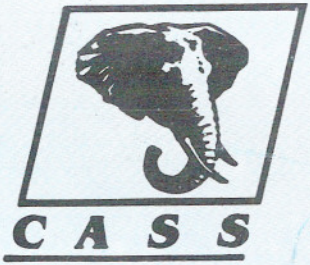
CENTRE FOR ADVANCED STRATEGIC STUDIES



PROCEEDINGS OF SEMINAR ON "DEFENCE & INDUSTRY" 17TH MAY, 1993

CENTRE FOR ADVANCED STRATEGIC STUDIES

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SEMINAR

DEFENCE AND INDUSTRY

17TH MAY 1993

(Venue : Shivaji Sabhagruha, Poona University)

The Seminar on "Defence and Industry" held on 17th May 1993, in the Shivaji Sabhagruha in the University of Poona was a major one. There were nearly sixty participants, which included captains of industry, academicians, research scholars and high ranking civil and military officers, serving as well as retired, from Pune region as well as from Delhi, with practical experience in defence industry. The list of the participants of this well attended seminar is given separately.

The views expressed by the speakers are their own and not attributable to any institution/organisation.

Introduction :

Starting from scratch at the time of independence, the country during the last four decades, built up an impressive infrastructure in the shape of 39 Ordnance Factories, eight Defence Public Sector Undertakings and a Defence Research and Development Organisation (DRDO) with 40 laboratories. By and large, defence production has been totally in government run establishments and has recorded a sizeable turnover covering a wide range of equipment and weapon systems. Yet self reliance still remains a far cry. We are very much dependent on imports for our major weapon systems, resulting in a net outflow of about 2-3 billion dollars annually in foreign exchange. Indian security is to an extent hostage to foreign countries and multi-nationals. The situation has worsened after the demise of the Soviet Union and consequent breakdown of supply and spares. During the seventies and eighties, major modernisation of the weapon systems of the armed forces was done with the help of the Soviet Union. Seventy percent of the equipment of the Air Force and the Army and sixty percent of the Navy is of Soviet origin. The DRDO, due to inherent and systemic shortcomings has not been able to deliver as per its potential and expectations. Private sector has been discouraged from contributing its mite towards defence production. At international exhibitions, it is evident that even smaller countries, eg. Indonesia,

Malaysia and Singapore have stolen a march over India in the production as well as export of sophisticated arms.

At present, a thorough overhaul of our economic and industrial policies is on the anvil. This should cover the defence industries sector too, if India is to achieve a reasonable degree of self reliance in defence hardware. The imperatives of modern technology, the shortening of the time span of weapon system modernisation from decades to three to four years now, compels prompt defence research, development and production responses.

The theme of the seminar was to examine and discuss the shortcomings of the defence industry, reasons for its failure in achieving the goal of self reliance, and to suggest remedial measures to enable it to realise its full potential, apace national security requirements.

Shri R.D. Sathe, in the absence of Shri P.V.R. Rao, President, CASS, opened the seminar which was spread over three sessions. The first session covered the subject from the aspect of the private sector, the second from public sector and the third from the point of view of the Ministry of Defence.

Shri S.L. Kirloskar, the doyen of Pune industrialists and with considerable experience in collaborating with defence production inaugurated the seminar. Shri R.D. Aga, Chairman and Managing Director of Thermax Ltd., Pune, with some experience in collaborating with defence production and which made a name in pollution control equipment, recycling of waste and in energy conservation, was the main speaker in the first session, which was chaired and moderated by Shri R.D. Sathe. The main speaker for the second session was Captain Prabhala (Retd), former Managing Director of Bharat Electronics Ltd., (BEL) and at present Managing Director BPL-Sanyo, a private sector consumer electronic firm. Admiral J.G. Nadkarni (Regd.) was the Chairman and Moderator of this session. Commodore Das of the Indian Navy, representing the Director General of Quality Assurance (DGQA), Ministry of Defence was the main speaker in the third session, which was chaired and moderated by Shri Sharad Marathe.

After the presentation by the main speakers, each session was thrown open for general discussion, which proved lively, animated and useful.

INAUGURAL SESSION

As Chairman of the inaugural session, Shri R.D. Sathe welcomed the seminar participants and gave a brief background of the Centre for Advanced Strategic Studies (CASS). It was a culmination of 10 years of efforts to bring under one roof defence officers, civil servants, diplomats, industrialists, scientists and youth. The problem of external defence, internal security and development were closely interlinked. CASS will be attempting to see these problems as a complete whole and propose national strategies to cope with these challenges.

Commenting on the theme of the seminar, Mr. Sathe stressed upon the crucial role played by the R&D. He drew attention to the fact that the US Defence R&D budget is three times that of Japan, the other strong economic power. The American industry similarly spent $70 billion on research. He opined that there is a clear linkage between this emphasis on research expenditure and leading role of the US in the field of technology. There is a direct link between the activities of organisations like DARPA (Defence Advanced Research Projects Agency) that does work on furturistic projects and their economic spin offs. He felt that scientific knowledge was growing at even faster pace and speed of dissemination of that knowledge is the key to progress. The smooth and uninterrupted flow of information is more important than merely the available stock of knowhow.

INAUGURAL SPEECH BY S.L. KIRLOSKAR

I have attended many seminars and workshops on this very theme. Every time everybody agreed that defence and industry must cooperate and produce defence goods. All these years, we have been lavish with words but short on action. Nothing seems to have changed, in fact matters have gone from bad to worse. This is evident from the panic that seems to have gripped us due to the collapse of the Soviet Union and cutting off of the supply of spares for the defence equipment. Be it the notorious Bofors gun import, much in news due to the allegations of kickbacks or import of T-72 tanks for that matter the import of jet trainer, we seem to be constantly looking for 'imports' rather than our own products. The situation over the years has deteriorated rather than improved.

It appears to me that in India we have constant tussle going on between those who want to make things in India and those who want to import. My own experience has been rather dismal. We developed an engine for a tank but had to wait for nearly 7 years for decision on production. No industry worth its salt can wait that long and keep its men and machines idle. I do not know who is holding up this process in the government?

The Indian industry has come of age. The private sector has now built up capability to build complete weapon systems like the Bofors guns or even aircraft carriers. Instead the industry is approached only for problem solving or making sub assemblies. I know of a case where a vital imported equipment posed problems as the main bearing was defective and was heating up. I am afraid we are giving second hand and poor quality equipment in the hands of our jawans only to get them butchered on the field of battle. I feel there is a bureaucratic brake being applied somewhere.

