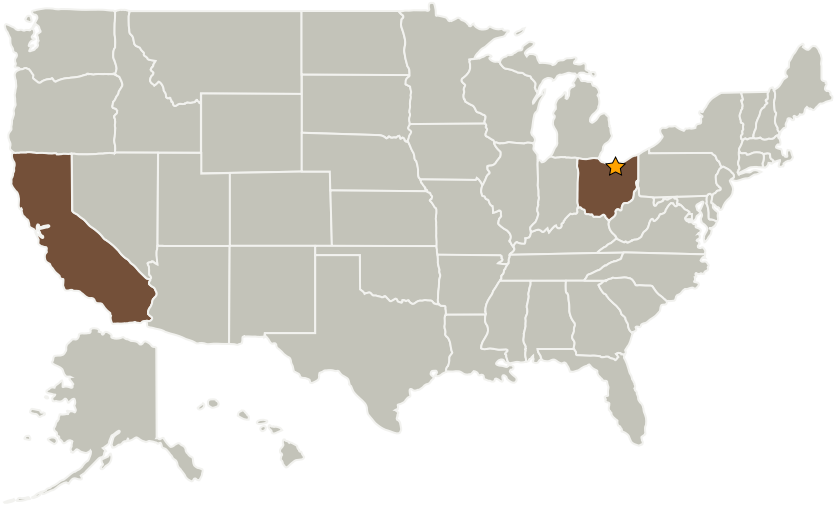
Multi-Agent Optical Sensor Chip for Cryogenic Fluids Leak Detection, Phase I

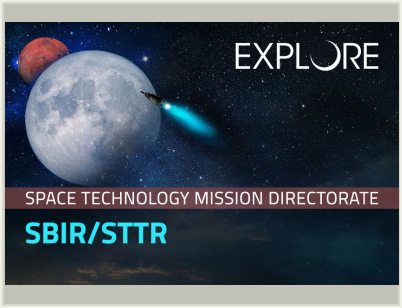
Completed Technology Project (2009 - 2009)

Project Introduction

In space missions, launch vehicles (LV) are filled with cryogenic propellant fluids. It is important to protect these LVs from any leakage of liquid propellants through a reliable, accurate, leak detection system. Currently used analytical methods do not meet space mission requirements of low power consumption, reliability, low weight, and cost effectiveness. To overcome these limitations, Intelligent Optical Systems (IOS) proposes to adapt, optimize, and integrate optical detection technologies into an accurate leak detection system for H2, O2, and CH4. Due to their extreme low temperatures, these cryogenic fluids induce a contraction of the materials they contact, creating a potential cause of leakage. Hydrogen leakage in air creates an explosive atmosphere for hydrogen concentrations (between 4% (v/v) -- the lower explosive limit (LEL) and 74.5% (v/v) -- the upper explosive limit (UEL)) at room temperature and pressure. The early detection of cryogenic fluid leakage is extremely important for reasons of safety, reliability, and economy. IOS will provide its expertise in optical sensing to develop a miniaturized, reliable, highly sensitive, multi agent detection prototype, a Multi-Agent Optical Sensor Chip for Cryogenic Fluids Leak Detection (MOSCLD). The study will target detection limits of 1ppm or less and a response time in the millisecond range.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Intelligent Optical Systems, Inc.	Supporting Organization	Industry	Torrance, California

Primary U.S. Work Locations	
California	Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
  └ TX14.1 Cryogenic Systems
    └ TX14.1.2 Launch Vehicle Propellant