



The Development of the Israeli National Missile Defense Concept

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ABSTRACT:

Over the last three decades, the Israeli missile defense concept has evolved significantly along with the emerging threats. As a result of the long-term strategy implemented in the 1990s, contemporary missile defense of Israel has been developed into a complex, multi-tiered system aimed to match the country's unique security needs.

The purpose of this study is to determine the main directions in the development of the Israeli missile defense concept that have led to its current form. The study identifies key elements of the multi-layered missile defense architecture, as well as their role in Israel's overall defense strategy. With the use of theoretical research methods, the period of 1991–2020 was examined in order to trace the development of new missile defense systems and the evolution of Israel's position on the subject in relation to the changing international situation.

The author concludes that the comprehensive anti-missile shield, consisting of the Arrow-3, Arrow-2, David's Sling and Iron Dome systems, provides Israel with solid defense against short, medium and long range missile threats, and presents potential to be developed into one of the most advanced missile defense systems in the world.

KEYWORDS:

Israel, missile defense, Iron Dome, David's Sling, Arrow

Introduction

Over the last years, missile defense has been one of the key issues in the Israeli debate on military security. It became an urgent problem after the unilateral disengagement from the Gaza Strip in 2005, which resulted in persistent short-range rocket fire carried out mainly by Hamas and Palestinian Islamic Jihad. However, the development of a missile defense system in Israel started earlier, in the 1980's, when Israel and the United States signed a memorandum of understanding on the development of an interception system against long-range missiles. The memorandum initiated strategic cooperation between the two states and the American financial support for the interception system designed to match Israel's unique security situation.¹ The Israeli idea for missile defense has evolved from the focus on long-range threats, through the need for a defense system against short-range rockets from Gaza, to a multi-layer defense system concept that consists of various systems responsible for defense against all-range missiles, rockets and mortars.² An in-depth look at this complex concept allows to explore the evolution of the Israeli defense priorities in relation to the turbulent security environment in the Middle East.

The aim of this paper is to determine the main directions of the development of the Israeli national missile defense concept over the last three decades. The study also attempts to identify key elements of the missile defense concept and their role in the overall Israeli defense strategy. The period of 1991–2020 was examined in order to trace the development of new missile defense systems and the evolution of Israeli position on this matter in relation to the changing international situation and the emergence of new security threats. The author argues that creating an effective, multi-layer missile defense system became a key factor in shaping the contemporary defense strategy of Israel.

Literature Review

Dynamic evolution of Israel's missile defense has attracted attention of researchers around the world. Due to the continuous use of the Iron Dome defense system against short-range rockets coming from the Gaza Strip, this element of Israeli missile defense architecture has been most widely analyzed, allowing the authors to assess performance effectiveness based on actual combat use. No monographs on specific elements of the Israeli missile defense system have been published so far. Valuable scientific articles on the subject include those written by M.J. Armstrong,³ U. Rubin⁴ and D. Preisler-Swery.⁵ A variety of brief, yet significant papers on Israeli missile defense and its role in the state security have been

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1. E.S. Marshall, *Israel: Current Issues and Historical Background*, Nova Science Publishers, New York 2002, p. 40.
 2. J. Nagel, J. Schanzer, *Assessing Israel's Iron Dome Missile Defense System*, FDD, Washington 2019, p. 5.
 3. M.J. Armstrong, *Modeling Short-Range Ballistic Missile Defense and Israel's Iron Dome System*, "Operations Research" 2014, Vol. 62, No. 5; M.J. Armstrong, *The Effectiveness of Rocket Attacks and Defenses in Israel*, "Journal of Global Security Studies" 2018, No. 3(2).
 4. U. Rubin, *Israel's Air and Missile Defense During the 2014 Gaza War*, The Begin-Sadat Center for Strategic Studies, Ramat Gan 2015.
 5. D. Preisler-Swery, *The Last Missile War? The Influence of the "Iron Dome" on the Operational Concepts of Hamas, Hezbollah and the IDF*, "DADO Center Journal" 2015, Vol. 4.

published by the experts of the Institute for National Security Studies in Tel Aviv.⁶ Literature on the Arrow weapon system and the most recently deployed David's Sling system is limited. The most noteworthy analyses of the Israeli missile defense concept as a whole include *Another Brick in The Wall: the Israeli Experience in Missile Defense* by J.L. Samaan.⁷ Saaman's study provides an overview of the evolution of Israeli missile defense prior to 2015. However, this research is already outdated, as it was published before the deployment of David's Sling and Arrow-3 and before work on a new laser missile defense system started. Therefore, the analysis of the most recent developments and newly deployed missile defense systems in this paper had to be based mainly on producers' publications, official statements of the government or military leaders and press releases, as well as brief information related to the analyzed issue mentioned in books on missile defense in various countries (e.g. by M. Czajkowski,⁸ C. McArdle Kelleher and P. Dombrowski⁹ and S. Maślanka¹⁰).