The Public Sector and government factories have maintained monopoly over production of defence hardware. Unfortunately, they have seldom met the needs of the armed forces either qualitatively or quantitatively or both. Consequently the defence forces look for their requirements in the US, UK et al. What is needed is a close coordination with the industry. I want to stress that the industry is not the enemy of the country. The British have left a legacy that every thing connected with defence is to be kept secret and away from the Indians and this trend of distrusting your own countrymen continues to date.

Indian industry may not be able to produce the goods as sophisticated as the western advanced countries but is it not true that to have something 'here and now' is infinitely better than having something on the moon? What we need is coordination between the forces and the industry. The need is for ACTION! I hope this seminar will generate that kind of impetus that will translate into action. I declare this seminar open now.

SESSION I

"DEFENCE PRODUCTION : PRIVATE SECTOR"

Chairman : Shri R.D. Sathe
Main Speaker : Shri R.D. Aga

PAPER PRESENTED BY SHRI R.D. AGA

Thank you for inviting me to participate in the seminar on Defence and Industry.

I must compliment the Centre for Advanced Strategic Studies for taking the initiative in organising this seminar, which is very timely, and addressing itself to issues emanating from the changed scenario, both internationally and at the national level.

While I am happy and honoured to be asked to make a presentation, may I say that I am not the right person to make a contribution to the deliberations. I have a very peripheral association with the Defence Sector. Many many years ago, we were asked to develop and supply an auxiliary boiler to the naval frigate being manufactured in India. We took it on, because it was exciting - the space constraints, and the roll and pitch of the ship in motion and its stability when in action - called for a sophistication of design and a choice of components which provided a challenge. Some years later we were asked to design and supply a complete hot water system in Antartica - once again a challenge - the use of cryogenic materials, building a high degree of reliability and so on. Recently we were asked by the Border Security Force to design and supply a mobile water treatment system for treating waste water (including radio-active waste) and make it reusable using activated carbon, ion-exchange resins and electrodialysis. As I said, all these challenged our ingenuity - we enjoyed it - it was a labour of love - but we never made any money at the end of it. I mentioned this to my friend, Ram Sathe, who invited me, and begged to be excused. He would not have it.

He insisted that I participate. So here I am, and I am happy to participate, but what I have to say may not bear the stamp of hard, hands-on experience of doing business with the Defence Sector.

The brief, but very well-worded, background paper that was passed on to me, talks of the following issues :

1. We have, over the years, built up an infrastructure for defence production consisting of 39 Ordnance Factories, 8 Defence Public Sector undertakings and some 40 laboratories for Research and Development. Despite this, 50 per cent of the stores and arms required by the Services have to be imported - with a net outflow of about $ 2 to $2.5 billion annually in foreign exchange.

2. More important, to the extent that 50 per cent of our defence requirements are imported, we are vulnerable to pressure from outside sources which may be inimical to our country's interests. Self-reliance and import substitution, which were the buzz-words in our economic thinking for the last 40 years, have not been given the same focus in defence equipment where self-reliance really counts.

3. The collapse of the Soviet Union and the chaos that has engulfed the CIS countries bears another vulnerability. I did not realise that 70 per cent of the equipment of the Air Force and the Army and 60 per cent of the Navy is of Soviet origin. Two concerns : First, can the CIS countries be depended upon to keep up the momentum of supplies; secondly, what about the availability of spares?

4. Despite our investment in the infrastructure on defence equipment over the last 40 years, smaller countries have stolen a march in the production and export of high quality arms - Israel, South Africa and, of late, Indonesia, Malaysia and Singapore. Have we lost a sense of focus and direction?

5. Defence production has been the strongly guarded prerogative of the Ordnance Factories and a few Public Sector organisations. The Private Sector has been scrupulously kept out. Has the time arrived to reassess our policy on the issue?

In addition to the points mentioned in the background paper, a few more issues need to be looked at :

(1) The Gulf War has brought to light the sophistication of push-button warfare, the deterrent capability of the anti-missile, the possibility of pin-point targeting and the role of electronic and computer software.

(2) Nearer home, the issues in Kashmir, in the Punjab, in Assam, in Tamil Nadu, the narco-terrorism in Pakistan, the regional and communal tensions and the frequent intervention of the Army following on the breakdown of the normal machinery for maintenance of law and order - all these call for a changed role and new strategies.

(3) The pressure to contain and reduce the budget deficit requires more cost-effective solutions to our Defence outlay. Our defence expenditure averages a little over 3 per cent of the Gross Domestic Product. This year's defence budget is no more than last year's adjusted to the inflation factor. What is more, our defence expenditure is relatively inelastic because 60 per cent of the amount is on direct and indirect personnel costs. So how do we achieve our objective of defence preparedness, given our financial constraints.

(4) And that takes us to the ultimate solution - the Bomb. Nuclear capability gives cheap deterrence. But are we prepared for the political implications of such a decision?

Let us come back to the question of Defence and Private Sector. To give you some figures :

Our Defence Budget this year will be of the order of Rs. 20,000 crore plus. 60 per cent of this, or Rs. 12,000 crore will be personnel related; 40 per cent or Rs. 8000 crore, will be equipment, maintenance and services. Half of that - Rs. 4000 crore- will be imported. Of the remaining half of Rs. 4000 crore, Rs. 3800 crore will come from the Ordnance factories and the eight Public Sector plants dedicated to defence. Only a measly sum of Rs. 300 crore comes from the Private Sector. Where do we go from here.

1. Let us first look at the market. The obvious market is the Rs. 4000 crore of imports. Can we list out all the items (subject to classified information), list out companies in the

Private Sector according to their capabilities, set up a dialogue on how we can jointly work out a development programme, have a specific time table for development of a prototype, testing, Alfa & Beta sites, and leading on to commercial production.

I am aware that some effort has been made in this direction, but it is too peripheral. The seminars and workshops that have been organised from time to time to discuss the various facets of civil sector participation in defence production gives an impression of little left-overs which are passed on. The sort of items that are given for civil participation include assemblies/sub-assemblies of vehicles, lead acid batteries, tyres, fuses, fire tenders and similar items.

By contrast, one can take a cue from the Indian Space Research Organisation (ISRO). ISRO has identified six industrial units that might participate in fabrication of cryogenic engine for the indigenous geo-synchronous satellite launch vehicle (GSLV).

The six companies include four private sector units - Godrej, Larsen & Toubro, Machine Tools and Reconditioners (MTAR), Walchandnager Industries - and the public sector Hindustan Aeronautics and Kerala Hitech Industries (KELTEC). ISRO is now studying the technical capabilities and infrastructure available with these companies that put them in a position to fabricate various components of the cryogenic engine. ISRO will provide detailed designs and drawings of parts of the cryogenic engine to the companies for fabrication once the designs are finalised.

