

A COMPARATIVE STRATEGIC ANALYSIS OF SPACE TECHNOLOGIES: DEVELOPING A ROADMAP FOR TURKEY

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Abstract

In recent years, space policy is different from the usual strategies. A multipolar, heterogeneous and multipurpose space policy is valid with many new players in addition to US, Russia, European Union and China.

In this frame, the space policy of Turkey has crucial role on becoming more effective in the world. Thus this paper will focus on efficient and suitable strategies for Turkey to become an effective player in space policy. In this manner a roadmap will be discussed for Turkey through space policy and technologies.

Key Words: *Space policy, Turkey, roadmap*

JEL Classification: Z19

1. INTRODUCTION

Space policy has varied with the involvement of developing countries. Many of these developing countries started space activities as requirement of national security and military purposes and later were able to prepare a civilian national space programme. This tendency is not only related to have prestige in space issues but also related to creating an industry in the country and accelerating the economic growth. Space activities create its own industries and also support innovation in related areas. In this paper, as a developing and aiming to become a prestigious country in the world, space policy of Turkey will be discussed.

As known, some countries with successful space policy such as China and Iran started space activities around the purpose of economic growth and space created a specific field in whole economy. As Özalp argues (2009) Turkey started the 21st century making increasing efforts for rapid economic development, social change

and renewal however this process lead to a heavy load on current system; thus Turkey should find new investment areas in order to continue its sustained progress. Space is very appropriate area for Turkey to progress since it has a dynamic structure and open to enhance. However Turkey has not performed seriously in space activities yet. Some of developing countries which have become significant players in space power have started space activities many years ago. For example Brazil formed its national space agency (AEB) in 1996, India formed in 1999 and Iran has established in 2003. Turkey is too late to organise a national space agency, although the formal plan of establishment of Turkish Space Agency is ready, it has not come into operation yet. In this context, Turkey should immediately actualise an appropriate and dynamic national space programme which include space infrastructure and space policy in short and long terms.

In space issue, Turkey has many advantages and disadvantages. First of all, Turkey is situated in a dynamic and complicated region. In the region there are countries like Iran and Israel which have assertive security technologies and space activities. Thus this situation makes more efforts in security and space technologies a must for Turkey. In many cases through the world, space technologies develop as a necessity related to security and military purposes. Turkey should turn these requirements to opportunities in progress of space technologies. Second Turkey has a dynamic and young population which would meet the need of qualified human capital. Turkey also has a large domestic market that accelerates the development of space industry inside. As mentioned in Security, Aeronautics and Space Industry Panel Report of Vision 2023 Document (2003), Turkey has already have some platforms such as TÜBİTAK and SCST to produce science and technology policies thus it can be said that Turkey is not at zero point. And also Turkey has some endeavours to participate into international collaboration in space activities.

However Turkey has significant weaknesses. First of all, lack of management and coordination is a serious objection to put policies into practice. There is not a responsible institution which plan space strategies and control them in application process. Without a well coordinated space strategy, all endeavours do not have effective results and go down the drain. Turkey has also crucial problems in benefiting human capital since current education system does not include sufficient space programmes well enough. There are not enough researchers in space area. Only two percent of all researchers in Turkey are related to astronomy or astrophysics. Brain drain is also crucial challenge in owning qualified human capital. Space projects are mostly far away to create a space industry inside of the

country. Space related projects are mostly dependent on foreign resources and exclude the participation of domestic producers. Another weakness is about insufficient international collaborations in space activities. Turkey has cooperation with ESA but this cooperation is not able to accelerate the space activities enough. In this point, Turkey should consider new partners and new collaborations. Perhaps the most important disadvantage is that Turkish society is lack of space conscious. Firstly, governments and official institutions mostly are not aware of the significance and necessity of a substantial space strategy. Moreover in the society there is no interest and conscious to support space activities. This leads the main problems and timidity in the progress of space activities. These advantages and disadvantages in Turkish space policy are mostly reflection of the main weaknesses and powerful points of science and technology policies mentioned in Security, Aeronautics and Space Industry Panel Report (2003). And systematic solutions and ameliorations towards science and technology policies will advance space policy also.

