

# Israel Missile Chronology

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Last update: January 2010

*This annotated chronology is based on the data sources that follow each entry. Public sources often provide conflicting information on classified military programs. In some cases we are unable to resolve these discrepancies, in others we have deliberately refrained from doing so to highlight the potential influence of false or misleading information as it appeared over time. In many cases, we are unable to independently verify claims. Hence in reviewing this chronology, readers should take into account the credibility of the sources employed here.*

*Inclusion in this chronology does not necessarily indicate that a particular development is of direct or indirect proliferation significance. Some entries provide international or domestic context for technological development and national policymaking. Moreover, some entries may refer to developments with positive consequences for nonproliferation.*

## 2009-2007

### 20 November 2009

Israeli Lieutenant General Gabi Ashkenazi and his military intelligence chief, Major General Amos Yadlin, warned that Hezbollah and militant Palestinian groups now have missiles that are capable of hitting Tel Aviv. According to the commanders, soon all of Israel will be under missile threat from Lebanon and Gaza, which adds new urgency to Israel to develop a system that is capable of shooting down short-range rockets. Major General Amos Yadlin also warned that Iran is seeking to smuggle a large number of Fajr-5 (Dawn) rockets into Gaza. The Fajr-5 rockets have a range of 68-75 km, are fired from a mobile launcher, and were first used by Hamas in January 2009 to bombard the Negev town of Beersheba. This city is 32 km from the Israeli nuclear facility in Dimona. Hezbollah currently has a rocket arsenal that is estimated to consist of 42,000 rockets, which mainly consists of Katyusha-type short-range rockets which are very inaccurate.

—Ed Blanche, "Israel Claims Hamas and Hezbollah Missiles Can Reach Tel Aviv," *Jane's Missiles and Rockets*, 20 November 2009.

### 21 October 2009

Israel and the United States held a joint missile-defense exercise, codenamed "Juniper Cobra 10." The exercise lasted three weeks and was meant to improve cooperation between the U.S. Army and the Israeli Defense Force. Systems used during the exercise included the U.S. Navy's Aegis shipboard system, unidentified Patriot units, and Israel's Arrow II. According to the Israeli press, the exercise was meant to simulate an Iranian missile attack on Israel. Reports indicated that the U.S. might leave some of its missile defense components in Israel following the exercise.

—Doug Richardson, "Israel and US State Biggest-Ever Joint Missile-Defense Exercise," *Jane's Missiles and Rockets*,

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27 October 2009; Yaakov Lappin, "US deploys Patriots during joint military drill," *Jerusalem Post*, 28 October 2009; "Israel can use stockpiled U.S. arms," UPI, 19 January 2010.

### **31 July 2009**

Israel successfully test fired an improved version of the Barak naval surface-to-air missile (SAM). This missile is intended to be able to hit all air targets including rockets. The Sa'ar 5-class corvette Lahav launched this missile at a simulated enemy missile. The Israeli government announced that all Israel Navy ships will be upgraded with the new Barak missile. This system has been sold to Chile, India, and Singapore. A land-based version has also been sold to Venezuela.

—Doug Richardson, "Israel successfully tests improved Barak naval SAM," *Jane's Missiles and Rockets*, 31 July 2009.

### **15-16 July 2009**

Iron Dome successfully intercepted three Katyusha-type rockets during live-fire testing. These trials mark the end of the system's initial development phase. Israeli officials have noted that any withdrawal from the West Bank will be contingent upon establishing defenses to counter short-range rocket attacks.

—"Israel trains SAM battalion for Iron Dome," UPI, 20 July 2009; Yaakov Katz, "Iron Dome system successful in tests," *Jerusalem Post*, 15 July 2009; "Anti-rocket defense system Iron Dome aces first live try," Reuters, 15 July 2009.

### **3 July 2009**

Israel Aerospace Industries displayed its new smart glide bomb, the Medium Laser Guided Bomb, at the Paris Air Show. Israeli staff described the bomb as a "precision weapon for precision attacks or close-air support against various types of target such as buildings, small bunkers, time-critical targets and moving targets," offering "pinpoint accuracy for all weather conditions," and trajectory control. The bomb is able to carry an 80 kg warhead and is guided to its target via GPS and a nose-targeted laser seeker. The shell of the bomb incorporates a fine rectangular grid that is able to screen the interior from electromagnetic interference.

Israel Aerospace Industries also displayed its new anti-radar UAV drone called the Harop at the Paris Air Show. The Harop is similar to the Harpy, but uses an undernose-mounted electro-optical turret for surveillance, target acquisition, and final homing. The UAV can attack from any direction and at any angle between horizontal and vertical. It carries a high-explosive fragmentation warhead that can destroy targets such as missile launchers, radars, or other valuable enemy assets. Israel Aerospace Industries announced that it plans to supply the Harop system to foreign customers.

—Doug Richardson, "Israel Develops a New Glide Bomb," *Jane's Missiles and Rockets*, 3 July 2009; Doug Richardson, "Israel Reveals its 'Kamikaze' Unmanned Aerial Vehicle," *Jane's Missiles and Rockets*, 3 July 2009.

### **1 July 2009**

Jason Horowitz, business development and marketing director of Rafael Advanced Defense Systems' Air-to-Air and Air and Missile Defense Systems operations, announced that the first guided test launch of the Stunner missile will take place in 2010 or early 2011. The Stunner missile will be used in Israel's long-range missile defense system

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called "David's Sling" and is being co-developed by Rafael and Raytheon. The Stunner missile costs much less than many other types of missile interceptors and will be able to be periodically replaced.

—Doug Richardson, "Israel Adopts Low-Cost Approach to Missile Defense," *Jane's Missiles and Rockets*, 1 July 2009.

#### **12 May 2009**

Israel Air Force commander Major General Ido Nehushtan announced that the first elements of Israel's Iron Dome rocket defense system will be operational in 2010. He also said that it will be four years before the multi-layer system required for effective rocket and missile defense is operational. The systems he identified as be associated with Israel's multi-tier defense were the Iron Dome system, David's Sling interceptors, the Arrow-3 anti-ballistic missile system, and the Magic Wand system.

—David C. Isby, "Effective Rocket Defense of Israel Requires Three Tiers, IAF Commander Says," *Jane's Missiles and Rockets*, 1 June 2009.

#### **1 May 2009**

The Israeli Air Force organized a new surface-to-air missile (SAM) battalion that will operate the Rafael Advanced Defense Systems Iron Dome system. Until the Rafael-Raytheon David's Sling (Tamir) interceptor missile system is operational, the battalion will operate radar systems and provide warning to Israeli citizens of rocket launches. The battalion will also help track the location of rocket launches in order to aid counter-fire operations. The battalion is planned to eventually operate the Rafael Magic Wand system, meant to counter 40-250 km medium-range rockets such as the Iranian-designed Fajr and Zelzal. The battalion is scheduled to be operational before the end of 2009.

—David C. Isby, "Israel Prepares SAM Battalion to Operate Iron Dome," *Jane's Missiles and Rockets*, 1 May 2009.

#### **21 April 2009**

Israeli Defense Minister Ehud Barak announced that Israel would seek to purchase the land-based derivative of the Raytheon Phalanx close-in weapon system, also known as counter-rocket, artillery and mortar (C-RAM) system, in order to counter mortars fired by both Palestinian and Hezbollah militants. The system would complement the Israeli-manufactured Iron Dome system which remains in development. The C-RAM system is effective up to 2,000 m, and has been used by U.S. forces to defend the Green Zone in Baghdad. Israel plans to form a line of land-based systems across the Negev Desert north of the Gaza Strip to protect Israeli citizens from rocket attacks. It is rumored that Israel could also deploy C-RAM systems in northern Israel to protect Israeli citizens from Hezbollah rockets. The Pentagon would have to approve the sale of any C-RAM systems to Israel since all systems being produced are currently earmarked for U.S. forces in Iraq and Afghanistan. Each C-RAM system would cost \$25 million.

—"Israel seeks U.S. cannon to fight Gaza rockets," Reuters, 21 April 2009; Martin Sieff, "Israel's Barak buys U.S. Phalanx to protect Sderot," UPI, 1 May 2009; Ed Blanche, "Israel Declares Phalanx as Weapon of Choice to Counter Hamas Rockets," *Jane's Missiles and Rockets*, 5 May 2009.

#### **7 April 2009**

Israel successfully tested the Arrow (Chetz) Anti-Tactical Ballistic Missile (ATBM). The test used a simulated Iranian Shahab-3 medium-range ballistic missile (IRBM). This was the 17th test of the Arrow system, but the first test

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interception by an upgraded Arrow II. Officials from the Israel Missile Defense Organization (IMDO) and the U.S. Missile Defense Agency (MDA) took part in the test. The Arrow 2 interceptor was developed for the Israeli Ministry of Defense by Israel Aerospace Industries and Boeing. Boeing noted in a news release that the test was "operationally realistic." During the same week, the Rafael Advanced Defense System's Iron Dome (Kippat Barzel) short-range ballistic rocket and artillery protection system was successfully test-fired.

—Gareth Jennings, "Israel Conducts Successful Arrow Test-Intercept," *Jane's Missiles and Rockets*, 9 April 2009; Martin Sieff, "IAI/Boeing Arrow shoots down second missile target," UPI, 29 April 2009.

### **3 February 2009**

Israeli defense officials worry that Syria will transfer anti-aircraft missiles to Hezbollah in Lebanon while the IDF is preoccupied in the Gaza Strip. Israeli Defense Minister Ehud Barak asserts, "We [Israel] are also keeping an eye on the weapons smuggling from Syria to Hezbollah and there are a number of systems that we view as breaking the balance of power that cannot be allowed to be transferred." Barak maintains that in the event of an attack by Hezbollah, Israel would "need to consider its response" but would hold the Lebanese government responsible.

—Ya'aqov Katz, "Israel Fears Syria Might Aid Hezbollah," referenced in "Israel Concerned That Syria Will Give Hezbollah Anti-Aircraft Missiles," BBC Worldwide Monitoring, 5 February 2009.

### **12 January 2009**

As the military offensive continues in Gaza, Israeli security officials debate whether the U.S. Skyguard missile defense system, abandoned in 2005, could have protected southern Israel from Hamas rockets. Many officers, scientists and analysts have been criticizing the Defense Ministry's alternative, the Iron Dome defense system. The Iron Dome system has experienced difficulties intercepting Qassam rockets fired at ranges shorter than 4.5 kilometers, leaving some Israeli populations vulnerable to Hamas rockets. Israeli defense officials emphasize that no missile defense system is one hundred percent effective, but that Iron Dome is continuing to improve and is the most realistic defense against Qassam rockets, Grads, mortars and similar weaponry.

— "Iron Dome is the right system to use," *The Jerusalem Post*, 12 January 2009; Reuven Pedatzur, "Iron Dome found to be helpless against Qassams," *Haaretz*, 22 February 2008.

### **23 November 2008**

U.S. technicians are testing the X-band radar in the Negev, Israel [Note: See NTI Chronology 28 September 2008]. The radar facility includes two 1,300-foot antennae near the Dimona nuclear facility with a range of 1,250 miles. It is one of the newest elements of U.S.-Israeli cooperation to improve Israel's missile defense capabilities. The 80 U.S. technicians hope to have the radar fully operational by mid-December 2008.

—"U.S. to activate radar in Israel next month," Agence-France Presse, 24 November 2008; Yaakov Katz, "X-Band radar system to become operational by mid-December," *Jerusalem Post*, 23 November 2008; Uzi Mahnaimi, "Israel fears U.S. will dither while Iran goes nuclear," *The Sunday Times*, 23 November 2008.

### **17 November 2008**

Israel and Germany have built a prototype infrared sensor to distinguish between a nuclear-armed ballistic missile and multiple decoys during an attack. A German source confirms the existence of the project, dubbed "Project Bluebird," and further verifies testing on commercial aircraft. Israel is seeking U.S. assistance to place the sensor

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on UAV's in order to integrate it into the Arrow missile defense system.

—Yakkov Lappin, "Israel, Germany develop nuclear warning system," *Jerusalem Post*, 17 November 2008.

#### **28 October 2008**

Israel is improving its passive ballistic missile defense capability as part of efforts to upgrade its missile defense systems. The upgrade will enhance the impact point prediction capability being developed by the Israeli Air Force, which will fuse trajectory data on incoming missile threats provided by U.S. and Israeli radar. It has the potential to divide the country into more protected areas, so that normal activity can continue in parts of the country that are not at risk. Israel's passive missile defense currently divides the country into ten areas for warning purposes, but Israel hopes to expand to twenty-seven areas by 2009, and to 100 by 2010. The system was first developed in response to the 1991 ballistic missile attacks from Iraq and modified during the 2006 Lebanon conflict.

—David C. Isby, "Israel seeks to upgrade passive missile-defence system," *Jane's Missiles and Rockets*, 28 October 2008.

#### **28 September 2008**

The United States completes deployment of the X-band radar system to Israel this week. The radar system will be operated by U.S. military security personnel, making this the first time that U.S. troops have been permanently stationed on Israeli soil. A similar radar system was deployed to Japan in 2006 in response to a North Korean missile test.

—"U.S. Deploys Anti-Missile Radar to Israel," *Yedh'iot Ahronot*, 28 September 2008; U.S. Deploys Powerful Radar to Israel: Pentagon," Reuters, 29 September 2008.

#### **15 September 2008**

Israeli officials announce that plans to equip Israeli Defense Forces tanks with anti-missile defense systems have been postponed due to budgetary constraints. The Trophy systems were developed by RAFAEL and were originally set to be installed on IDF tanks in 2010.

—Ya'akov Katz, "Trophy Tank Defense System Two Years Behind Schedule," *The Jerusalem Post*, 16 September 2008; Barbara Opall-Rome, "Debut of Israeli Trophy Delayed," *Defense News*, 15 September 2008.

