A Survey of Successful Offset Experiences Worldwide

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In venturing to write about successful offset policy and experience in different countries, the basic problem faced is that of unavailability of data. There are no universally laid down parameters or measures to weigh the costs and benefits of offset programmes. Even if some countries have individually undertaken an exercise to evaluate such costs and benefits, the information is not always available in the public domain. Cross country comparisons would also not yield consistent results.

Nearly all governments make purchases of defence equipment, and a majority of them have some form of offset policy. The objectives of the policy may vary, but are usually stated with a fair degree of clarity. One approach to the evaluation of offset programmes could be to make a general assessment, based on such empirical evidence as is available, of the direction and degree of the achievements, viewed against the stated objectives. Another approach could be to look at the results for the buyer country of offset provisions embedded in particular defence acquisition programs. From a survey of country-wide experience, it is also possible to discern common trends in the growth path of offset policies, which could impart useful lessons for the future. This paper is an effort in these general directions.

The Middle East: Saudi Arabia

Saudi Arabian policy has focused on the need to transform the economy and to reduce the overall dependence of the country on the export of

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petroleum. Their economic plans prioritise the development of agriculture and industry; they seek to diversify the production base and to improve the skill levels of workers for the benefit of the national economy. There is also an emphasis on promotion of private sector participation and encouragement to the investment of capital in business ventures within Saudi Arabia.

In Saudi Arabia, offset programmes are not regarded as instruments for counter-trade. The objective of the offset programme is to create a number of private sector business projects, mutually beneficial partnerships between Saudi and foreign companies, usually in the form of joint ventures. The Saudi government is looking for technology transfer to upgrade its own capabilities for an overall diversification and strengthening of the economy. Other objectives are to make the best use of the country's natural resources, to improve potential for long term export, and to develop various service industries which are needed for supporting infrastructure.

The three major programmes through which the Saudi offsets policy has evolved are discussed below:

(a) Peace Shield: This was a programme with Boeing of the USA as prime contractor for establishment of a ground based air defence facility in which the Saudi government pursued an offset programme aimed at bringing in high technology transfer content. The Boeing group set up four Peace Shield offset companies-

- The Advanced Electronic Company, to manufacture the latest and most advanced military and commercial electronic equipment within Saudi Arabia.
- Aircraft Accessories and Components Company, for maintenance, repair and overhaul of aircraft components like flight controls, pneumatic fuel and hydraulic systems.

- Al -Salam Aircraft Company for MRO, upgrade and modification of civil and military aircraft.
- International Systems Engineering is a company that specializes in information technology, systems integration and development.

(b) Al-Yamamah: This was a major defence contract between the UK and Saudi Arabia for purchase of military and civil aircraft, helicopters and ships, with associated training and support, as well as construction projects, with British Aerospace as the prime contractor. The total value of this programme was around $7-8 billion i.e. about four to six times larger than the Peace Shield programme. The contract had an investment target of about $1.5 billion. Investments in pharmaceuticals, vegetable oil manufacturing, petroleum, food processing, health care and environment care equipment were also welcomed. The objective was to acquire fully developed, proven technology for immediate commercial application.

(c) Al-Sawary II: This was a programme for purchase of frigates from France for the Saudi Navy at a cost of $3 billion, carrying an offset investment obligation of about 35per cent, in various fields including glass, precious metals, smart cards and agro industry.

Offsets have certainly helped to contribute to the industrialization of Saudi Arabia, diversification of the economy, and participation by the private sector in national economic development. A number of high technology ventures which otherwise may not have fructified, came into existence. Ventures lower in technology content, but with favourable long term business prospects, have also been established. As per the Secretary General of the Economic Offset Program, as many as 36 industrial service projects have come up, with investments totalling about $4.5 billion. These projects have created more than 6,500 new job opportunities. In 2006, the total sales of the companies created under the offset program reached $8 billion and exports about $1.5 billion. The main investments have been in

the aircraft, electronic and electric industries (13 per cent), food and medicine (12 per cent), and chemicals and petrochemicals (6 per cent). Health management through specialist medical colleges, nursing schools, nanotechnology research centres and production of specialist medical equipment are the next focus areas.

