100}\right)(1-p_t)(1-p_o)} \qquad ...(2)$$

where

n=number of bombs required to destroy 50% of the target

b=number of bombs carried per sortie

p_f=proportion of 'dud' bombs

p_a=proportion of abortive sorties.

Damage on target	:	50%
Attrition of A/c	:	10% of attack sorties
Weight of Bomb	:	1000 Lbs.
H.E.	:	250 Kg.
No. of Bombs per aircraft	:	4

TABLE NO. 2

Number of Sorties/Bombs of Aircraft for a Known Destruction for Different CEPs and Target Sizes

CEP	30 mtrs	60 mtrs	90 mtrs	120 mtrs
Radius of Target	Number of sorties/bombs			
50 mtrs	1/2	2/3	3/6	4/9
100 mtrs	3/6	2/5	3/7	4/11
150 mtrs	6/16	5/13	4/11	5/13

The lower figures are the No. of bombs. The sorties have been calculated from equation (2).

COST OF BOMBING

The cost of inflicting a certain level of damage on a given target with bombs of a certain lethal radius with a known circular error pobable and carried by an aircraft subject to a specified level of attrition due to enemy ground defences, can be stated as follows :—

Total cost per target (C_A)	=	Cost of aircraft sortie time per target	+	Cost of killed aircraft per target	+	Cost of lost/ killed pilots per target	+	Cost of bombs for a specified level of damage per target

The mission cost can be expressed in the following form :

$$C_A=\left[\left(\frac{C_a}{H}+\alpha C_0\right) ts\left(1-\frac{K}{100}\right)\right]+S\left(\frac{K}{100}\right)C_a+S\left(\frac{K}{100}\right)p_p C_p + bsC_b\,(1-p_a) \quad \ldots(3)$$

K =per cent attrition rate of aircraft
C_A=mission cost for aircraft
C_a=aircraft cost
C_0=operational/maintenance cost per flying hour
t =flight time per sortie (in hours)
H =life of aircraft measured in number of flying hours
p_s=probability of pilot being killed/lost per killed sortie
C_p=cost of pilot
C_b=cost per bomb
α =cost factor for aircraft availability
S =sortie from equation (2), so also b and pa.

COST EFFECTIVENESS OF BOMBING MISSIONS

Given the size of a target and CEP of a bomb it is possible to estimate the cost-effectiveness of bombing missions. Fig. 1 shows this. For very small targets it is necessary to have a bomb with a very low CEP, only then the cost of bombing mission can be minimized and the mission made cost-effective. The graph shows that a minimum exists for different target sizes and CEP of the bombs. For targets of small size like a bridge or a radar site, there is thus a need for a guided bomb or a guided missile, TV, laser or anti-radiation type with a very small CEP.

ACCURACY OF AIR-TO-SURFACE BOMBS/MISSILES

The accuracies achievable in air-to surface guided missiles and bombs vary with the type of guidance incorporated into the system. These are given in Table 3.

TABLE 3

Accuracy of Air to Surface Systems

Sl. No.	Guidance	Accuracy (m)
1.	Laser Systems	10
2.	TV Systems	10
3.	Infra-red Systems	10
4.	Radar Systems	50
5.	Microwave Radiometer	20
6.	Satellite Position Finding	10
7.	Radar Area Correlation	50

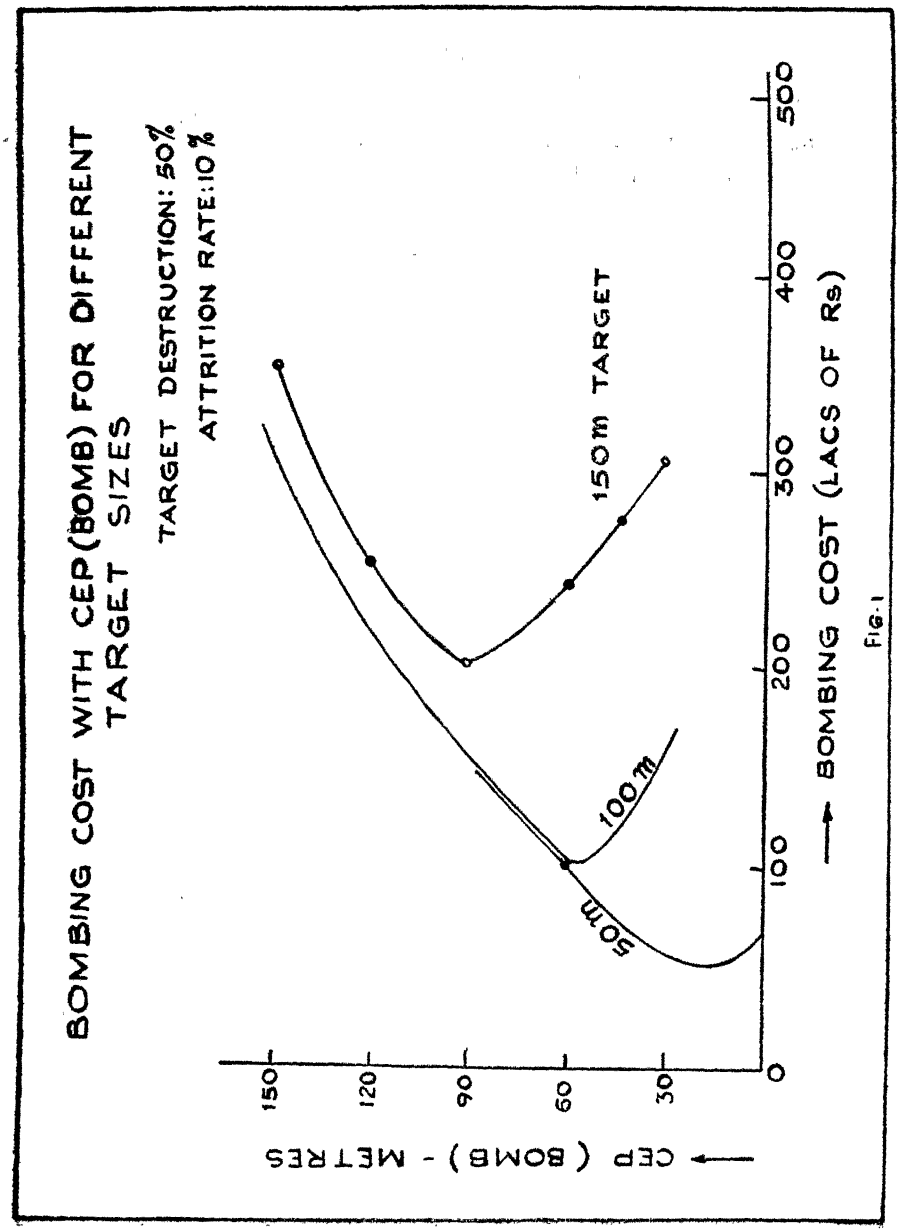
BOMBING COST WITH CEP (BOMB) FOR DIFFERENT TARGET SIZES
TARGET DESTRUCTION: 50%
ATTRITION RATE: 10%
150m TARGET
100m
50m
CEP (BOMB) - METRES
BOMBING COST (LACS OF Rs)
150
120
90
60
30
0
100
200
300
400
500

Fig. 1

SMART BOMBS

The 'Smart' bombs are conventional bombs incorporating electro-optical or laser guidance system. In general the heavier bombs, 1000-3000 lbs., use TV guidance and fin control to glide accurately on to the chosen targets, while the smaller types, 500-1000 lbs, depend on the reflected laser beam from the target which is "illuminated" by a ground based "source" or from a hovering plane.

