ADVANCED
ROCKETS
CORPORATION

Space Should be Routine

02

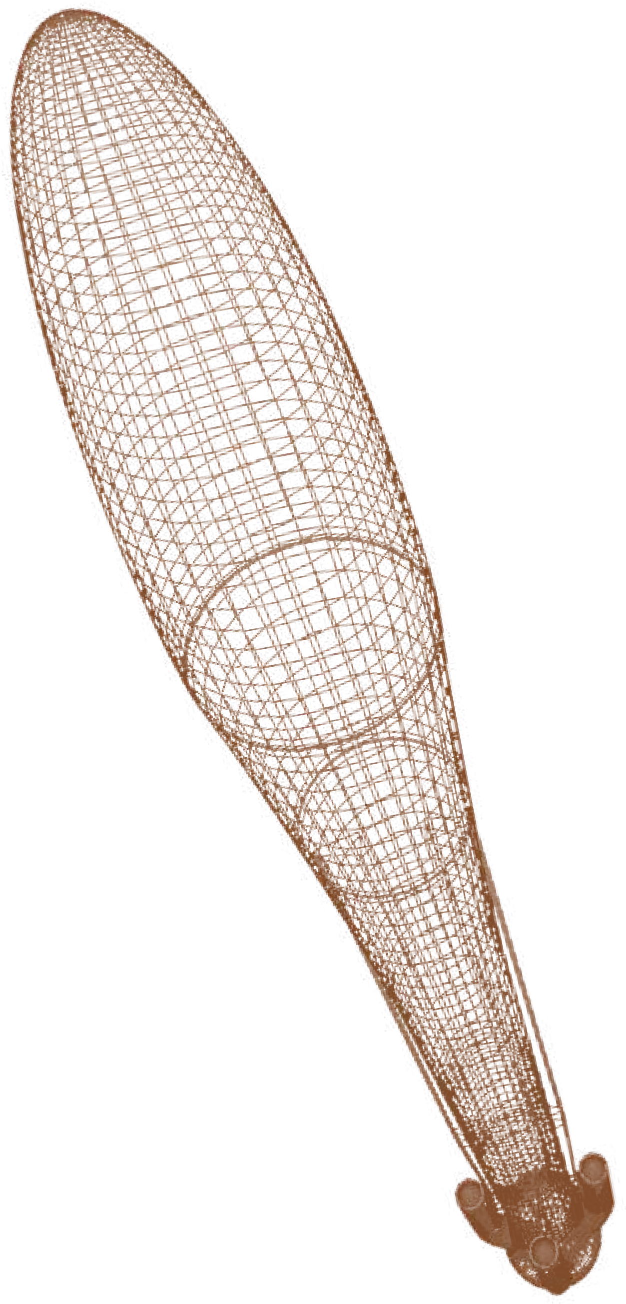
THE NEED

The Ecosystem Will Reach Its Limit

Going to space should be routine. The launch industry has room to grow.

Current technology enabling space access is prohibitively expensive, operationally fickle, and resource wasteful. The space economy and subsequent markets are becoming more of a fact and less of a wish. To realize the full economic potential, affordable and routine point-to-point launch cadence are required for all who want to participate.

This will reduce the barrier of entry for companies looking to build and sustain the space ecosystem in LEO, MEO, GEO and beyond. This capability is vital for all future space research, commerce, economic activity, transportation, and exploration.



THE ARC ADVANTAGE

Solving Industry Challenges

Efficiency gains that far surpass the limits of traditional rocketry. Flexible launch to other orbits. Sustained hypersonic flight spanning Mach 0 - Mach 10.

Our approach hinges on artful and efficient design - integrating flight tested technology with innovative solutions for use within a next generation system. Our hybrid airbreathing engines accommodate wide mission sets and unique customer needs.

Traditional rockets require 1-3 months to service the vehicle and turn it around for use. ARC's vehicle can be serviced and re-certified for flight within 1-3 days due to its air-breathing properties and construction which greatly reduces the stress on the engine components during flight. Additionally, our initial airbreathing stage dramatically increases our vehicles' Delta-V, reaching Mach 5, enabling our second rocket stage the velocity to reach its destination and deliver the payload without the use of an Orbital Transfer Vehicle (OTV). Thus, reducing the cost to launch AND payload delivery, as well as providing routine launch cadence that can scale with, and expand, the space industry.

