

# ISRAEL HIGH-TECH & INVESTMENT REPORT

A MONTHLY REPORT COVERING NEWS AND INVESTMENT OPPORTUNITIES  
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JOSEPH MORGENSTERN, PUBLISHER

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## The Origin of High-Tech

A quarter century of the country's existence served as a model for its own development. Today, these same countries look to Israel for electronic systems and software. They seek from Israel medical equipment and systems ranging from imaging to medical and aesthetic lasers. Airport security experts come to Israel to learn how its people are coping with the problems of terrorism and how its national airline provides safety for its passengers. Alternative sources of energy, such as geothermal applications or the use of solar energy for laser research, are either highly developed or at an advanced stage of research - again, a source of deep interest on the part of the developing nations and on the part of the international scientific and industrial community.

Diamond factories operated with automated equipment are maintaining a competitive edge for Israeli polishers who must compete with low-wage producers.

Belgian diamond manufacturers have expressed concern about the advantage which the Israelis have gained as a result of this technological breakthrough.

And then to top it off, Israel has become the world's eighth member to join the exclusive club of nations who have successfully built and launched a satellite into orbit.

Electronics, medical systems, software, Internet security, and multimedia are now high on the list of not only exportable items but world class products.

### Intellectual Curiosity

What is it that drives Israelis to reach this level of achievement? The answer is rooted in part in the tradition of intellectual curiosity and analysis, which is an aspect of Jewish culture. It is a tradition that emphasizes education and that has produced, out of all numerical proportion, outstanding scientists and inventors. This age-old reverence for education has found expression in the development of a good Israeli public school system and excellent universities and institutes of science and technology.



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Even more likely, the technological accomplishments may be a result of the innate stubbornness, resilience, and creative drive of a polyglot people. Because of the multi national mix of the population, many of the researchers have brought with them a variety of experiences and points of view acquired in different parts of the world. All are joined together by the determination to create a country which will become strong in spite of a lack of natural resources and of hostility on the part of most of its neighbors. This need for national security has led to the development of new defense technologies. Ambition for a better quality of life and higher standards of living has led to the creation of an export-driven economy. And most Israelis are aware that the ability to sell and succeed in the international marketplace is dependent on their products being more innovative and better priced than those of the country's competitors.

### Charles DeGaulle: One of the Fathers of Israel's High-Tech Phenomenon

In the wake of the Six Day War, it became apparent that Charles DeGaulle had effectively cut off the supply parts for the French made planes used so successfully by the Israeli air force. It was a bitter pill to swallow and voices of reason began to promote the idea that Israeli institutes of higher-learning must be weaned away from fundamental research to applied research. The country must produce its own electronics and smart systems and become independent of funky suppliers. The adaptation of this concept marked the birth of Israel's high-technology industries which for the greater part dedicated itself to supply the critical needs of a country which needed to be always ready to defend itself. It was a slow go at first but once momentum gathered Israelis turned to technology in earnest.

In 1975, I undertook to provide broad English-language coverage on all topics related to Israel's science-based industries. The decision to do so, however, was easier to make than to

implement. While Israelis are known worldwide for their bravado and chutzpah, their reticence in discussing their business activities was overwhelming. To get at the facts, to get to know the individuals who are key to Israel's technology, took many years of patience and, sometimes, frustration.

By 1988, a year in which Israel celebrated 40 years of independence, Israel's leaders of Israel's high-technology industries, had become aware of the problems of setting up strong industries when capital is not readily available. They became "more open", more willing to offer foreign investors equity participation and opportunities to fund profitable local ventures. This marked a radical deviation from traditional thinking, which postulated that "If you have something good, keep it to yourself."

### The Current Wave: High-Tech Reaches for the Millennium

They are overexposed - Business Week, Der Spiegel, Newsweek, The Economist and other world-class publications focus on it and

#### **Israel High-Tech & Investment Report**

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#### **Publisher and Editor in Chief**

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#### **Subscription Inquiries**

E-mail: [htir\\_1@netvision.net.il](mailto:htir_1@netvision.net.il)

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publish a stream of stories. The journalists, rarely having a background in science and technology, are exerting themselves to understand it and interpret it and expose it to their readers.

