

Israel's Defense Industry in the 21st Century: Challenges and Opportunities

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The current financial troubles of Israel Military Industries (IMI) and the record arms sales to India turned the spotlight once again on Israel's biggest industrial sector, the defense industry. The past decade brought many changes to the domestic defense companies, including mergers and sweeping adjustments to work and management practices. Their improved output and state-of-the-art capabilities helped place Israel among the top five arms exporters. The Israeli government, preoccupied with other burning issues, has displayed a hands-off approach and steered away from attempts to intervene in the direction and structure of the industry, which includes the three state-owned companies of Israel Aircraft Industries (IAI), IMI, and Rafael. A seemingly benign posture, it fails to take note of far-reaching changes in industrial defense policies, both in Western Europe and the US. Furthermore, deep cuts in the defense budget for 2005

suggest that the industries will have to find alternative revenue streams, as new orders from the Israel Defense Forces (IDF) are likely to fall sharply in coming years.

This essay charts how the Israeli state-owned firms have managed in the past to bounce back after painful restructuring processes, but questions their ability to retain a commanding position in today's highly competitive export markets without clear governmental guidance regarding their intended structure and aims.

The Quest for Self-Sufficiency in Arms Production

The growth of the Israeli defense industry was a combination of policy and circumstance. Acute threats by Arab states led to the psychological as well as material institutionalization of the "centrality of security" concept, an approach that was strengthened by arms embargoes and broken agreements among foreign suppliers. Hence, Israel's policymakers encouraged a rapid expansion of the state-owned arms industries and their involvement in production of state-of-the-art weapon systems.

Over the years Israel realized that

financial and technological constraints made self-sufficiency in arms supply impossible. This recognition led to a dual-policy approach towards defense procurement. While the government continued to pursue every opportunity to buy weapons abroad, it also invested heavily in establishing a sophisticated defense industry.¹ It was thought that the defense industry would have the ability to tailor weapons and develop new ones not available elsewhere by creating advanced, defense-oriented research and development facilities. Such an industry would also be a source of employment, urban development, and export revenue. Most important, by reducing the risk of future arms embargoes, Israel would be able to maintain better diplomatic and political latitude.²

Table 1 presents a select list of main military technologies developed in Israel. The criteria for developing and manufacturing weapons locally were driven by the following considerations:³

- Political: the refusal of foreign powers to sell critical weapon systems (or the breach of contractual commitments to supply battle systems).⁴

- Economic: the lower cost of

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domestic production compared to imports, and the ability to prolong the service life of combat systems through upgrades.

■ **Military:** the achievements of Israeli developers that helped the IDF acquire a decisive advantage on the battlefield, for example, in electronic warfare.

■ **Strategic:** the production of special weapon systems unavailable from other sources, needed to facilitate a regional deterrence posture. Independent research, development, and manufacturing helped Israel reduce its reliance on foreign supply sources.⁵ A comprehensive knowledge base was set up in universities and government laboratories through global networking and applying practices such as reverse engineering, industrial espionage, and smuggling specialists and equipment in covert operations.⁶

The need for additional income and the rising costs of new developments enhanced arms export endeavors. Israel was quick to offer operational solutions to foreign customers, based in part on IDF combat experience. Over the past thirty-five years, defense export sales increased eighty times, from \$40-70 million in the 1970s to \$3-4 billion in the 2000s, amounting to approximately one fifth of Israel's total exports.⁷

A rapid rise of export revenues in the 1980s partially subsidized the R&D costs of new weapons and compensated for sharp cuts in the domestic R&D budget.⁸ Revenues generated by arms sales to Iran (during the shah's reign), South Africa, China,

Table 1: Israel's Core Military Technologies (selected list)

Field	Subject/System
Navigation and ranging	Range finders
Energy and laser	Non-lethal weapons; laser designators; range finders
Aeronautics	Structure and aerodynamics
Battle Protection	Survival suits; reactive armors
Electronics	Radar; pulse output modules
Ergonomics	Cockpits
Communications	Encoding systems and techniques
Electro-optics	Image processing; display and surveillance systems
Control	Gimbals control
Micro-electronics	Sensors and signal processing; superconductivity
Computing	Software
Structure and materials	Low radar cross-section; low infrared signature materials
Platforms	UAV and aircraft; launchers; tanks
Electronic warfare	Passive and active electronic countermeasures, electronic counter-countermeasures
Propulsion	Engines for space, land, airborne, and naval uses
Simulation	Flight, missile, and naval simulators