3.2 Billion

Pentagon FY2021 Hypersonic Budget

9.8 Billion

2021 Launch Industry

1+ Trillion

Estimated 2040 value of the space economy

TARGET MARKETS

ARC's market engagement strategy focuses on U.S. government applications *and* commercial launch needs. This tandem approach allows us faster time-to-market through aligned interests, strategic partnerships, and direct investment.

U.S. Government

Missile Systems | Airbreathing Hypersonic R&D | Experimental Payload Testing | Point-to-Point Transportation Vehicles

Commercial

Initial focus is enabling space infrastructure. Satellite, cargo, research, and manufacturing launches are growing.

05 # COMMERCIAL STRATEGY

ARC will serve as a catalyst for the actualization and expansion of the off-earth economy by providing more affordable and routine launch services to existing companies and “new space" entrants in emerging markets.

This will be accomplished in 3 phases of growth in opportunities.

Phase I: Routine launch services for free-flying space ports/space stations in LEO and their customers. As their customer base and the industry expands, our customer base will scale with them.

Phase II: Engage tangential industries and technologies critical to building and sustaining the off-earth economy.

Satellite launch | Space tourism | In-orbit refueling | Additive manufacturing | Asteroid Mining | Space debris removal | Autonomy

Phase III: Scale with the ecosystem - eventually build towards broader mission sets (to include MEO, GEO, and beyond) and manned-space flight.

06

U.S. GOVERNMENT STRATEGY

Hypersonic capabilities pose a major threat to our national security and space domain capabilities. The U.S. trails China and Russia in investment & capabilities. We are actively pursuing opportunities to find the best fit for our technology development and mission integration.

Four mission-critical needs have been identified

1. Missile Systems
2. Air-breathing Hypersonic R&D
3. Experimental Payload Testing
4. Point-to-Point Transportation Vehicles

THE SOLUTION - ARC ACE

ACE is the combination of our DELV (vehicle) & LEAPS (propulsion) designs, a comprehensive multipurpose system tackling industry challenges more effectively than existing hypersonic technologies.

DELV

Dynamic Enhanced Launch Vehicle

DELV is a vertical take-off and re-entry launch vehicle. Its design provides significant reductions in drag during forward flight and maximized drag during re-entry. The design also reduces thermal load and heat flux throughout the entire vehicle. We plan to optimize vehicle geometry to allow for integration of various propulsion systems as well as the creation of temperature zones that make it possible to isolate specific parts of the vehicle from heat extremes. Currently, we are exploring how this concept can be integrated to further optimize the efficiency of the propulsion system.

LEAPS

Low-Cost Evolved Air-breathing Propulsion System

This hybrid air-breathing rocket system maximizes the same use of systems during the air-breathing phase as it does during the rocket phase. Our engines will be operational and highly efficient from Mach 0 to 10, saving weight from fuel and oxidizers and increasing ISP. The LEAPS system leverages the advantages of the DELV architecture in an entirely new cycle that utilizes electricity as much as possible. Most subsystems within LEAPS are mature and have been flight tested. The most novel element of LEAPS is the heat-exchange architecture, which will help to electrify the system during the first flight phase by capitalizing on “wasted” energy escaping from the propulsion system as heat.

ACE INTEGRATED TECHNOLOGY

1 Vehicle:
Overall fixed geometric and light weight design minimizes drag and aerodynamic heating during ascent but has a high drag coefficient during return. This vehicle is extremely reusable and adaptable – it can see use in many different applications.

2 Mass Injection:
Our proprietary mass injection system significantly reduces drag and thermal loads on the vehicle.

3 Combustion Chamber Cooling:
Our method for injecting cooling fluid into the combustor liner helps eliminate hot spots, while maximizing flow rate in the cooling passages. This will make the combustion unit much more reusable.

4 Structures:
Overall features, systems, and techniques reduce overall drag and thermal loads.

5 Load:
Reduced thermal and mechanical loads prolong the overall life of the vehicle, while improving reliability and utilization.