Technology transfer was always important in the Saudi offset programme. In the beginning, some of the offset proposals were attractively "high technology"; however, high technology is not always easy to transfer. Cutting edge technology is generally not shared. What may be passed on is technology that is shortly about to be replaced by new developments. Even so, there has to be a work force with high skill level and capabilities in the buying country to fully utilize the benefits of the technology. Further, there should not only be an ability to use the technology, but also to carry forward the technological developments, without which the acquired technology will rapidly become obsolete. Recognizing these inherent problems, the Saudi offset program has progressively stressed on the transfer of medium, commercial exploitable technology, rather than "high" technology.

Saudi Arabia also did not embark on the route of trying to manufacture components and sub assemblies of main systems under license as was done in some other countries. They did not have a huge skilled workforce, for whom it was necessary to find jobs. The market for such items is also quite limited. Besides, the sale of items manufactured under license is generally controlled by the license giver. The Saudis preferred to concentrate on the establishment of industry and R&D for commercial and dual use products with wider markets.

Measured against the total available resources for investment actually available, the investments that have been made may be somewhat small. Some of the reasons put forward are: lack of progress in identifying good

business opportunities, lack of reliable market data on local partners, and complexity of the government procedures / organizations that foreign vendors have to deal with. The Saudi government has tried to put in place a friendlier organization to smooth over bureaucratic hurdles, and provides advice through a one stop administration under Saudi Arabian General Investment Authority (SAGIA). SAGIA holds international road shows, and coordinates with regional chambers of commerce and industry to achieve better results. Offset financing is made available to reduce upfront investment risks. Loans up to $10 million are available on a seven year term basis. Joint ventures are recipients of number of facilities such as tax holiday, freedom to repatriate capital/profits, exemption from import duty on essential imports, and tariff protection up to certain levels. They also have access to reasonably priced infrastructural amenities.

Israel

The offset philosophy of the Israeli government is different from that of Saudi Arabia. The policy in Israel is one of encouraging industrial co-operation i.e. the offset programme aims to promote close co-operative working between Israeli and foreign firms, with the long range perspective of enabling the former to add value through such strategic partnering. In fact, the Israeli government agency that promotes and administers offsets is called, appropriately, the Industrial Co-operation Authority.

To understand this philosophy one has to consider the general economic conditions in Israel and the level of their technological capabilities. A dominant characteristic of the Israeli environment is the extremely high skill levels of their work force. It is estimated that more than a quarter of the work force has acquired higher technical and academic qualifications. At the same time, manpower costs in Israel are quite competitive when compared the Western world. The Israeli government also chips in with large subsidies and other kinds of assistance including financial incentives

and tax holidays for R&D investments, further reducing the cost of technological and research efforts.

By leveraging the unique skill sets of the work force, within a period of about 50 years, the economy has been transformed from agrarian to fully industrialized, with special capabilities in niche markets such as medical aids and equipment, digital communication and information technology, defence electronics, advanced agricultural technologies, etc. Israel is today recognized the world over as a centre for high technology. Israeli companies are known for their state-of-the-art technologies and quality products. This makes it easier for foreign companies to place high tech work in quite substantial quantities, with Israel.

As mentioned above, the government of Israel has, as a conscious policy, spent large amounts of money in the promotion of research and development. Israel spends about 3 per cent of its GDP on R&D, which is at par with the most advanced economies of the world.

In spite of the high levels of technical sophistication, the problem that Israeli companies faced was that of lack of access to large global markets. There was a need to link these firms with the global economy. This is what the offsets were used for. Offset helped to bring the Israeli firms into contact with some of the world's technological and industrial leaders, and by partnering with them the Israeli firms have been able to get an entry into the world market and add to their value. Offsets have enabled these firms to undertake high tech subcontracting and R&D, and given them world wide exposure and market openings.

Offsets have also led to additional investment, new jobs and technology transfer, which the Israeli economy was in a very good position to absorb.

One of the important principles underlying the Israeli offset policy is that

the projects and activities pursued under programme should be of mutual benefit to both parties. The underlying intention is to forge long term strategic alliances between foreign and Israeli firms which will outlast the requirement of the offset contract; if the policy tries to extract too much out of the foreign firms it will lead only to short term opportunistic projects and the offset partner will try to exit at the earliest opportunity.

