FORCE MODERNISATION: PRINCIPLES AND PRACTICE

SUJEET SAMADDAR

Force modernisation has, in the recent past, become a blend of art and science. It is a science because it follows a well defined process of information gathering, analysis and generation of alternatives that facilitates objectivity and enables rational decision-making. But it is also an art. It requires careful drawing together of a complex mosaic of strategic and technological threats and opportunities that must not only reflect the big picture of the capabilities required but must also portray forces that produce these capabilities. Force modernisation is, thus, a complex process that must necessarily evaluate the strategic environment, available and forecast technologies, budgets, domestic industrial capacities and human skills to determine force generation, force structure and force composition options for the future. Force modernisation practitioners must balance the skills of the art of the possible with the science of the pragmatic.

Force modernisation has clear advantages and disadvantages. Force modernisation results in induction of cutting edge technology; improves the Mean Time Between Failures (MTBF) and thereby ensures higher reliability of critical systems; produces a more consolidated capability footprint; and,

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usually reduces the burden on and of manpower. But, there are disadvantages as well, of which the foremost is the high capital cost of induction. The necessity for extended trials which tie up existing resources and the risk that the technology/ platform choice can itself be so wrong that the modernised force may face a radically different threat requiring completely different capabilities than was determined at the time of the investment decision are some of the other pitfalls. Since force modernisation is capital intensive and risky, substantial and sometimes frustratingly long analysis to overcome catastrophic consequences, becomes inescapable. The moot principle must remain one of caution and deliberation. Wisdom lies in adopting a cautious approach that allows some forces to continue with legacy systems for today's combat environment, a little investment into future systems to cater for tomorrow's conflict and finally setting aside a definite proportion of the modernisation budget for generation-after-next technology systems. The expertise of the professional lies in determining these proportions.

In this paper, I will deal with the conceptual underpinnings of force modernisation. I will begin by describing the process, spell out certain principles and review the existing practice and finally sum up with some recommendations.

PROCESS

The force modernisation process has certain key components. Firstly, it requires analysis of the emerging strategic and technological environment. Secondly, a functional understanding of the role of modernised forces to serve the national interests in both the literal and regional contexts requires some knowledge of the foreign policy of the state. Thirdly, an objective assessment of the challenges, opportunities and vulnerabilities that exist or that may arise during the envisaged period of the modernisation process

must also be made. Finally, force modernisation programmes need to be firmly tethered to an objective assessment of the broad budgetary support that may be available. The last would, of course, be determined by the popular support that force modernisation programmes enjoy amongst the political leadership of the state.

Whilst the ends and means are clearly enunciated, the ways are dynamic, variable and sensitive to a host of uncertainties.

THE SECURITY NARRATIVE

The Legacy Security Narrative

Ways, ends and means have formed a strategic continuum over time. Nations have traditionally defined the objective of security as the ability to achieve a desired end state that would ensure robust economic progress, wholesome human development and the ability to conduct a sovereign foreign policy without encumbrances and restrictions. To achieve these ends, the objective is to, firstly, ensure that the shared global commons of the sea, air, space and cyberspace are not dominated by any one state alone; secondly, sovereign land and sea borders remain tranquil; and, finally, the country is internally stable. The means available to achieve these objectives are the diplomatic, military, information and economic resources of the nation, of course, underpinned on good governance. Whilst the ends and means are clearly enunciated, the ways are dynamic, variable and sensitive to a host of uncertainties. For force planners, the state's security apparatus must be vested with flexibility that is geared to make an effective response to a challenge, exploit an opportunity and overcome vulnerabilities. These tasks require a mix of forces that are able to deliver the three basic requirements of the legacy security narrative:

- Military force should be able to *deter aggression* by both punishment and denial.
- Military force should be able to *defend interests* through a direct action or an implied threat.

The competition for resources would be one of the important drivers of national strategy of the future.

- Military forces must at least *maintain the status quo* by achieving a military balance in one's own favour to prevent any revisionist action by an adversary.

The Neo-Security Narrative

The future security environment has thrown up certain new distensions which do not easily fit into the legacy security architecture. Energy, and with it the Sea Lanes of Communications (SLOCs), has become a crucial component of national security. The protection of under sea structures, trans-oceanic cables, fisheries and seabed mining; the vulnerability of strategic choke points and water ways; increased preponderance of maritime terrorism and piracy that upset the economic activity of a state have combined to devolve certain additional components to maritime security. There are also new ways of thinking that are emerging in the modern era – the revolution in military and marine affairs, rapid advances in information and communication technologies, new diplomatic mechanisms that create new-fangled instruments that restrict the ability of countries to exercise violence to achieve national objectives amongst others. Also, dwindling commodity, minerals and energy resources and heightened competitiveness of markets due new entrants who can sell cheaper are also posing serious economic threats to states. Whether these threats would be balanced through diplomacy and negotiation or settled by force – particularly in the case of scarce resources – is not known.