Methods

In order to achieve the aim of this paper, the author used theoretical research methods characteristic for security studies. The case study of the Israeli missile defense development was based on comparative scientific literature analysis as well as critical analysis of selected statements of the Israeli authorities, adequate press releases and on-line sources. Due to the fact that the Israeli missile defense concept is still evolving, the author prioritized most recent literature, documents and online sources in order to include significant developments of the missile defense system over the last few years. Most of the materials analyzed in this article consist of qualitative data. The main focus of this article is the concept itself, thus the details related to technological solutions or construction of each mentioned missile defense platform were described only in brief. The research results are presented in relation to the changing international situation in the region.

Major Elements of the Israeli Missile Defense System

The beginnings of the Israeli missile defense in its current form can be traced back to 1991 and the First Gulf War, when Iraq fired 39 Scud missiles against Israeli cities.¹¹ The performance of the Patriot missile defense system, which was first used in Israel during

6 See for example: M. Elran, C. Padan, *Long-Range Rocket Fire on Israel's Depth: Lessons for Homefront Defense*, "INSS Insight" 2019, No. 1159; U. Rubin, *Missile Defense and Israel's Deterrence against a Nuclear Iran* [in:] *Israel and Nuclear Iran*, E. Kam (ed.), INSS, Tel Aviv 2018; Y. Arazi, G. Perel, *Integrating Technologies to Protect the Home Front against Ballistic Threats and Cruise Missiles*, "Military and Strategic Affairs" 2013, Vol. 5, No. 3.

7 J.L. Samaan, *Another Brick in The Wall: the Israeli Experience in Missile Defense*, Strategic Studies Institute, US Army War College, Carlisle 2015.

8 M. Czajkowski, *Obrona przeciwrakietowa w stosunkach międzynarodowych*, Wydawnictwo Uniwersytetu Jagiellońskiego, Kraków 2013.

9 *Regional Missile Defense from a Global Perspective*, C. McArdle Kelleher, P. Dombrowski (eds.), Stanford University Press, Stanford 2015.

10 *Geneza i rozwój obrony przeciwrakietowej*, S. Maślanka (ed.), Akademia Sztuki Wojennej, Warszawa 2019.

11 A. Lovran, *Israel Strategy after Desert Storm*, Frank Cass, London 1997, p. 2.

this attack, was widely criticized for its relatively low effectiveness.¹² In the aftermath of this debate, the Israel Missile Defense Organization (IMDO) was established as a division within the Directorate of Defense Research and Development at the Israeli Ministry of Defense. It became a leading administrative body responsible for the development of the national missile defense concept that could respond adequately to particular security needs of Israel.¹³ At the same time, a new national long-term missile defense strategy (*Homa*) was implemented.¹⁴ Over the last three decades, the IMDO has cooperated closely with the United States Missile Defense Agency (MDA) and has received joint funding from the American military aid program. All of the currently deployed missile defense platforms are a result of Israeli-American collaboration and both partners have actively participated in their development.¹⁵

The contemporary Israeli national missile defense concept consists of three integrated anti-missile systems, designed to defend the country from long, medium and short-range missiles and artillery rockets. The aim of the multi-tiered missile defense is to provide maximum coverage against all the possible missile threats in the turbulent region. Currently, it consists of three major layers:

- 1) low tier – Iron Dome;
- 2) mid-tier – David's Sling;
- 3) upper-tier – Arrow-2 and Arrow-3.¹⁶

Iron Dome was designed by Rafael Advanced Defense Systems and Israel Aerospace Industries¹⁷ in order to defend the Israeli territory from short-range artillery rockets and mortars, fired by non-state actors (such as Lebanese Hezbollah, Hamas and Palestinian Islamic Jihad operating from the Gaza Strip). The development of the new system began in the aftermath of the Second Lebanon War (2006), when an unprecedented number of rockets and artillery shells was launched against Israel. As A. Kober claims, over 4,000 rockets were fired then against the residents of northern Israel, who were forced to remain in air-raid shelters or were relocated to other parts of the country.¹⁸ In 2006, the Israeli missile defense system was not prepared to stop constant short-range rocket fire. This created a sense of vulnerability in the population and sparked a debate on the urgent need to develop a solution to this problem. The debate actually started after the disengagement from the Gaza Strip in 2005. Over the last decade, short-range rocket and mortar fire from the Gaza Strip has remained the most frequent threat to the security of Israeli civilians,