For this reason, the Israeli offset policy is quite lenient in several respects. There is no clause for liquidated damages or other formal penalties. A reasonable percentage (minimum 35 per cent in the case of civil procurements and 50 per cent in the case of military procurements) is asked for by way of offset. The policy does not lay down precisely what sectors the offsets are to be directed at; the general principle is of direct or other high tech technology transfer and defence industry investments. This gives the country the required flexibility to take advantage of any good proposal that may come its way. There are arrangements for pre-offsets i.e. offsets without specific obligation and for banking of offsets. At least 20 per cent of the offset should be direct offset. The time period for completion of the offset obligation is also flexible and negotiable – usually it is stipulated at three years.

There are two aspects of offset policy in Israel- offsets programmes that are created as a result of government purchases and offset programmes that are created out of private sector procurement activity. The Israeli government requires mandatory offsets on its procurements. However, the volume of voluntary offsets in the private sector is greater than that of mandatory offsets required by the commercial activities of the government. The Industrial Co-operation Authority (ICA) monitors and co-ordinates the offset policy both in the government and in the private sector, although it does not formally approve projects; conclusion of agreements is in the domain of the respective parties that are taking part in the trade. The approach followed by the ICA is of active support and openness to

innovative ideas and out-of-the-box proposals for fulfilment of offset obligations.

The success of the Israeli offset policy can be gauged from the following statistics for 2000-2006 put out by the ICA:

Obligations-	Civil	$2167 million
	Military	$2299 million
Fulfilment-	Civil	$5583 million
	Military	$3168 million

One of the larger and more successful offset programmes finalized by the Israeli government was associated with the $2 billion purchase of combat aircraft in the nineties. Mc Donnell Douglas, who won the bid, agreed to provide liberal offset package of about 100 per cent of the sale value. The technology transfers that came out of these offsets have helped Israeli companies such as Israel Aircraft Industries, Cyclone Aviation Products, Israel Military Industries, and TAT Aero to develop their own weapons and systems that now enable them to compete for export orders.

Asia: Japan

Japan is a good example of a country which has utilized its strategic importance and favoured relationship with a world superpower to develop its indigenous defence industry in the post World War II years.

Japan's industrial policy since the second half of the 19th century, has been based on the principle that technology transfer and absorption from the western powers with the idea of first emulating their state-of-the-art techniques and finally overtaking them, is the key to rapid, robust and diversified industrialization. In the realm of defence industrialization, Japan has used its special position vis-à-vis the United States to obtain

substantial offsets in the form of technology transfer and rights to undertake licensed production of high tech military equipments and systems. It has built up a sizeable military industrial complex of its own. Moreover, the spin-off benefits from the technological developments in defence industry have resulted in huge gains in the civilian sector as well.

The Japanese policy of indigenization of defence production is shaped by its overall view with regard to technological self-sufficiency and ascendance. The Japanese belief is that there cannot be real security unless the country is independent with regard to technological knowledge and competence, and self sufficient in the production of armaments. A general unease on account of the excessive dependence on American military support, misgivings about the state of the US economy and its continued commitment and interest in backing Japan, and the rising life-cycle costs being incurred on the maintenance and upgrade of foreign systems, were other factors that propelled Japan to strive for self reliance in arms production. Last but not the least, there was a clear vision that the absorption of military technology and the creation of domestic arms production capacity would have important spread effects in the development of civil commercial technologies that would serve Japan's long term goal of becoming an industrial and technological superpower.

A major source of the technology inflows into Japan came from defence offsets. Japan has received from the US licence rights for a larger number of defence equipments and systems than any other country in the world. As per the US government data, between 1960 and 1988, licences for 28 major systems were given to Japan. These include several programmes under fixed wing and rotary wing aircraft, aircraft parts, sub-systems and engines, and missiles.