Singapore, and Chile helped fund major weapon systems and maintain inflated employment levels within the industry.⁹ Some export deals, for instance with South Africa and China, included technology transfers and joint development of weapons.¹⁰ The profits from arms exports were large enough to stifle any question over the risks of keeping a defense industrial base, which was clearly too big for Israel's own needs. Indeed, the arms sales not only played a crucial role in offsetting Israel's trade imbalance, but also helped to save Jewish communi-

ties¹¹ and to maintain contacts with countries that refrained from full diplomatic relations.¹²

Industrial Adjustments in the 1990s

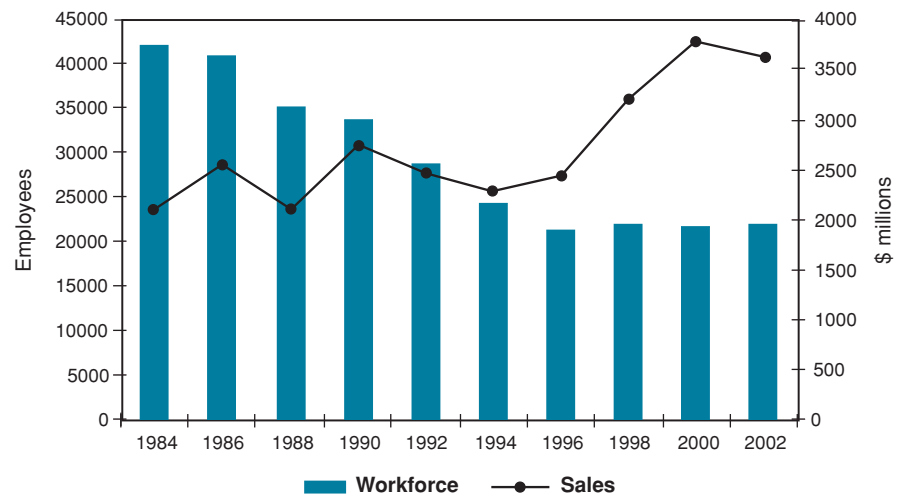
Major events in the second half of the 1980s, principally an economic crisis in Israel and the end of the Cold War, had a lasting impact on the defense industry. Local defense expenditure was reduced as the government tried to rein in hyperinflation through a series of deep cuts in domestic expenditure. Consequently, the IDF

bought far less from the local industry,¹³ opting for American products paid through US military aid to Israel. Major contracts with foreign clients were completed while others did not arrive, thus leaving the defense industry to struggle with redundant capacity.

Indeed, extensive US military aid, which now stands at around \$2 billion a year, exposed deep anomalies in the relationship between the IDF, the Ministry of Defense (MoD), and the defense industry.¹⁴ During the 1980s, the IDF started exercising a principle known to economists as “consumer sovereignty,” following a decision by the MoD in 1975 to give the IDF full control over the defense budget, including weapons development and acquisition. This meant that the IDF was able to determine not only its needs but also to prioritize its spending allocation. Consequently, the IDF’s preferences took precedence over the interests of the domestic industrial base.¹⁵ The military has always favored off-the-shelf equipment and objected to vast investment in costly and risky programs funded through the defense budget.¹⁶ Gradually, the IDF allocated less and less to R&D projects, and more to salaries and pension payments, in order to ensure its competitiveness as a prospective employer.¹⁷

The cancellation of the Lavi fighter aircraft project in 1987, under strong pressure of the Israel Air Force and the American administration, was a turning point in the relationship between the armed forces and the defense industries. The government no longer

Figure 1: Improved Performance of Israeli State-Owned Defense Industries



Note: figures include subsidiaries; exclude former employees on companies’ payroll.

Sources: IAI, IMI, and Rafael corporate reports; State Comptroller, Ministry of Finance, and Government Companies Authority reports.

viewed the local defense industries as the preferred supplier to the IDF, and the US pledged to back Israel militarily and diplomatically during the peace negotiations in the Middle East.¹⁸ Thus, the industries were merely required to guarantee the IDF’s qualitative edge through “power multiplier” systems, in other words, to supply weapons that would guarantee superiority in the battlefield that were not available from other sources.¹⁹

The conclusion of major contracts, most notably with South Africa, raised further complications. IAI, IMI, and Rafael were forced to undertake massive employee reductions. In a protracted and often confrontational development, staff size was cut from 43,700 in 1985 (at the peak of the expansion) to 22,000 in 2002²⁰ (figure 1). Research and production interests

shifted from major platforms to technologically advanced systems and components for the military and the civilian markets.²¹ The contraction process, which started in 1992 and was to spread over a period of 20-25 years, was paid directly by the state’s treasury and not by the companies themselves, and it included severance pay and early retirement packages, state guarantees, and other aid allowances, at a total cost of \$5 billion. This expenditure was deemed necessary in order to ensure that Israel would have a viable defense industry “for the next hundred years.”²²