#### **12 September 2008**

The U.S. rejects Israel's request for "bunker buster" bombs and mid-air refueling planes in a security aid package. The U.S. had previously supplied Israel with such "bunker buster" bombs during the 2006 war against Lebanon. Israel also requests \$164 million worth of equipment to upgrade its Patriot missile battery, which is expected to be granted.

—Amos Herel and Aluf Benn, "Israel Asks U.S. for Arms, Air Corridor to Attack Iran," *Ha'aretz*, 11 September 2008; "U.S. won't Send 'Bunker Busters'," *The Washington Times*, 12 September 2008; "Israel Requests \$241 Million in Patriot Upgrades, SDBs and LAAWs," *Defense Daily International*, 12 September 2008.

#### **7 August 2008**

In light of Israel's decision to move forward with the Arrow 3 missile defense system, U.S. Missile Defense Agency Director Lt.-Gen. Henry Obering III meets with Israeli officials to pledge U.S. financial and developmental

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assistance. The Arrow 3 system is more advanced in speed, range and altitude than the Arrow 2, and Israel expects it to become operational by 2012. Lt. Gen. Obering also signs an agreement to help Israel develop the David's Sling missile defense program. David's Sling, described by Lt. Gen. Obering as "an extremely fast reaction system," will defend Israel against rocket, ballistic missile, and air-breathing threats.

—Ya'aqov Katz, "U.S. Defense Department Pledges Support for Arrow 3," *The Jerusalem Post*, in OSC document GMP20080807740009, 7 August 2008; Barbara Opall-Rome, "U.S.-Israel to Develop David's Sling Missile Defense," *Defense News*, 7 Aug 2008.

#### **19 May 2008**

Ongoing investigations into corruption within India's Defense Ministry result in the indefinite suspension of a joint Indian-Israeli project to develop air defense missiles. India's Central Bureau of Investigations is investigating former Defense Minister George Fernandes for pushing the purchase of Barak Missile Systems, a missile defense system used by Israel's navy and developed jointly by ELTA and RAFAEL, despite reservations from select Indian Cabinet officials. This investigation will not, however, affect Israel Aerospace Industries' ongoing work to develop a 60km missile defense system for India's Navy.

—Sandeep Dikshit, "Barak Probe Stalls Project," *The Hindu*, in OSC document SAP20080521390001, 21 May 2008; "Barak Missile Deal: CBI Questions Fernandes," *ExpressIndia*, 19 May 2008.

#### **15 April 2008**

Israel successfully tests the Green Pine Radar, part of the Arrow missile defense system. The Green Pine radar system can detect targets up to 500 km, and was successful in location and simulated intercept of the Blue Sparrow missile. The Blue Sparrow is a new missile produced by RAFAEL and is useful for such tests because of its relative similarity to ballistic missiles like Iran's Shahab-3.

—"Israel Takes Step Toward Anti-Missile System," Agence France Press, 15 April 2008; Ya'aqov Katz, "Israel Allowed to Connect to U.S. Worldwide Missile Warning System. New Arrow Missile Targeting System Successfully Tested," *The Jerusalem Post*, 16 April 2008; "Arrow 2 Theatre Ballistic Missile Defense - Israel, [www.army-technology.com](http://www.army-technology.com).

#### **11 May 2008**

During U.S. President Bush's trip to Israel this week, he is expected to offer Israel the forward-based X-band radar. Raytheon, the company responsible for developing the radar, says the system is able to detect targets up to approximately 2,900 miles away. The radar will be better able to counter ballistic missile threats and will also bring Israel into the U.S. missile shield.

—"Bush to discuss offering Israel Powerful radar system during visit this week," *Jerusalem Post*, 11 May 2008; "U.S. Looks Set to Offer Israel Powerful New Radar," Reuters, 12 May 2008.

#### **10 May 2008**

The U.S. administration appears set to offer Israel a powerful new radar system. The proposed system is believed to be the forward-based X-Band radar built by Raytheon. Transportable by air, the X-Band radar "uses high-powered pulsed beams for extremely high resolution tracking of objects in space such as a missile that could be tipped with a chemical, germ, or nuclear warhead." While greatly boosting Israel's defenses against ballistic

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missiles, the new system would allow Israel to engage a Shahab-3 ballistic missile, six times sooner than Israel's present Green Pine Radar.

—Jim Wolf, "U.S. looks set to offer Israel powerful new radar," Reuters, 10 May 2008.

#### **4 April 2008**

The Israeli Air Force (IAF) plans to conduct an exercise "to test the Arrow missile defense system's capability in tracking an advanced Iranian Shihab 3." The test will be designed to focus on the capabilities of the Green Pine Radar which forms an integral part of the Arrow missile defense system as it tracks a missile made by Israel's Rafael, called Black Sparrow.

—Yaakov Katz, "Can the Arrow Thwart Iran's Shihab 3 Missile?," The Jerusalem Post, 4 April 2008.

#### **14 March 2008**

Israel's Defense Ministry Director-General Pinhas Buhris will travel to the United States to meet with U.S. officials on continuing funding of Israel's Arrow missile defense system. In addition, Buhris intends to meet with Pentagon officials about a future acquisition concerning the Lockheed Martin-built Terminal High Altitude Area Defense (THAAD) missile defense system.

—Yaakov Katz, "Facing Iran threat Israel tries again to buy F-22 jets from U.S.," The Jerusalem Post, 14 March 2008.

#### **1 March 2008**

The Israeli Navy is upgrading its anti-missile defenses by deploying Rafael's new Wideband Zapping Anti-Radar Decoy (WIZARD). Intended to "help defend vessels against increasingly widely fielded chaff-discriminating radar-guided missiles," the WIZARD system will "provide a substantial and relatively persistent radar lure for incoming missile threats." The system will also be able to "overcome the usual chaff-discriminating algorithms," which are used to distinguish chaff from actual targets. RAFAEL first unveiled the new decoy system at NATO's MCG/8 electronic warfare exercise in June 2007.

—Nick Brown. "Israel chooses Rafael's Wizard decoy for navy," *International Defense Review*, 1 March 2008; "Wizard Naval Decoy Demonstrated at NATO Trials," *Deagel.com*, 16 July 07, [www.deagel.com](http://www.deagel.com).

#### **22 February 2008**

The Israeli Air Force is upgrading its missile testing field. The upgrade, scheduled to be completed in two years, will include "the establishment of a sophisticated command room, modern radar, and advanced optical and computer systems."

—Shira Kohen. "The Missile Field that Will Try to Give NASA a Fight," *Bamahane*, 22 Feb 2008, Open Source Document GMP20080222741001.

#### **16 February 2008**

Israel's Urban Aeronautics and Israel Aerospace Industries (IAI) announce joint venture agreements with India's TATA Advanced Systems. The TATA-Urban Aeronautics agreement "is to explore opportunities for manufacturing unmanned aerial vehicles (UAVs)." The TATA-IAI agreement is to focus on the "development and production of a wide range of products: missiles; unmanned aerial vehicles; electronic warfare; and security systems."

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—"TATA, EADS Partner for Indian Army Tactical Comms System Bid," *Jane's Defense Industry*, 18 Feb 2008; "India-Israel to Jointly Develop Anti-Aircraft Missiles," *Agence France Press*, 26 Feb 2008.

#### **16 February 2008**

Israel's Rafael Advanced Defense Systems announces its partnership with India's Bharat Electronics in the field of missile electronics and guidance technologies. The partnership will allow Israel to "meet future offset requirements through the transfer of technology and work-share."

—"Bharat, RAFAEL Move on Plans for Missile Technology," *Jane's Defense Industry*, 18 Feb 2008.

#### **4 February 2008**

The USS San Jacinto equipped with the AEGIS anti-missile defense system docks at the Port of Haifa. Intended to deploy in the event of an Iranian missile attack against Israel, it is equipped with the SPY-1A radar system, "capable of detecting and tracking any aircraft or missile flying within 320 km."

—Yaakov Katz, "US anti-missile ship to dock in Haifa," *Jerusalem Post*, 4 February 2008.

#### **22 January 2008**

Israel's Rafael Advanced Defense Systems unveils the newly developed "Stunner" missile. The missile is designed to intercept mid to long-range rocket threats and missiles. Jointly developed by Rafael and U.S. defense contractor Raytheon, it is expected to become operational in four years and will be incorporated into the Magic Wand anti-missile system.

—Barak Ravid, "Israel unveils plans for missile to counter Hezbollah missiles," *Haaretz*, 22 January 2008.

#### **18 January 2008**

Israel test fired a long-range ballistic missile yesterday morning from the Palmachim Air Force Base in central Israel. Israeli radio reported that the missile tested "was capable of carrying an 'unconventional payload.'"

—Yaakov Katz, "Long-Range Ballistic Missile Test-Fired," *The Jerusalem Post*, 18 Jan 2008.

#### **30 December 2007**

Israel Aerospace Industries (IAI) announced that it will develop a missile for India that is designed to intercept aircraft, missiles and UAV threats from Pakistan.

—Arye Egozi, "Israel to Develop for India Missile to Intercept Threats from Pakistan," *Yedi'ot Aharonot*, 30 Dec 2007, from GMP20071230754003.

#### **20 December 2007**

The IDF announced this week that it is making progress in testing the new Patriot missile launching system in southern Israel. The new system will improve upon earlier attempts at interception of surface-to-surface missiles.

—Leah Krauss, "Analysis: Missile Defense Testing Advances," *United Press International*, 20 Dec 2007.

#### **3 December 2007**

Newly declassified documents belonging to Henry Kissinger, then President Nixon's national security adviser, reveal that, in 1969, the U.S. government considered pressuring Israel not to deploy the Jericho nuclear-armed intermediate-range ballistic missiles in its arsenal. This was in response to growing discontent in the U.S.

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government regarding Israel's nuclear weapons program.

—Doug Richardson, "U.S. Considered Pressure on Israel Against Jericho Missile, Reveals Kissinger Memorandum," *Jane's Missiles & Rockets*, 03 Dec 2007.

#### **14 November 2007**

As part of an Israeli effort to replenish its emergency weapons stockpiles, Israel's Patriot Air Defense Systems are set to receive 100 additional Patriot Advanced Capability (PAC-2) Guided Enhanced Missile Plus missile rounds.

—Alon Ben-David, "Israel Continues to Replenish War Stocks," *Jane's Defense Weekly*, 14 November 07.

#### **12 November 2007**

At a recent meeting of the Knesset-Congressional committee on defense issues, one of the main topics on the agenda was the need to upgrade Israel's anti-missile defense systems. Israel proposed the development of "a new system capable of intercepting missiles in outer space, with a kill ratio of around 99 percent." The current interception rate of the Arrow system is 90 percent.

—Leslie Susser, "Israel to U.S.: Listen, It's Pretty Serious," *Jerusalem Report*, 12 November 07.

#### **11 November 2007**

Israel's missile defense shield around the Dimona nuclear reactor was placed on red alert last week due to fears of an impending retaliatory air strike by Syria. Israel also moved a battery of its Patriot anti-aircraft missiles to Dimona.

—Uzi Mahnaimi "Israel on Alert for Syria Airstrike," *London Sunday Times*, 11 November 07.

#### **9 November 2007**

The 2008 Appropriations Bill for the U.S. Department of Defense includes \$37 million intended for the production of components for the anti-ballistic missile Arrow in the U.S. and Israel. The manufacturing of the Arrow, which is part of Israel's Arrow anti-ballistic missile defense system, is managed by Israeli Missile Defense Organization. The Appropriations Bill also includes \$36.5 million for Israel's Hunter Unmanned Aerial Vehicles (UAVs).

— "Arrow Missile Defense Components Receive Conference Attention," *Defense Daily International*, 9 November 07; Hillary Krieger, "Congress Boosts Israeli Missile R&D," *Jerusalem Post*, 11 November 07.

#### **8 November 2007**

The U.S. Congress recently approved providing Israel with \$155 million to develop David's Sling, an advanced missile interception system. David's Sling will be able to counter projectiles ranging from rudimentary rockets of the sort frequently used by Gaza militants to long-range missiles like those in the arsenal of Israel's arch foe Iran.

—"Israel Gets U.S. Aid for Anti-Missile System," *Agence France Press*, 8 November 07.

#### **26 October 2007**

In light of Israel's recent defense policy decision to pursue a missile shield doctrine in the place of preemptive strikes, Israeli Defense establishment officials proposed the use of a laser-based missile defense system, like the M-THEL (Mobile Tactical High Energy Laser). The M-THEL was a joint Israel-U.S. program that was suspended in 2005. The U.S. army first cancelled the program, which led Israel to follow suit the following year.

—"Israel Sees Missile Defense as Replacing Preemptive Strike," *Middle East Newline*, 26 October 2007.

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#### **24 October 2007**

Israel presented a test of the PAC-3 missile system during a conference of the Jerusalem Center for Public and State Affairs and the Israeli Missile Defense Organization. Since the Patriot system is designed to act as a second layer of defense, a test of the Arrow system, which is Israel's first layer of defense, was also presented.

—Hanan Greenberg, "Israel to Receive New Patriot System," *Ynet News*, in OSC document GMP20071024736001, 24 October 07.

#### **31 August 2007**

Israel wishes to buy advanced medium range air-to-air (AMRAAM) missiles, equipment and services. The estimated cost is \$171 million, according to the U.S. Defense Security Cooperation Agency (DSCA). It is also reported that Israel "wants to spend \$163 million on 30 RGM-84L Block II Harpoon Anti-Ship missiles with containers and 500 AIM-9M Sidewinder Short Range Air-to-Air Infrared Guided missiles as well as associated equipment and services." Raytheon and Boeing would be the primary contractors. The DSCA reported that it is within the interests of the U.S. "to assist Israel developing and maintaining a strong and ready self-defense capability."

