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## Abstract

Israel has a 30-year tradition of space activity developing, operating, and launching satellites into space. As a small country, Israel enhances its power through space in ways otherwise not possible. This opportunity is accompanied by significant challenges, especially in maintaining the qualitative gap and preserving Israel's position at the forefront of technology, as well as securing the space environment. The significance of space in Israel's strategic

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conception shapes Israel's perspective on space security. This chapter provides a short overview of the Israeli space program, outlines Israel's strategic conception focusing on the role of its space program, analyzes Israel's approach to space security, and outlines current challenges and opportunities space presents for Israel.

*Presence in space essential to us... and I am convinced that we must establish this as an objective to which we must aspire. (Mofaz S (2003) Lecture at the conference, A new security paradigm. Yuval Neeman Workshop for Science, Technology and Security, Tel Aviv University)  
Defense Minister, Major General (Res.) Shaul Mofaz 2003.*

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## 28.1 Introduction

In the early 1980s in order to fulfill acute security needs, Israel embarked on an ambitious space program, which placed it among the group of states which are capable of self production, maintenance, and control of satellites and launchers. Having an indigenous national space, capability is part of Israel's national security strategy. As a traditional spacefaring nation and a sophisticated producer and user of space technologies and applications, Israel attributes great importance to securing the space environment for peaceful uses for all nations.

Looking back 30 years, the overall space activity of Israel is much broader than national security activity. In the 1990s Israel commercialized its space activity. It has a robust commercial space industry, alongside a strong scientific sector. Nevertheless, this chapter analyzes Israel's security needs and overall approach to space security. Israel's approach to space security may be described as threefold: (1) developing and maintaining self-sufficiency in niche technologies and applications important to Israel's strategic needs, (2) protecting its systems and capabilities, and (3) securing the space environment for all users.

The main body of the chapter is composed of five sections. The first section depicts the overall Israeli approach to space. The second section provides a short overview of the Israeli space program. The third section outlines Israel's strategic conception focusing on the role of its space program. In the fourth section the authors analyze Israel's approach to space security. The fifth section outlines challenges and opportunities space presents for Israel.

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## 28.2 Israel's Pragmatic Approach to Space

Israel's approach towards space and space security emerges primarily from its position in the regional and global systems. As a small and threatened country, Israel strives to secure and assure its national security, as well as achieve a lofty position (especially in its region).

Israel's need to relate to a broad circle of states which surround it, beyond its immediate neighbors, and its national and security interests demand an orientation towards space. As a small country, Israel suffers from an acute lack of resources. For these reasons, the country manifests a pragmatic approach to space power, aimed to satisfy national security needs. Generally, these consist of the capability to reach distant threats from an intelligence and operational point of view. This mainly involves early warning, intelligence, deterrence, and self-reliance in advanced technologies.

Israel seeks a presence in space and regional dominance in space in niche areas: Earth observation (i.e., lightweight satellites, high resolution electro-optic, and SAR), low-Earth orbit (LEO) launch capability, and communications. Israel does not undertake to build all systems entirely on its own. It has, for example, no navigation or weather systems and has no manned mission. However, Israel seeks to cooperate with international partners on projects of this nature, as well as scientific projects.

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### **28.3 Israel's Space Program: Evolution and Overview**

In the last 30 years, Israel developed a highly advanced space industry and indigenous infrastructure of space technology in two main niche areas: Earth observation and communications, including the ground segment of communications satellites.

The major impetus leading to the decision to embark on an independent Israeli space program was the 1979 Egypt-Israel Peace Treaty, and the perceived need to protect Israel, including through the need to verify Egypt's compliance with the treaty. The agreement, signed in 1979, did not neutralize Israel's concerns of hostile Egyptian aspirations. There was a clear need for intelligence on what was happening in Egypt without violating its sovereignty. It was determined that independent operation of a reconnaissance satellite would provide the optimal solution to this operational problem. In 1981, the Israeli space program was established out of a pragmatic approach aimed to satisfy national security needs of early warning, deterrence, and self-reliance in advanced technologies.