Privately owned defense companies with competing expertise also undermined the position of state-owned companies, as they were gradually attracting a larger portion of MoD contracts. Their growing presence was increasingly felt following

the introduction of the Compulsory Tender Law that required the Ministry of Defense and all other branches of government to introduce a competitive bidding process for services and products. Privately owned companies stepped into the state-owned industry's traditional territory, such as upgrades and electronic warfare systems, and demonstrated that their leaner structure posed a real challenge to the state-owned sector.²³

The privately owned defense industry, which accounts for a third of the defense industry base, started a process of mergers and acquisitions. Elbit Systems and El-Op merged in July 2000,²⁴ while Koor Industries consolidated its defense businesses, which included Elisra Electronic Systems, Tadiran Electronic Systems, Tadiran Spectralink, and BVR, under the umbrella of Elisra Group. In sharp contrast to this development, the government was reluctant, and in some instances unable, to further plans for far-reaching restructuring in the state-owned sector.²⁵ Potential clashes with workers' unions, lack of practical advice by the bureaucracy, and contradictory positions of senior officials deterred politicians from rocking the boat. They opted for the status quo and stable labor relations despite recommendations of senior civil servants to privatize the state-owned sector.²⁶ Thus, the government paid lip service to the notion of privatization,²⁷ without taking concrete steps.

Among the most salient obstacles was the refusal of the Ministry of Defense to relinquish its control over these industries until a law was in

place to safeguard the nation's vital interests, for example guarding against the involvement of foreign ownership, control, and influence of the defense sector.²⁸ Nevertheless, in 2002 the government completed the incorporation process of Rafael and permitted IAI to buy 30 percent of the shares of the Elisra Group. The Ministry of Finance and the Government Companies Authority presented a plan for partial privatization of IAI, which includes issuing up to 30 percent of the company's shares.²⁹ Political and financial factors, however, are stymieing the plan, as IAI's profitability in 2003 and 2004 tumbled sharply following a drop in civilian orders and the cuts in Israel's defense budgets, which affected all industries.³⁰

Against this backdrop, major industries started selling lucrative business lines in an attempt to raise cash. IAI, for instance, sold Galaxy Aerospace, its business jet subsidiary. The cash-starved IMI started selling factories and has been implementing yet another consolidation and recovery plan over the past two years, due to severe cash flow and negative equity problems.³¹ IMI was granted a loan from the government, which also decided to fully privatize IMI's subsidiary, Ashot Ashkelon. IMI's fate remains unclear and the Ministries of Defense and Finance examined the idea of a sale of the firm, as a whole or in parts. A possible merger with Rafael was also suggested.³² However, no concrete steps have been taken so far in either direction.

The 21st Century and Beyond

The post-9/11 challenges present a different reality for defense industries worldwide. The aftermath of the terrorist attacks caused a transformation of military thinking on both sides of the Atlantic. There is a greater emphasis on precision weapons and mobility, a crucial combination for an efficient fight against enemies who may be otherwise difficult to pin down. There is also a focused interest on homeland defense and better awareness that winning a war now depends as much on superior information as on dominance of the skies or control of posts on the ground.³³ Consequently, the US increased its defense spending by an annual 5-10 percent, and it is scheduled to reach \$413 billion by 2005. The European Union adopted a Joint Action for a European Defense Agency, aimed at improving procurement mechanisms and streamlining defense capabilities with a moderate rise in budget totaling nearly \$193 billion across the continent.

The interest in sophisticated weapons came after years of receding demand, during which many US firms underwent a swift wave of mergers and acquisitions. The defense industry in America is now comprised of only five major prime contractors. This is not the case of the European firms, which are scattered in fragmented markets and largely excluded from the growing American demand.³⁴ Rather than following the US model of consolidation, the Europeans have preferred to create joint ven-

tures, thus exercising only a limited industrial restructuring.

The future of the defense industry in Europe has become a subject of heated debate. France and Germany believe that if left unaided, the European industry is doomed in the face of the larger, better financed US firms. The two governments decided to push for the creation of "super conglomerates" in key markets, following the German government's success in engineering a merger between its two biggest shipyards. The UK, on the other hand, advocates a different, free-market oriented perspective, as was manifested in its "Defence Industrial Policy" document of 2002.³⁵ It is far less inclined to be involved in interventionist actions.³⁶

For their part, Israeli policymakers have done virtually nothing since the 1998 publication of the recommendations of a special committee headed by a senior Ministry of Defense official, Moshe Peled, which supported structural reforms and privatization.³⁷ However, in the current climate and circumstances, the government is unwilling or unable to further any of them, most notably in the case of IAI, which is now "at the bottom of the Sharon government priorities."³⁸ As a result, Israeli firms, both private and state-owned, have taken matters into their own hands. By buying local companies in key target markets and setting joint ventures, they have become more attractive to the Pentagon and major defense establishments around the world.³⁹ The purchase of controlling stakes in US firms by IAI, Elbit, and El-Op and the formation of new

subsidiaries is a tried and true strategy that was implemented to varying degrees of success in the European market as well.

