MERIA

IRAN'S SPACE PROGRAM: THE NEXT GENIE IN A BOTTLE?

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External support continues to help advance Iran's space effort. Tehran is advancing its space program to satisfy numerous civil and military objectives, including manufacturing satellites to accurately guide its Shahab ballistic missiles. The United States and Israel remain gravely concerned of Iranian efforts togain more military power. The Iranian space endeavor mimics a disturbing pattern other countries use clandestinely to advance their bng-range missile programs. Iran might reengineer the Shahab to carry future satellites and try to obtain significant political rewards from future satellite launches. Exploiting this event would unite Iran politically, complicating Washington's regional objective, and further destabilizing the region.

Iranian efforts to advance its space program follow an unsettling pattern seen elsewhere. In slightly different ways and to varying degrees of success, China, North Korea, and Pakistan use a civil space program clandestinely to manufacture longer-range missiles to further safeguard national security. Iran seeks to become a space power for similar reasons. This is a concern to the United States and its allies. Unlike other Islamic countries with satellites, the Iranian defense ministry plays a prominent role in shaping the space effort with possible contributions from the Islamic Revolution Guards Corps (IRGC). This military component manages the Shahab ballistic missile program, which Iran might modify into a space launch vehicle (SLV) with foreign support.

The United States and its allies find the Iranian space endeavor threatening. Tehran seeks to build satellites to improve the military's ability to target potential enemies and to closely monitor the region. Enhancing the Shahab to become satellite-guided would allow Iran to strike Israel and United States military forces stationed throughout the region precisely. Statements from Iran's president, Mahmoud Ahmadinejad, who declared his intention to "wipe Israel off the map" and dismissed the United States as a "hollow superpower," heighten the level of tension.

Iran might seek to develop a space program to improve national pride. Successfully testing a launch vehicle would allow Iran to boast that it is a space power. The propaganda Tehran espouses following this event might unite the country. This would further legitimize Ahmadinejad's policies and rhetoric, and generate greater regional and international fear regarding the regime's intentions.

EFFORTS TO DEVELOP SPACE TECHNOLOGIES

Iranian efforts to exploit space began under the Shah who tried to improve his country's scientific standing. In 1959, Tehran became a founding member of the United Nations' Committee on the Peaceful Uses of Outer Space (UNCOPUOS). The United Nations' General Assembly

requested that UNCOPUOS review international collaborative programs to exploit space for civil purposes, serve as a forum for information exchanges, and encourage the development and facilitate the advancement of national programs to study outer space.(1)

Iranian efforts to exploit space started over thirty years ago, which demonstrates that the country put a premium on further understanding this arena. Iran built a facility to obtain photographs soon after the United States launched the first system designed to capture imagery of the Earth. The Iranian Remote Sensing Center (IRSC) is responsible for gathering, processing, and distributing relevant material to users throughout the country for resource planning and management. The IRSC helps officials determine suitable areas to develop, and its personnel maintained operations while the country experienced a revolution and a devastating conflict with neighboring Iraq. (2)

Partly as a response to Iran's eight-year war of attrition against Iraq, Iranians wanted to improve their political, social, and economic standing. As such, the people elected the pragmatist Ali Akbar Hashemi Rafsanjani, and later, the reformist Muhammad Khatami as president. These leaders wanted to further modernize the country partly with more Western financial assistance. To encourage greater Western support, both presidents diminished the fundamentalists' influence. Khatami issued various reforms to modernize the country to include reinvigorating efforts for the nation to become more active in space. He helped the country to view becoming a space power as a vehicle for modernity. Some of the goals Tehran enumerated at a 2002 UNCOPUOS meeting reinforces this perception:

1. Commercializing space programs for Earth observation, and predicting environmental changes;

2. Promoting international cooperation based on concepts of joint benefits;

3. Encouraging space efforts in the private sector to increase awareness within the public of space and incorporate related initiatives into daily lives;

4. Developing a mastery of space science and technology directed to assist in the development of space programs and commercial projects;

5. Increasing interest in space programs among the youth, who will play a notable role in the country's future. (3)

Iran seeks to accomplish these and other broad objectives in order to become more technologically advanced. Possessing imagery and other types of material from space will assist Tehran to identify areas suitable for development and those to be avoided because of their susceptibility to earthquakes and floods. (4) Iran attempted partially to do that by manufacturing satellites. On January 5, 2003, Rear Admiral Ali Shamkhani, the country's former defense minister, stated that within eighteen months, "Iran will be the first Islamic country to penetrate the stratosphere with its own satellite and with its own launch system." According to Shamkhani, the satellite launch would be in response to American actions: "The Persian Gulf was once a place from which constant threats against the Islamic Republic emanated. But now, with the resources that we are gaining, this region cannot be used against us by any

outside force." When he made this announcement, Tehran figured it was the next target after coalition forces met their objectives in Iraq. That has yet to occur, but Iran still seeks a space capability partly because of America's growing regional presence.(5) Developing these programs in response to the increased United States presence indicates that Iran feels threatened and partly seeks to exploit space to safeguard its own national security.

Iran apparently attempted to meet some of the above-noted goals starting in April 2003. The legislature approved a bill to create the Iranian Space Agency (ISA) to serve as a policy-formulating organization for space initiatives. The ISA performs research on technology, remote sensing projects, develops national space equipment, and participates in the development of national and international space endeavors. It also coordinates various space-related activities within the country's research institutes, administrative agencies, and universities. These efforts also help the ISA to execute decisions from the Supreme Aerospace Council. (6)

Iran's legislature created this body in December 2003(7) to approve various space-related programs and to promote partnerships among other organizations. (8) The council functions with input from senior government officials. The ISA's director serves as the council's secretary, and the country's president functions as chairman. Appointment of the president and not the minister of science or another more knowledgeable stakeholder might impede the advancement of current and future space projects, because the president has numerous other matters to oversee and less expertise. Nonetheless, his presence raises the ISA's profile. Other members include the defense minister and four "space experts."(9) This arrangement raises national security implications, because one of the unspecified space specialists might include the IRGC's commander. Military reforms in 1989 slightly curtailed this group's independence from the defense ministry. While the IRGC retains an independent command, it administratively functions within the regular armed forces at the General Staff.(10) The Iranian delegate neglected to disclose the IRGC or the council's efforts to safeguard security at the 2002 UNCOPUOS meeting, possibly to minimize accusations that it wanted to exploit space for military purposes.