In 1988, the first satellite – Ofeq-1 – was successfully launched. Two years later, Israel launched Ofeq-2. In 1995, Ofeq-3, the first operational electro-optic reconnaissance satellite, was put in orbit. In the years that had come, Israel successfully put in orbit several more Ofeq series satellite (5, 7, and 9). In 2008, Israel launched TECSAR, a sophisticated lightweight synthetic-aperture radar [SAR] satellite.

In the 1990s, besides its national space expertise, Israel developed commercial satellites (Amos communication satellite series, EROS remote sensing electro-optical series), subsystems, and other equipment. In the next few years, Israel is expected to launch several more satellites of different payloads including hyperspectral and a nanosatellite, which will be used to demonstrate new technology capabilities.

## 28.4 Israel's National Security Strategy and the Role of Its Space Program

Israel has built its strength in space in accordance with priorities that correspond to its national and security needs. Understanding Israel's perception of space and of space security demands an analysis of Israel's strategic conception, especially in relation to space.

### 28.4.1 Israel's Strategic Conception

Israel has no official publication that presents its security doctrine and grand strategy. The only officially adopted document is an "Overview" written in 1953 by David Ben-Gurion, Israel's first Prime Minister (Ben-Gurion 1981; Ben Israel 2001). Ben-Gurion's report (originally 46 pages long) was submitted to the government on October 18, 1953. In this overview, Ben-Gurion evaluates and analyzes the geostrategic facts, challenges, and threats faced by the young State of Israel, which was established 5 years earlier in 1948. Ben-Gurion also provides principles of addressing these threats and challenges.

A fundamental part of Israel's security doctrine is the concept that because Israel's independence was not recognized by its neighbors, the country might go through many "rounds" of warfare, and cannot afford to lose even one. The doctrine has always been based on three principles: deterrence, early warning, and decisive victory.

The first and foremost principle of Israel's doctrine is to deter war, and if deterrence fails, to bring the battle to a rapid and clear conclusion, by destroying the attacking forces on the adversary's territory. For this reason and due to the overwhelming numerical and geographical inferiority of Israel, assuring early warning intelligence is vital for Israel's national security. Decisive victory is necessary to keep wars brief and to develop aggregate deterrence over the course of many "rounds" of conflict. In order to deter war or low-intensity conflicts, Israel projects an image of a capable force that will retaliate disproportionately. This strategic posture is often misunderstood, and Israeli military reaction is often accused of applying "excess" force.

Although 60 years have passed, many of the threats and challenges described and analyzed by Ben-Gurion, including some of the methods of mitigation, remain relevant today. Nevertheless, over the years there were several attempts to update the national security policy and formalize it. The most recent one took place in 2004–2006 by a committee headed by Dan Meridor, appointed by then PM Ariel Sharon and Defense Minister Shaul Mofaz. Given the rise of rocket and terrorism threats in the last two decades, the Meridor committee suggested an additional fourth dimension – "civilian defense."

Under these conditions and principles, national space capabilities and infrastructure for military and civilian applications are perceived as force multipliers boosting Israel's technological advantage, which allows it to enhance military

capabilities. These capabilities also contribute to a number of nonmilitary fields. This, in turn, enables the country to increase its level of national security and strengthen its status in the region. Hence, a strong state-of-the-art space program is highly important to Israel's national security. Nonetheless, as explained above, Israel's limited resources dictate that it must concentrate on those fields that are critical.

The following statement by Major General (Ret.) David Ivry, former Air Force Commander (1977–1982), provides valuable insight into the role of the Israeli space program in Israel's deterrence strategy:

The perception of one's capabilities and one's willingness to use those capabilities are important components of deterrence. The perception of space capabilities is one of the primary components in Israel's future deterrence. Therefore, Ofeq 1, 2, and 3 contributed far more than anyone estimated. Imaging resolution is not the strategic measurement. Rather, the strategic measurement is the perception of capabilities that the State of Israel displays. Not what we possess, but rather what the enemy estimates that we possess. The gaps in capabilities and information, in the tactical field, miniaturization field, and others are an immeasurably important component in the dimension of our strategic deterrence.