While launching the weapon the pilot of the launcher aircraft can maintain a standoff distance from the strike point and he can take evasive action from the enemy air defence system. Both the systems permit the pilot after lock-on to release the weapon in a large cone whose apex is the chosen target.

TV GUIDED BOMBS

There are, in fact, 4 TV guided air-to-ground weapons available at present in the western countries—Martel, Maverick, Condor and Walleye. Martel and Condor have larger range and rely on the aircraft operator for radio-link command after the launch, whereas Maverick and Walleye use auto-guidance, thus, providing the pilot "launch, leave and forget" type of facilities.

Walleye have featured notably well in the Vietnam War and it is known that this weapon has been procured by the armed forces of Israel as well. A list of various TV/laser guided weapons with known characteristics is given in Appendix I.

In the electro-optical guidance system a TV camera vidicon, stabilized on gyro mounting, is fitted on the nose of the bomb. Images of the target viewed by the camera is projected *via* coaxial cable to a TV monitor. In the autoguidance type the bomb must first "see" the target and memorize it. After release any deviation in the flight path is sensed in the contrast seeker and corrected signal are generated. In the other type pilot himself finds the deviation on the TV monitor and sends the signal through the radio-link.

LASER BOMBS

In the laser bomb the target must be "illuminated" either by a circling aircraft or from a ground based operator. The bombs are fitted with passive "seekers" which sense the reflected laser energy and home on to the target. Thus, these unpowered bombs operate in a semi-active mode. The laser seeker differs from an IR seeker in many aspects. It looks at a narrow spectral band generated by laser, usually, 1.06

micron wave length. These seekers are made of silicon detector and work faster because it looks at an "illuminated spot" rather than a cone of energy as in case of IR homing devices. This brings the CEP figures to such low value.

The laser guided bombs have been developed in USA and have also been supplied to Iran and some Arabian countries. The laser guidance kit costs $ 3,000 and can be fitted to 500-2000 lb conventional bombs. PAVEWAY Laser bombs manufactured by Texas Instrument Co. are of the following types:-

1. KMU-351/A/B 2000 lb Mk-84 GP Bomb
2. KMU-370B/B 3000 lb M-118 Demolition Bomb
3. KMU-421/B 2000 lb Cluster Munition

Low Drag Bombs

A low drag bomb is ideally suitable for attacking airfields. Durendal manufactured by Engins Matra of France is an example. The bomb has a parachute which works as a break when it is released from a low height at 600 kts. An ignitor motor operates at appropriate time to give it a good impact velocity for piercing the concrete runway. Each bomb can create a crater destroying approximately 200 sq. metres of concrete surface. Several of these can be carried in an aircraft for a raid.

Air to Surface Guided Missiles

The guidance systems which have been universally employed in the air to surface missiles to achieve adequate standoff range could be of the following systems:-

(a) Passing EM Homing Systems
(b) Active EM Guided Systems
(c) TV/Optical Systems
(d) Laser Guided Systems
(e) Infra-red Guided Systems
(f) Command Guided Systems

Anti-radiation Guided Missiles

The anti-radiation missile is ideally suited for attack on radar sites and missile positions containing missile guidance radars from outside the missile ranges. These missiles can also be used against communication centres if they are radiating. The guidance in this class of missiles is passive homing type using a passive radiation seeker in the missile head.

The range of release of the missile is of the order of 10 to 16 Km from the radiating source. It can be improved upon by using a highly sensitive receiver. US Shriek missile and French Martel AS-37 are examples of anti-radiating systems which have good standoff ranges.

The anti-radiation missile can be launched from the carrier aircraft once its receiver has locked on the transmitting frequency. Since the frequency of transmission is likely to cover several bands in a missile radar, communication centres and radar network, it is normal to build several modules for various frequency bands which can be fitted and preset in an anti-radiation missile head, the propulsion and warhead remaining unchanged.

Active EM Guided Missiles

This class of missiles carries its own transmitter, and receiver in its head. The transmitter is needed to illuminate the target. Usually X and S band frequencies are used and the missile can accurately hit a target over short distances. Such missiles are useful for attack on Naval ships, missile boats and fast petrol vessels as any other method of guidance does not give the required degree of accuracy for attack at sea surface. Pakistan has acquired Exocet in this category while two other types of missiles Otomat and Seakiller MK-III are also available with active EM guidance; the latter is a short range missile of 10 to 20 Km standoff range.

TV/Optical Guided ASGW Systems

In the TV/optical guided missiles, there is a TV camera in the nose of the missile. The video output of this camera is fed into an automatic tracking circuit in the missile. The pilot manoeuvres to get his sight lined up with the target and when he does so, servo controls lock the missile's automatic tracking device on to the same target. When the aircraft is within the firing range of the missile, the air to surface missile is launched. At any time after launching, which can take place several miles from the target, the aircraft can leave for other missions. Normally in the guidance phase, the parent aircraft carrying the missile has to cover approximately half the launch range of the missile in average daylight visibility. The standoff range obtainable in these systems is 10 to 12 Kms and a CEP of approximately 10 metres.

The TV guided air-to-surface missiles can be launched against targets which may be defended by Ack Ack guns outside their firing range. However, the missiles are limited to daylight operations. Martel

AJ-168 is an example of this class of missile. They can also be foxed if a target generates smoke screens. To provide them some night vision, a lot of R&D development has to be undertaken using image intensifier techniques.

Laser Guided ASGW Systems

The broad principles of laser guided air-to-surface systems have already been stated above. Such a missile uses a target designator to illuminate the target while a sensor on the missile homes on to the reflected laser energy. The target designator can also be airborne either on a separate aircraft hovering on the target or in the aircraft carrying the missile. Most designators use Neodium Yittrium Aluminium Garnet as a laser source. This operates at a very narrow IR Band at a wavelength of 1.06μ The designator produces 10 pulses per second each of a duration of 10 ms. The beam width is only 1.6m red. For using such a narrow beam designator it has to be mounted on a stabilised platform in the aircraft. Once a target has been illuminated and the receiver picks up the reflected laser beam, the air-to-surface missile is locked on to the target. It has a CEP of 10 metres and a standoff range of 5 to 12 Kms. The laser guided air-to-surface missile has a smaller standoff range. The laser beam also gets attenuated in the atmosphere due to water vapour and other impurities. However, laser technology is growing and more powerful laser sources are becoming available. It has a great potential for further development with greater standoff ranges.

Command Guided ASGW Systems

In command guided ASGW a radar tracks the target constantly and applies guidance signals to the missile through the radio command link. This type of guidance is in use in AS-30 and RD-05 air-to-surface missiles. IR flares are fitted to the missile for air tracking and an IR tracker is mounted on the aircraft to provide a form of automatic guidance. It gives continuous data on the missile position relative to the aircraft while the pilot uses his attack sight, to provide a continuous bearing to the target. An on-board computer uses these data to derive corrective command signals which are transmitted to the missile. In this system of guidance the aircraft is locked on to the missile till it has hit the target. The aircraft in such a system is quite vulnerable.

