AFRL

ADVANCED SPACE CRAFT ENERGETIC NON-TOXIC (ASCENT) GREEN MONOPROPELLANT

SATELLITE MISSION BENEFITS

Increased Performance

- 10% higher specific impulse and 50% higher density impulse than Hydrazine
- Can fully reconstitute upon reheat

Reduced Mission Costs

Significant life cycle cost reductions:

- No SCAPE suit, equipment, inspections required
- Less labor and training

Fewer Co-Manifest Challenges

- Reduced physical risk to other satellites
- Reduced launch schedule risk
- Compatible with COTS storage materials

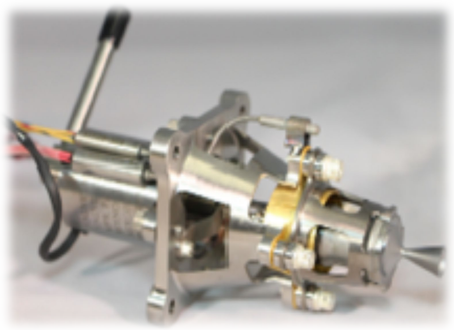
Simplified Handling and Transportation

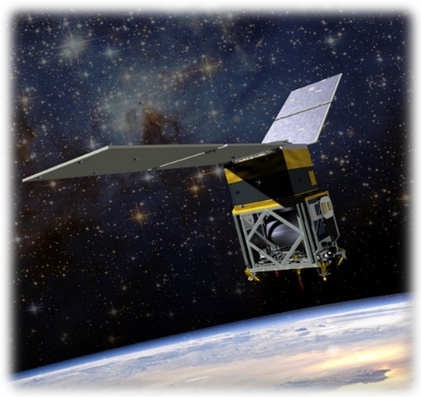
Low toxicity propellant

- Simplified spill procedures
- Reduced shipping and disposal costs

DEMONSTRATED ON ORBIT – GREEN PROPELLANT INFUSION MISSION

- NASA, Ball Aerospace, Aerojet Rocketdyne, AFRL
- Launched June 2019, Successful completion Oct 2020
- Demonstrated: ASCENT on orbit, ASCENT ACS, ASCENT GNC
- ESPA-class, five 1N thrusters
- AFRL loaded 14kg of ASCENT successfully

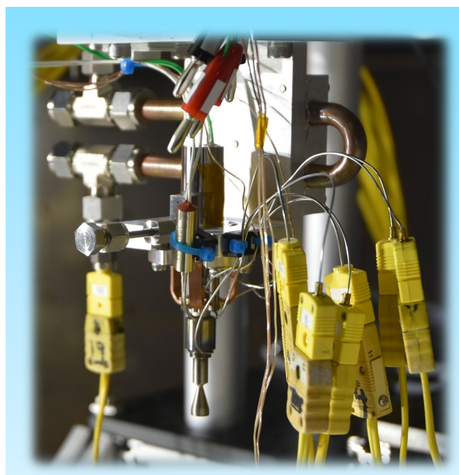




ASCENT TECHNOLOGY PROGRAMS

ASCENT 1N THRUSTERS

- Development thrusters successfully hot fire tested at AFRL Edwards, ECELL facility
- Flight weight thrusters on contract, expected completion late FY23



Busek 1N

Plasma Processes 1N

Moog 1N

ASCENT Technology Programs

- 100mN to launch on Lunar Flashlight Propulsion System Spring 2022 – Plasma Processes
- 0.5N flight thruster December 2022 – Busek
- 5N NASA SBIR – Plasma Processes
- 22N thruster Summer 2022 – Benchmark

ECELL at AFRL Edwards

Inside ECELL test chamber

COMPATIBLE WITH COTS MATERIALS

METALS

Long Term: Gold, Pt/Rh 90/10, Ti: 3Al-2.5V, 6 Al-4V, CpTi

Short Term: Ti grade 19, CRES: 13-8PH, 15-5PH, 17-7PH, 17-4PH, 301, 302, 304, 316L, 321, Inconel 718

NON-METALS

Long Term:
PEEK, PTFE, PFA, AF-E-332, SIFA, HDPE, Kalrez: 4079, 6375, 6380, 9100, Kynar, Masterflex, Polypropylene, Viton

Short Term:
Hydrazine, EPDM, AF-E-411

LOW TOXICITY STORABLE GREEN PROPELLANT

- Formerly named AF-M315E
- Commercially available through Digital Solid State Propulsion

Hazard Class: 1.3C explosive
Density: 1.46 g/cm3
Theoretical Isp at 300psi: 266s
Vapor Pressure: 1.4 kPa
Freezing Point: -80C

Primary Constituents: HEHN, HAN, H20

$[HOCH_2CH_2N_2H_4]^+ [NO_3]^-$

Hydroxyethylhydrazinium nitrate (HEHN)

$[NH_3OH]^+ [NO_3]^-$

Hydroxylammonium Nitrate (HAN)

Products: H2O, N2, CO2, CO, H2

THE AIR FORCE RESEARCH LABORATORY