The next section delves into the principles of Israel's national security conception and analyzes the role of space.

### **28.4.2 Quality Over Quantity**

The basic principle of Israel's national security concept is that Israel must balance its numerical inferiority by creating and maintaining a qualitative edge in all civilian and military realms: education provided to citizens, expertise of scientists, the level of research and development, the quality of weapons systems, and strong motivation among the military cadres. In particular, investments in science and technology are central factors in the power equation between Israel and its neighbors.

The "Quality over Quantity" concept has remained valid throughout the years and is applied to all aspects of Israel's security doctrine. So far, it has been proven successful in countering conventional wars, terrorism, and low-intensity conflicts. This concept also plays a role in the development of Israel's space capabilities.

### **28.4.3 The Need for Self-Reliance in Space**

Israel is an isolated country which suffers severe security problems that are intensified by a long history of wars, acts of terror, and atrocities that date long before the state was established in 1948. Analyzing its problems, interests, and objectives, Israeli decision-makers reached the conclusion that self-reliance, especially in science and technology, is needed in order to achieve qualitative

superiority over its adversaries.<sup>1</sup> The same rationale was applied in embarking on a space program. Israeli decision-makers aspired to have the capability without having to rely on other nations or consider potential pressure. Furthermore, the internationally acknowledged norm in which having a national space capability is a means, and a symbol of, power, had also played a role (at least partially), in Israel's decision to access and utilize space using its own launchers and satellites (Paikowsky 2009b).

The following statement by IDF Colonel Eli Polak testifies to the importance of indigenous Israeli satellites: "Satellites" products enable a better understanding of the intelligence picture, provide combat support, and aid decision-making at high political level. It is not possible to describe a conflict scenario today without Blue-and-White (i.e., 100 % Israeli) satellite intelligence (Blizovsky 2009).

#### **28.4.4 Strategic Depth**

Israel's narrow borders constitute a lack of strategic depth and have posed existential threats which necessitated a search for solutions to avoid the elements of strategic surprise and sudden attack. For these reasons, Israel's security doctrine demands advanced intelligence capabilities for early warning; as well as combat capabilities for a rapid transfer of battle away from Israel's population centers to enemy territory. The orientation towards space assists Israel in coping with the challenges presented by the lack of *strategic depth*.

The opportunity to observe enemy territory from space is a scientific and technological solution to the military problem which Israel faces. Observation from space enables Israel to cope with threats from Arab countries directly bordering the country, as well as those that threaten Israel but are located farther away geographically. At the 2010 Ilan Ramon Space Conference, the then IDF Air Force Commander Major General Ido Nechushtan pointed out the advantage provided by Israel's space program regarding the lack of strategic depth, and said space is a force multiplier that provides Israel with a strategic depth crucial to its national security (Nechushtan 2010).

#### **28.4.5 Improving Intelligence Capabilities for Near and Distant Arenas**

Satellite-derived intelligence information is considered to be a great equalizer in strategic terms because it increases transparency among states and diminishes the sense of uncertainty, thus reducing the risk of surprise. Use of satellites, therefore,

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<sup>1</sup>For more information on the history of the Israeli space program and the motivation of Israel to embark on an indigenous capability, see Paikowsky (2009)

reduces the fear of surprise, increases the level of security, and permits the building and preservation of relations based on trust (Shafir 2004).