ASGW Available Abroad

The characteristics of modern air-to-surface missiles as available at present from abroad are given at 'Appendix I. Most of the short range ASGW (less than 20 Km range) can be carried in some of the carriers available with Airforce and Navy.

CONCLUSIONS

The use of air to surface missiles can effectively reduce the aircraft attrition on targets defended by Ack Ack guns and missiles. The accuracy of these weapons and the standoff ranges are such that small assault groups can carry out a lot of damage on selected military targets without involving non-military areas and civil population. Thus targets of military value even when well defended can be successfully attacked and military potential of a would be enemy can be effectively and quickly reduced during a conflict. The use of these weapons can even pre-empt a likely conflict.

NEED FOR SELF-RELIANCE

Most of the weapons in air-to-surface role are at present being imported from US, France, USSR or UK. In India the knowhow in the field of guidance needs to be accelerated to attain some level of self-sufficiency. There are gaps in knowledge, technology and shortage of proper materials. These require to be made up in a short time, as ASGW systems are getting introduced in many neighbouring countries. In Saudi Arabia alone advanced air-to-ground standoff weapons form part of a $ 750 million contract with F-5E/F Fighter aircraft. Success in this area would depend on several inter-related factors such as the investment in Defence R&D, in creating the infra-structure in form of guidance techniques and ASGW systems. The level of industrial sophistication in the country, the quality of technical education and the availability of raw materials would determine the pace of self-reliance in this important field of defence technology. Perhaps some technical collaboration with countries willing to share this technology with adequate in-house R&D can accelerate this process.

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Characteristics of ASGW

Appendix I

Sl. No.	Missile	Wt. Kg.	Range Km.	Speed	Time to Max. Range/ sec.	Guidance	Warheads
1.	Martel As-37	530	30 when fired at M 1.0 low level	NA	NA	Passive Radiation Seeker	150 kg. proximity fuze.
2.	Martel AJ-168	550	—do—	NA	NA	Television & Radio Command & altimeter	150 kg.
3.	RB-04E Antiship	600	NA	NA	NA	Cruise : Autopilot+ radio altimeter	Fragmentation, impact+proximity fuze.
4.	Otomat	730	• Mk-I Min 6 Km Max 60 Km	M 0.9	NA	Cruise—Autopilot+ radio altimeter Attack-Mk-I	65 kg. explosive.
5.	Seakiller Mk II	270	25 Km	300m/s	NA	Beam Rider+ Command+radio altimeter, optical back up.	70 kg. SAP, impact+proximity fuze.
6.	Kormoran	600	Max 37 Km	M 0.95	NA	Cruise : Autopilot+ radio altimeter	160 kg.
7.	Shrike AGM-45	177	16	M 2	NA	Passive Radiation Seeker.	HE/Fragmentation.
8.	Exocet AM-39	650	Max 52-70	M 0.95	NA	Cruise : Autopilot+ radio altimeter attack.	165 kg.
9.	Condor	958	110	NA	NA	Cruise-Autopilot & Command from A/c.	286 kg.
10.	Sea Skua	200	I2-15	NA	NA	SAR-illumination	C. 35 kg.

The Tribals of Bihar

P.C. Roy Chaudhury

THE tribals in Bihar form about 15 per cent of the total population; the third largest tribal population in an Indian state. They are mainly the Santals, Mundas, Oraons, Hos, Kharias etc and concentrated in Chotanagpur area. Some are many thousands in number like the Santals, Mundas and Oraons, while some like the Birhors are just a hundred or two and they are dying away fast. Another declining tribe the Paharias live only on the hill tops and avoid human habitation if possible. The Birhors live only on the fringes of the forests and move away from their habitation after the fauna and flora of the area are exhausted. They would eat any living creature like rats, ants, squirrels and even snakes. The Birhors live in leaf-made huts which have an opening of about two-three sq feet at the bottom for their entrance. Attempt to settte them in villages has not been very successful.

The tribals of Bihars are at different and much varied stages of civilization. Some like the Birhors do not know ploughing at all. Some are still used to *Jhumming* that is burn the forests and the weeds and sow reeds on the ashes without the use of the plough.

Some again, belonging to the Santals, Mundas or Oraons have been to Oxford and Cambridge or the States and won blue in sports or tripos. Some of them have become successful parliamentarians. The Kharias and Hos are pulling up fast. There is more of literacy, sports and joys than in their neighbouring non-tribal areas. As a rule the houses of the Santals or Mundas or Oraons are cleaner and have more basic amenities. Culturally they are different but very distinctive. Their womenfolk have much more of freedom and pragmatic approach to life than even advanced and literate Hindu women. They have had their traditional rights to property long before their Hindu counterparts were conceded their rights. Their rules for divorce or separation are much more liberal.

The christian missionaries have played a great role in spreading literacy, sanitation and education in the tribal areas. It is a mistaken n otion that they were only keen to evangalise. They went into the most

inaccessible corners of the Santal Parganas or Palmau districts and in the midst of gross insanitation, starvation, and even epidemics, opened schools, made roads and distributed medicines.

There is no place for idolatry in traditional tribal religion but there are evidences of anthropomorphism in their concept of deities as is evident in their dreams. The religion is entirely practical concerned with happiness in this world. Supernaturalism is divorced of any ethical context.

The tribals have to earn their living by the sweat of his brow. But the drudgery of economic life is relieved by a regular cycle of festivals. Each important festival is marked by the following essential features :—

1. The houses are repaired, cleaned and painted on the occasion.
2. Offerings are made in the sacred grove.
3. There is excessive drinking of rice beer.
4. There are communal dances.

The chief festival is the *Maghe parab*, which takes place in January-February, after the harvesting is over. At each village, the festival continues for seven days, when revelry reaches the maximum on the fourth day, i.e. the date of *Marang-Maghe*. During this festival a great deal of sexual laxity is permitted and it is customary to utter foul words, indicative of the sexual act, in chorus in the presence of elders and females. The parents and guardians refrain from restricting the amorous enterprise of the youth.

The next important festival is the *Ba parab* or flower festival. This takes place when the *sal* tree is in bloom for the first time in the year. *Sal* flowers are gathered by the village youths and dames and at the sacred grove, offerings are made to the village tutelary deities with new *sal* blossoms, rice-beer and fowls' meat; *puja* is followed by dancing. The dancing is comparatively quieter than in the case of the *Maghe parab*.

The most favourite amusement of the Tribals is group dancing. Each village has its dancing ground or *Susan akra*. Now-a-days dancing is restricted only to specific festivals or on occasions of marriage. Each occasion has its typical rythm and movement. In some of the dances, i.e. *Maghe* dance or marriage dance, boys and girls join together. A boy and a girl standing alternatively in the circle the movement is alternatively anti-clockwise and clockwise. At the centre of the dancers stand young men with drums, violin or *banam* and *flutes* or *ratu*. Dancers follow the beat of drums, sometimes dances are accompanied by songs

but often the dance only takes the lead from a song. The *Maghe* dance has particularly fast and amorous movements In the *Ba* dance only the women stand in the circle while the boys participate merely as musicians. There is no special dress for dancing.

Cock-fighting is also a popular pastime. At every weekly market, or hat may be found a number of tribals collected in a corner of the market place indulging in this sport. Betting is done.