DEVELOPING BALLISTIC MISSILES AS SPACE PROGRAMS

Reorganizing the Iranian aerospace sector can help the country more effectively consolidate resources to advance various space efforts, such as launching satellites onboard indigenously-developed SLVs. Nasser Maleki, former deputy director of the Iranian aerospace organization, acknowledged that the same technology used to manufacture missiles could also be used to manufacture SLVs.(11) Building an SLV based on ballistic missile technology has distinct advantages: lower cost, less time needed for training, and less likelihood of international scrutiny because the same technology can apply to manufacturing the SLV. These benefits might explain why Iran seeks to deploy its satellites onboard indigenously-manufactured SLVs. (12) Tehran will likely do that by modifying its road-mobile, single-stage, liquid propellant Shahab ballistic missile. This and other liquid propellant systems have many moving parts, which increase the chances of

failure and the launch preparation period. In contrast, solid propellant rockets have a shorter launch preparation period, because the fuel is stored in the system prior to launch. Iran has systems powered by both types of propellants, which it could use for different stages of a SLV.

On February 7, 1999, Shamkhani, acknowledged his country's plans to construct an SLV, the Shahab-4, indigenously. His statement marked the first time an Iranian government official publicly admitted that the country considered developing an SLV for civil purposes. (13) In September 2000, an Iranian government spokesperson stated that the nation developed a modified missile, the Shahab-3D, to launch communication satellites.(14) The Shahab-3D is a two-stage projectile that underwent a flight test in September 2000 using a combination of solid and liquid propellants. Three years later, Tehran declared that it ended the Shahab-4 program. (15) The effort might have restarted in early 2006. Some Western intelligence service sources confirmed to a prominent German news agency that Iran successfully fired the Shahab-4 on January 17, 2006 to measure different electronic and aerodynamic tests in flight. Major General Yahya Rahim Safavi, the IRGC commander, informed the public about the event on Iranian television on January 28, 2006.(16) Perhaps he did that to remind the world that his country could manufacture long-range ballistic missiles. Iran again flexed its military's muscles with another Shahab-3 test while Israeli Prime Minister Ehud Olmert met with United States President George Bush in Washington in May 2006.

The Shahab system resembles North Korea's liquid propellant No-dong, which both countries agreed to develop jointly. Their collaborative efforts expanded in 1991, through the North Korean delivery of Scud-Cs to Iran in exchange for hard currency. The United States responded by imposing sanctions on the participant entities and opened talks with North Korea to limit this country's nuclear program to ensure it solely served peaceful purposes. These factors apparently motivated Iran to advance the Shahab endeavor indigenously; based on No-dong design. (17)

Initially, Iran tried to build its newest Shahab ballistic missile without North Korean support. However, Tehran experienced difficulties constructing the engine. Iran requested and eventually obtained Pyongyang's help. North Korean willingness to proliferate missile technology undermined the government's claim that it stopped participating in the Iranian missile effort. North Korean support helped Iran manufacture the Shahab-3. This missile has a range of about 1,300 kilometers (810 miles), and its first test flight occurred in July 1998. The IRGC soon obtained operational control of the missile, and it continues to manage this program. (18)

Perhaps the IRGC encouraged senior Iranian government officials to broadcast publicly the ballistic missile launches. Openly showcasing the missiles is a notable development, particularly because Iran did that earlier with different Shahab variants. On August 11, 2004, Iran tested the Shahab-A. This missile has a range between 1,500 to 1,800 kilometers (approximately 930 to 1,120 miles). On September 17, 2004, Iran tested a longer-ranged system, the Shahab-B. This event marked the first time Iranian engineers publicly tested a missile with a reported range of between 2,000 to 2,500 kilometers (about 1,240 to 1,550 miles).(19) The 2004 tests were less of a surprise to Uzi Rubin, the former founding director of Israel's Missile

Defense Organization, than the issuance of photography and video Tehran released afterwards. According to Rubin, the event was a message of confidence from Tehran in the Shahab-3 and a warning: The missile is becoming more advanced not only as a system, but also as a comprehensive weapons package. (20) Enhancing this missile into an integrated system indicates that Iran seeks to capitalize on existing technology to become a greater regional threat. Tehran seeks an SLV based on ballistic missiles, a disturbing pattern seen elsewhere to varying degrees of success.

China developed SLVs partly based on its ballistic missile inventory. Its first two Long March rockets were derived from modified intercontinental ballistic missiles (ICBMs). Beijing continues primarily to use various Long March SLVs to place satellites into orbit. At least two prominent Chinese aerospace firms played a key role in this effort and have a history of proliferating military-related technologies to Iran. In response, the U.S. State Department sanctioned the China North Industries Corporation five times since May 2003 and the China Precision Machinery Import-Export Corporation (CPMIEC) or its managing group four times since 1991.(21) More recently, the U.S. Treasury Department froze CPMIEC and three other Chinese aerospace corporations' U.S.-held assets for providing or trying to proliferate missile-related material to notable Iranian aerospace corporations. According to the Treasury Department's statement, the Chinese companies tried or succeeded in providing support to Iran's Shahid Henmat Industrial Group (SHIG). SHIG manages liquid-fueled ballistic missile efforts, to include the Shahab-III.(22) Attempts by Chinese entities to help advance Iranian ballistic missile efforts undercut Beijing's claims that it continues to support international nonproliferation efforts.

The Iranian SLV initiative advanced further with North Korean assistance. On August 31, 1998, North Korea attempted to launch a satellite by reengineering a ballistic missile. The Taepo-dong 1 failed to place its satellite into orbit due to a mechanical failure. Nonetheless, the event marked an important advancement in North Korea's missile program. The country showcased some key requisites for developing longer-ranged missiles—multi-stage separation, and advanced guidance mechanisms. Moreover, Pyongyang now owned a multi-stage rocket capable of hitting targets much further than its more publicized cousin, the shorter-range and single-stage No-dong. Iran and Pakistan sent delegations to witness the 1998 launch. Their presence indicates that both nations could use Taepo-dong 1 technologies for their indigenous SLV efforts. (23) Perhaps this event motivated Iran to conduct the September 2000 Shahab test using solid and liquid stages. (24)

The level of support between North Korea and Iran reportedly improved in late 2005. According to senior U.S. and Asian officials, a North Korean freighter delivered some Soviet-era SS-N-6 submarine-launched ballistic missiles. Iran could equip the missile on its three Russian-supplied submarines, or incorporate some of the components into an SLV. Proliferating complete systems to Iran represents a renewed level of cooperation between both rogue states. Moreover, U.S. officials state that the delivery is a technological advancement from earlier transfers, because the SS-N-6 has components that can launch heavier loads over greater distances.(25)

Obtaining this missile will help advance the Iranian missile or space effort and enhance North Korea's ability to proliferate weapons. This event further undermines the difficulty of preventing the spread of dangerous weapons to rogue states.