Russia is supplying the basic technology for the cryogenic engine to ISRO under an agreement signed between ISRO and Glav-cosmos, the Russian space agency, in 1991.

The cryogenic engine, fuelled by liquid hydrogen and liquid oxygen, will power the rocket, designed to carry a 2,500 kg, INSAT-type satellite into a 37,000 km orbit. The first GSLV flight is scheduled for 1995.

The companies short-listed for participation in the cryogenic engine project have established the infrastructure required for the fabrication of different components of rocket engines. Bombay based Godrej, Hyderabad-based MTAR, and KELTEC are currently fabricating the Vikas liquid engine for the polar satellite launch vehicle (PSLV). Godrej and MTAR have already supplied a Vikas engine each to ISRO. MTAR had earlier fabricated components like the liquid apogee motor, and altitude and orbit control system for the space department. This is real, active man-sized participation - no fuses and fire-tenders.

Can Defence take a cue from ISRO on how a well-thought out action plan can be implemented for private sector participation?

2. The private sector can only survive through adding value. Development costs a considerable amount of money, time and talent. As I mentioned earlier, my own company did some development work, but this was incidental and was not by way of a long term business plan. If a company has to look at a defence project as a business, one has to look at development costs. A cost plus approach to begin with and some commitment on purchase of a certain quantity at a certain price. Unfortunately, there have been occasions when a development has been made, but the unit is then given for tendering to the lowest bidder. The mobile water treatment plant for the Border Security Force, which I mentioned a little earlier, falls in that category.

3. Development is also not just a matter of passing out specifications and asking for performance at various stages. Development to be effective requires a partnership between a manufacturer and the customer. Each partner has to share his thoughts, ideas, experience, in a very supportive way.

I want to share with you an example of a development of a project which we undertook with the ONGC. We have a Chemical Division which manufactures a whole range of ion exchange resins. We were given to understand that the ONGC purchases each year Rs. 20 to 30 crore worth of a

product called Pour Point Depressant, bulk of which is imported. We set up a programme to develop the product, we worked closely with the ONGC. After the first trials proved successful, a trial order was placed. This was tried in the field and a larger order was passed on at a competitive price, and following on that, competitive tenders were invited. As a result, for the last couple of years, we are in a position to supply the total requirement of this product without imports.

I am deeply aware of the very nurturing way in which the R&D establishment in Dighi has been working with us on certain projects. I say this because otherwise merely setting up seminars and exhibitions and asking companies to collaborate will not be effective.

4. A concern has been expressed about the availability of spares for a Soviet equipment. I am not aware of any specific action plan to indigenise some of these spares. Here again is a whole area of opportunity on the ISRO model with a time-bound programme.

I was reading the other day that the Russian government has cleared the export of spares and equipment from India to third world countries. This can open up an important opportunity area for a joint effort between Industry and Defence.

5. Talking of Industry and Defence, I would like to share with you one other example. We have had a presence in the erstwhile Soviet Union for the last 15 years, and we have been supplying our equipment, which is basically boilers, heating equipment, resins for water treatment, and we represent some specific companies from India in the areas of machine tools, computers and castings and forgings. As a result, we have been in touch with a number of large factories in various parts of the CIS who are involved in defence production. Several of them have approached us and asked us if we could represent them for supply of spares. We took this up with the Ministry of Defence, but were politely told to mind our business. I believe that companies like ours, who have developed a rapport at the

factory level, can play a useful role in making available components and spares, which, if discussed at a political level, might have other implications.

I am also aware of a fair amount of Soviet expertise available in the CIS factories. Many Soviet experts would be happy to come to India for short term assignments. This could be an area which some of the defence establishments might like to look at.

6. I mentioned about the financial constraints under which our defence objective have to be achieved. One solution is to make our activities cost-effective. Our Ordnance Factories have a turnover of Rs.1500 crores with fixed assets of Rs. 800 crores, and a manpower of 175,000 people. On the face of it there appears to be a considerable scope for reducing costs. Similarly, if we look at the 8 public sector organisations which are dedicated to Defence, their fixed assets are Rs. 2000 crores, turnover Rs.2800 crores, and manpower 180,000 people. It is unfair to make a broad generalisation without looking into details, but on the face of it, this entire activity would seem to lend itself to drastic reduction in personnel and an increase in turnover. One way of doing this is to inject competition. I am not suggesting that defence production should be thrown wide open to competition. Certainly lethal equipment must be restricted to the Ordnance factories, but other than lethal equipment can the doors be flung open to competition? It would be interesting to know how much further value addition can be achieved.

7. Taking a focus on the Rs. 4000 crore of imports, can we take a cue from the manner in which incentives have been built to improve exports? You may be aware that any industry that exports is entitled to duty free imports plus an incentive by way of income tax remission. If the focus is to build up a self-reliant defence sector, the same advantages should be made available as would be done for exports. It bears logic because the indigenous manufacturer should be on par with his competitor abroad in terms of basic costs and duties.

8. One area in which the private sector can contribute is in the area of systems and procedures. It is a pity that defence, as indeed many other sectors, is relegated to the Administrative Services, where the focus is not on obtaining results and reducing costs, but in terms of maintaining the status quo. I believe when Robert McNamara, who was a whiz kid in the Ford Motor Company, took over as Secretary of Defence, he completely overhauled the systems and procedures of accounting, costing and value added, with astonishing results. We have some outstanding management consultants in India, who can certainly contribute towards overhauling some of our antiquated procedures and systems in Defence Audit and Accounts.

9. Private Industry can profit a great deal by working with the defence establishments in terms of utilising their resources and facilities. The 40 defence laboratories have a wealth of talent and equipment and a sharing of information would be mutually beneficial. I believe there is a facility which has been set up for making composites - a technology for missiles. Only 30 per cent of its capacity has been utilised and 70 per cent can be made available for the engineering industry. If composites are used in making tennis rackets, why not for making a light weight, durable bicycle? I understand this facility has been advertised, but the private sector has not taken advantage of it. I would strongly suggest that the Defence Research and Development Organisation come out with a brochure setting out the activities in the 40 laboratories and the equipment available and advertise it widely throughout the engineering industry.

If I may sum up the few sketchy thoughts I have set forth :

The Defence Sector's goal and mission is Preparedness at all times. To achieve this, self-reliance is the answer. This is particularly crucial at this juncture when our substantial reliance on the erstwhile Soviet Union is being disturbed. What is called for is a partnership where the Private Sector can make available its talent and its resources to a common purpose. I sincerely hope that the deliberations today will make a small contribution towards realising this shared vision.