Hunting, which was probably in the past a regular means of livelihood, is today at least a favourite pastime in those parts where patches of jungles still persist near the settlements. The grand season of hunting is between January and June.

In their social organisation the following groups play most important roles (1) the family, (2) the *tonda* or settlement group, and (3) clan. The family is invariably of the simple type with father at its head. *Tonda* has a headman called *nava* who is also the priest of the groups. He has his assistant known as the *kotwar* or *diguar*. The members of the *tonda* group go out together for communal hunting, the most important of which is the monkey hunt or *geri sendra*.

The tribe is divided into a number of exogamous patrilineal clans, called *gotras* mostly named after some animal, plant, fruit flower or material object, such as *andi* (wild cat), *bonga sauri* (a kind of wild grass), *geroa* (a small bird *Gidhi* or vulture) and *hembrom* (betel palm) etc. There is distinctive association of totemic tamboos with the clan names, a Birhor must abstain from killing, destroying, maiming, hunting, injuring, eating or otherwise using animal, plant or other object that forms his clan totem, or anything, made out of or obtained from it. Thus the men of Murum clan cover their eyes when they happen to come across a mumrum stag.

Marriage is considered indispensable for every tribal and adult marriage is the usual rule. There are ten different forms of valid marriage among some tribals like the Santals and the Birhors, viz, *Nam-napam Bapala* (love marriage), *Udra Udri Bapala* (elopement marriage), *Balo Bapala* (intrusion marriage), *Sipundur Bapala* (forceable anointment of the bride's forehead with *sindur* at a public place), *Singha Bapala* (widow remarriage), *Hirum Bapala* (a married man marrying for the second time while the first wife is alive), *Kiring Jawae Bapala* (bought son-in law marriage), *Golhat Bapala* (marriage by exchange of mates between two families), *Bing Raihi Bapala* (a marriage without payment of bride-price), and *Sadar Bapala* (a regular marriage by negotiation between the guardians of the two groups).

The magico-religious beliefs and practices are practically identical with those of the tribals. The tribal's whole life, economic, domestic and socio-political is pervaded by his belief in supernaturalism. Typical Mundari deities like *Sing bonga* (Sun God or Supreme Being), *Haprom* (ancestral spirits), *Buru bonga* (ancestral family spirits) rank highest in tribal religion. Contact with Hindu neighbours has left little impression on the essential structure of their belief in supernaturalism; only some Hindu deities like Debimai, Kalimai and Mahadeb have been included in their pantheon.

The tribals have an established reputation of being more law abiding and honest.

The folk literature and songs among the Adibasis have been preserved from generation to generation by repetition even in the absence of the written script. Roman script was introduced by the Missionaries.

Witch-craft among the Adibasis has naturally affected the various castes that live in the same village of the Adibasis. Non-Adibasis also report to the *sokhas* or witch-doctor for the cure of some illness, if any misfortune has to be avoided.

As to ownership of property, the Adibasis seem to be perfectly conscious of the right of the individuals and of the family. Ownership of any object in common by a group larger than family is not known, except for the public places in the village like the sacred grove, dancing area and so on. But there is a good deal of co-operation in economic matters. Exchange of agricultural labour is very common and communal hunting and fishing with equitable distribution of the spoils indicate their collective spirit. In thatching a new house it is customary that the adult males in the hamlet or *tola* are to co-operate in the work in the return for only a sumptuous drink of rice-beer. In agriculture, transplanting and weeding are the principal operation done by the females whereas ploughing and sowing are strictly the work of males. Harvesting and thrashing are done both by males and females.

Boiled rice is decidedly the common staple food of the Adibasis. Even the wild Kharias and the wandering tribals who do not practise agriculture but procure rice in exchange of their collected jungle products or manufactured articles depend on rice. Next to boiled rice, home-brewn rice beer, known generally as *handia, illi* or *diang*, is an important item of diet. To them it is the much cherished life-giving fluid. The other rice preparations are chapped rice or *chira* made by the Bagtis or the Bhuiyas, puffed rice or *muri* and rice powder cakes or *lahu*. The *mahua* tree (*Bassia latifolia*) provides them with a variety of food, the flower gives the distilled liquor, fruits are powdered to make cakes and the seeds are pressed for oil.

With progressive deforestation leading to gradual extinction of wild fauna, meat does not form a regular item of food now. The domestic animals and birds do not adequately compensate as these are kept either for sacrifices to spirits in time of urgency or sold for cash.

The low agricultural lands holding water during the rains and the *bunds* are the main fishing grounds. Small fishes are more or less regularly caught with basket traps, so that the intake of fish is probably more regular than that of meat.

Every house has generally an attached plot for kitchen garden, where common vegetables, like spinach, pumpkin, gourd, brinjal, cucurbitas, etc are grown. Recently vegetables like cauliflower, cabbage or tomato are also being introduced. Besides kitchen garden products, the forests supply with some edible roots and fruits. Pulses, such as *rahar* and *khesari* are grown on uplands and are regularly taken. Oil is sparingly used as a cooking medium. Spices are simple, namely chillies and turmeric. The Manki-Munda section of the population, that is the upper class, have very nearly adopted the diet habits of their more affluent Hindu neighbours.

The dress and ornaments have changed considerably in the last fifty years. Formerly the adult male used to put on only a piece of cloth ($4\frac{1}{2}$' x 10') known as *botoi*. The women, too, used to put on a *lahanga* covering the portion from the waist down to the knees while the rest of the body remained uncovered. Flowers are used for decking the hair and bead and silver trinkets for the body.

Now-a-days, except among the so-called wild Kharias of Dhalbhum and the Birhors, the men generally put on a *dhoti* to cover the lower parts and wearing a guerhsey frock or shirt is fairly common. Among the factory labourers the use of shirts is becoming common.

For the women, an upper garment is considered essential, to-day, particularly in the presence of *dikkus* or foreigners. The handloom *lahanga* has largely given way to mill-made sari. One end of the sari covers the breasts. Formerly the lower end of the sari did not hang far below the knees, but today it often stretches to meet the ankles in imitation of the Hindu neighbours.

Though the factor of kinship bond is supreme in their social organisation, there is some definite social consciousness due to life within the limits of a village. The village or *hatu* has its own sacred grove, tutelary deities, headman or *munda* and the priest or *deuri*. The village has its council or *panchayat* and the major festivals are organised communally. Further the inhabitants of the village are also often genealogically related. All these factors together make the inhabitants strongly conscious of the village affiliation.

Contd. on page 394

Book Reviews

INDIA AND UN PEACE-KEEPING ACTIVITIES : A CASE STUDY OF KOREA, 1947-53
by ALKA GUPTA
(Published by Radiant Publishers, New Delhi 1977) pp 163 : Price Rs. 35

SHRIMATHY Alka Gupta's case study of Korea covers the period 1947-53, with special reference to India's contribution, under the aegis of the United Nations. In fact, the focus is on the yeoman service rendered by India, both diplomatically and militarily to bring about a peaceful settlement of the crucial issue of repatriation of prisoners of war, which had defied a solution for long. Had such a solution not been found, the Korean War could have escalated.

