

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

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FINAL CONFIGURATION OF THE ISPACE HAKUTO ROVER FOR A GOOGLE LUNAR XPRIZE  
MISSION IN 2017.**Abstract**

ispace is developing a four wheeler rover called Sorato for a lunar mission beginning at the end of 2017. The rover is being developed for the Hakuto Google Lunar XPRIZE (GLXP) team, now one of five finalists in the competition to be the first private team to travel 500m on the lunar surface. ispace is now partnered with India-based Axiom and its GLXP team, Indus. Indus has contracted a launch on the Indian PSLV launch vehicle, and Hakuto is its payload.

The Sorato rover has progressed over several years to its final flight configuration of just 4 kilograms, with a comprehensive sensors package including 4 conventional cameras and one newly-developed time-of-flight camera. This paper presents the final year of design and qualification testing to prepare the rover for flight. The design includes inexpensive COTS components, offset by a redundant architecture which requires only a small subset of components to reach its objective. This paper presents several years of screening and radiation testing efforts to allow order-of-magnitude increases in computing power compared to conventional missions.

It also presents advances in materials selection, design and qualification testing to reduce the mass of the rover, using the thermal properties of engineering plastics such as Polyetherimide resin. ispace is using a promotional business model to fund its first mission. It is also planning future missions with dozens of rovers. These requirements justify the use of mass-manufacturing techniques such as injection molding of engineering plastics and optimization thereof. Using injection molding of the wheels has saved 450 grams as well as increased the thermal performance of wheels (in terms of isolating the rover from the lunar noontime surface temperatures) compared to previous ispace rovers.

The summary of environmental testing and simulation for the cruise and surface mission simulations is presented to give an overall justification for Sorato's predicted performance of traveling 21 kilometers in a mission of less than on lunar day's duration (approximately 260 Earth hours) .