Sagitta Borealis Systems

Precision-Manufactured, High-Performance Propulsion for the SmallSat Era

Stefan Bell, PhD
Founder

WHY NOW

Constellations Are Scaling Faster Than Propulsion Can Keep Up

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1,000+

satellites per constellation, a scale that didn't exist a decade ago

Downsizing

size, weight, and power of satellites put tight constraints for legacy propulsion systems

Unreliable or nonexistent

state of propulsion at this scale, today

Critical Applications of Constellations

Defense

Golden Dome & next-gen surveillance networks require thousands of maneuverable satellites

Global, Uninterrupted Communications

Radio and internet constellations need station-keeping and de-orbit propulsion at scale

Live Climate Monitoring

Persistent CO2, ice, and fire monitoring networks depend on long-duration small satellites

OUR TECH

High Performance 3D Printed Electrospray Thrusters

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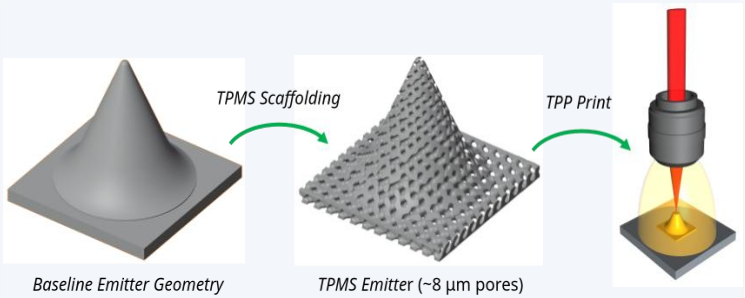
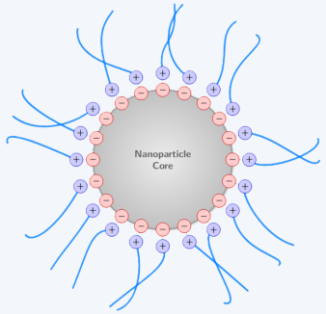
*A low-cost, additively manufactured thruster paired with a nanoparticle propellant. **Designed** for the small-satellite era.*



Additively Manufactured Emitters

3D-printed architected porous microstructures replace fragile, hand-fabricated MEMS parts, improving reliability and lifetime.



Designer Propellant (NIMs)

A tunable nanoparticle-based fluid engineered to mission demands, not constrained by decades-old, fixed-chemistry ionic liquids.

Agile Development Pipeline

New emitter designs are printed and tested in about 2 hours for roughly $2, not months and hundreds of thousands of dollars.

OUR ADVANTAGE

Rapid & Agile Propulsion Development

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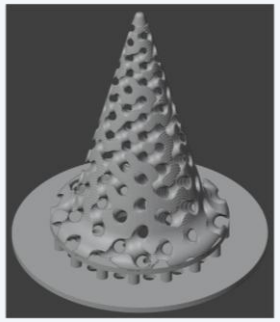
Electrospray emitter design can be rapidly iterated on in a way no other propulsion system can be