—"Israel Seeking \$334 Million in Missiles, \$308 Million in Jet Fuel," *Defense Daily International*, 31 August 2007.

#### **24 August 2007**

In light of the threat to Israel of "unprecedented missile barrages" in the future, the Israeli Defense Forces (IDF) is set to "modify its missile defense doctrine and has changed its deployment of the Arrow missile in northern Israel." The IDF has concluded that, judging from the large number of missiles and rockets that hit northern Israel during the Second Lebanon War and concerns over war with Syria, Israel's "next war will be characterized by missile onslaughts, and lots of them." Because of this, the IDF is switching to a "wide deployment" of Arrow missile batteries. Prior to now, the deployment of Arrow missiles in northern Israel was characterized as "thin deployment," based on the threat of Iraq's Scud missiles from the first Gulf War. IDF has also submitted a request to the U.S. Pentagon for "information on two American-made missile defense systems - the Terminal High Altitude Air Defense (THAAD) and the Aegis. The reason for this is to prepare Israeli infrastructure for the possibility of either the purchase of these systems or the deployed by the U.S. in time of war.

—Ya'akov Katz, "Fearing Syrian Missile Onslaught, IDF Boosts Arrow Defenses in North," *Jerusalem Post*, in OSC document GMP20070824739002, 24 August 07.

#### **23 August 2007**

The Israeli Air Force (IAF) intends to buy "advanced U.S.-made Patriot PAC-3 missiles from Lockheed Martin." The IAF is currently using the PAC-2 missile defense system as a second level of defense if the Arrow system fails. In the new system, the PAC-3 missiles are capable of intercepting aircraft and long-range ballistic missiles and each launcher will be equipped with 16 missiles instead of four. The PAC-3 system uses a "hit-to-kill system rather than an exploding warhead used by the PAC-2." The PAC-2 launchers will need to be modified and upgraded for the PAC-3 missiles.

—Arye Egozi, "Israel to Buy Advanced Anti-Aircraft Missiles," *Ynetnews*, in OSC document GMP20070823735012, 23 August 07; Yaakov Katz, "IDF Might Buy Latest Patriot Missile Systems. Reportedly Capable of Intercepting Most Syrian Missiles," *Jerusalem Post*, 20 August 2007.

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### **9 August 2007**

Israel's Iron Dome missile defense system, a short-range rocket-based missile interception system, will be operational in 18 months, according to officials at RAFAEL, Israel's national authority for the development of weapons and military technology. In response to an increasing number of threats of Palestinian "ballistic capabilities," Israeli Defense Minister Ehud Barak has been reported as stating that an operational Iron Dome system is a "prerequisite for an Israeli pullout from the West Bank." The Iron Dome system will be able to intercept rockets, like the Qassam rockets being fired by militants in Gaza.

—Yuval Azoulay, "Missile Interception System to be Launching in 18 Months," *Ha'aretz*, in OSC document GMP20070809735009, 09 August 07.

### **5 August 2007**

A joint-venture between Israeli RAFAEL and U.S. company Raytheon promises to produce world's first ground-based anti-shoulder-held missile protective system. The system will be able to detect "the launching of a shoulder-held missile at an aircraft instantly, either during takeoff or upon landing."

—Arye Egozi, "Israel-US Co-Manufacture Laser-Based Anti-Shoulder-Held Missile Ground System," *Yedi'ot Aharonot*, in OSC document GMP20070805739007, 05 August 07.

### **3 August 2007**

The new Israeli arms assistance package from the U.S., which "will top \$30 billion over the next 10 years," coincides with Israeli Defense Minister Ehud Barak's new plan for strengthening national security. Barak's plan includes a multi-layered missile and rocket defense system. In fact, the Ministry of Defense chose Israel's RAFAEL and U.S. Company Raytheon to work on a short range ballistic missile defense development program.

—B.C. Kessner, "Reactions, Possible Priorities Following U.S. Arms Assistance to Israel," *Defense Daily International*, 3 August 2007.

### **2 August 2007**

Israeli security officials reported that the Israeli government is reconsidering funding the laser-based Sky Guard missile protection system. The Sky Guard system was developed by U.S. Company Northrop Grumman and "passed performance tests in the U.S. with flying colors, registering a successful interception rate of nearly 100 percent." The Sky Guard system was previously dropped in favor of the Iron Dome system, which is based on intercepting rockets rather than laser beams. The pro-Sky Guard lobbying group argues that "Sky Guard was nearly completed, requiring minimal further investment to make it operational," while the Iron Dome System was to be completed within three years.

—Baraq Ravid, "Sky Guard May be Rising from the Dead," *Ha'aretz*, in OSC document GMP20070802736010, 02 August 07.

### **27 July 2007**

Israel's antiaircraft forces conducted a test of its Stinger missile batteries last week. After a test, most Stinger missiles were able to down mini-UAVs (unmanned aerial vehicles). Specifically, the Stinger missiles "demonstrated important capabilities in destroying especially small targets."

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—Pinhas Wolf, "Test Successful: Most Stinger Missiles Intercept Mini-UAV," *Bamahane*, in OSC document GMP20070727741007, 27 July 07.

### **13 July 2007**

Israel will develop and produce a new generation of missile defense technology in collaboration with India. This comes after years of collaboration between the two countries on developing radar and electronic technologies for missiles. In fact, "Israel had earlier sold Green Pine radars to India."

—Ranjit Kumar, "Missiles to be developed with Israel's Cooperation," *Navbharat Times*, in OSC document SAP20070713479006, 13 July 07.

### **13 July 2007**

Israel will jointly develop and co-produce "a new generation of medium range surface-to-air missiles" with India. This new generation missile will have a range of 70 km. and, reports have said, Israeli Aerospace Industries (IAI) is "working on a medium range version of the Spyder-MR" missile.

—"India, Israel to jointly develop medium range missiles," *PTI* 13 July 2007.

### **9 July 2007**

Israel Aerospace Industries will sign a deal with India's Defense Research and Development Organization "to develop a long-range version of the Barak missile system for the India Air Force. The new version would have a range of 150 km.

—Shiv Kumar, "DRDO Will Build Version A for IAF," *The Tribune*, in OSC document SAP20070710377015, 10 July 07.

### **2 July 2007**

Israel Military Industries (IMI) proposed establishing a Missile and Rocket Corps to take the place of the Artillery Corps in the IDF. The IMI contends that this would "enable the ground forces to launch precision attacks on targets at a range of 200 km., and to strike isolated targets with great accuracy."

—Felix Shalom, "IMI Proposes to Replace Artillery Corps. With Missile Corps.," *Ma'ariv*, in OSC document GMP20070702738003, 02 July 07.

### **27 June 2007**

Members of the U.S. Congress's House Appropriations Committee are reportedly trying "to encourage Israel to purchase U.S.-made antimissile systems instead of, or alongside with, the Arrow missiles, which are developed in Israel." The committee supports Lockheed Martin in its development of the THAAD antimissile missiles and has submitted a proposal to Congress recommending allocating Israel \$135 million to purchase these systems, even though an official request has not been made by Israel.

—Dani Shalom, "US Persuading Israel to Purchase THAAD Missiles in lieu of Arrow Missiles," *Maqor Rishon*, in OSC document GMP20070627741010, 27 June 07.

### **11 June 2007**

A new version of Israel's SkyLite B mini-UAV, with a "range of more than 21 mi., endurance of up to 3 hr. and a secure digital data link," was introduced by Israel's Rafael missile company. The new model can "operate in winds of up to 30 kt. and in rain, autonomously track a moving object and provide high-resolution images with accurate

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targeting data."

—Staff, "Israel's Rafael Missile Company," *Aviation Week and Space Technology*, 11 June 2007.

#### **1 June 2007**

The U.S. Senate Armed Services Committee recently proposed providing "\$60 million increased funding to aid partnership programs with Israel." \$25 million is slated for the co-production of the Arrow theater ballistic missile defense system, which Israel Aerospace Industries is producing; \$10 million will go toward a study of whether the Theatre High Altitude Area Defense (THAAD) system would be suitable to follow Israel's Arrow system; and \$25 million would go to the joint development of a short-range ballistic missile defense system for Israel.

—"Senate Panel Okays \$60 Million for Missile Partnership Programs with Israel," *Defense Daily International*, 01 June 2007.

#### **21 May 2007**

The first photos of Israel's "secret, large-payload, unmanned aircraft-capable of carrying air-to-air and air-to-ground missiles for at least a day--," have been leaked. The UAV is called the Heron II, Eitan and Machatz II. Its payload includes an Israeli Aerospace Industries (IAI)-manufactured Elta radar-warning receiver, which will allow the UAV "to identify and respond immediately to new emitters in the combat area-especially those associated with air defenses or battlefield ballistic missiles." Other characteristics of the UAV include: "active electronically scanned radar for high-resolution, long-range surveillance, an advanced infrared seeker to track a boosting missile and enough computing power to discriminate between the exhaust plume and missile body during the last seconds of the interception." Israel is considering using the new UAV in intelligence-gathering and surveillance missions, internal carriage of advanced, air-to-air missiles, carriage of air-to-ground missiles, and aerial tankers.

—David A. Fulgham, "Israel's Secret UAV: Unauthorized Pictures of IAI's new, weapons-carrying UAV finally surface," *Aviation Week & Space Technology*, 21 May 2007.

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## **2006-2005**

#### **15 December 2006**

Dov Raviv, Israeli Developer of the Arrow anti-tactical ballistic missile system, proposes a new missile defense system called Hotzetz to counter the threat posed by short and medium range missiles and rockets. Features of the Hotzetz include the ability to intercept missiles or rockets launched from a distance of 5 to 1,500 km, as well as those launched from the ground up to an altitude of 20 km. The Hotzetz system has been patented and presented to the Israeli Aerospace Industry (IAI). IAI is currently presenting it to defense authorities as a possible solution to the missile and rocket threat.

—Dov Raviv, "Israel: Arrow Developer Proposes New System to Tackle Rocket-Missile Threats," *Ma'ariv*, In OSC Document GMP20061215743007, 15 December 2006.

#### **24 November 2006**

Israeli Aircraft Industries (IAI) to supply its new EL/M-2248 Multi-Function-Surveillance, Tracking and Missile

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Guidance (MF-Star) radar to "an undisclosed customer." It is reported that the MF-Star system is meant for the Israeli Navy who plans to retrofit the radar to its three Sa'ar 5 corvettes to replace the existing EL/M-2218 missile-detection radar and Cardion SPS-55 search radar. [Note: The EL/M-2248 radar system is used to track incoming missile threats as the guidance system for the SPYDER surface-to-air defense missile. It delivers high quality imaging and weapons support in the toughest target/environmental conditions in the existing and future naval arena. Its operational capabilities include 3D long-range air surveillance and 3D medium range automatic threat alert, missile horizon search and threat alert, as well as target classification.]

—Richard Scott, "IAI Elta secures MF-Star contract," *Jane's Defense Weekly*, 24 November 2006; "MF-STAR: Multi-function Surveillance Track and Guidance Radar," *Israeli Aerospace Industries*, 4 March 2007.

### **16 November 2006**

Israel enhances the SPYDER (Surface-to-Air Python and Derby) anti-aircraft system. The modifications will make the SPYDER anti-aircraft missile system capable of intercepting medium-range threats such as attack aircraft, bombers, cruise missiles and unmanned aerial vehicles, through the use of tandem-mounted boosters. Studies are also being conducted to determine the feasibility of integrating the SPYDER with the Arrow missile defense system. [Note: The SPYDER is an anti-aircraft missile system that uses both the Python and Derby missiles, originally air-to-air missile systems, and converts them for use as a surface-to-air defense system.]

—"Israel: IAI, Rafael Upgrade SPYDER Missile to Tackle Medium-Range Threats," *Middle East Newline*, In OSC Document GMP20061116739005, 16 November 2006; "Israel boosts SPYDER range to 35+ km," *Jane's Missiles and Rockets*, 1 August 2006.

### **3 October 2006**

United States Congress votes to provide \$150 million to boost joint ballistic missile defense with Israel. Much of the money will go to the Arrow anti-missile system to facilitate "co-production of the system components in the U.S. and for developing improvements."

—Martin Sieff, "BMD Watch: Congress boosts Israel's Arrow," *United Press International*, 3 October 2006.

### **September 2006**

Israeli Defense Minister Amir Peretz orders the defense establishment to begin development on an anti-missile defense system to counter short and medium range missile threats. There are several different options currently under consideration to meet this need. One option is Northrop Grumman's Sky Guard laser gun system. Another option is to modify the Arrow missile defense system, creating the mini-Arrow system, which is already under development and which is meant to intercept short and intermediate range missiles. Proponents of the mini-Arrow system argue that it would require only a quarter of the funds needed to complete development of the Sky Guard system (an estimated \$200 million are needed to complete development of Sky Guard). However, each missile in the mini-Arrow system would cost several hundred thousands of dollars, whereas one "shot" from the laser gun is estimated to cost a mere \$3,000. Makers also say that the Sky Guard system could be ready for deployment in as little as 18 months. A third option to consider is the Stunner anti-missile missile system currently in R&D stages. The Stunner is a combination of the technology from the Python air-to-air missile and that of the Patriot missile. R&D costs for the Stunner system are estimated at \$250 million, with each missile costing approximately \$500,000. A fourth possible system, known as David's Sling, is a high-speed interceptor being developed to defend against

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targets that only stay airborne for about two minutes. It would target the 302mm Katyusha rockets used by Hezbollah.