Thus, in January 2000 Elbit announced the establishment of a wholly owned subsidiary in Austria,⁴⁰ and in July 2003 it purchased a Belgian firm for electro-optical products and space applications.⁴¹ A year later it formed a successful joint venture with the French giant Thales, which was selected in July 2004 by the British Defence Ministry as the preferred bidder for a major UAV program.⁴² In November 2003, Tadiran Communications announced that it had acquired 75 percent of the German firm Racoms, which produces military radio communications products for the German army. Of the state-owned companies, Rafael increased its European presence significantly. In February 2004 it formed a joint venture with the European giant EADS for the marketing of anti-missile protection suits.⁴³ Four months later, Rafael announced that it signed an agreement to establish a new German-based company, EuroSpike GmbH, with two of Germany's biggest defense firms, Rheinmetall Defence Electronics GmbH (RDE) and Diehl Munitionssysteme GmbH (DME). The new company will serve as the prime contractor for a family of guided missiles for European customers.⁴⁴ On the same day, IAI announced that it signed a cooperation agreement with RDE to offer jointly an upgrade kit for the main German battle tank, Leopard.⁴⁵ It also formed joint ventures for marketing and development

of UAVs and training aircraft with American firms.⁴⁶

Most of these cooperative ventures and takeovers concern relatively small companies engaged in similar activities whose main clients are European defense ministries. However, Israeli firms expect these operations to lead to a significant increase in the sale of military technologies to Europeans armies and to NATO in the next few years. For example, Elbit Systems President and CEO Joseph Ackerman predicted that "in the future, we expect our European activities to almost double and amount to 28 percent of our total sales, up from the current 15 percent."⁴⁷

Until a few years ago, the links between Israeli industries and European industries were limited to ad hoc cooperation. The takeover of European firms and the creation of strategic joint ventures reflect a bold step in a direction advocated by the Israeli Ministry of Defense long ago, namely to help Europe bridge its technological gap with the US by collaborating with Israel's leading defense firms, as was demonstrated by the decision of European aerospace giant EADS and the French firms Dassault Aviation and Sagem to cooperate with IAI in the development and production of UAV technology.⁴⁸ This approach benefits Israel, which seeks a deeper and positive presence in Europe, as well as the Europeans, who seek ways to further their technological capabilities despite budget limitations.⁴⁹

Strategic partnerships between Israeli firms and similar industries in Europe draw Israeli firms closer to

their target clients. In addition to marketing advantages, Israeli firms are likely to promote mutual research and tailor-made solutions with EU and NATO member states, which were made possible through agreements for cooperation and joint research between Israel and the EU⁵⁰ and bilateral arrangements with key countries in Europe, including Germany, the UK, France, and Italy. By situating themselves at the heart of Europe, Israeli firms are better positioned to forge industrial partnerships with new EU members from Eastern Europe, most notably Poland and the Czech Republic, whose defense industrial base is lagging behind that of mainstream Europe.⁵¹ Rafael and Elbit have already realized the potential in Eastern Europe, forging major deals in Poland and Romania, respectively.

In terms of future budgetary trends, the EU countries are unlikely to match the US defense budget any time soon and will rely on NATO's operational capabilities. However, Israel anticipates a significant worldwide growth in budgets for homeland security, counter-terrorism, and asymmetric warfare, especially in the areas of installations protection, border systems, bio-terror prevention, data security, and access control (through biometric screening).⁵² Israel possesses cutting edge, battle proven technologies in these areas and offers shorter and cheaper R&D cycles. It is a world leader in development of sophisticated fences, border control, and monitoring systems, which can answer new security concerns facing the EU following its enlargement. EU's

long borders are viewed by many as an easy target for terrorists, smugglers, and illegal immigrants, a fear that prompted the EU to allocate more than €2 billion for spending on new border protection systems by 2006.⁵³ Spain and Italy have already acquired border protection systems from Israel and others are likely to follow suit.

Europe is one of two key target areas for Israeli firms. The other growing market is Asia, where India is fast becoming a major customer for Israeli defense firms, with average sales approaching \$1 billion per year. Some companies considered expanding through local partners, like the small Israeli firm ITL (International technologies Lasers, a subsidiary of Soltam Systems), which supplies laser pointers, optical target sights, and night vision systems to the IDF and armies in Europe and Southeast Asia.⁵⁴ At the same time, Rafael has been negotiating an agreement to manufacture missiles and communication systems in Bangalore, India,⁵⁵ which resembles the level of cooperation offered earlier by Israel.

