

DEFENCE COOPERATION: A CASE STUDY OF INDIA AND SINGAPORE

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With the possible exceptions of Russia and the US, all countries are dependent on imports of foreign weapon technology for indigenously developed weapons. Often, such dependency is extensive and deepening, and it is highly likely that the US will soon become the only country in the world with the capability to fund development of advanced weapons and technology on its own, creating the US monopoly of key technologies. While some countries might accept dependency, others may find it politically discomfiting, economically disadvantageous or militarily threatening. As a remedy to one-sided dependency, countries launch cooperative weapon development programmes, creating not only a larger market and pool of Research and Development (R&D) funds and technological resources, but also seeking interdependence. Such interdependence seems to work best when there is an existing cultural affinity, political engagement and economic interdependence. Alternatively, countries may develop niche technology that, while not included in cooperative programmes, still creates interdependence. The alternative option of self-sufficiency involves substituting imports for local development and production of weapons.¹ India has embarked on the self-sufficiency route but, due to certain external factors, has faced the technology denial regime. This has led to delays and incompleteness of certain projects.

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1. "Armaments, Disarmament and International Security," *Stockholm Peace Research Institute (SIPRI) Yearbook* (Stockholm: Oxford University Press, 2007), pp. 402-403.

A strategic partnership with Singapore has developed to a large extent, with India giving training facilities on a lease basis to Singapore Air Force personnel.

Nevertheless, India's joint ventures on defence with other countries are increasingly becoming successful. India's partnerships with Israel and Russia are cases in point. The trends indicate that India is not only cultivating strategic partnerships through military exercises, but also looking for partners in defence technology upgradation and pooling of resources. In fact, a strategic partnership with Singapore has developed to a large extent, with India giving training facilities on a lease basis to Singapore Air Force personnel for five years. After training its pilots at Kalaikunda air base and nearby firing ranges, India signed another agreement with Singapore on August 12, 2008, permitting it the use of the Babina and Deolali firing ranges for armour and artillery exercises. The agreement allows Singapore to train its ground forces in India for the next five years. Significantly, India has also allowed Singapore to station a small detachment of its army personnel and equipment (artillery guns and tanks) at the Babina and Deolali ranges for the duration of the agreement.² This arrangement is the first of its kind in India, which points towards increasing bonhomie in India-Singapore defence relations. It is to be seen whether there can be convergence in defence technology also.

The Defence Cooperation Agreement (DCA) signed in 2003³ received a significant impetus with the signing of the Comprehensive Economic Cooperation Agreement (CECA) which followed in 2005.⁴ Today, India and Singapore have emerged as strong trading partners. India's exports to Singapore amounted to US\$ 6,064 million in 2006-07 and US\$ 7,371.15 million in 2007-08.⁵ On the other hand, imports accounted for US\$ 5,485.26

2. See, "After Kalaikunda, Singapore to Train at Indian Army Firing Ranges", *The Indian Express*, August 13, 2008.

3. Pankaj Jha, "India's Emerging Defence Cooperation with Southeast Asia", *India Strategic*, vol. 2, no. 9, September 2007, p.8.

4. "Agreements, MoUs Signed by India and Singapore", <<http://meaindia.nic.in/treatiesagreement/2005/29ta2906200501.htm>> Accessed on December 17, 2009.

5. Export Import Databank, Ministry of Commerce, Government of India, <<http://commerce.nic.in/eidb/ergncnt.as.p>> Accessed on January 2, 2010.

million in 2006-07 and US\$ 8,121.61 million in 2007-08.⁶ It is widely believed that India's trade with Singapore will get a boost with the India-ASEAN (Association of Southeast Asian Nations) Free Trade Agreement coming into force from January 1, 2010. Additionally, Singapore has also emerged as one of the largest foreign direct investors in India, with cumulative investment flows since August 1991 amounting to more than US \$ 1.5 billion. As is evident from the huge volumes of trade, economic drivers have created the space for joint ventures in defence production. Convergence of interests in the political, economic and defence sectors, together, is paving the way to a new horizon in India-Singapore relations.

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DEFENCE CONVERGENCE: POST-COLD WAR INITIATIVES

Since the birth of Singapore in 1965 until the end of the Cold War, India-Singapore relations comprised mostly a case of missed opportunities. The compulsions of Cold War politics and the resultant perceptions allowed little space for cooperation between the two countries. However, the collapse of the Soviet Union, the end of regional conflicts in Cambodia and Afghanistan, and India's own strategic reorientation helped thaw the frozen relationship. Defence cooperation has been a natural corollary to the newfound warmth in the bilateral relations. India's "Look East Policy" and the opening up of the economy in the early Nineties attracted Singapore to initiate wide-ranging and long-standing defence cooperation and policy dialogue. India reciprocated with the initiation of the anti-submarine warfare exercises in 1994. The upswing in defence ties is a result of a two-pronged strategy of economic and military cooperation – the Defence Cooperation Agreement in 2003 and the Comprehensive Economic Cooperation Agreement in 2005. In 2004, India granted the Singapore Army and Air Force training facilities on its soil — a significant departure from its traditional position of not allowing any foreign military presence. In October 2004, Singapore and India held their

