

Optimal Resource Allocations for Defence and Inter and Intra-Service Sharing

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“The world is inhabited by peaceful and peace-loving people and though even the peace-loving people will often have some differences among them, they must, nevertheless co-exist, as the only alternative to co-existence is co-destruction. This calls for cost-effective defence strategies, aimed at credible defence, because if you wish for peace, you need to understand war and be prepared for it, though not at the cost of the suffering humanity.”

- Pandit Jawaharlal Nehru

Defence sector has a significant share in world economy and trade and accounted for more than Rs. 45 trillion in 2005, almost 2.5 per cent of the world GDP. In international arms trade, the top exporting countries are Russia and the USA, and the top two importers are China and India. Arms imports by India in the 2001-05 period is estimated at over Rs. 3600 billion at constant 1990 prices. For a developing country like India, the opportunity cost (in terms of alternatives foregone) of the marginal defence rupee is much greater than for relatively more developed countries. Therefore, it is imperative to seek optimal utilisation of defence budget.

One look at the Inter-Service budget allocations in the current financial year indicate that the Army has the lead with a budget of Rs. 45,684.51 crore (47.59 per cent of total budget), followed by the Air Force at Rs. 27,021.74 crore (28.15 per cent) and the Navy bringing up the rear at Rs. 17,529.44 crores (18.25 per cent). The allocation for Defence Research and Development has gone up by Rs. 433.49 crore, and it now stands at Rs. 5887.22 crore, representing 6.13 per cent of the total budget. On the face of it the allocations appear Army-centric.

There is a need to study budgetary allocations for defence on the tenets of managerial economics while conducting similar study to review Inter-Service and Intra-Service budget allocations as well. This aspect has been a contentious issue as it invariably deals with intangible factors. Ideally resource allocation needs to be based on the strategic goals to be achieved. Presently, we follow incremental budget process, which is widely accepted as sub-optimal. Therefore, there is a need to find a more suitable model to replace the existing one.

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Here the aim is to study the aspects involved in resource allocations and suggest a model to ensure optimal resource allocations at all levels i.e. at national level for various competing sectors as well as Inter and Intra-service level.

Defence versus Development Dilemma

Need for Allocation

Critics of excessive defence expenditure tend to view resources allocated towards security as a wasteful expenditure or at best a necessary evil. Thus, the debate on defence versus development is never ending. An underestimation of an external threat with a correspondingly lower military preparedness to permit greater resources allocated to development could lead to the erosion of national security, if an attack does take place. This indeed, was the experience of India in the first 15 years after independent existence, culminating in the 1962 debacle. On the other hand, the exaggeration of an external threat and the correspondingly higher military preparedness could, at one level, lead to counter-measures by the potential adversary, thus, escalating the threat environment to a higher plane, and, at another, demand excessive resources, eroding the developmental process within the state and possibly creating conditions inimical to domestic security. The history of Iran during the 1970s under the Shah's rule and thereafter is representative of this phenomenon. The answer lies in viewing defence and development as concurrent goals to be sought in an objective balance rather than in a mutually exclusive paradigm.

Level of Allocations

There would be competing claims for funds, and inevitably resource constraints. Development programmes in social sectors such as education and health have highly valued ends. If a country has 'too much' defence, it is wasting its resources, and if it has 'too little' defence, its security is at risk. To study optimal resource allocations to defence, we need to have clarity on objectives. In India, there has traditionally been a reluctance to define the country's vital long-term security interests and/or threat perceptions in any formal way. These objectives, defined in terms of global, regional and internal security interests, could form a sound basis for projecting demand and planning for optimum levels of defence expenditure. Secrecy requirements should not get in the way. Other countries have found ways to set out their objectives; for example, the UK's Defence White Paper of 2003, France's Law on Military Planning 2003-08, China's Defence White Papers 1998-2004 and Canada's Strategy 2020. Most well-organised countries attempt to set out their defence objectives and the means to be employed to achieve these objectives. Much progress has been made in

this direction though formal acceptance of such documents through ratification by the government of the day is yet to be achieved. It has proved difficult in practice even to finalize a five-year defence plan before the end of the plan period. The historical resource allocation strategy has appeared to be incremental, driven and dominated by the felt need by the individual services. It is interesting to note that despite its maritime presence and ambitions, China is managing without an aircraft carrier even today.