The underlying goal behind these efforts is to find a steady source of income other than the IDF by securing a foothold in the growing market of European and Indian defense. The IDF has become a secondary customer for almost all companies, whose exports activities now account for almost 80 percent of revenues. This is an astonishing achievement, bearing in mind that the reverse is true in relation to US and European companies, where 70-80 percent of their income derives from domestic customers.⁵⁶

With the MoD encouragement of Israeli firms going abroad and expanding their activities with local partners, this outward trend is likely to continue, despite the cyclical nature of the exports market and certain commercial risks, and despite the danger in opening up to foreign industries that might become competitors, as was the case with South African firms after the collapse of the apartheid regime.⁵⁷ In practical terms, these partnerships and joint ventures have replaced the traditional relationship with the IDF. While in the past the "battle proven" label was viewed as an essential component in the export endeavors, the present trend is to work with foreign partners, whose local presence and influence make them an ideal sales promoter vis-à-vis the client.

These partnerships can also serve as a safety net against unfavorable political changes. Some indications suggest that in certain cases, for example changes in government, Israel's export efforts are frequently hampered. A major Israeli defense firm calculated that its sales to Spain plummeted by more than 90 percent over the past four years and that this trend is likely to continue, especially since the election of a socialist pro-Palestinian government. It remains to be seen whether Israel will be able to overcome a potential change of heart in Turkey and India, following recent internal developments. The dependence on a relatively small number of major clients, like India and Turkey, which is similar in many respects to the situation in the 1980s, makes the

industries vulnerable to sudden changes in the political climate. The industries faced financial difficulties when their contracts with Iran and later on with South Africa finished, and similar scenarios are likely here.

Conclusions

The post 9/11 security dilemmas changed the nature of military operations, and with them, the required equipment and technology. It is widely accepted that borderless enemies can no longer be defeated with manpower-intensive, platform-heavy, and predictable doctrine. Gone are the days of trench warfare and carpet-bombing targets. Instead, there is a clear need for sophisticated, rapid, and precise military solutions. This was demonstrated in the US-led invasion in Iraq, which provided a venue for the deployment of cutting-edge military technologies such as unmanned aerial vehicles, precision guidance munitions, and satellites. Israel was not involved in the war with Iraq, but the type of products and technologies put to use by the US and its allies are aligned with leading areas of business that Israel started to pursue several years ago, including the ability to conduct day and night warfare, real-time intelligence, command and control systems, precision guidance munitions, and UAVs.

Indeed, the past four years suggest that the consolidation and recovery efforts of the 1990s have yielded significant achievements. The defense industrial base demonstrated an im-

pressive ability to change and adapt. Its response ranged from the closure of money-losing units and massive cuts in benefits and salaries to acquiring or establishing companies in the US, Europe, and Asia, while keeping abreast with the latest technology.

Israel's position among the top five arms exporters suggests that its export-oriented strategy works. It rep-

The fact that a certain sector seems stable does not warrant a hands-off approach; rather, the post 9/11 and post-Saddam realities demand a complete overhaul of defense industrial policy.

resents the across the board transformation of the defense industries from sluggish and inward looking to highly competitive and farsighted. However, this rosy picture might be short lived. For a start, the three major state-owned industries remain just that – state-owned. Despite their latest managerial practices and rapid response to changing business circumstance, they lack true flexibility and their drive for high profit margins is limited. The reliance on a small number of major clients and the long client acquisition period require sufficient flexibility to downsize when major contracts end. Without such ability, which is usually achieved once

the ownership is transferred to private or public hands, the industries will require additional financial aid from the government due to excess workforce.

But privatizing the state-owned sector is not enough. The Israeli defense industrial base will have to undergo further consolidations and mergers, along the lines of the US

market, preferably by creating no more than three major groups. This will ensure important power and endurance and the advantage of economy of scale, as the US firms are developing competing capabilities to those of Israel's, seizing on the availability of an increased defense budget that also places significant hurdles on foreign companies. Indeed, Israeli firms will find it increasingly difficult to penetrate the European and US markets on their own, for political and security

reasons

While the IDF continues to shy away from buying Israeli-made products for lack of resources, an aggressive pursuit after deeper and meaningful partnerships and cooperation abroad looks inevitable. Such arrangements, including the formation of new companies and overseas subsidiaries, will secure access to bidding invitations and eventually to vital revenue streams, which in turn will be used for developing future generations of weapons. Some Israeli firms have widened their markets by investing into the industries of other countries, a strategy that will enable them, in time, to present themselves as multi-

national companies with more than one national identity. BAE-Systems, Thales, EADS, and Elbit Systems have already pursued this route. However, this is not a risk-free choice. Increased involvement in foreign markets, even in a limited manner, may expose the Israeli government to direct or indirect pressure if it takes a controversial political move, especially if it continues to be the owner of the biggest defense firms in Israel.