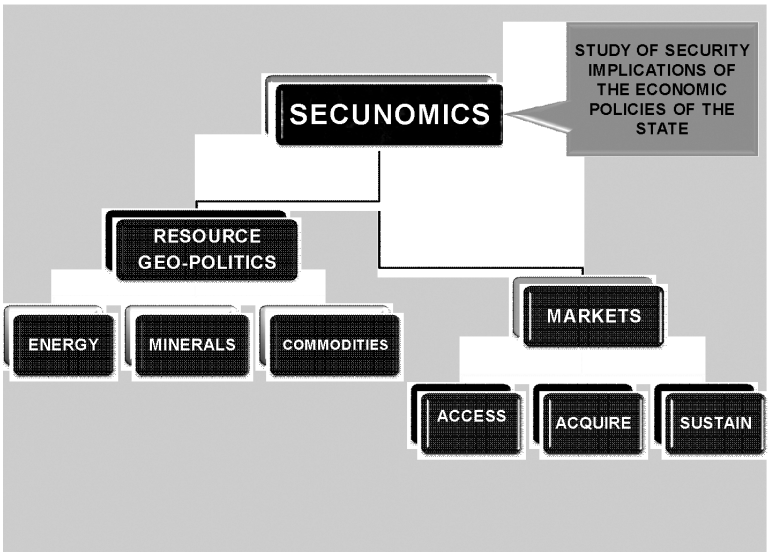
These trends and thought processes are converging towards creation of a neo-security narrative which has the following main features:

- The competition for resources would be one of the important drivers of national strategy of the future. Strategies of coalition and cooperation with states and territories which possess the resources or provide the access to energy, commodity and mineral resources – so vital for the generation of wealth of the nation and the well-being of its people – would be increasingly inclined towards achieving energy, commodity and mineral security.

- Command over resources that produce goods is alone not sufficient for progress. These must be sold or exchanged in international markets. Hence, the competition for markets would be the other driver. The emergence of the vast market potential of the Brazil, Russia, India, China (BRIC) economies is already fostering new alliances and partnerships. It is possible that the future security structure would support a revival of the mercantilist approach to the conduct of international relations.

This brings me to the emerging discipline of what I call secunomics[1], which is the study of security implications of the economic policies of a state. Fig 1 below depicts the broad subject classification of the science of secunomics.

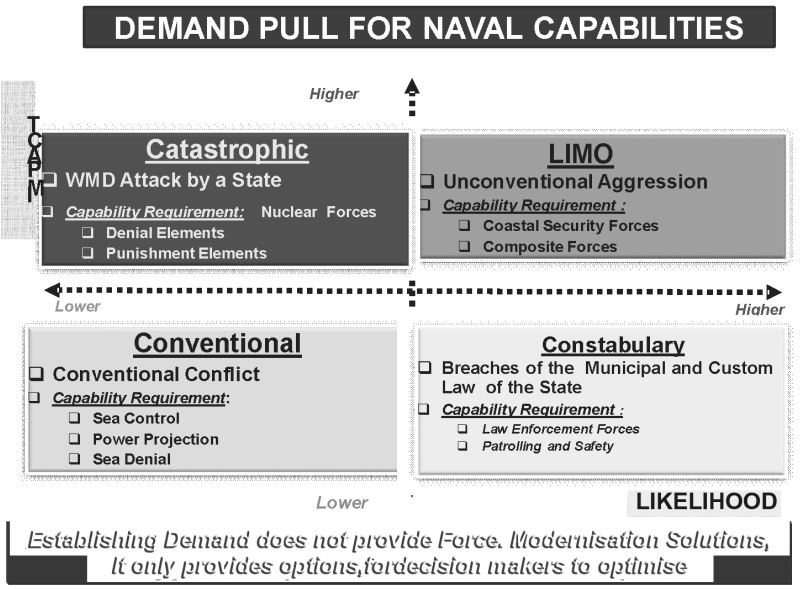
Fig 1: Secunomics



Force modernisation proposals that factor the neo-security narrative together with the legacy security architecture, have an element of risk. A likelihood and impact analysis of the risks creates a demand pull for naval capabilities, as summarised in Fig 2.

1. Sujeet Samaddar, "Resource Geopolitics, Markets and Navies: The Competitive Advantage of Surface Combatants," Seminar on Future Surface Combatants, RUSI, London, UK. June 03-04, 2008.

