COUNCIL on FOREIGN RELATIONS

The KSLV I Launch and South Korea's Space Strategy

Current Issues in U.S.-ROK Relations

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Publisher
Council on Foreign Relations Press

Release Date
October 2012

Overview

South Korea (the Republic of Korea, or ROK) has successfully established its place in the international shipbuilding, electronics, and automobile industries. Yet despite major investments in space technology, the ROK is still waiting for a breakthrough in its efforts to launch a satellite into orbit. Its third attempt is currently scheduled to take place at the Naro Space Center on October 26, 2012. In the midst of double-digit increases in Chinese and Indian space budgets and the expansion of Japan's space program to include military activities, what is South Korea's strategy for Asia's emerging space competition? And how likely is it to accomplish its goals, given its late entry into this complex high-tech sector?

After years of technological underdevelopment, the ROK created the Korean Aerospace Research Institute (KARI) in 1989, just as it was undergoing democratization and opening up to the outside world. Its initial strategy focused on using import substitution to establish a national capability for operating foreign-produced satellites, with the intention of eventually building its own communications and remote-sensing spacecraft. During this time, KARI benefited from cooperation with Britain, the United States, and other foreign satellite manufacturers.

In conjunction with its satellite program, KARI also began experiments in sounding-rocket technology in the 1990s. By the late 1990s, however, these solid-fuel boosters had reached altitudes of nearly 180 kilometers, bumping into U.S.-imposed missile-range restrictions South Korea had agreed to in return for surface-to-surface missile technology in the 1970s. Washington feared that the ROK's military government might be tempted to use missiles for offensive purposes. As a result, KARI concentrated on building a network of communications and remote-sensing satellites using foreign technologies, while beginning to construct its own scientific satellites, which it launched on foreign boosters.

However, the advance of North Korea's ballistic missile program and its attempted launch of a satellite from its Taepodong I missile in 1998 posed a clear military threat to South Korea. In the context of the North-South political rivalry, Pyongyang's space launch gambit also risked endangering Seoul's technological reputation. Frustrated by attempts to acquire booster technology outside the Missile Technology Control Regime (MTCR), South Korea took steps to become a member.

After entering the MTCR in 2001, Seoul sought to acquire liquid-fuel boosters for use in a devoted space-launch program. After failing to reach a deal with U.S. providers (due to high cost and non-MTCR-related U.S. export controls), KARI ended up entering an agreement with Russia in 2004 for the purchase of a large liquid-fuel Angara booster to serve as the first stage of its planned Korea Space Launch Vehicle (KSLV) I. KARI would construct the solid-fuel second-stage booster and the satellite.

As part of the space agreement, Russia agreed to assist in the development and construction of a space-launch facility on an island in South Jeolla province and to provide KARI with astronaut training and a flight to the International Space Station. After a mini-scandal involving the unauthorized removal of training manuals from Russia's Star City by the ROK's first-choice astronaut Ko San, the Russian Space Agency barred him from its program. This turn of events allowed his female alternate, Yi So-yeon, to claim the title of the first Korean citizen to venture into space. She traveled to the space station in April 2008, becoming a national hero, although critics derided the flight for its $20 million price tag and reliance on Russian technology.

KARI's success in satellite component development and the construction of a state-of-the-art space control and remote-sensing center in Taejon provided evidence of South Korean progress toward its goal of becoming one of the world's top ten space powers by 2015. However, budgetary troubles beginning in 2008 and difficulties in mastering the complexities of satellite launch have recently plagued KARI. In 2009, KARI's first attempt to launch the KSLV I ended in disappointment, after a successful Russian first stage was followed by the failed release of the satellite shroud from the Korean-built second stage, causing the still-attached spacecraft to lose velocity, tumble, and burn up in the atmosphere. KARI's second launch attempt in June 2010 ended in an explosion about two minutes into the KSLV I's flight, causing finger pointing by both Russia and South Korea. Lacking other options, KARI eventually purchased another Angara booster for its third KSLV I attempt.

South Korea is struggling in space against structural obstacles having to do with its late entry into space technology and exploration. Put simply, as a middle-sized power, Seoul has to invest a higher percent of its resources into space activity if it hopes to develop a sustainable niche position among Asia's larger and more established space powers, which are decades ahead of it. Japan achieved its first satellite launch in January 1970, China in April 1970, and India in July 1980.

However, Seoul's peninsular rival North Korea faces even greater obstacles in its space efforts because of its sharply limited finances, much lower technological base, and UN sanctions on its technology-acquisition program. Pyongyang has failed in three attempts to orbit a satellite thus far and has no experience in operating satellites or with advanced satellite production. Another advantage Seoul enjoys compared to Pyongyang is its good relations with more developed space powers. Besides its space ties to Russia and the United States, KARI cooperates with members of the European Space Agency, Ukraine, India, and Japan. North Korea's sole contacts in space activity may be with Iran.

Historically speaking, early failures in space-launch programs are part of the normal growing pains of such efforts. The United States suffered many problems in the latter half of 1957 and throughout 1958 as it struggled to catch up with the Soviet Union after the successful launch of *Sputnik*. KARI is likely to overcome its problems with the KSLV I. However, what can it realistically expect of its space program? With a budget that has declined in recent years and now sits at $262 million (compared to Japan's $3.8 billion and India's $1.34 billion), South Korea will need to devote considerably more resources to space activities if it hopes to catch up with its Asian neighbors.

KARI's future plans include the development of a domestically produced, three-stage, liquid-fuel KSLV II booster by 2021 capable of launching payloads of up to 1.5 tons into low-Earth orbit (compared to the 100 kilograms of the KSLV I). The ROK aims to launch its first lunar probe by 2023, a feat already accomplished by Japan, China, and India in the past decade. Notably, KARI has abandoned efforts to maintain its astronaut program due to its high cost, suggesting a possible recognition of more limited aims.

The ROK's space program is now focused on developing national technological independence in space activity, particularly for space launch and satellite production. These technologies are important for national security missions, such as space-based reconnaissance, but they are also necessary building blocks for providing commercial space services in the future. Thus, in the medium term, South Korea's space program will be more of an "investment" than a moneymaker.

Fortunately, KARI can expand its reach into space by building more intensive cooperative links with its friends and allies, thus allowing it to cost-share in international missions and satellite constellations without having to own or construct all of the technology. As the United States pivots toward Asia, it has begun to reach out more actively to its allies to share military satellite costs and reduce vulnerabilities to its own space assets posed by China's emerging capabilities.

The ROK could play a mutually beneficial role as part of a growing network of U.S.-allied space capabilities, joining Japan, Australia, and members of the European Space Agency in increasingly linked networks for communications, remote sensing, space situational awareness, and global

positioning. India may eventually join these nations as well. While such an approach may be less glamorous than a go-it-alone strategy, it is also safer and more affordable for Seoul.

Nevertheless, Seoul will face challenges in bringing itself up to the level of allied actors and in developing even a limited range of commercial products that will be viable in a competitive space marketplace. A successful flight of the KSLV I may convince the government that it should push ahead.

There are high entry costs to space activity, but it will provide important contributions to national security and offer benefits that come with the associated prestige. In this regard, the ROK government may have already decided that increased investment in space capability is unavoidable.

More About This Publication

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