—Ya'aqov Katz, "Israel's Peretz Orders Development of Anti-missile System, Training of Reserves," *Jerusalem Post*, in FBIS Document GMP20060825735002, 26 August 2006; Yosi Melman, "Israel Still Examining Different Options to Counter Short, Medium Range Missiles," *Ha'aretz*, in FBIS Document GMP2060828735007, 28 August 2006; Amnon Barzilay, "Israel Seeks Info on Northrop Grumman's Sky Guard Laser Missile Defense System," *Globes*, in FBIS Document GMP20060906739005, 6 September 2006; Gopal Ratnam, "Israel Eyes New Missile Defense Systems," *Defense News*, 7 September 2006.

### **September 2006**

Israel is reconsidering its decision to scrap the joint U.S.-Israeli laser defense system THEL (tactical high energy laser, also known as Nautilus) earlier this year. The THEL could have potentially provided an effective counter to the thousands of Katyusha rockets fired at Israel by Hezbollah during July and August 2006. The system was shelved last year due to funding constraints and its limited mobile capabilities. However, Israel and the United States are reconsidering their decision to discontinue development, and Northrop Grumman, the U.S. partner in the THEL development, is already offering a smaller, more mobile version of the THEL, known as Sky Guard. The THEL is a system designed to track up to 60 targets at a time, and to fire on and destroy targets at a range of up to 3 miles.

—Benjamin Harvey, "Israelis differ over whether missile defense system would have mattered against Hezbollah," *Associated Press*, 5 August 2006; Martin Sieff, "BMD Focus: Will THEL live again?" *United Press International*, 24 August 2006; Ya'aqov Katz, "Israel's Peretz Orders Development of Anti-missile System, Training of Reserves," *Jerusalem Post*, 25 August 2006; Jaap van Wesel, "Americans Eye Revival of Anti-Katyusha Laser," *Jerusalem Report*, 18 September 2006.

### **14 August 2006**

In 2005, Israel imported arms from Bosnia-Herzegovina. Among the items exported to Israel were bombs, shells, mines, unspecified missiles, and similar military munitions.

—"Bosnia's Weapons Exports, Imports in 2005 Detailed," *Financial Times*, 14 August 2006.

### **July 2006**

An Israeli Saar-5 missile ship is hit by a missile launched by Hezbollah off the coast of Beirut. The missile used was a Chinese made C-802 surface to sea missile that was sold to Iran and later modified. Once it became known that Iran had purchased the C-802 missiles from China, Israeli intelligence warned the navy to assume that Hezbollah might be in possession of them as well. Four Israeli soldiers were also killed as a result of the attack.

—"Navy: We didn't know what kind of missiles they were," *Jerusalem Post*, 17 July 2006; "Navy probe blames faulty intelligence for missile ship hit," *Globes Publisher Itonut*, 20 July 2006; "Israeli Navy Warned Hizbollah Has China-Made Iranian C-802 Missile, Failed to Act," *Ha'aretz*, in FBIS Document GMP20060830736006, 30 August 2006.

### **23 July 2006**

The United States Senate Committee on Appropriations approves \$25 million to develop a missile to intercept

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short-range ballistic missiles and long range Katyusha rockets. The program is called short-range ballistic missile defense (SRBM), or mini-Arrow. The defense system is meant to counter the threat in Israel posed by rockets and missiles possessed by Syria and Hezbollah with a range of 20-200 kilometers. These include Katyushas, the Fajr and Zilzal rockets, as well as the Iskander missile that Syria is seeking to purchase from Russia.

—Amnon Barzilay, "US Senate grants Israel \$25m for anti-Katyusha missile," *Globes Publisher Itonut*, 23 July 2006.

#### **16 July 2006**

Israel's war with Hezbollah prompts Israeli Defense Forces to deploy Patriot anti-missile batteries outside Haifa. The deployment is meant to counter any type of missile threat that could be posed by Hezbollah.

—"Martial la in North as rockets hit Tiberius," *Jerusalem Post*, 16 July 2006.

#### **6 July 2006**

Israel signs a contract with Germany to purchase two Type 800 Dolphin-class submarines. Israel is financing two-thirds of the project, with the German government paying the remaining expenses. Total cost of the purchase is \$1.3 billion. Several news sources have reported that Dolphin-class submarines purchased by Israel in the past have been modified to fire nuclear-capable submarine-launched cruise missiles (SLCMs), which the Israeli government has denied.

—Yaakov Katz, "Exclusive: Israel Buys 2 German Subs," *Jerusalem Post*, 22 August 2006; Alon Ben-David, "Israel Orders Two More Dolphin Subs," *Jane's Defence Weekly*, 30 August 2006; Ramit Plushnik-Masti, "In Message to Iran, Israel Adds 2 More Submarines Capable of Carrying Atomic Warheads," Associated Press, 25 August, 2006; "German Officials Say Contracts Signed on Submarines for Israel," *Deutsche Presse-Agentur*, 24 August 2006; "Israel: Submarines," *Federation of American Scientists*, 19 June 2000.

#### **14 June 2006**

Israel's newly announced short-range ballistic missile defense (SRBMD) system, to be developed by the Rafael Israeli Armament Development Authority and Raytheon, is to have the "Stunner" as its missile interceptor. The Stunner will be based on Israel's Python [note: the Python is a short-range air-to-air missile], and will be "capable of intercepting threat missiles at high endo-atmospheric altitudes." According to Adam Cherrill of Raytheon Advanced Missile Defence Programs, "it is aerodynamically controlled, so the altitude limit is governed by the availability of air." The SRBMD is to be designed with the same systems currently in use by the Arrow 2 and Patriot missile defenses. A feasibility study on the program is to be conducted, followed by an 18 month "risk reduction" stage, before development can begin. The system is expected to be operational by 2011.

—James O'Halloran, "Israeli Stunner Will Offset Missile Threat," *Jane's Defence Weekly*, 14 June 2006; Raytheon, "Python / Moab," *Missile Systems of the World*, AMI International: 1999, p. 52.

#### **6 June 2006**

The Israeli Air Force, in conjunction with the Israeli Ministry of Defense and Israel Aircraft Industries, is developing the Arrow Mark IV, an upgrade to the current ballistic missile defense system. It will include enhanced missile interceptors as well as new radar. This program is partially financed by the United States government.

—Martin Sieff, "BMD Watch: Israel Plans New Arrow Mark 4," *United Press International*, 6 June 2006.

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#### **5 June 2006**

An unofficial report states that the United States has rejected the Israeli Navy's request for the sale of "sea-based missiles," including several with the potential to be cruise missiles.

—"U.S. Refuses to Sell Missiles to Israel Navy," Middle East Newline, 5 June 2006.

#### **25 May 2006**

Israel's Ministry of Defense Research and Development Directorate has chosen Rafael Israeli Armament Development Authority and Raytheon to create a short-range ballistic missile defense system. The two companies propose to develop a "hit to kill approach" to destroy missiles fired from a range of 40 to 250km.

—"Israel Selects Consortium for Missile Defense," Middle East Newline, 17 May 2006; "Israeli Def Ministry Selects RAFAEL, Raytheon for Missile Interceptor Development," Israeli Ministry of Defense, 25 May 2006, in Open Source Center Document GMP20060530026001.

#### **28 April 2006**

While giving a tour of the Israeli Arrow ballistic missile defense system, Major Elyakim, commanding officer of the Palmahim Air Force base, says, "the Arrow does not protect all of Israel. The battery in Palmahim covers the center of the country, and the one in Ein Shemer near Hadera covers the northern region. Other areas - mainly in the south - are partly covered." He discusses the future of the Arrow deployment, stating that in the long run, Israel will "deploy batteries throughout the country, to create a protective umbrella across its skies."

—Yaakov Katz, "Ready...Aim...Intercept!" *Jerusalem Post*, 28 April 2006.

#### **24 April 2006**

The Israeli Defense Forces increase the alert level of the Arrow 2, a ballistic missile defense system. According to Major Elyakim of the Palmahim Air Force base, the higher alert is indicative of "what is happening around us," including protection against the possibility of attack from Iran.

—Ya'akov Katz, "IDF Raises Vigilance of Arrow System in Wake of Developments in Iran," *Jerusalem Post*, 24 April 2006, in Open Source Center Document GMP20060424621009; Martin Sieff, "BMD Watch: Israel Raises Iran Alert Level," United Press International, 25 April 2006.

#### **14 April 2006**

Arrow anti-ballistic missile batteries in Israel are upgraded to enable them to intercept Iran's long-range missiles. This upgrade has been carried out in the event that Tehran should decide to attack Israel as a response to a U.S. attack on Iran's nuclear facilities. Israel estimates that Iran already has the capability of attacking Israel with accurate long-range missiles.

—Arye Egozi, "Israel: Arrow Missiles Adjusted to Allow Ballistic Missiles Interception," *Yedi'ot Aharonot*, in FBIS Document GMP20060414614007, 14 April 2006.

#### **28 March 2006**

Alliant Techsystems Inc., Boeing Co. and Israeli Aircraft Industries Ltd. are joining forces to compete for a contract that would support Israel's short-range ballistic missile defense program. The contract is a part of the Ministry of Defense's *Homa* project, and is meant to find a solution to the Kassam rockets being launched by Palestinian

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militants. Their proposal plans to adapt Arrow anti-ballistic missile technology to intercept short-range rockets.  
—"Alliant joins IAI-Boeing in anti-Kassam tender; A Rafael-Raytheon consortium is also bidding in the tender,"  
*Globes*, 28 March 2006.

#### **17 March 2006**

In order to improve its missile defense capabilities the Israeli Air Force (IAF) is working to upgrade its MIM-104 Patriot low- to high-altitude air-defense system to the Patriot Advanced Capability 3 (PAC-3) system. According to a senior defense source, "The PAC-3 will complement our layered missile defense structure and will enable us to close a gap in our ability to intercept incoming missiles in the lower tier. It will also substantially increase our capabilities to intercept incoming cruise missiles and aircraft." One of Israel's primary motivations for upgrading to the PAC-3 system is the emerging cruise missile threat in the region, especially with allegations that Iran recently obtained the Russian designed Kh-55 (AS-15, 'Kent') cruise missiles which have a range of up to 3,000km.  
—Alon Ben-David, "Israel eyes Patriot PAC-3 to boost missile defense," *Jane's Defense Weekly*, 17 March 2006.

#### **2 March 2006**

A high-ranking Israeli Defense Force official states that the Arrow 2 anti-ballistic missile system is capable of intercepting and destroying Iranian missiles carrying nuclear warheads. The official went on to explain that new developments in the Arrow system have made it possible to detect missiles carrying a split warhead armed with decoys. He also asserted that any "incoming missile would be destroyed at such a high altitude that it would disperse and destroy its payload without causing any casualties."  
—Yaakov Katz, "Arrow Can Block 'Any Iranian Missile,'" *Jerusalem Post*, 2 March 2006.

#### **1 March 2006**

Israel supplies Burma with air-to-air missiles. Israel has also supplied Burma with military software, advanced electronic devices and intelligence training.  
—"Burma: Report Names Countries Supplying Arms," *Chiangmai Irrawady*, in FBIS Document SEP20060317035004, 1 March 2006.

#### **3 February 2006**

Israel and India agree to jointly develop and produce a long-range version of the Barak air defense missile. [Note: the Barak/Adams missile system is an anti-cruise missile system capable of ship or mobile launch developed by Israeli Aircraft Industries]. The missile will be produced by the Hyderabad-based defense Research and Development Organization and the Israel Aircraft Industries. The Barak missile can be launched from both submarines and war vessels, and has been developed for use as a surface to surface missile with a range of 300 kilometers.  
—Ranjit Kumar, "India and Israel to Produce Missiles Jointly," *New Dehli Navbharat Times*, in FBIS Document SAP20060203006004, 3 February 2006; Raytheon, *Missile Systems of the World*, (Lexington, Massachusetts: AMI International, 1999), p. 50.

#### **14 December 2005**

Israel is scheduled to deliver a 100-km range air to surface missile, the stand-off Crystal Maze, capable of carrying

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an 80 kg warhead to India next month. The Crystal Maze is an all-weather bunker busting missile that is launched from an aircraft to destroy targets from a distance of 80-100 kilometers.

—"India All Set to Acquire Crystal Maze Missiles from Israel," *Indian Express*, 14 December 2005.

#### **4 December 2005**

Germany approves the sale of two Dolphin-class submarines to Israel. The two submarines, which will be added to a fleet of three similar-class submarines, will have improved capabilities that will allow them to remain submerged for weeks at a time. The Dolphin-class submarine is also equipped with torpedo tubes reportedly capable of launching cruise missiles carrying nuclear warheads, which would strengthen Israel's second-strike capability. The new submarines will likely be delivered sometime in the next decade.

—Efraim Inbar, "Deterring the Iranian Nuclear Threat," *Jerusalem Post*, 4 December 2005.

#### **2 December 2005**

The Israeli Civil Aviation Administration (CAA) concludes testing of a civilian aircraft defense system against ground-to-air missiles. Israel's national airline "El Al" has already installed the system, known as Flight Guard, on one of its aircraft. Plans are in place to install the anti-missile protection system on an additional six civilian aircrafts in the near future. The Flight Guard system is being converted for use on civilian aircrafts in response to a 2002 attempt by al-Qaeda to use missiles to shoot down an Israeli airliner taking off from Mombassa, Kenya.

—"Israel's El Al to Install Defensive Systems on Aircraft," BBC, 4 December 2005.

#### **2 December 2005**

The Israeli Air Force successfully tests the Arrow 2 anti-ballistic missile system against a Black Sparrow test missile. The Black Sparrow was designed to simulate the Iranian Shahab-3 missile.

—Arieh O'Sullivan, "IAF Successfully Tests Arrow Against Mock Shihab," *Jerusalem Post*, 4 December 2005.