Fig 2: Demand Pull for Naval Capabilities



TECHNOLOGY ASSESSMENT

A second critical factor for determining the direction of force modernisation is the assessment of where technology would move and how it would impact upon the capabilities of future forces. Whilst this would be the subject matter of a seminar by itself, in this paper I would highlight certain concepts to illustrate its importance in the force modernisation process. These are:

- **Stealth**. Whilst rapid strides are being made in the design, creation and application of radar transparent materials and paints, infrared (IR) suppression, and acoustic reduction technologies, particularly in the production of aircraft, and unmanned aerial vehicles, there is also a movement towards counter-stealth technologies that move away from detecting the target and instead focus on determining the movement and, thus, locate the target. Advances in precision laser techniques that penetrate the airframe and attack specific components that render equipment dysfunctional are a challenge to stealth machines.
- **Network-Centric Operations**. Networking capabilities are being developed

to introduce multi-spectral data fusion, sensor-shooter segregation and real-time battlespace awareness. However, concurrent advances in anti networking capabilities are also beginning to take form. These relate to creation of systems and weapons that attack the core infrastructure that facilitates networking.

- **Weapons Technology.** Whilst highly sophisticated lethal weapons including tactical nuclear weapons such as the famed Daisy Cutter and bunker busters are being developed, the science of non-lethal weapons and directed energy weapons that reduce collateral damage and loss of life are also being developed.
- **Propulsion**. So far as propulsion technologies are concerned, the move is towards creation of hybrid systems such as electro-mechanical and electro-solar propulsion systems and the use of alternate fuels such as bio-fuel and fuel cells and, of course, highly enriched uranium micro nuclear reactors in ships and submarines
- **Signal Processing and Information and Communication Technology (ICT)**. Advances in signal processing and highly sophisticated software that enables reduction in signal noise ratios are creating new paradigms in sensor technologies, particularly integrated Electronic Warfare (EW) and radar detection systems.
- **Advanced Technologies**. The science of robotics, nano-technology and intelligent materials are moving rapidly towards highly efficient application in combat systems and augmenting personnel effectiveness in battle. Together with advances in biotechnology and cognitive science, a fundamental shift in how matter and mind can be exploited militarily is already at the conceptual state.

Once these technologies are coalesced, it would facilitate networking of air, sea, space and cyberspace forces. It would serve the twin purpose of ensuring full spectrum battlespace awareness and delivering integrated combat power at a place and time of own choosing. On the down side, such networked and technologically enabled forces would be vulnerable to electro-magnetic, cyber space and anti-satellite weapons.

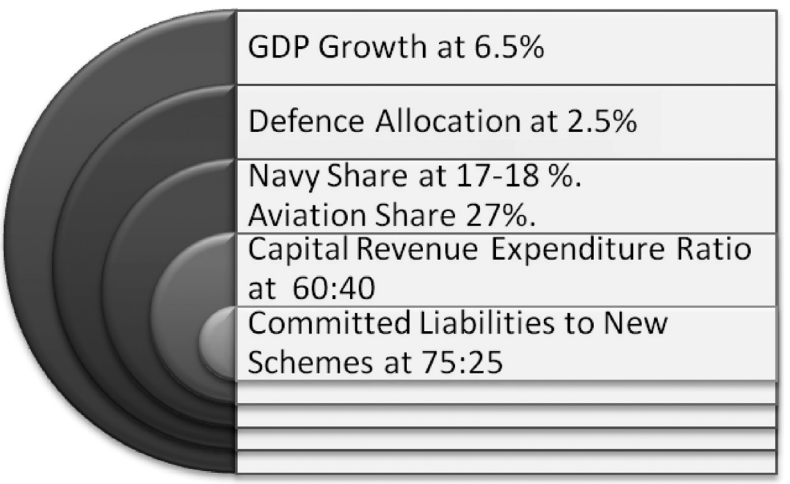
Force modernisation planners have to proceed on some assessment of the anticipated budgetary outlays that would support committed liabilities and yet provision for new schemes.

BUDGETARY COMMITMENTS

Another factor that is an equally important determinant to force modernisation plans is the crucial consideration of the budgetary provisions that would support the venture. The picture, as far as allocation to the defence sector is concerned, is somewhat less than optimistic. Defence allocations have dwindled from a high of 4.3 per cent of Gross Domestic Product (GDP) in 1987-88 to 1.98 per cent in 2008-09. Defence expenditure as a percent of Central Government Expenditure (CGE) has also similarly been trounced from 22 per cent in 1971 to about 15 per cent in 2008-09.

