

Familiarization And Detection Of Green Monopropellants Project

Center Independent Research & Developments: KSC IRAD Program

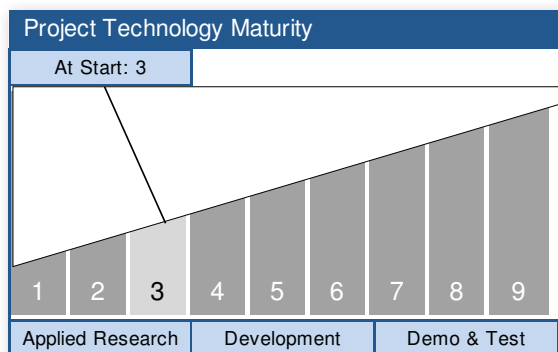
Office Of The Chief Technologist (OCT)

National Aeronautics and
Space Administration



ABSTRACT

Ammonium dinitramide (ADN) and hydroxyl ammonium nitrate (HAN) are “green” monopropellants which will be appearing at Kennedy Space Center (KSC) for processing in the next few years. These are relatively safe replacements for hydrazine as a monopropellant; however, little is known about methods of leak detection, vapor scrubbing, air emissions, or cleanup that will be required for safe and environmentally benign operations at KSC. The goal of this work is to develop leak detection and related technologies for the two new “green” ...**Read more on the last page.**



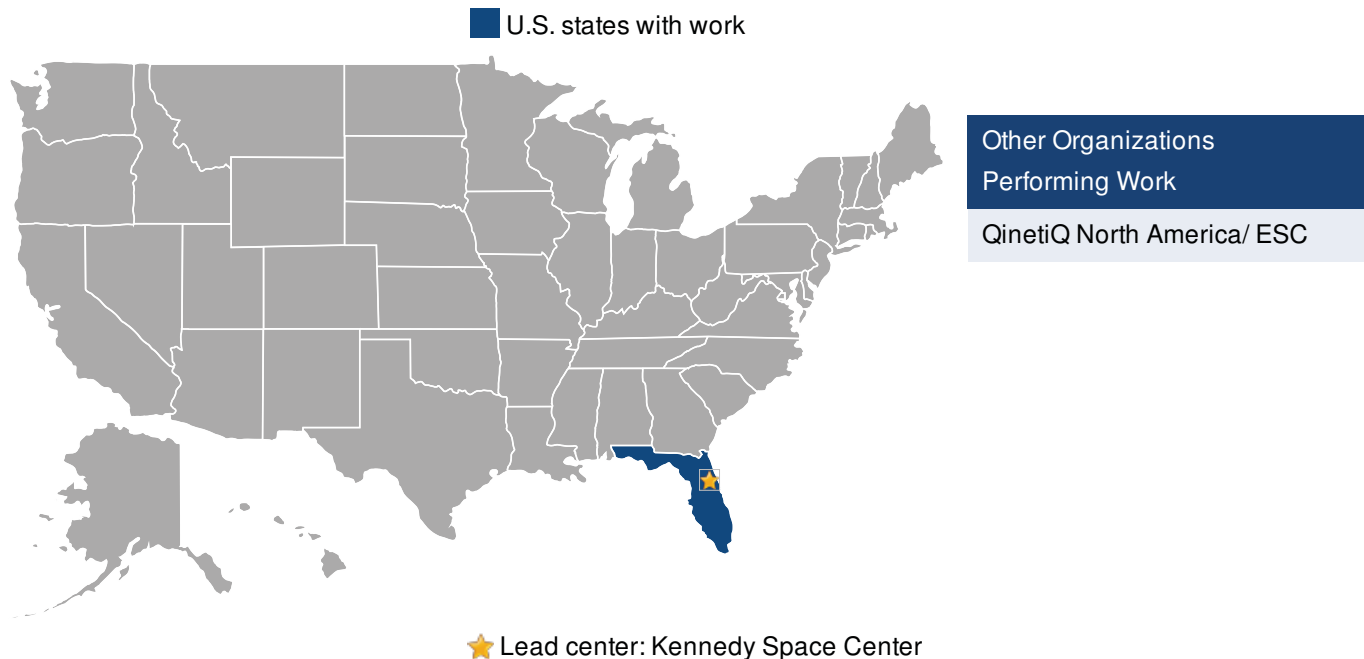
Technology Area: Ground & Launch Systems Processing TA13 (Primary)
In-Space Propulsion Technologies TA02 (Secondary)

ANTICIPATED BENEFITS

To NASA funded missions:

The unique capability of the Applied Chemistry Laboratory for hypergol generation and detection, and the development/evaluation of sensors, continues to bring in customers from across the country who are interested in validating new technology for hypergol systems. The ADN sensor, HAN detector and propellant familiarization project will continue to build this unique capability for future businesses and customers as well as supporting the need for “green” propellant sensors for potential future program ...