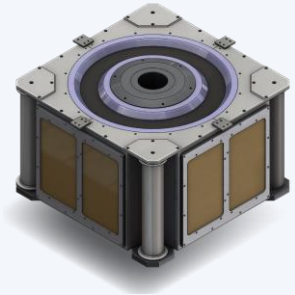
Initial conditions

Legacy, agnostic hardware

Scratch

Design



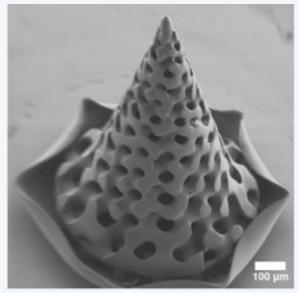


Img: Busek

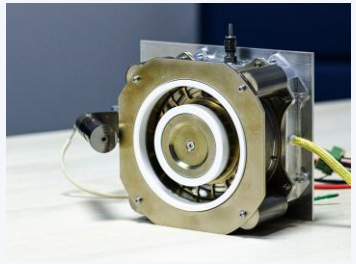
30 minutes
~$2

3-6 months
$100k+

Print



Fab

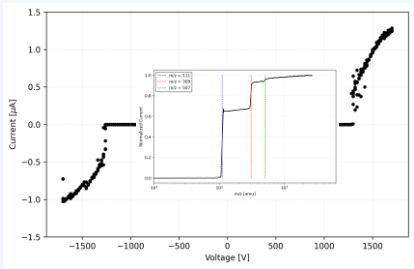


Img: SETS

60 minutes
In-house

4-6 months
$10k+

Test