Equally troubling was the possible presence of Iranian representatives in North Korea during its July 4, 2006 ballistic missile tests. Assistant Secretary of State Chris Hill, the chief United States negotiator with Pyongyang, retracted statements he made at a Congressional hearing that an Iranian delegation witnessed the seven launches. Nonetheless, Kim Tae-woo, a South Korean analyst with the governmental Korea Institute for Defense Analyses in Seoul, said, "There is a high probability of Iranian involvement in these missile tests, but we don't have hard evidence."(26) The likelihood that Iran witnessed the event further deepens Washington's concerns that both rogue states seek to destabilize security by collaborating on different ballistic missile efforts.

It is less clear whether Pakistan sent a delegation to witness the July 2006 tests. Nonetheless, Islamabad appears to be following North Korea's example. Pakistan might produce an SLV by modifying its available Hatf 5 (Ghauri) ballistic missile. The system can carry a nuclear warhead and has similar design features to Iran's Shahab-3 and North Korea's No-dong ballistic missile, which indicates possible cooperation. In addition, North Korea sent either complete No-dongs or their engines to Pakistan and oil-rich Iran. Islamabad also obtained intermediate-range ballistic missiles from North Korea, apparently in exchange for sending Pyongyang highly enriched uranium for use in the nuclear program.(27)

In March 1995, Pakistan renewed interest in the space program. President Pervez Musharraf formally tasked the nation's space agency, the Space and Upper Atmospheric Research Commission (SUPARCO), to explore and oversee the building of an SLV and satellite. SUPARCO's former director, Salim Mehmud, acknowledged that this organization sponsored studies that explored SLV development. SUPARCO's technicians also built Pakistan's two Badr spacecrafts. According to the infamous nuclear scientist, Abdul Qadeer Khan, Pakistan needs to develop SLVs and satellites in response to similar advancements in neighboring India. (28)

North Korean and Iranian support to enhance Pakistan's space and ballistic missile initiatives is a significant source of worry in India and the United States. Washington imposed various "red lines" to prevent the transfer of sensitive technologies to India. The United States attempted to maintain a technological balance between India and Pakistan. However, under the United States-Indian Next-Steps in Strategic Partnership (NSSP) program, that balance might soon tilt to India's advantage. Both democracies seek to improve bilateral relations, partly through the establishment of more joint civil space projects. However, the NSSP neglects to address India's sophisticated and maturing missile program and its willingness to export missile technologies abroad, to include Iran. Tehran would benefit from Indian ballistic missile assistance, especially the Agni 2. The Agni 2 intermediate-range, mobile, and solid propellant system has a range of about 2,000 kilometers (1,245 miles) and a modified first stage that is likely similar to the country's polar SLV. The Agni 2 will also serve as part of India's undeveloped

ICBM, the Surya. This system will have sufficient range to hit China—India's other main external rival. The agreement Washington reached with New Delhi has significant arms control implications. India remains unwilling to follow weapon nonproliferation and nuclear test-ban agreements, which it views as biased toward more powerful countries. (29) India's experience in developing accurate missiles and satellites could greatly benefit Iran.

Indian support will complement the knowledge Tehran obtained elsewhere, especially from Russia. According to some U.S. officials, since late 1996, Russia has been a main supplier of Iranian ballistic missile technology and training.(30) Sixteen Iranian undergraduate students studied engineering and rocketry at the Moscow Aviation Institute (MAI), a leading facility involved in various Soviet ICBM initiatives. Iran likely picked this facility because its professors taught some Chinese students during the late 1950s, when their country had a fledgling missile program. Iranian students at MAI cultivated relationships with their professors and invited them to speak in Tehran. Iran hosted dozens of Russian experts knowledgeable in guidance systems, metallurgy, and aerodynamics. (31) Greater understanding of these fields can help Iranian technicians further improve various missile endeavors, partly by duplicating Chinese efforts.

Training students at prominent institutes was less of a concern to military experts than the proliferation of Russian missile technologies to Iran. From the Russian firm Energomash Science and Production Association, Iran obtained components related to the RD-214 engine, used on the Soviet-era SS-4 single stage and liquid propellant medium-range ballistic missile (MRBM).(32) Moscow powered one stage of its SL-7 (R-12/Cosmos) SLV with a RD-214 engine. Some Western military experts were more worried about this component's transfer than the North Korean delivery of its No-dong ballistic missiles to Iran, because the SS-4 has a larger warhead and longer-range, about 2,000 kilometers (1,250 miles).(33) This range will allow Tehran to hit military and civilian targets throughout Asia and Europe.

Moscow views Tehran as a key vehicle for maintaining stability in the Near and Middle East. Russia seeks to exploit Iran's regional influence to maintain security in the sensitive trans-Caucuses and Persian Gulf in order to undermine efforts by Muslim terrorists to establish a greater foothold there.(34) Expanding this partnership will likely become a more vital component of both countries' national security as they increase cooperation into other sectors. Lucrative oil contrasts will further improve bilateral relations, hindering Washington's ability to isolate Iran diplomatically and economically.