N.K. Firodia : "Private Sectors Role In Defence Production"

At the request of the chairman and a number of participants, Shri N.K. Firodia, a Gandhian and a leading industrialist with vast experience spanning over many decades, briefly narrated his experience related to defence production:

The Indian private sector is treated with indifference whereas foreigners are given every facility by the Defence Departments. The crux of the problem is should the private industry go to defence and solicit possibilities of orders? At present, the files are readily opened for the foreigners whereas the information therein is denied to the Indian private industry under the garb of secrecy. The Indian private industry has the potential to manufacture to meet defence requirements, if only, it is given the required facilities and not step-motherly treatment.

The reason for reserving the defence production in the public sector had more to do with the politicians' desire to control this sector rather than economic factor of high capital costs and low volume of production etc. Also, under the cloak of secrecy, vital decisions about selection of equipment and weapon systems to be ordered were taken in a totally arbitrary fashion. The decision to start a vehicle factory for German model trucks was taken at a wedding reception. If the contribution of Indian private sector industry in defence production has to be improved, a change in the attitude of the government is necessary.

SESSION II
"DEFENCE AND INDUSTRY : PUBLIC SECTOR"

Chairman : Admiral J.G. Nadkarni (Retd.)
Main Speaker : Capt. Prabhala IN (Retd.)

PAPER PRESENTED BY CAPT. PRABHALA IN (RETD.)

Defence & Industry - The Public Sector

Introduction :

The Defence Public Sector (DPS) has made impressive strides since its inception. The turnover of the DPS units in 1992-93 was Rs.3300 Crores with another Rs.2000 crores contributed by the Ordnance Factories and Rs.200 crores by the Defence Supplies Wing. Of course, all this production was not meant for defence only. Civilian customers accounted for Rs.1500 crores. Defence industry output for defence alone was thus Rs.4000 crores in 1992-93. Exports of defence sector were over Rs. 100 crores.

There are eight Defence Public Sector companies whose activities range from aircraft, electronics, ship building, heavy vehicles, missiles, to special alloys, turning out a very wide range of equipments both for civil and military purposes. Ordnance factories numbering 39 produce even a greater variety of products viz. arms, ammunition, vehicles, tanks electronics, & special clothing.

Self Reliance :

Praiseworthy as this achievement may be, critics are right in pointing out that we are still far from reaching the goal of self reliance. After all, this was the primary goal for setting up and nurturing defence industry. Further, Defence Services as customers are rarely happy with the performance of the suppliers, be it with regard to delivery or quality or price.

Why is the country still not self-reliant after so many years of sustained effort and vast sums of money spent in the defence sector?. Why is it that the country still has to import substantially weapon systems, aircraft, ships, radar, electronic warfare, and ammunition

from abroad?. Why does the Defence Industry spend so little on R&D and why does it take so long to introduce new products and why is it that quality of the products is still not up to the mark?

These questions are legitimate even when allowance is made for exaggeration by the critics. There are many dimensions and many reasons. There are structural weaknesses in the way R&D is carried out; there are technological weaknesses as a country; there are flaws in the perspectives of the military and the Government about the industry. It should also be borne in mind that no country is entirely happy with its defence industry; a love-hate relationship seems to be its fate.

It needs no saying that defence product development, particularly of complex systems and platforms, is expensive, time-consuming and risky. Unlike civilian or industrial products in which the industry finds out what may be needed by the market and embarks on development activity, the Military defines what it wants and asks the industry to come up with it. Very often technology has to be pushed to its limits; a series of trials and evaluations are necessary before acceptance; each is an occasion for changes in technical specifications and performance parameters. The market is confined to the national requirements in most cases, unless one is a super power or has defence exports as a national goal.

R&D - Who Funds Whom?

While there is no limit set by the government on the amount spent by the defence public sector on R&D, it must be appreciated that weapons development is a very expensive and risky affair and even the biggest company will find it impossible to finance the entire R&D. Although there is a general impression that our defence companies are too big, the fact of the matter is that our defence companies figure way down in the list of top 100 defence companies in the world. For instance, Bharat Electronics occupied 83rd place couple of years ago. With devaluations of the rupee, it may not be figuring in this year's list at all.

A company of the size of Bharat Electronics with its diverse products and customers can only afford to spend a certain amount on the department of new products for defence. Development of a major electronic warfare system or a fire control tracking radar is not possible within this R&D budget. It will either mean no other R&D

in the company or a ruinous effect on its balance sheet. Thus, any company commits its R&D to products where the expenditure is not too large or the risks not too big and the potential sales are big enough to recoup the R&D expenditure.

In most countries, the development of expensive weapon systems is funded by the government. The government may call for proposals for the development from selected companies with demonstrated competence and then award the development contract to the one or at times two companies. The entire expenditure involved in the development upto the stage of commercial production is funded by the government. The government even pays for the proposals. It is only in the cases where there is relatively low risk and the amount spent on R&D can be amortised over a potentially large number, that industry itself funds the R&D.

Such is not the case in our country. The existence of government-owned laboratories naturally means that whatever funds are available for development go to these laboratories. Laboratories all over the world have their limitations when it comes to development of products fit for manufacture and field operability because many other disciplines have to be applied to ensure such outcome, e.g. engineering, standardisation, tooling, packaging, reliability testing etc. These apparently mundane activities are firstly alien to the culture of a laboratory and secondly, they can only be undertaken by industry with well-equipped manufacturing and support facilities. Product development in the wrong place is the principal reason for the long time and high cost of indigenous development of weapon system. There is a wasteful duplication of effort and consequently, the product is obsolete even before it enters service. The situation is worse if the development laboratory and the manufacturing company are located far apart in distance and mental attitudes. The success of the missile programme and a few other projects does not negate this argument about different cultures.

Technological Issues :

The reason for the relatively technological backwardness of our products is the absence of a network of specialised suppliers of materials, components and sub-systems since advanced weapon systems and delivery platforms are the result of integration of various components, materials and equipment which naturally no single agency can produce in-house. The more sophisticated a system is, the more

sophisticated are the materials and components that go into it. Sophisticated materials and components require huge investments and intense R&D efforts. Very often such investments cannot be justified on the basis of military requirements alone. It is only when there is a multiple-use market that such investments become viable. A classic example is Gallium Arsenide (Ga As) technology. The entire requirement of the military would hardly be a week's production in a Ga As plant. Combining the military needs with the civilian applications such as consumer electronics, microwave communications and satellite earth stations will ensure its economic viability.

There is thus a fundamental reversal in the symbiosis between defence research and civilian spin-offs. In earlier days, defence often provided the stimulus to technological advance. Semiconductor technology in the U.S. took off in the 50's thanks to the funding and support of the military. Now, it is the other way: the drive for superior performance comes from computers, communications and consumer electronics industry and the military is the downstream beneficiary. Technology is driven by mass production industry. Diffusion and pervasiveness helps to lower the cost of the state-of-the-art technology.