In this context, in recent years Israel has been witnessing a worrying expansion of Iranian military activity. Iran has pushed forward with ballistic missile development, space capabilities, and most notably a nuclear weapons program. Additionally, Iran actively engages in ground-based satellite disruptions. Satellite imagery and analysis have played an essential role in the international community's awareness and response regarding the above referenced Iranian programs. Despite increasing international condemnation, these activities have continued and serve to emphasize the importance of protecting space assets from attacks, as well as making use of space assets to detect and deter attacks.

In Israel's strategic thinking, the Israeli space program is recognized as a critical component of its independent intelligence capability. The issue of Israel's self-sufficiency is a complex one. Israel is far from being totally self-reliant; it depends on American political support in international forum and economic aid. Nevertheless, in the field of intelligence, Israel has a great deal of autonomy and does not rely on foreign sources for supplying it with intelligence technology.

Possession of independent intelligence capabilities has many implications for Israel beyond the field of intelligence. It enhances the power of the state and the image of Israel in the eyes of its opponents as well as its allies, and increases its flexibility, both from the perspective of its ability to gather information and the resulting autonomy in decision-making. Independent capabilities also permit the country to conceal its areas of interest and to gather information unhindered. To achieve this independence, Israel has been building its space program, especially the capability to develop and launch satellites. The main rationale for this undertaking can be found, for example, in a parliament report published in March 2004. The members of the Steinitz Commission recommended intensifying the development of an Israeli reconnaissance satellite system as infrastructure for long distance Visint intelligence. "This system should be built in such a way that it has the ability to respond to threats to the State of Israel in near and distant 'tiers of threat,' and the capability to track down, identify and monitor technological, industrial and military infrastructures" (Knesset Foreign Policy and Security Subcommittee 2004).

#### **28.4.6 Space, Military Doctrine, and Force Buildup**

Having a presence in space is part of the fundamental components of the military doctrine Israel adopted in the last two decades. This doctrine draws from the American military doctrine known as Revolution in Military Affairs (RMA), which was developed in the early 1990s. RMA has four facets: control of space, dominant maneuver, information warfare, and precision strike. Space plays an important role in each of these areas (Ben Israel 2004; Paikowsky 2005): intelligence, deterrence, navigation and guidance, communications (shortening sensor-shooter

loops among the forces), command and control, meteorology, and media. Israel's space program plays an important role in the military doctrine, both in practice and conceptually.

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## **28.5 Space: An Opportunity and a Challenge**

The description of a rationale for Israel's engagement in space activities provided above reveals that Israel (which operates a successful space program on a modest budget) views space as a significant opportunity, especially as a force multiplier projecting the quality of force over its quantity. In the era of the information revolution and the expansion into space (which is an integral part of this process), quantity and mass of ORBAT (order of battle) no longer play such a big role. Israel, as a small country that exploits its features, opportunities, and capabilities, can enhance its power through space in ways it otherwise not possible.

This opportunity is accompanied by significant challenges, especially in maintaining the qualitative gap and preserving Israel's position at the forefront of technology. The significance of space in Israel's strategic conception shapes Israel's perspective on space security.

Israel perceives space as a global commons and therefore aspires to contribute to a secure and sustainable space environment. Israel acknowledges the worldwide use of space for supporting terrestrial military activity, as well as defending, and deterring harmful actions, against space systems. Nevertheless, it seeks greater international collaboration and cooperation, especially among democratic spacefaring nations, in maintaining space as a peaceful environment for the benefit of all.

### **28.5.1 A Growing Reliance on Space and the Sensitivity to Space Sustainability**

The increasing reliance on space-based systems for day-to-day activities on Earth, along with the global trend of a growing use of space for military activities, increases the vulnerability of the space domain to hazards and harmful activities. Space is becoming more congested and competitive. The growing number of space security incidents has led nations to find methods of ensuring their access to space, their freedom of action, as well as proper functioning of their assets there. For example, a growing number of nations now seek to develop space situational awareness (SSA) capabilities and debris removal (DR) capabilities. Improved international SSA capabilities and DR capabilities may have a positive effect on the sustainability of outer space because they would increase transparency. If shared, these systems could also upgrade confidence in the international community, as they would enable better prediction, and prevention, of harmful interference with space assets. Nevertheless, these new developing concepts could also be used



for negating the use of satellites. This could have dangerous implications for the space environment.<sup>2</sup> Many spacefaring nations are concerned with these trends, including Israel. Similar to other spacefaring nations which use and appreciate space, Israel too is gradually becoming more reliant on its space activity for day-to-day life. But together with the reliance on space comes the sensitivity to its sustainability and security.