Transfer of licences helped in a rapid indigenization of the Japanese military industry. Japan has made major progress in self sufficiency and

more than 90 per cent of Japan's requirements for military products are now met within the country. There have been a number of important developments in the aerospace sector. For the F1 fighter there was a Japanese fire control design; for the T4 intermediate jet trainer the fuselage and engine were developed in Japan; 80 per cent of the materials and systems for the P3-C Orion are sourced from within the country; the FS-X advanced fighter bomber has been built indigenously with Mitsubishi as the prime contractor in collaboration with General Dynamics (later Lockheed Martin); almost all the air defence missiles required by Japan are locally produced. On the naval side, Japan indigenously manufactures all the combat vessels and submarines that it uses. In land systems, Japan has a huge capability for all kind of infantry weapons. Japan's main battle tank in earlier years was the Type 74 produced by Mitsubishi Heavy Industries, with many of the systems and sub systems of Japan design and make, and the tank's 105mm gun manufactured under licence from Royal Ordnance, a British company. This MBT was replaced by the Type 90 - a completely indigenous tank again manufactured by MHI as prime contractor, using several advanced materials and technologies including modular composite ceramic armour developed by local industry.

The technological developments from offsets also had important spin-offs in the promotion of strategic civil industries in Japan. The technology for the brakes of Japan's famous Bullet train came out of the knowledge gained from production of F-86 aircraft. In a unique example of sharing of learning and experience, Mitsubishi Heavy Industries that produces the FS X fighters, use the same premises, machinery and skilled operatives for doing works connected with Boeing civil jets. Japanese firms have acquired much knowledge in the manufacture of composites from work experience on tanks and aircraft wing structures. Licensed production of military radio equipment led to the establishment of the radio production industry in Japan.

Other kinds of spin-offs are with regard to soft skills including advanced project management from handling complex military projects, expertise in systems integration, production, inventory and quality control, standardization of products, industrial engineering, etc. In enabling the country to absorb such technologies, Japan's early investment in human resources and education paid rich dividends.

In Japan, development of military and civil productive activities has remained closely co-operative and interwoven. The military and civilian industries have evolved together, not isolated or separate from each other. Japan's strategic industries specialize in dual use technologies i.e. technologies which have commercial as well military uses. These technologies are great drivers of economic growth and pervade the aerospace, electronics and telecommunications, materials, machine tool, and automobile industries. In respect of a number of critical dual use technologies such as micro-electronic circuitry, semi-conductor compounds and robotics, Japanese industry is perceived to be ahead even of the US. The dual use industries permit reverse spin-offs with the advancements taking place in the civilian sphere aiding new developments of military items and processes.

Also noteworthy is the fact that the benefits of development and production of military equipment was not confined to the primary contractors who won the initial contracts but was allowed to diffuse downwards to a larger number of companies through the mechanism of sub contracting, many of whom might have been losers in the primary bid. This unique system has helped to build up a body of expertise in the different industries of suitable scale without over-concentration or over-dispersion. The Japanese defence contractors are diversified companies dealing in a wide range of civilian goods. This helps them to tide over periods of contraction in defence demand as they are not dependent on defence sales for their survival.

Japan's R&D funding is also interesting. Nearly 95 per cent of the R&D expenditure, government and private, is devoted to commercial applications with maximum economic and social returns. Government is more of a facilitator, rather than a funding agency, for promising projects. The major share of funding comes from the private sector. In case the R&D efforts result in the development of a marketable product, the investment can be recovered from the price of the item. However, the R&D risks in the event of failure have to be shared by the private sector as well.

Today, Japan is a serious competitor to its erstwhile suppliers in the US in respect of a number of products, components, systems and sub-systems. As the US gets more cautious about parting with cutting-edge technologies to Japan, the Japanese authorities have also tempered their stand on complete technological self reliance, to focus more on the benefits of co-development and co-production programmes to sustain their research and development base and retain access to the best technologies of the world.

Europe: Spain

Spain is a good example of a country which has used offsets and allied programmes to stimulate defence industry and use it as an instrument for re-industrialisation. By stimulating demand through government owned production entities, providing tariff protection to new industries and creating high volume export oriented sectors, the government aimed at propelling the Spanish armaments industry to European standards. In particular, the electronic industry was seen as a possible high tech industrial niche. The mechanisms employed were offsets on foreign military purchases, encouragement to R&D projects and subsidy support to military electronic and engineering industries.

In 1983, Spain entered into agreement with McDonnell Douglas Corporation, USA, to buy 84 F 18 aircraft, in what was the first major

acquisition effort of the Spanish armed forces in the post Franco years. McDonnell Douglas Corporation agreed to provide offsets of $ 1.8 billion. An Offset Management Office was set up in Spain to oversee the implementation of the offset programme.