Img: PEPL

Refine performance

Accept performance

Emission of Nanoparticles Directly from Fluid

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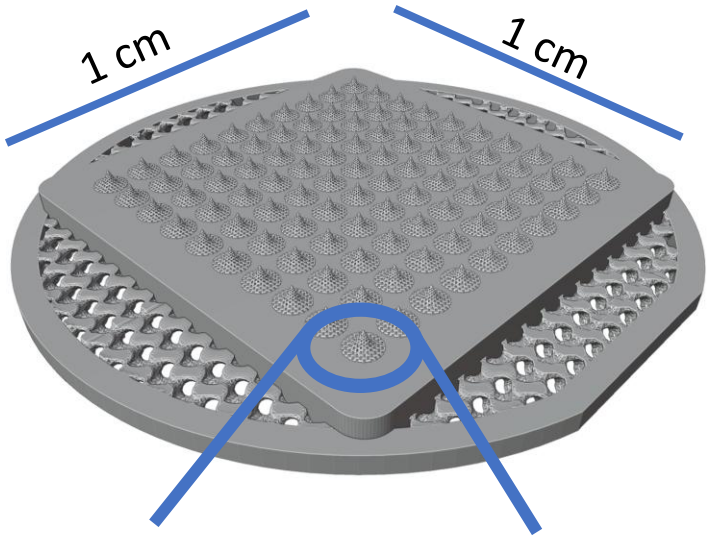
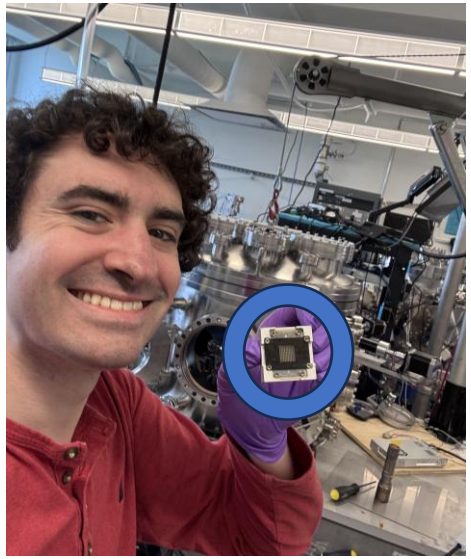
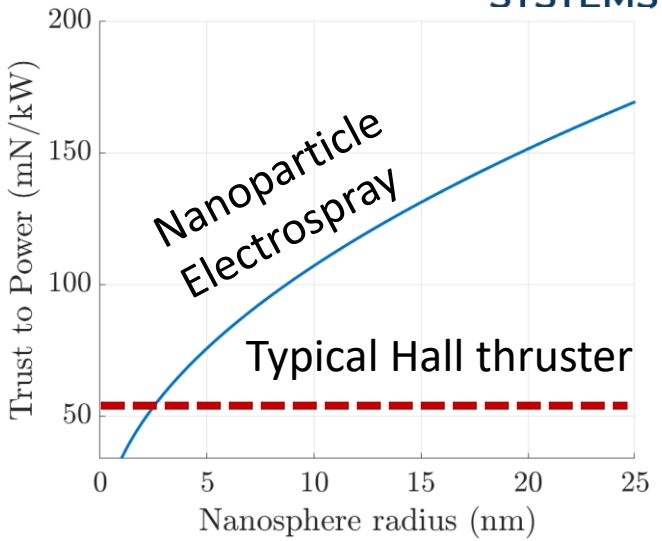
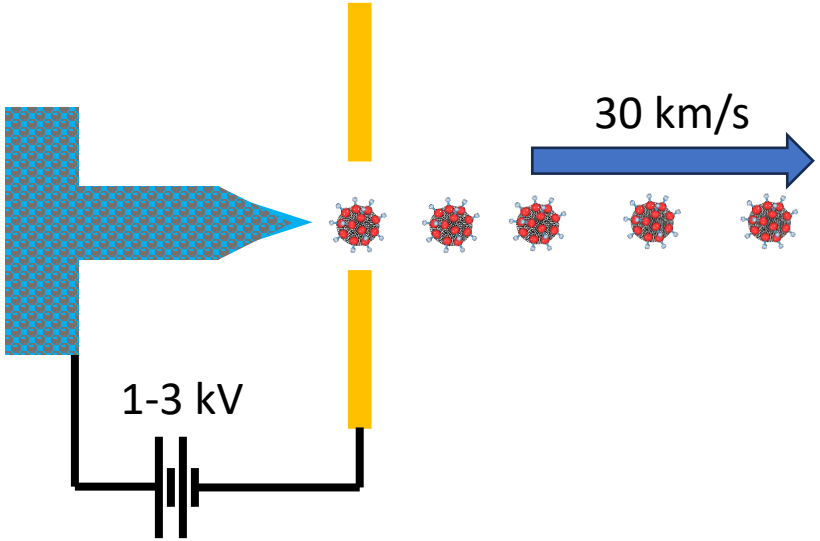
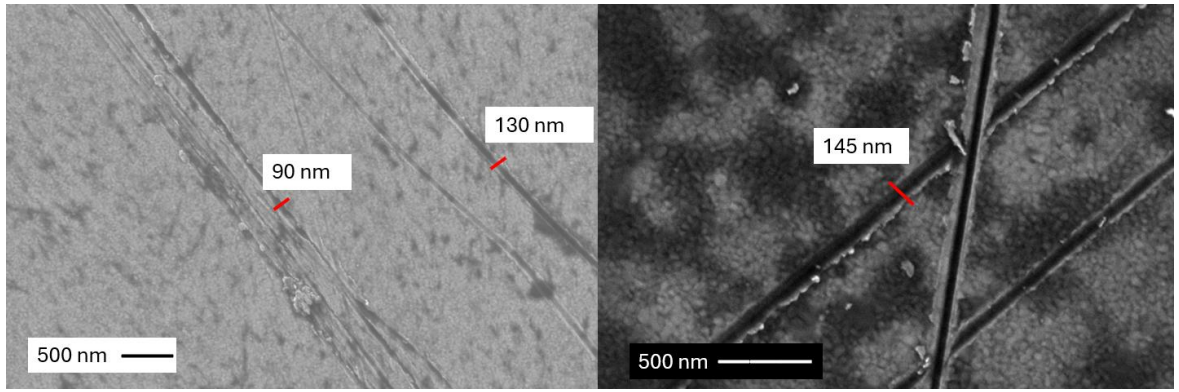