6 Nozzle:
Improved efficiency & dependability over other systems (like Aerospike).

Front Side Back

7 Lift:
Designed for vertical take-off, the vehicle can be easily configured, based on mission and application, to generate its own lift with minimal drag penalty. Significant savings in fuel allows for the use of sturdier construction materials and techniques which improve mission assurance and vehicle longevity.

8 Cycle:
Our engine cycle optimizes every component at all phases of flight vs existing combined cycle engines that carry components that are not fully utilized for a huge chunk of the flight phases. Our cycle is also optimized to permit high supersonic and hypersonic flight regime operations up to Mach 10 in atmosphere or near vacuum conditions.

9 Inlet:
Novel design optimizes air flow efficiency through the propulsion system during hypersonic travel.

10 Propulsion Integration:
The vehicle is optimized for our propulsion system allowing for extremely efficient operations and components that would be impossible to locate in other vehicles.

11 Propulsion:
Objective was to develop a propulsion system with an ISP of over 1000 (rockets are usually ~400). We have been able to demonstrate an ISP of at least 2000.

The rocket shown is an artists interpretation only and does not reflect the actual shape which is proprietary.

COMPETITIVE ADVANTAGE

COST REDUCTION:

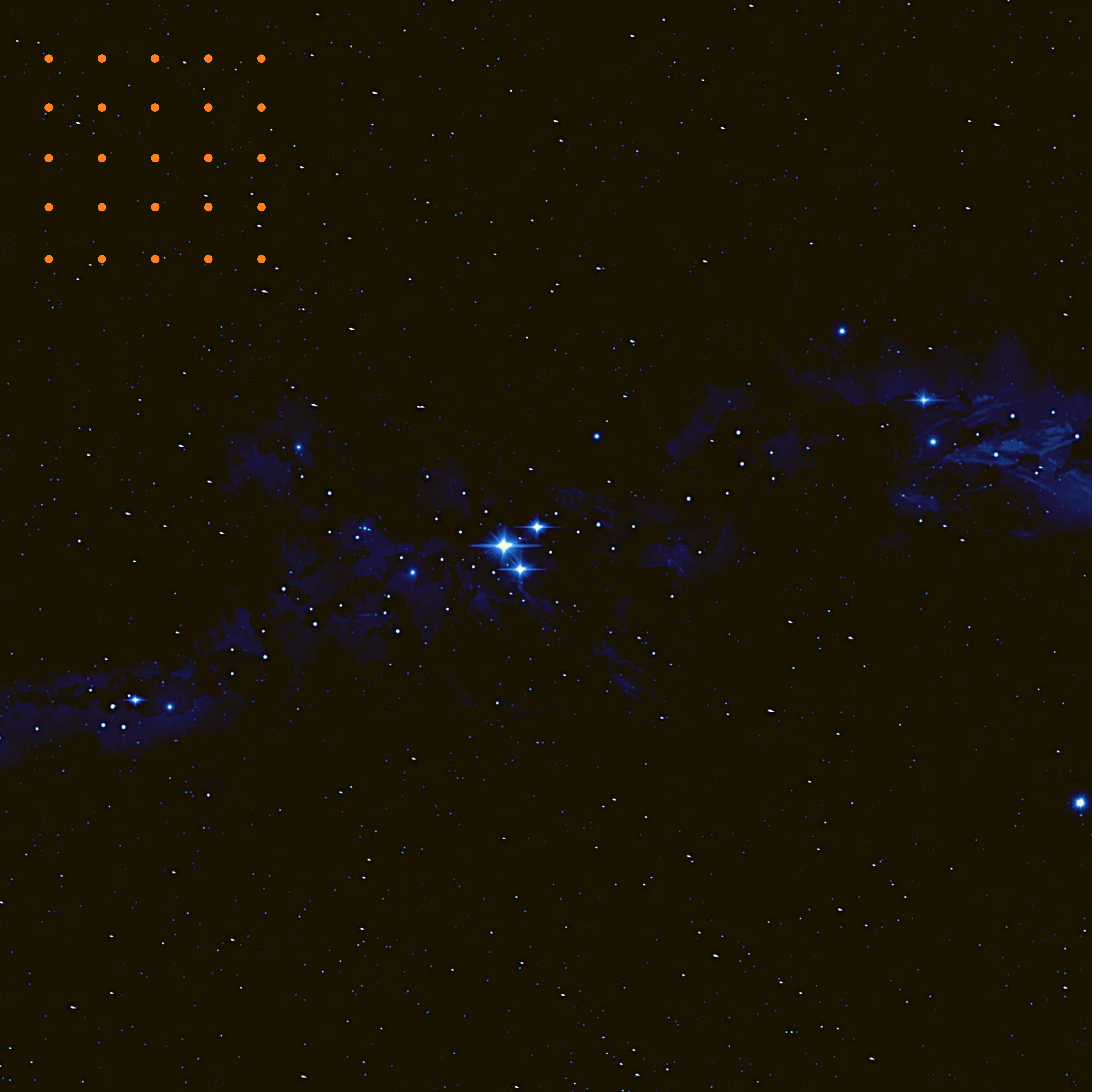
- Increased ISP - more fuel efficient propulsion systems.
- Longer Lifespan - estimated 400+ uses from high-survivability system design.
- 2x order of magnitude reduction of launch cost. Eliminates the need for OTV. Delivers payload with a single launch vehicle and single cost.