The U.S. intelligence community remains worried about Tehran's desire to manufacture SLVs, because they have most of the key components needed to build an ICBM. (35) Recent initiatives to enhance the Shahab-3 reinforce the concern. Shamkhani stated that his country possesses the technology to mass-produce Shahab-3s (36). Iran's ability to do that might have contributed to U.S. Director of National Intelligence John D. Negroponte's acknowledgement that Tehran has the largest inventory of ballistic missiles in the region.(37) Iran's ability to build and deploy this missile quickly, complicates efforts to assess accurately the numbers and

develop countermeasures. Moreover, Tehran publicly acknowledged that it increased this missile's range to about 2,000 kilometers (1,245 miles). Many European politicians and military officials fear that Iran seeks to target areas beyond the Middle East. One Western diplomat questioned the reasoning for Tehran to develop longer-range missiles, "Why design a Rolls-Royce if it is needed to deliver a pizza?"(38) Iran is already capable of hitting Israel and most regional U.S. military facilities with the Shahab-3. Improvements to this program demonstrate that Iran seeks a sophisticated and long-range missile program, possibly to target countries beyond the Middle East. Ali Akbar Hashemi Rafsanjani, former Iranian president and current leader of the Expediency Council, a body that mediates between the regime's institutions, reinforced such concerns by stating that countries possessing missiles similar to the Shahab-3 could modify their systems to reach all other stages—presumably to include intercontinental ranges. He also said that the country could consider developing a satellite program from advancements in the missile field and the defense ministry's involvement. (39) The statement not only reemphasized that the country's space program would have a military component, but it would also exploit missile technology to produce an SLV.

Iran's space program and its efforts to develop long-range missiles have yet to generate sufficient global concern. Richard Speier, an arms control expert at the National Defense University, surmises that the international community remains unconcerned, because the space program remains relatively low-profile.(40) In addition to concurring with this assessment, Patrick Clawson, an Iranian expert at the Washington Institute for Near East Policy, points out that Tehran has a history of making grandiose statements about possessing a certain technological feat long before it is operational.(41) For instance, in July 1999, Iran's government-run radio announced that the country would launch three satellites within two years.(42) That has yet to happen, which reinforces the perception that an operational Iranian space capability is mere rhetoric. Clawson surmises that the world also believes Tehran lacks the requisite infrastructure to develop an independent satellite production program.(43) Perhaps that explains why the press departments in the White House and U.S. State and Defense departments did not issue official statements or comments the week after Russia launched Iran's first satellite. Ahmadinejad's speech the previous day about his plan to "wipe Israel off the map" overshadowed the event.(44) Political rhetoric aside, the Iranian space endeavor is a growing threat.

COLLABORTIVE SPACE EFFORTS WITH CHINA AND REGIONAL FORUMS

The danger that Iran's space program poses to regional security will likely increase with greater cooperation with China. According to Ahmad Motamedi, Iran's Minister of Communications and Information Technology, China is an attractive partner partly because of its ability to launch 40 rockets successfully since 1996.(45) Beijing not only has a mature space effort, but key programs that have military applications. Two examples are the Brazilian-Chinese joint project to launch a remote-sensing satellite constellation and Beijing's active involvement in the European Galileo global positioning system (GPS) project. Critics argue that China can replicate the technologies from this project to

manufacture an indigenous GPS navigation program or exploit current vulnerabilities. (46) One Chinese aerospace journal already explored some of the system's susceptibilities, to include attacks from space or ground-based lasers and anti-satellites. China's involvement in the Galileo effort could help Beijing reaffirm or disprove the efficacy of these methods, which could also benefit Iran in producing similar systems. (47)

Chinese technicians assist their Iranian counterparts through regional endeavors. The Small Multi-Mission Satellite (SMMS) project is an effort to collaborate on various space projects, to include building a satellite. China and Iran continue to lead this initiative. The spacecraft will enter orbit onboard a Chinese SLV to perform civilian remote sensing and communications experiments. Iranian technicians continue to build the remote sensing camera. Some of the technologies used to develop the device can enhance Iran's long-term reconnaissance capabilities. (48)

The SMMS effort is overseen by the Asia-Pacific Multilateral Cooperation in Space Technology and Applications (AP-MCSTA) group. The AP-MCSTA attempts to encourage information exchanges in space technology among countries in the Asia-Pacific region. (49) The AP-MCSTA helps Iran and technicians from other countries obtain more knowledge, often through classes and conferences. Participants in the AP-MCSTA and China's National Space Administration jointly developed training opportunities to establish relationships and exchange knowledge. Over 120 participants from approximately 30 countries attended a two-week course at China's Academy of Space Technology in mid-2005 to learn about space-related topics. Some of the courses explored satellite structure, orbit control, micro-satellite design, remote sensing, and spacecraft engineering project management.(50) Iran and other developing nations will benefit from these and other topics, because they can obtain a greater understanding of how to establish, effectively manage, and complete various space initiatives.

Lectures are a notable way for Iran to establish and cultivate relationships with experts. China's Ma Wenpo taught the June-July 2005 class on remote sensing. He also wrote an article that not only explained the role that internal calibration sensors play in assisting remote sensing ground stations to obtain accurate imagery from satellites, but also assessed different systems.(51) This information would help Iran build facilities equipped with the technology to effectively capture and distribute space imagery, greatly enhancing its early-warning capabilities. Tehran's engagement in regional organizations and interactions with experts in classrooms are vehicles to establish and cultivate relationships with foreign technicians in order to advance its military programs.

IRANIAN CIVIL AND MILITARY SPACE GOALS

Tehran recognizes that it must swiftly advance the space endeavor to avoid Western sanctions. Iran fears that such measures will occur once the West concludes that it seeks to manufacture sophisticated reconnaissance satellites. As Muhammad Reza Movaseghinia, an Iranian space official, noted, "We have to move quickly and achieve our goals in space.

Otherwise we will face political, economic and security threats."(52) The space program is important to Iran, because it views becoming a space power as a vehicle for survival against perceived external dangers.

On October 27, 2005, Iran met a key aerospace objective by becoming the 43rd nation to own a satellite. The Sinah-1 spacecraft entered orbit onboard a Russian rocket to monitor natural disasters and observe agricultural trends. (53) According to Director General of Iran Electronic Industries Ebrahim Mahmoudzadeh, Russia also built the $15 million spacecraft. Tehran initially planned to construct the satellite, but its manufacturer, the Iranian Institute of Applied Research, experienced technical difficulties and requested Russian assistance.(54) Moscow provided Iran with support and planned to launch Sinah-1 in September 2005. However, according to Moscow's chief of the press service of Space Troops, Colonel Aleksei Kuznetsov, manufacturing delays in Sinah-1 postponed the launch until October 2005.(55)

The Sinah-1's primary mission is to demonstrate that Iran can possess an operational satellite. The country's deputy telecommunications minister and head of the space program admitted that it could technically spy on Israel, but Ahmad Talebzadeh stated he could obtain more detailed imagery commercially. (56) According to Jonathan McDowell, a Harvard astronomer who monitors the Iranian space effort, commercial photography is frequently too old and inaccurate for spying and determining military targets.(57) Perhaps Iran might soon build a sophisticated reconnaissance spacecraft. Muhammad Enterazi, a satellite program manager, noted that, "We are at the very beginning of a long, long road in space technology. But we have the potential to develop an ingenious space program."(58) Unless stopped, Iranian specialists could apply the knowledge gained from the Sinah-1 project to construct more powerful satellites.

