



Report

Technology foresight in practice: A proposal for Turkish space vision



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ABSTRACT

We are witnessing a fundamental change in the perception of space-related issues. Once a symbol of technological competition between opposing political systems, space activities have become a part of everyday life and an indispensable means for states to achieve economic, scientific, political and social goals. This Report addresses the space activities of Turkey, a latecomer to space challenge but a country rapidly progressing in this field. In this context, major space-related policies and projects are first discussed. The current status of the Turkish space industry is then defined through SWOT analysis (strengths, weaknesses, opportunities, threats). The analysis is informed by a May 2012 workshop was held in Turkey at the Defense Sciences Institute, which brought together a range of interested actors to discuss Turkey's space policy. The workshop was followed up six months later with a survey of a larger group of participants. This Report lays out the findings of these two events, articulating the strengths and weaknesses for Turkey's space aspirations, and also a proposal for the country's future space ambitions. Strategies and policies that will be supportive in achieving the proposed space vision are also introduced.

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1. Introduction

Turkey's early considerations of space activities dates back to the 1990s [1] and space technology has been highlighted as one of the issues (along with informatics, advanced technology materials, biotechnology and nuclear technology) to affect almost all sectors of the economy and all fields of life [1,2]. Despite having been mentioned in political documents several times, not enough public awareness was raised before the large-scale visionary study of Scientific and Technological Research Council of Turkey (TÜBİTAK), which was started in 2002 and is titled The Vision 2023.

Following The Vision 2023, which surveyed space activities in the context of avionics and national defense [3], a much better understanding of the matter was reached, and space studies were defined and documented as a priority area across several different agencies:

- The official gazette no. 25621, dated 22 October 2004 acknowledged the critical role of science culture was legally recognized.
- Soon thereafter, at the 11th meeting of the Supreme Council for Science and Technology (SCST) held on 8 September 2004, it was

decided to prepare an implementation plan on research and development (R&D) projects with 10 years' perspective. In this context, the National Space Research Program was prepared in 2005 [4,5].

- Subsequent to this, in line with the articles 482 and 530 of the 9th Development Plan covering the period of 2007–2013, space technologies were designated as a priority technology area to be supported [6]. In addition, the National Science, Technology and Innovation Strategy for the years 2011–2016 prepared by TÜBİTAK, identifies space among the areas which requires additional momentum for R&D and innovation studies in line with Turkey's geopolitical position and needs [7].
- Furthermore, a chapter in the Development Assessment Reports Decisions Concerning the National Space Research Program (2005/9), which was issued after the 25th SCST meeting held on 15 January 2013, speaks about the decision “to take all measures necessary for realizing the National Space Research Program as a long-term and sustainable state policy with its own budget and roadmap” [8].

The above demonstrates that space is now a widely discussed subject on Turkey's agenda as well as occurring in various policy documents, and considered to be one of the priority technology areas. Nevertheless, despite this general perception, there is a lack of country-wide initiatives that will guide space activities, or even detailed strategic plans on specific sub-technologies to be focused on.

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2. Milestones

Turkey's first small satellite BİLSAT-1 was built together with the SSTL, a company of Surrey University in the UK and launched from Russia on 26 September 2003. The project was carried out by the Space Technologies Research Institute (TÜBİTAK UZAY), a TÜBİTAK affiliate. BİLSAT, whose major function was remote sensing, also had a limited communication capacity as well. The participation of a team of engineers and technicians in the BİLSAT manufacturing process provided for technology transfer on small satellites. As such, the necessary infrastructure composed of clean rooms for satellite design and manufacturing, prototype laboratories, testing laboratories and office design was established. Also, an earth station was set up at TÜBİTAK UZAY for operational purposes of the satellite.

The second satellite built by using the technology transferred in the development process of BİLSAT-1 is RASAT. Launched from Russia on 17 August 2011, it was financed by the State Planning Organization (SPO) and developed by TÜBİTAK UZAY. While the tender for the satellite's imaging system was granted to South Korea's Satrect Initiative Company, it is the first earth observation satellite designed and manufactured in Turkey that also includes modules developed by Turkish engineers.