The Korean War had many firsts. For the first time a UN military command functioned in the battlefield : Communist China's forces were employed outside China; and many developing nations demonstrated their fear of colonial powers attempting to re-establish their hegemony through dubious ways. India had a sensitive role to play. Her sincerity, humanism and neutrality have been acclaimed by all. But, with hindsight, one cannot help feeling that we should not have ventured into such a hazardous adventure without a far better understanding of the complexities of the issues involved. The brilliant performance of the commanders and troops brought about an acceptable conclusion. Such a blissful termination has over-shadowed the serious risks the Korean venture entertained for India and the world.

Politically, India had advocated that "Force shall not be used against the prisoners of war to prevent or effect their return to their homelands, and no violence to their persons or affront to their dignities or self-respect shall be permitted in any manner or for any purpose whatsoever". In its style of functioning and actual execution of duties, the Custodian Force found such a restriction to hamper its efficiency. Such an unconditional and voluntary limitation probably encouraged a dominating and vociferous minority to stifle the wishes of many individual prisoners. For, the bullies knew that as long as they could dominate the prison compounds from inside, Indian troops were handicapped to separate the sheep from the goat. The psychological impact, and consequential practical difficulties which would accrue by abjuring the use of

force could not have been fully realised when our country took such an equivocal stand on this issue.

Normally, prisoners of war find themselves at the mercy of their captors consequent to their low morale, and enforcement of discipline would require only a show of force. The situation experienced by the Custodian Force was of a very different order. The prisoners of both sides were fully indoctrinated of their virtual immunity from the use of force by Indian troops. They were well organised into batches, which forestalled the display of initiative by any individual prisoner. Above all, there was vigorous and effective leadership within the prison camps. All these the Custodian Force came to know only later. Under such circumstances it was virtually impossible to fully execute the mandate of 'Explanation' by opposing forces. This turned out to be a partial omission, which could not be fully rectified under the Terms of Reference, within the given time.

At one stage NNRC & CFI were confronted with a worsening of the situation which could have resulted in the Indian contingent having to stay in Korea indefinitely. This was prevented more than anything else, by the sagacity and tactfulness of Generals Thimayya and Thorat.

It is not known if Indian political leaders had obtained the views of Army authorities before making the statement to abjure the use of force. Nor is it clear if Army Headquarter in India had a clear conception of the effect of indoctrination carried out on Prisoners by both sides.

For, "ahimsa" was a tactful admission of "uti possidetis" ie the principle of leaving belligerants in possession of what they have gained. This compromised the effectiveness of troops. What remained was only the moral force, and the force of habit—both by themselves inadequate for such a vital mission. In-built in the agreement, there should have been a discretionary clause for the use of minimum force, to effectively execute 'Explanation'. Perhaps, such a condition might have vitiated the delicate political arrangements reached after prolonged bargaining. After all, politics is the art of what is possible ! However, having taken the decision, the Custodian Forces should have been properly briefed that it was on a trusteeship mission, and not on a genuine prisoner of war mission. That message reached the troops fairly fast—through trial and error. But there were misunderstandings to begin with. There were officers in Korea and India, who missed the subtle and delicate character of the mission, and preferred the use of force to gain moral ascendency over the prisoners of the belligerants.

Alka Gupta has faithfully brought out this historic episode in its proper perspective. Her style is eminently clear and captivating. The fact

that the use of "Custodian Forces" was not attempted again confirms that there are complexities and inherent dangers in their functioning to settle similar situations. Nevertheless, one feels that should the voice of mankind call out for a similar venture, India should not be found wanting to take legitimate risks. Where our intentions are noble, and methods above suspicion, cooperation would be forthcoming and solution would be found for any challenging situations. Korea was such an instance.

TNR

MILITARY HISTORY OF BRITISH INDIA (1607-1947)
Edited by H. S. BHATIA
(Published by Deep & Deep Publication, New Delhi) pp 256 : Price Rs. 60

BEGINNING with the grant of a charter by Queen Elizabeth to the East India Company on the last day of the year 1600, the book traces the military history of India up to the departure of the British in 1947.

The British conquest of India was the first in the history of the sub-continent to be effected from the sea and it was also the first which had its beginnings in trade and was not a purely military invasion.

In these two respects, it differed from all earlier invasions which came through the land-route across the north-west frontier and the invaders were accompanied by military forces to overcome the local opposition. The Mughal empire (to which the British empire may be said to be the successor) took care to maintain large standing armies to buttress its authority but it never built a strong navy. Evidently the Mughals did not aspire to rule the sea, across which came the European trading nations who ultimately gave a new turn to the history of this land.

The first Europeans to come to India (and the last to leave) were the Portuguese. They established direct trading connections with India making Goa on the Western coast as their centre of activity. Then came the Dutch and the British, but the success of the Dutch in the East Indian Islands (the 'spice islands' as they were then called) drove the English to concentrate on developing trade with the Mughal empire in India, despite Portuguese opposition.

The last of the European nations to develop interest in the direct trade with India was France, whose East India Company set up trading stations at Pondicherry and elsewhere and became rivals of the English there as in America.

The struggle between the British and the French in India was fought out in the later stage of the general overseas conflict of the two powers between 1740 and the peace of 1763. And in this, the British were finally successful. Thus by the close of the Seven Year War, Britain was supreme in both North America and India.

The editor of the volume under review remarks in the preface that though the English arrived as professed traders and merchants, almost all their ships were of the type of battleships and brought cannon and other warlike stores and the settlements of the East India Company had artillerymen forming a portion of the guard maintained for their protection. If he is implying that trading was only a cover for the underlying military and imperial intentions of the British from the beginning, a historian would find it hard to agree with him. The English company had to have troops for the struggle with the European rivals for the profitable commerce of the East, and the settlements, or factories as they were called, had to be protected against not only other Europeans but also from local chiefs. The disintegration of the Mughal empire had started during the last years of the reign of Aurangzeb and the process had accelerated after his death in 1707. Though the Honourable East India Company had started its activities with permission of the Mughal emperors, the writ of the central authority at Delhi did not run effectively in the outlying parts of the empire. The Company thus could not look to authority in Delhi or Agra for protection, and had perforce not only to maintain a force but to enlarge it by recruiting Indian sepoys (other ranks) trained and drilled by British Officers. After various changes in organisation and composition, the army became a powerful instrument for the creation of the British empire in India.

That the British created this instrument for their own benefit—first for protecting their trade, settlements and factories against European and Indian adversaries and later for building up the empire and holding it—is an accepted truth of history. But the fact that they left this well-oiled machine as a legacy to free India is a matter for gratification and pride.

The rise and growth of the British military system in India makes a very interesting story which has, however, not been told in its entirety in any single volume. There are several books dealing with particular aspects or periods of this story but it is not possible for every one to read all those. Mr. Bhatia has done a great service to students of military science and history in putting the different relevant bits into one single whole and linking them together with his own editorial notes in the beginning of each chapter. The result is a delightfully informative and readable volume albeit a brief one. The difficult task has been performed

admirably and one can easily see the great deal of reading, research and discriminative selection which it must have involved in producing this well documented and authentic volume.

Apart from the historical background and the evolution of the armed forces, their organisation and composition etc, there is a very interesting chapter on military adventurers and soldiers of fortune both European and American. Such adventurers found a fertile field for their activities in the unsettled and confused state of the polity in India with the country broken up into a large number of warring states, each trying to strengthen its position by hiring foreign soldiers to train its troops in the European system of warfare. A more detailed account of some of these soldiers of fortune can be found in the books of Alexander Innes Shand, William Franklin and Lester Hutchinson and others. But Mr. Bhatia has given enough glimpses of some adventurers and freebooters, both European and American, to whet one's appetite for reading more about them.