6. Ibid.

bilateral air exercise codenamed SINDEX 04 in Gwalior in central India⁷, and again in January 2006, at Kalaikunda, near Kolkata. On November 24, 2008, the sixth joint air exercise between the Air Forces of India and Singapore was held at the Kalaikunda air base in West Bengal. The Republic of Singapore Air Force (RSAF) brought its F-16C/D fighter aircraft and the Indian Air Force (IAF) its MiG-27 ground attack fighters in the twenty-day war-games.⁸ Naval ships from Singapore, as part of the exercise codenamed "Milan", have been visiting Port Blair in the Andamans biennially since 1991⁹ and, from 1996, have called on Vishakhapatnam for Anti-Submarine Warfare (ASW) exercises. In return, Indian naval ships have also been regularly visiting Singapore. Interestingly, from 1993 till date, the highest number of joint naval exercises has been with Singapore only. These have included missions for search and rescue operations, anti-piracy and ASW. The growing operational familiarity has led the navies of the two countries to venture into the South China Sea and conduct joint exercises as part of SIMBEX-05.¹⁰ This was given an added thrust at the diplomatic level when in February 2006, Singapore posted its first ever defence adviser to New Delhi.¹¹ SIMBEX is an acronym for "Singapore India Maritime Bilateral Exercise". It stands upon an enduring foundation of bilateral naval cooperation that was formalised a decade-and-a-half ago, when Republic of Singapore Navy (RSN) ships began training in ASW with the Indian Navy, in 1994. The 2009 edition of the SIMBEX series of annual bilateral naval exercises between the Indian Navy (IN) and the RSN, commenced in the Andaman Sea on March 24, 2009 and went on till April 2, 2009.¹² The RSN participated in the exercise with two missile corvettes, a

7. Operation Ankush was the initial joint air exercise between India and Singapore held in Gwalior in 2004. Four F-16C s and Two F- 16Ds participated in it.

8. "India, Singapore Hold Joint Air Exercise-SINDEX 2008", <<http://www.india-defence.com/reports-4104>> Accessed on January 3, 2010.

9. The 'Milan' scheduled for the year 2005, was not held owing to the tsunami devastation in the Indian Ocean region.

10. SIMBEX -05 was held in Singapore's naval environment as part of a natural progression of the city state's naval exercises with India .For more details, see *The Hindu*, March 6,2005 .

11. This appointment gains importance owing to the fact that Singapore has not posted its Defence Attaché in any of the European countries. This observation was made by the Defence Attaché of Singapore in 2006.

12. "SIMBEX 2009- Singapore, India Conduct Naval Exercise", <<http://www.bharatkrishak.com/NAVY/Galleries/Bridges/2009/Simbex/>> Accessed on January 3, 2010.

frigate and a submarine. The IN deployed two destroyers, a corvette and an oil tanker. Maritime patrol aircraft from both countries provided air surveillance for the exercise, while fighter aircraft from the RSAF simulated aerial attacks. The navies have also interacted in several multilateral exercises. Singapore and India have crucial stakes in shielding their common sea-lanes of communication, combating piracy and narcotics trade, curbing gun-running, and preventing maritime terrorism.¹³ Over the years, successive editions of SIMBEX have incorporated a wide range of sea-going serials, ranging from platform-specific exercises in *Damage Control* and *Fire Fighting*, through *Visit, Board, Search and Seizure* (VBBS) procedures in support of low intensity maritime operations and the countering of asymmetric threats, all the way up to advanced multi-threat scenarios, involving surface, sub-surface and airborne combatants, inclusive of weapon-firing serials.¹⁴ These naval exercises clearly demonstrate that defence relations between the two countries have moved from 'liaison visits to strategic engagement'.

The first bilateral army exercise – involving armoured and artillery units – was held from February 11 to April 5, 2005, in Deolali and Babina.¹⁵ The army exercises continued again in January 2006 at the same location. The third set of exercises was held in Babina, codenamed "Exercise Bold Kurukshetra" in March 2007. These exercises were aimed at multi-tiered planning and joint execution of missions under a unified command structure.¹⁶ The Singapore Armed Forces (SAF) and the Indian Army conducted a bilateral artillery exercise in Deolali, India, code-named "Agni Warrior" in October 2009. The 2009 exercise, which was the sixth in the "Agni Warrior" series, involved soldiers from the 23rd and 24th Battalion, Singapore Artillery, as well as the Indian Army's 283 Field Regiment. As part of the exercise, the two armies carried out a combined live-firing with the SAF's FH-88

13. Manjit Pardesi, "Deepening Singapore-India Strategic Ties", *IDSS Commentaries*, March 22, 2005. <http://dr.ntu.edu.sg/bitstream/handle/10220/4002/RSIS-COMMENT_171.pdf?sequence=1> Accessed on January 6, 2010.

14. n. 12.

15. Singapore India Sign Memorandum of Understanding for Army Exercises in India", <http://www.mindef.gov.sg/inimdef/news_and_events/nr/2005 > Accessed on September 12, 2005.

16. "India, Singapore Lock Horns in 'Kurukshetra'", <<http://www.rediff.com/cms/print.jsp?docpath=//news/2007/mar/24game.htm>> Accessed on December 30, 2009.