#### **17 November 2005**

Following a series of failures with its indigenously developed Shavit II satellite launch vehicle (SLV), Israel has decided to launch its next reconnaissance satellite using an Indian Polar SLV. As per senior Israeli defense sources, India has agreed to launch Israel Aircraft Industries (IAI) subsidiary Elta's TecSAR synthetic aperture radar imaging satellite from the Indian Space Research Organization's (ISRO's) Satish Dhawan Space Centre in southern India. The TecSAR is defined as a civilian purpose satellite.

—Alon Ben-David, "Israel to launch recon satellite from India," *Jane's Defense Weekly*, 17 November 2005.

#### **9 November 2005**

The Israel Air Force (IAF) received the first Arrow 2 anti-ballistic missile interceptor produced jointly by Israel Aircraft Industries Ltd and Boeing Integrated Defense Systems. Israel Aircraft Industries (IAI) is the chief contractor for the Arrow, Boeing being the subcontractor. Israel has two operational Arrow batteries, and reportedly needs 100 interceptors for each battery.

—Robin Hughes, "First Israeli-U.S. Arrow 2 Missile Delivered," *Jane's Defense Weekly*, 9 November 2005.

#### **4 November 2005**

India is set to purchase some 50 Heron MALE (Medium Altitude, Long Endurance) UAV's from Israel Aircraft

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Industries (IAI) in a deal worth \$220 million. They will reportedly be put to use for carrying out reconnaissance missions on India's mountainous borders with China and Pakistan.

—Iftikhar Gilani, "India to buy 50 drones from Israel," *Daily Times*, 4 November 2005.

#### **12 October 2005**

IDF deploys a sophisticated new radar system near the Gaza Strip, which it hopes will give early warning to Israeli residents of incoming Katyusha missiles, Kassam rockets and possibly mortar rounds. The system is the prototype for a state-of-the-art wider missile defense system the Nautilus also known by the acronym THEL for Theatre High-Energy Laser, which has been in joint development by Israel and the United States for almost a decade and is ultimately intended to be able to intercept such incoming fire with a high-energy laser beam.

—Arieh O'Sullivan, "IDF deploys new radar system near Gaza," *Jerusalem Post*, 12 October 2005.

#### **7 September 2005**

As part of a resolution following a dispute with the U.S. over arms sales to China, Israel sets up an inter-ministerial steering committee to meet arms control commitments to the U.S. The task of the steering committee is to propose a law for regulating defense exports that includes supervision of exports of dual-use products and technologies by March 2006. According to Ehud Olmert, the acting Minister of Finance and Minister of Industry, Trade and Labor Israel seeks to ground its national interest in legislation in order to define a national policy in this matter. At present the Ministry of Defense supervises military exports and the Ministry of Industry, Trade and Labor supervises exports of dual-use products and technologies.

—Hadas Manor, "Olmert: Israel will meet arms export commitments to U.S.," *Globes*, 7 September 2005.

#### **7 September 2005**

Israeli government approves the sale of state-owned Israel Military Industries (IMI). As per the terms of the sale, both IMI missile facilities, Givon Advanced Systems and Maltam Rocket Systems, will be sold to Rafael Armament Development Authority.

—Alon Ben-David, "Israeli Government Decides Fate of IMI," *Jane's Defense Weekly*, 7 September 2005.

#### **16 August 2005**

As part of the resolution to the conflict between Israel's Ministry of Defense and the U.S. Pentagon over arms sales, the United States will renew military technology transfers to Israel. Bryan Whitman, a Pentagon spokesman, says that the technology transfers will not be reinstated fully until Israel fulfills its responsibilities under the agreement. The agreed upon memorandum of understanding includes requirements that Israel accept the 1996 Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies and create an "intergovernment arms-export control system."

—Bill Gertz, "U.S. to Restart Arms Technology Transfers to Israel," *Washington Times*, 17 August 2005.

#### **16 August 2005**

A joint statement by Israel and the U.S. says that the Israeli Defense Ministry and the U.S. Pentagon have resolved their dispute over an Israeli/Chinese arms contract for upgrades on Harpy UAVs. The statement announces that

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"further measures will be taken . . . to reestablish confidence" between the two countries.

—"Israel, US Resolve Row Over China Arms Deal," Agence France-Presse, 16 August 2005.

#### **17 July 2005**

A visit to the United States by Israel's Defense Minister, Shaul Mofaz, is postponed due to increasing violence in the Gaza Strip. Mofaz was set to negotiate a memorandum of understanding between the United States and Israel regarding future Israeli arms sales to China. The negotiations surround Israel's intended upgrade of Harpy anti-radar UAVs for China.

—Danielle Haas, "Israeli Defense Minister Postpones U.S. Trip Amid Regional Violence: Officials," Associated Press, 17 July 2005.

#### **12 July 2005**

Israel Aircraft Industries and Israel Military Industries complete a successful test of a new satellite launcher at Palmahim. The launcher is intended to put larger and heavier satellites into orbit than the current Shavit launcher is capable of. This provides Israel with the ability to launch larger surface-to-surface missiles with longer ranges.

—"Israel Successfully Tests New Satellite Launcher on 12 July," *Yedi'ot Aharonot*, 13 July 2005, in FBIS Document GMP20050713616002.

#### **22 June 2005**

Israeli officials ask the U.S. Congress for a preliminary \$16 million in aid to produce a defense system to counter short-range ballistic missiles whose ranges are between 40-200 km. The director of the Israel Ballistic Missile Defense Organization, Arie Herzog, claims that these short-range ballistic missiles are proliferating in Lebanon and Syria, posing a threat to cities in northern Israel. Sources in the Israeli weapons industry say that with the Patriot and Arrow weapons systems, Israel is prepared for long-range ballistic missiles yet not those with short-ranges. Rafael Armament Development Authority and Israel Aircraft Industries are competing to develop the system. Rafael recommends a "hit-to-kill missile with a sensor," while IAI proposes a "'sensor-less approach' with a proximity-kill solution."

—Robin Hughes, "Paris Air Show: Israel Seeks US Support to Counter Ballistic Threat," *Jane's Defence Weekly*, 22 June 2005.

#### **27-28 June 2005**

Arms discussions between Israel and the United States regarding sales of Israeli military technology to China, including the Harpy UAV, do not end in an agreement. There is to be a second round of talks in July. Washington objects to the sale of any military technology to China. U.S. Secretary of State Condoleezza Rice states that Israel must "be sensitive to U.S. concerns" and interests in the region.

— Barry Schweid, "Israel, U.S. Make Progress, but No Deal," Associated Press, 28 June 2005.

#### **19 June 2005**

Israel halts an arms deal with China in which it was to upgrade Harpy anti-radar UAVs originally purchased by China in 1994. The agreement has been disrupted by U.S. complaints that the new components "amounted to a significant upgrade that would... [ignore] a 2003 U.S. request to halt all military sales to China." Israel has also

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agreed to confiscate the UAV components that are already on Israeli soil. As a result of the tensions between the United States and Israel that this deal is creating, the Israeli Defense Ministry is sending a delegation for arms talks to Washington.

— Edward Cody, "China Scolds U.S. for Blocking Israeli Arms Sale," *Washington Post*, 28 June 2005; Gavin Rabinowitz, "Report: Israel to Confiscate Parts for Chinese Weapons Under U.S. Pressure," Associated Press, 26 June 2005.

#### **9 June 2005**

Israeli sources say the Arrow missile, jointly produced by the United States and Israel, will be tested this spring. The U.S. portion of the project is complete and the parts will soon be shipped to Israel where they will be combined for final assembly.

—Ran Dagoni, "Israel-US Produced Arrow Missile to be Tested Next Spring," *Globes Publisher Itonut*, 9 June 2005.

#### **9 June 2005**

One of Russia's Inter-state Financial Groups (MFGP), "Defense Systems," a supporter of the Russian defense industry, has been delivering the Pechora-2M, a surface-to-air anti-cruise missile, to Egypt since 2003.

— "Russia: Profile of 'Oboronitelnyye Sistemy' Company," *Krasnaya zvezda*, 9 June 2005, in FBIS Document CEP20050608949008; "S-125 SA3 GOA," [www.GlobalSecurity.org](http://www.GlobalSecurity.org).

#### **June 2005**

Israel Aircraft Industries Ltd. is to receive its first shipment of Arrow missile interceptors made in conjunction with Boeing. The joint venture has produced various components such as missile canisters and electronics for use in the missiles. The Israel Missile Defense Organization expects the monthly shipment rate of missile interceptors to double by year's end, eventually reaching a goal of five interceptors each month.

—Tony Capaccio, "Israel to Receive First IAI-Boeing Arrow Missiles this Month," *Bloomberg*, 14 June 2005.

#### **31 March 2005**

Israeli Minister of Defense Shaul Mofaz meets U.S. Secretary of Defense Donald Rumsfeld in order to resolve a dispute over Israel's military relations with China. Israel's Harpy Unmanned Aerial Vehicles (UAV) deal with China is viewed negatively by the United States because of the possibility that it might be used against its ally, Taiwan. The deal with China, signed in 1999, was for upgrades to UAVs that were sold to China earlier in the 1990s.

—"Mofaz Hints Israel Might Abandon Harpy UAV Deal With China Under US Pressure," *Rhison Leziyyon Globes*, 31 March 2005 in FBIS Document GMP2005331000198.

#### **21 March 2005**

Israel and the United States combine efforts in testing the compatibility of the Arrow and Patriot missile units. As part of a regular series of tests code-named Juniper Cobra, the tests are intended to demonstrate the Arrow's ground-based radar to work with the Patriot system elements to define incoming targets and determine a total plan of attack. Defense sources claim that with bilateral efforts such as these, the system will be more compatible with U.S. anti-missile programs and would facilitate Israeli plans to deploy a centralized national command-and-

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control center by 2007.

—"Israel, U.S. Test Compatibility of Arrow, Patriot Units," *Defense News*, 21 March 2005.

### **9 March 2005**

Israel and the United States agree to simulate a missile attack on Israel and deny this is in preparation for an attack on Iran's nuclear reactor. The exercise will incorporate Patriot, Arrow, and Hawk missile batteries and will be similar to the exercise that the United States and Israel carried out before the attack on Iraq in 2003. The exercise will simulate an attack by Iranian Shehab missiles for Israeli defense purposes.

—"Israeli army denies simulation exercise preparation for attack on Iran," BBC, 9 March 2005.

### **8 March 2005**

Israel successfully fires the Laura missile in the Mediterranean Sea, which can carry a 570-kilo warhead at a target in mid-sea. The testing was put off for two days because of U.S. jets collecting intelligence in the area.

—"US Plane Presence on Israel Missile Test Believed 'Industrial Espionage,'" *Voice of Israel*, 8 March 2005, in FBIS Document GMP20050309000199.

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## **2004-2000**

### **7 December 2004**

Israel deploys Patriot missile-defense systems in response to possible fears of UAV attacks by Hezbollah.

—"Israel Deploys Patriot Battery Against UAV," *Global Security Newswire*, 7 December 2004.

### **December 2004**

Israel hopes to get two new Dolphin-class submarines from Germany in the next year. Israel also hopes that Germany will finance the two subs in order to celebrate the 40[th] anniversary of the establishment of diplomatic ties between the two countries. These submarines are missile capable.

—"Israel hopes to secure submarine deal with Germany," *Deutsche Presse-Agentur*, 12 December 2004.

### **December 2004**

Israel develops a version of the Spike extended-range anti-tank missile called the Spike PBF. This new missile contains penetration, blast, and fragmentation capabilities.

—"Israel Develops New, Longer-Range Version of Spike Airborne Anti-Tank Missile," *Middle East Newswire*, 10 December 2004, in FBIS Document GMP20041213000169.

### **December 2004**

Israel and Indian defense ties are strengthened with such proposals as marketing for Hindustan Aeronautics-made MiG-21UM trainer jets, Heron UAVs, and Barak-II ship defense missiles. Other proposals include the upgrade of the Tu-142 maritime patrol planes in a tripartite agreement with Russia, the Lahat anti-tank missiles Crystal Maze

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laser-guided bombs, and the Pop-Eye beyond visual-range missiles.

—"JWG Meets, Israel to Try Out F16s Against SU-30s," *Indian Express*, 25 December 2004.

#### **December 2004**

The United States demands that Israel confiscate the Harpy unmanned aerial vehicles (UAVs) from China that were sold in the 1990s and are now being returned to Israel for upgrading. The United States wants to see that the UAVs are only repaired and not upgraded. American demands stem from fears that these drones may threaten U.S. troops in Taiwan.

—"Israel's China-US weapons dilemma," *United Press International*, 29 December 2004.

#### **December 2004**

In response to the Qassam rockets fired by Palestinian militants in recent months, Israel and the United States begin developing the Nautilus system. The Nautilus system fires laser beams in order to destroy Katyushas, rockets, and Qassams as well as mortar shells in the air.

—"Israel: Anti-Katyusha Laser Radar to Be Tested on Qassam Rockets," *BBC*, 21 December 2004.

#### **6 October 2004**

Former Iranian president Akbar Hashemi Rafsanjani says that Iran has developed a missile capable of reaching Israel. The announcement follows Israel's admission that it purchased 500 'bunker-buster' bombs from the United States, regarded by some Iranians as a threat to Iran's nuclear facilities. The new missile was paraded in Tehran the week before with a banner reading: "Israel must be wiped off the map."

—"New Iranian Missile 'Can Reach Israel'," *The Daily Telegraph* (London), 6 October 2004.

#### **October 2004**

Israel plans to develop anti-Qassam missiles in order to contain the attacks at Sederot. The new missiles will be different from the Arrow and other types of missiles. The Qassams are relatively small and difficult to intercept, making it necessary for a different kind of missile needed for defense.

—"Israel Plans to Develop 'Anti-Qassam Missile' to Thwart Attacks on Sederot," *Ma'ariv*, 4 October 2005, in FBIS Document GMP20041004000154.