The book has a number of illustrations, some of them rare ones, a useful key to important terms, chronology of relevant events from the year 1600 to 1947, some appendices, a bibliography and an index. One of the appendices gives a complete list of the Commanders-in-Chief of British India beginning with Stringer Lawrence (1748) to Auchinleck and another has a small note on India's defence organisation of today.

The book is thus an account of the military system in most of its important aspects but one cannot agree that it is a detailed account as the blurb claims. Some of the matters have been treated too briefly and there is no mention at all of Indianisation of the army. The INA, or the Azad Hind Fauj, and the Naval mutiny of 1946 are dismissed in one or two lines each and that too in the chronology. But this need not detract from the usefulness of the compilation which eminently serves the purpose of a handy reference book which is a must for all good libraries and students of British Indian History, particularly of military history.

P. N. K.

PERSONALITY ASSESSMENT THROUGH PROJECTIVE MOVIE PICTURES

by S.L. DASS

(Published by S. Chand & Co. (Pvt) Ltd, New Delhi, 1974) 203 P. Price Rs. 25.00

THE book by Dr. Dass is in fact a Thesis for a Doctorate Degree (which has been awarded to him on this basis, by the Punjab University)—later presented and published in book form.

The outlook of the author has been to arrive at a better assessment of "Personality" of candidates who come up for selection tests in fairly sizeable groups. (The necessity of the work was conceived while the author was working for the Services Selection Boards).

As compared to Murray's "Thematic Apperception Test" which is based on "still"-pictures (being shown to candidates), on which the candidates are called upon to write cogent, connected and complete (short) stories within laid-down time limits, — Dr. Dass has suggested the projection of silent "*motion*"-*pictures* of the same duration (as of the stills), on themes more carefully selected, to bring out the various component elements of a candidate's personality.

It has been asserted that the "actions" of the characters of the movie pictures, kept silent, can provide much better scope to the candidates, — who can project their own feelings, emotions, desires and anxieties much more freely and intensely (than in the cases of the still pictures).

A considerable amount of thinking and preparatory work had been involved in the project. A system of marking the scores of the candidates (carefully devised) was followed by the examiners. The project has been verified through actual tests conducted on the final and pre-final year students of several Schools.

Co-operation was received from the Teachers of the schools concerned, from post-graduate students of psychology, and from a number of Psychologists.

The "scores" of the students were verified independently by different examiners and then correlated. And much statistical verification followed thereafter.

Personality of an individual is undoubtedly a "nearly intangible complex" influenced by very many factors commencing from heredity and environment. Qualitative and quantitative assessment of the various traits of personality by the psychologists has been regarded as a very useful tool in the selection of candidates.

The present work has been offered as a "better tool" in the hands of the psychologists, — and from this point of view, is of sufficient interest. The author himself has put forward the requirement of further work and independent verifications by others in the field.

The book is well produced and easily read, but being basically a piece of research work it suffers from the affluence of data, tables and appendices which must necessarily form part of a thesis.

S.D.S.

COMBAT AND COMBATANTS

by SQN LDR K.N. PARIK

(Published by Sunrise International, New Delhi 1977) pp 149 Price Rs. 40

THIS is a monograph on Leadership and Morale by an author who is admirably equipped by background. The chief merit lies in the exposition of the central idea in simple and understandable language and its discussion against typical Indian conditions—an effort which meets the long-felt need.

While some of the conclusions about the fighting efficiency of individual Vietnamese soldier or the prescription about the combatant's sex life may not bear deeper scrutiny, being up-to-date is the forte of this book.

The author's analysis of the paramountcy of group inter action is a useful antidote to the normally prevailing confusion about the place of individual morale. The most outstanding contribution of the author is to focus our attention on the hither to dark area : the need for a harmonius but unequivocal blend of national and military ideals. Lines of inquiry into this field are shrouded in the mists of aberrations and misinterpretations. As a result, the reflective combatant is often saddled with an avoidable dichotomy.

The author has been candid about the banes of sexual promiscuity; but the solutions suggested are utopian. The crying need for adequate recreational activities, rest and recuperation centres, hobby schemes and so on should have been dwelt at length.

In discussing the types of leadership, the trait approach has been unduly emphasized. Similarly the 'motivating' factors should have been stressed as superior to 'maintaining' factors. The interpretation of the indices of morale in the present day context is highly value laden. A smartly turned out quarterguard or a well appointed officers' mess need not always reflect high morale.

The problems and pitfalls of leadership have been brilliantly analysed and the essential ingredients of senior subordinate relationship ie mutual trust, confidence and respect, correctly identified. The author needs to be congratulated on his endeavour to make us increasingly aware of the importance of purposeful training for leadership.

The psychology of the flying and sea faring men is tastefully dissected in relation to their respective requirements. The chapters on the 'guerilla' and the psychological warfare appear out of tune with the general tenor, as they do not either modify or reinforce the previous conclusions.

From the vast mass of available material on combat and leadership, the author has painstakingly gleaned the more critical segments that are important in our context and woven them to an impressive design of lasting value.

KMB

WAR IN EUROPEAN HISTORY

by MICHAEL HOWARD

(Published by Oxford University Press, London, 1976) pp 165 Price £ 1.50

THIS publication under review deals with the evolution of War in Europe since the early Middle Ages. In fact, political entities in Europe as in other regions of the world were built and rebuilt on the anvil of war. The author has categorised the wars in Europe chronologically as (1) The Wars of the Knights, (2) The Wars of the Mercenaries,, (3) The Wars of the Merchants, (4) The Wars of the Professionals, (5) The Wars of the Revolution, (6) The Wars of the Nations, and (7) The Wars of the Technologists. He has also discussed war in the nuclear age. He has analysed the strategies and tactics, weapon systems and the socio-political factors, that helped in evolving them. The wars of the Knights in Europe, based on feudal economic base, came to an end with the French invasion of Italy in 1494, when Modern European History could be said to have begun. The French infantry and artillery men now served not for feudal obligations and benefits, but for pay. The mercenary wars of 15th and 16 centuries came to an end in the 17th century when the princes turned to merchants and overseas trade for more and more money to meet the ever-increasing costs of war. With the discovery of new lands, establishment of overseas trade through the formation of trading companies, and the growth of naval power, based on the fire power of guns, the wars of merchants began. War, in this era, has been described by Howard as "a continuation of commerce with an admixture of other means." By the 18th century, the war like activities of the trading companies were increasingly subordinated to state control, and towards the end of that century 'professionalism' and 'patriotism' became important factors in European wars. It was the Dutch wealth, derived from overseas trade, which, for the first time in Europe, enabled the United Provinces to maintain a regular army throughout the year. Gustavus Adolphus of Sweden followed it, and then the French, the Prussians, and others. Large standing armies needed an efficient state to organise royal income and expenditure, supply and logistics. It has been said that the Prussian State was "called into being to provide for the needs of the King of Prussia's army." The replacement of the matchlock musket with flintlock firing system and the invention of the ring bayonet in the last two decades of the 17th century revolutionised infantry tactics.

