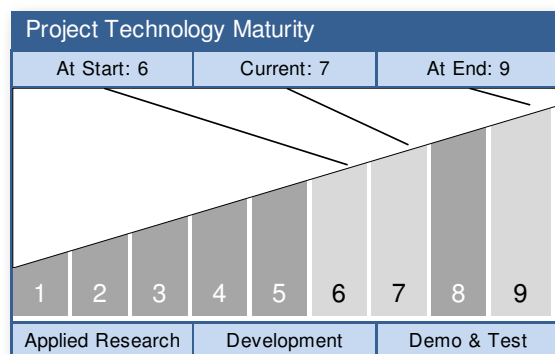# Advanced Ground Systems Maintenance Intelligent Devices/Smart Sensors Project

Human Exploration And Operations Mission Directorate (HEOMD)

National Aeronautics and
Space Administration

ABSTRACT

This project provides development and qualification of Smart Sensors capable of self-diagnosis and assessment of their capability/readiness to support operations. These sensors will provide pressure and temperature measurements for use in ground systems.

Intelligent Devices undergoing testing

Project Technology Maturity

At Start: 6	Current: 7	At End: 9

1	2	3	4	5	6	7	8	9
Applied Research			Development			Demo & Test		

Technology Area: Ground & Launch Systems Processing TA13 (Primary)
Robotics, Tele-Robotics & Autonomous Systems TA04 (Secondary)

ANTICIPATED BENEFITS

To NASA funded missions:

Ethernet-based temperature and pressure smart multi-sensor arrays capable of self-calibration, self-assessment, automated configuration control and other capabilities will support maintenance "on-need" instead of schedule-based preventive maintenance and will result in
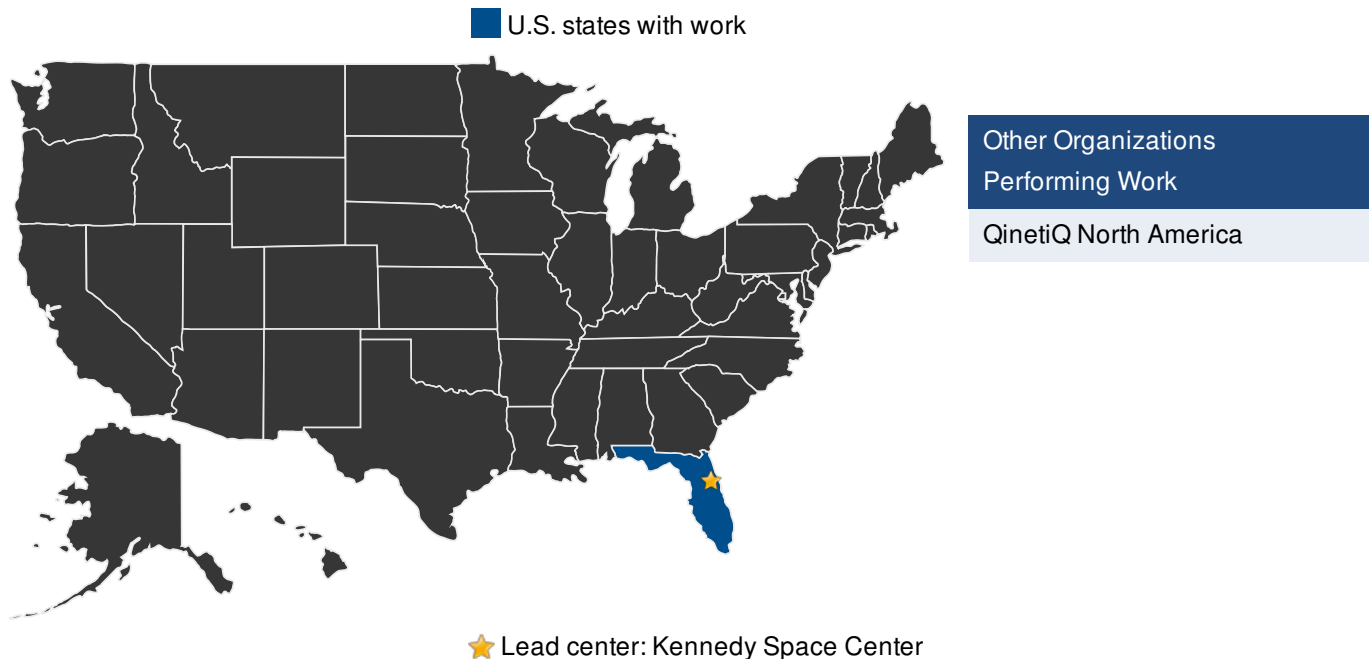
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U.S. states with work