Under such circumstances, will the government reduce its controlling stake in the domestic defense industry? Is it expected that the state will adopt a preemptive, wide range response to the global developments in this sector? Probably not. Judging by past experience, the government is not likely to intervene, let alone take a new initiative unless a major financial crisis looms once again. This apparent inaction could not be more dangerous. The fact that a certain sector seems stable – IMI's problems notwithstanding – does not warrant a hands-off approach; on the contrary, the post 9/11 and post-Saddam realities present major dilemmas that demand a complete overhaul of defense industrial policy.

At the moment, the Israeli government is following the unwise philosophy of "if it ain't broke, don't fix it." It should, however, follow the example of the UK government and abandon the model of defense industries as an element of national sovereignty, owned by the state and closely monitored by its agencies. Thus, it should seek a backseat role as a regulator rather than a proprietor and improve

the climate for further industrial restructuring, including privatization of the entire state-owned industry, apart from strategic, non-commercial segments. The government should do so by easing existing restrictions, for example the de facto ban on foreign ownership. Reversal of this policy will provide Israel with certain leverage over US firms, should they buy stakes in Israeli ones, and close working relations with the Israeli defense establishment will be absolutely critical in ensuring the Israeli firms' future growth in value and revenues. Contrary to the widely held view (and not only in Israel), the most opportune moment to take stock and change the course of the industry is when there are no visible signs of distress and while backlog orders are in abundance. In other words, right now.

Notes

1. Yaakov Lifshitz, *Defense Economics: The General Theory and the Israeli Case* (Tel Aviv: The Jerusalem Institute for Israel Studies and Ministry of Defense Publishing House, 2000), p. 359 [Hebrew].
2. Interview by the author with former prime minister Shimon Peres, December 2, 1997; Zeev Bonen, "The Israeli Defense Industry – Past and Future," lecture transcript (Technion, Yad Neeman, February 16, 1994), p. 35.
3. Israel Tal, *National Security – The Few against the Many* (Tel Aviv: Dvir, 1996), p. 72 [Hebrew]. Maj. Gen. (res.) Israel Tal, formerly deputy chief of staff, served as a senior assistant to the defense minister (1975-2000). See also Efraim Inbar, *Rabin and Israel's National Security* (Baltimore: Johns Hopkins University Press, 1999), p. 79.
4. Two of the most notable cases were the canceled sale of British Chieftain tanks in 1969, and the refusal of France to supply high-speed torpedo boats mounted with sea-to-sea missiles. Israel later smuggled the boats from the Cherbourg shipyard on Christmas 1969.
5. Interviews by the author with Israel Tal, January 14, 1998, and Michael Shor (Director-General of Israel Military Industries, 1972-90), June 30, 1998.
6. See report by the Defense Investigations Service (DIS), the field security branch of the American Department of Defense, quoted in *Haaretz*, January 31, 1996. The Kfir fighter plane, for example, was based on plans of the French Mirage V acquired clandestinely through a Swiss source in the 1960s. The Bureau of Scientific Relations (Lekem) in the Ministry of Defense was responsible for collecting scientific and technical intelligence abroad from open and covert sources. Lekem was disbanded in 1986 after it was identified as the agency responsible for spying on the US by recruiting Jonathan Pollard, an American naval intelligence employee. See "Israel – A Country Study," Federal Research Division, Library of Congress, December 1988; internet edition, <http://lcweb2.loc.gov/frd/cs/iltoc.html>, May 9, 1997 and March 2, 1998; and Stuart Reiser, *The Israeli Arms Industry* (New York: Holmes and Meyer, 1989), p. 104.
7. *Defense News* has ranked Israel as no. 3 in the world's top defense exporters, after the US and Russia. See Associated Press, November 19, 2003; on Amir Hayek, Director of Israel Export Institute, assessing Israel's industrial development, see <http://lib.cet.ac.il/pages/printitem.asp?item=2308>.
8. See interviews by the author with David Ivry, October 7, 1997 and June 28, 1998. Major General (res.) Ivry was Air Force Commander, deputy Chief of Staff, Chairman of IAI, and Direc-