They often are overvalued but continue to maintain their attractiveness for international companies who seek to buy the technology or become strategic venture partners or marketeers of the product, and for investors who pay many times the shares earnings so as to own them in their investment portfolio. The "they" are the Israeli high technology companies which, when lumped together, are a growing mass containing an expanding base of technological knowledge.

Samuel W. Lewis, with The Washington Institute for Near East Policy and former US Ambassador to Israel, raised the issue of what are the unique characteristics which set apart the winners from the losers. The veteran diplomat spent the better part of an evening at a cocktail party with me, discussing Israeli high-tech companies.

Initially identified for Mr. Lewis some companies which are commercially successful, have high market capitalization and a growing niche of the market. "A company with software targeted for Internet access, its control, its use for faxes or with a solution to the "millennium problem" will find it easy, initially, to get commercial and media attention, not to mention investor enthusiasm," I suggested. VocalTec and its Internet telephony Gateway program and Crystal Software Solutions are two such cases. Clever ideas, aimed at vast markets but not based on heavily researched technology.

The commonly accepted wisdom is that identifying companies likely to maintain rapid growth and profitability and reward investing shareholders over the long term, is a near impossible task. Difficult yes, but perhaps not as difficult as most would believe.

To begin with, identify companies whose underlying know-how has previously been the object of intense research and development. This profile fits only those companies which use an aspect of defense related technology. Only in recent years has defense formed less than 40% of the national budget. A healthy chunk of those funds, billions of dollars, was used in developing telecommunications, jet fighters, nightsights, pilotless observation planes and other not publicly revealed hardware.

Companies applying these technologies have a clear-cut advantage that may have a time and product advantage over competitors, providing them with a market edge. When they are managed by engineers and technicians who worked on them in the defense research establishment, preferably under the Ministry of Defense, the combination may increase the chances of the company becoming a "winner".

ECI Telecom bases its key product on Israeli Air Force pilots' use of speech scrambling techniques. ESC Medical System was the hottest Israeli share in 1996. Its CEO Dr. S. Eckhouse, spent part of his professional career with Raphael Israel Armaments Development Authority working on sophisticated laser systems. Geotek's advanced digital network was developed on licenses obtained from the Raphael Israel Armament Development authority. With sales only in excess of \$100 million in 1996, the company's sales could multiply tenfold by the year 2000.

Gilat Satellite's VSAT technology for providing communications links for isolated areas, is also rooted in IDF experience.

Small, unheralded companies in encryption, electronic closures, and night-vision, have the benefit of bringing to the business personnel, whose experience has been honed in working on advanced defense technologies. This is one key to identifying technology companies as



winners well before they make their mark in the business world.

Investing in Israeli technology will likely yield the greatest profit to the individual or institutional investor by investing in a group of companies. Using the above criteria, and applying the diversified approach of venture capital companies should work out handsomely.

### Be an Electronic Engineer, My Son!

The debate in high-tech circles is - can the growing high-tech sector find enough electronic engineers to man the continuously expanding industry? Since each electronic engineer in 1996 produced sales of \$800,000, mostly exports, an additional 1000 engineers could lead to growth in exports of \$800 million, suggests Zohar Zissapel managing director of the RAD Group of Companies.

At the beginning of the current academic year, there were 2,000 aspiring electronic engineering students, but they are still four years away from the market place. Presently Israel's institutes of higher learning are graduating about 1,300 engineers and computer specialists a year.

### Or a Genetic Biotechnologist!

On Sunday, February 23rd, 1997 Dr. Ian Wilmut of the Roslin Institute in Scotland announced that his team had cloned an adult farm animal, a female sheep named Dolly which had been born seven months before. A year earlier the same team made history when it cloned sheep embryos. Two of the clones are now in their adulthood and one of them is pregnant.

With the cloning of Dolly the British scientists took a step closer towards mass production of animal herds which can be farmed for milk, blood and organs. The researchers stressed that the procedure opened the possibility of a more efficient production (cloning) of animals to grow health products.