2. BACKGROUND OF TURKISH SPACE POLICY AND CURRENT SITUATION

The first planning about space started in 1990s. SCST made TÜBİTAK responsible for determining and execution of planning related to space technologies in 1993 with the document of “Turkish Science and Technology Policy 1993-2003”. In 1998 a draft bill of a National Aeronautics and Space Studies Council was prepared by TÜBİTAK. In 2001, drafts of “Establishing a Turkish Space Agency” and “National Space Policy” were prepared by Turkish Air Force. In 2004, space studies were described officially as a “privileged subject”. Moreover in 2004 an agreement was signed by government for cooperation with ESA. In 2005, inside TÜBİTAK to coordinate space activities, “Space Research Group” was established.

One of the main steps is the decision of SCST in 2005 related to “National Space Research Programme”. The preparation of this programme was done in 2003 with the document of Vision 2023 and related document Security, Aeronautics and Space Industry Panel Report of Vision 2023. In this panel report the establishment of National Space Agency, necessity of a National Space Programme, requirement of cooperation with ESA, R&D activities especially on satellite systems, communication bands and launching technologies. Another issue in report is about education for space technologies. Security, Aeronautics and Space Industry Panel Report of Vision 2023 is a significant document since it demonstrates Turkish space strategy in with an integrative perspective with science and

technology vision of Turkey. This document can be accepted as a pioneer and basic strategy of national space programme and it prepares a base for official national space programme.

National Space Research Programme (NSRP) is comprehensive programme shaping main frame of space policy. It includes the period 2005-2014. The programme was accepted with the decisions by SCST in 2005 and has been revised and evaluated each year by SCST since 2005. This is a very crucial development in space field. As Özalp mentioned (2009) two main issues result in this development. One is since 2004 the percentage of R&D expenditures to GDP has risen to 2%; the other one is space research is accepted as privileged area under the custody of Prime Ministry. The programme is shaped around the purposes of development of space industry, increasing research capability with domestic resources, encouragement of researches in space science, development of new technologies and forming a space culture through the society.

The main target of NSRP is cited as “to research space and Earth by considering national interest and next generations”. In that manner, the programme aims to have space culture society, to establish space infrastructure and to launch a observation and discovery satellite to a specific planet via a Turkish rocket system and to catch up the level of China, Brazil, India, US, Russia, England and France in space in ten years. As main strategy, the requirement of supporting the space activities under the responsibility of state is emphasised. Moreover state should support institutions and human capital, creative ideas and incentives for innovative activities. By these attempts all parts of society, private sector, universities, industry, defence, public institutions and society will benefit much.

The main issues in National Space Research Programme are evaluated in SCST meetings and progressing issues are mentioned. In the latest meeting in December 2011, it is seen that projects related to science are mostly in research process. There is only concrete progress in radio telescopes in TUG and establishment of research centres projects. In technology area, gyroscope project is completed and the other projects are on progress. In this area two satellite projects are significant. One of them is the main project of NSRP, GÖKTÜRK 2, an earth observation research and technology demonstration satellite with 2.5m pixel resolution. The project is carried out by the cooperation of TÜBİTAK UZAY and Turkish Aerospace Industries (TAI) and expected to be launched by 2012. The capability tests have been done in France in July 2011. When it is launched, it will be first Turkish design high resolution satellite. Another crucial satellite project is RASAT, the first earth observation satellite designed and manufactured in Turkey.

It was launched from Russia in August 2011 and will approximately last its duty for three years. RASAT is completely designed and tested in Turkey that will lead to promote next satellite projects. In addition to these, Turkey has three European made communication satellites, Turksat 1C (launched in 1996), Turksat 2A (2001) and Turksat 3A (2008), in orbit and provide communication infrastructure.

Another important progress is related to human resources and knowledge area. The NSRP mainly aims to have the necessary human resources for space field. Thus TÜBİTAK firstly put into action a scholarship programme for space education. TÜBİTAK BİDEB 2213 and 2230 scholarship programmes for MSc and PhD degrees at abroad aim to meet expert and researcher needs for space field. These programmes have comprehensive context including space science, technology, management, policy and law. In this context, in the years 2006-2010, 25 students were sent abroad for MSc and PhD degrees. In last two years, 7 students have graduated from these programmes and turned back to Turkey.

One of the aims mentioned in NSRP is to increase the interest in industry and enhance the space related industries. In this context, the departments in universities take crucial roles in this purpose by collaborating with industry. Moreover space research centres are established not only to develop space technologies but also to lay the foundation of space industry in Turkey. TÜBİTAK UZAY (Space Technologies Research Institute), Aerostructure and Space group in TAI, Space Technologies Research Centre in Bilkent (BİLKENT BİLÜZAY), Space Systems Design Laboratory in İTÜ, Radio Astronomy Observatory in Erciyes University, Astrophysics Research Centre in 18 Mart University and the Aeronautics and Space Department in METU are important institutions doing scientific studies related to space.