Manufacturing an independent satellite is likely to occur through development of the 60-kilogram (130 pound) Mesbah spacecraft. The system is initially intended to obtain pictures for a variety of civilian purposes, to include greater data collection and distribution, assisting in efforts to find natural resources and to more accurately predict the weather. Eventually, Iran will modify the satellite for remote sensing. The military could benefit from this technology, because it could obtain knowledge of where to build suitable facilities. The Iran Telecommunications Research Center (ITRC) and the Iran Science Organization of Science and Technology (IROST) are jointly building this micro-satellite with the Italian company Carlo Gavazzi Space. Construction of Mesbah began in 1997, just before the start of then-Iranian President Muhammad Khatami's second term. On August 4, 2005, the day after Ahmadinejad succeeded Khatami, Tehran showcased Mesbah in an unveiling ceremony. Once operational, personnel from ITRC/IROST will control it from a ground station in Tehran throughout its three-year lifespan. Mesbah will augment Iran's understanding of space technology and further increase its scientific standing throughout the region and developing world. (59)

Mesbah was scheduled to enter orbit in early 2006 onboard a Russian rocket. Perhaps Iran decided against using Russia to launch future satellites after it placed the Arab Satellite Communications Organization 4A spacecraft in an incorrect orbit. The February 28, 2006 setback marked the third in 36 launches for the Proton launch vehicle program since it

starting launching commercial systems.(60) Russia's inability to place the 4A in its proper orbit might cause Iran to consider exploring other options, to include using an indigenously-developed SLV, to launch Mesbah or other systems.

Mesbah could serve as a springboard for Iran to manufacture more sophisticated reconnaissance satellites. Doing that would meet one of the country's goals,(61) undermining Tehran's claims that the space program is solely intended for peaceful purposes. One Israeli defense source stated that Iran's space program is a significant concern to the Jewish state. According to this official, Israel fears that if the military launches a strike to disable the Iranian nuclear program, "[…] the last thing we need is Iranian early warning received by satellite."(62) Obtaining imagery that shows increased activity at Israeli Air Force facilities might cause Tehran to conclude that Jerusalem seeks to launch a preemptive aerial attack on Iran's nuclear sites. Advanced knowledge of such an operation would undermine Israel's efforts to achieve total surprise because Iran would have more time to prepare its defenses and to transfer personnel and nuclear material to more secure locations. Technicians could then continue the nuclear effort confident that their country has an enhanced early-warning capability to further safeguard national security.

To meet this objective possibly, Iranian technicians are developing two similar reconnaissance systems. The Iranian Defense Ministry initiated an endeavor to manufacture the Sepehr satellite. (63) The ministry's close involvement reinforces the argument that Iran will exploit space to become more militarily powerful. Iran contracted with the Russian company M.F. Reshetnev Scientific-Production Association of Applied Mechanics (NPO PM, Zheleznogorsk) to build the $132 million Zohreh satellite. Zohreh is designed to provide Iranians with numerous services to include television and radio broadcasts, internet, and e-mail access. Technicians from NPO PM will assist their Iranian counterparts to control the system, which will increase the system's functionality, because it can avoid space debris and other satellites. (64) Possessing advanced reconnaissance spacecrafts could greatly help Iran, particularly after a natural disaster, because emergency personnel could effectively coordinate relief efforts. The military can also exploit this technology by rapidly distributing orders to forces to neutralize potential threats. Sending and receiving data quickly throughout the theater is a key characteristic of a sophisticated military, which Iran seeks to further modernize with space assets. Sepehr and Zohreh will allow Tehran to closely monitor developments in Israel and neighboring Iraq and respond accordingly whenever a threat arises.

Iran is partly considering building small satellites because they have distinct advantages. Besides their size, micro-satellites are lightweight and inexpensive. Tehran might exploit these advantages to develop an anti-satellite weapon, even though that would undermine the spirit of the 1967 Outer Space Treaty, which prohibits Iran (and other treaty participants) from placing weapons on space systems.(65) Moreover, Tehran would weaken its obligations under United Nations General Assembly Resolution 37/99. Parties to this document agree to a comprehensive disarmament of various weapon systems, to include anti-satellite

systems (Annex D). Tehran favored the request that the United Nations' Conference on Disarmament continue to deliberate on an effective and verifiable agreement to prevent an arms race in outer space.(66) The level of Iranian willingness in meeting these documents objectives will shed some light on the country's space program, including focus areas, deficiencies, and future international collaborative efforts. Knowledge of these fields will help the international community to more effectively assess Iran's projects and establish ways to prevent Tehran from exploiting space to further jeopardize international security.

SPACE AND NATIONAL PRIDE

Iran fervently believes that it has a sovereign right to sophisticated technologies, to include a space and nuclear program. Tehran views these endeavors as sources of national pride and a victory against some external forces, which Shamkhani accused of stifling the country's scientific advancements.(67) Iran's return to space with an indigenously-produced SLV would make the country the first in the Islamic world with this capability. Therefore, a mature space effort would provide Iran with *more* national pride than the nuclear program, because Pakistan could boast that it is the first to own "an Islamic bomb." However, all Islamic countries lack the scientific infrastructure to launch satellites independently. Iran wants to change that.