Israel enjoys and suffers from a growing reliance on space systems for its critical national infrastructure. For this reason, it is concerned about the growing global trend of space militarization. Such threats, if realized, could lead to Israel losing its current relative advantages in the realm of space. Therefore, Israel is looking for ways to protect its satellites and achieve a sustainable space environment.

Due to the lack of officially released statements and policy papers on this topic in Israel, an important source of information on Israeli space policy is the various conferences and academic events which take place each year. Presentations by high officials of the Israeli space community offer valuable insight into current trends in Israeli space policy. The following statement was made by Commander of the Israeli Air Force, Eliezer Shkedi, at the 2007 Ilan Ramon Annual Space Conference: “the operational importance of space is increasing constantly. Why is this field critical? There exists a concern that others who recognize its importance will try to attack space assets. We must consider defense measures, against physical harm, jamming, blinding, or any other technique. One of the greatest surprises that can happen in the modern world, in advanced countries with space assets, is a situation in which a country is surprised to find its space assets damaged. This kind of damage can be caused by an enemy nation or a terrorist organization. I suggest that none of us close our eyes, to understand that this is the reality and to confront the situation with eyes wide open. This is a dream scenario for countries that have been left behind by advanced technological capabilities” (Shkedy 2007).

Shkedi’s statement is an example of the growing recognition in Israel of the importance of a sustainable space environment and the need to protect space systems. In his annual presentation at the 2008 Ilan Ramon Space Conference, IAF Commander Shkedi addressed the Chinese ASAT test by saying that “We cannot ignore this issue. The issue of dealing with the expanding space capabilities, combined with the increasing dependence of the modern military on space. . . in my estimation this issue is on ‘our table’ whether we like it or not. To ignore the matter would be very much incorrect. As one who is concerned with operational aspects, and we must be very concerned with operational aspects, we must understand how to develop space assets and how to protect them so that they will be operational when necessary. I say specifically “when necessary” because apparently a limited conflict will present few threats to space capabilities. However, I have no doubt that as the level of conflict rises, or if an enemy feels that the threat to him is very high, one of the issues that he will find himself confronted

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<sup>2</sup>For further discussion of this issue, please see Levi and Dekel (2011)

with will be whether or not to use, or to attempt to use, methods that oppose land, sea, and air assets, and develop such capabilities against space assets. Most likely space conflict will not be a burning issue in the next year. But looking five years ahead, or 10 years ahead, I feel that it will be a very relevant issue.” (Shekedy 2008).

### **28.5.2 Support of the Global Trend to Secure the Space Environment**

Besides the ASAT occurrences of the last few years, there have also been several events of satellite jamming and interference.<sup>3</sup> It is too early to determine whether space weaponization is inevitable, and if the use of ASATs will be internationally accepted as legitimate. Having ASAT technology be part of a country’s space security capability can serve three goals. First, it allows a military to have the capacity for aggressive action against an adversary; second, it provides a capability to defend against hostile activities; third, it may be used for deterrence against potential aggressive actions. The risk is that ASATs for aggressive actions will be developed under the excuse of deterrence and defense reasons.

As long as this trend of a growing military use of space is followed by responsible and cautious actors, it is not a cause for immediate alarm. If these technologies proliferate and fall into the hands of irresponsible actors and rogue states, space may evolve into a dangerously unpredictable arena. This process would have significant implications for the national security of all the “space club” members,<sup>4</sup> including Israel. For this reason, advocates of non-weaponization of space often argue that declarations and actions to develop ASAT capabilities increase the potential for a space arms race (Milowicki and Johnson-Freese 2008).