Turkey has raised its interest for international area. In 2005, the international cooperation was determined as a main area to be developed in national space programme. This title includes three main items: cooperation with ESA, regional collaborations and participation international space organisations. The relations has started with ESA by the agreement between ESA and Turkey about the “Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes” in 2004 and entered into force in 2006. The cooperation agreement has prolonged until 2016 in the latest meeting arranged with ESA in 2010 TÜBİTAK has accepted new partner of UNESCO and ESA common initiative “Space Agencies Open Initiative on Space Technologies to Support the World Heritage Convention” in 2010. Also Turkey has attended UN Committee on the “Peaceful Uses of Outer Space” since 2008. Another significant attempt is the cooperation

agreement signed between TÜBİTAK and ROSCOSMOS in the context of “Exploration and Use of Outer Space for Peaceful Purposes” in 2009. This attempt will lead to further cooperation with Russia. All these international cooperation result Turkey in increasing experiences and knowledge about space and also raise Turkey’s level in space field.

Although the national programme and space strategy of Turkey have weak points and are open to improvement, the existence and pursuance of it seriously are promising for Turkey for a considerable progress in space activities. In the next part, weak points will be evaluated and suggestions for national space policy will be included.

3. CRITICS AND SUGGESTIONS

As discussed Vision 2023 is the main document of Turkey’s science and technology strategy and presents the main road map of economic development and technical progress. As mentioned in this document, in 2005 a national space programme was prepared and the strategies and actions were evaluated and improved in following years. The existence of a main document and control and management mechanism is so significant step for construction a national space policy. Thus National Space Research Programme is a crucial gain for Turkey.

In Turkey space industry is mostly dominated by a few firms such as TAI, Aselsan in defence industry. First of all, projects should be extended to the market by including the SMEs. There are small but R&D based firms in techno parks whose technical capability and adaptability are high. The collaboration of main contractors like TAI, Aselsan with these SMEs should be encouraged. In defence projects these firms mostly collaborate with domestic R&D based firms as subcontractors in ratio of 30% in their production. The Undersecretariat for Defence Industries has forced the main contractors to work with subcontractors since 2007. The goal mentioned in Vision 2023 document is to increase domestic contribution to 60% in defence industry. Similar attempts in space related projects may lead to domestic R&D based SMEs to increase their interests and accelerate the development of space industry in Turkey. Space projects are mostly high budget projects that are mostly be conducted by state. But in terms of procurement of inputs, SMEs will be beneficial. In the Report of TÜSİAD and Sabancı University Competition Forum and National Innovation Initiative (2009), similar precautions and suggestions discussed above are included. They are mainly special R&D budget, support of productive idea, production and marketing strategies, social initiatives to develop infrastructure, university collaborations and international cooperation, usage of risk capital and participation to The

Undersecretariat for Defence Industries' programmes. Another issue that the Report (2009) pointed out is the need of other financial sources to support space infrastructure in Turkey except TÜBİTAK supports. According to the Report, foreign funding in terms of European Union 7th Frame Programme can be good solutions for new financial sources to develop space industry and infrastructure for to reach the targets.

Human capital and knowledge are the obligatory area in the NSRP. TÜBİTAK's scholarships, space research centres, international cooperation in space training are concrete steps to achieve the targets. However creating a space culture and transformation of a society to a knowledge society is a long term project which the results are not seen in short term. In space education Turkey was lagged for years while the assertive countries such as China and Iran started space education for a long time ago. However the goals in space programme will help Turkey close the gap. Education in high schools and space summer schools should become widespread and the interest of children should be raised. The quality and technical ability of astronomy, space and aeronautics departments should be increased. TÜBİTAK BİDEB 2213 and 2230 scholarship programmes should be maintained but especially the precautions against brain drain should be put into action. Researchers, experts should be supported via better social rights and research environment.