The wars of the Revolution synthesised the 'professionalism' of the ancient regime and the enthusiasm of nationalism and patriotism. Military professionalism was not forgotton in the post-Napoleonic era. All the major European powers had set up or reconstituted their military schools for the professional training of their officers (the Royal Military College of England, the French one at St. Cyr, the Prussian Kriegsakademie in Berlin, and the Russian Imperial Military Academy were set up in 1802, 1808, 1810 and 1832 respectively). The size of the armies also increased gradually as a result of the solution to supply problems. The size of the European armies, limited to about 80,000 men in the eighteenth century, rose by five or even six times in the early 19th century, as in the case of the Napoleonic invasion of Russia in 1812 when the invading French army numbered 600,000. With the introduction of the railways and the electric telegraph the problems of supply and command became easier to tackle, and in the Franco-German War of 1870 the Germans deployed 1.2 million men, while in 1914 the German figure rose to 3.4 millions, with comparable increase in the armies of other big European powers. During 1815-1914, as the revolution in communication transformeds strategy, so the innovations in the weapons technology changed tactics. Rifling of small arms, replacement of the flintlock firing mechanism with the far more reliable percussion cap, and the development of the steel breech-loading cannon by Krupp extended the range and accuracy of the small firearms and artillery. By the end of the 19th century European society was militarized so much that the next century witnessed the wars of the nations based on the mobilisation of the working classes through the ideologies of nationalism and socialism.

The introduction of the tank, radio wireless, submarine, aircraft, radar and atomic power has made the present day war a war of technologists, and revolutionalised the power of weapons and equipment unbelievably. While the First World War yielded a total of 13 million dead, only two atomic bombs killed 130,000 people in 1945. Although mutual deterrence has not allowed the big powers to start another world war, the author has concluded his book with the following note of caution :

> "Nothing has occurred since 1945 to indicate that war, or the threat of it, could not still be an effective instrument of state policy. Against peoples who were not prepared to defend themselves it might be very effective indeed."

The book contains chapter-wise notes for further reading. It gives, a masterly analysis of the development of war in Europe, in all its aspects. which every student of military history will find interesting and instructive

BC

Correspondence

Correspondence is invited on subjects which have been dealt in the Journal, or which are of general interest to the Services.

To
The Editor
'USI' JOURNAL
Kashmir House
King George's Avenue
New Delhi-110011.

I

ORGANISING FOR EFFECTIVENESS
AN OUTLINE REVIEW OF THE ARMY ORGANISATION

Dear Sir,

I have read with interest Brig. RA Rajan's article 'Organising for Effectiveness—An outline Review of the Army Organisation'. His main preoccupation in this article seems to be with the reorganisation of the supporting arms to some extent and the services in particular. In fact, he states that 'the present pattern of organisation and command and control of Infantry, Armoured and Artillery organisations need not be disturbed'.

The firepower and fighting effectiveness of the Army will not necessarily be improved by the reorganisation of the supporting arms and services only. The author would have done greater service to the Army if he had highlighted the need for re-organisation of the 'teeth arms'. He could have dealt with the need for missile regiments and whether they should be manned by the armoured Corps, infantry or artillery, the justification for training centres for each of the infantry regiments in contrast to the Armoured Corps and Artillery, the utilisation of the vast manpower in the 'teeth arms' on nation building activities during peace time and various other topics which would also have resulted in financial and other gains also, besides improving effectiveness.

Brig. Rajan has mainly dealt with the need for the reorganisation of ASC, AOC and EME. The recommendations in respect of ASC and AOC are on the lines followed by the British Army, though the article has not covered in sufficient detail, the role of the Transport Corps and Logistics Corps.

In dealing with the Corps of EME, he has suggested that a Corps of Electronic Engineers and a Corps of Mechanical Engineers should be formed. It is doubtful whether the author has considered all the implications while making such a recommendation. Electronics are an integral part of AFVs, guns and especially anti-aircraft guns and various other equipment. In the repair of such equipment, the mechanical systems are dependent on the electronic systems and vice-versa. If the responsibility for the repair of these equipment has to be shared by the Corps of Electronic Engineers and the Corps of Mechanical Engineers, the results can well be imagined. Today in the training of EME personnel on AFVs and Armament, both mechanical and electronic systems are covered.

The author has further suggested that the role of the Army Base Workshops EME could be taken over by the Public and Private sector undertakings. I wish to point out that this is not a novel idea. Soon after the events of 1962, this same idea was mooted at very high levels at Army HQ and the Ministry of Defence. A Committee was set up by the Ministry consisting of a representative each of the Ministry of Defence, Ministry of Finance (Def) and Army HQ. The broad terms of reference were to examine the need for Army Base Workshops and if such a need existed, the number of workshops required and their location. The present Armys Base Workshops and Base Workshops are in line with the recommendation of this Committee, which were virtually accepted in toto by the Ministry. I do, however, agree that there is no harm in re-examining the proposal.

Firstly, it should be remembered that the Army has a large quantity of imported equipment for the repair of which no facilities are available in the country. In spite of the rapid advances made towards indigenisation of equipment, the Army will continue to hold imported equipment for many more years. Secondly, equipment manufacturers rarely accept responsibility for the repair and over-haul of equipment. Commercial type of equipment used in the Army is generally restricted to 'B' Vehicles (GS) and some of the lesser important equipment. As far as 'B' vehicles (GS) are concerned, they are governed by the discard policy and their over-haul is not a major commitment of the Army Base Workshops. Further, as far as I remember, it was the Corps of EME that had persuaded the Ministry of Defence in the 1950s to permit the over-haul of some 'B' vehicles in the private sector. This experiment failed miserably and I wonder whether the vehicles have even now been returned to the Army as it had resulted in protracted litigation. It is unnecessary to give details of further attempts made from time to time to persuade public and private sector undertakings to accept the repair of Army equipment.

As far as R & D is concerned, while I am inadequately informed, I would like to point out that it is upto the Army to utilise the resources

available to better advantage. R & D in Defence needs to be further strengthened with suitable manpower and funds. Whilst it is essential to utilise the resources available outside Defence, there is little justification for contemplating reduction of Defence R & D. I suggest that the DCOAS and MGO, supported by DWE and the Directors of various arms and services should associate themselves more actively and intelligently with the activities of Defence R & D.

To sum up, the suggestions made by the author are not novel and do not indicate a fresh flow of ideas towards organising for effectiveness. The author would have done better if he had thrown up ideas on how to improve fire power, inter communications, mobility and other important aspects rather than the oft repeated desire to tailor the 'tail'.

The Enfield India Ltd.
Royal Enfield Buildings
P. B. No. 5284
Madras-600019
7th September, 1977

Lt Gen C. Sundara Rao.

II

Dear Sir,

I have read with interest the article on 'Organising for effectiveness—an outline review of the Army Organisation' by Brigadier RA Rajan (Retd) appearing in the October-December, 1976 issue of your journal. However, I do not agree with his views on the combat Engineers. With the introduction of sophisticated and heavier equipment not only in the Corps of Engineers but the Defence Services as a whole for whom the engineer support is provided by the Corps of Engineers, it is not entirely a field engineering or civil engineering role. No engineering task can be executed by one discipline only—it requires an inter disciplinary effort ie of civil, mechanical, electrical with the knowledge of other disciplines such as electronics, aeronautical, marine engineering and so on. A combat engineer therefore, must possess an engineering degree by virtue of which he acquires basic knowledge of all disciplines to undertake any such complex tasks, particularly when the standard equipment is in short supply and a military engineer has to depend on improvisation with local resources.