Defence Economics

Economics is all about resource generation and allocation. Defence Economics is not so much about resource generation as about resource allocation. It is not to say that defence planning can proceed unmindful of the resource-generation concerns. The military planning and strategy have to necessarily relate to the country-specific economic reality. This calls for pragmatism and unorthodox thinking. Defence Economics will have to provide convincing frameworks for this unorthodox thinking whether it is by way of demonstrating the effectiveness of reduction in force-levels or moving towards joint-ness or even choice of technologies. It is in this context that economic tools and techniques will have to be adopted to evaluate various alternative strategies in terms of what they would cost in absolute terms and in terms of the opportunity cost. This will perhaps make it more acceptable to sacrifice what is ideal in favour of what is practical. Every nation in the world has the right to determine its needs, based on its national security objectives. Defence Economics cannot dictate that determination.

Impact of Defence Allocation

The dominant view among economists has been that defence is a drag on economic growth. A contrary view was brought out strongly for the first time in a study of developing countries on this topic by Benoit in 1973. Of the favourable effects of defence spending, Benoit lists many, of which the following seem relevant for the Indian situation:

- *Security*: To the extent that the military provides security to the country, it enables an atmosphere conducive to investment and long-term planning decisions.
- *Training*: Military manpower receives training even at the rudimentary level and this can be beneficial if the recruits come in substantial numbers from the subsistence economy and if the military programmes introduce people to 'modern' methods and social skills and general inculcation of 'national' values.

- *Infrastructure*: The military may create infrastructure, such as roads, airports, docks and communications, which can be used by the civilian sector, especially 'up country'.
- *Consumable*: The services provide substantial numbers of people with food, clothing, shelter and medicines. They also engage in 'civic action' programmes and in 'hearts and minds' campaigns.

Allocation for Defence

Neighbourhood Allocation Model

Analysis of defence expenditure of different nations is a complex task because of exchange rate variations, widely fluctuating inflationary trends, etc. The off-budget defence expenditure compounds this problem further. However, one universally accepted norm is the military expenditure vs. GDP ratio. It reflects the proportion of national resources allocated towards the security of a nation. Another useful indicator would be comparison of military expenditure with the government expenditure, which indicates the proportion of the government revenues allocated for defence. The question as to how much of national resources should be diverted for the sake of defence does not find a precise answer as there is a huge fluctuation in defence spending among nations vis-à-vis their GDP.

China

China has always been secretive about information on almost all areas pertaining to the country. The official military expenditure figures have not been available for a long time, with a more detailed picture in the Chinese Defence White Paper being published every two years in the past decade or so. However, there is a huge variation between the actual expenditure incurred on defence and the official figures. There is also huge off-budget expenditure, besides the tendency of debiting military expenditure to other departments of the state. China's defence spending is by no means transparent. Although the number of people in uniform has fallen, military pay and benefits have risen sharply. Since the mid-1990s, China has increased expenditure on military procurement to purchase a number of modern aircraft and naval ships, many of which have come from abroad. For the past decade average official defence expenditure was 1.47 per cent of GDP while the estimated actual defence expenditure was 3.79 per cent of GDP.

Pakistan

Right from 1947, Pakistan has always made higher allocations towards defence

expenditure. Various phases in the political history of the country during the past 50 years or so dictated the budgetary allocations for defence. Pakistan spent an average of 6.50 per cent of its GDP on defence between 1980 and 1990. Between 1990 and 2000, the average defence expenditure to GDP ratio came down to 5.46 per cent. However, between 2000 and 2003, this figure slid further to 4.57 per cent. During the ten-year period from 1994-95 to 2003-04, Pakistan's average defence expenditure as a percentage of GDP was 4.5. As a percentage of federal government expenditure for the same period, the average stood at 26.64.