FLEXIBILITY:

- Geography & Weather - improved lateral rigidity & trajectory flexibility that allows for course correction to bypass weather events.
- Fast Turnaround - minimal refurbishment or replacement required. Reduces time from 1-3 months to 1-3 days.
- Customization - reduced need for fuel and oxidizer mass can be allocated for mission customization based on client needs; something not yet seen in the industry.

RELIABILITY:

- Safety & Survivability - design reinforces key areas, like safety systems, structures, and fail-safes.
- Recoverability - Continuous Intact Abort Capabilities (CIAC), ex: engine out capability, is key to reliability and payload assurance.



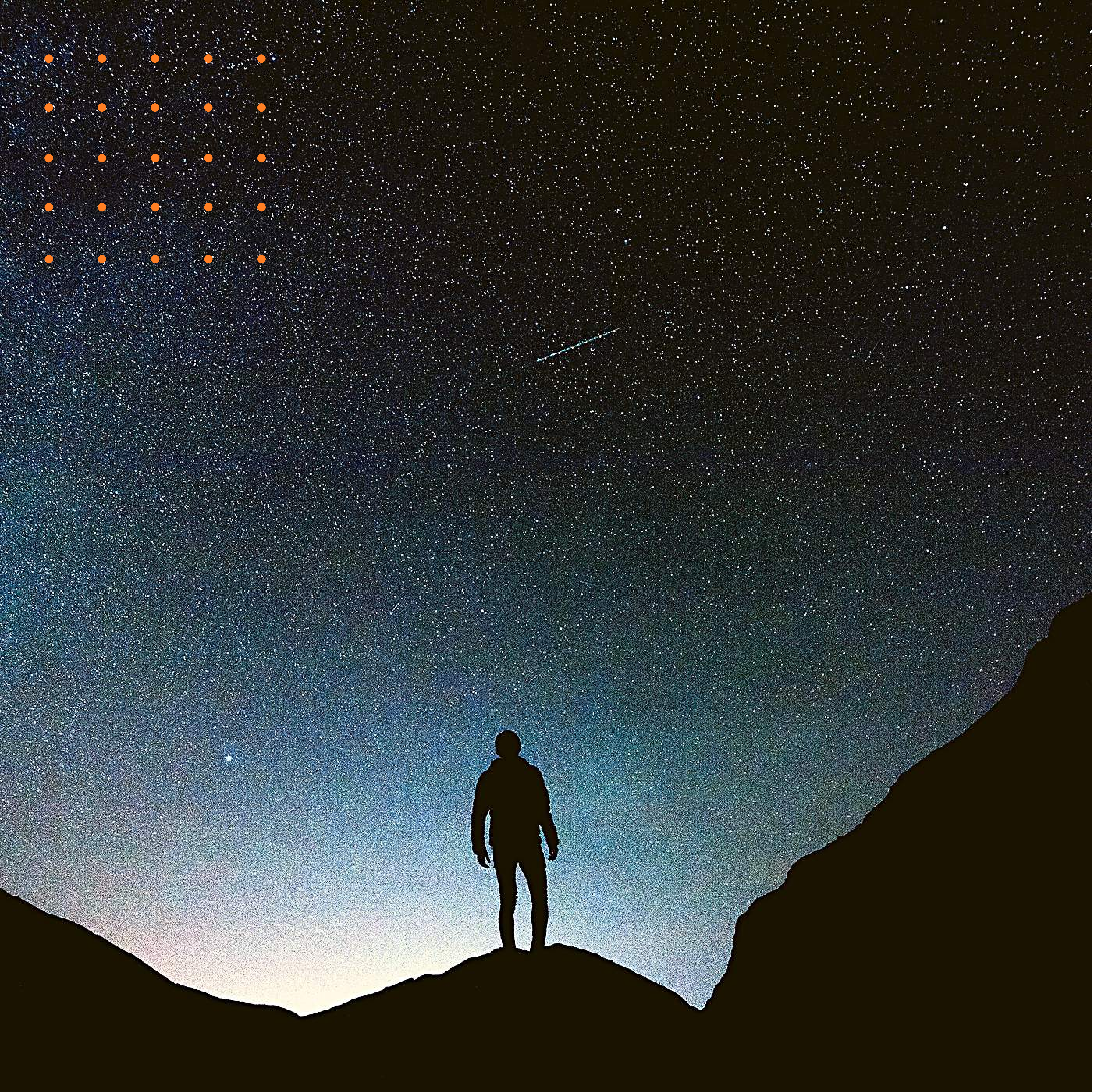
CAPITAL & DEVELOPMENT

