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Israeli Anti-ballistic Missile and Counter-rocket Systems: Architecture and Operational Record

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Threatened by potential missile and rocket attacks from various locations, Israel developed its indigenous anti-ballistic missile and counter-rocket systems. Their importance to military strategy and place in the budget of Israel is growing. As a leading country in this area, Israel is an attractive partner for NATO countries, and its experience may also be applicable to the Arab countries of the Gulf. Poland should also take a closer look at the political, military and industrial opportunities for cooperation with Israel on these systems.

Israeli Experiences. In 1990 during Operation Desert Storm, Israel became the target of ballistic missiles for the first time. The U.S. then deployed several batteries of Patriot missiles (PAC-1) in Israel to defend it against Iraqi Scud attacks. Unsatisfied with the effectiveness of the Patriots, Israel decided to develop its own missile defence system, foreseen as "multilayered" (able to intercept missiles of various ranges and at different altitudes) and inter-operational with the American systems. In parallel to the projected ballistic missile threats, Israel developed and further tested radars and modifications of its Arrow-1 (Hetz-1 in Hebrew) ballistic missile system since 1990 and its Arrow-2 (Hetz-II) system since 1995.

Similar to the U.S., two schools of thought about ballistic missiles and tactical rockets formed in the 1990s in Israel. Critics and sceptics have questioned the sense of an "Israeli shield" on the basis of strategic and economic arguments as a potential enemy would always attempt to increase its advantage by launching more missiles or rockets, thus investments in a modern offensive arsenal was a better option for them than developing defensive systems. On the other hand, proponents of the defensive systems stressed the growing range of ballistic missiles and progress in Iran's nuclear programme. With Israel's lack of "strategic depth" and inadequate missile defence, the threat would become serious not only to its civil population and economy but also to its strategic forces. In the view of the second camp, an effective ballistic missile defence system would enhance Israeli nuclear deterrence and guarantee an adequate response to a nuclear ballistic missile strike by Iran or some other country in the region that might develop such an arsenal.

In the previous decade, supporters of plans for an indigenous "multilayered shield" gained the advantage amongst Israeli experts and decision-makers. At the same time, Iran became the main supplier of light missiles and tactical rockets for non-state groups hostile to Israel. During the conflict between Israel and Lebanon-based Hezbollah in 2006, this militia fired more than 4,300 rockets and missiles, which killed 53 Israelis and paralysed the country and its economy. During Operation Cast Lead in 2008, Hamas, based in the Gaza Strip, fired 3,200 rockets and Israel lost 13 soldiers and civilians. Israel's response was to accelerate the development of the Iron Dome counter-rocket and anti-missile system. A successful test of the system took place during Operation Pillar of Defence in November 2012. In this case, Hamas fired more than 1,500 rockets and missiles, but only a third of them targeted urban areas in Israel. Almost 500 "smart" missiles were launched by Iron Dome and destroyed 421 Palestinian rockets, i.e., the effectiveness level was about 80-90% and Israel was perceived as the victorious side, as only 5 soldiers and civilians were killed during that conflict.

Elements of the Israeli Missile and Rocket Shield. Anti-ballistic missile and counter-rocket systems gained importance in Israel's defence budget, though the majority of their development has come with help and been financed by the U.S. Almost $440 million from the American's annual $3 billion in total military assistance to Israel have been dedicated to research and development and deployment of various systems. Each system is either independent of or an element of a sophisticated air, missile and rocket "shield" over the country.

The Arrow-3 (Super Arrow) system, tested since 2011 and foreseen for military service in 2014, is dedicated for use against Iranian Shahab-3 and Sajjil-2 medium-range ballistic missiles in the exoatmosphere. Super Arrow is based on the newest generation of interceptor missiles and satellite early warning systems as well as American TPY-2 X-Band radar. The older Arrow-2 system, in service from 2000, is also designed for the interception of medium-range ballistic missiles, though in the last phase of the warhead's trajectory. In the newest configuration it will replace the Arrow-1 prototype and augment Arrow-3, so it should increase Israel's survivability if under attack by a few dozen Iranian missiles (with or without nuclear warheads). Currently, Israel has deployed two Arrow-2 batteries and is negotiating the export of this system to India and the Republic of Korea.