12 S. Fetter, G.N. Lewis, L. Gronlund, *Why were Scud Casualties so low?*, "Nature" 1993, Vol. 361, pp. 293–294.

13 *IMDO- Israel Missile Defense Organization*, Ministry of Defense, https://english.mod.gov.il/About/Innovative_Strength/Pages/IMDO_Israel_Missile_Defense_Organization.aspx [accessed on: 08.06.2020].

14 G.E. Lailari, *Homa: Israel's National Missile Defense Strategy*, Air Command and Staff College, Maxwell 2001, pp. 18–19.

15 J.M. Sharp, *U.S. Foreign Aid to Israel*, Congressional Research Service, Washington 2019, p. 6.

16 S. Maślanka, *Geneza i rozwój obrony przeciwrakietowej Izraela*, in: *Geneza i rozwój obrony przeciwrakietowej*, S. Maślanka (ed.), Akademia Sztuki Wojennej, Warszawa 2019, p. 140.

17 In 2014, American Raytheon also joined the Iron Dome project.

18 A. Kober, *The Israel Defense Forces in the Second Lebanon War: Why the poor performance?*, "Journal of Strategic Studies" 2008, No. 31(1), p. 8.

in particular those residing in the so-called “Gaza Envelope” – populated areas within 7–10 km of the Gaza border.¹⁹ As a response to the significant rocket threat from southern Lebanon and the Gaza Strip, the program to develop a new interception system was started in 2007. Iron Dome was designed to intercept rockets and mortars within the range between 4 km and 70 km. The initial plan assumed that one battery would cover up to 150 square km of the Israeli territory.²⁰ The project received significant funding from the American military aid program. According to J.M. Sharp, the U.S. has provided over 1,6 billion USD to Israel for Iron Dome production and maintenance.²¹ It took less than 5 years for the first Iron Dome battery to go operational. In April 2011, the system successfully intercepted its first rocket fired by Hamas. According to J. Nagel and J. Schanzer, since then the system has intercepted and destroyed over 1,500 short-range rockets and mortars.²²

Up to 2020, ten Iron Dome batteries had been strategically deployed around Israel, each of them comprising a battlefield radar, 3 or 4 stationary launchers and 20 Tamir interceptors.²³ The batteries are mobile and can be redeployed to particular areas if the security situation changes. Most of them have been deployed close to large urban centers and at the confrontation lines on the northern and southern border. According to J.M. Sharp, a naval version of Iron Dome has also been deployed to protect Israeli off-shore natural gas facilities.²⁴ Due to poor accuracy of the opponents’ rockets²⁵ and relatively high costs of firing each Tamir missile,²⁶ the system was designed to fire the interceptors only at projectiles that pose a threat to populated areas or protected infrastructure. If the system determines that the projectile will land in an uninhabited area, the interceptors are not fired (although it still allows the operators to trigger the early-warning system).²⁷ From the moment the system went fully operational, there has been an ongoing debate over the effectiveness of the iconic Iron Dome. After the deployment of the first batteries, U. Rubin (former director of the IMDO), called it a *game changer*.²⁸ His stance was supported by many commentators and military authorities, who claimed 80-90% effectiveness of the system during

19 For detailed statistical data on the growth of the rocket threat, see the monthly and annual reports of the Israeli Security Agency: *Monthly & Annual Reports*, ISA, <https://www.shabak.gov.il/english/publications/Pages/monthlyreports.aspx> [accessed on: 09.06.2020].

20 J.L. Samaan, op. cit., p. 25.

21 J.M. Sharp, op. cit., p. 19. Conf.: L. Berman, *Israel’s Iron Dome: Why America Is Investing Hundreds of Millions of Dollars*, “National Security Outlook” 2012, No. 2, p. 6.

22 Data valid for 2019. Vide: J. Nagel, J. Schanzer, op. cit., p. 2.

23 *Iron Dome System and Sky Hunter Missile*, Raytheon Missiles & Defense, <https://www.raytheonmissilesanddefense.com/capabilities/products/iron dome> [accessed on: 09.06.2020].

