Iran's Efforts to Conquer Space

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Iran became the forty-third country in the world to own a satellite when the Sinah-1, Iran's first satellite, was launched on October 27, 2005. The Sinah-1 is an important milestone in Iran's efforts to gain space technologies, though the actual significance of the launch is mostly in the prestige Iran gained, since the satellite was developed and launched by foreign contractors. It was carried by a Russian Kosmos-3M space launch vehicle (SLV) that took off from Plesetsk, in northern Russia. In addition to the Iranian satellite, the SLV carried seven satellites for various other states and research organizations.

The history of Iran's space efforts and its drive to pursue independent space projects began during the shah's reign. The main goal in 1977 was to establish an Iranian communications satellite system. In addition, several Iranian organizations were involved in plans to send small research satellites into space that would pave the way for launching a military intelligence-gathering satellite. The Sinah-1 is thus only the first achievement in an ambitious program.

This article will discuss Iran's space activity and examine its implications for Israel and the general strategic balance in the Middle East. The Iranian plan for missile development – both surface-to-surface military missiles and satellite-launching missiles – is not part of this discussion.

The Research Satellite Project

In 1997 there were reports of a Russian-Iranian agreement on the transfer of technology enabling Iran to build its own research satellite. The name of the planned satellite, Mesbah (variously translated as "dawn," "lighthouse," and "flashlight"), was announced in 1999. Since then contradictory details on the project have been published, referring to it as a spy satellite, a communications satellite to be built instead of the previously-begun Zohreh, or a satellite solely for educational purposes. Information in recent years points to a number of Iranian research satellites projects; the Mesbah was to be the first among them.

Sinah-1

The Sinah-1, and not the Mesbah, became the first Iranian satellite. Not many details are known about the Sinah-1, and reports about its mission are clouded. Its mass is 160 kilograms and it carries two cameras and communication equipment. This data is somewhat surprising since all previous reports about Iran's research satellites dealt with much smaller satellites. Like the rest of the satellites carried on the same booster, it is probably intended to enter a helio-synchronous orbit with an inclination of 98.2 degrees. This orbit will give the satellite almost global coverage. No data is available yet as to the satellite's altitude. It is known that some of the satellites carried on the booster did not succeed in entering their orbit, but no data is available regarding the Sinah-1.

The Sinah-1 was described as an earth monitoring satellite, with its cameras intended to monitor agriculture and natural resources in Iran, as well as to monitor natural disasters. According to Iranian spokespersons it cost $15 million and was designed by the Russian firm Polyot, based in Omsk (the firm that produced the Kosmos-3M SLV). One can assume that the Sinah-1 is a version of the Sterkh satellite, designed and marketed by this firm.

Mesbah

Mesbah is the name of a research satellite built with the aid of the Italian company Carlo Gavazzi Space. The satellite is based on a multi-purpose bus for the MITA mini-satellites that the company developed for the Italian space agency. The MITA is a three-axis-stabilized cube-shaped platform designed for satellites weighing up to 100 kilograms

The Mesbah will have a mass of 60 kilograms. Little about its payload has been revealed, but it will apparently include a remote sensing camera with a resolution of tens of meters. The satellite will also carry communications equipment designed for amateur radio frequencies that will forward e-mail messages according to the "store and forward" method. The satellite will be placed in low orbit at an altitude of about 900 kilometers.

Iran has studied a number of options for launching the satellite, including an indigenously-built SLV. It was ultimately decided to use a Russian SLV from

Plesetsk. The Mesbah was intended to be the first Iranian satellite, but an accident caused by an electrical short circuit prevented its launch in September 2005. No new date for its launch has been given.

The Asian Research Satellite

In 2000 Iran was reported to be cooperating with a number of Asian countries in constructing a small research satellite. The cost of the project was said to be around $44 million, of which Iran would contribute only $5.6 million. China, Mongolia, Thailand, Pakistan, and Bangladesh were also taking part in the project (according to other reports, the countries were China, Korea, Indonesia, and Mongolia). It appears that a Chinese launch vehicle was to be used. Since early 2004 no further information on the project has been received, and its fate is unknown.