The government's objectives were: *first*, to spur the development of Spanish firms, particularly in the aerospace and electronics sectors, *second* to enhance the technological base of Spanish industry through technology transfer from abroad, *third*, to create export opportunities for Spanish firms to break into the global market, particularly the American market, and *finally*, to create employment in Spain so that the negative effects of the purchase of aircraft on the Spanish trade balance were fully compensated.

The offsets were in four groups:

- *Group A*- designated offsets- which referred to work, items or services to be carried out by Spanish firms on the aircraft that were being purchased.
- *Group B*- aerospace co-production offsets- which referred to work to be done by Spanish firms for aircraft meant to be exported to other countries or other aerospace activities.
- *Group C*- indirect offsets- activities involving the use of defence related technologies other than in the aerospace area.
- *Group D*- indirect commercial offset including investments made in Spain and sales from such investments.

The total offsets from groups A and B had to be not less than 17 per cent of the total package and tourism related offsets could not be more than 10 per cent.

When work was subtracted by McDonnell Douglas to Spanish companies, if the costs of production were higher than would be incurred by McDonnell Douglas in normal subcontracts, the additional cost would be

reimbursed to McDonnell Douglas by the Spanish government. For this purpose, the Spanish government set aside US $100 million. Despite the extra costs, the Spanish government was keen to maximize the amount of group A and B offsets during the negotiations phase. Although local assembly could not be taken up being prohibitively expensive, offsets were obtained for equipment, material, avionics and simulators. The offsets were to be implemented over a period of 10 years.

It was found that the fulfilment of the offsets was biased in favour of indirect offsets in the industrial sectors where Spain has been traditionally strong, such as chemicals, pharmaceuticals, iron and steel, foodstuffs and consumer goods and electronics. These industries generated a considerable volume of exports. The increase in exports helped to compensate to some extent the negative effect on the trade balance of the import of F 18 fighters by Spain. There was also an increase in job opportunities and employment in different sectors of the Spanish economy.

There were limitations on the capacity of Spain's defence industry to absorb large amounts of direct offsets. However, technology transfers to an extent did take place also in sectors such as aerospace in which Spain did not have much commercial advantage. Although such transfers were low in terms of comparative volume, they were important in that they created capabilities in areas like micro electronics, radars, automated test beds and simulators, materials and composites.

In the defence sector the benefits of direct offset were reaped by a limited number of firms. Two companies, CASA (aerospace) and INDRA (electronics) received more than 90 per cent of the defence related direct offsets. Technology diffusion has also therefore been confined to these firms. On the other hand, the indirect commercial offsets were dispersed amongst a large number of small firms. An important implication is that

indirect offsets proved to be an administrative challenge for the Offsets Management Office as it had to put in much greater time and effort in overseeing the implementation of the programme through a wide variety of small firms and to appraise a number of individual projects for suitability and calculation of "offset value" to the Spanish economy.

Spain has since been concentrating on smaller and more focused and targeted offset programmes of shorter duration, many of which are structured as co-production or co-development agreements. The Offsets Management Office has been re-named the Industrial Co-operation Management Office to reflect the change in focus. Some of the advantages of co-operation and co-production are:

- Activities to be done by the local partner are finalized before the arms purchase is made;
- Activities usually relate to the field in which the arms purchase is being made;
- There is no need to administer offset applications;
- The Spanish firms are able to interact more closely with their foreign partners and have a greater involvement in the evolution of the project and associated R&D.

The challenge is for countries at lower technological levels to identify areas in which they could meaningfully participate in a co-development programme. The experience gained by Spain from the early offset programmes proved useful as it helped to raise the level of the defence industrial base, demarcated areas of potential development and gave an opening to Spanish exports in niche markets.

In the 1990s, the government evolved a policy to use the arms acquisition programmes to attract foreign partners into investments in domestic companies. As per this policy, a state company with a prime contract from the government could have a foreign subcontractor with a minority share.

It was felt that after making sizeable (though minority) investments to modernize and develop Spanish firms, and to equip them with the latest skills, the foreign partners would display greater long term commitment to Spanish industry.