We are no exception to the adage that the real strength of a country is its manufacturing excellence. Given our weakness in world class manufacturing we should not be surprised at the technology and quality of our defence products. Our industry is particulary weak in materials, tooling and components. These are capital and energy intensive and demand strict compliance with process parameters. Unreliable infrastructure and poor work discipline are its enemies. In the absence of such high quality, state-of-the-art inputs, the defence industry has either to make do with what is available locally with its attendant difficulties, or resort to import. The increasing application of Missile Technology Control Regine (MTCR) and COCOM restrictions on export of such materials and components by the advanced countries often precludes the second option.

Public Vs Private Sector

In the last decade our government has been keen to bring in the private sector to cater to the defence needs. Pressure from the private sector in the belief that there is a vast market and good profits could be a reason. To drive prices down by encouraging competition could be another reason. To shake the sense of complacency and put the defence public sector in its place could be the third factor.

There is no apriori reason why the defence needs should be catered to only by the government-owned industry. The private sector is no less patriotic or competent. If one were to start, we could organise things differently. However, since, we do not have that luxury, we need to take into account the impact of such a step on defence, public sector and ordnance factories. They have surplus capacities due to over-generous manning policies in the past as well as due to technological changes. The labour content in modern electronics, say, is a fraction of what it used to be. Higher and higher levels of integration of functions in specialiased components and sub-systems has shifted the nature of skills and efforts required in a product from the shopfloor to vendors and design laboratories. Software content in many electronic systems now costs as much as hardware. Under these circumstances, unless an exit route is found for the redundant labour, freedom of entry to new player will only accentuate the difficulties of public sector.

For these very reasons, plus the escalating cost of R&D and the stamina required to survive in the new world of peace dividend, the trend elsewhere is the exact opposite of what we are trying to do. The number of players in any defence segment is dwindling rather than increasing all over the world. Mergers and acquisitions within a country and across the country is the order of the day. Recent news that General Electric has sold its Aerospace business to Martin Marietta is another pointer in the same direction. Even a country like the U.S. with its $300 billion defence budget does not seem to be able to support more than one or two players in each segment.

The dilemma of Defence Public Sector is made more acute by another concurrent demand: it should stick to defence business only and should not dabble in other markets and products. With unfailing regularity, once in 10 or 12 years, the portfolio of products, their relative profitability and competitiveness is reviewed and during this period, proposals for diversification into civilian markets are put on hold. The reason for such a policy are never made explicit but one can surmise that there is a fear that defence requirements will be neglected by diversion of management focus and the civilian markets may be subsidised by cross financing from defence. Be that as it may, it is difficult to reconcile the desire to free the Military customer from being captive to a supplier (hence private sector as alternative source) while denying the freedom to the defence public sector to avoid captivity to one customer, viz the military. One has to be fair, if monopoly supplier is bad in principle, so is a monopoly customer.

It is not that the private sector has no role to play in meeting defence needs. Even at present, the private sector supplies most of the raw materials, intermediate materials, a large variety of components and certain specialised sub-units and equipments. As the private industry gets modernised under the impact of liberalisation of the economy, it will have even a greater role to play and will supply the defence industry with many items currently being imported or made in-house uneconomically. There is scope even now for the private sector to take up specific items as vendors and sub-contractors to the defence sector and specialise in them. As I pointed out earlier, defence industry is a pyramid in which a number of specialised firms feed the bigger ones finally culminating in the apex systems suppliers. Such a role may not be glamorous but not to be scoffed at. Coexistence and cooperation rather than competition is what is needed.

There is a commonly held belief that public sector is per se inefficient and therefore, we must get rid of it. Being a firm believer in the dictum that the behaviour of a company should depend upon the market expectations and environment, and not on ownership, I do not subscribe to this view. French railways, German telecommunications, Italian Petrochemcial Industry and Singapore Airlines are only a few example of successful public sector companies. Thomson-CSF, the sole defence electronics company in France is government owned. There is no reason why we cannot emulate such examples.

What is needed is a change in the perspective of the principal stake-holders - parliament, government, management and labour. Liberalisation of the economy has placed the public sector, including defence public sector, in an unenviable position. It can neither take advantage of the liberalisation nor carve out a niche for itself. One can imagine what its fate will be in a few years.

Conclusion :

In the end, improvement in our defence capability and attainment of self-reliance in defence needs can only come about if we make certain hard choices - between R&D in government (existing) and government funded R&D in industry (proposed); between technology at any cost (unaffordable) and technology as a result of general industrial advancement (preferred);between better-run public sector (easier option) and privatised defence industry (try it). I hope we have the wisdom to make the right decisions.

V.G.Bhide : "Need for Strong Defence Research & Development"

The Chairman and a number of participants requested Professor V.G. Bhide, a renowned physicist, former Vice Chancellor of Poona University and currently Head of the Department of Energy Studies, University of Poona, to give his views on the status, efficacy and application of research and development as related to defence production. He said :-

The neglect of pure science and associated research in the country, over many decades has had a baleful influence on research and development, including defence research and development in the country. It is science that provides the input for technology.

There is a very pressing need for an efficient Defence Research and Development. Research and development has always been the main determinant in building up the country's industrial and economic muscle and its defence and armed capability. It holds the key to progress and advancement. All developed countries spend a sizeable percentage of their Gross National Product on research and development. The trend in India is in the reverse direction. The R&D expenditure which was one percent of the GNP, very poor by any standard, has dropped further down and is now at 0.89 percent.

Except for the missile programme, R&D work has been aimless. We are reinventing the wheel under the garb of Research and Development in the country as a whole. Effective time lag goes on increasing in India between Research and Development and production peak.

Research & Development per se is not enough. Serious attention needs to be paid to design engineering. Our materials industry, component industry is appalling. There is a big gap between Research and Development and actual production. Ninety percent of investment in Research and Development goes waste in India. Our R&D management, so far, has been lamentable.

No country is ever really self sufficient. We need to concentrate on some areas and become world beaters. We have the necessary potential.

SESSION III

"DEFENCE AND INDUSTRY : MINISTRY OF DEFENCE POINT OF VIEW"

Chairman : Shri S.S. Marathe
Main Speaker : Cdre Das, IN

The Chairman, Shri S.S. Marathe, said that the country recorded an annual 5.5 percent compound growth rate during the eighties in its GNP. The dynamics of such a phenomenal growth are not generally understood. The growth in the eighties decade equalled the combined growth of the previous three decades. Further, there has been a directional change in 1991 in the economic and industrial policy which is bound to have a far reaching effect on industry both in the public and private sector and on research and development. The country is fast moving away from the command economy to a market friendly economy, leaving no room for protected islands of inefficiency either in the public or the private sector. The R&D will also be equally affected. The syndrome of "we" versus "they" has to be avoided. A well thought out strategy for the future is called for. Stating that the above aspects should be kept in view, he invited the main speaker, Commodore Das to give his presentation.