Indian Defence Budget

For the first 12 years after Independence the defence expenditure of India as a per cent of GDP was as low as 1.8. Following the Sino-Indian War of 1962, this figure witnessed a 3 per cent average mark over the next 25 years. Until the 1990s, India was a classic case of low GDP and, therefore, low defence expenditure growth. After economic reforms in 1990s, India's GDP grew on an average by more than 6 per cent. This allowed approximately 10 per cent annual growths in the defence expenditure. Due to prolonged neglect in meeting deficiencies and updating defence equipment since mid 1980s, which got highlighted during the Kargil war, this increase has been considered insufficient by many. Both, the Standing Committee on Defence in the Parliament and the 11th Finance Commission have recommended that India's defence budget should be raised from the present 2.2 per cent of the GDP to 3 per cent. Trends of military expenditure/GDP in the past two decades i.e. the period 1985-2005 reflect that this figure has been around 2.75 per cent. However, this figure has been gradually declining and presently stands at mere 1.99 per cent of GDP.

Optimal Resource Allocations for Defence

There are a number of models being followed to work out the allocation of resources for defence. Some of the options available are as follows:

- *Fixed per cent of GDP:* As brought out during the initial part of this paper, the defence allocations averaged 2.9 to 3 per cent of the GDP from 1960 right up to 1990. However, thereafter, this ratio came down steadily to 1.99 per cent. There have been arguments in the recent past that defence allocation must be at least be 2.5 – 2.7 per cent of the GDP. However, moot question remains – Is this optimal allocation? Defence allocation fixed as a per centage of GDP of a nation actually forms a good template for comparing resource allocation by various countries on defence, however, it is not a suitable method for absolute allocation as GDP is dependent on various

economic factors which may be unrelated to defence. Defence allocation needs to be function of geo-strategic environment of a particular country and must not be entirely dependent on geo economic factors.

- *Fixed Share of Governmental Expenditure:* Worldwide, the armed forces are wholly financed by the governments. Therefore, there is a temptation to fix allocation for defence as a fixed share of governmental expenditure. Statistically, this forms a good template to find out the priorities of a government, however, it can not form an ideal method for allocation for defence. Allocation for defence needs to be based on requirements and not on share distribution of overall expenditure.
- *Based on Actual Expenditure of the Preceding Year:* This is the most widely used model for defence allocation and is based on actual expenditure of the preceding year and caters for additional amount for inflation. This in turn works out to be a model of fixed allocation for defence as far as its net value is concerned. Major disadvantage of following the methods are that they are dependent purely on economic factors and ignore the core issue of defence for which the allocation is required.
- *User Defined Allocation:* To obviate shortcoming of the methods listed above, another method that is followed is allocation defined by the end user. In this method, all components of the defence establishment work out their plan and associated costs. Sum total of cost of all components is added to arrive at the final allocation for defence. This will be an ideal scenario for the end users; however, as a nation this may not be an ideal solution. Normally such a model has been followed in countries with military dictatorship and such nations have had major economic failures due to excessive resource allocation for defence.
- *Capability Based Allocation:* Depending on the national aim, the defence objectives are defined and to meet these objectives, defence capabilities are required to be developed and sustained. Cost of each capability needs to be worked out by adding cost of each sub set of the desired capability. Addition of all such costs actually defines the level of allocation for defence. To reach optimal capability, it is a necessity that a thorough study of external and internal environment, strengths, weaknesses, threats and opportunities is conducted and strategies formulated to achieve national goals. Based on the same, defence capabilities required to be built, enunciated and force structure be planned accordingly; to achieve the desired force structure allocations be made. If the national strategic goals require strategy of maritime projection of force accordingly strong maritime forces with adequate airpower capabilities and required amphibious force followed by

additional ground forces become inevitable. Accordingly allocation would have to be made. This would ensure capability based planning. If the resources required work out to say 5 per cent of GDP, that be so. Thus the allocation must be based on what you want to achieve. Capability based planning cannot be a one-way process. Thus the allocations required for defence would be a function of Defence Value based on Defence Contingencies forecast, probability of their occurrence, risks and impact of occurrence. It would also be a function to be balanced against costs of achieving such capabilities. This is an ideal model as the allocation is governed by the necessity and not by the resources. However, the only drawback with such a model is that it does not complete the feedback loop and does not refer back to the national aim.

- *Optimisation Cycle for Capability Based Allocation:* To overcome the drawback of capability based allocation model, an optimization cycle is recommended. In this model, objectives for all facet of national power are derived form the national aim, akin to the defence objectives. Thereafter, capability based costing is carried out for each sector. Now, sum total of all such facets of national power are added up and compared with the national resources. In case of a difference between the two, national aim is required to be redefined and the whole cycle repeated so that the resources required are same as the resources available. This methodology will ensure highest value of achievement of national aim with the available resources. The allocation worked out with this method will be ideal defence allocation for the nation.