South America: Brazil

Brazil, though a peaceful nation, has always been a dominant force in the Americas. One of the principles underlying the Brazilian policy is that the country should be able to provide adequately for national security and should not depend for its protection on foreign arms. Development of the armaments industry has therefore been a very important objective. It was also felt that the growth of military industry would have the effect of stimulating the development of the civilian industrial sector as well, while helping the economy to gradually ascend the technology ladder.

The Brazilian government has for many years now, leveraged its armaments purchases to acquire the latest military technologies from abroad through such methods as licensed production, co-production and joint ventures although it has formally articulated its offsets policy quite recently. Technology transfer has always been a key requisite in all Brazilian arms procurements. The state has also been willing to invest a good deal of resources in the indigenous projects, although commercial success of the ventures has been somewhat patchy.

The first big steps in the programme of military industrialization of Brazil were taken in the late sixties. Embraer Corporation, the Brazilian aeronautics major, was established in 1969. It proved to be leader in the absorption and indigenization of foreign aeronautic technologies that accrued to it by way of offset deals. Embraer made good use of the excellent industrial and human resource base that had been painstakingly built up by the government in the run-up to industrialization. The

Embraer's first military plane, the EMB 326 Xavante trainer was manufactured under licence from Aeromacchi, Italy. In the early 1970s, Embraer had a technology transfer agreement with Piper of the US for manufacture of the Piper Seneca light aero-planes. In 1975, when 49 F-5 aircraft were purchased by Brazil from Northrop of the US, Embraer was involved in the manufacture of several fuselage components. Embraer next embarked on a co-production arrangement with Aeromacchi and Aeritalia of Italy a subsonic light attack jet fighter aircraft, the AMX. Different parts and subsystems of this aircraft were made in Brazil under licence arrangements, such as engine components, multi-mode radar, and head-up display. Some 200 of these aircraft have been produced and are in use in the Brazilian and Italian Air Force. SIVAM is a huge monitoring, surveillance, communications and air traffic control system for Brazil's Amazon basin area. It is a $1.4 billion contract and the collaborators are Raytheon, US along with Embraer and other Brazilian companies. Embraer supplied some of the airborne platforms by adapting existing regional jets. The SIVAM programme also gave a new lease of life to Embraer's ALX super Tucano, a light attack turbo prop aircraft which was a collaborative up-grade of the indigenous Tucano trainer, with Aeromacchi of Italy. This apart, a company called ATECH was set up so that Brazil could take part in development, operation, maintenance and up-grades of all the software required under the SIVAM project. The SIVAM project was a major step forward in technology absorption by Brazil and also gave an opportunity for the development of local software capabilities. Brazil is now embarking on a next generation fighter replacement programme.

Brazil has thus experienced a steady increase of its capabilities in the aviation sector and the various projects that have been undertaken have helped to bring about a broad diffusion of technology throughout the economy. The commercial results, especially for military planes, have been mixed- some of the programmes such as the AMX proved to be quite expensive and could not obtain any export orders. This was fortunately

compensated by Embraer's good export performance in the regional civil jet market. Another criticism that is sometimes levelled against the Brazilian paradigm is that there is quite a heavy dependence on imported components and sub-systems and up to 60 per cent of the components of any Embraer aircraft continue to be imported. The counter argument is that this could be a deliberate strategy whereby Embraer concentrated on absorbing technologies in pre-determined critical areas such as fuselage and systems integration rather than pursuing an unattainable goal of complete indigenization.

The first major contract on the naval side was for the construction of six frigates in collaboration with Vosper Thorneycroft of the UK. Local Brazilian capabilities in ship borne weapons and electronics are greater than their ability to construct ships; the up-gradation of their frigates with a dedicated combat system was undertaken by a consortium of one French and four Brazilian firms.

Small arms and ammunition have been manufactured by Brazil under licence from Italian, Belgium and British firms for a long time. Avibras, Brazil's missile producing company uses a lot of indigenous technology, but has had technology sharing arrangements with Canada, former Soviet Union and China.