- tor General of the Ministry of Defense (MoD) (1987-96). He also headed the National Security Council and served as Israel's ambassador in Washington.
9. *Haaretz*: July 17, 1994; February 5, 1999; October 19, 2000; and July 16, 2004; see also interviews by the author with former prime minister Yitzhak Shamir, June 30, 1998, and with David Ivry, October 7, 1997 and June 28, 1998.
 10. China was co-developing its future combat fighter based on the Lavi. See *Defense News*, September 2, 1996, p. 6; During the apartheid regime, South Africa was a major client. It bought surplus Kfir aircraft that were phased out of the Israel Air Force service, and air-to-air missiles technology that was later used by South African firms to develop their own versions, which ultimately competed with Israeli designs. Some of the projects that were co-developed with other countries resulted in heavy losses; for example the development of early warning aircraft cost IAI a loss of \$120 million. See *Haaretz*, April 1, 1997 and April 25, 2000.
 11. Aharon Klieman, *Israel's Global Reach: Arms Sales as Diplomacy* (Washington: Pergamon-Brassey's, 1985), p. 35; Israel bribed Sudan and Ethiopian leaders with arms to enable rescue operations of Ethiopian Jews in the 1990s.
 12. India and China established full diplomatic relations only in 1992, after decades of secret relations. See Moshe Yegar, "Basic Factors in Asia-Israel Relations," in Moshe Yegar, Yosef Govrin, and Arye Oded (eds.), *Ministry of Foreign Affairs – The First Fifty Years* (Jerusalem: Keter Press, 2002), pp. 534-35 [Hebrew]. Countries like Indonesia, which still have no formal relations with Israel, were supplied with military systems to help maintain a level of dialogue. In addition, IAI opened a representative office in Jakarta, Indonesia. See www.menareport.com, November 19, 2003, citing the Israeli daily *Yediot Ahronot*.
 13. IMI's sales to the MoD fell by 45 percent from an average of \$200 million a year between 1982 and 1984, to \$109 million a year between 1985 and 1988. See *State Comptroller Special Report*, June 1994, p. 17. During the same period, IAI sales to the MoD dropped by 22 percent from \$641 million a year to \$500 million. See *State Comptroller Report* no. 45, p. 868.
 14. The US assistance supports the Israeli defense industry in several ways: it allows Israel to convert about 25 percent of the aid – around \$475 million – to Israeli currency for local uses. Since the end of the 1980s the US also offers offset programs as part of arms sales packages sold to Israel.
 15. Interview with Prof. Pinhas Zussman, July 6, 1998. Prof. Zussman, an economist, served as the MoD director-general between 1975 and 1979.
 16. Moshe Arens, "Arrow, Ofek, Lavi," *Haaretz*, August 5, 2004.
 17. The military R&D budget, which is part of the defense budget, was cut by 43 percent between 1986 and 1994. See *State Comptroller Report* no. 44, p. 1028. At the same time, the proportions of salary and pension payments grew exponentially. More than 2.3 billion shekels were allocated to the IDF's pension payments in 1998, compared to 0.9 billion shekels in 1986 (in 2000 prices) – an increase of 255 percent. During the same period, the portion allocated for salary in the defense budget grew from 35 percent of the defense budget to 45 percent, while the portion for services and acquisition fell from 50 percent to 40 percent between 1987 and 1997. See: Ministry of Finance, Budget 2000 and Budget 1998 proposals.
 18. See testimony of the Director of the Defense Security Assistance Agency before the House of Representatives Appropriations Subcommittee on Foreign Operations: "Defense Department Testimony on US Aid to the Middle East," United States Information Service, May 6, 1994, p. 1.
 19. *State Comptroller Report* no. 45, p. 910; Lifshitz, *Defense Economics*, p. 362.
 20. IAI workforce dropped from 22,000 in 1985 to 13,000 in 2001; IMI cut its labor force from 1460 to 4500, and Rafael reduced its workforce from 7000 to 4800. See Arens et al, *The Israeli Military Industries*, BESA Center for Strategic Studies at Bar-Ilan University, Colloquia on Strategy and Diplomacy, no. 9, August 1995, p. 25 [Hebrew].
 21. See interviews by the author with Imri Tov, MoD's economic advisor (1988-2000), October 8, 1997; and with Haim Adar, MoD's procurement director, January 18, 1998 and June 25, 1998. IAI is heavily involved in research and production for the civilian market. IAI reported that 39 percent of its revenues in 1999 were from the civilian sector while Rafael's and IMI's had only 2 percent and 5 percent, respectively. See *Haaretz*, April 6, 2000, and *Defense News*, August 9, 1999.
 22. Interview by the author with Yuval Rachlevsky, director of wages at the Ministry of Finance, March 16, 2002.
 23. Interview by the author with Colonel (res.) Aviem Sela, former head of operations, Israel Air Force, July 5, 1998.
 24. The merged company, which became the second largest defense group in Israel, employs 4000 workers with an annual turnover of \$750 million. *Haaretz*, October 3, 2000.
 25. Doron Cohen, director of the Government Companies Authority, resigned in February 2000, protesting against the government's indifference towards the privatization plans in the state-controlled sector. *Haaretz*, February 3, 2000.
 26. A proposal for an official policy in the defense industry sector, a statement published by the directors-general of the Ministry of Defense and Ministry of Finance, May 9, 1993.