In Israel the least surprised individual about the Wilmut cloning of Dolly is Professor Moshe Shani, a world class re-searcher in animal cell biology and animal skeletal muscle development, and the developer of a technology which rests on gene manipulation in goats to create the presence of human serum albumin (hsa) in their milk.

The innovative technology allows for the introduction of foreign genes and targeting them into goats' mammary glands. Commercial viability starts with the resulting milk containing more than one gram of "hsa" per liter of milk. In a recent discussion with Professor Shani, he said that the project using his technology has now 11 transgenic goats, all second generation females, whose milk is expected towards the end of 1997. What makes the milk so precious? It contains human serum albumin for which there is an annual global market demand of \$500 million.

The separation and products. Time consuming and costly clinical trials are prerequisites for the granting of marketing approval by the Food & Drug Administration. Israel's hospitals are approved for clinical trials by the Federal Drug Administration. Multinational companies count on getting clinical trials done here and they take advantage of the world class reputation that these hospitals enjoy in the international medical community.

Merck, Bayer, and Hoffman LaRoche are among the many companies conducting clinical trials here. Small companies, taking advantage of Israel's medical strengths, are prospering as well. An American company named Angiosonics researched and developed at a Tel Aviv Hospital a unique system that virtually explodes plaque into harmless particles in arteries.

The development was cited recently in professional publications and in the international press as a major "breakthrough" in the treatment of heart disease.



The patented system that has undergone extensive trials in Israel and in other international medical centers. Angiosonics is poised for commercial success as are other commercial companies such as Spegas, Combact and Myriad. They are just some among scores of companies which will make their mark positively on the commercial scene.

Moreover, the speed at which new projects surface will accelerate as the country's hospitals increase their research activities. Hospitals have the advantage of an existing, highly valuable infrastructure and the availability of researchers and experienced medical practitioners.

A further advantage is the quality of its medical staff and researchers, recently grown in size as a result of the Russian immigration. "Israeli geography" namely the sheer smallness of the country itself, is another positive factor as it allows for easy interaction between researchers in different disciplines. Six leading hospitals are located within 90 minutes driving distance from Tel Aviv.

Dr. Martin Lapidot, deputy general manager of the Rabin & Golda Medical Center, (formerly Beilinson), points out that sponsored medical research and development and pre-certification trials are a growing specialty. These activities have resulted in a number of outstanding medical developments including a procedure for the relief of prostate cancer and a highly popular treatment for the removal of kidney stones with a non-invasive system which crushes the kidney stones so that they can be removed naturally by the human body. I have recently undergone such a procedure at Tel-Aviv's Ichilov-Sourasky Medical Center. I underwent the non-invasive stone crushing procedure at 6 p.m. and was released the next morning.

"Clinical trials are a tool for creating funds for research and development. The large

companies like Bayer and Roche have budgets greater than that of Israel and it is a substantial business for the hospital. Working with these companies exposes our staff to international expertise," says Gad Gilat, Professor of Science and Coordinator of Clinical Trials at Asaf Harofe Medical Center, a large Government hospital. The trials can turn out to be very profitable for the hospital. "A department head may organize trials which earn a profit for the hospital of 40-50% of the budget," says Gilat.

However, is the expansion of clinical trials an unmixed blessing? Far from it. "The medical researchers running the clinical trials have to move within a narrow range of activity prescribed by the sponsor. It tends to suppress creative research," says Dr. Hylton Miller, head of the catheterization department and a researcher whose advice is sought by commercial companies. Miller looks ahead to establish, in the foreseeable future a \$2 million research center at Ichilov-Sourasky.

The research and development at all levels in the medical field is becoming widespread but this new, powerful trend will be felt fully only as the projects yield products, result in sales and, in due course, big dollar exports.

### Wall Street Beckons and Investors Smile

By the end of 1997 the number of Israeli companies on Wall Street will almost certainly exceed 100. The Israeli companies form the second largest foreign representation, after Canada. The sheer number puts them well ahead of Germany and Japan.