Paper presented by Commodore Das.

Commodore Das, IN, : "Defence and Industry : Ministry of Defence Point of Veiw".

Pune is the birthplace of the DGQA organization to which I belong. The first inspection unit was raised at the Ammunition Factory, Kirkee, in the year 1968. Today it has grown to be the largest QA organisation in the country.

Normally, it is the task of the Industry to sell to the market. Today I have an unusual task of selling the market to the Industry. Not being a marketing man, frankly I am most diffident about the outcome. After a decade of work in the field of inventory control, purchase, indigenisation and quality assurance, I feel that our plates are so full of present prospects, that a talk on future prospects and

strategy, which I have been asked to cover, appears to be premature. I wonder how you would react if I were to tell you that we are importing drinking water, albeit for a little specialised purpose, namely canned water for life rafts.

Though, as has been brought out in the background paper, we have successfully developed a number of items over last four decades, much more remains to be done. As yet, we top the list of defence importers though our per capita income happens to be amongst the lowest.

Our defence forces like all others, comprise basically of men and equipment. For the sustenance of men, who remain isolated over long period whether on high seas, jungles, mountains or desert, a whole range of consumer items have to be provided for. A ship at sea is a mobile, floating township. The men have to be provided with personal needs of food, clothing, toilets, bunks, furnishings, cooking ranges, lighting, ventilation, air-conditioning, refrigeration etc. To be a mobile platform, the ship needs a sturdy hull, propulsion and auxiliary systems, electric power, communication, navigational aids, damage control equipment etc. For war, it requires sensors, weapon control and delivery systems and ammunitions. In addition, there is a variety of aircrafts, helicopters and their associated support systems and weapons.

Another area which is slowly gaining importance is simulators. Because of rising fuel costs, it is becoming increasingly prohibitive financially to train defence personnel by actual flying, sailing or operation of tanks. Hence a wide range of simulators are being developed for training without fuel expense. I am mentioning the Naval equipment in particular not merely because I am a Naval Officer, but because of the fact that though size and budgetwise the Navy is the smallest, it covers the widest range of technology. From toilet papers to torpedoes, the Naval inventory covers about five lakh items.

Before we go into the future prospects, it is necessary that we first take a stock of our achievements and have an introspection into our methods, policies and procedures.

On the positive side, the majority of general stores and personnel items have been indigenised. Thanks to the untiring efforts of our

public and private sector undertakings, we have made a major headway in more sophisticated areas of engineering systems, vehicles including tanks, communication, sensors, control systems, some training simulators, guns, small arms and ammunition. Orders have been placed for complex weapon control systems and advanced stage of finalising manufacture of state of art gun mountings. The D R D O have successfully tried some missiles and we are looking forward to an early productionisation.

The background paper has brought out that our country has been producing ships, aircrafts, tanks etc. for quite some time. From the initial phase of sticker technology, we have now graduated to manufacturing some systems and sub-systems. In fact, we have come to a level of self confidence of attempting our own R&D in these areas.

Despite these strides in indigenisation, our import bill continues to be a matter of concern. The underlying reasons for the continued dependence on foreign countries could be grouped into three basic reasons.

(a) Easy availability at affordable prices from erstwhile USSR.
(b) Indigenous failure due to unsatisfactory quality.
(c) Indigenisation not attempted due to meagre quantity.

Till the eighties, the country was fortunate to receive major portion of her defence requirements at affordable price and attractive credit terms. But with the disintegration of the USSR, the situation has changed. Though it has been stated that the situation has changed for the worse, in my opinion, the situation has given much desired fillip to our indigenisation effort. Necessity, they say, is the mother of invention. Thanks to the possible drying up of this source, the defence logisticians have started looking more inwards for supply of equipment, spares and stores. In addition, earlier, the Soviet Union used to charge a political price rather than a commercial price. Lately, Russians have been steadily increasing their prices to international levels. The need for indigenisation has, therefore, assumed an important dimension. The Ministry of Defence have constituted a number of empowered study groups to identify items that are technically and commercially feasible to be indigenised and work out time bound action plans. This policy, I feel, will bring a sea change in the attitude of defence logisticians who have been relying on the easy way out, i.e. import.

There have been some cases of indigenisation failure and lack of confidence because of poor supplies. In the past, the defence purchase organisations have not been very choosy about their suppliers. Consequently a number of manufacturers with poor infrastructure had entered our defence market.

Reputed firms could not get orders as they could not match the quotes of these firms. Also having obtained the order at low prices, these firms attempted to cut corners and compromise on quality. In certain cases, they grabbed the order because of low quotations though they lacked essential process or Quality Assurance capabilities. To obviate this problem, the Department of Defence Production have introduced a rigid vendor assessment procedure and issued the guidelines às a priced publication. Consequently, a number of suppliers have been deregistered.

Firms with ISO-9000 certificate would be preferred, though, as per existing rules, we have no provision to give them any price advantage. We have also a scheme of self certification.

Meagre quantities projected for procurement has been one of the main factors discouraging indigenisation. As a general rule the services headquarters have been projecting their requirements based on annual reviews. Number of items projected for procurement could not be indigenised earlier as quantities were unattractive. It has now been agreed that if an item has a recurring requirement, long term requirement would be projected for indigenisation. The order will either cover requirement over five years or more with staggered delivery or a letter of intent, would be given based on long term requirement, but the item would be ordered from year to year. If, however, there is a shortfall in demand, the unamortised portion of capital investment made by the firm could be reimbursed.

As added incentives, the firms are being given advance against bank guarantees to reduce financial cost. In addition, the Q.A. organisations are available to guide manufacture, carry out input material inspections and generally function as technical partners of the industry in their development efforts.

For supply of items to the Navy, excise duty is exempted and components materials required to be imported are custom duty exempted.

With the above policy changes, we are most hopeful that the Industry would also rise to the occasion and take up indigenisation of items like the entire range of submarine machinery and spares which have eluded indigenisation.

A large variety of spares, sub assemblies and systems of Army and Air Force also await indigenisation.

I consider the question of export of defence goods as of utmost importance to the industry and country as a whole. No industry producing defence goods can sustain itself solely on domestic orders. Even countries which have massive defence budgets, like USA, Russia and China, export defence goods extensively. Countries which do not have a standing army, like Switzerland have high tech defence industries existing solely on export. A perusal of the table of defence exports made by various countries over a decade reveals that India, as in the last Olympic medal tally, is conspicuous by its absence.