24 J.M. Sharp, op. cit., p. 12.

25 The vast majority of rockets fired at Israel from the Gaza Strip are locally manufactured unguided Qassam type rockets.

26 The estimates vary between 50,000 – 90,000 USD for each Tamir interceptor. Vide: M. Czajkowski, op. cit., p. 147. Conf.: J.L. Saaman, op. cit., p. 25.

27 J.M. Sharp, op. cit., p. 12.

28 L. Berman, op. cit., p. 2.

Operation Pillar of Defense in 2012 and Operation Protective Edge in 2014.²⁹ On the other hand, several experts and observers have expressed caution with the released data on interception effectiveness and attributed low casualties to civil defense.³⁰

The David's Sling system (previously known as the Magic Wand) is the mid-tier of the multi-layer missile defense architecture. The system was co-developed by Rafael Advanced Defense Systems and Raytheon to counter medium-range missiles and cruise missiles fired from 40 km to 300 km, as well as UAVs and enemy aircraft.³¹ Similarly to the Iron Dome project, the U.S. has contributed large funds to the development of David's Sling. According to the report by J.M. Sharp, by 2019 the project had received over 1,8 billion USD from American military aid.³² The development of the system was initiated in 2006 as a response to the potential missile threat from Lebanon, Syria and Iran. David's Sling was intended to replace older U.S. Patriot and MIM-23 Hawk systems. After a few years of tests, the first batteries were deployed in 2017 and the system was declared operational. On July 23, 2018 it was activated for the first time after two missiles had been fired from Syria.³³ The David's Sling battalion commander stated in a press interview that "the interceptor battery and the radar are not deployed close to the area or city being protected, as the protective envelope of the David's Sling system is nation-wide."³⁴ Therefore, the system can cover the whole territory of Israel and fill the gap between short-range capabilities of Iron Dome and long-range missile defense provided by the Arrow Weapon System. Although it has not been as frequently tested in combat as Iron Dome, the initial reviews are positive. As the producers claim, the Stunner missile used as an interceptor for David's Sling has been proven to intercept and successfully destroy 92% of short-range ballistic missiles and high-caliber types of rockets available worldwide.³⁵

Three versions of the Arrow missile defense system comprise the upper-tier of the multi-layered missile defense. The development of the system was initiated prior to the previously described Iron Dome and David's Sling, shortly before the 1991 Iraqi Scud attacks. After combat tests in 1990, the first Arrow anti-ballistic missile defense system was introduced in the aftermath of the First Gulf War. In 1995, Israel Aerospace Industries and American Boeing co-produced and started testing a new version of the system (Arrow-2), capable of intercepting medium to long-range ballistic missiles. Arrow-2 went operation-

29 M.J. Armstrong, *The Effectiveness of Rocket Attacks...*, op. cit., p. 115; J.M. Sharp, op. cit., pp. 12-13; J.L. Saaman, op. cit., pp. 30-31; J. Nagel, J. Shanzer, op. cit., p. 5.

30 M.J. Armstrong, *The Effectiveness of Rocket Attacks...*, op. cit., p. 116. Conf.: E.B. Landau, A. Bermant, *Iron Dome Protection: Missile Defense in Israel's Security Concept in: The Lessons of Operation Protective Edge*, A. Kurz, S. Brom (ed.), Institute for National Security Studies, Tel Aviv 2014, p. 38.

31 J.L. Saaman, op. cit., p. 26; J.M. Sharp, op. cit., p. 16.

32 J.M. Sharp, op. cit., p. 17.

33 O. Heller, *First Operational Use of David's Sling System*, Israel Defense, <https://www.israeldefense.co.il/en/node/35094> [accessed on: 09.06.2020].

34 Ibidem.

35 *David's Sling System and SkyCeptor Missile*, Raytheon Missiles & Defense, <https://www.raytheonmissilesanddefense.com/capabilities/products/davidssling> [accessed on: 09.06.2020].

al in 2000 and was deployed in central Israel.³⁶ According to the Israeli sources, the system marked its operational debut on March 17, 2017, when it successfully intercepted a Syrian SA-5 missile (despite not being originally designed to combat anti-aircraft missiles).³⁷ The most recent version of the system, codenamed Arrow-3, was declared operational in 2017 and serves as the top layer of the Israeli missile defense array, with a flight range of over 2,400 km. According to the Israeli Ministry of Defense statements, the capabilities of Arrow-3 enable it to intercept longer-range and higher-altitude ballistic missiles, compared to the previous version.³⁸ The Arrow program has been co-funded by the U.S. since the 1990s, providing over 3,5 billion USD to the project.³⁹