Over the years we have been studying what are the compelling reasons for Israelis to seek an American listing. Some of the reason are generally accepted by all who understand the US markets but some are related to internal Israeli considerations. Our list of considerations includes: The US capital market is the biggest/most sophisticated/ most professional/



most efficient and certainly most widely reported market with the exposure provided for these companies helping them to build product images and investment loyalty. These companies are reported on not only on television, in the printed media but also on Internet sites. Recently companies such as NICE Systems, Gilat Satellite and ESC Medical have tapped American investors for "secondary" financing of up to \$100 million per deal.

A year ago, it was the Internet shares that caught the imagination and attention of American investors. The two most outstanding Israeli representatives in this sector are VocalTec and CheckPoint.

This year, the magic words are "the year 2000". Crystal Solutions is a company dealing with millennium software solutions. That is why it has become the most successful Israeli flotation on Wall Street, providing its investors with a 290% return.

Computer communications and telephony are also enjoying an unprecedented investment appeal, and the shares of companies in the sector respond accordingly. 18 Israeli companies have been floated on Wall Street since the beginning of the year. Ten of them are new companies.

The new issues have produced a stunning 54% return. Many of these have handsomely outperformed the Russell 100 or the Russell 2000 indices which track technology issues.

Now in line for an American listing are Super-Sol, Elbit Systems, Tefron, RADcom and others, which expect to raise hundreds of millions of dollars. Is the wellspring for new Israeli issues drying out? Not at all. While the exact figure is not known there appear to be between 1,000 to 1,500 start-up companies in Israel for whom an American listing is a sine qua non.

Why do the Israelis avoid their own market in preference to the United States? Not enough exposure, a stock exchange which does not afford comparable liquidity and perhaps its smallness and being known as an emerging growth market, only recently listed on the Morgan Stanley World Index.

High Visibility International Investors are "Buying" into Innovation  
John Sculley, former Apple Computer CEO, invested in OLiVR, a multimedia Jerusalem based software developer, Ephyx an interactive video producer and Zapa Digital Arts, an electronic advertising firm. More than 50 venture capital firms with \$2.0 billion under management are active today while six years ago there was only one venture capitalist fund with \$30 million under management. Finance Minister Yaacov Neeman put the icing on the "welcome and invest in Israel" policy by exempting foreign investors from Israeli capital-gains taxes. The high-tech sector has attracted some of America's best know investors: AT&T pension fund, Massachusetts Institute of Technology Endowment Fund, Boston's Hancock Ventres and Chase Capital.

ESC Medical Ltd. a manufacturer of novel and laser systems for cosmetic surgery and treatments, Galileo Technology Ltd. maker of advanced digital chips were the big hits of 1997. The Nitzanim Fund, whose investors include Japan's Kyocera Corp. realized a paper profit of \$52 million from its \$1.0 million investment in ESC Medical and in Galileo a paper profit of \$89 million.

Another huge deal has been added to the series of investments by US companies in Israel. In one of the largest deals of its kind to date, Cordis Corporation, a wholly-owned subsidiary of Johnson & Johnson, announced the signing of a definitive merger agreement with Biosense, Inc. based in Haifa, Israel with corporate headquarters in Orangeburg, N.Y. The company develops catheter-based



interbody navigation and location systems used in cardiology and neurosurgery. Biosense's shareholders will receive a sum estimated at \$400 million in Johnson & Johnson shares.

Germany's Siemens paid \$30 million for Ornet, a developer of data communications software. The American Applied Materials, Inc. a world leader in semiconductor production equipment purchased Orbot Instruments and Opal Ltd., developers of measurement systems for the semiconductor industry, for \$285 million.

### Development & Growth

World leader Intel developed, at its Israeli research center its new Pentium Processor with MMX Technology, which an Intel executive described as a "processor which will reach every PC-owning household in the world."

Most Israeli companies export and as such are generally well-protected from any buffeting from Israel's economy which currently is struggling to emerge from recessionary conditions.

The past decade has seen a dramatic change in the composition of Israel's exports. As of August of last year high-tech exports represented 35% of the total and software another 3% per cent. In 1988 high-tech exports represented 24% of the total and software merely one per cent. Exports are growing and should total \$16 billion or more for all of 1997. A 40% rise in high tech-exports in 10 years if unmatched, certainly ranks among the top in the world and is indicative which direction the trend is taking.