Iran and Saudi Arabia use Russia to launch their spacecrafts. Saudi Arabia's six satellites entered orbit onboard Russian rockets. It has many SLVs that can carry small satellites, which is beneficial to Saudi Arabia because engineers have greater flexibility in picking the launch date. (68) The Kingdom views space as a source of national pride. Muhammad bin Ibrahim al-Souail, vice president for Research Institutes at the King Abdulaziz City for Science and Technology (KACST), explained that the engineers who built the Saudisat-1 and Saudisat-2 satellites obtained specialized knowledge, which will serve as a springboard for other related initiatives.(69)

The spacecrafts that Russia hoisted were indigenously-constructed at the Space Research Institute (SRI) in KAAST. SRI also supports the spread and advancement of space technology. The country's other notable space facility is the Saudi Center for Remote Sensing (SCRS). Saudi Arabia established the center in 1986, because it recognized that remote sensing had numerous civil benefits. Enhancements to SCRS allow it to obtain and distribute imagery simultaneously from multiple foreign remote sensing systems.(70)

Saudi Arabia's space effort is far more mature than Iran's, yet generates significantly less international concern. According to Turki bin Sa'ud bin Muhammad al-Sa'ud, head of KAAST, his facility completely financed the Saudisat-1 and Saudisat-2 satellites without assistance from the defense ministry or any other government entity. The director called any claims that the two systems had a military purpose "baseless." The satellites are intended solely for telecommunications and research purposes. (71) KAAST's ability to completely fund this initiative demonstrates Saudi Arabia's desire to exploit space solely for civil purposes.

In contrast, the Iranian space effort is a growing source of international unease. The defense ministry and possibly the IRGC play a more prominent role in the country's space program. Their involvement, Iranian motivations for becoming a space power, behavior, and cooperation with countries

that cloak their long-range ballistic missile efforts behind a civil space project, raises disturbing questions about this nation's intentions in space.

The international community will likely react to a future Iranian SLV launch in a similar manner to North Korea's August 1998 failed attempt to place a satellite into orbit using a reengineered ballistic missile. North Korea's Taepo-dong 1 launch was a key factor that reinvigorated efforts within the United States to develop a ballistic missile defense shield. Iran's SLV launch will generate greater European support for the U.S. ballistic missile defense program. The event will also increase pressure on the European Union states of United Kingdom, Germany, and France to resolve the Iranian nuclear issue before the IRGC can threaten Europe with a miniaturized nuclear warhead onboard a modified missile.

Iran seeks to challenge Israel's regional monopoly in outer space. Israel is the only regional actor who can deploy satellites onboard indigenously-manufactured SLVs. The Shavit SLV is a modified Jericho MRBM that placed numerous civilian and military systems in space. The space program is a tremendous source of pride for Israel. Hayim Eshed, head of the Israeli Defense Ministry Space Administration, boasted that "With the exception of the Americans, we are superior to all other countries in two fields of satellite technology—resolution of photographs and picture quality."(72)

Israel further enhanced its satellite technologies with the April 25, 2006 launch of its Earth Remote Observation Satellite (EROS)-B photo reconnaissance system. The EROS-B entered orbit onboard a Russian SLV to capture imagery of Iran's military facilities. The satellite's sophisticated camera significantly enhances Israeli photo reconnaissance capabilities. One Israeli defense official stated that the satellites could find images as small as 27.5 inches. The system can also photograph activities in ballistic launch sites to obtain advanced warning of potential strikes and study future missile tests. The same source remarked that "the most important thing in a satellite is its ability to photograph and its resolution."(73) Israel has an edge over others in the region in satellite technology, which Iran seeks to change quickly.

CONCLUSIONS

The Iranian space effort resembles a disturbing pattern seen earlier to varying degrees of success. North Korea, China, and Pakistan cloak their efforts to modify ballistic missiles within a civil space program. Iran seeks to repeat history partly by exchanging ballistic missile technologies with these and other parties. This international assistance might eventually help Iran launch an indigenously-developed SLV. Such an event would generate global concern in a manner similar to North Korea's 1998 failed satellite launch.

Despite the distinct possibility of such an occurrence, Iran's space program has yet to generate sufficient global concern. The United States and its allies will certainly view the Iranian space project as a greater threat once Tehran owns satellites that can find and accurately guide missiles to their targets. Iran seeks spacecraft to achieve this feat and to further enhance the military's capabilities.

Iran's reentrance into space using an indigenously-developed system would provide the country with an unprecedented amount of national pride. Becoming a space

power would unite the Iranian people and further legitimize the leadership's policies. Achieving this technological feat would also significantly increase Iran's global position and create new concerns for the international community. The United States, Israel, and others have a great deal to fear once Tehran unleashes its next genie.

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NOTES

[1] Resolution Adopted by the General Assembly, *1472 (XIV). International Cooperation in the Peaceful Uses of Outer Space*, December 12, 1959.

[2] "Interview of Dr. A.A. Amidian with Tehran Times Int. Daily on NOV-13-2002," http://www.isa.ir/en/rs/.

[3] *International Cooperation in the Peaceful Uses of Outer Space: Activities of Member States in 2002 National Activities of Iran (Islamic Republic of)*, United Nations Office for Outer Space Affairs, http://www.oosa.unvienna.org/natact/2002/iran.html, last updated February 7, 2003.

[4] "Iranian Minister Invites China to Help Design, Build Small Satellites," *Tehran TV*, in Foreign Broadcast Information Service (FBIS) FEA20051031011879, November 1, 2005.

[5] "Russia-Iran Satellite Deal Seen Removing Threat of US Strike," *Kommersant*, February 2, 2005, pp. 1, 9, FBIS CEP20050202000292.

[6] "International Cooperation in the Peaceful Uses of Outer Space: Activities of Member States in 2003," United Nations Office for Outer Space Affairs, http://www.oosa.unvienna.org/natact/2003/iran.html, last updated January 27, 2004.

[7] Remarks of Dr. HE Motamedi, Minister of Communications and Information Technology, Opening ceremony of the "United Nations/Islamic Republic of Iran Regional Workshop on the Use of Space Technology for Environmental Security, Disaster Rehabilitation and Sustainable Development," May 8-12, 2004, http://www.gisdevelopment.net/proceedings/tehran/OpeningCeremony/Ahmad_MOTAMEDI.htm.

[8] "International Cooperation in the Peaceful Uses of Outer Space: Activities of Member States in 2003."

[9] "Iranian Cabinet Approves Establishment of Supreme National Space Council," *Mehr News Agency*, February 21, 2005, in FBIS IAP20050221000034; Bill Samii, "Iran to Have A Space Council," *Radio Free Europe/Radio Liberty*, Vol. 9, No. 34 (February 22, 2005), http://www.rferl.org/newsline/2005/02/6-SWA/swa-220205.asp.

[10] "Jane's Sentinel Security Assessment – The Gulf States," *Security and Foreign Forces, Iran* (Jane's Defense Group, January 13, 2006).