The indigenisation of Singapore's defence industry has given it a competitive edge in defence technology.

howitzer guns and 155mm battery guns from the Indian Army on October 26, 2009.¹⁷ The joint military exercises under the defence cooperation agreement have enhanced India's expeditionary capabilities, while simultaneously adding a new understanding of the interoperability of systems and greater engagement of the two countries in the defence sphere. The question is whether military exercises could be a prelude to defence industry cooperation. In fact, during 1992, it was mooted that India should refurbish its MiG series of aircraft with the help of Singapore Technologies¹⁸ but this could not get underway. Subsequently, however, when defence cooperation enhanced under the framework on defence cooperation, Singapore's Prime Minister opined that defence cooperation could percolate to the defence technology domain.

The indigenisation of Singapore's defence industry has given it a competitive edge in defence technology. It has created niche markets for its products as well as joint development options at the global level. India, being a principal importer of defence equipment, has expectedly raised commercial interests in Singapore. Its preference is, however, to have joint ventures in the field of defence R&D and product development and not merely a 'buyer-seller' relationship with Singapore.

DEFENCE TECHNOLOGY COLLABORATION: WHY IS IT NECESSARY?

The Third World defence equipment acquisition and military production technology acquisition pattern may be understood through an analysis of a number of arms transfer trends. These important trends are: the growing competition for sales of weapon systems, particularly among the Western European nations; the growing number of arms suppliers compelled to enter and to compete in the arms market primarily due to economic incentives; the

17. "Singapore and Indian Armies Conduct Bilateral Artillery Exercise", http://www.mindef.gov.sg/inimdef/news_and_events/nr/2009/Oct/29Oct09_nr.html> Accessed on January 2, 2010.

18 G.V.C. Naidu, "India's Strategic Relations with Southeast Asia", in Baladas Ghosal, ed., *India and Southeast Asia: Challenges and Opportunities* (New Delhi: Konark Publishers Pvt.Ltd, 1996), pp.28-41.

number of new arms producers and suppliers, particularly those of the Third World; and, perhaps most critical in the long-term, the increasing necessity for arms suppliers to provide offsets on arms transfer agreements.

As more and more nations have developed a capability to produce weapon systems, they have entered the export market. Increasingly, much of the competition for exports is derived from the recent arrivals on the arms export stage which is motivated by economic considerations. These countries (one of them being Singapore), in contrast with the United States and the erstwhile Soviet Union, do not have a domestic demand for arms production. Thus, it is economically not as viable for them as it is for countries like the US and Russia. The impulse to export is largely motivated by the necessity of recovering the costs incurred in developing their arms industries, and is based on achieving the economies of scale that longer production runs can provide. While the cost savings of exports of these new producers are difficult to measure and data is obviously scarce or indirect, an example of cost savings may be seen from the exports of the General Dynamics F-16 fighter. Supplementing domestic requirements with exports can, not only reduce the manufacturer's costs per unit, but also reduce the costs of domestic defence procurement. In addition, many countries, both from the Third World and beyond, are experiencing trade deficits. The global economic slowdown has made the situation worse for these countries. Arms exports comprise one way to ameliorate this condition.

The dependency of military industries in the Third World indicates the importance of technology acquisition through licensed production in these countries. The policies and economic pressures on the more developed nations regarding technology transfers, offsets, co-production and licensing have already made a substantial contribution to the military production levels and the technology of production in Third World countries. In most of the Third World countries, the major issue is to acquire production knowledge. The production knowledge acquisition might lead to large scale indigenisation of defence production. The route to indigenous production of defence equipment goes through several stages. The primary stages are centred on the acquisition of military equipment through purchase or grant assistance

The final stages are the development of the ability to modify acquired systems, to copy them, to design new systems and to produce those systems.

from other nations. The recipient nation may require additional services to learn to operate and maintain the items it receives. Subsequently, the recipient will learn to perform routine check-ups and repairs, maintenance and rebuild tasks. The next stage of production knowledge acquisition includes licensed production and co-production agreements, for assembly of a system or for the production of components. At this point, the recipient has developed the capability to produce major components or parts for the system and has established the facilities for final local assembly. Major items such as power trains or advanced electronics, however, must be imported. The final stages are the development of the ability to modify acquired systems, to copy them, to design new systems and to produce those systems. An upgradation of this stage is the ability to design major weapon systems and then produce them with minimal dependence on external sources for critical components. Finally, a nation may develop the capability to design and then manufacture weapon systems using all indigenously made components. Thereafter, the nation tries to export the defence equipment for offsetting the development and production costs of the weapon system.

It is likely that the current defence technology patterns will escalate technology transfer through the practice of offsets as Third World countries increasingly attempt to export equipment to defray the costs of their defence production. Already, the transfer of technology has resulted in diminishing control over arms in the world as well as over the technology for producing the arms. The future of Third World producers, with economic motivations for arms exports and under recipient pressure to offset their purchases, will only contribute to declining arms and technology control.

The second major source of frequent technology transfer is the one created by the corporations, where pursuit of a particular product may lead to new applications in the commercial arena which were not considered at the outset for product development. Frequently, these may include technologies

developed for the defence arena such as those in communications, materials or other related fundamental aspects of military need. Consequently, the concept of dual use in the military arena became increasingly favoured through the mid-1990s in most parts of the world as a result of the change in the overall global market environment for defence material needs. Enormous efforts have been underway, aimed at adapting existing developed military technologies to the civilian arena under the broad umbrella of dual use technologies. Indeed, since the onset of the Strategic Defence Initiative (SDI) and Ballistic Missile Defence Organisation (BMDO), at least one organisation was tasked with the dual use mission right from its inception, and adheres to the earlier discussed suggestion that technology transfer is most successfully accomplished when dual applications or at least two initial applications are taken into consideration, from the 'concept' or 'development' stage. This allows more rapid integration of technology for both intended uses – in the defence arena as well as the civilian sector¹⁹. In fact, Singapore qualifies as a viable partner in defence technology cooperation and joint venture initiatives due to the commercial application of the defence technology and also the limited domestic demand.