A different approach, based on the democratic peace theory, in which democracies rarely go to war with one another, suggests that democratic nations involved in space security actions and ASAT capability development will not act against one another. For this reason, their aspirations and actions should not be perceived by other democratic and responsible nations as threatening actions. Democratic nations, such as Israel, should not be overly concerned by other democratic nations developing such capabilities. It is in this context that Israel supports efforts of other democratic and reliable allied countries to develop space security capabilities.<sup>5</sup>

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<sup>3</sup>An important example is the case of Iran’s satellite jamming activity against BBC broadcasts, which was widely criticized and condemned by leading European Union countries and the UN-ITU. Theodoulou M Tehran told to end satellite jamming. *The National*. <http://www.thenational.ae/apps/pbcs.dll/article?AID=/20100322/FOREIGN/703219849/1002/FOREIGN>. Accessed 22 March 2010.

<sup>4</sup>For a definition and discussion of the nature of the space club, see Paikowsky (2009) and Paikowsky (2009)

<sup>5</sup>For a more detailed discussion, see Paikowsky and Ben-Israel (2011)

The democratic peace theory is based on the philosophical idea of Immanuel Kant in his book *Perpetual Peace* (1795). In the discipline of international relations, this idea has been examined since the 1960s and even empirically tested by several scholars in the 1990s.

As a spacefaring nation that utilizes space assets on a daily basis in the defense field, and even more in the civilian and commercial fields, Israel is interested in a space environment that is safe and secure, expects other countries to act responsibly in space, and will act in cooperation to achieve this goal.

Recent years have seen a number of international initiatives and agreements being advanced by countries interested in space sustainability. The European Union proposed an Outer Space Code of Conduct.<sup>6</sup> Russia and China have suggested the draft treaty on prevention of placement of weapons in space (PPWT).<sup>7</sup> In 2008, the UN passed a series of guidelines for debris mitigation (UN Debris Mitigation Guidelines). Years before these proposals, a resolution calling for the prevention of an arms race in outer space (PAROS) has been debated within the UN Conference on Disarmament. The United States and Israel oppose PAROS.

The United States is concerned with the binding nature of such proposals. It is especially concerned with the lack of transparency and enforcement that would enable irresponsible countries and actors to take advantage of those abiding by the treaties. This could result in responsible actors losing their relative advantage, their freedom of action in space, and their ability to defend their space assets. Therefore, the United States supports non-binding agreements which would serve as confidence building measures.

Israel favorably views these legally non-binding efforts towards space sustainability. In Israel there is an understanding and belief in the need for international cooperation to ensure that space remains accessible and sustainable for the future.

### **28.5.3 An Emerging Threat: Space and Cyberspace Security**

The growing dependence of the global economy on space systems creates a common concern regarding debris and other threats in the space environment which threaten space systems. As part of this process, recognition is gradually increasing that physical damage to satellites is not worthwhile and should be avoided because it may damage other satellites indiscriminately. Additionally, the likelihood of soft interference in the operation of space systems by jamming or cyber attacks is rising. This was also recognized by many in Israel who perceive a direct link between cyber threats (Levi and Dekel 2011; Levi and Dekel 2012) and assuring the security and safety of space systems (Ben-Israel 2012).

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<sup>6</sup>For the updated version of the European initiative of the Outer Space Code of Conduct (2012)

<sup>7</sup>For more information on the PPWT

## 28.6 Conclusions

Israel's space program was launched in response to national security needs. Over the years, with Israel's development and evolution as a country, its needs and capabilities have also evolved. Today, Israel has commercial, scientific, and civilian space assets and is expanding its involvement in international space cooperation. These developments, combined with increasing reliance on space for day-to-day activities and the nation's continuing security issues, make space security a concern for Israel.

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