The expected final total of \$1.6 billion will be a record for the past decade, Israeli venture capital fundraising activity in 2016 reached \$1.4 billion, IVC Research Center reports. 23 venture capital funds raised these funds, including 12 first-time funds. Of the 2016 vintage funds, 14 made a first closing at an average 60% of their targets, and are expected to raise additional capital to be added to the

2016 vintage funds. It is expected that 2016 vintage fund raising will finally total \$1.6 billion, a record for the past decade, to surpass 2015 vintage year's \$1.5 billion raised by 19 funds. A seventh Israeli VC fund raising cycle began in 2015, and has already reached 79% of the amount raised in the sixth cycle between 2011 and 2014.

### **IVC-KPMG: Israeli startups raise record \$1.7b in Q2**

IVC Research Center CEO Koby Simana says, "VC funds managed to raise a considerable amount in 2016, surpassing expectations. This echoes the oversubscription reported by the VC industry in the US, which was arguably the strongest year ever in VC fund raising. More capital will be raised in 2017 for new and existing funds, so with all this capital available, we expect local VCs to shift their primary focus in 2017 to making new investments, which will hopefully have a positive impact on the local high-tech ecosystem."

In 2016, four Israeli venture capital funds raised more than \$100 million each. OrbiMed Israel Partners closed its second fund with \$307 million. Vintage's ninth fund raised \$200 million, having closed its \$125 million eighth fund just a year earlier, followed by Aleph's second fund, with \$180 million raised, after its first fund was closed in 2013. Last on the list was Red Dot Capital Partners, a first-time growth fund which raised \$150 million and was closed in early 2016.

Growth funds drive the seventh fundraising cycle, with identical shares of 46% in both the 2015 and 2016 vintage years, although the number of players decreased - only four growth funds in the 2016 vintage year compared to nine new growth funds in 2015. The average 2016 vintage growth fund is thus the largest, at \$157 million, and is expected to increase to as much as \$164 million when targets are reached by the funds still raising further capital.



The micro venture capital fund trend also received a boost, doubling from seven funds in 2015 to 15 micro funds raised in 2016, accounting for 15% of total capital raised by venture capital funds in 2016, compared to 10% in the 2015 vintage.

As 2017 begins, more than \$3.5 billion is available for investment by Israeli venture capital funds. Of this amount, over \$1.1 billion is earmarked for first investments, with the remainder reserved for follow-on investments. There are currently 49 venture capital funds that are still in the process of raising funds, 25 of which have made first closings. The other 24 venture capital funds have not made any investments yet, with half being brand new funds. With nearly \$1 billion expected to be raised in 2017, we believe that as much as \$500,000 will be available for first investments over the coming year.

An IVC-ZAG report noted that Israeli venture capital funds invested a total of \$634 million in Israeli high-tech companies in 2016, slightly up from \$627 million invested in 2015. In the past five years, Israeli venture capital fund investments steadily increased, from \$482 million in 2012 to the current level. At the same time, their share of total capital invested has been decreasing gradually, from 26% in 2012 down to 13% in 2016, the lowest yet.

### **Israel Air Force Receives First Arrow 3 Missile Defense Rockets**

The Arrow 3, jointly developed by Israel and the U.S., is designed to intercept ballistic missiles at long distances, even outside the atmosphere.

Israel's Defense Ministry and the U.S. Missile Defense Agency have completed the first phase of development on the Arrow 3 missile defense system and the first of the advanced rockets were delivered to Israel on Wednesday.

The new system represents a significant increase in Israel's ability to defend against long-range missiles. Among other things, the system improves on the Arrow 2 system in the areas of control and monitoring abilities while also expanding radar detection range.

Israel and the U.S. are continuing in their joint development of the Arrow 3, and additional operational tests are expected in the coming years before Israel has been fully equipped with the system.

The Arrow 3 is designed to intercept ballistic missiles at long distances and outside the atmosphere. The U.S. Department of Defense's Missile Defense Agency and Boeing are partners in the project run by state-owned Israel Aerospace Industries. Each Arrow 3 missile is estimated to cost about \$2.2 million.

