

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Moon Exploration – Part 1 (2A)

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LANDING ON THE MOON AND A HOP - THE CHALLENGES OF DESIGNING, BUILDING AND  
INTEGRATING THE SPACEIL LUNAR LANDER PROPULSION SYSTEM**Abstract**

The SpaceIL Lunar Lander is the first Israeli mission to the moon, designed with the goal of landing on the moon and performing a short hop in order to win the google lunar xprize. This system was also an innovation for Israel Aerospace Industries, as the first bi-propellant propulsion system to be designed and integrated in Israel.

The Lander propulsion system performance and reliability are critical to the success of the mission - The high energies involved dictate an efficient system on one hand. On the other hand the program had limited budget due to its nature as a non-governmental, non-commercial program. The system design principles used to achieve the required performance on-budget and on-time will be detailed.

The propulsion system was developed specifically for the Lunar Lander mission, including new components, custom designed for the mission, as well as modifications to existing products and off-the-shelf items. Detailed analysis and testing were performed, both for the components and at system level using breadboard testing. The system includes a high thrust main engine; Auxiliary thrusters used both for ACS and a boost to the main thrust during landing; High performance Composite Overwrapped Pressure Vessels; Custom design PMD Propellant tanks and more.

Additional challenges solved during the program include: The requirement for high T/W ratio and accurate thrust control during the landing - without the use of a throttle-able engine; Designing a system capable of operating in space and under lunar gravity during the hop and landing; Integration and testing of additive manufactured (3d printed) structures, to reduce the system weight while maintaining rigidity.

The propulsion system has completed integration and testing, the results of will be presented.