So far, our industry was diffident about entering the world defence market because of the general impression that our goods are sub-standard and prices exorbitant. Over the last five years of work in the field I have experienced that pricewise our goods are competitive if not cheaper, particularly in labour intensive products. With the persistent efforts of our Q.A. organisation, the quality of a vast number of items developed indigenously compares quite favourably with international standards. What is lacking pathetically is an aggressive marketing of our products. Our organisation (QA) subscribes to a number of international magazines which are full of advertisements from foreign firms. I am yet to see the names of giants like BEL, HAL, BHEL, L&T, Kirloskar, CCI etc. appearing in these magazines.

I have been personally trying to propagate the concept of defence export to a number of manufacturers and export houses, I am happy to state that one of our ex-Chief of Naval staff has utilised these inputs and grabbed some export orders at very remunerative prices.

I have spent considerable time in analysing the strength and weakness of our industry. Despite poor efficiency and also political disturbances, our labour cost is substantially cheaper on account of vast differences in pay bills. Hence, in all labour intensive products, we have a marked price advantage. On the other hand, because of

high interest rates, the financing cost works out to be rather high. However, this is offset to a considerable extent by the advances paid against development orders. Further, with the removal of controls, the industry is free to raise funds from the public. Of late, reputed firms have been announcing rights issues with as much as Rs. 190/- premium.

Though the raw material price is high in Indian market for exports and supply to the Indian Navy, these could be imported duty free. Lastly, by and large, the Indian industry does not have to invest in R&D, as it is given free of charge by our D.R.D.O. In other cases, indigenisation is done by technology transfer, the fees of which is either paid by our defence forces or amortised fully in supplies to our country. A large number of items are also produced by reverse engineering where again, the R&D expenditure is not very high. Taking all the above factors into account, generally the indigenous items should be pricewise quite competitive.

The areas where our Industry needs to make marked improvement are timely supplies, documentation and product support. Delivery period is of utmost importance to the defence forces. It must be realised that a single item like underwater paints costing a lakh of Rupees could hold up undocking of a ship costing hundreds of crores. Similarly, defence equipment have to be maintained in isolated areas by our own personnel for which they need documentation, test equipment, tools and spares. These are equally important while exporting goods.

These are two major international events, though most unfortunate, have opened up new vistas for our industries. First is the demise of the erstwhile USSR, which has orphaned all countries dependent on it for defence equipment and spares. Out of these, India has made the maximum progress in indigenisation of Russian items. With our low cost and comparable quality, we could easily emerge as the only option for supply of defence hardware to these countries. The second international event of importance to our defence production was the Gulf War. Consequent to this war, a number of Western countries have placed severe restrictions, if not total embargo on supply of defence items to some countries. With the drying up of the Soviet source, here again India could provide a viable market to meet their defence needs. What is again needed is aggressive marketing. The joint Naval exercises organised by our present C.N.S. could

indirectly help in this direction by projecting the required image of our industry whose efforts have gone into production of the ships taking part in such exercise.

Our industry, no doubt has a disadvantage in marketing of defence hardware as they lack experience and knowhow. They are fully capable of approaching a foreign super market for export of say a leather jacket. But knocking at the doors of the Pentagon is an entirely different matter. I have deliberately delved in this area more than necessary because I feel that the Centre for Advanced Strategic Studies (CASS) which is manned mostly by retired defence services officers can play an active role by way of consultancy in export. I would like to emphasize that there is a great future in this area and presently with the existing global situation we have opportunity knocking at our doors. Unless we act fast and use the opportunity it would not be possible for us to sustain our industry in the long run even with our Defence Revenue budget of Rs. 5500 Crores on stores and another 5000 crores on Capital Outlay.

In conclusion, I would like to put it to the august gathering that the future prospect is bright and we are now poised for a major leap in the area of defence production both for meeting the rising domestic need, as also play a major part in the international defence hardware market. The government is fully aware of the need to support the industry in this effort and has taken some major policy decisions in this direction. The government has also made its defence purchases more transparent than in the past.

J.G. Nadkarni : Closing Remarks

Admiral J.G. Nadkarni, Director of the Centre for Advanced Strategic Studies thanked the main speakers and all the participants of the seminar, which generated very lively discussions. He expressed the hope that the seminar deliberations will prove useful in a proper understanding of our strengths and weaknesses in our R&D and defence production and in formulating strategies for the future.

He thanked the Department of Defence & Strategic Studies and the University of Poona for their valuable support to the Centre for Advanced Strategic Studies in organising this seminar and declared the seminar as closed.

SUMMARY OF DISCUSSIONS

Over the years an impressive infrastructure for defence production in the form of 39 Ordnance Factories, eight Public Sector Undertakings and an elaborate Defence Research and Development Organisation with 40 laboratories under its wing has been set up in the public sector. Its production has recorded impressive increase, but the goal of self reliance, except in the case of small arms, clothing and accoutrements, has eluded it. The private sector appears to have been deliberately kept out. The country depends heavily on imports for all its major weapon systems. Indian security is hostage to foreign countries and transnationals.

The country has launched its policy of liberalisation and economic, fiscal and industrial reform for integrating it with the global system. This needs to be fully extended to the defence sector as well as Defence Research and Development to make them accountable and cost effective. At present, there is a wide gap between planned projections and ground realities.

The defence industry management is hamstrung by bureaucratic controls and resultant inordinate delays, and by archaic labour laws that militate against efficient management. Nearly 90 percent of the Defence R&D effort and expenditure goes waste due to delays, lack of harmonisation with the operational needs and timely synchronisation with production effort. The imperatives of modern technology which has condensed the life cycle of major weapon system from decades to three or four years, do not permit lackadaisical leisurely defence R&D and production effort, if the country is to achieve at least a reasonable degree of self reliance in defence production. The vast potential of private industry for defence production remains untapped.

The seminar has been very timely. It addressed itself to assessing the strengths and weaknesses of the defence industry, and the private industry, to analysing the reasons for the shortcomings and to recommending a number of measures that could be undertaken to make the industry including defence industry and the defence R&D more effective in meeting defence needs and in achieving the goal of self reliance at least substantially.

A general consensus emerged on the following lines :—

— The Ministries of Defence and Defence Production should not discriminate against the private sector, should take into confidence and fully utilise its tremendous potential as has been done by the Indian Space Research Organisation (ISRO)

— Viable industries in the private sector should be intimately associated with defence R&D from the initial stages and given necessary financial and technical assistance and guidance and economic order quantity for productionising designed equipment in a spirit of cooperative partnership. Wherever necessary, development costs should be subsidised by the government.

— Other things being equal, or in cases where differences are marginal, indigenous industry should be given preference over foreign firms.