Brazil has not looked for job creation or correction of balance of trade, but rather only to technological development of its defence and related industries through technology transfers, collaboration, co-production and joint ventures. Foreign companies on their part were attracted by Brazil's cheap labour and raw material supply, efforts and investments made for developing the capability of absorbing technology, conducive government policies and potential access to South American markets. By developing an autonomous technological capability, so much so that Brazil is in a position to take part in international collaborative projects for design,

development and production of advanced aircraft, it can be said that the Brazilian policy makers have achieved the goals they had set for themselves. With the development and up-gradation of military industry, there has also been a strengthening of the entire civilian industrial and technological base.

Whether the programmes have been a thumping commercial success is a different question altogether. It has been noted that costs of some of the projects has been quite high. Because of Brazil's small defence procurement budget, the commercial success of its various projects has always been heavily dependent on exports. In the eighties, Brazil was ranked amongst the top 10 arms exporters of the world. With the end of the Iran- Iraq conflict and the Cold war, arms sales dropped. Although Embraer's military sales expectedly fell, it was able to pull through because of a continued strong export performance for the civilian regional jets. With 40 per cent market share in 1999, it was about equal to Bombardier of Canada. In fact, diversification into civil production was required to maintain viable operations also for Avibras, which went into production of telecommunications and electronic industrial equipment. The defence industry of Brazil is now showing some signs of a small revival. The government is hopeful that the offsets that are likely to flow from the induction of the latest advanced jet fighter will help the process.

Conclusion

Are there any common themes or principles we can arrive at from this study? The following points emerge.

There is no universal “one size fits all” policy applicable to all countries. Each country has to evolve the offset policy that suits it best, taking into account its special requirements, unique capabilities, the depth and extent of its natural and human resources, and the level of its economic

development. The objectives of the offset policy should be based on a realistic assessment of the country's capability to absorb potential inputs.

The desire to acquire and absorb the latest technologies underlies most offset programmes. Technology transfer may sound quite attractive but it is only as effective as the ability to learn and make productive use of that learning. Good use of technology of course requires a highly skilled workforce. Moreover, merely acquiring an existing technology is not enough, there has to be the capability to take that technology forward through continuous and vigorous R&D. Otherwise, the nation receiving the technology becomes at best a branch manufacturing facility for the vendor country. Further, technologies have a way of becoming rapidly obsolete.

An offset policy should have a clear focus. Instead of dissipating energies in broad generalized programmes with multiple objectives, the nation is better served by a concentration of effort in specific objectives.

An offset policy can be successful in the long term only if both the parties in the offset deal find a real interest in the transaction. This is the difficult balancing act for the offset policy maker of achieving equilibrium between the obligations imposed on the foreign party, and the co-operation and benefits it wishes to reap. Imposition of stringent penalties for non-performance of offset contracts may be counter-productive.

Finally, the offset policy should have flexibility. Once an offset programme is in place, its results need to be monitored carefully and based on feedback received from actual implementation, moderations or mid-course corrections could be undertaken. The roll out of an offset programme is likely to be a learning experience for both parties.

Both management experience and international offset experience are critical to success of international cooperative projects (Farr, 1992). If the buyer is not a potential competitor for the seller, the offset will probably be more successful because sellers would not be likely to share technology with nor buy products from a potential competitor (Kremer and Sain, 1992). In addition, technical experience and capabilities of the buyer is one of the important success factors (Weida, 1996; Farr 1992). Other factors related to the buyer are a stable political and economic environment and a good relationship with the sellers government (Tien and Yang, 2004; Verzariu, 1985). The Survey particularly drew on Susan Fortneyâ€™s previous research on billable hours and their impact on ethics.47 The Survey questions fall into four broad categories:48.Â Finally, the Survey was intended to promote discussion within firms about these issues and, as a result, to prompt change in both individual and law firm attitudes and practices as appropriate. It was not intended to be a one-way conversation; that is, it was not designed to be a rigidly prescrip-tive checklist for good billing practices. The LSC hoped that lawyers and law firms could profitably use the Survey questions as a check of what they were doing. The Lodestone survey provides state-of-the-art long-offset data using Sentinel solid streamers which are essential when imaging the variable-quality and compartmentalised Permian and Carboniferous reservoirs lying beneath complex salt bodies, using high-end processing techniques. Luc Schlumberger, executive vice president, multi-client and new ventures, CGGVeritas, said: "Given the increasing interest of the industry in the Southern North Sea, we believe Lodestone will offer a high-quality resource to unlock the full potential of this prolific basin."