INDIA-SINGAPORE: DEFENCE TECHNOLOGY CONVERGENCE

One of the more common vehicles by which technology transfer began to emerge as an industry had its roots predominantly in the creation of "joint venture strategies" achieving particular prominence during the 1970s and 1980s. A joint venture strategy usually meant the development of partnerships in the country of desired manufacture to arrive at local production of a given product. In the contemporary times, these have been increasingly regarded as "strategic partnerships" aimed at selected regional or even global marketplaces. The process by which these have been created from the 1970s until the present usually focussed on the identification of a suitable partner to secure mutual funding, manufacture and distribution of products within that market segment.

19. P.F Gerity, "Fundamentals of International Technology Transfer" in Robert F. Dundervill et al. eds., *Defence Conversion Strategies* (Dordrecht: NATO ASI Series, Kluwer Academic Publishers, 1997), p.14.

Among the most active and effective technology transfer mechanisms in commercial areas is the joint venture.

One of the lessons to be learned in the technology transfer arena is that it is not always the case that the 'best' or the 'most advanced technologies' will attain a successful market posture. One must examine a market carefully and determine at least the initial need for the product within that arena and then begin to identify those that provide the technologies which might successfully compete for that market segment. Often, it is necessary to identify second and third tier technologies for market introduction into critical international markets. The initial task may become one of convincing those with the technology to enter possible new target markets. This is because it is usually easier to convince those with second and third tier technologies to consider this possibility as opposed to those who are industry leaders. Identification of the technology and interested party is normally only the beginning point for the consideration of successful technology transfer. The second decision which must be made is determination of the satisfactory partner to team with in the target market for product and technology introduction and manufacture. This part of the process is, perhaps, the most critical phase regarding technology transfer and its successful outcome²⁰.

Among the most active and effective technology transfer mechanisms in commercial areas is the joint venture, a mutual undertaking by two or more distinct public or private entities. Large scale joint ventures have not been common until relatively recently in the Third World largely because of the absence of a skilled manpower base. Regulations (and other informal restrictions) promulgated by a number of Third World countries requiring near majority or majority participation in many activities have led to a rapid proliferation of joint venture arrangements, especially in the Middle East. But these are often more mechanisms for personal arrangements of recipient country nationals rather than for any true technology transfer. On the other hand, joint ventures between US and Israeli defence related firms started

20. Ibid., p. 16.

earlier, and have been much more effective mechanisms for transfer due to the skills base of the Israeli partners²¹.

Similar in some respects to joint ventures, foreign affiliation involves overseas extension of ownership either through subsidiaries or other affiliates in other countries or through outright merger with a foreign firm or institution. Since international transactions in these circumstances are intra-firm transactions, much of the commercial or proprietary resistance to the international transfer of technology is minimised. Another active channel is the establishment or use of turnkey operations but this would work only when there is an adequate skilled manpower base. Co-production and co-development agreements may involve a one-way transfer of technology as well. It should be noted that licence agreements have not been included among the most effective channels of transfer of technology.²² Singapore had embarked on the commercial development of technology as well as opening of subsidiaries and affiliates to gain access to relevant technology.

Singapore's defence industry has been driven to develop hardware both in collaboration with foreign defence corporations and by its home-grown enterprises. The Singapore Technologies Electronics Ltd (ST Electronics) was set-up in 1969, then known as the Singapore Electronic and Engineering Pvt. Ltd (SEEL), providing effective solutions and services in aerospace, electronics, land systems and marine sectors. In 1997, the four separate arms were merged to form Singapore Technologies Engineering Ltd (ST Engineering). This has broadened and deepened the technological capability of Singapore's indigenous defence industry and, importantly, positioned it to leverage defence collaboration. In line with the above objectives, the strategy of the indigenous defence sector is as follows:

- Establish long-term and enduring relationships with pioneers in the defence industry.
- Emphasis on training and education to provide a highly skilled

21. Kwang Il Baek, ed., *The Dilemma of Third World Defence Industries: Supplier Control or Recipient Autonomy*, Pacific and World Studies No.3 (Boulder, Colorado: CIS-Inha University, West View Press, 1989), p.63.

22. Ibid.

technical workforce with the capacity for absorbing new and emerging technologies.