Force modernisation planners have to proceed on some assessment of the anticipated budgetary outlays that would support committed liabilities and yet provision for new schemes. This is a difficult task and some indicative benchmarks that are taken into consideration in the process of force modernisation are summarised in Fig 3.

Fig 3: Planning for Budgetary Support



REPLACEMENT OR RECAPITALISATION

Life Span of Combat Platforms. Assuming that the electronic generation era is at 12 years, 54 per cent of the platforms/assets are more than two generations old and their efficacy in battle is highly suspect. Therefore, whilst the combat *potential* in terms of ships, submarines and aircraft is premised on numbers of listed assets, combat *power* that can be delivered reflects the actual capability of the forces. It is evident that the combat *power* that is exercisable is less than half of the combat *potential*. This is an important aspect to determine the future course of modernisation. The choice for force modernisation planners is to either recapitalise an existing asset or replace it with a new one and this choice is not easy. The value addition that recapitalisation provides needs to be balanced against the cost and the period over which replaced equipment would remain combat worthy. Replacement decisions also need to factor the lead time in acquiring a new platform and whether the resultant intervening vulnerability is an acceptable risk.

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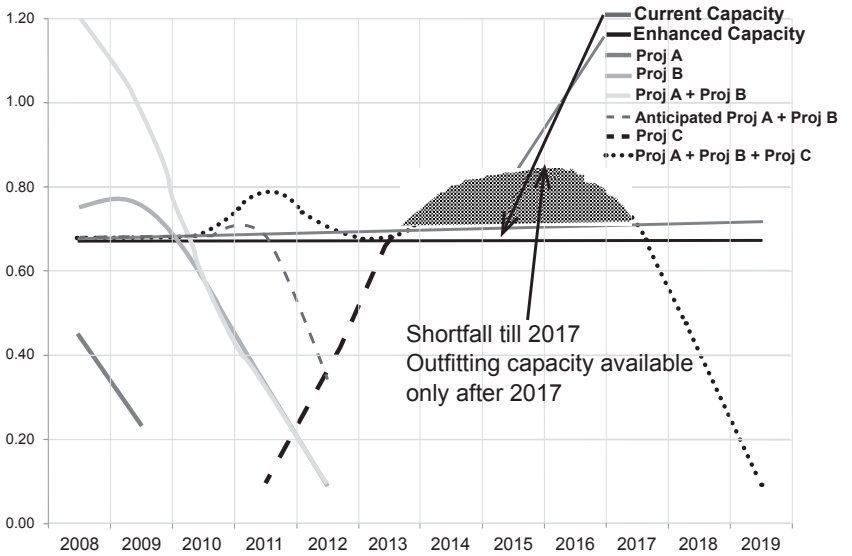
Industrial Capacity. Force modernisation plans must also take cognisance of the feasibility of operationalising its prescriptions. The foremost requirement is to first determine that the domestic defence industrial base is able to support the capability definitions and the induction timelines. This requires a formal calculation of the loading of each production centre in terms of its manufacturing capacity so as to determine what can be built in India and what needs to be sourced from abroad. Fig 4 illustrates the methodology adopted towards making a capacity assessment for a production unit. It can be seen that there is a shortfall in capacity till 2017 and, therefore, these projects would not be completed within the allocated time and resources. The conclusion such an assessment offers is that Project 'C' would need to be ordered on a separate unit if the force levels are to be achieved in the requisite time-frame.

Fig 4: Schematic for Assessing Domestic Capacity



PRINCIPLES

In this section of the paper, I argue that the force modernisation programmes are likely to be more successful if they are conceived within a set of principles. These principles are not scientific in nature – in the sense that there is no firm causative relationship between input and output – but are instead a body of advice for the force modernisation professional. These principles may or may not work in tandem and neither can they be considered in isolation but for every modernisation programme, each of these principles would apply in a measure that is unique to that programme.

Focussed. A modernisation programme must remain focussed on the specific capability that is intended to be achieved for the future forces. Central to any modernisation programme for the armed forces is the overriding requirement to possess such capabilities that succeed in combat operations and sustain it for a defined duration before and after such operations are completed. Therefore, force modernisation must be anchored to a clear Concept of Operations (ConOps). Other capabilities that are sometimes factored in the modernisation process and which detract from the main focus of the modernisation effort are

issues such as operations other than war, support of friendly governments, non-combat missions such as humanitarian assistance and disaster relief operations and UN operations under Chapter VI, Chapter VII, etc. In building up a focus, the first principle is to modernise so as to effectively implement the ConOps first efficiently and subsequently, with cost implications examined in the end. National security is paramount and must be achieved at all costs since there is no half way house between victory and defeat in war.