#### **27 September 2004**

Israel's director of Israel Aircraft Industries' Arrow project Boaz Levi claims that Israel has been safe from ballistic missile attack since the Arrow missile system was received by the Israel Defense Forces four years earlier. He also states that recent test failures of the Arrow system were due to specific and momentary malfunction of an intercepting component.

—"Israel Safe from Ballistic Missiles, Says Arrow Project Director," *BBC Worldwide Monitoring*, 27 September 2004.

#### **September 2004**

The United States and Israel secretly test the Arrow anti-ballistic missile in California over the previous two months. The test is reportedly successful for the most part except for a failure to down one Scud-D missile in August.

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—"Egyptian Columnist on US-Israeli Arrow Antiballistic Missile System, Test Success," *Al-Ahram*, 2 September 2004, in FBIS Document GMP20040906000003.

#### **27 August 2004**

Israeli officials defend a failed test of the Arrow II anti-ballistic missile system. The test, which was carried out in California, involved a simulation of weapons similar to those possessed by Syria and Iran. In this particular test, the incoming weapons were not successfully intercepted. The *Associated Press* reports that this is the 13th interception test of the Arrow II system.

—"Israelis Defend Missile Failure," BBC News, 27 August 2004.

#### **29 July 2004**

Israel successfully tests the Arrow II anti-ballistic missile at the Point Magu Sea Range in California. The test utilizes a confiscated Iraqi Scud missile as the target for the Arrow II. The arrow program is half funded by the United States.

—"Israel Says Anti-Missile Missile Successfully Test-Fired in US," Agence France Presse, 29 July 2004.

#### **9 June 2004**

Jane's Defense Weekly reports that Israel has developed its first surface-to-surface cruise missile with a range of over 180 miles. The Delilah-GL (ground launch) is a derivation of the Delilah, an air-launched Israeli missile.

—"Report: Israel Develops Its First Cruise Missile," Associated Press, 9 June 2004.

#### **19 May 2004**

The Israel Defense Forces announce that it has over the two previous days successfully tested Patriot and Hawk missiles at an Israel Air Force base in central Israel. The tests were intended to check recent technological refinements on the two missiles, which are become part of Israel's air defense.

—"IAF Conducts 'Patriot' and 'Hawk' Missile Test," *Globes Online*, 19 May 2004.

#### **3 March 2004**

Israel's state-owned defense contractor, Israel Aircraft Industries, reports that it successfully tested a solid-fuel, long range guided missile in the Mediterranean Sea. The missile is meant to destroy targets such as surface-to-air missiles, air defense units, and command and control sites.

—"Israel Tests New Missile," United Press International, 3 March 2004.

#### **16 December 2003**

Israel successfully conducts a test of the Arrow weapon system. It is the eleventh Arrow interceptor test and the sixth test of the complete weapon system. The test objectives are to demonstrate the system's improved performance including a higher altitude interception of an incoming target. According to Israeli Aircraft Industries, "the target trajectory demonstrated an operational scenario against the state of Israel and all the system components performed in their operational configuration." The target is air launched toward the Israeli coast. Working in operational configuration, the Fire Control Radar (FCR) acquires the target and sends data to the Battle Management Center (BMC). A defense plan was issued and a mission command sent to the launcher. The

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interceptor performs successfully and the target is intercepted.

—Israeli Aircraft Industries, "Successful Arrow Test," 16 December 2003, [www.iai.co.il](http://www.iai.co.il).

### **12 October 2003**

A Los Angeles Times report discloses that Israel has modified US-supplied Harpoon cruise missiles to carry nuclear warheads on submarines. US officials disclose the information "to caution Israel's enemies at a time of heightened tensions in the region [because of the US-British invasion of Iraq] and concern over Iran's alleged [nuclear weapons] ambitions." [Note: It is unclear from the report whether US and Israeli officials were responding to the Times report or the revelations by the officials came first.]

—Douglas Frantz, "Israel Adds Fuel to Nuclear Fire," *Los Angeles Times*, 12 October 2003, [www.iai.co.il](http://www.iai.co.il).

### **27 August 2001**

Israel conducts a test of the Arrow-2 anti-ballistic missile system at the Palmachin airbase.

—Encyclopedia Astronautica, "Arrow-2," [www.astronautix.com](http://www.astronautix.com).

### **26 June 2001**

Israel successfully places its newest and most secret spy satellite, Ofek 5, in orbit an estimated 1000km above earth. The launch is conducted from the Shavit SLV and takes place at a site near the Palmachim Air Force base on the Mediterranean coast, west of Rishon Lezion and Rehovoth. The "brilliant flash and sparkling tail" is witnessed by thousands of motorists driving south and east on highways out of Tel Aviv, and gives rise to rumors of a Jericho-II launch. What witnesses actually see is the boost phase of the Ofek-5 by the Shavit.

—"DEBKA Military Sources: Israel Successfully Launched Secret Spy Satellite," DEBKA-Net-Weekly, in FBIS GMP20010706000093, 5 July 2001.

### **June 2001**

Israel conducts a Jericho-II flight test from the Palmachim flight-test center near Tel Aviv.

—Jane's Strategic Weapon Systems 36, "Offensive Weapons, Israel, Jericho I/2 (YA-1/YA-3)," 24 July 2001, <http://online.janes.com>.

### **June 2001**

An unnamed Israeli Defense Forces source confirms the suspected link between the Jericho missile and the Shavit satellite launch vehicle stating that the "Shavit is Jericho." [Note: This revelation confirms years of speculation from international experts.]

—"Israel's Triad Could Deter TBM Attacks," Jane's Missiles & Rockets, June 2001, [www.janes.com](http://www.janes.com).

### **October 2000**

The first batteries of the Arrow-2 system are declared operational.

—Jane's Strategic Weapons Systems 36, "Defensive Weapons, Israel, Arrow," 12 November 2001, <http://online.janes.com>.

### **September 2000**

The Arrow's radar detects the test of a Scud-D missile launched in eastern Syria.

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—Wisconsin Project on Nuclear Arms Control, "Israeli Missile Milestones," Risk Report (6) 2, November/December 2000, [www.wisconsinproject.org](http://www.wisconsinproject.org).

### **September 2000**

In its eighth test, the Arrow-2 hits and destroys a Black Sparrow target simulating a Scud flying towards the launch site, simulating a 300km-range ballistic missile attack. Israel Aircraft Industries (IAI) declares that the system is ready for use.

—Wisconsin Project on Nuclear Arms Control, "Israeli Missile Milestones," Risk Report (6) 2, November/December 2000, [www.wisconsinproject.org](http://www.wisconsinproject.org); Jane's Strategic Weapons Systems 36, "Defensive Weapons, Israel, Arrow," 12 November 2001, <http://online.janes.com>.

### **August 2000**

Space Imaging Corporation satellite photos indicate Israeli nuclear facilities have not expanded considerably over the last 30 years. Before publication of the photos, international specialists had concluded that Israel had stockpiled approximately 400 nuclear warheads for its Jericho missiles. However, the Federation of American Scientists now estimates the warheads are not in excess of 200.

—David Horowitz "Satellite Sees Little Growth in Israel's Nuclear facility," *Irish Times*, 25 August 2000, <http://web.lexis-nexis.com>.

### **May 2000**

Israel is reported to have secretly carried out its first test-launches from two German-built Dolphin-class submarines of cruise missiles capable of carrying nuclear warheads. The missiles launched from vessels off the coast of Sri Lanka in the Indian Ocean are said to have hit a target at a range of about 1,500km. Israel is reported to possess a 200kg nuclear warhead, containing 6kg of plutonium that could be mounted on cruise missiles. Israel is reportedly developing an air-launched cruise missile that could be operational by 2002, called the Popeye Turbo. The Popeye Turbo has an estimated range between 200-350km and is a turbo-jet powered cruise missile that incorporates avionics and other components developed for the Popeye family of missiles. The AGM-142 HAVE NAP is a variant of the Israeli Air Force Popeye missile, which uses a solid-propellant rocket motor. The Popeye II, also known as the Have Lite, is a smaller missile with more advanced technology. The Popeye II is designed for deployment on fighter aircraft and has a range of 150km.

The Popeye Turbo missile is likely similar, if not identical, to the Israeli submarine-launched cruise missile carried on the Dolphin-class submarines. The baseline Popeye missile has a range of 80km has a diameter of 21 inches, and is around 16 feet long. The reported range of 1,500km for the SLCM tested is several times greater than the previously reported range for the Popeye Turbo. [Note: However, little is known about the Popeye Turbo and open source literature provides little information on this system.]

—Federation of American Scientists, "Special Weapons Systems, Israel, Popye," [undated], [www.fas.org](http://www.fas.org).

### **6 April 2000**

Israel tests launches a Jericho-I missile off the Israeli coast that lands 64km from the US Navy Aegis cruiser Anzio, which is en route to a joint exercise with the IDF. U.S. Navy officials protest to Israeli officials regarding the

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proximity of the launch and the "no notice" missile launch policy implemented by the IDF.

—"U.S. Miffed at Jericho Missile Test," *Jerusalem Post*, 3 May 2000.

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## 1999-1990

### 1 November 1999

The seventh flight-test of the Arrow-2 is the first test of the complete system and results in a direct hit on a TM-91 ballistic missile target. The test fully integrates the radar, fire control center, launch control center, and communications with the Arrow-2 missile. The test is made against a target flying away from the launch site.

—Jane's Strategic Weapons Systems 36, "Defensive Weapons, Israel, Arrow," 12 November 2001, <http://online.janes.com>.

### 14 September 1998

The sixth test of the Arrow-2 integrates the complete Arrow system but without a target.

—Jane's Strategic Weapons Systems 36, "Defensive Weapons, Israel, Arrow," 12 November 2001, <http://online.janes.com>.

### 4 May 1998

Yitzak Ben-Israeli's, head of Israel's Administration for Research and Development of Fighting Means and Technological Infrastructure (MAFAT), declares that Israel will be prepared to intercept incoming ballistic missiles at a distance of dozens of kilometers by the year 2000. He also reveals that Israel is one year away from deploying the first of three Arrow ballistic missile defense systems.

—"Next Generation of Spy Satellites," FBIS-NES-98-124, 4 May 1998.

### May 1998

Israeli Defense Minister Yitzhak Moredachai approves a 10-year plan to continue development and production of the joint United States Israeli Arrow-2 anti-ballistic missile system.

—"Israel Ready to Deploy Arrow 2 missile System." Xinhua News Service 28 May 1998.

### August 1997

The fifth flight-test of the Arrow-2 is unsuccessful.

—Jane's Strategic Weapons Systems 36, "Defensive Weapons, Israel, Arrow," 12 November 2001, <http://online.janes.com>.

### 11 March 1997

In its fourth test, the Arrow-2 successfully intercepts and destroys its target despite a warhead failure.

—Wisconsin Project on Nuclear Arms Control, "Israeli Missile Milestones," Risk Report (6) 2, November/December 2000, [www.wisconsinproject.org](http://www.wisconsinproject.org); Jane's Strategic Weapons Systems 36, "Defensive Weapons, Israel, Arrow," 12 November 2001, <http://online.janes.com>.

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### **20 August 1996**

The Arrow-2 successfully intercepts and destroys another missile, modified to simulate a Scud, in its inaugural intercept and third overall test.

—Wisconsin Project on Nuclear Arms Control, "Israeli Missile Milestones," Risk Report (6) 2, November/December 2000, [www.wisconsinproject.org](http://www.wisconsinproject.org); Jane's Strategic Weapons Systems 36, "Defensive Weapons, Israel, Arrow," 12 November 2001, <http://online.janes.com>.

### **August 1996**

A report published in Jane's Sentinel alleges that Israel possesses 150 Jericho-I missiles, 50 Jericho-II missiles, and 160 MGM (Lance) missiles. The report also alleges that a Jericho-III is being developed with the assistance of South Africa. Fifty Jericho-I missiles are reportedly deployed on mobile launchers close to nuclear-warhead facilities and 100 are allegedly deployed at Kfar Zehariya in the Judean Hills. The Jericho missiles are built at Be'er Ya'acov and tested at the Palmachin test site.

—"A must read about Israel's military machine," *Jerusalem Post*, 9 August 1996.

### **20 February 1996**

Israel conducts the second test of the Arrow-2. The test is designed to demonstrate the missile's ability to intercept a simulated missile, and to evaluate the integration of the Green Pine Fire Control radar system, manufactured by Elta Electronics Industries, with the missile.

—Wisconsin Project on Nuclear Arms Control, "Israeli Missile Milestones," Risk Report (6) 2, November/December 2000, [www.wisconsinproject.org](http://www.wisconsinproject.org); Jane's Strategic Weapons Systems 36, "Defensive Weapons, Israel, Arrow," 12 November 2001, <http://online.janes.com>.

### **July 1995**

The first test of the Arrow-2, an operational version of the Arrow-1, is described as successful. The test is designed to evaluate the performance of the missile's guidance systems and rocket engines. The Arrow-2 is reported to weigh no more than 1,300kg and it is believed that the total missile is 6.95m long. The Arrow-2 is a two-stage solid-propellant missile, with a boost and a sustainer stage, with both stages using thrust vector control (TVC). The first stage is believed to be 3.45m long with a diameter of 0.8m, followed by a short sustainer motor assembly of 0.75m length, with a kill vehicle that is 2.75m long and a weight of around 500kg. The terminal seeker has "an indium antimonite focal plane array (IR) seeker developed by Amber Engineering" (part of Raytheon) in the United States, "together with the focused blast/fragmentation warhead designed for Arrow-1." The Arrow-2 kill vehicle contains the terminal seeker, warhead, and fuse, and uses four moving delta aerodynamic control fins for lower altitude interceptions. An active radar fuse is believed to be used, and in later versions this could form part of a dual-mode seeker assembly. The kill vehicle is designed to achieve a hit-to-kill interception, but if this is not achieved, the proximity fuse will direct the warhead fragments at the target shortly before reaching the closest point to the target. It is believed that the minimum intercept altitude is around 10km, and maximum intercept altitude is 50km, with a maximum range of 90km. It is reported that the Arrow-2 missile has a maximum speed of 2.5km/s.