- Minimise the self-purchases which are currently about 45 per cent of total procurement.
- Emphasis on dual use industries and technologies of strategic significance to leverage spin-offs from critical technologies through a bigger market.
- Privatisation of the local defence industry to allow for greater transparency and efficiency in defence collaboration.²³

Singapore's enhanced technical capability provides for greater potential collaboration than any other Southeast Asian country. Simultaneously, it also gives it the economic and strategic space that allows for strategic manoeuvrability. For example, as a 2007 RAND Report suggests, the US would like to place one of its aircraft carriers near Singapore in view of any exigency arising out of China's military might and modernisation of its navy²⁴. Also, Singapore is the only Asian participant, apart from Israel and Turkey, in the Joint Strike Fighter (JSF) programme with the US and UK. South Korea, a longstanding US partner, with its emphasis on self-reliant defence capabilities, is constrained in deriving the possible benefits of being a security cooperation partner. Even Japan, which has one of the most advanced defence industries, is unable to participate in the defence technology exports and joint collaboration.²⁵

The great speed with which Singapore's defence industry is acquiring technical knowhow would quickly make it one of the most versatile, allowing for wide-ranging joint ventures and collaborations in defence production. In 2002, the Singapore defence industry was given the North Atlantic Treaty Organisation (NATO) Codification System (NCS) 'Tier Two' status. This pertains to the regular maintenance and repairs of the NATO armoury and the millions of spare parts required. NATO has established

23. "Government Procurement Policy, NZIER", <<http://www.defence.govt.nz/pdfs/nzier.pdf>> Accessed on June 3, 2007.

24. Roger Cliff, Evan Medeiros, and Keith Crane, "Keeping the Pacific: An American Response to China's Growing Military Might", <<http://www.rand.org/publications/randreview/issues/spring2007/pacific.html>> Accessed on June 3, 2007.

25. Christopher Griffin, "Pacific Arms Race: Why Asia is Where the JSF Matters Most", <<http://www.armedforcesjournal.com/2007/03/2545493>> Accessed on December 28, 2009.

more than 17 million spare parts under its codification. About 50 countries use the NCS but only four are certified to help NATO issue numbers on all the spare parts: Brazil, New Zealand, Australia and Singapore.²⁶ This gives the defence industry of these countries significant benefits in areas such as inventory reduction, warehousing and multi-source procurement.

The strength of Singapore's defence industry has been the diversification of the industry into the civil domain as well as providing tailor-made solutions to its customers. The one key feature to the success of ST Engineering is minimum government interference. A regulatory body, the Defence Science and Technology Agency (DSTA), coordinates the working of the various units of ST Engineering. While the government's non-interference policy is crucial to the overall growth and functioning of the company, the flip side is that the government is not proactive in promoting its industry, thus, resulting in a customer base that could have been far greater than the current one. In order to survive as well as to expand its base, ST Engineering has made several critical decisions:

- Civilianisation of industry which means that ST Engineering, apart from listing itself in the Singapore Stock Exchange, entered the civilian products sector like commercial aircraft maintenance, satellite and broadband communications, e-government infocomm and mobility solutions, infocomm security products and solutions, emergency and security systems, electro-optic systems, intelligent building management, transportation systems, training and simulation systems.²⁷
- Inducting dual-use technologies for civilian and defence production which was seen during the outbreak of the Severe Acute Respiratory Syndrome (SARS) when thermal imaging was used to scan the passengers for possible symptoms of fever at the airports.²⁸

26. "DSTA Attains NATO Codification System(NCS)Tier 2 Status", <<http://www.dsta.gov.sg/home/DisplayPage/sideContentPage10.asp?id=433>> Accessed on July 6, 2006.

27. Information Brochure, Singapore Technologies Engineering, Singapore, 2005.

28. Adrian Kuah and Bernard Loo, *Examining The Defence Industrialisation-Economic Growth Relationship: The Case of Singapore*, Working Paper No.70 (Singapore: Institute of Defence and Strategic Studies, July 2004), pp.15-16 < <http://www.ciaonet.org/wps/ku05/ku05.pdf>> Accessed on January 1, 2010.

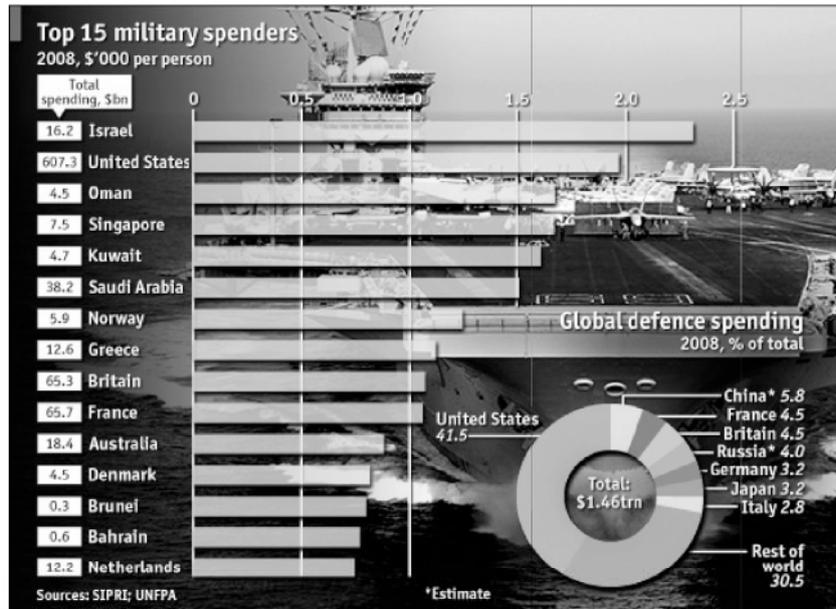
- High investment in systems integration and communication systems so as to have an advantage in cutting edge technologies in the wake of network-centric warfare and use of technology for the third generation soldiers.
- Joint collaborations, leading to Singapore's defence industry setting up its bases in various countries.²⁹ This has helped expand business and, thus, long-term sustainability, better perks and facilities for its workforce.
- Heavy investment in R&D to cater to the customer base with more tailor-made solutions. Instead of being a large-scale producer of arms, ST Engineering diversified itself and envisioned its place in the second tier defence firms which do not have much capital but have a high knowledge base to capitalise on.