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Responsive. A second principle is that a modernisation programme should be clearly responsive to the combat environment. Strategically, modernisation programmes must take cognisance of possible alliances and coalitions that can create new challenges or lead to a competitive arena which could be a source of conflict. Emerging technological advancements and how to induct future technologies into present platforms and generation-after-next technologies into future platforms is the second consideration. Doctrinal changes in warfare such as concepts of asymmetric warfare, space-based warfare, cyber warfare and command and control warfare is a third input to which the modernisation programme could be responsive.

Competitive. This principle enunciates that the modernisation programme must secure a clear competitive advantage over the adversary. Such advantage can be brought about, firstly, through technological superiority; secondly, through higher combat capacity which includes volumes and numbers in excess of these possessed by the adversary; and, finally, greater capability (which is the product of capacity and competency) to exploit combat forces. For example, a capability in night fighting and waging of all weather operations results in a competitive advantage over an adversary who is blind by night and incapacitated by weather and thereby unable to fight – a fissure that can be leveraged for victory.

Time Horizon. Modernisation programmes should be considered along a continuum of time, with specific prioritisation for near-term, mid-term and

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long-term requirements that provide for a holistic integration of the capacity building process. For example, clearly in the near term, the prime requirement of a seamless coastal/border security structure that would prevent recurrence of the 26/11 carnage should be the foremost modernisation objective. Investment in sophisticated surveillance systems and procurement of high speed craft, helicopters and Unmanned Aerial Vehicles (UAVs), must first be addressed before oceanic or strategic forces are created. Similarly, in the mid-term, force modernisation programmes must accord priority to ensure the security of the national maritime and air zones. In the long term, force projections and other military-diplomatic forces can be considered. This is not to state that any one time horizon of modernisation needs to be at the exclusion of the other. Balanced force levels, through intelligent modernisation programmes that can meet each contingency to varying predefined degrees of capacity can be created simultaneously.

Rational. This principle states that the best is the enemy of the good. In striving to get the best Service Requirements (SRs), most modernisation programmes fail since the specified SRs are so stringent that they are usually not deliverable in the period envisaged. However, some cases have been successful and programmes with rather esoteric SRs have seen the light of day. Guidance for rational SRs formulation, that would support the force modernisation process, could be:

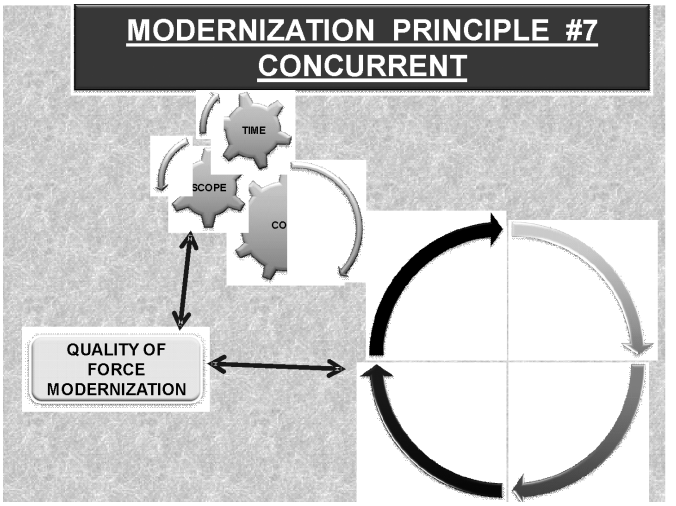
- Select SRs that are deliverable in the near-term.
- Formulate SRs that are feasible in the mid-term.
- Conceive SRs that are imaginable in the long-term.

Visionary. This principle states that there are no quick fix solutions to the process of modernisation. Modernisation planning is a visionary exercise and

is only likely to succeed when the apex leadership supports intelligent initiative, innovative enterprise and progressive thinking rather than staid and conventional risk-averse decision-making which only furthers personal ambitions and actually harms the modernisation process. Future security imperatives such as the military-diplomatic response to the neo-security narrative that has been discussed earlier in the paper calls for a consolidated approach towards building capacities that provide options exercisable in a war of resource geo-politics and market access. It requires conceptualising stratagems that address military vulnerabilities that prevent realisation of the objectives of the state. Such an approach requires enlightened staff work that can anticipate emerging trends and leadership that can act on them so as to significantly reduce decision risk in force composition and force structure as well as find new opportunities from future scenarios that these trends support.

