



SpaceIL: Landing the first Israeli Spacecraft on the Moon

About SpaceIL

SpaceIL is a nonprofit organization working to land the first Israeli spacecraft on the Moon. SpaceIL is the sole Israeli team competing in the Google Lunar XPRIZE (GLXP) international race to the Moon. Being the only team established as a nonprofit, SpaceIL is committed to donating the potential prize money to science and science education in Israel. Founded at the end of 2010 by Yariv Bash, Kfir Damari and Yonatan Winetraub - three young Israeli engineers- SpaceIL exemplifies the spirit of the "start-up nation" and is working to ensure that Israel lives up to its reputation of excellence in the fields of science and technology. Through this Moon mission, SpaceIL aspires to create an Israeli "Apollo effect" inspiring the young generation to study science, technology, engineering and math (STEM).

Team and Leadership

Shortly after the nonprofit was established, the organization scaled into a national phenomenon in Israel. What started with three engineers sketching a spacecraft design over drinks in a bar, is now an organization comprised of nearly 30 full-time staff and dozens of volunteers across Israel. In 2013, Eran Privman (PhD), joined the team as CEO to manage the nonprofit enterprise. SpaceIL has become a source of national pride, providing an opportunity to showcase Israel's ambitious spirit, creative solutions and innovative energy.

Network of Supporters

From its inception, SpaceIL received the enthusiastic support of Israel's former President Shimon Peres and current President Reuven Rivlin. In addition, a network of renowned academics, business and industry leaders and experts support SpaceIL, including: Israel's Space Agency, Weizmann Institute of Science, Tel Aviv University, Bezeq Communications and Israel Aerospace Industry (IAI), which is SpaceIL's main contractor with many years of experience in satellite building. Since the MBT space factory of IAI is the only location in Israel wherein spacecrafts can be built and tested before journeying to space, the SpaceIL-IAI relationship is critically important to the mission. SpaceIL has the leadership and support of a number of private donors and foundations as well.

Google Lunar XPRIZE Competition and SpaceIL's Launch Announcement

The rules of the Google Lunar XPRIZE competition state that the first private, non-governmental team to build an unmanned spacecraft, soft-land it on the Moon, move 500 meters across the lunar surface and send high definition pictures and video back to Earth, wins a \$20M prize. Thirty-three private teams from around the world began the competition; today, only 16 remain, with SpaceIL among the two leading contenders after reaching a dramatic milestone: in October 2015, at the Jerusalem Residence of Israeli

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President Reuven Rivlin, SpaceIL announced that it had signed a launch contract (with Spaceflight) on a SpaceX Falcon 9 launcher, securing a “ticket” to the Moon. This was a critical moment in the competition; as the first team to announce the signing of a launch contract, SpaceIL showed a level of progress and commitment that put the team in a category of its own. Shortly after SpaceIL’s launch announcement, one of the American teams became the second to announce a launch contract.

Making Space Exploration Accessible

Until now, only global superpowers with billion dollar space programs have successfully landed on the Moon. SpaceIL aims to show the world that this same accomplishment can be achieved for a relatively small budget and that any private group, small country or university can contribute to space exploration. The concept behind the competition's rule that only non-governmental teams can participate, is important to SpaceIL; it reinforces one of the team's principles, that space should be accessible to all and within reach.

Innovation in Space Exploration

Leveraging Israeli expertise in micro-satellite technologies, SpaceIL is applying know-how garnered for defense related necessities (satellites) to a new purpose: space exploration, seeking to build one of the smallest and smartest spacecrafts to ever land on the Moon.

The Hop

Entering the GLXP two years after most of the other teams, SpaceIL had to make up for lost time. By thinking out-of-the-box, SpaceIL engineers concluded that they could accomplish the mission without a rover by using the spacecraft's propulsion system to hover over the surface of the Moon. While the other Google Lunar XPRIZE teams developed large, complex and expensive lunar rovers to move the competition's required 500 meters on the Moon’s surface, SpaceIL developed the cost-efficient concept of a space hop: to have the spacecraft land and then take off again with the fuel left in its propulsion system, and then perform another landing 500 meters away.

Multi functionality

An example of strategic thinking built for extra efficiency, SpaceIL's propulsion system will be used both for landing and for performing the 500 meter hop. The helium tank is multi-functional as well, with its placement on top of the fuel tanks. This is meant to contain the gas as well as compress the fuel in the tanks below. Yet another use of the helium is to perform small corrections of the spacecraft’s angles in orbit – whenever there’s a need to correct the orbit, gas will be pushed out of the lower thrusters.





Design and Construction

The initial idea was to send a SpaceIL spacecraft the size of a small bottle of soda to space; the three co-founders came up with this concept right in the beginning, since they understood that all that was needed for the mission was a computer, a camera and a fuel tank. But they realized soon after that there were no off-the-shelf fuel tanks for space small enough to fit their original concept so there was an evolution in thinking with regard to the design of the spacecraft. The team scratched the original idea and designed a larger model that could carry fuel tanks already available for use. This second design was larger - about the size of an Israeli washing machine. As the team advanced in the process, the design concept evolved yet again; the third and final design, unveiled at the launch announcement ceremony, is a bit larger than a standard U.S. dishwasher. It stands at 1.5 meters high, 2 meters wide with the legs in deployed position and weighs approximately 500 kg. Most of its mass (about 80%) can be found in the propulsion system (engines + fuel tanks).

Scientific Experiment

Along with its partners at the Weizmann Institute of Science, SpaceIL is aiming to break new scientific ground by [unveiling the secrets of the Moon's magnetic field](#): The spacecraft will be carry a magnetometer to take measurements of the magnetic field on the surface of the Moon. In this way, SpaceIL seeks to make an additional and important contribution to scientific research of the history of the Moon, beyond the competition's criteria.

Mission Status

Building the spacecraft is a bit like assembling a puzzle: the process of developing and manufacturing the various components and mission-critical systems of the SpaceIL spacecraft is being completed piece by piece. At this point in the process, a number of components are near completion and awaiting integration. Completed components of the spacecraft include [SpaceIL's camera](#), [transceiver](#) and [IMU](#), a major electronic component in the spacecraft's navigation system.

Tests and Design Reviews

After testing the spacecraft's navigation sensor in a rocket experiment conducted in 2011 and upon completing several preliminary design reviews over the last few years to finalize the spacecraft's design, SpaceIL is in full scale development in accordance with the specifics of the launch agreement.

For more information: www.spaceil.com



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