Singapore's defence industrial base has developed into a more customer-based industry with policies to counter rising costs through repair and making the industry more competitive at the global level. The developments of the lightweight howitzer Pegasus and SAR-21 assault rifle, to name a few, are success stories. In fact, owing to its diversified defence industry, the Singapore government is enhancing its defence budget and allocated one per cent of its total US\$5.16 billion defence budget to R&D of new defence technology in 2006. The budgetary allocation to the defence sector almost doubled in financial year 2008, reaching \$10.8 billion. The 2009 budget spending amounted to US \$ 11.4 billion. It was around 6 per cent of Singapore's Gross Domestic Product (GDP) in 2009, thereby making Singapore's one of the biggest defence budgets in the world.³⁰ The defence spending trends are further clarified in Fig 1 below.

29. Adrian W.J. Kuah, "The Political Economy of Defence Industrialisation in Singapore: The Costs, Trade-Offs and Synergies", *Defence Studies*, vol. 5, no. 2, June 2005, pp.213-227.

30. "Singapore to Have One of the Highest Defence Budgets in the World in 2009", <<http://theonlinecitizen.com/2009/07/singapore-to-have-one-of-the-highest-defence-budget-in-the-world-in-2009/>> Accessed on January 1, 2010.

Fig 1



Source: SIPRI, UNFPA. On the net at: <http://i140.photobucket.com/albums/r19/theonlinecitizen/Pictures%20Posted%20on%20TOC/Security%20Forces/Military.jpg>

The money allocated is expected to go towards advancing weapons, exploring tactics and adding capabilities for the military.³¹ The capacity and capability building has been the harbinger of growth of Singapore's defence industry and the 'butter versus guns' debate has not escalated to the extent of undermining its growth. The defence industry has the capability to sustain itself through innovation and adaptation as well as developing dual use technologies.

While the advantages of dual use technologies are manifold, there are, however, certain drawbacks. Singapore's defence industry has been relying to a large extent on maintenance and repair as well venturing into the commercial domain, which has led to substantial profits, but it has not been able to develop large military hardware independently.

31 "Singapore to Spend More on Developing Defence Technology: Report", <<http://www.spacewar.com/2004/040411061332.bfpq4fw.html>> Accessed on December 22, 2009..

Though commercialisation of defence technology makes sound economic sense, strictly in defence understanding, the strategic advantage in terms of weapons and innovation gets diluted in the long-term. Secondly, the capabilities have been more in consonance with the economic requirements rather than building a defence technology base, which could be of help in times of war. Singapore has been scouting for partners who have strong economic fundamentals as well as a good defence industrial base for joint production and joint ventures in development of systems.

INDIA-SINGAPORE: EVOLVING DEFENCE TECHNOLOGY COOPERATION

After having entered the Indian telecommunication and infrastructure sectors, Singapore companies have been eyeing the defence sector for quite some time. Regular visits of its Defence Science and Technology Agency (DSTA) personnel to India helped to establish the Singapore Technology Engineering Liaison Office in 2004. Subsequently, Singapore opened its Defence Adviser Office in 2005. Singapore, interestingly has no Defence Adviser Office in the European countries. Singapore Defence Industry, which is synonymous with ST Engineering, has been involved in manufacturing fast craft patrol boats for the Indian Coast Guard and also repair of Indian naval vessels in Singapore. In recent times, there has been a flurry of activities between Singapore's Defence Scientific Adviser and the DRDO Chief, exploring the possibilities of future cooperation in the field of space technology and R&D. Other areas of cooperation are in the realm of life-cycle management as well as upgrading aircraft and provision for time-bound replacement. India has been using the services of Singapore's defence industry, more specifically ST Aerospace, in the following areas (Table 1):

Table 1

Customer	Existing Business
Indian Navy	Supporting in their avionics upgrade of the Sea King helicopters and Harrier aircraft.
Hindustan Aeronautics Limited (HAL)	Supporting HAL in the area of avionics, mainly on the product range of radio.
Global Vectra Helicorp	Overhauling the transmission and power train items for the Bell Helicopters fleet.
Deccan Aviation	Supporting Deccan Aviation on the various product range from mechanical and avionics shops.
Pawan Hans	Supporting the power train items for the Bell Helicopters fleet
Indian Coast Guard	Repairing ARC182 items for the Indian Coast Guard. ³²

In the maritime domain, Indian naval ships have been visiting Singapore Technologies Marine for repairs and maintenance. The turnaround time provided by the Singapore Technologies Marine adds to the cost advantage and reduces the burden on India's shipyards. In the Eighties, the Singapore defence industry helped India to manufacture two fast attack craft and subsequently four were manufactured in the Cochin shipyards. India has also been seeking Korea's help in ship-building technology. Comparatively, Singapore scores above South Korea because of the lower costs and better efficiency. Lack of space provides Singapore the advantage to venture overseas and offer its expertise in ship repair and maintenance.