The missiles are carried on a towed trailer, with six missiles in their canisters raised to the vertical before launch. The missiles use a hot ejection method from the canisters, and up to three missiles can be fired at any one target.

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In addition, there will be a Tadiran fire-control center (known as Citron Tree) vehicle associated with each Arrow battery that provides battle management, integration with other defense systems, a pre-mission simulation capability, and a post-mission analysis function. The fire control center has 10 operator positions, can control up to 14 intercepts, and is to have link 16 (Tadil J) added for interoperability with Patriot fire units. A launch control center (known as Hazelnut Tree) is vehicle mounted and controls four to eight launcher vehicles, allocating the missiles as requested by the fire control center. Following launch, an Arrow-2 missile accelerates with the first stage boost motor and for long-range engagements this is followed by a coast period. The second stage sustainer motor then ignites, and the first stage assembly separates leaving the second stage approaching the target. After target acquisition by the kill vehicle's terminal seeker, the guidance directs the kill vehicle towards the intercept point, until there is a direct impact or the fuse detects the target and initiates the warhead.

—Wisconsin Project on Nuclear Arms Control, "Israeli Missile Milestones," Risk Report (6) 2, November/December 2000, [www.wisconsinproject.org](http://www.wisconsinproject.org); Jane's Strategic Weapons Systems 36, "Defensive Weapons, Israel, Arrow," 12 November 2001, <http://online.janes.com>.

#### **April 1995**

Israel launches the 225kg Ofeq-3 satellite using its three-stage Shavit rocket from the Palmachim test site near Tel Aviv. The launch is expected to advance Israel's real-time nuclear missile targeting capacity. The satellite's real-time surveillance capability will also be combined with the Arrow missile to strengthen Israel's anti-ballistic missile defenses.

—"Israel's Space and Missile Projects," Jane's Intelligence Review, August 1995, pp. 352-354, <http://web.lexis-nexis.com>.

#### **April 1995**

Israel begins development of a 2,000km extended-range variant of its 1,500km range Jericho-II intermediate-range ballistic missile (IRBM).

—"Israel Will Stretch Ballistic Missile," *Flight International*, 19 April 1995-4/25/95, p. 4, <http://web.lexis-nexis.com>.

#### **1995**

Reports continue to emerge that IAI is working on the NEXT, an upgraded version of the Shavit. The work entails stretching stages 1 and 2 and adding a bipropellant stage 4. Development depends on commercial commitments, and there have been no reported launches.

—Jane's Strategic Weapons Systems 33, "Offensive Weapons (Unclassified Projects) - Satellite Launch Vehicles, Israel," 14 February 2000, <http://online.janes.com>.

#### **October 1994**

During the 45th International Astronautical Federation Congress in Jerusalem, Israel presents its plans to develop an upgraded four-stage version of its Shavit booster/SLV to be designated "Next." The four stages consist of first- and second-stage solid motors approximately 20 percent longer than the original Shavit and use Israeli Aircraft Industries (IAI) new 3000 Newton (674 lbs) thrust liquid rocket system on the fourth stage. Israel intends to market "Next" for commercial launches of US science and commercial communications satellites. "Next" will be designed for a 300kg (660 lb) payload.

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—Craig Covault, "IAF Highlights New Israeli Booster," *Aviation Week & Space Technology*, 17 October 1994, p. 25, <http://web.lexis-nexis.com>.

#### **15 September 1994**

Reported test of Jericho-II or modified "Jericho 3" from Palmachin.

—Encyclopedia Astronautica, "Jericho 2," [www.astronautix.com](http://www.astronautix.com).

#### **February 1993**

The fifth test of Arrow-1 demonstrates that "the Arrow can locate and intercept an incoming missile."

—Wisconsin Project on Nuclear Arms Control, "Israeli Missile Milestones," Risk Report (6) 2, November/December 2000, [www.wisconsinproject.org](http://www.wisconsinproject.org).

#### **1993**

US government officials confirm the existence of underground launch facilities for the nuclear capable Jericho-I and Jericho-II missiles, 14 miles west of Jerusalem. The facilities consist of a bunker storage area, a road network, and caves used as pre-launch preparation sites. French and Russian satellite photos indicate that the facility was expanded between 1989 and 1993 to accommodate the Jericho-I missile. At this time Israel's nuclear program includes approximately 50 Jericho-I missiles and 50 Jericho-II missiles.

—David A. Fulghum and Jeffrey M. Lenorovitz, "Israel Missile Base in Hill," *Aviation Week & Space Technology*, 8 November 1993, p. 29, <http://web.lexis-nexis.com>.

#### **March 1992**

Israel conducts a successful sixth test of the Jericho-II missile from the Palmachim test site.

—William E. Burrows and Robert Windrem, *Critical Mass The Dangerous for Superpowers in a Fragmented World* (New York: Simon & Schuster, 1994), p. 455.

#### **August 1991**

Israel and South Africa conduct joint tests of the Barak naval anti-missile system off the Natal Coast. The Barak-1 missile has four folding clipped-tip delta wings and four folding moving clipped-tip control fins at the rear. The missile is 2.17m long, has a body diameter of 0.17m, an unfolded wing span of 0.68m, and weighs 98kg. In addition to the control fins, there are thrust deflectors in the boost motor exhaust nozzle to assist in controlling the missile after its launch. The boost motor section is ejected after the initial boost phase. Guidance is by radar-controlled Command to Line of Sight (CLOS), using Elta STR coherent pulse-Doppler radar, or using an electro-optic tracker in severe ECM conditions. The Barak missile warhead weighs 22kg, and is a fragmentation type with an active laser fusing system that is supported by an altimeter to intercept very low-level targets. The missile has a range of 12km against aircraft targets, and around 5km against sea-skimming anti-ship missiles. A minimum range of 500m is reported. The lightweight system including radar, fire-control system, and eight missiles in launch canisters weighs a total of 3,000kg. The fire-control radar can command two separate missiles towards each target and it is reported that the Barak system can be fully automatic under the control of a threat evaluation system.

—Gerald M. Steinberg, "Israel: Case Study for International Missile Trade and Nonproliferation" in eds. William C. Potter and Harlan W. Jenks, *The International Missile Bazaar: The New Suppliers Network*, (Boulder, CO: Westview

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Press, 1994), p. 242; Jane's Strategic Weapon Systems 35, "Defensive Weapons, Israel, Barak," 19 January 2001, <http://online.janes.com>.

#### **March 1991**

Israel conducts a successful second test of its launch in order to verify the design and integration of the components of the missile.

—"Israel conducts second Test Of Arrow ABM over Mediterranean," *Aviation Week & Space Technology*, 1 April 1991, <http://web.lexis-nexis.com>.

#### **19 November 1990**

South Africa admits conducting a second ballistic missile test-flight, but insists that the missiles are booster rockets for a peaceful space program.

—John Pike, "Overberg Test Range OTB Arniston South Africa," 29 May 2000, Federation of American Scientists, [www.fas.org](http://www.fas.org); William E. Burrows and Robert Windrem, *Critical Mass The Dangerous for Superpowers in a Fragmented World* (New York: Simon & Schuster, 1994), p. 455.

#### **August 1990**

The first test of the Arrow ATBM is unsuccessful.

—Wisconsin Project on Nuclear Arms Control, "Israeli Missile Milestones," *Risk Report* (6) 2, November/December 2000, [www.wisconsinproject.org](http://www.wisconsinproject.org).

#### **January 1990**

Israel conducts a successful test of the Jericho-II missile from the Palmachim test site.

—William E. Burrows and Robert Windrem, *Critical Mass The Dangerous for Superpowers in a Fragmented World* (New York: Simon & Schuster, 1994), p. 455.

#### **1990**

Israel conducts the first test of the Arrow-1 anti-tactical ballistic missile. The Arrow-1 is designed as a theater defense missile system capable of intercepting SS-1 Scuds, SS-21 Scarab SRBMs (Short-Range Ballistic Missiles) and also the longer range Iraqi Al-Hussein, as well as the Chinese CSS-2 missiles deployed in Saudi Arabia. The Arrow-1 is a two-stage solid-propellant missile, with an overall length of 7.5m, a body diameter of 1.2m, and a launch weight of around 2,000 kg. It is estimated that the second stage has a length of 2.5m, and that Arrow-1 has inertial and command update mid-course guidance, with a terminal IR focal plane array. The missile is described as being high-speed and very maneuverable, with thrust vector control (TVC) in the boost and second-stage motor nozzles. The range capability has been described as around 50km. A focused proximity fused fragmentation warhead is reported to be under development for the missile.

—Jane's Strategic Weapons Systems 36, "Defensive Weapons, Israel, Arrow," 12 November 2001, <http://online.janes.com>.

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## 1989-1980

### 14 September 1989

Israel conducts a third test of the improved Jericho-II. The missile flies nearly 1,300km, putting southern Russia and Iran in range.

—"Israel: How Far Can Its Missiles Fly?" Risk Report (1) 5, June 1995, Wisconsin Project on Nuclear Arms Control, [www.wisconsinproject.org](http://www.wisconsinproject.org).

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### 1989

The Israeli Jericho-II enters service. The Jericho-II reportedly has two solid-propellant stages, a length of 14m, a body diameter of 1.56m, and a launch weight of 26,000kg. The motors are manufactured by Israel Military Industries, who make the solid-propellant motors for the Shavit SLV and later the Arrow ABM system. The first stage motor burns for 52 seconds and the second stage for 85 seconds, with boost burn completed at around 105km altitude. An alternative launch weight of 21,935kg is also been reported, with a first stage weight of 10,970kg and a second stage weight of 9,965kg. The payload capability is reported to be around 1,000kg, permitting either nuclear or conventional high explosive (HE) warheads. The warhead separates after the boost phase of flight. The missile has inertial guidance and the re-entry vehicle may also have a radar image correlation system for terminal guidance. Jericho-II is reported to be located in underground caves and silos, but it is believed that the missile is also road mobile with a wheeled transporter-erector launcher (TEL), or launch capability from railroad flat trucks. The missile is reported to have a maximum range of 1,500km, but could have a range of around 3,500km with a 1,000kg payload. The TEL vehicle used to launch Jericho-II is believed to be 16m long and supported by three vehicles for command and communications, site survey, and weather. [Note: The SRBM South Africa tests in July 1989 is widely believed to be a version of the Jericho-II.]

—Jane's Strategic Weapon Systems 36, "Offensive Weapons, Israel, Jericho I/2 (YA-1/YA-3)," 24 July 2001, <http://online.janes.com>.

### 19 September 1988

Israel's first launch of the Shavit space launch vehicle (SLV) places the Ofeq-1 satellite into orbit. Using the orbital parameters of the satellite launched, the US Lawrence Livermore National Laboratory concludes that the Shavit SLV could be reconfigured as a ballistic missile capable of delivering a 500kg warhead to a range of 7,500km. Shavit is a three-stage, solid-propellant launcher designed to carry 250kg payloads into low earth orbit. It has an overall length of 18m, a body diameter of 1.35m, and is reported to weigh 23,000kg at launch. Stage 1 is 6.5m long, and has a body diameter of 1.35m. It contains a TAAS Israel Industries Ltd. motor with an unspecified amount of HTPB solid propellant with a reported burn time of one minute. Attitude control is maintained by four air vanes and four jet vanes, which are jettisoned after the vertical launch phase. Stage 2 is 5.3 meters long and has a body diameter

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of 1.35 meters. Its motor is similar to stage 1, but with expansion ratio increased for altitude performance. The stage 2 motor also has a burn time of one minute. Attitude control in pitch and yaw is maintained by four liquid-injection thrust vector control (LITVC) modules. Stage 3 is 2.1m long with a body diameter of 1.3m and weighs 2,000kg, of which 1,800kg is propellant. The apogee kick motor is a RAFAEL AUS-51 "Marble" that has a burn time of 92 seconds. [Note: AUS stands for Advanced Upper Stage.] Attitude control is by spin stabilization accomplished with RAFAEL ST-200N thrusters. Israel Military Industries produces the first and second stage motors, while RAFAEL is responsible for the third stage motor. The demonstrated payload capacity is 160kg into an elliptical orbit of 207km by 1,587km with a highly retrograde inclination of 143.2 degrees.

—UN Department of Disarmament Affairs, South Africa's Nuclear Tipped Ballistic Missile Capability (New York: United Nations, 1991), p. 22; Jane's Strategic Weapons Systems 33, "Offensive Weapons (Unclassified Projects) – Satellite Launch Vehicles, Israel," 14 February 2000, <http://online.janes.com>; Seth W. Carus, "Israeli Ballistic Missile Developments," Testimony before the Commission to Assess the Ballistic Missile Threat to the United States, 15 July 1998, [www.fas.org](http://www.fas.org); Leonard Spector with Jacqueline Smith, Nuclear Ambitions (Boulder, CO: Westview Press, 1990), p. 162; Federation of American Scientists, "Israel and Space Transportation, Shavit," [undated], [www.fas.org](http://www.fas.org).

#### **September 1988**

Israel conducts a second flight-test of the modified Jericho-II missile.

—"Israel: How Far Can Its Missiles Fly?" Risk Report (1) 5, June 1995, Wisconsin Project on Nuclear Arms Control, [www.wisconsinproject.org](http://www.wisconsinproject.org).

#### **May 1987**

Israel tests an improved version of the Jericho-II missile. During a test-flight, the missile travels more than 800km. It is the first test of the extended range Jericho to be monitored by US intelligence officials.