International cooperation is another target in the NSRP which has crucial importance in the progress of space activities in Turkey in terms of technical training, industrial relations, space exploration and space science. In policy documents the main partner is pointed as ESA and additionally regional cooperation. As discussed above, Turkey is taking step for cooperation with ESA, participating in international organisations and hosting for their meetings. Of course these endeavours make known Turkey in space field. However Turkey should focus on new partnership in space collaboration by considering the new balance in space power. ESA is a significant partner while considering Turkey's attempt to European Union however in recent years ESA is losing its dominance in the region due to financial constraints and changes in the partnership with the USA. Instead of ESA, Russia is trying to gain back its dominance in space power. Russia is also supporting China, Iran and some other developing countries in technology and knowledge. Space infrastructure in China and Iran have established by the help of Russia and today they maintain the collaboration in space field and become effective in the development of new players. This cooperation will probably make China and Russia more effective in space power considering the power loss of ESA and recent stagnant policy of the USA. Thus

Turkey should maintain the agreements with ROSCOSMOS and look for new partnership with Russia and China.

National Space Programme requires ascendant management initially. As mentioned in Vision 2023 Security, Aeronautics and Space Industry Panel Report (2003), a central responsible institution for space activities to maintain effectively in officially and commercially is required. Before this justification, in 2001, National Security Council had approved the establishment of “Turkish Space Agency”. Moreover regarding to Council of Ministers’ Decision about “in order for all space activities to be directed by a single centre”, a draft was prepared related to establishment of Turkish Space Agency. However there has been no concrete step about the establishment of the agency until 2011. During this period, TÜBİTAK has taken responsibility of space activities and application of the NSRP. In 2011, Ministry of Transportation took action by preparing necessary law to establish Turkish Space Agency. The establishment of agency did not take place almost a decade and this lag can be evaluated as a managerial failure of the system. Although TÜBİTAK’s attempt in space activities are comprehensive and integrated to general science and technology policy, a single central authority focusing on only space activities will be more beneficial on setting space infrastructure and organising space activities in all fields such as defence, industry, education, society and international cooperation. Thus Turkish Space Agency should be privileged target of space policy in short term.

Another significant issue in management of space policy is related to the existence of a control mechanism and accountability. The NSRP has comprehensive and well-designed content however the applicability and actualisation of targets and projects are more important than the content. For example there is an evaluation demonstrating the process of the projects contained in the NSRP in the latest meeting of Supreme Council for Science and Technology and most of the projects are seen as incomplete. Thus a control mechanism has vital role on achievement of the goals of the National Space Programme. In the meetings of Supreme Council for Science and Technology, the progress of the programme is evaluated however these evaluations are made in limited period and not detailed. Lack of accountability and the authority responsible for the process have crucial role on delays of the projects putting into action. Thus establishment of Turkish Space Agency will also fill the gap in this issue

The last issue is about revision of the space programme. Technology changes occur so rapidly that the policies depended on technology should be revised by the time. The space policy of Turkey was mostly constituted in the beginning of

2000s and recent strategies are shaped around those old decisions. For example human space flights were indispensable elements of space policy however today even the USA has finished its human space flight programme. Exploration of space was very crucial for progression of space science and big players had high budget projects on their own however international cooperation comes into prominence for big projects instead of individual endeavours. Therefore, the road map in the NSRP should be revised around the recent developments in space activities. First of all, more rational targets should be identified. For example to target launch a national satellite to Mars via a domestic rocket until 2014 seems to overburden Turkey's space capacity when considering the infrastructural problems. To develop a national launching system and rockets are very high budget projects that as discussed in first part, a few countries have launching technologies. In short term, Turkey should focus on increasing and diversifying satellite capability instead of national launching systems. The NSRP should be reshaped around more emphasis on space industry, training programmes and international cooperation with new partnerships. Space programme should also be enhanced with new fields related to space such as solar energy and space environment.

4. CONCLUSION

Space activities are reshaped with new players recently. Developing countries increase their interest for space and become more effective in space field by establishing national space policies. This attitude accelerates economic growth and brings prestige to developing countries. Big players China and Russia become more assertive while USA has altered its space policy strictly from human space flights towards private sector and international cooperation. Global economic crises and high budget space projects lead countries to collaboration in space instead of individual projects.

In this context Turkey has taken step to constitute a national space policy which has been overdue already. Vision 2023 Project and National Space Research Program are crucial endeavours in this way. Implementation of the programme has vital importance for Turkey on making up for the lost time in space activities. Thus Turkey should speed up the establishment of a central single authority in space field and develop a control mechanism to supervise the actualisation of the policies. By getting involved in international cooperation, improving human resources, generating required infrastructure for space industry and upgrading its current technology, Turkey should become more ascendant and effective in space

policies and activities all around the world. Well designed strategies and persistence in application of policies will help Turkey

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