Optimum Defence Capabilities

The determination of optimal defence capabilities to be developed and maintained as well as the associated readiness states is the major challenge to the defence planner. This is so because it is premised on an uncertain future, is severely constrained by the availability of resources, will always be contested by sectional interests within the defence establishment as well as out side and is extremely difficult to communicate to a populace concerned with more immediate social and personal security issues. Too often the defence debate is dominated by short-term views on security, based on snapshot views of the world, and the cost of defence. The argument is “there is no threat, so why spend?” As has already been stated, strategic situations change rapidly whilst the building of defence capabilities and expertise takes time. All strategic defence planning must therefore take the long-term view. Furthermore the potential consequences of being wrong are enormous in their implications for the future security and well-being of the state. The development and

maintenance of defence capabilities are also the main cost drivers of defence. The solution of the defence capabilities equation, therefore, requires the major effort in the defence planning process. It is also the prime area of debate between the defence planner and political decision makers. Political decision makers cannot be expected to simply decide on the ends and ways of defence without major inputs regarding the implications of their decisions especially the implications for the security of the state and the financial implications. This poses the challenge to the defence planner to find a rationale for the determination of the required defence capabilities that will elicit the understanding and support of political decision makers and civil society. Obviously such a rationale must be based on the need for efficiency in defence expenditure.

Defence Value

If it is accepted that the primary object of the defence force is to defend and protect the state, its territorial integrity and its people through the provision of contingency ready military forces and that this is to be done within given financial restrictions. Efficiency implies the most optimal output for any given input or simply put the best value for money. This raises the question of how to determine defence value. As defence is concerned with possible future events or threats (defence contingencies), each of which carries an implied risk to the state, defence value should be equated to risk reduction. Each defence contingency carries with it an associated risk. If, therefore, the relative risk value of such contingencies can be determined, this will allow for the development of a system of determining relative defence value.

Defence Contingencies

The first step in this process is the determination of defence contingencies. This entails describing in some detail the possible future events that the defence forces might have to counter. In this process there are no limits and the more accurately the contingencies are described the better it would be. Examples are:

- Invasion of the National Territory by a foreign power.
- Punitive military action against the State.
- Coercive military action against the State.
- Disruption of National Sea lines of communication and trade.
- Military naval, air and land blockades.
- Border violations and trans-border crime.
- Natural and other disasters beyond the scope of civil society.

- Peace missions in alignment with international and regional obligations.

Risk

For each such contingency a statistical probability of occurrence can be determined. Obviously contingencies of high probability and major impact carry more risk to the state than contingencies of low probability and minor impact. It can therefore be stated that risk is a function of probability and impact. High-risk contingencies have high probability of occurrence and the potential for grave impact and vice-versa. Risk is therefore proportional to the probability of occurrence and potential impact. Risk is proportional to Probability and Impact.

The Determination of Probability

The determination of probability is the most difficult exercise in defence planning, as it is the most subjective and somewhat akin to crystal ball gazing. It cannot be an exact science as it deals with an uncertain and ever-changing future. However, without applying the mind to this factor it is extremely difficult to plan for the future and to determine priorities for defence capabilities to be maintained and developed. This Appendix does not provide an exact formula for determining probability, but gives guidance regarding some factors to be considered. In “real life” the determination of the probability of occurrence of a contingency rests mostly with the intelligence community consisting of national intelligence, foreign affairs and military intelligence and strategists. Pointers to the determination of probability are:

- Evaluate the historic (both international and national) frequency of occurrence over a very long period.
- Use a wide spread of probability over a range nearer 0.001 to 1 than 0.1 to 1. This ensures greater discrimination in the calculation of probability. As an example the probability of an invasion could be nearer 0.001 than 0.1. Absolute probability is nearly impossible to calculate. It is therefore recommended the effort should concentrate on the determination of relative probability between the likelihood of the occurrence of contingencies. The involvement of politicians, academics and civil society organisations in this exercise will greatly enhance the quality of the product.