Safir

In 1999, at the time that construction of the Mesbah satellite was announced, Iranian officials revealed that another research satellite project was underway. This satellite, referred to as SMMS, SMNS, Safir, and even Sinah-1, was to be small and "multi-functional," weighing only twenty kilograms. It is hard to say whether this was a single project, a composite of different projects, or if the project was linked to the Asian satellite project. According to Iranian spokespersons, this would be a "pure" Iranian satellite built by Iranian engineers and launched by an Iranian satellite launcher – the Shehab-4, but it seems that this satellite, too, will be launched by a Russian SLV.

Research Satellite Project Implications

Various goals have been ascribed to the research satellites. Iranian spokespersons have noted that the satellites are designed for the "remote survey of the earth's surface," "identification of natural resources, monitoring of electricity, and gas and oil energy networks," and that "later the satellite will be used for communications and crisis management." On the other hand, observers in Israel and the United States emphasize the military side of the Iranians' space program. The Israeli press presented the Iranian models as spy satellites for collecting visual intelligence data.

Nonetheless, it appears that the Iranian satellites are unable to operate as spy satellites. It seems that even the Sinah-1, though heavy compared to other research satellites, is too small to carry a camera capable of taking photographs with a resolution suitable for military intelligence gathering. Furthermore, the satellites are built by a foreign company and launched by a foreign country. It is most unlikely that Iran would hand over to foreign hands an intelligence-gathering project that by its nature is classified.

The main goal in launching research satellites is the acquisition of technological know-how. Some Iranian spokespeople have candidly stated this. They want to train engineers and researchers in various areas of planning, construction, and launching satellites. Actually this is nothing unusual. Many countries, including those in the Third World, are involved in similar projects. Today's technology is readily accessible, and a number of companies in the world specialize in the production of generic buses for mini-satellites, micro-satellites, and nano-satellites. When ordering a satellite, the client's team participates in the development of the payload and its integration into the bus. At this stage, at any rate, Iran's situation appears to be no different from that of other states. Iran has managed to reach the stage of launching a satellite with the aid of foreign manufacturers – a stage that other countries in the Middle East, including Saudi Arabia, Egypt, Algeria, and Turkey, attained quite some time ago.

Nevertheless, the Iranian projects should not be underestimated. Although Iran currently depends on foreign technology both for the construction and launching of satellites, it has not given up its goal. The research satellites are already regarded as a contribution to national strength, and referring to them, former Iranian defense minister Ali Shamkhani said that "Iran's space capability is one of the main means of deterrence." Moreover, Iran has not surrendered its desire to launch a satellite on its own SLV. Development of the Shehab-4, intended to be Iran's first SLV, continues. This may be followed by the Shehab-5 and Shehab-6, able to launch heavier satellites.

The Russian press has dealt extensively with Russia's efforts to convince Iran to abandon the idea of using its own SLV. According to these reports, the Russians feared that the United States would regard an Iranian launch as a last straw and be

prompted to respond harshly. Naturally Russia is interested in demonstrating to the world its ability to restrain Iran. It is far more probable, however, that Iran's SLV project has not ripened yet and Iran still lacks the requisite technological capability. If Iran had an operational SLV, it is unlikely that Iran would have been willing to abandon a launch project out of fear of American reaction. Until this capability is attained, the American threat remains a comfortable excuse to hide behind.

The Zohreh Communications Satellite Project

History of the Project

In the 1970s the Iranians began work on a project to launch communications satellites into geo-stationary orbit. The first period witnessed the joint Iranian-Indian Zohreh ("Venus") project designed to send four Iranian communications satellites into geo-stationary orbit. At the same time, Iran and India negotiated with NASA for launching satellites on a space shuttle. Since then the project has gone through several phases. Iran conducted negotiations with French companies for a long time, and the French-built satellites were to be launched in 1995. Insufficient progress materialized, however, and from early 1988 Iran conducted similar negotiations with Russian organizations. This project was suspended in 2003, and only in late 2004 were contacts renewed, probably with different organizations in Russia.