Fundraising events are tied to critical phases of our technology and commercialization plans.

- **Phase 1 - TRL 4** (Seed)
  - $5M fundraising
  - Government funding, MOUs, & licensing

- **Phase 2 - TRL 5-7** (Series A)
  - $100M fundraising
  - Early purchase contracts, expand licensing, & government contracts

- **Phase 3 - TRL 8-9+** (Series B)
  - $140M fundraising
  - ACE completely operational - go-to-market via space ports, MOUs, and government contracts



PHASE 1 - SEED ROUND

Technology and design have been substantiated mathematically through preliminary computational analysis and product development review. We are now ready to move through design, preliminary manufacturing, and testing.

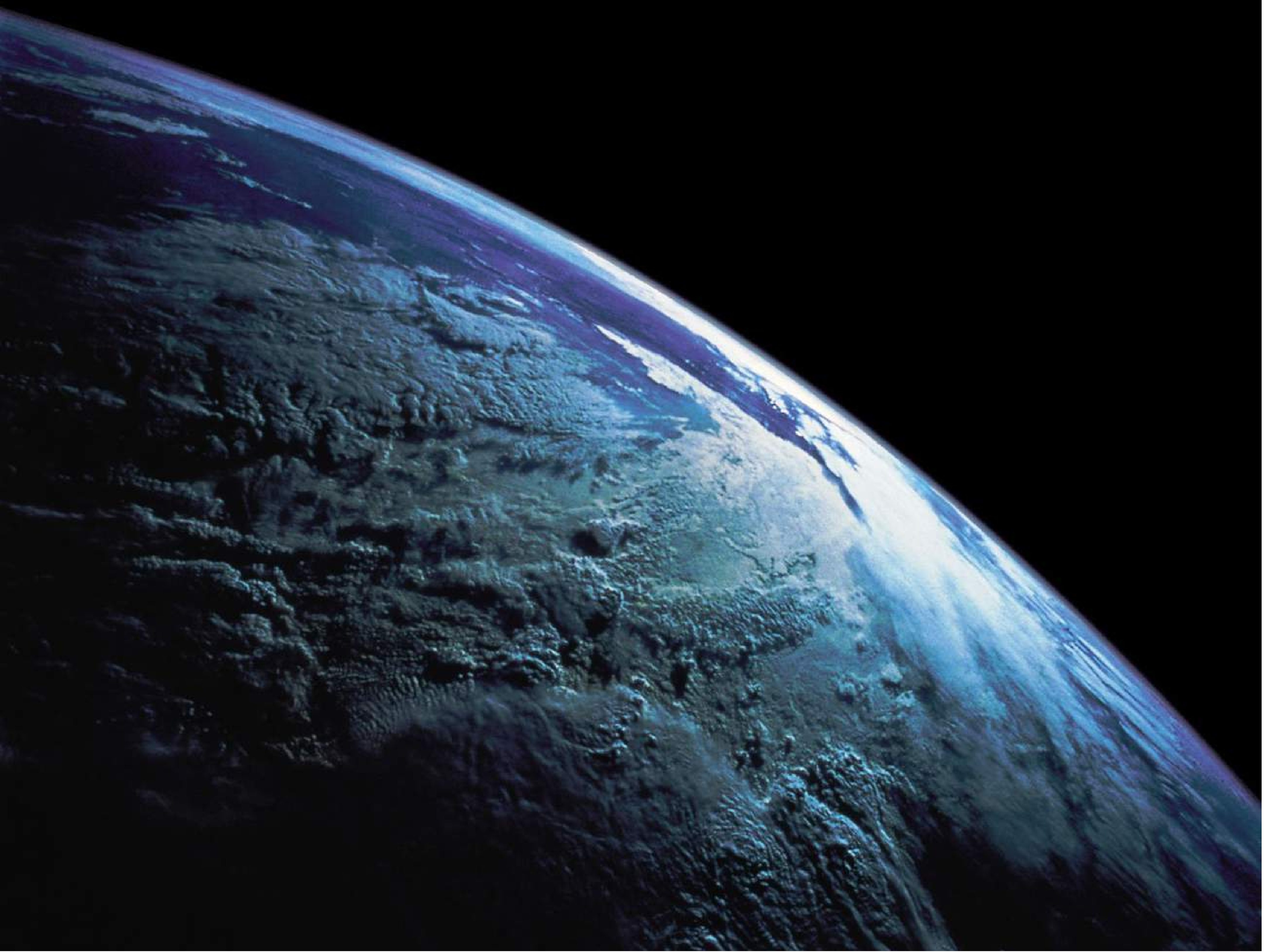
Objectives:

1. Mature overall system design to TRL 4 (completion of heat exchange architecture).
2. Completion of final product design review (PDR).
3. Establish key partnerships for further development and manufacturing to achieve TRL 7 (propulsion cycle).

Requirements:

- ETA: Q4 2021
- **Cost: $5,000,000**

*****_Government funding & pending/potential early partnerships can further accelerate timelines and offset expenses_



PHASE 1 - INVESTMENT

Payroll - 55%
Onboard complete engineering team, starting with lead engineers for each discipline. Reinforce key executive team, while also hiring operational staff.

External Partners - 20%
Gain efficiencies by outsourcing cost-intensive responsibilities vs bringing entirely internal during this early stage.

G+A - 20%
Streamlined rent and facilities during Phase 1.

Marketing - 5%
PR, thought-leadership, and industry awareness campaigns highlighting technology, MOUs, contracts, etc.

TECHNOLOGY DEVELOPMENT TIMELINE

Q2 2021

Begin PDR & TRL 4 Development. Raise Seed Round.
Conduct heat exchange architecture validation and design/PDR process. Begin discussions with potential partners for further development from TRL 4 and beyond.

JUNE 2021

Close Seed Round & Begin Contract Exploration.
Proceed with PDR with Seed capital on-hand for next stage. Negotiate partnerships for joint industry projects and government contracts.

OCT 2021

TRL 4 Achieved; PDR Complete; Begin Propulsion System Development.
Heat exchange architecture available to license (optional). Collaborations and joint development efforts begin. Begin computational analysis of propulsion system - Phase I of development to TRL 7.

Q1 2022

Raise Series A; Begin Manufacturing; Move to Go-to-Market Efforts.
Wrap computational analysis of propulsion system and begin build, testing, and manufacturing. Utilize existing partnerships, new potential joint development partners, and in-house resources from new capital to quickly move into deeper testing and manufacturing.

Q2 2023

TRL 7 Achieved; Raise Series B; Begin Commercial Customer Discussions.
Propulsion cycle available to license (optional). Use Series B raise for further development and scaling to TRL 8/9 (ACE completion).

Q2 2025

TRL 8/9 Achieved; ACE Completed. Mission Flights Begin.
Contracts and orders now being accepted. Manufacturing and operations to scale with revenue.