Determination of Impact

Determination of impact is less subjective than probability. Nonetheless this is not an easy exercise and the involvement of civil society and academics in particular in

this endeavour is once again strongly recommended. The potential impact of a contingency, that cannot be successfully countered, can be calculated using the following parameters:

- The potential loss of life.
- The potential loss of infrastructure.
- The potential loss of economic production and trade.
- The relative loss of sovereignty.
- The relative loss of national image and prestige.
- The relative loss of international confidence.
- The effect on national morale.

Once the list of contingencies and their relative risk value (Probability and Impact) have been determined, the value part of the “value for money” formula has been established. What now remains to be done is to calculate the cost of dealing with these potential contingencies. This, once again, is a complex exercise.

Concepts of Operations and Force Design

For each of the defined contingencies the best operational concept to counter such an eventuality and the corresponding required capabilities (mini-force design) must be determined. War-gaming or simulation processes are the best tools for doing this. Once this has been done each mini-force design must be accurately calculated. This is a major exercise that requires the full and honest participation of the combat services and units down to ground level as well as of financial experts. If this is not accurately done the basis for decision-making is seriously undermined.

Costing

Each element of the mini-force design must be fully cost-calculated over its life cycle to be able to determine cost/benefit ratios for optimisation. This cost consists of annual personnel cost, annual operating cost, annualised capital cost etc. The emphasis on full life cycle cost is to ensure sustainability of the end result. If this is not done, it will lead to decisions being taken that will prove to be unaffordable in the future. This is the cause of many militaries in the third world having large inventories of unserviceable, unsupportable and unusable equipment.

Optimising

Once the list of contingencies, defence value calculations (relative risk reduction values) and the cost of the elements of the force design are available, calculations of best value for money can be done. This would probably provide the best results if computer support is used. The process for determining optimised force designs is repeated below:

- *Step 1:* Determine the list of possible defence contingencies.
- *Step 2:* Determine defence value (risk reduction) per contingency through probability and impact calculations.
- *Step 3:* Determine best operational concepts and the associated required mini-force design per contingency.
- *Step 4:* Determine full sustainable cost per mini-force design.
- *Step 5:* Draw up a table/graph of all contingencies indicating the defence value and associated cost for each.
- *Step 6:* Evaluate.

It must be emphasised that this process will not provide precise scientifically accurate answers, but it will provide insight into the defence planning problem and a good basis for decision makers. It removes the subjectivity of arguments by the individual combat services for prioritising their requirements. It provides a menu for decision-making where the services that can be ordered are shown against cost and from which the implications of decisions can be seen. By indicating value of each field (defence, healthcare, education, infrastructure, social services etc), we would get equations for total resource allocation with respect to required risk/assurance level expected for each field and probability of occurrence. By optimising the equation it would be feasible to arrive at optimum solution for each field. Obviously, if lesser allocation is made to any of the fields, lower assurance level would have to be accepted.

The Equation would be something as given below:-

Defence Value = $\sum_{i=1}^n F_{vix} P_i$ For given assurance level respectively.

Where F_v is the value of the result of each defence contingency, P is the probability of occurrence of the contingency

Total Resources = $\sum_{j=1}^n H_j$

Where H is the resource consumer, the value of each resource consumer is to be calculated in the same manner as explained for Defence Value.

Inter/Intra-Service Resource Allocations

Inter Service Allocations

During the ten-year period between 1996-97 and 2005-06, the average share of expenditure of the Army, Navy and Air Force was 57 per cent, 15 per cent and 24 per cent (rounded off), respectively. However, there has been considerable fluctuation of allocations among the Services. For example, the army's share rose from 58 per cent in 1997-98 to 64 per cent in 1999-2000 and remained steady at 62 per cent for the next two years, before it gradually started receding. It touched a low of 47 per cent in 2004-05 and marginally went up to 49 per cent in 2005-06. In absolute terms, taking the deviation from the decade's average into account, the cut in the army's share is Rs 6,640 crore in 2005-06 alone. In the case of the navy, the share has been steadily ascending. Its share has gone up from 13 per cent in 1996-97 to 14 per cent in the following year and to 15 per cent in the next four years; 17 per cent in 2002-03 and 2003-04, before reaching a peak of 17.84 per cent in 2005-06. In the case of the air force, the share fell from 26 per cent in 1997-98 to 23 per cent in the following year and hovered between 21 and 22 per cent for the next five years. Its share reached a peak of 31 per cent in 2004-05 before coming down to 26 per cent in 2005-06. Presently the inter service share of defence budget is Army 46.97 per cent, Navy 18.47 per cent and 28.53 per cent for the Air Force. The allocations for inter services need to be based on their share in the capability development and capability sustenance. The model for inter service allocation needs to be an offshoot of capability based resource allocation process. In that, the defence capability required to be developed needs to be categories in various individual components. Each component need to be allocated to a particular service for development and cost associated with the development of such a capability component needs to be allocated to that service. This will ensure inter service resource allocation based on requirement of capability development and not on mere numbers/past allocations.