[11] "Aerospace Official Says Iran's Missile Technology Peaceful, Fulfils 'Space Needs'," *Voice of the Islamic Republic of Iran Radio*, in FBIS IAP20041020000094, October 20, 2004.

[12] "Russia: Journal Details Iranian Development of Diverse Missile Technologies," *Avia Panorama*, December 15, 2004, in FBIS CEP20050419000292.

[13] "Iran: Shamkhani Announces Shahab-4 Space Rocket Production," *The Islamic Republic News Agency (IRNA)*, February 7, 1999 in FBIS FTS19990207000166.

[14] Bill Gertz, "Iran Missile Test Fails After Takeoff," *The Washington Times*, September 22, 2000, http://nautilus.org/archives/pub/ftp/npp//000922IranBM.txt.

[15] "Jane's Strategic Weapon Systems," *Offensive Weapons, Iran, Shahab 3/4* (Jane's Defense Group, July 19, 2005).

[16] "Germany: Western Intelligence Services Confirm Iranian Missile Developments," *Deutschlands Neue Nachrichtenagentur*, February 6, 2006, in FBIS EUP20060206072006.

[17] Kenneth Katzman, "Iran: Arms and Weapons of Mass Destruction Suppliers," *Congressional Research Service*, Order Number RL30551, Updated January 3, 2003, http://www.usembassy.it/pdf/other/RL30551.pdf.

[18] "Jane's Strategic Weapon Systems."

[19] *Ibid*.

[20] Uzi Rubin, "Iran's New 'Baby Bottle' Shihab," *Middle East Missile Monitor*, August 8, 2004, http://www.me-monitor.com/docframes.asp?file=files/IransNewBabyBottleShihab.htm.

[21] "Remarks to U.S.-China Economic and Security Review Commission," Stephen G. Rademaker, Assistant Secretary of State for Arms Control, Washington, DC, March 10, 2005, http://www.state.gov/t/ac/rls/rm/43277.htm; "China's Record of Proliferation Activities, Paula A. DeSutter, Assistant Secretary of State for Verification and Compliance," Testimony before the U.S.-China Commission, Washington, DC, July 24, 2003, http://www.state.gov/t/vci/rls/rm/24518.htm.

[22] "Treasury Designates U.S. and Chinese Companies Supporting Iranian Missile Proliferation," *United States Department of the Treasury*, June 13, 2006, JS-4317, http://www.treasury.gov/press/releases/js4317.htm.

[23] "Jane's Strategic Weapon Systems," *Offensive Weapons, Korea, North, Taep'o-dong 1* (Jane's Defense Group, July 19, 2005).

[24] "Jane's Strategic Weapon Systems."

[25] Gordon Fairclough, "Politics & Economics: Pyongyang Deepens Tehran Ties with Suspected Arms Exports," *The Wall Street Journal*, July 6, 2006, p. A4.

[26] Barbara Demick, "N. Korea-Iran Ties Seem to Be Growing Stronger," *The Los Angeles Times*, July 27, 2006.

[27] Larry A. Niksch, "North Korea's Nuclear Weapons Program," Order Code IB91141, Updated April 7, 2006, *Congressional Research Service*. http://fpc.state.gov/documents/organization/64417.pdf; Sharon A. Squassoni, "Weapons of Mass Destruction: Trade Between North Korea and Pakistan," Order Code RL31900, Updated March 11, 2004, *Congressional Research Service*. http://fpc.state.gov/documents/organization/30781.pdf.

[28] "Pakistan: Report—Space Agency Asked To Manufacture, Launch Advanced Satellite," *The News*, March 27, 2005, in FBIS SAP20050327000006; "Qadeer Khan:

Pakistani Scientists Active in Building Satellite Launch Vehicle," *Dawn*, March 11, 2001, in FBIS SAP20010311000032.

[29] K. Alan Kronstadt, "India-U.S. Relations," Order Code IB93097, Updated April 6, 2006, *Congressional Research Service*, http://fpc.state.gov/documents/organization/64407.pdf; Richard Speier, "U.S. Space Aid to India: On a "Glide Path" to ICBM Trouble?," March 2003, *Arms Control Today*, http://www.armscontrol.org/act/2006_03/MARCH-IndiaFeature.asp; Siddharth Srivastava, "India Races into Space," *Asia Times*, May 20, 2005,, http://www.atimes.com/atimes/South_Asia/GE20Df04.html.

[30] Katzman, Updated January 3, 2003, *Congressional Research Service*.

[31] Michael Dobbs, "Collapse of Soviet Union Proved Boon to Iranian Missile Program," *The Washington* Post, January 13, 2002: A. 19; "The United States House of Representatives Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China," http://www.house.gov/coxreport/pdf/ch4.pdf, p. 177.

[32] "Part II of Iran's Missile Program Article," *Izvestiya*, October 22, 1998, p. 5, in FBIS FTS19981022001488; "BND Says Iran 'Stepped Up' Arms Programs 'Considerably,'" *Welt am Soontag*, April 27, 1997, p.4, in FBIS FTS19970428000303.

[33] Clifford Beal, and Ed Blanche "Iran's Shahab-4 is Soviet SS-4, Says US Intelligence," *Jane's Defense Weekly*, Vol. 31, No. 7 (February 17, 1999); Robin Wright, "Russia Warned on Helping Iran Missile Program," *The Los Angeles Times*, February 12, 1997, p. 1.

[34] "Russia Views Relations with Iran as Mideast Stability Factor," *Pravda*, October 3, 2003, http://english.pravda.ru/diplomatic/2003/03/10/44189.html.

[35] "The Worldwide Threat 2004: Challenges in a Changing Global Context," Testimony of Director of Central Intelligence George J. Tenet, Senate Select Committee on Intelligence, February 24, 2004, http://www.cia.gov/cia/public_affairs/speeches/2004/dci_speech_02142004.html.

[36] "Iran 'Can' Mass-Produce Missiles," British Broadcast Corporation (BBC), November 9, 2004.

[37] "Annual Threat Assessment of the Director of National Intelligence for the Senate Armed Services Committee 28 February 2006," John D. Negroponte Director of National Intelligence, http://armed-services.senate.gov/statemnt/2006/February/Negroponte%2002-28-06.pdf.