Read more on the last page.



Contributing Partners

Armstrong Flight Research Center
Marshall Space Flight Center

DETAILED DESCRIPTION

Ammonium dinitramide (ADN) and hydroxyl ammonium nitrate (HAN) are “green” monopropellants which will be appearing at KSC for processing in the next few years and will be used to test an F-16 Emergency Power Unit (EPU) through collaborations with Marshall Space Flight Center. These are relatively safe replacements for hydrazine as a monopropellant; however, little is known about methods of leak detection, vapor scrubbing, air emissions, or cleanup that will be required for safe and environmentally benign operations at KSC. The goal of this work is to develop leak detection and related technologies for the two new “green” monopropellants.

ADN was developed by the Swedish Space Corporation (SSC), while HAN was developed by the Air Force Research Laboratory to be a propellant. Alliant Techsystems Inc (ATK) is predominantly evaluating ADN for future use, while Ball Aerospace was awarded a NASA Technology Demonstration Mission (TDM) to use HAN as a ...

MANAGEMENT

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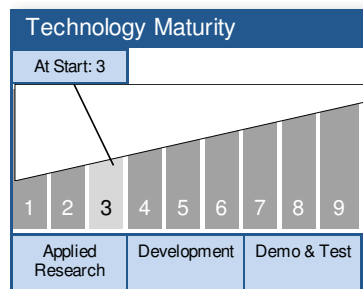
DETAILED DESCRIPTION (CONT'D)

monopropellant to be launched from KSC/Cape Canaveral Air Force Station. KSC needs the technology in place prior to their arrival and needs to make recommendations as to their adoption if significant issues are found. This is novel work that is necessary to safely support the evaluation and development of the next generation of "green" propellants.



TECHNOLOGY DETAILS

Familiarization and Detection of Green Monopropellants



TECHNOLOGY DESCRIPTION

This project seeks to evaluate several methods of detecting ADN and to develop methods of detection for HAN. Familiarization with ADN and HAN specifically regarding handling, transport, cleanup and properties is a key part to the development of this technology.

This technology is categorized as a hardware system for other applications

- Technology Area
 - TA13 Ground & Launch Systems Processing (Primary)
 - TA02 In-Space Propulsion Technologies (Secondary)

CAPABILITIES PROVIDED

This technology provides the capability to detect ADN using commercial off the shelf (COTS) based sensors and to detect HAN using a developed method that can be used in various environments. Readiness to safely process these propellants and provide specific feedback to spacecraft developers will be the key contribution of this project.

This technology is expected to impact current and future programs looking to use or who are currently using "green" monopropellants by providing detection methods to increasing the safety of those involved with the handling, storage and transportation of these propellants.

ABSTRACT (CONTINUED FROM PAGE 1)

monopropellants.



ANTICIPATED BENEFITS

To NASA funded missions: (CONT'D)

needs.

NASA's Return on Investment: The Office of the Chief Technologist (OCT) has funded a "green" propellants mission called Green Propellant Infusion Mission (GPIM), acknowledging the importance of new, "friendlier" propellants.

To NASA unfunded & planned missions:

Marshall Space Flight Center (MSFC) is currently working with the U.S. Air Force to test green propellants in F-16's Emergency Power Unit (EPU). Familiarization and sensor detection of "green" propellants will allow KSC and NASA to be able to support future hardware using these types of fuel with increased safety and mission reliability. Data acquired during this project may lead to potential new detection methods for other materials outside NASA, including toxic industrial materials and industrial processing waste.

To other government agencies:

The Swedish Space Corporation, as well as the U.S. Air Force, are currently investigating the use of green propellants in various systems. The information gained during this project will be useful to other government agencies and commercial organizations that utilize hypergol propellants.

To the commercial space industry:

The ADN sensor, HAN detector and propellant familiarization project will continue to build this unique capability for future businesses and customers as well as supporting the need for "green" propellant sensors for potential future program needs. The information gained during this project will be useful to other government agencies and commercial organizations that utilize hypergol propellants.

To the nation:

The unique capability of the Applied Chemistry Laboratory for hypergol generation and detection, and the development/evaluation of sensors, continues to bring in customers from across the country who are interested in validating new technology for hypergol systems. The ADN sensor, HAN detector and propellant familiarization project will continue to build this unique capability for future businesses and customers as well as supporting the need for "green" propellant sensors for potential future program ...

ANTICIPATED BENEFITS

To the nation: (CONT'D)

needs.