Regarding Military Engineering Service (MES), though it performs the same function for the Defence Services as the CPWD/PWDs perform for the civil except that MES which is 50% militarised in the officer rank and $33^1/3\%$ in the subordinate ranks is specially trained to translate the

requirements of the users and continues to provide works support in the Communication Zone during an Emergency such as maintenance and repairs of airfields and other defence installations. Both in 1962 and in 1965 a number of works were entrusted to CPWD and State PWDs, but it did not prove successful. The users, there after, were reluctant to entrust any more works to them as no control could be exercised on the time of completion or cost of such works. A number of works have already been entrusted to Border Roads Organisation (BRO) in sensitive and inaccessible areas such as Ladakh, Tenga Valley, H. T. Road. But BRO is an expensive departmental organisation and eats into the meagre funds available for capital works and maintenance.

Corps of Engineers have been short of officers cadre since Independence and introduction of graduate entry, Short Service Commission, Special List Cadre or Direct University entry have not helped to mitigate this shortage. Therefore, College of Military Engineering must continue to run degree courses not only for the NDA entry but also for the direct entry into IMA and Short Service Commissioned Officers granted regular commission. The biggest advantage is that these courses are job-oriented and an officer on graduation is fit to take his place in the Corps of Engineers to take on any task assigned to him.

64, Friends Colony,
New Delhi-110014
1 November 77

Lt Gen B N Das

III

Dear Sir,

THE article 'Organising for Effectiveness—An Outline Review of the Army Organisation' published in September-December 1976 issue of the Journal is quite thought provoking. The 'Law of Dependency', the deterimental effects of conflict and friction in any organisation, the state of tension or dissatisfaction amongst the arms and services due to unequal distribution of power and responsibilities, the dynamic nature of army organisation and how the three basic components of an organisation—viz the skill, the responsibility and authority should be balanced for achieving satisfaction and efficiency in an organisation are brought out clearly and vividly. The thoughts thus provoked and extended to the functional requirement of 'Electronics Engineers' in the Army are brought out in the following few lines.

As science and technology is advancing, Electronics have revolutionised the same. Electronics have made such a rapid growth in the recent past that they have pervaded almost all walks of life and defence is no exception to this all pervasive nature of Electronics. However, one should not bypass the fact that electronics is not independent by itself

but it has given rise to system concept. Electronics is a part of weapou system, communication system, surveillance and radar system, computers to mention a few. This being the nature of electronics, it goes to say that electronics engineers also cannot stand out and exist as a separate entity, at least in defence organisations. Today's electronics engineer must be a systems trained officer who should be able to visualise the system functioning and how electronics fit into that system.

Let us take for example a sophisticated equipment introduced and in use in the army—an equipment in which a radar, computer and weapons are mounted on a tracked vehicle; a stabilisation system provided to stabilise the above equipment. While on move, a communication system provided for data transmission to other elements of the organisation. This system, when broken down into various disciplines of engineering, consists of :—

(a)	A tracked vehicle	—mechanical engineering
(b)	Radar and computer	—electronics engineering
(c)	Guns	—armament engineering
(d)	Stabilisation and control eqpt.	—control system engineering
(e)	Communication sets	—electronics engineering

Let us now consider the repair organisation which has to maintain, diagnose the defects, analyse the defects, rectify the faults, test the system for its tolerances and keep it in operationally fit condition at all times. If the equipment enters the repair organisation, the latter should be able to give attention to all the sub systems of the equipment. Electronically the equipment may be at its peak performance limits, but it is of no use unless it is mechanically reliable and its guns can fire. Such being the requirement, the repair organisation also should consist the skill of all the above engineering branches.

On the other hand if the electronics engineers is a separate organisation, the equipment has to be taken to two or more organisations to make it road and battle worthy. This procedure increases the equipment down time apart from increasing the organisational complexity.

Also it is worthwhile to remember that any engineering branch cannot exist without ancillary support and administrative staff. This perforce means duplication in effort, creating and expansion (Parkinson's Laws) of a separate organisation and the inevitable burden on the exchequer.

The Electrical and Mechanical Engineers is well geared up to be the complex repair organisation. Every person in the EME (Supervisor level),

is given the know-how of systems concept in the army and a working knowledge of electronics. In the second and third steps, they are made to specialise in various disciplines of engineering. Persons thus trained, posted in a proper proportion to the repair agencies, will be in a better position to ensure the battle worthiness of the sophisticated equipment.

To separate electronics engineers from the present repair organisation is, to say the least, akin to splitting the medical corps into different corps like medicine, surgery, orthopedics, skin and so on, which is not viable and responsive to functional requirements which are the aims of the author,

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Contd. from page 79

It is a fact that though pre-marital chastity is not a must, post-marital chastity is, more or less, insisted on. Divorce is easily obtained by the women for impotence, incompatibility or other serious domestic unhappiness. An offence against a woman is taken as an offence against the society and the aggrieved person can even kill the offender. The *Bitlaha* is a terrible punishment given by the Santals by desecrating or destroying the homestead land, crops or house of the offender and maiming him physically. The *Bitlaha* is done by giving due notice to the offender and proclaiming the fact in different markets for weeks. Usually the offender runs away from his house and village for good. The woman who is molested is taken back without any hesitation if she was not a willing party.

The tribals of Bihar are sensitive and in the last one century had a number of risings. They are now politically very conscious and think they have had a raw deal in the past. Jaipal Singh, a Cambridge Hockey Blue and a seasoned parliament member was a Christian Munda and had spear-headed the movement for one state for all the Adibasis from Ascusol in Bengal to Bhilai in Madhyapradesh - the Jharkhand movement. This is the richest area for minerals and forest wealth in India. The movement had become moribund in the later years of Jaipal Singh. It is again being revived. But there is a discordant element now. The non-Xian tribals do not now see eye to eye with the Christian tribals and think in the past the Christian tribals have had the best of the two worlds. The Adibasis of Bihar have their political aspirations in common with those of Madhya Pradesh, Orissa and Andhra. The Adibasis are at a cross-road today and they need a careful handling.

Secretary's Notes

SEASON'S GREETINGS

As we come to the end of 1977, I would like to thank you personally for the keen interest that you have taken as member of this Institution which has helped to make 1977 another rewarding year in the life of the Institution. The Institution such as ours necessarily draws its strength and vigour from the support it receives from its members. I am sure that you will continue to associate yourself with its activities. I will also request you to enrol at least one more member for the USI so that the Institution is able to further expand its activities.

I wish you a happier New Year.

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The Council of the United Service Institution has agreed to certai benefits to members of the Royal United Services Institution for Defence Studies, London on reciprocal basis. Thus any paid up member of the two organisations, when visiting each other's country can now take part in any functions organised by us such as lecture/seminar and use of library without any additional charges.

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CORRIGENDUM

USI Journal July—September 1977 Page 244 Article on First Round Hit in Tank Versus Tank Engagement

by BRIGADIER RD LAW (RETD)

The explanation of Curves A, B & C omitted be read as follows :—

A = Visual Estimation

B = Simplified Fire Control System.

C = A fully integrated Fire Control System.

U S I

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