Concurrent. The quality of a force modernisation proposal derived from classical project management theory is bound by the elements of time, scope and cost. If any one element is fixed, the other two need to be adjusted so that the quality of the force modernisation proposal is realised within the allocated budget, meets the defined scope, and is delivered on time. Whilst the modernisation of platforms and assets is being implemented, it is equally important that

Fig 5: Concurrent Modernisation



If India is to truly develop into a major military power, it is imperative that the nation's military forces have the full support of domestic industry.

concurrent attention is paid to development of newer skills sets and competencies in human resources, development of associated infrastructure which needs to be modernised, as well as modernisation of the procurement systems and process itself .

Build in India. If India is to truly develop into a major military power, it is imperative that the nation's military forces have the full support of domestic industry. These principles suggest that when examining modernisation options for equipment induction, the favoured vendor should be an Indian enterprise, albeit with foreign tie-ups, if necessary. The nation's domestic production base needs to be strengthened to support the needs of the military. Various options that can be considered in this endeavour include establishment of joint venture and production hubs that cater exclusively for products that have a high volume of demand among the three Services and possible applications in the paramilitary and civilian sectors as well. UAVs and helicopters are two such products from the aviation sector that come to mind immediately. Such products, and the list is far longer than the two items mentioned, must be domestically produced since they have applications in both the civil and military sectors. The way ahead would be to first create the production base in India and then explore markets abroad. Such an approach would result in development of an indigenous vendor/sub-vendor base and also contribute to the global supply chain for these products. The second aspect of building in India requires investment in defence Research and Development (R&D). Whilst the Defence Research and Development Organisation (DRDO) may have the over-arching responsibilities towards defence R&D, the private sector also needs to chip in with product improvement and technologically enhancing the existing version together with innovative applications as a joint partnership among industry, academicians, cooperative R&D centres and industry itself. Such initiatives must, of course, be supported, or, at least, encouraged, by the state.

Policy. Governmental support through innovative policies that encourage the private sector to invest in defence products is mandatory to support the modernisation process. Force modernisation practitioners should be vigilant to identify opportunities where well structured governmental intervention can be conducive to encouraging domestic industry to enter the defence sector. Firstly, a fixed 26 per cent cap on Foreign Direct Investment (FDI) for all defence products may not be attractive for foreign investors. Instead, FDI limits could be fixed at the Request for Proposal (RFP) stage on a case by case basis, including accepting a higher FDI in sectors or products where a specific competitive advantage can be gained. These advantages could accrue from access to specific niche technology or establishment of production facilities in specific geographic regions which are socially backward or undeveloped. A second way to provide support to the defence industry would be through specific sops, as have been offered to the Information Technology (IT) sector, to make investment in defence products an attractive option for Indian industry. Some other sops that can be considered are tax and duty exemption for investment into R&D of defence products, creation of exclusive Defence Industrial Zones which have a Special Economic Zone (SEZ) status, accord of deemed export status for offsets, and governmental support for assured orders for products developed by Indian industry which conform with Service requirements even on a single vendor basis.

Force modernisation can only succeed if the appropriate budgetary support has been catered for, and modernisation contracts are fair and equitable to all parties.

Budget for a Plan. Force modernisation can only succeed if the appropriate budgetary support has been catered for, and modernisation contracts are fair and equitable to all parties. Considering the long gestation periods and associated risks of the modernisation process, budgeting realistically becomes an important consideration for successful modernisation. Hence, modernisation programmes must include a safety factor and defined exit points which ensure that budgets sought are in

accordance with a plan that has progressive and identifiable milestones towards achieving the required capabilities. This would also require force modernisation practitioners to structure contracts that provide for inflation and associated price escalation based on mutually agreed formulae. Such an approach leads to three modernisation options. Within the constraints of time, scope and cost of the modernisation programme, the options that can be exercised are summarised in Table 1 below. These options have been defined as the "modernisation," "modernisation plus" the "modernisation plus plus" options. The attendant benefits and risks associated with each programme are indicated in the table:

Table 1: Summary of Modernisation Options

MODERNIZATION OPTIONS			
	RENOVATION (MODERNIZATION)	UPGRADATION (MODERNIZATION +)	TRANSFORMATION (MODERNIZATION ++)
APPROACH	• REPLACE LEGACY EQUIPMENT WITH CURRENT GENERATION TECHNOLOGY	• EVOLUTIONARY TECHNOLOGY ON EXISTING PLATFORMS • INFUSION OF NEXT GENERATION TECHNOLOGY IN NEW PROJECTS.	• REVOLUTIONARY TECHNOLOGY • INFUSION OF GEN AFTER NEXT TECHNOLOGIES IN NEW PROJECTS
OBJECTIVE	PRESERVE STATUS QUO	PREVAIL IN CONFLICT	PREVENT CONFLICT
CAPACITY	CONVENTIONAL	CONVENTIONAL & NON CONVENTIONAL	CONVENTIONAL, NON CONVENTIONAL, UNCONVENTIONAL.
RISK	TENUOUS BALANCE	FAVOURABLE ODDS	GAIN COMPETITIVE EDGE
FINANCIAL SUPPORT	MINIMAL / REVENUE	CAPITAL REVENUE	R&D, CAPITAL REVENUE