The three elements combined create an almost impenetrable shield, considered to be one of the most complex and technologically advanced missile defense systems in the world.⁴⁰ As indicated above, Iron Dome, David's Sling and currently deployed Arrow-2 and Arrow-3, complemented by the remaining Patriot batteries, enable Israel to defend its territory from rocket and missile threats within the range from 4 km to 2,400 km. Paradoxically, the shortest-range rockets and mortar shells are still an unresolved issue. Despite being able to intercept short-range rockets within approximately 15 seconds, the Iron Dome system faces a problem of extremely short-range rockets and mortars fired frequently from the Gaza Strip at the towns and rural settlements adjacent to the border.⁴¹ The distance between the Strip and the nearest locations that can be reached by enemy rocket launchers is less than 2 km, which means the time for response is not always long enough to detect the threat and activate Iron Dome missiles. The rapid development of a precise early-warning system and civil defense measures over the last decade have provided only an interim solution to this matter.⁴² For this reason, in 2014 a team of Israeli defense industries reportedly initiated a new project aimed to fill the lowest-tier gap in the rocket defense system. A new High Energy Laser Weapon System (HELWS), initially codenamed Iron Beam, is supposed to use solid-state laser technology in order to trace and destroy short flight time rockets, mortars and UAVs within the range of up to 10 km.⁴³ According to the press releases of the IMDO from January 2020, joint Israeli-American projects have been launched with the aim to develop ground based laser (supplementary to the Iron Dome) as well as

36 J.L. Saaman, op. cit., p. 12.

37 U. Rubin, *Arrow Intercepts a Syrian Missile: Technological, Operational, and Political Aspects*, "BESA Center Perspectives" 2017, No. 437, pp. 1–2.

38 *New Era in Arrow Weapon System: Operational Arrow-3 Interceptors Transferred to Israeli Air Force Aerial Defense Array*, Israel Ministry of Defense, January 18, 2017, https://missiledefenseadvocacy.org/wp-content/uploads/2017/01/Arrow3_Jan2017.pdf [accessed on: 09.06.2020].

39 J.M. Sharp, op. cit., p. 18.

40 M. Czajkowski, op. cit., p. 146.

41 E.B. Landau, A. Bermant, op. cit., p. 37.

42 For detailed analysis regarding the evolution of civil defense and early warning system in Israel after the disengagement from the Gaza Strip see: J. Zych, *Obrona cywilna a bezpieczeństwo współczesnego państwa – na przykładzie Izraela* in: *Współczesna wielowymiarowość bezpieczeństwa narodowego. Wybrane problemy z zakresu bezpieczeństwa publicznego i powszechnego*, T. Kośmider (ed.), Apeiron, Kraków 2018, pp. 61–100.

43 S. Maślanka, op. cit., pp. 146–147; E.B. Landau, A. Bermant, op. cit., p. 37.

mobile vehicle-mounted and airborne laser systems which could protect bigger areas and accompany moving military forces.⁴⁴ Although the production of HELWS is doubtlessly expensive, it would cost significantly less to operate it in comparison with Iron Dome. Despite the recent announcement of the Ministry of Defense on the breakthrough in the development of laser anti-rocket technology, the capabilities of this brand new system have not been demonstrated yet, and the date of deployment remains unknown.

National Missile Defense Concept

The current Israeli missile defense concept derives from the long-term strategy created by the IMDO in the early 1990s. As G.E. Lailari remarks, the strategy known as *Homa*⁴⁵ was based on three elements:

- 1) endo-atmospheric interception;
- 2) exo-atmospheric interception;
- 3) interception at the launch phase.⁴⁶

The plan envisioned the creation of a multi-layered anti-missile shield placed under the Israeli Air Force. Despite close co-operation with the U.S., the goal was to develop missile defense platforms adjusted to the specific Israeli security environment. Noticeably, the plan evolved along with the changing international situation. The elements of the system described above, if placed in chronological order, go along with the emergence of new threats. The first missile defense systems developed in Israel – Arrow and its successor, Arrow-2 – were a direct response to the tactical ballistic missile threat from Iraq. The second system – Iron Dome – was developed in the aftermath of the Second Lebanon War (2006), withdrawal from the Gaza Strip in 2005 and serious damage experienced during Operation Cast Lead (2008–2009).⁴⁷ The development of the recently deployed David's Sling was triggered by regional proliferation of short and medium-range rockets exceeding the 70 km upper limit of the Iron Dome's capabilities.⁴⁸ In particular, those included precise medium-range rockets provided to Hezbollah and Hamas by Iran.⁴⁹ Arrow-3, the system's top tier, was developed as a response to the growing ballistic missile threat emanating from Iran.⁵⁰ Finally, the Iron Beam laser system – currently in development – is supposed to fill the last remaining gap in the “defensive shield” created by all the missile defense systems altogether. As a result of the dynamic progress in this area, over the last three decades Israel has built sophisticated, multi-tiered missile defense architecture which significantly improved the country's security (see Figure 1).

