

Non-Toxic HAN Monopropellant Propulsion

Phase I Project Summary**Research Objective:**

The SBIR Phase I demonstrated a non-toxic monopropellant, AF-M315E, based on hydroxylammonium nitrate (HAN). AF-M315E has superior performance as compared to hydrazine and much lower toxicity. No self-contained breathing apparatus is required to load HAN. HAN-based monopropellants require higher chamber temperatures to combust. Current hydrazine based combustion chamber technology and catalyst are inadequate. However, current state-of-the-art chambers are compatible with monopropellants and new ignition techniques are being developed. The goal of the SBIR project is to fabricate and test a flight-weight thrust chamber for HAN-based monopropellants.

Research Performed:

A long life combustion chamber was designed and tested with HAN monopropellant AF-M315E. The prototype long life combustion chamber was fabricated. Ignition of HAN monopropellant was demonstrated with an innovative catalyst.

Research Results:

- 4 lbf thruster was designed and manufactured for non-toxic AF-M315E mono-propellant.
- A metal foam based monolithic catalyst was developed and fabricated.
- Ignition of AF-M315E monopropellant was demonstrated.
- The thruster was successfully tested for 50 millisecond and 1 second pulses and then a 10 second burn.
- There was no degradation of thruster after testing in air.
- A “green” non-toxic monopropellant alternative to hydrazine was demonstrated.

Phase II Justification

A viable alternative to toxic hydrazine was demonstrated in Phase I. In Phase II, improvements to thrust chamber assembly will be conducted. Testing of the Phase II thrust chamber will determine life and response time. The Phase II testing will be conducted with major propulsion companies to enable transition of “green” propulsion into commercial products.