27. Ministry of Finance, *Budget Proposal for 2000*, internet edition; interview with David Ivry (then MoD director-general and signatory to the document), October 7, 1997.
28. See protocols of the joint session of Treasury and Legislative Affairs committees, *Knesset*, May 15, 2003 and May 22, 2003. The absence of such legislation prompted the Ministry of Defense to veto the sale of IMI's heavy ammunition division to the American firm Lockheed-Martin in 1996. See interview by the author with Zvia Gross, legal advisor to the Ministry of Defense, March 15, 1998; see also *Haaretz*, September 23, 1999 and February 2, 2001.
29. In accordance with the government decision of April 2, 2003, see Ministry of Finance, *Main Points of Budget 2004* (Jerusalem: Ministry of Finance, 2003), p. 74; *Haaretz*, May 27, 2003.
30. *Haaretz*, February, 2004, and Ministry of Finance, *Annual Budget Report for 2004*. See: <http://www.mof.gov.il/budget2004/>.
31. *Haaretz*, January 5, 2004.
32. *Government Authority Report 2003* (Jerusalem: Government Companies Authority, March 2004), p. 11; *Maariv*, September 6, 2004.
33. *The Economist*, July 20, 2002.
34. The US DoD applies protectionist policies and practices, which caused a rift with the UK Ministry of Defence; see *Financial Times*, July 30, 2004. Foreign firms that wish to work in the US market find that their access is restricted and subject to complex controls. Even technology created in other countries and then exported to the US becomes subject to American export controls when incorporated within a US product. A recent official UK study noted that "obstacles to entry into the American market are still significant." See: http://www.mod.uk/issues/industrial_policy.htm.
35. Ibid.
36. *Aviation Week*, July 19, 2004, p. 100.
37. See interviews with Moshe Peled, in the following BBC News internet links: http://news.bbc.co.uk/1/low/events/israel_at_50/israel_today/79621.stm; http://news.bbc.co.uk/1/low/special_report/1998/israel_defence/53505.stm.
38. *Haaretz*, February 3, 2004.
39. *Haaretz*, May 2, 2004.
40. Elbit's press release, January 18, 2000, <http://www.elbit.co.il/news/arch/jan2000a.html>.
41. Elbit's press release, July 1, 2003, <http://www.elbit.co.il/news/arch/july2003a.html>.
42. "Thales UK selected for the MoD's Watchkeeper program," Thales North America press release, July 20, 2004, see: <http://www.northamerica.thalesgroup.com/press/latest/?90>.
43. Rafael's communiqué, February 2004: <http://www.rafael.co.il/web/rafnew/news/news-010304.htm>.
44. Rheinmetall Defence Technologies press release, June 16, 2004, <http://www.rheinmetall-detec.de/index.php?lang=3&fid=2488>.
45. Rheinmetall Defence Technologies press release, June 16, 2004, <http://www.rheinmetall-detec.de/index.php?lang=3&fid=2487>.
46. *Haaretz*, July 20, 2004 and October 14, 2004.
47. *Aviation Week*, Farnborough Show News, July 2004.
48. Agence France Presse (AFP) report, cited by *Defense News*, August 18, 2004, see <http://www.defensenews.com/story.php?F=3130237&C=europe> and *Globes*, June 17, 2004, <http://www.globes.co.il/serveen/globes/docview.asp?did=805989&fid=942>.
49. *Haaretz*, June 9, 2003.
50. Various R&D agreements between Israel and the EU, including the new navigation Galileo project and the 6th R&D framework, allow Israeli firms access to state-of-the-art projects with major European firms.
51. For a detailed discussion see Uzi Eilam, "Europe's Eastward Expansion: The Challenge for Israel," *Strategic Assessment* 6, no. 4 (2004): 37-44.
52. *Israel Venture Capital Journal* 3, no. 2 (2003): 8-9.
53. *Haaretz*, June 6, 2003.
54. *News First Class* website, 29 December 2003, citing the Indian newspaper *The Economic Times*. See online report: <http://www.nfc.co.il/newsprint/version.asp?docId=37106&subjectID=1>.
55. *News First Class* website, 28 January 2004, citing the Indian newspaper *Sify*. See: <http://www.nfc.co.il/newsprint/version.asp?docId=39122&subjectID=1>.
56. *Maariv*, February 24, 2004.
57. An interview with a senior MoD official, July 2004.

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