In January 2005 it was announced that a contract had been signed for constructing the Zohreh satellites. The new version of the Zohreh contract was signed with the Aviaexport Company. The contract's net worth is reported to be $132 million, much lower than the previous transaction ($300-$350 million). The actual satellite will be developed by PM-NPO Reshetnev in Krasnoyarsk, a firm experienced in satellite production. The Iranian satellites will be the Express-1000,[1] the firm's new state-of-the-art satellite, much smaller than other communications satellites in use.[2] Its internal equipment will be French-produced but according to reports German companies will also be involved in the project. The launch is scheduled to take place thirty to thirty-six months from when the terms of the contract are met. If the contract was actualized, that is, if Iran actually made the first payment, the launch date will be set for 2007-8.

Figure 1. The PM-NPO's Express-1000 Bus

Source: company website

Communications Satellite Project Implications

Three communications networks operate in Iran, and these operate over 1000 ground stations and supply voice and data communications services.[3] Although the network is based on a microwave backbone, communications satellites are not unknown in Iran because the local telecommunications company rents foreign satellite services.[4] Iran is interested in expanding the volume of its civilian communications, and satellite communication will certainly be able to provide coverage to vast, inaccessible, sparsely populated areas, such as desert and mountain regions. Good radio and television coverage to these areas has proven difficult, so that transmission via satellite may be the best solution.

Iran sees a number of advantages in launching its own satellite, advantages that go beyond basic communications needs:

1. The ability to use satellite channels for military purposes without fear of their blockage by an embargo in an emergency. Iran has learned from its experience with American efforts to restrict its import of strategic goods. Iran is also aware that in an emergency its communications satellites may be obstructed because of American pressure. It fears Washington's ability to pressure international satellite providers into blocking these channels.
2. Control over civilian reception of television and radio transmissions. This is a very sensitive topic in the Islamic republic. At present Iranian law forbids citizens to own satellite dishes because of the fear that the contents of certain programs are not compatible with the spirit of Islam. Thus, state ownership of a communications satellite will allow citizens to own reception equipment for satellite broadcasts and provide reception in remote areas. At the same time, the government will be able to control the broadcasts and contents that are picked up by citizens.
3. A successful communications satellite project has the potential of becoming a successful economic enterprise. It has been claimed that over time the cost of

maintaining national satellite communications channels is cheaper than purchasing them from a foreign provider. Furthermore, superfluous channels can be sold to other communications consumers in the region, thus defraying some of the outlay.

4. Above all, ownership of a communications satellite gives a major boost to national pride since it demonstrates the state's technological capability. In Iran's efforts to attain the status of a regional superpower, demonstrative steps such as these are of great importance.

Still, the negative aspects of this effort cannot be ignored. First, they contain an economic risk, as the project's profitability is far from assured. A project of this nature may be inordinately more expensive than purchasing channels from a foreign provider. Moreover, in the case of channel acquisition from a foreign provider, expenses will always be more controlled, since only the exact amount of communications volume will be ordered in accordance with the budget. In the case of financial constraints, expenses can be cut back by limiting the use of channels. On the other hand, when a national satellite is owned, a situation could develop whereby the state finds itself with an excess of unmarketable channels. Potential buyers may be put off from purchasing channels from Iran, fearing external pressure (from the United States, for example) and preferring to avoid communications volume from Iran.

After examining almost thirty years of Iran's handling of the project, the question also arises whether the project will ever materialize. Many times over the years Iran has concluded contracts that have repeatedly come to naught.

Iran's difficulties in obtaining its own communications satellite are even more conspicuous against the background of other Middle East states' success in this domain. In a world where communications satellites are produced and launched by commercial bodies, the ownership of communications satellites has become solely an economic enterprise. Thus, aside from Israel, which produces its own communications satellites, today Saudi Arabia has its own communications satellites (through the ArabSat project, which has launched eight satellites to date); Egypt owns two satellites (the NileSat project); Turkey owns four satellites (project TurkSat); and

the United Arab Emirates (with their own Thuraya satellites, a unique technological project that cost over $1 billion) has already launched two of its three satellites.