Other Organizations Performing Work

QinetiQ North America

⭐ Lead center: Kennedy Space Center

DETAILED DESCRIPTION

Intelligent Devices embeds algorithms directly on the sensor, which allows the sensor to reason about its health and readiness to perform an operation. Intelligent Devices and the architecture that supports them allow sensor fusion - that is, taking multiple sensing elements and providing the best health and status, based on all the inputs. This technology is also an enabler for operational capabilities that were not previously possible, including determining the actual configuration of the hardware to providing enhanced fault detection or virtual sensing of things that are derived, such as density from pressure and temperature or rate of change. Not only will Intelligent Devices help to improve system availability; this technology will also allow us to extend recalibration cycles, which translates to a cost savings.

MANAGEMENT

Program Executive:
Michael Bolger
Program Manager:
Kirk Lougheed
Project Manager:
Barbara Brown
Principal Investigator:
Barbara Brown

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TECHNOLOGY DETAILS

Advanced Ground Systems Maintenance Intelligent Devices/Smart Sensors

Technology Maturity		
At Start: 6	Current: 7	At End: 9
1 2 3	4 5 6	7 8 9
Applied Research	Development	Demo & Test
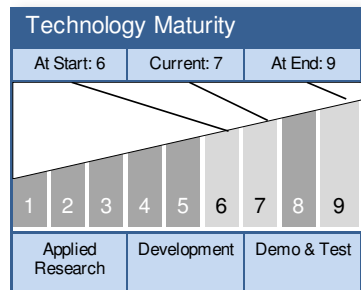
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This technology is categorized as a hardware assembly for other applications

- Technology Area

    ○ TA13 Ground & Launch Systems Processing (Primary)

    ○ TA04 Robotics, Tele-Robotics & Autonomous Systems (Secondary)

    ○ TA06 Human Health, Life Support & Habitation Systems (Additional)

CAPABILITIES PROVIDED

Plug-and-play sensor capability: 5 Ethernet-based temperature probes and 5 Ethernet-based pressure heads with smart multi-sensor arrays capable of self-calibration, self-assessment, automated configuration control and other capabilities. Plug-and-play sensor capability.

POTENTIAL APPLICATIONS

Intelligent Devices (sensors/actuators with embedded intelligence) applications are very diverse. Any application requiring command and control requires connection to devices that provides measurements, indications and actuation. Because these intelligent devices are constantly checking for their health and their availability to support, the overall system becomes more robust, system availability and reliability is enhanced, and system maintenance is reduced (only devices that require maintenance are serviced instead of scheduled service). Devices inform the system when

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PROJECT LIBRARY

Images

- Intelligent Devices undergoing testing

  (https://techport.nasa.gov/fetchFile?objectId=1928)

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ANTICIPATED BENEFITS

To NASA funded missions: (CONT'D)

improved data reliability and decreased maintenance cost. Supports autonomous operations/systems with self-prognostics/diagnostics capabilities.

TECHNOLOGY DETAILS

POTENTIAL APPLICATIONS (CONT'D)

they are degrading or an impeding failure is detected, so systems operators can address the issue before the system fails. Therefore, potential applications are numerous, both within NASA and industry.

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