Israel is also using the American Patriot (PAC-2 and PAC-3) systems designed for protection from attacks by Scud or Shahab missiles and UAVs from Syria and Lebanon. This layer of the shield is based on six Israeli batteries with PAC missiles and radar used by the Arrow batteries. Israel is also regularly exercising the interoperability of its own batteries with the American PAC batteries, as well as with U.S. Navy Aegis ships. The system called David's Sling is planned to enter service in 2013/2014, and is foreseen to fulfil the space between the PACs and Iron Dome. It will provide a defence of Israel against attacks by Scud missiles, cruise missiles or heavy short-range rockets (200–250 km), especially those launched from Lebanon or Syria. Lastly, Iron Dome is designed for defence against rockets with ranges of 70–200 km, especially rockets fired from areas across the border in Lebanon or from the Gaza Strip. It is based on radar, command-and-control and rocket interceptors, capable of monitoring more than 1,000 rockets per minute, selecting the most dangerous among them and responding. Initially, 4–5 Iron Dome batteries were foreseen as protection for military bases, but pressure from the public expanded those plans to 13 batteries in total, covering and protecting the main cities of Israel.

Israel is also studying other types of very short-range counter-rocket and anti-mortar defences. Among future options are laser systems, but these projects are still extremely expensive, so priority has been given to more Iron Dome batteries. However, laser systems have not been excluded in the future, when they became cheaper and more capable to augment the shield. Another important element of the shield is an effective civil defence capable of early warning and evacuations. Civil defence in synergy with the shield system is able to minimise injury to the civilian population and damage to infrastructure.

Conclusions and Recommendations. The country's experience with Iraqi Scuds, the progress of Iran's ballistic missile programmes and asymmetrical conflicts have been increasing the role of anti-ballistic missile and counter-rocket defences in the strategy of Israel. The effectiveness of the Iron Dome tactical system in the last clash between Israel and Hamas contrast with the lack of this kind of defence in previous conflicts. Israel is now prepared for attacks that use various types of missiles and rockets, though there is no guarantee of defence against massive salvos or simultaneous, coordinated attacks.

Not only is Israel a leading country with regards to anti-ballistic defence and counter-rocket technology but it also has developed unique expertise concerning the strategy and tactics of using such systems. Moreover, the unique architecture of Israel's anti-ballistic missile and counter-rocket systems allows for an elastic reaction to threats: not only deterrence and defence *sui generis* but also preventive and pre-emptive military options under the umbrella of these systems. For these reasons Poland, which is seeking its own air and missile defence system, should take a closer look at the opportunities for closer cooperation with Israel. Regardless of whether it analyses the potential acquisition of the Israeli systems, enters into research-and-development cooperation, or inquires into the legal aspects of transfers of U.S.-Israeli technologies, Poland should also examine the prospects for bilateral military cooperation. The latter might include lessons learned from operational use of such systems.

Unlike Israel, the Arab countries of the Persian Gulf are not prepared for missile and rocket attacks. The nearest neighbours of Iran also lack of counter-rocket systems similar to Iron Dome. Those countries should work out gaps in their capabilities for defence against Iranian ballistic missile attacks. Arab countries should give priority to full interoperability of their national PAC and THAAD batteries with USCENTCOM systems. That might suggest also the need for greater mobility of the American systems and more intensive exercises involving the U.S. and NATO and Arab partners. More restrictions are needed to block the technological progress of Iran and Iranian missile and rocket proliferation, including via more tight sanctions by the UN and EU as well as through cooperation in the implementation of UNSC Resolution No 1540.