However, the major bottleneck, at the moment, for the India-Singapore defence technology partnership is the ongoing Central Bureau of Investigation (CBI) run enquiry regarding corruption charges against Singapore Technologies (ST). Singapore Technologies is alleged to have bribed Indian officials to grab the defence deals. With the enquiry still on, Singapore is suffering a lot because of this, since new agreements cannot be inked unless ST is given a clean chit. One cannot conclusively say whether the company, along with other six international companies, including the

32. ST Aerospace Customer Records, 2006.

Singapore would also like to reap the benefits of the economies of scale because of India's huge military production base as well as increased domestic demand.

ones from Israel, were involved in the bribery row, but it could prove disastrous to the companies involved in the bribery case, including the one from Singapore. For instance, in June 2009, Singapore-made 155-mm lightweight howitzers were lined up at the Army's testing range at Pokhran for testing but it took a long time for them to get the clearance. The top brass of the defence contractor, Singapore Technologies, the President and CEO Tan Phey Hock and Vice President Patrick Choy, visited Delhi in an attempt to explain to New Delhi that their company had nothing to do with either middlemen or those named in the bribery scandal allegedly involving former Ordnance Factory Board chief Sudipta Ghosh. This, in no uncertain terms, gave a tough time to Singapore.³³ On January 6, 2010, it was reported in the Indian media that ST might lose the US \$ 1 billion contract to the US because of the CBI enquiry. According to reports in the *Indian Express*, India's national daily, "A top defence official has said the Defence Ministry is looking at other options, including a direct military purchase from the US, for the ultra light 155 mm howitzer contract in which ST was the only contender."³⁴ The only ray of hope for Singapore, as reported in the *Indian Express*, is that "a direct military sale of the ST gun from Singapore could be pursued by the Ministry. This direct government-to-government sale would also take care of legal problems being faced in negotiating directly with a tainted firm like ST."³⁵

ASSESSING CAPABILITIES

India is on a fast track to harness the benefits of joint collaboration in the development of weapon systems. The advanced light helicopter with Israel and the supersonic missile Brahmos with Russia are success stories of joint

33. "Gun Ready for Testing, Singapore Firm Top Brass Rush to Explain" *The Indian Express* (New Delhi), June 14, 2009.

34. "Singapore Firm May Lose Army Contract to US", *The Indian Express* (New Delhi), January 7, 2010.

35. *Ibid.*

ventures. Singapore would also like to reap the benefits of the economies of scale because of India's huge military production base as well as increased domestic demand. As India tries to integrate its rising economy with Southeast Asia, Singapore would increasingly play a key role as a base for India to expand into this region and also as the main destination for joint collaboration in R&D in defence. Singapore, responding to being a 'hot destination', has evolved a concept of defence ecosystem backed by efficiency and smooth coordination between its various agencies like DSTA and DSO. The defence industry in Singapore has risen to 35th position in the world defence suppliers' standings, with the 2001-05 aggregate exports amounting to US\$71 million (at constant 1990 prices).³⁶ The basic components of the Singapore defence ecosystem include the users, the developers and the producers, together with their operating environment. All are closely linked, from shared interests to cross-posted personnel. In fact, Singapore also endeavours to form a capable military force hinged on a sound defence industry catering to the requirements of the SAF. The effort was originally centred on three key thrusts:

- Developing the local defence industry.
- Building up a pool of specialised personnel to form the nucleus of Singapore's engineering and R&D efforts.
- Developing R&D capabilities.

These remain the basis for developing capabilities in acquisition, maintenance, design, manufacturing and production, upgradation and R&D.³⁷ Singapore's defence sector is particularly unique among the developed countries as the activities are overwhelmingly concentrated in a single group of companies. This has been the result of government policy aimed at developing self-reliance, combined with a limited domestic market. The growth of ST Engineering has been impressive and as per

36. n. 1.

37. Robert Karniol, "Industry Briefing-Singapore Defence Ecosystem", *Jane's Defence Weekly*, February 15, 2006.

the latest data, the group has revenues of about US\$3.34 billion³⁸ along with an area of operations spanning 22 cities in 15 countries and a global workforce numbering of 12,000. In most of the cases, the industry has resorted to custom-made equipment either by acquiring an indigenous subsidiary or through a joint venture with the state enterprise. One of the success stories of Singapore's defence industry has been the development of the lightweight howitzer. The Indian Army has issued a Request for Proposals (RFP) for the procurement of 140 ultra lightweight 155mm/39 calibre field howitzers. The howitzers which were offered comprise the Pegasus SLWH from Singapore Technologies and LW 155 UFH from BAE Land systems³⁹.

SINGAPORE: GATEWAY FOR JOINT COLLABORATION AND R&D

India has developed a competency with regard to electronic systems while Singapore has built up the expertise in the systems integration and in miniaturisation of systems. As India's domestic defence sector is still constrained owing to the existing international sanctions post-Pokhran in 1998, it is imperative to initiate fruitful and effective defence relations with technologically advanced capable countries like Singapore. Countries like South Korea, Japan, and Australia have their own large domestic demand and it is difficult to achieve a closer partnership with them. The technical collaboration would, in turn, strengthen bilateral relations. A few of the areas of cooperation are given below.

Repair and Maintenance

In order to meet its repair and maintenance requirements, India has to seek alternatives from countries which have a developed second-tier industry. The two countries which emerge prominently are South Korea and Singapore. China can be discounted from a political and security perspective. South Korea, as explained earlier, has its limitations. For India,

38. For details, see <http://www.stengg.com/pressroom/press_releases_read.aspx?paid=1002> Accessed on December 25,2009.

39. Prasun K. Sengupta, "Firepower for Effect: Lightweight Howitzers to Enhance Firepower," *Force*, vol. 5, no. 6, February 2008, p. 75.