The system was successfully tested by Israel in December, 2015 after a partial failure one year previously.

The Arrow is the long-range segment in Israel's three-tier missile shield. This also includes the successfully deployed Iron Dome, which targets short-range rockets and mortar bombs used by Palestinian terrorists in Gaza, and the mid-range David's Sling, which is still under development. They can be deployed alongside U.S. counterpart systems like the AEGIS.

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### **Why Israel has the most technologically advanced military on Earth**

Israel is one of the world's top weapons exporters with \$6.5 billion in annual arms sales. In 1950, just two years after the State of Israel was founded, the country's first commercial delegation set off for South America.

Israel desperately needed trading partners. Unlike its Arab adversaries, Israel did not have natural resources to fund its economy. There was no oil or minerals. Nothing. The delegation held a couple of meetings but was mostly met with laughs. The Israelis were trying to sell



oranges, kerosene stove tops and fake teeth. For countries like Argentina, which grew its own oranges and was connected to the electrical grid, the products were pretty useless. It's hard to imagine this is what Israeli exports looked like a mere 67 years ago. Today, Israel is a high-tech superpower and one of the world's top weapons exporters with approximately \$6.5 billion in annual arms sales. Since 1985, for example, Israel is the world's largest exporter of drones, responsible for about 60 percent of the global market, trailed by the US, whose market share is under 25 percent. Its customers are everywhere; Russia, South Korea, Australia, France, Germany and Brazil.

In 2010, for example, five NATO countries were flying Israeli drones in Afghanistan. How did this happen? How did Israel, a country not yet even 70 years old, become a superpower with one of the most technologically advanced militaries in the world that is changing the way modern wars are fought?

The answer, I believe, is a combination of a number of national characteristics unique to Israel. First, despite Israel's small size, about 4.5 percent of its GDP is spent on research and development, almost twice the Organization for Economic Co-operation and Development average. Of that amount, about 30 percent goes to products of a military nature. By comparison, only 2 percent of German R&D and 17 percent of the US R&D is for the military. Another major contribution is the culture of innovation and creativity in Israel. Israelis are more willing to take risks than other nations. They get this from their compulsory military service during which they are tasked, at a young age, to carry out missions often with deadly consequences.

While Israeli 19-year-olds embark on operations behind enemy lines, their western counterparts can be found in the safety of their college dormitories.

Lastly, Israel has been in a perpetual state of conflict since its inception, fighting a war almost every decade. This reality, of having your back up against the wall, sharpens the mind. It forces Israelis to be creative and come up with innovative ways and weapons to survive.

### This is the Israel story

#### Robotic border patrols

The Guardium is a part of a new category of robotic weapons known as Unmanned Ground Vehicles or UGVs. Israel is the first country in the world using these robots to replace soldiers on missions like border patrols. Already, Guardium UGVs are deployed along Israel's border with Syria in the north and the Gaza Strip in the south. The Guardium is based on a Tomcar dune-buggy-like vehicle and equipped with a range of sensors, cameras and weapons. It can be driven by a soldier sitting in a command center miles away or receive a pre-designated route for its patrol, making it completely autonomous.

The increasing use of robots by the Israel Defense Forces is part of a larger strategy to minimize risk to soldiers when possible. In addition, soldiers require breaks, food and water. All a Guardium needs is a full tank of gas. Other UGVs in use by the IDF include the Segev, which is based on a Ford F-350 pickup truck.

Facing terrorists who use tunnels to infiltrate into Israel from places like the Gaza Strip, Israel is also relying on UGVs, like robotic "snakes" to slither their way into underground passageways and enemy headquarters. The robots will then map out the structures, giving soldiers an accurate picture of a battle area before storming the place. The same is happening at sea. Israeli defense contractor Rafael has developed an unmanned patrol ship called "Protector" which is being used by Israel to protect its strategic ports and patrol



the country's long Mediterranean coastline.

### The Arrow Anti-Missile Program

In 2000, the Israeli Air Force received its first operational Arrow missile battery, making Israel the first country in the world with an operational system that could shoot down incoming enemy missiles.