Intra-Service Allocations

Allocation of intra service between two major heads i.e. capital and revenue will have to be done on a similar model. Normally capital expenditure is associated with capability generation/creation and revenue expenditure is for capability

sustenance. The underlying principle for intra services resource allocation is the impact of allocation on 'Net Combat Potential' of the service. Each subsystem of the service needs to be analysed for input cost and out put combat capability. Older systems needing excessive maintenance may be replaced by more efficient new systems but cost factor on both fronts needs to be analysed before a final decision is taken. This needs to be an ongoing process to ensure maximum combat potential for every rupee spent or committed for future expenditure.

Assisting Tools

A paper titled '*Budget Allocations for Integrative Technologies : Theory & Application to the US Military*' April 12, 2005, by Oren Setter and Asher Tishet of Faculty of Management, Tel Aviv University gives a very involved mathematical model to calculate allocations to Integrative Technologies when competing other demands are concerned. Similar model could be evolved to meet the requirements of inter/intra-service allocations as basic problem is the same. However, this model is also based on perceived probabilities, outcomes, values/results of the capability etc. The whole model being based on subjective criteria, does not provide a concrete solution. However, it is credible enough if dispassionate assessment of various issues is undertaken. However, the model is a bit too involved and mathematical to be understood and explained by this author. All the same, organisations could make use of the model to evolve suitable model to meet the requirements of the services. In any case professional academic bodies would be able to provide suitable model if necessary.

Not so mathematically involved, but as effective model could be evolved based on Analytical Hierarchical Processing (AHP) tool or with software such as Expert Choice or those based on Visual Basic. While the author is in no position to present a suitable model at this juncture due to lack of adequate expertise, the model could be formed by a team from CDM if so desired. These models calculate the weights to be associated with hierarchy of competing capabilities/goods. However, forming matrices using assessments of a large number of respondents and normalizing the matrices so formed, generally neutralize this variation adequately to provide fairly rational model for inter/intra-service allocation. It needs to be emphasised that inter/intra-service allocations must be based on sound assessment of strategies to achieve the expected goals.

Conclusion

Resource allocation amongst competing requirements is indeed a daunting task. Defence of a country is akin to an insurance policy. Each nation needs to consider its

external and internal environment, assess the strengths, weaknesses, threats and opportunities and formulate strategies to counter the threats, cover weaknesses, exploit strengths and opportunities. Based on the strategies, force structure needs to be worked out. Optimal allocation of resources could be worked out based on an optimization model balancing costs of all such force structure elements with defence value. An efficient fighting machine capable of meeting national security objectives requires well planned investment based on defence strategies formulated to achieve national goals. National Defence Strategy would provide the basis for formulating the capabilities required to be built and as a consequence the force structure that needs to be ensured. In absence of such approved details, planned inductions can at best be a good attempt at improving the state of affairs but without any guarantee of ensuring progress. But merely raising the defence allocation does not meet our requirement unless we have the right focus, mechanisms and the will to spend it optimally. A cycling optimal model based on National Aspirations vs. Defence Allocation vs Cost is suggested. The required price tag needs to be rationalized with respect to the national aim to arrive at allocations for defence.

Inter service allocation needs to be based on resources required to develop specific capabilities earmarked for a particular service. The overall aim is to optimise capability development within the allocated resources irrespective of the service playing the lead role. For intra-service allocations, the only relevant factor is the impact of allocation on 'Net Combat Potential'. Utilisation of overall defence allocation needs to produce maximum defence value to achieve stated objectives. 