In light of the need for more advanced observation satellites to be used for image procurement mainly for civilian purposes as well as national security objectives, Turkey has started the GÖKTÜRK-1 Project. The GÖKTÜRK-2 Project was then initiated by the Turkish government, after several international issues contributed to the failure to achieve the expected progress in the observation specifications of GÖKTÜRK-1.

Started under the coordination of the Turkish Ministry of National Defence, GÖKTÜRK-2 was developed by TÜBİTAK UZAY and TAI using TÜBİTAK resources [9], and launched from China on 18 December 2012 (thus achieving launch even before the former project GÖKTÜRK-1). The project has contributed to the development of space technologies infrastructure and helped acquire practical experience in the area of satellite design, manufacturing, testing and integration in Turkey.

3. Conceptual framework

Strategic management of space technologies is an important phase in the capacity building efforts of nations [10,11] and what strategic actions to take can best be organized around a synergistic, widely accepted vision that fulfils public prospects. Once the vision statement is reached in consensus, the next step is to take a snapshot of the sector by SWOT analysis, so that an in-depth perception of the sectoral capabilities can pave the way for successful future plans and actions.

3.1. Setting up the vision

A major element of strategic planning is the statement of vision, which puts forth the desired point of destination in the future. The vision is the conceptual expression of the best future status one wants to achieve and the good, successful, realistic, reliable and attractive future of an organization [12,13]. On the other hand, strategic management analyzes what goals should be achieved in order to reach the desired future and the process leading the way to the achievement of these goals [14]. As such, it has been argued that the basic requirement for strategic level planning and management of Turkish space activities is defining the country's space vision.

To define a vision for the country's space activities and engage in a brainstorming activity on space technologies, a workshop was organized in May 2012 at the Defense Sciences Institute. At the workshop myriad actors were consulted, including public and

private sector representatives, members of research centres and academia, and experts.

During the workshop, participants were asked to write down their views – on a separate paper on each round – concerning the desired future for Turkey in the area of space technologies, then the answer sheets were rotated among the participants until all ideas were exhausted. Thus, being given the opportunity to see each other's views, participants were able to make a conceptual pre-evaluation of their own ideas as well as arrive at new ideas not thought of in the first instance, but formed through associating with other participants' views.

In the next stage, all ideas were put on a flip-chart, the data set was narrowed down by grouping together similar opinions, and participants were given free time to vote for the group's combined ideas through a distributed sequence. At this stage, no restrictions were put on the participants other than using a single vote for each idea to prevent any loss of opinions. Setting no limits on the number of ideas experts could vote allowed each group to identify its focus of interest while at the same time ranking the ideas by their level of importance. The highest ranking ideas were translated into national goals set to be achieved in the area of space technologies in the next two decades.

At this point, through the mediators chosen separately from the two groups, two vision statements were organized into a single one. With the consensus of all participants, the space vision for Turkey was specified as follows: "To be among the top ten countries integrated within the global value chain; that has established its complete innovation system in the area of space from basic research to economic value generation, that can launch its own spacecraft and can make the most of space".

3.2. SWOT analysis and the sectoral snapshot

SWOT analysis is a research method developed through strategic management research carried out in Harvard Business School in the 1960s [15]. It requires analysis and assessment of the internal and external conditions of an organization taken up on a micro or macro level. As such, it is an important analytical tool frequently mentioned in the strategic management literature and used by organizations such as universities and public institutions [16] in order to make situational derivations.

In this study, SWOT analysis is used to determine the current status of Turkey in space technologies and is carried out by a survey through January to February 2013 as a follow-up event of the vision workshop. The participants were asked about their views regarding Turkey's strengths and weaknesses in space technologies as well as the existing opportunities and threats. The responses were collected both by mails and face to face interviews, after which the data set was narrowed down by grouping together similar statements in the answers. By checking the frequency of the statements used in the answers, importance ratings were made.

3.2.1. Strengths

Turkey's strengths, which are part of the internal factors' group of space technologies, are shown in Table 1.

According to Table 1, the presence of space technologies among Turkey's strategic technology goals and the supportive role of government in the area of space stands as the most important internal strength. This is followed by the presentation of demands by the demand and supply sides. Thus, the technical criteria for future satellite projects are shaped and new business opportunities for the national space industry are created.

In addition, the country's industry as newly acquainted with space activities, and people working in this area, are gaining not only the know-how that accompanies successful satellite projects

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