The idea to create the Arrow was born in the mid-1980s after President Ronald Reagan floated his Star Wars plan and offered America's allies to partner in developing systems that could protect the country from Soviet nuclear missiles. The Arrow was an evolutionary idea. Due to Israel's small size and lack of territory, all ballistic missiles deployed in the region - Syria, Iraq and Iran - can reach anywhere within the country and pose a strategic and possibly even existential threat. Israel, the developers argued, needed a system that could shoot down enemy missiles over neighboring countries and provide overall protection for the tiny Jewish State.

The program had its ups and downs but got a huge boost in funding after the First Gulf War in 1991 when Saddam Hussein fired 39 Scuds into Israel, paralyzing the country and forcing millions of Israelis into bomb shelters with their gas masks. The Arrow was just the beginning. Today, Israel has the Arrow, which is partially funded by the United States, to intercept long-range ballistic missiles, David's Sling to intercept medium-range rockets and cruise missiles as well as the combat-proven Iron Dome, which has intercepted hundreds of Katyusha rockets fired from the Gaza Strip in recent years.

Israel is the only country in the world that has used missile defense systems in times of war. These systems do more than just save lives. They also give the country's leadership "diplomatic maneuverability," the opportunity to think and strategize before retaliating against rocket attacks.

While other countries have also invested in missile defense, none has created a multi-tier architecture like Israel.

### Mini spy satellites

In 1988, Israel launched its first spy satellite into space, gaining membership in the exclusive club of just eight nations with independent satellite-launching capabilities.

From the beginning, there were those who doubted Israel was capable of developing, building and launching its own satellite, but in the nearly 30 years since that day, it has grown into a satellite superpower, now operating eight different spy satellites in space.

This is a critical capability considering the threats Israel faces from countries like Iran, which it still suspects is planning one day to build a nuclear weapon.

Israel has shied away from building big satellites and instead designs what are known as "mini satellites," which weigh about 300 kilograms in comparison to America's 25-ton satellites.

### Israel's spy satellites are split into two categories:

Most of Israel's satellites come with advanced high-resolution cameras like the Ofek-9, launched in 2010, which can discern objects as small as 50 centimeters from hundreds of miles away.

Israel's other category of satellites are known as the TecSar. These satellites use a synthetic aperture sensor, basically a radar system that can create high-resolution images at almost the same quality as a regular camera. The advantage this technology provides Israel is tremendous. A camera cannot see through clouds or fog, but radars can work in all weather conditions and can even see through camouflage nets. What this means is that Israel has the ability to track its enemies and gather



intelligence on them at all times of the day and through rain, fog or clouds. Israel's success in developing state-of-the-art satellites has caught the world's attention. In 2005, the French entered a strategic partnership with an Israeli company to develop a satellite, and in 2012 Italy ordered a reconnaissance satellite, paying \$182 million. Singapore and India have also reportedly purchased Israeli satellites over the years.

### Drones

It is referred to in Israel as the "drone that can reach Iran." The Heron TP is Israel's largest unmanned aerial vehicle with an 85-foot wingspan, the same as a Boeing 737 airliner. It can stay airborne for 24 hours and carry a 1-ton payload. While Israel doesn't openly admit it, the Heron TP is believed to also be capable of launching air-to-surface missiles. Israel was the first country in the world to operate drones in combat operations. Its first use of drones was in 1969 when the Israel Defense Forces flew toy airplanes with cameras glued to their bellies along the Suez Canal to spy on Egypt. In 1982, it flew its first combat drone - called "Scout" - in Lebanon where they played a key role in locating and neutralizing Syrian anti-aircraft missile systems.

That operation caught the world's attention and in 1986, Israel supplied the US Navy with its first drone, known as the "Pioneer." A few years later, one Pioneer made history when it flew over a group of Iraqi soldiers during the First Gulf War. The soldiers saw the aircraft, took off their white undershirts and waved them in the air. It was the first time in history that a military unit had surrendered to a robot.