Full system size









Impact events from nanoparticles

An Open Quadrant: High Performance, Low SWaP

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Traditional micro propulsion forces a choice:
settle for weak thrust, or pay for the size, weight, and power of a full-scale system.

*We sit in the mass class with the **fewest or no** competing systems today.*

Performance increases ↑

High Performance
Low SWaP

SAGITTA BOREALIS SYSTEMS

Us!

ENPULSION

High Performance
High SWaP

SAFRAN AEROSPACE · DEFENCE · SECURITY

NASA

large ion engines, Hall thrusters

Low Performance
Low SWaP

MOOG

REVOLUTION SPACE

traditional cold gas, electrospray

Low Performance
High SWaP

ION-X

BUSEK Space Propulsion and Systems

legacy, micro EP systems

SWaP (size, weight, power) increases →

MARKET SIZE

A Fast-Growing Market With Named Customers Already Engaged

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TAM: SmallSat propulsion market: $2.6B today, 12% CAGR

Target Customers

Primes & Government

Lockheed Martin

NASA

AFRL — LOI

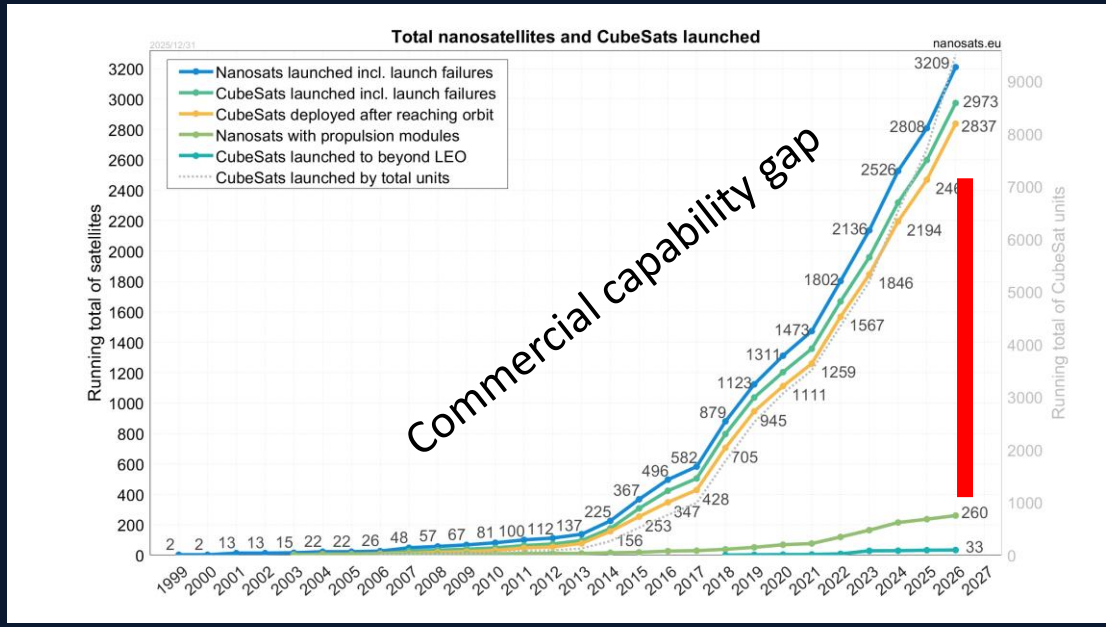
NRL — LOI

Commercial New Space

Varda

GHGSat

Kepler



Rapid Feedback Development Model

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BEACH-HEAD

“Standardized Electrospray”

A reliable, baseline module for the propulsion R&D community, building early cash flow, and outsourcing testing directly to customers.

- **Cost-effective fabrication:** $2 per emitter, reliable process already demonstrated
- **Easy to design & swap:** modular emitter and propellant loading
- **System cost ~$5,000** → targeted sale price ~$10,000
- **Identify pain-points BEFORE flight:** Enables direct technical feedback early
- **vs. incumbent:** AFET-2 thruster costs $12,000+ to build, $50+ per emitter, hard to load, high geometrical variability

IN DEVELOPMENT

Flight Thruster

A full on-orbit propulsion system, built with as much COTS hardware as possible, for commercial constellation operators.

- **750 emitters per chip:** ~1,500 print-minutes with quick-print geometry @ densities 50% greater than SoA
- **Print-to-align extractor:** alignment within 1 micron
- **Build cost ~$110,000:** (base/reservoir, extractor, housing, COTS power unit) excluding flight qualification
- **Built with lessons learned:** Standardized electrospray lessons feed directly into design & integration considerations for flight

TRACTION & VALIDATION

De-Risked by University Grant Funding, Government Testing, and IP

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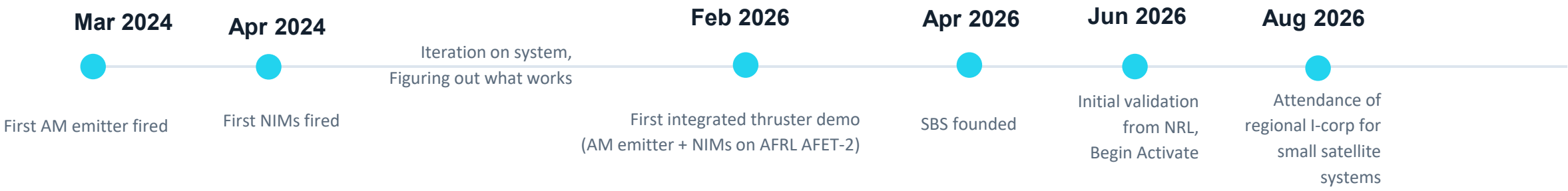
$1M DARPA TALOS grant
2-year award, 2024

2 Provisional patents on
Emitter and propellant

2 Letters of Support
AFRL and NRL

Program Milestones



Performed in part at the Cornell NanoScale Facility (NSF Grant NNCI-2025233) & CCMR. Access to shared fabrication and characterization instrumentation.