The exact reasons for Iran's cancellation of its contracts are not known. Some observers think that Iran's heavy financial burdens have precluded the finalization of the projects. Others claim that in some cases Iran made demands that the providers could not accept. For example, in one case it was reported that Iran demanded guarantees against the imposition of embargos, conditions that no one was willing to agree to. But it seems that Iran's main problem in attaining communications satellite capability is due to the inherent nature of the Iranian government system, that is, the inability of the various bodies operating in the system to reach an agreement and implement it. If this is indeed the case, it may well hold true for other strategic projects as well.

Iranian Space Agencies and Organizations

A number of agencies in Iran are engaged in space research. The Iranian space agency, ISA, was established by a Majlis decision in 2003. Its work is to coordinate and monitor various Iranian agencies involved in space-related activities that have been in operation for several years. The oldest agency for gathering satellite information is the Iranian Remote Sensing Center (IRSC). This veteran unit coordinates ground image distribution activities and geological and mineral studies. The agency has ground stations that can receive data from a number of the current and future satellites. The center also coordinates the research of agencies such as the Geological and Mineral Research Center that is affiliated with the Ministry of Mines and Metals; the Forest and Range Organization; the Soil Conservation and Watershed Management Research Center; the National Center of Oceanography; the Ministry of Energy; the Ministry of Oil; the Ministry of Science, Research, and Technology; and the National Center of Cartography (NCC), which is responsible for mapping and the topographical base. This agency uses satellite data including GPS for topographical mapping, geodesic projects, and triangulation.

In addition, seven Iranian universities offer courses and training in areas connected to satellite technology and the application of satellites. The subjects taught

are communications satellites, remote sensors, geo-information, satellite meteorology, space engineering, and others.

Conclusion

Iran is determined to attain an independent satellite capability for communications and research, and in the future, for military purposes. If the launches of the Zohreh communications satellites and the other research satellites are successful, Iran will probably seek to obtain additional capabilities, especially the independent construction and launching of its own satellites. It will also probably try to build a military image-collecting satellite for supplying photographs of military quality. Iran regards these projects beyond their functional aspects, as contributing to the nation's strength and deterrence capability and bolstering its position as the region's leader. Today, at a time when almost every state can purchase satellite products on the open market – from imagery for research to communications channels, and even military quality imagery (up to a resolution of one meter) – there is little cost effectiveness in investing enormous resources to attain an independent satellite capability.

Nevertheless, a close examination of the projects that Iran has been engaged in indicates its great difficulty in attaining these capabilities. Iran has failed to reach even the basic stages in these grandiose projects after many years of effort, stages that other states attained a long time ago. The reasons for this failure are not clear but they seem to be linked to the government's inherent inability to coordinate government agencies, resolve conflicting demands, and mobilize the required resources for the projects. In other words, Iran is motivated to achieve far-reaching goals. Iran also has a significant technological infrastructure. Nevertheless, the engine is stalled and important projects are being delayed.

If this assessment is correct and the Iranian failure is a deep systemic failure, this could point to questions on Iran's capability to materialize other ambitious programs, such as in the realms of ballistic missiles and nuclear weapons.

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1 Express–1000 satellites will be launched either on the Soyuz-2 launcher equipped with a Fregat-type booster, or as part of a group launch on the Proton launcher with a Briz-M booster.

2 It weighs only 832 kilograms and will carry twelve transponders produced by the French company Alcatel Espace.

3 According to the plan at the beginning of the decade, there were supposed to be twelve million lines operating in Iran by 2003 – one telephone for every five people. More recent data is unavailable.

[4] Iranian National Telecommunications Company (TCI) has transponders on the Intelsat satellite. The Islamic Republic Broadcast Organization rents its own transponders on the Intelsat, which is positioned on longitude 63 east. The organization also uses Eutelsat, HotBird-3, and Telstar satellite services. In addition, the communications station in Tehran via the Inmarsat satellite is designed mainly for communication with ships at sea. Iran employs satellite channels for contact with ships and mobile ground stations.