TRL 3-4

TRL 5-9

BUSINESS PATHS

Our tactics align with our larger strategy and development timeline, which we have broken into phases anchored by technological milestones and opportunities for revenue generation. This approach allows us to mitigate investment, presents clear metrics for success, and provides timestamps for our growth.

Opportunity for four paths of operating (or exiting) our business upon completion of our next development phase (TRL 4) during 2021.

1. Private funding for complete development & go-to-market of hypersonic technologies & launch vehicles.
2. Licensing of key technologies to larger aerospace company.
3. Acquisition by larger aerospace company.
4. Joint development effort with larger aerospace company.

Existing Strategic Partners

ARKISYS

Space Impulse

LEADERSHIP TEAM

Founder/CEO/CTO
(Technology/Propulsion)
Othniel Mbamalu

Partner
(Hypersonics/Engineering)
Dr Periklis Papadopoulos

President/COO
(Strategy/Operations)
Kelli Kedis Ogborn

Co-Founder
(Finance/Marketing)
Trever Gregory

Co-Founder
(Growth/Partnerships)
Dane Matheson

Co-Founder
(Avionics)
Kent Judy

Chief of Staff
(HR/Operations)
Kate Lucey Mace

Head of Legal
(General Counsel)
Alan Spatz

Our executive and founding team is built of experts in aerospace engineering, business and finance, and technology commercialization. From NASA to DARPA alumni and executive leadership from global tech conglomerates, our team has the experience and credentials (active TS/SCI clearance) required to build and scale a world-class company.

OUR FOUNDER

Othniel C. Mbamalu

Othniel C. Mbamalu is the founder of Advanced Rockets Corporation (ARC) and has been working towards going to space since childhood - filing his first patent at 16 years old, creating the foundation for ARC today. Driven by his life's mission to voyage into space, Mbamalu came to Southern California from Nigeria in 2014 with the intent of establishing an aerospace company that could provide cost-effective leap-ahead high-speed capabilities for defense, civil and space applications. With two patents granted, five patents-pending, and a host of trade secrets, Mbamalu now oversees and directs the ARC engineering team in watching his dreams become reality.

OUR PRESIDENT

Kelli Kedis Ogborn

Kelli Kedis Ogborn drives organizational and product growth through leadership roles in disruptive technology commercialization of space and defense innovations. With extensive experience in R&D and cutting-edge technology applications for the U.S. government and private sector, her qualitative and quantitative methodologies guide organizations that are transitioning from development ecosystems to market capitalization. Kedis Ogborn is an often-published author on the market applications of innovation and has worked extensively as an authoritative voice within the emerging space economy – discussing economic drivers and technology trends driving the industry forward and shaping its investment potential and growth. She is a main facilitator for Space Foundation Space Commerce programs- positioning companies and countries for growth into the $1T+ future space economy, a frequent panel reviewer and technology assessor for commercialization merit of government R&D proposals, mentor for entrepreneurs, and speaker for STEM initiatives. Previous to ARC, Kelli was contracted as the Congressional Liaison to the Defense Advanced Research Projects Agency (DARPA) – through Spire Communications and Booz Allen Hamilton.

OUR AEROSPACE ENGINEER

Dr. Periklis Papadopoulos

Aerospace Engineering Professor at NASA, Spent 10 years committed to the Curiosity landing program. Founded Space Systems LLC. He also earned the prestigious Turning Goals into Reality award. He holds a tenured full professor position at San Jose State University. Periklis, was also the man who personally landed Curiosity on Mars in 2012. Dr. Papadopoulos leads a team of researchers that has been awarded several contracts from the US Department of the Air Force, Headquarters Flight Test Center (AFMC), the Air Force Research Laboratory (AFRL) Advanced Vehicles Concepts branch of the Propulsion Directorate at Edwards Air Force Base, ERC and NASA ARC. He served as a Senior Research Scientist at NASA-ARC / ELORET - Thermosciences Institute for over 15 years, where he participated and project lead planetary mission studies, space transportation and re-entry programs. He was the co-investigator and probe developer for the ATROMOS/NASA Mars Polar Lander. He directed the microsatellite and cube-sat program and laboratory at SJSU. He has been invited speaker at the JANNAF Interagency Propulsion Committee, AIAA Thermophysics conference, and International Conference on Numerical Grid Generation in Computational Field Simulations.

CONTACT US

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