ROADMAP

Path to Flight and Early Commercialization

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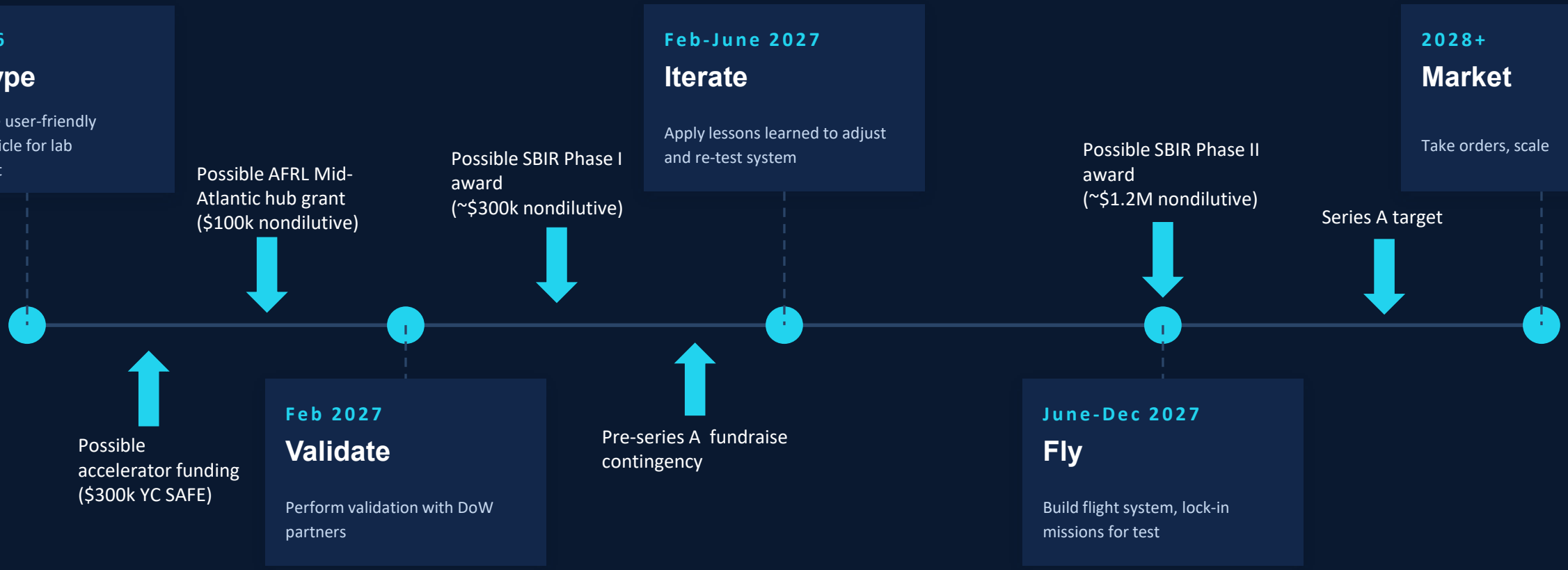

TEAM

Team & Advisory Expertise

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SB

Stefan Bell

Founder & CEO

7+ years electrospray & lab experience

EP

Prof. Elaine Petro

Advisor

10+ years aerospace engineering

EG

Prof. Emmanuel Giannelis

Advisor

30+ years materials & chemistry; NIMs co-inventor

NC

Prof. Sadaf Sobhani

Advisor

10+ years ceramics and additive manufacturing experience

Possible CTO: Dr. Carl Geiger, to be brought on with funding

WHAT'S NEXT

Enabling the Space Infrastructure of Tomorrow

SAGITTA BOREALIS SYSTEMS

We are pre-fundraise & focused on de-risking the technology through 2026. Here's how we're looking to collaborate.

Strategic & Technical Partners

Labs, and constellation operators for flight integration, hosted payloads, and pilot testing

Non-Dilutive Funding

Grants and government partners to ground-based development and testing

Early Investor Conversations

Building relationships ahead of a priced round as the technology and traction mature

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