44 J. Nagel, B. Bowman, L. Zivitski, *Assessing Israel's tactical laser breakthrough*, Defense News, <https://www.defensenews.com/opinion/commentary/2020/01/17/how-realistic-is-israels-tactical-laser-breakthrough> [accessed on: 10.06.2020].

45 Hebrew for *Fortress Wall*.

46 G.E. Lailari, op. cit., p. 18.

47 Y. Elster, A. Zussman, N. Zussman, *Effective Counter-terrorism: Rockets, Iron Dome and the Israeli Housing Market*, “Journal of Policy Analysis and Management” 2019, Vol. 38, No. 2, p. 312.

48 J. L. Saaman, op. cit., p. 25.

49 M. Herzog, *Iran across the Border. Israel's Pushback in Syria*, “Policy Notes” 2019 No. 66, p. 4.

50 P. Izewicz, *Iran's Ballistic Missile Program: Its Status and the Way Forward*, “Non-Proliferation Papers” 2017, No. 57, p. 6.

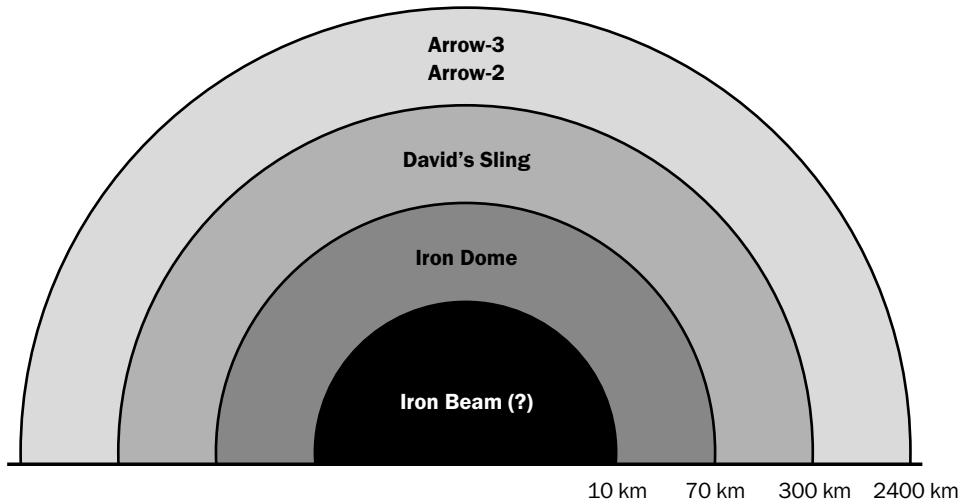


Figure 1. Layers of the Israeli multi-tiered missile defense system

Author's own elaboration

The development of the missile defense concept has been affected both by the unstable situation in the region, and the changing internal situation in Israel. The idea of a multi-tiered missile defense system in its current form is a consequence of the Israeli perception of its strategic environment, which found expression in the most recent, unclassified *Strategy of the IDF*, giving an insight into the Israeli concept of military security. According to this document, published by the IDF General Staff in 2015, the threats facing the state of Israel can be divided into the following categories:

- 1) distant states (Iran);
- 2) nearby states (Lebanon);
- 3) failed or disintegrated states (Syria);
- 4) sub-state terrorist organizations (Hamas, Hezbollah);
- 5) non-state terrorist organizations (Islamic Jihad, Palestinian Islamic Jihad, ISIL, etc.)⁵¹.

D.D. Kaye, A. Nader and P. Roshan note that Iran's expanding nuclear and missile programs raised serious concerns in Israel in the early 2000s. Since then, the threat of nuclear weapons development and growing missile capabilities of this openly hostile state reached the top of Israel's security agenda.⁵² However, as U. Rubin concludes, rocket fire has been transformed from a nuisance to a strategic threat only after Israel's withdrawal from the Gaza Strip in 2005.⁵³ J. Nagel and J. Schanzer confirm this position and point out that

51 *Deterring Terror: How Israel Confronts the Next Generation of Threats. English Translation of the Official Strategy of the Israel Defense Forces, 2015*, Belfer Center for Science and International Affairs, Cambridge 2016, p. 4.