—"Israel: How Far Can Its Missiles Fly?" Risk Report (1) 5, June 1995, Wisconsin Project on Nuclear Arms Control, [www.wisconsinproject.org](http://www.wisconsinproject.org); "Israel Reported to Test New, Longer-Range Missile," New York Times, 22 July 1987, <http://web.lexis-nexis.com>.

#### **May 1986**

Israel and the United States sign a memorandum of understanding on joint development of the Arrow anti-tactical ballistic missile (ATBM) system.

—Wisconsin Project on Nuclear Arms Control, "Israeli Missile Milestones," Risk Report (6) 2, November/December 2000, [www.wisconsinproject.org](http://www.wisconsinproject.org).

#### **Late 1980s**

South Africa begins cooperation with Israel on several missile projects, including a South African version of Israel's Jericho-II ballistic missile.

—Jane's Strategic Weapons Systems 34, "Offensive Weapons, Israel: Jericho I/2 (YA1/YA3)," 19 September 2000, <http://online.janes.com>.

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### 1986

Israel conducts the first test-firings of the Jericho-II missile, which, at this time, is believed to be a longer-range and more accurate version of the Jericho-I. [Note: It is unclear whether the designs are actually related.]

—Jane's Strategic Weapon Systems 36, "Offensive Weapons, Israel, Jericho I/2 (YA-1/YA-3)," 24 July 2001, <http://online.janes.com>.

### 1983

The Israeli Space Agency is founded in Tel Aviv.

—Wisconsin Project on Nuclear Arms Control, "Israeli Missile Milestones," Risk Report (6) 2, November/December 2000, [www.wisconsinproject.org](http://www.wisconsinproject.org).

### 1982

South Africa and Israel cooperate on development of the Skorpioen ship-to-ship-missile, based on the Israeli Gabriel Mk 2 missile. The Mk 2 is reportedly 3.42m long with a airframe diameter of 0.34m and a weight of 522kg at launch. Before launch the missile guidance system is programmed with the target data obtained from its search radar. It is then fired and guided by "two gyro autopilots" and assumes an initial cruise altitude of about 100m. At a range of 7.5km from the launcher the onboard autopilot commands the missile to descend to 20m altitude using a radio altimeter to maintain height. At a predetermined distance from the target, the semi-active radar is switched on, the target is acquired, and the missile descends to one of its three possible preset attack altitudes for the final approach. The actual set altitude varies between 1 and 3m and depends upon the sea state encountered at the time. Propulsion is by a solid-propellant boost and sustainer motor. The effective missile range is reported to be 35km, with a cruise speed of mach 0.7. The Semi-Armor-Piercing (SAP) warhead weighs 180kg and contains around 75kg of conventional high explosive (HE).

—Signe Landgren, *Embargo Disimplemented: South Africa's Military Industry* (New York: Oxford University Press, 1989), pp. 108-109; Jane's Strategic Weapon Systems 36, "Offensive Weapons, Israel, Gabriel," 24 July 2001, <http://online.janes.com>.

### 5 December 1980

Israel, South Africa, and Taiwan are reported to have reached an agreement to collaborate in the joint production of strategic cruise missiles and small unmanned jets capable of delivering nuclear warheads. US Intelligence sources are aware of the nuclear collaboration and report that South Africa and Taiwan are attempting to keep their cruise missile plans secret. Information on the joint collaboration remains restricted to the national security community.

—"3 Nations to Begin Cruise Missile Project," *Washington Post*, 5 December 1980.

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## 1979-1953

### 1977

Israel begins development of the Jericho-II missile, possibly with funding from Iran. The Israeli designation is

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reported to be YA-3.

—Jane's Strategic Weapon Systems 36, "Offensive Weapons, Israel, Jericho I/2 (YA-1/YA-3)," 24 July 2001, <http://online.janes.com>.

#### **1975**

The US Army prepares Lance surface-to-surface missiles for possible shipment to Israel. The Lance missile has previously been deployed by the US Army in Europe armed with tactical nuclear warheads. Israel is expected eventually to receive about 300 of the missiles. Some US congressional leaders and senior Defense Department officials believe that Israel wants the Lance missile for use as a delivery vehicle for its tactical nuclear warheads. Technical problems and range limitations with the "Jericho/MD-620" missile cause US Defense Department officials to monitor closely Israeli requests for weapons technology to determine whether they could be related to improving the Jericho missile.

—Aviation Week and Space Technology, "Israel to Receive Lance Missiles, F-15s," 15 September 1975, p. 16.

#### **1974**

Israeli Prime Minister Shimon Peres and South African President John Vorster hold a secret meeting in Geneva. The two reportedly sign an agreement for strategic cooperation between the two countries. The agreement is a mutual defense pact according to which "the two countries would assist each other in wartime by supplying spare parts and ammunition from emergency stocks. Each country agreed that its territory would be used to store all types of weapons for the other country." According to Dierter Gerhardt, a senior commander in the South African navy who for many years spied for the Soviet Union, under a later clause in the agreement called "Chalet," Israel agreed to arm eight Jericho-II missiles with "special warheads" for South Africa.

—"Treasons of Conscience," *Weekly Mail & Guardian*, 11 August 2000, [www.sn.apc.org](http://www.sn.apc.org).

#### **Late 1973**

Following the October 1973 War, Israel approaches the United States in an unsuccessful attempt to obtain the Pershing-I missile. [Note: The attempt may indicate that the Jericho-I missile, which has identical range as the Pershing, is not operational or experiencing technical problems, although some sources indicate that it entered service in 1973 and was deployed with nuclear warheads during the war. Other sources imply that the request for the Pershing was mainly to acquire technology to help improve the guidance system and accuracy of the Jericho-I.]

—CNS interview with missile engineer familiar with technical dimensions of South African missile program who wishes to remain anonymous.

#### **Late 1973**

Following the October 1973 War, in which South Africa provided Israel with an emergency supply of Mirage fighter parts, Israel upgrades the status of its mission in South Africa to an embassy.

—US Central Intelligence Agency, National Foreign Assessment Center, Africa Report, Supplement, 8 June 1981, secret report partially declassified and released 7 May 1996, <http://foia.ucia.gov>, p. 2.

#### **6 October 1973**

Syria and Egypt launch a surprise attack against Israel in what becomes known as the Yom Kippur/Ramadan War.

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[Note: Israelis and many Westerners generally refer to the war as the Yom Kippur War while Arabs refer to it as the Ramadan war.]

### **1971-1978**

Israel constructs 50 Jericho-I missiles. [Note: Previously the first 14 were constructed in and delivered from France.]

—Jane's Strategic Weapon Systems 36, "Offensive Weapons, Israel, Jericho I/2 (YA-1/YA-3)," 24 July 2001, <http://online.janes.com>.

### **October 1971**

The New York Times reports that Israel is producing a nuclear capable ballistic missile known as the Jericho-I, at a rate of three to six missiles per month. The missiles have a "300-mile range" with a 1,000-1,500lb payload. The cost is estimated to be between \$1 million to \$1.5 million per missile. The Times reports that US analysts are not certain whether Israel has nuclear warheads but suggest that the Jericho is too expensive to be used to deliver conventional, high-explosive warhead. At this point, US analysts believe that Israel has nuclear weapons components that could be quickly assembled for use in a crisis with Jericho missiles or jet-fighters despite Israeli pledge not to be first country to introduce nuclear weapons into the Middle East. Some US officials are concerned that if Egypt and the Soviet Union are convinced that Israel has deployed nuclear tipped missiles capable of striking strategic Egyptian positions, the Soviets may feel impelled to deploy comparable missiles in Egypt. Such missiles would likely be operated by Soviet forces. Jericho is viewed as attempt by Israel to deter Egypt and the Soviet Union from contemplating an all-out effort to bomb Israeli cities and destroy the country.

—Seth W. Carus, "Israeli Ballistic Missile Developments," Testimony before the Commission to Assess the Ballistic Missile Threat to the United States, 15 July 1998, [www.fas.org](http://www.fas.org); New York Times, 5 October 1971.

### **March 1966**

Israel conducts a successful test-firing of the Jericho-I missile.

—Avner Cohen, *Israel and the Bomb*, (New York: Columbia University Press, 1988), p. 116.

### **30 September 1968**

Israel conducts a test-flight of a Jericho-I missile at Ile du Levant.

—Encyclopedia Astronautica, "Jericho Chronology," [www.astronautix.com](http://www.astronautix.com).

### **16 March 1966**

Test flight of Jericho-I missile at Ile du Levant, an offshore island in the Mediterranean near Toulon.

—Encyclopedia Astronautica, "Jericho Chronology," [www.astronautix.com](http://www.astronautix.com).

### **1 February 1965**

The first test of a Jericho-I first stage takes place. [Note: It is unclear whether this is a flight test or a test of the missile engine.]

—"Dassault Lève Le Voile Sur Le Missile Jericho," *Air & Cosmos/Aviation International*, 6 December 1996, p. 36.

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### **1965-1968**

The Jericho-I is flight-tested 16 times. Ten of the flights are rated as successful. The launches take place at a French naval base on the Ile du Levant.

—Jane's Strategic Weapon Systems 36, "Offensive Weapons, Israel, Jericho I/2 (YA-1/YA-3)," 24 July 2001, <http://online.janes.com>; Encyclopedia Astronautica, [www.astronautix.com](http://www.astronautix.com).

### **23 December 1963**

Israel conducts an unsuccessful test-firing of the first two stages of the Jericho-I missile at an unnamed French site. [Note: This contradicts other reports which date the first test of the Jericho-I to 1965 with some dating as late as 1967.]

—Avner Cohen, *Israel and the Bomb*, (New York: Columbia University Press, 1988), pp. 116, 282.

### **26 April 1963**

The contract for "Operation Jericho" is signed between Israel and Dassault in Tel Aviv.

—"Dassault Lifts The Lid On The Jericho Missile Story (Dassault Lève Le Voile Sur Le Missile Jericho)," *Air & Cosmos/Aviation International*, 6 December 1996, p. 36.

### **7 September 1962**

Israel commissions the Jericho-I ballistic missile from the French firm Dassault Aviation. The request is for a surface-to-surface ballistic missile system capable of delivering a 750kg warhead with a range of 235-500km, with a CEP (circular error probability) of less than 1km. Israel's request also specifies a system that could launch between four and eight missiles per hour in all weather from either a fixed or mobile launcher. The request specifies a preparation time of two hours, and a success rate of 90 percent.

The Jericho-I eventually becomes a two-stage ballistic missile 13.4m long and 0.8m in diameter weighing 6.7 metric tons with four clipped-tip delta stabilizing fins at the base of the second stage and a separating warhead assembly. The first stage has a length of 4.05m and a weight of 1,950kg, and the second stage has a length of 5.0m and a weight of 4,100kg. The payload assembly is 4.35m in length with a weight of 650kg. The solid-propellant motors are later made by the Rocket Systems Division of Israel Military Industries.

Boost-phase guidance uses an inertial package incorporating a computerized auto-pilot with an unprecedented accuracy of 1/1000 of a degree. Burn-out occurs at an altitude of 150km, and the warhead separates 1ms later, re-entering at a speed of Mach 8. The Jericho-1 design is revolutionary in that it is the first French missile to use an on-board computer. This experience is useful in enabling Dassault to integrate similar technology in all subsequent French missiles, including the S-3, M-20, M-4, and the Ariane program.

The Jericho-1 (originally designated MD-620) is developed in secrecy by Dassault in cooperation with the French Ministerial Armaments Committee (DMA), but without financial support from the French government. Israeli Minister of Defense Shimon Peres directs the project, and communicates directly with Marcel Dassault.

Jean Rouault and Philippe Amblard manage the project at Dassault. Leading French firms contribute to the effort, including EMD on computers, Nord-Aviation on propulsion, Puderie de-St-Medard on propellants, Sagem on

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guidance components, TRT on radio telemetry, Aerazur and Hispano-Suiza on the transporter-erector launcher (TEL). The missiles are built in Dassault factories in Argenteuil and St-Cloud, with final assembly carried out by 100 French technicians and an Israeli team between May 1964 and May 1969.

—"Dassault Lifts the Lid On The Jericho Missile Story (Dassault Lève Le Voile Sur Le Missile Jericho)," Air & Cosmos/Aviation International, 6 December 1996, p. 36.

### **1958**

Israel's military research and development establishment, RAFAEL, tests a land-attack missile called the Luz. The missile is envisioned in surface-to-surface, air-to-surface, and ship-to-ship versions. The surface-launched version has a range of about 27km. The Artillery Corps eventually fields one battery of the missiles, although it apparently is not well-received by army leadership. The ship-launched version enters formal development, but the program is abandoned and replaced by the system that comes to be known as the Gabriel, which is developed by Israel Aircraft Industries with Israel Military Industries producing the rocket motors. RAFAEL has problems with the rocket motors, and never resolves problems with guidance and control.

—W. Seth Carus, "Israeli Ballistic Missile Developments," Testimony before the Commission to Assess the Ballistic Missile Threat to the United States, 15 July 1998, [www.fas.org](http://www.fas.org).

### **1954-1967**

Israel begins development of guided missiles. During this period, France and Israel collaborate closely on missile development, but the cooperation program ends due to problems with guidance systems. The program is subsequently relocated to Israel.

—W. Seth Carus, "Israeli Ballistic Missile Developments," Testimony before the Commission to Assess the Ballistic Missile Threat to the United States, 15 July 1998, [www.fas.org](http://www.fas.org).

### **1953**

Israel Aircraft Industries (IAI), the future developer of the Shavit rocket, is established.

—Wisconsin Project on Nuclear Arms Control, "Israeli Missile Milestones," Risk Report (6) 2, November/December 2000, [www.wisconsinproject.org](http://www.wisconsinproject.org).

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