— Quality consciousness is almost absent in the Indian industry, jettisoned for short term gains and profits. The position in the materials and component industry is lamentable. The industry needs to be urged, if necessary, compelled to pay attention to this aspect. It should immediately get on Total Quality Management frequency, acquire IS 9000 series/BS - 1600 series recongnition and make itself internationally competitive to be able to effectively contribute towards defence production.

— Archaic labour laws and procedures which militate against efficient management and quality production should be immediately changed to permit prompt sacking of inefficient workers and managers.

— The Public Sector Undertakings should be made accountable and more efficient and given greater autonomy in respect of planning, production and tapping resources and markets. They should be subjected to prompt exit policy - closure for perenmially loss making inefficient undertakings - and adequate powers to get rid of inefficient workers and managers and inefficient practices. They should be given powers to utilise idle and spare capacity for civilian

production for fuller utilisation of available resources and for becoming cost effective.

— The politicians and bureaucrats should strictly confine themselves to laying down broad policies and leave the planning and execution and other details entirely to the chief executives of these undertakings.

— Instead of defining a "product" or a "weapon" the armed forces should define a problem and associate R&D with the solution

— The users, that is the defence services should exercise great care and display flexibility in stipulating technical specifications for the equipment to be procured, and, instead of rigidly adhering to those of a foreign product, should survey and keep in view the indigenous production potential and should desist from making any changes to these specifications at short intervals. At present, almost every user trial has coincided with change in user specifications.

— The users should place a premium on indigenous development and procurement while finalising operational requirement and technical specifications, without jeopardising combat efficiency.

— Under the present extremely dilatory and complicated system, the designed equipment availability stage coincides with the stage of obsolescence rendering the whole effort futile and self defeating. The time span from design to peak production needs to be drastically reduced. Association of users at the design stage and elimination of time gap between proving and productionisation are essential. Lately the time for obsolescence of major weapon systems has become three to four years, instead of a few decades obtaining earlier.

— Export of defence stores is often vital for economic scale of production. It should therefore not be hamstrung by moralistic and idealistic overtones, but should be primarily governed by economic and commercial considerations. This calls for dynamic marketing strategies eliminating political and bureaucratic bungling, delays and interference.

— The DRDO should keep abreast of the latest technological developments which could influence the battlefield environment and fighting techniques, and should programme itself to meet the changing defence needs.

— The abrupt disruption in the supply of Soviet arms and equipment is a very serious setback to our defence capability, but tackled with imagination and discretion, it could be converted into an excellent opportunity for strengthening our defence production and making it globally competitive.

— Even highly developed countries with big defence budgets are finding it too expensive and taxing to achieve self sufficiency for their defence needs. India is facing a severe resource crunch. It should concentrate on some specific areas and become world beater as we have the necessary potential. If need be, a consortium approach with like minded countries should be adopted.

DEFENCE AND INDUSTRY

SEMINAR - 17TH MAY, 1993

LIST OF PARTICIPANTS

1.	Shri R.D. Sathe	- CASS
2.	Shri. S.S. Marathe	- CASS
3.	Prof V.G. Bhide	- CASS
4.	Adm J.G. Nadkarni (Retd)	- CASS
5.	Air Marshal Y.V. Malse(Retd)	- CASS
6.	Shri R.D. Pradhan	- CASS
7.	Shri S.L. Kirloskar	- CASS and Industrialist
8.	Shri N.K. Firodia	- CASS and Industrialist
9.	Lt.Gen K.C. Taneja	- Comdt CME
10.	Vice Admiral Inderjit Bedi	- Comdt NDA
11.	Rear Admiral Ajay Sharma	- Director & Dean IAT
12.	Dr. Sudhakar Pandey	- Dean Faculty of Arts, Poona Univeristy
13.	Air Marshal R.S. Bedi	- DG, DPS, South Block, New Delhi
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15.	Air Cdre P.S. Dikshit	- IDSA, New Delhi
16.	Brig S.D. Sood	- IDSA, New Delhi
17.	Shri K.N. Pande	- Offg. Director ARDE
18.	Shri S.N. Deshpande	- ERDL
19.	Smt Vasantha Ramaswamy	- R&D Engrs
20.	Shri Sharma	- R&D Engrs
21.	Shri R.D. Aga	- Chairman & MD, Thermax Ltd.
22.	Captain Prabhala, IN (Retd.)	- Ex Chairman & MD, BEL
23.	Cdre Das	- DGQA MofD, New Delhi
24.	Gp.Cpt Y.R. Sardesai (Retd.)	-
25.	Dr. (Col) B.S.K.S. Chopra (Retd.)	- Director, FTI, Symbiosis
26.	Shri V.L. Date	- CASS
27.	Col R.D. Palsokar (Retd)	- CASS
28.	Maj.Gen.H.W. Kulkarni (Retd)	-
29.	Maj.Gen. K.S. Pendse (Retd)	- CASS

30.	Gp. Capt. Sharma	- Dy. Dir C-DAC
31.	Shri Arvind Tilak	- CASS
32.	Shri S. G. Khandekar	- Kirloskar Brothers
33.	Lt.Gen. B.T.Pandit (Retd)	- CASS
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38.	Maj.Gen V.K. Madhok (Retd)	-
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40.	Dr. S.B. Ray	- Ex Addl. DGQA, MofD, New Delhi
41.	Shri Kamalapurkar	- Chairman DEMA
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45.	Gp.Capt. S.G. Chitnis (Retd)	- CASS
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48. to 60.	M.Phil & Ph.D. Students	- Department of Defence & Strategic Studies, Poona University

CENTRE FOR ADVANCED STRATEGIC STUDIES

The Centre for Advanced Strategic Studies (CASS), Pune was registered on 21st September 1992 under the Society's Registration Act, 1860, and as a Charitable Public Trust on 28th October, 1992, under the Bombay Charitable Public Trust Act of 1950. The Department of Scientific and Industrial Research, Ministry of Science and Technology, Government of India have accorded recognition to CASS as a Scientific and Industrial Research Institution. CASS has been granted exemption under Clause (i) (iii) of section 35 of I.T. Act, 1961 vide DG (ITE) Calcutta letter of 8 July '93. This gives hundred per cent income tax exemption for all donations/payments to the Centre.

The Centre aims at undertaking research and analysis of subjects relating to national and international security, economic security, strategies for peace, security and development through seminars, discussions, publications at periodical intervals and close interaction with the faculty members and research students in allied disciplines in the Universities/Institutions and the Armed Forces. It also awards research fellowships. The Centre aims to generate and promote interest amongst the academicians and the public in these subjects, with a view to making them alive to national security concerns. So far, it has conducted eight seminars and group discussions. The University of Poona has given very valuable support.