52 D.D. Kaye, A. Nader, P. Roshan, *Israel and Iran. A Dangerous Rivalry*, RAND Corporation, Santa Monica 2011, p. 23.

53 U. Rubin, *The Missile Threat from Gaza: From Nuisance to Strategic Threat*, BESA Center, Ramat Gan 2011, p. 5.

currently regional proliferation of missiles and rockets constitutes a strategic threat to Israel.⁵⁴ The transfers of Iranian ballistic missiles to non-state actors are also perceived as a growing threat to Israel.⁵⁵ Missiles produced in Iran have been reported to be used both by Hamas and Hezbollah, which means they are no longer a “distant threat” and they endanger the Israeli territory directly on a daily basis, both from the north and the southwest. U. Rubin suggests that further supplies of Iranian missiles to various militias and terrorist organizations operating close to the Israeli borders might create a “ring of fire,” which would become an existential threat to the state.⁵⁶ Thus, comprehensive defense against artillery rockets and ballistic missiles has to play a significant role in the Israeli national security strategy and deterrence concept. For this reason, current Israeli defense preparations accommodate scenarios of potential conflict with the use of Iranian-made missiles – be it a direct confrontation with Iran or non-state and sub-state organizations that receive supplies from Tehran. At the same time, the short-range rocket threat from the Gaza Strip remains the main factor of the accelerated development of the missile defense system’s lowest tier.

The multi-tier anti-missile system can be seen as the core of the Israeli active defense concept.⁵⁷ It also contributes to passive defense, especially the early warning system linked to the radars of each rocket and missile defense platform. The ability to detect most incoming projectiles allows the operators to activate alarms and provide the inhabitants of an attacked area with enough time to find shelter.⁵⁸ It should be acknowledged that the Israeli national missile defense concept has been designed not only to defend against an actual attack, but also to deter potential adversaries. According to the Middle East and North Africa analyst, I. Sipperco, current Israeli missile defense “provides an effective second layer of strategic deterrence after the powerful threat of disproportionate retaliation.”⁵⁹ It is arguable if the missile defense system has any significant impact on deterring non-state actors (terrorist organizations in particular), but it definitely plays an important role in deterring regional state opponents from ballistic missile attacks against Israel.⁶⁰ It should also be emphasized that the development of national missile defense architecture has noticeable impact on the civilian population and psychological wellbeing of the inhabitants residing in the areas most affected by short-range rocket fire. Regardless of actual effectiveness of each missile defense system, they do contribute to national resilience and grant people at least a basic feeling of security.⁶¹ An interesting insight into this aspect of Iron

54 J. Nagel, J. Schanzer, op. cit., p. 5.

55 S. Maślanka, op. cit., pp. 129–135.

56 U. Rubin, *Iranian Missiles and Its Evolving “Rings of Fire,”* Begin-Sadat Center for Strategic Studies, Ramat Gan 2020, p. 10.

57 J. Nagel, J. Schanzer, op. cit., p. 4; M. Finkel, Y. Friedman, D. Preisler-Swery, *Active Defense as the Fourth Pillar of the Israeli Security Concept – The Lesson from Operation Protective Edge,* “The DADO Center Journal” 2015, Vol. 4, p. 145.

58 J. Zych, op. cit., pp. 76–77.

59 I. Sipperco, *Shield of David: The Promise of Israeli National Missile Defense,* “Middle East Policy” 2010 Vol. 17(2), p. 136.

60 M. Czajkowski, op. cit., p. 150.

61 J. Nagel, J. Schanzer, op. cit., p. 5; J.L. Saaman, op. cit., p. 29.

Dome deployment has been presented by E. Lahav, S. Shahrabani and U. Benzion, whose survey proved the correlation between positive attitude towards the interception system and reduction of perceived risk among Israeli citizens.⁶² Last but not least, missile and rocket defense measures have remarkably reduced the cost of damage caused by the projectiles fired from the Gaza Strip over the last years. According to the calculations presented by J. Nagel and J. Schanzer, overall economic damage before the Iron Dome went operational was six to ten times greater than after the system was deployed, even though the number of rockets in the analyzed periods was similar.⁶³

