

# Lunar Autonomous Automatic Surface Navigation System

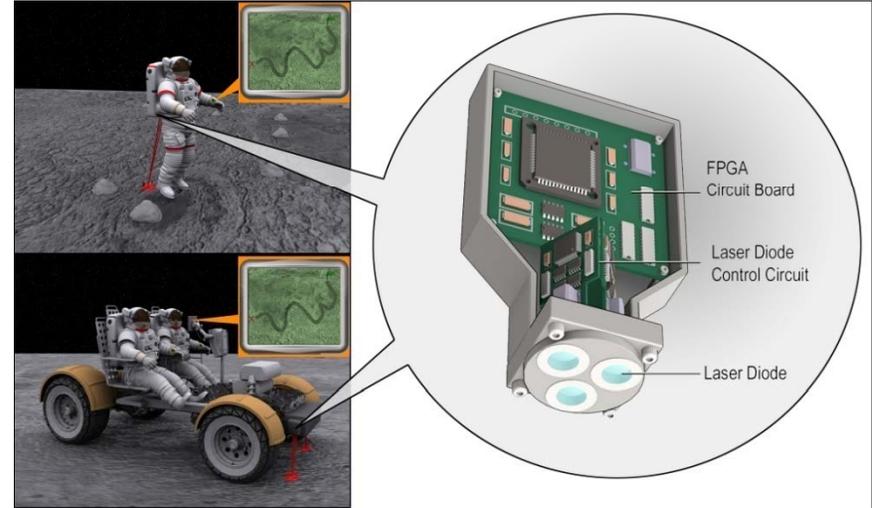


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## Identification and Significance of Innovation

To address the NASA need for navigation systems for planetary EVA, manned rovers, and lunar surface mobility units, Physical Optics Corporation (POC) proposes to develop a new Lunar completely Autonomous Automatic Surface Navigation (LAAN) system. The system incorporates POC's self-mixing laser interferometric speedometer sensor, POC's tunable liquid crystal lens autofocusing system, and a robust prediction tracking algorithm. The LAAN system offers position accuracy better than 2.5 m with 95% probability per 0.5 hr of motion without interaction with any other positioning system; and is compact (<10 in.<sup>3</sup>), lightweight (<8 oz), and low power. In Phase I, POC will demonstrate the feasibility of the LAAN prototype (TRL-4 at the End of Phase I). In Phase II, POC plans to develop a fully functional prototype and demonstrate its complete feasibility as TRL-6.



## Technical Objectives

1. Enhancement of self-mixing laser interferometric speedometer sensor parameters in data acquisition, signal processing speed, and parameters of its autofocusing system.
2. Development of the LAAN tracking prediction algorithm, including a kinematical model of a moving object.
3. Integration and testing of the LAAN hardware and embedded software.
4. Definition of the commercial market for the LAAN system.

## Work Plan

1. Develop Fast Data Acquisition and Signal Processing.
2. Design LAAN Liquid Crystal Autofocusing Optics.
3. Develop Predictive Algorithm for LAAN and LAAN simulation.
4. Integrate Sensor Module and Predictive Algorithm.
5. Demonstrate LAAN Feasibility.
6. Explore the Commercial Potential and Product Viability.
7. Prepare and Submit Reports.

## NASA Applications

The new Lunar completely Autonomous Automatic Surface Navigation (LAAN) system will provide NASA capabilities for location awareness, precision position fixing, best heading, and traverse path planning for planetary EVA, manned rovers, and lunar surface mobility units.

## Non-NASA Applications

Military applications of the LAAN will include: navigation/position determination for ground platforms in urban area battlefields where the GPS system does not work properly/destroyed; for dismounted soldiers, robots, and autonomous platforms (within buildings, tunnels, caves, etc.).

## Contact

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**NON-PROPRIETARY DATA**