Israel's drones have revolutionized the modern battlefield. They cost a fraction of a manned fighter jet - some as little as a few million dollars - and participate today in every single operation conducted by the IDF. Drones give soldiers the ability to make calculated decisions before invading territory or storming enemy

compounds. Before Israel bombs a building in the Gaza Strip, for example, it always has a drone in the air to ensure that civilians are not inside. They also reportedly fly almost daily over Lebanon, tracking fighters for Hezbollah, which is believed to have about 130,000 missiles capable of striking Israel.

### The top-secret tank

To this day, the Merkava tank is one of Israel's most top-secret projects. It is said to be one of the most lethal and protected tanks in the world, and its construction started out of pure necessity - the United Kingdom and other countries refused to sell Israel tanks. So in the 1970s it started to build its own.

The newest model - "known as the Merkava Mk-4 - is the most impressive. It can reach speeds of 40 mph and comes with a new modular armor kit, meaning that the tank can be fitted with the armor it needs based on the specific mission it is heading into.

An area, for example, known to be full of anti-tank missile squads requires heavy armor, while an operation without the threat of anti-tank missiles means less. This also allows tank crews to replace damaged pieces of armor on the battlefield without having to bring the full tank back to a repair shop inside Israel.

In 2012, the Merkava underwent its biggest change yet when a new system - called Trophy - was installed on the tank. Trophy is an active-protection system, basically a personal missile defense system for an individual tank.

Trophy uses a miniature radar to detect incoming anti-tank missiles and then fires a cloud of countermeasures — basically metal pellets — to intercept them. The radar also interfaces with the tank's battle management system. This means that once a missile launch is detected, the coordinates of the enemy squad that fired the missile are immediately obtained,



allowing the tank to retaliate quickly and accurately.

### IAF holds successful David's Sling missile defense system test

The Israeli Air Force successfully tested the David's Sling missile defense system and destroyed several "enemy" missiles fired over the ocean. David's Sling, which is expected to become fully operational within a few weeks, is designed to intercept medium- to long-range rockets and cruise missiles fired from ranges of 40 kilometers (25 miles) to 300 kilometers (186 miles) away. According to the Defense Ministry's Homa Directorate, which oversees the development of Israel's missile defenses, the test simulated the missile threats Israel faces.

Held at the Palmachim Airbase in central Israel, the test included a series of interception scenarios during which the system's radar and command and control abilities were put into action. IAF personnel assigned to the future David's Sling Unit participated in the test as part of their training.

Homa Director Moshe Patel said the test was "a complete success." "This successful test is an important milestone in Israel's operational defense capabilities," the Defense Ministry said in a statement. The system was developed by Rafael Advanced Defense Systems, along with the U.S. Missile Defense Agency, Israel Aerospace Industries' subsidiary Elta, Elbit Systems, and American defense contractor Raytheon. A Rafael official said that "the targets intercepted in this test fire were the most advanced [threats] the defense system can take on.

The targets were intercepted at very high altitude." He said David's Sling would allow Israelis "to lead a normal life even when faced with the threat of precision and unconventional missiles."

David's Sling is part of Israel's four-tiered air defense, which also includes the Iron Dome system designed to intercept and destroy short-range rockets and artillery shells, the Arrow 2 short- and medium-range ballistic missile interceptor, and the Arrow 3 long-range missile interceptor, which is in the last leg of its development. In the future, the Air Defense Forces plan to use David's Sling to intercept enemy drones, an IAF official said. Israel is one of the world's top weapons exporters with \$6.5 billion in annual arms sales. IDF In 1950, just two years after the State of Israel was founded, the country's first commercial delegat on set off for South America.

Israel desperately needed trading partners. Unlike its Arab adversaries, Israel did not have natural resources to fund its economy. There was no oil or minerals. Nothing. The delegation held a couple of meetings but was mostly met with laughs. The Israelis were trying to sell oranges, kerosene stove tops and fake teeth. For countries like Argentina, which grew its own oranges and was connected to the electrical grid, the products were pretty useless. It's hard to imagine this is what Israeli exports looked like a mere 67 years ago. Today, Israel is a high-tech superpower and one of the world's top weapons exporters with approximately \$6.5 billion in annual arms sales.





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