Conclusions

Israel remains one of the few countries whose missile defense system has not only been tested in combat, but the use of which has become an almost daily part of life. Therefore, it can serve as a valuable case study of modern missile defense development. As the analysis above shows, the Israeli missile defense concept has evolved along with the changing security environment. The main directions of the national missile defense development have been determined by the emerging threats as well as the long-term strategy, adopted after the first ballistic missile strike against Israeli cities in 1991. The multi-tiered missile defense architecture, consisting of Arrow-2, Arrow-3, David's Sling and Iron Dome, provides Israel with solid defense against short, medium and long-range missile threats. If the Iron Beam laser weapon project is finalized, it will fill the last remaining gap in the system and the "shield" over Israel will be complete. The study leads to the conclusion that over the last three decades Israel has managed to build technologically advanced, multi-layer anti-missile architecture, which significantly contributes to maintaining the country's qualitative military advantage over its potential adversaries in the region. Doubtlessly, it strengthens Israeli deterrence against hostile states in the Middle East. It can be argued whether it serves the same purpose against non-state actors, especially terrorist organizations, whose modus operandi does not necessarily adhere to the traditional military deterrence logic. Nevertheless, when deterrence fails, the Israeli missile defense provides solid protection for the citizens and infrastructure, as well as the operating military forces. It also enhances public morale, giving the attacked population a feeling of basic security together with civil defense measures. As the cited sources prove, the rapid development of the Israeli national missile defense program is widely considered as one of the most sophisticated in the world, despite its relatively high cost and certain operational limitations. Obviously, it does not provide hermetic security guarantee. However, in the context of the turbulent situation in the region, it appears that investing in multi-layer missile defense is a reasonable response to the threat posed by both state and non-state actors. Thus, the issue of missile defense in the overall Israeli defense concept has to be determined as a key

62 E. Lahav, S. Shahrabani, U. Benzion, *Emotions, Risk Perceptions and Precautionary Actions of Citizens During a Military Operation Using a New Defence Technology: The Israeli Case of the Iron Dome*, "Defence and Peace Economics" 2018, Vol. 30, No. 6, p. 6.

63 J. Nagel, J. Schanzer, op. cit., p. 3.

factor. The case of Israeli missile defense constitutes valuable research material, both in the field of security studies and political sciences. The concept and individual elements of the system are still in development, therefore it will be worth to observe and analyze them in the following years. ■

STRESZCZENIE:

W ostatnich trzech dekadach izraelska koncepcja obrony przeciwrakietowej dynamicznie ewoluowała wraz z pojawianiem się nowych zagrożeń. W wyniku realizacji długoterminowej strategii, przyjętej na początku lat dziewięćdziesiątych XX wieku, współczesna obrona przeciwrakietowa Izraela zyskała formę złożonego, wielopoziomowego systemu, ukierunkowanego na zaspokojenie unikalnych potrzeb bezpieczeństwa tego kraju.

W artykule określono główne kierunki rozwoju izraelskiej koncepcji obrony przeciwrakietowej, a także wskazano kluczowe elementy architektury obrony przeciwrakietowej oraz ich rolę w szerszej strategii obrony Izraela. Z wykorzystaniem teoretycznych metod badawczych przeanalizowano okres od 1991 do 2020 roku, aby prześledzić rozwój nowych systemów obrony przeciwrakietowej oraz ewolucję izraelskiego podejścia do tego zagadnienia w kontekście zmieniającej się sytuacji międzynarodowej.

Wyniki analizy prowadzą do konkluzji, że kompleksowa tarcza antyrakietowa, składająca się z systemów Arrow-2, Arrow-3, David's Sling i Iron Dome, zapewnia Izraelowi coraz skuteczniejszą obronę przed rakietami krótkiego, średniego i dalekiego zasięgu, a w toku dalszego rozwoju może stać się jednym z najbardziej zaawansowanych systemów obrony przeciwrakietowej na świecie.

SŁOWA KLUCZOWE

Izrael, obrona przeciwrakietowa, Iron Dome, David's Sling, Arrow

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Article history: Received: 11.06.2020; Reviewed: 30.06.2020; Accepted: 10.09.2020

DOI: DOI: 10.5604/01.3001.0014.4757

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Cite this article as: Zych J., MA, "The development of the Israeli national missile defense concept". *bellona quart.* 2020(2): 75–88

Policy: The content of the journal is circulated on the basis of the Open Access which means free and limitless access to scientific data.

Competing interests: The authors declare that they have no competing interests.

Table of content URL: <https://kwartalnikbellona.com/issue/12943>

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