[38] "Russian Report on Iranian Two-Stage Missile Development, Official Denial," *Nezavisimoye Voyennoye Obozreniye*, June 10, 2005, in FBIS CEP20050610949011.

[39] "Ex-President Says Iran Can Launch Missiles with 2000-km Range," *IRNA*, October 5, 2004, in LEXIS-NEXIS.

[40] Richard Speier, interview by the author, July 11, 2005.

[41] Patrick Clawson, interview by the author, July 7, 2005.

[42] "Three Satellites to be Launched within Two Years," *Voice of the Islamic Republic of Iran*, July 31, 1999, in FBIS FTS19990731000164.

[43] Clawson, interview by the author.

[44] William J. Broad and David E. Sanger, "Iran Joins Space Club, but to What End?," *The New York Times*, April 4, 2006, p. F1.

[45] "Iran, China Exchange Views on Space Cooperation," *Mehr News Agency*, May 20, 2005, in FBIS IAP20050520011035.

[46] David Lague, "GPS Substitute for China," *The International Herald Tribune*, April 19, 2005.

[47] "PRC Journal Explores Ways to Defeat GPS Satellites, Ground Stations, Receivers," *Junshi Wenzhai* [*Military Digest*], November 1, 2004, pp. 52-53, in FBIS CPP20041109000197.

[48] Craig Covault, "China, Iran Pursue Imaging Spacecraft," *Aviation Week & Space Technology*, October 1, 2001, Vol. 155, No. 14, p. 45.

[49] *Statement by Mr. Wang Keran, Deputy Secretary-General, Secretariat Of Asia-Pacific Multilateral Cooperation In Space Technology And Applications (AP-MCSTA) At The Opening Ceremony of The High-Level Experts Group Meeting on Technical Options for Disaster Management Systems: Tsunami and Others of UNESCAP* (UNCC, Bangkok, Thailand: June 22, 2005), http://www.unescap.org/icstd/events/egm_dms/docs/APMCSTA/Statement.doc.

[50] "Pacific Multinational Cooperation in Space Technology and Assessment Training Courses on Satellite Technology and Spacecraft Project Management," http://www.apmcsta.org/Education_Center/EC_current.htm.

[51] Ma Wenpo, "New Development of On-Board Calibration for Optimal Remote Sensors," *Spacecraft Recover & Remote Sensing* (*Hangtian Fanhui yu Yaogan*), Vol. 9 (1996), pp. 28-31.

[52] Ali Akbar Dareni, "Iran Trying to Bolster Its Space Program," The Associated Press, November 29, 2005.

[53] "First Iranian Satellite Launched," BBC, November 27, 2005, http://news.bbc.co.uk/2/hi/middle_east/4381436.stm.

[54] "Iran's No Longer Moscow's Satellite," *Kommersant*, October 28, 2005, http://www.kommersant.com/page.asp?idr=527&id=621811.

[55] "Iran Satellite Launch Delayed," United Press International via *The Middle East Times*, September 28, 2005, http://www.metimes.com/articles/normal.php?StoryID=20050928-054910-6431r.

[56] Ali Akbar Dareni, "Iran Now Says Satellite Can Spy on Israel," The Associated Press, November 16, 2005.

[57] Broad and Sanger, "Iran Joins Space Club."

[58] Dareni, "Iran Trying to Bolster Its Space Program."

[59] "Official Says Iran's Mesbah Satellite to be Launched in May 2005," *Vision of the Islamic Republic of Iran Network 1*, September 1, 2004, in LEXIS-NEXIS; Presentation by L. Zucconi, Managing Director, Carlo Gavazzi Spac S.p.A., "The Mesbah Project," IST, 2005, in Shiraz, Iran, September 10-12, 2005, http://www.itrc.ac.ir/ist2005/Keynote/K5/MESBAH_Conf.pdf.

[60] Justin Ray, "Proton Rocket Fails in Arab Satellite Launch," *Spaceflight Now*, February 28, 2006, http://spaceflightnow.com/proton/arabsat4a/.

[61] "Russia: Journal Details Iranian Development of Diverse Missile Technologies," *Avia Panorama*, December 15, 2004, in FBIS CEP20050419000292.

[62] Uzi Mahnaimi and Sarah Baxter, "Israel Readies Forces For Strike on Nuclear Iran," *The Sunday Times*, December 11, 2005,

http://www.timesonline.co.uk/article/0,,2089-1920074,00.html.

[63] "Iranian Defense Minister Says Sepehr Satellite To Be Iran's 'Eye' in Region," *Farhang-e Ashti*, October 6, 2004, in FBIS IAP20041012000027.

[64] "Russia's NPO PM to Manufacture Iranian Zohreh Communications Satellite," *Novosti Kosmonavtiki*, March 1, 2005, in FBIS CEP20050511949011.

[65] "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies," October 10, 1967, http://www.state.gov/t/ac/trt/5181.htm#treaty.

[66] "*The United Nations General Assembly, General and Complete Disarmament*, A/RES/37/99, December 13, 1982," http://www.un.org/documents/ga/res/37/a37r099.htm; *Official Record of the 101st Meeting 37th Session of the General Assembly*, A/37/PV101 (New York: United Nations, 1982).

[67] "Defense Minster: Iran Will Launch Its Own Satellite Within 18 Months," BBC, January 4, 2004, in LEXIS-NEXIS.

[68] "Saudi Prince Discusses Satellite Program," *Al-Sharq al-Awsat*, September 2, 2000, in FBIS GMP20000905000052.

[69] "Start of New Era in Saudi Space Technology," *Saudi Gazette*, October 2, 2000, p.2, in FBIS GMP20001004000139.

[70] *Committee on the Peaceful Uses of Outer Space, International cooperation in the peaceful uses of outer space: activities of Member States*, United Nations General Assembly, A/AC.105/752/Add.2, February 13, 2001, p. 16-18, http://www.unoosa.org/pdf/reports/ac105/AC105_752Add2E.pdf.

[71] "Saudi Prince Discusses Satellite Program," *Al-Sharq al-Awsat.*

[72] "Space Program Director: Israel Develops 3 Intelligence Satellites Simultaneously," *Ha'aretz*, August 3, 2003, in FBIS GMP20030803000069.

[73] "Russia Launches Israeli Spy Satellite," Cable News Network via The Associated Press, April 25, 2006, http://www.cnn.com/2006/TECH/space/04/25/israel.space.ap/index.html.