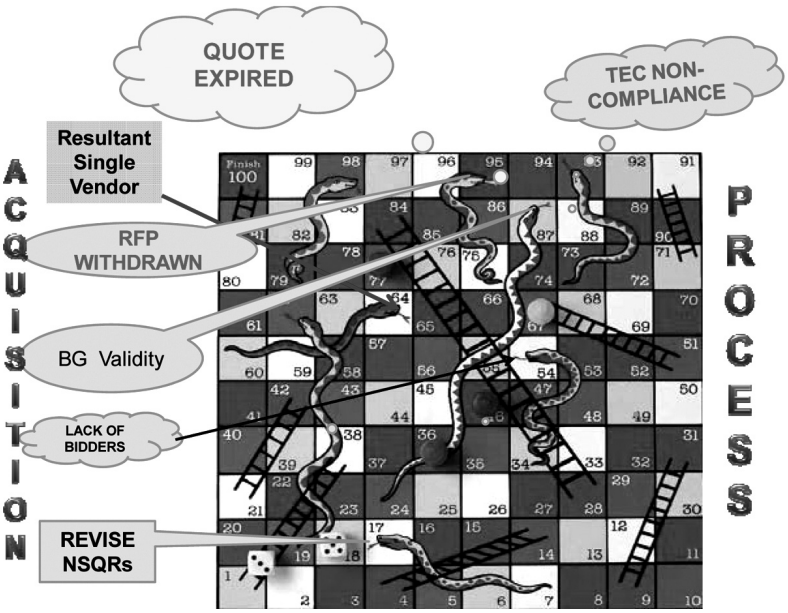
In concluding this section, it is reemphasised that the blended mix of adversarial forces and conflicts that characterise the neo-security environment requires a balanced portfolio of capabilities. Exchanging numbers for capabilities follows the law of diminishing returns since no matter how high-

tech a platform can be, it can only be in one place at one time and, therefore, quantity has a quality of its own. Sophisticated capabilities in high end war-fighting do not automatically take care of low intensity operations. Modernise, upgrade or transform, replace or recapitalise are key considerations for force modernisation and the central purpose of these principles is to provide indicative guidance to the planners.

PROCESS

The Defence Procurement Procedure, Edition 2008(DPP-08), specifies the methodology to be adopted for the acquisition of capabilities. The Procedure is no doubt transparent, objective and rigorous. Whether it is efficient, effective or economic is debatable. Be that as it may, it is the *de facto* procurement policy of the state and that fundamental position is unaltered and, therefore, force modernisation planners would do well to remain within the stipulated guidance and procedures that the DPP-08 provides. This means that beginning with the categorisation itself to the issue of RFP and subsequent technical and

Fig 6: The Acquisition Game



commercial evaluation of the options should all strictly conform to the DPP. Even if it takes a little longer to prepare the basic proposal, provided the end product is technically and procedurally compliant, this delay would be more than compensated by the ease with which the proposal would be processed. In a lighter vein, the acquisition process is quite like the snakes and ladders game (Fig 6). One never knows which roll of the dice (read mood of the government) will take you up the ladder or make you slide down the snake.

MODERNISATION OF THE FLEET AIR ARM

Drawing from the earlier discussions of threats and interests that arise from the considerations of the primacy of resource geo-politics and markets as the possible central focus of future security policies of the state, the Fleet Air Arm would need to move much further, much faster, more often, and sustain for much longer durations. This essentially translates into an overwhelmingly strong focus on the sustainability and survivability of aviation assets. Provision of fuel and ensuring high MTBF of equipment become of paramount importance for greater sustainability. Options for fuel support can be through buddy refuelling or from accompanying tankers. High MTBF would require greater reliability through better product design, quality and materials. To reduce down time modular construction, canisterised weapons and repair by replacement as the maintenance philosophy, would need to be adopted. What these requirements dictate is a set of concurrent acquisitions that would have to be processed together with the main proposal. For example, if repair by replacement is the maintenance philosophy then a substantial float in spares would be required and this may well exceed the specified scales of present-day acquisitions. Similarly, some analysis of the buddy or tanker option would need to be undertaken to accordingly tweak the main proposal to include these assets.