Singapore, thus, becomes an important strategic choice. Singapore has well developed maintenance and repair facilities catering to a number of military organisations. It also has the second largest third-party aerospace maintenance facility. In all likelihood, Western manufacturers might outsource the maintenance and spare facilities to alliance partners in Asia. This would help save costs on logistics and spare resources for further defence manufacturing.

Singapore has been trying hard to get a foothold in the Indian market through a joint venture with the Tatas in the aerospace sector and has been providing turnkey solutions to a few software companies in India on systems security. In 2006, ST Engineering signed a joint venture with the Kalyani Group of India for manufacturing defence equipment in India under the 26 per cent Foreign Direct Investment (FDI) approved by the government.⁴⁰ The superimposition of civilian research in the areas of metro-rail, simulators and systems integration is an added advantage for India. On the one hand, it would help in enhancing its technological base, while, on the other, in case of the diversification of the military hardware and future purchase of F-16s, it would give an early start in maintenance and repair of such systems.

Human Resource Development

One of Singapore's unquestionable strengths is in the area of project management, optimising R&D and cost cutting. Singapore has achieved this capability through efficiency and better turnaround time. It is interesting that while Singapore receives product orders, it has to seek testing facilities in other countries. For example, India provides testing facilities for its Unmanned Aerial Vehicles (UAVs). Clearly, Singapore's defence industry and research consortium have been well integrated and are delivering results efficiently. Singapore has for long categorised its acquisitions in the form of low technology, medium technology and high technology military hardware. In terms of low technology, it has been

40. "Kalyani Group Enters into Joint Venture Agreement with Singapore Technologies Kinetics" <http://www.bharatforge.com/investers/JV_with_Kalyani_Final.pdf> Accessed on December 14, 2009.

The Defence Cooperation Agreement of 2003 has the potential to create a minor trickle-down effect in terms of strengthening economic ties and boosting trade.

seeking off-the-shelf-purchase, while with regard to medium technology, it has relied on joint collaboration. On the high technology front, it still has to make headway. Singapore has enhanced its R&D capability through commercialisation of technology and exports so as to garner funds for further research. The niche areas are electronics, systems security, networking and communications. Interestingly, in all these areas, India is also seeking technical knowhow as well as technology transfer.

Singapore and India can work as beneficial partners and help overcome the hurdles. India, for example, faces a technical crunch in a few areas, so a joint venture or even allowing for time-bound research is vital. The private sector players would be an important component and the few joint ventures existing in India under the 26 per cent FDI guidelines would set a benchmark for the other private players to come to India and seek joint ventures. As already known, India outsources its defence requirements and has been tipped to be the largest importer of military hardware. In this regard, the private sector can build consortiums with government help and should include centres of excellence like the Indian Institutes of Technology (IITs) and Indian Institutes of Sciences (IISc), which could be given project-based funding to develop technical acumen among the engineering students.

Maritime Security and Surveillance

One important area of convergence can be the ground work on the development of advanced electro-optic sensors as well as fast patrol boats for enhancing the surveillance activities of the Coast Guard. ST Marine strength lies in its turnaround capability with regard to ship repair and this cuts costs as well as reduces man-hours of work. ST Marine even provided the Indian Coast Guard two patrol boats back in the Eighties⁴¹ but there has

41. Pankaj Jha's interaction with ST Marine officials in Singapore on March 3, 2006.

been little effort on the part of both governments to further cooperation in this field. India needs to be immediately reviving it with Singapore rather than adopting a pro-West purchasing policy for small requirements of patrol boats and small ships. Also, India's endeavours in the Andamans with the assistance of the Port of Singapore Authority (PSA) would be beneficial. Though a school of thought would argue that indigenisation is a good option for employment, in the field of defence economics, it should not become cost-intensive, and outsourcing becomes one of the rational options.

CONCLUSION

The Defence Cooperation Agreement of 2003 forms the backbone of the India-Singapore strategic engagement. The agreement has the potential to create a minor trickledown effect in terms of strengthening economic ties and boosting trade which is expected to triple in the next ten years. However, these propositions will materialise only if Singapore Technologies comes out clean from the ongoing CBI inquiry regarding the bribery case or when New Delhi decides to find an alternative route to cooperation with Singapore. Indications are that New Delhi is thinking of such an alternative route, which has the potential to open up new vistas of mutual defence technology cooperation. One might argue that Singapore is likely to emerge as a major defence supplier in the Asia-Pacific region and also a major player in upgradation, maintenance and repairs. India has a big defence industry but it lacks cost-efficiency, while Singapore has a comparatively smaller defence industrial base which is efficient by world standards because of its least turnaround time in ship repairs, upgrading of avionics and maintenance work. India has not ventured into private partnerships, while Singapore has engaged private players, though with certain checks and balances and through regulatory authorities. India has been searching for markets, while Singapore has been marketing and selling its defence products. India is scouting for joint collaboration, while Singapore needs offshore production facilities because of space compulsions. India has a long-term training arrangement with

Singapore, while Singapore has been searching for defence R&D prospects in India. The complementarities are many between the two countries and there is a need on the part of both to enhance their partnership to a new level. Defence technology cooperation through joint ventures and joint production presents such an opportunity.