Survivability of these expensive assets is a key consideration of the force modernisation programme. This would require specifying standards for features of stealth – optic, electro-magnetic (EM) or acoustic; capabilities for surveillance in the optical, radar, cyber and electronic support measures

(ESM) spectrum; and, a capacity for self-defence to ensure that last ditch defence is almost impenetrable. Hence, future aerospace forces must reflect flexibility in construction through plug and play systems, upgradeable expansion slots and essentially modular mission specific assemblies. Since the cost of acquisition will become increasingly prohibitive, airframes must be survivable for a life of at least 30 years. Such an approach would see through at least three generations of weapons and accessories and at least two generations of the propulsion plant on the same airframe with minimal rework on cabling, hydraulics and ducting. In summary, the force modernisation planner is seeking value for money in all his acquisition efforts. Assets must have short build periods and enjoy long MTBFs. They must be assured of high reliability and demand low maintenance and whilst they must look formidable, they must also have insignificant signatures.

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The Indian Navy is seized of the awesome potential of aerospace power at sea. There is, today, hardly any facet of maritime operations that does not use some or the other component of aerospace power. Accordingly, almost a quarter of the modernisation budget is allocated towards aviation acquisition programmes and this does not include aviation related infrastructure or aviation equipment which is budgeted for separately. Some of the acquisition proposals, not including avionics and ground-based equipment, of the Navy are mentioned below:

- Eight P-8I LRMR aircraft being procured from M/s Boeing.
- Additional MiG 29Ks being processed with the RAC MiG.
- Additional KM 31 AEW helicopters along with associated equipment and stores being progressed with M/s ROE.
- Negotiations for Advanced Jet Trainers (AJTs) in an advanced stage with Hindustan Aeronautics Limited (HAL).
- Induction of Heron UAVs from M/s IAI Malat, Israel, as a repeat order under process

- Global RFP issued for procurement of six MRMR aircraft
- Global RFP issued for procurement of sixteen multi-role helicopters.
- Global RFP issued for upgradation of eleven Kamov 28 helicopters.
- Global RFP Issued for upgradation of 17 Seaking 42B helicopters.

SUMMATION

I have argued in this paper that force modernisation is a mix of art and science and requires substantial understanding of various factors such as the strategic and technological environment, technical and financial evaluation of the replacement and recapitalisation options, budgetary considerations and the crucial consideration of the future concept of operations. I have suggested some principles that the force modernisation planner can consider before an investment decision is made. Force modernisation needs to be anchored to specific objectives in the long, medium and short terms but these objectives are not at the cost of the others. Force modernisation programmes are not useful unless they achieve a competitive advantage to prevent conflicts. In essence the "modernisation plus plus" model is supported, provided budgetary allocations are available. Whilst formulating esoteric SRs for the future force, clear deliverables of specific capability with precise exit points, if timelines and costs are not adhered to, must be elaborated in every indigenous modernisation proposal that requires domestic R & D support. Force modernisation should be treated as projects and must, therefore, be bound by scope, time and cost within strict and fixed SRs. Whilst the platform or asset is under acquisition, the principle of concurrency should not be overlooked, and human resources (HR), infrastructure and systems and processes should be simultaneously modernised.

Force modernisation programmes are not useful unless they achieve a competitive advantage to prevent conflicts.

No country can become an influential power in regional or global politics unless it manufactures its own armament in its own arsenal. Force modernisation

must recognise this important parameter and the effort should be to "Build in India" even if it cannot be "Built by India" for the time being. Once factories are located in India, the vendor base would grow and indigenous participation would increase in these ventures. Quite obviously, the Services cannot alone take this up further. All stakeholders must join together in facilitating creation of a sound (niche) defence production base in India and if future force modernisation programmes are to succeed, this is indeed a necessary condition. To facilitate the success of such an initiative, mission driven collaboration among the Services, industry, DRDO and academicia for specific products (UAV/helicopters) to secure at least a regional leadership in a niche segment can be conceived.

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The present era is full of opportunities for the modernisation of India's armed forces. The Services must, together, formulate a plan that seeks specific investments with governmental support for procuring evolutionary systems to meet near-term contingencies and also provides for generation-after-next systems that would catapult India into a major manufacturing base for defence products in the long term. Most of the essentials are in place; land and skilled labour are inexpensive; markets exist; concessions and encouragement from the Services and the government are available; and, some indigenous R & D in certain areas is of world standards. However, it cannot be left to defence PSUs (Public Sector Undertakings) and the DRDO alone to develop new technologies and products but they must partner with the private sector to develop futuristic generation-after-next war winning technologies.

In effect, what is required is a comprehensive, all inclusive force modernisation strategy that will prepare India to meet every eventuality in an uncertain future on its own strength. That strength is a sophisticated indigenous defence industrial base.