UKRI Innovate UK | Business Connect

July 2026

The Microgravity Opportunity

From Lab to In-Space Manufacturing

Agenda

11:30 – 11:45	**Welcome and Introduction**
11:45 – 12:05	**UK-BEN Microgravity Life Science Group** Joaquin Perez-Grande
12:05 – 12:25	**BioOrbit** Dr Molly Mulligan, President
12:25 – 12:45	**SpaceForge** Neil Monteiro, Microgravity Research Manager
12:45 – 12:55	**Audience Live Q&A with Speakers**
12:55 – 13:00	**Close**

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Before we begin

Audio & Video

- This event will be recorded.
- Cameras and microphones will remain off. Please share questions and thoughts through the Q&A and chat

Chat and Q&A

- Questions and comments shared during the event may be visible publicly, including in any published recording.
- Please use Q&A function to post your questions.
- Please upvote existing questions rather than reposting them. This helps us prioritise the questions most people want answered
- Post event please use B2Match and LinkedIn group

Mentimeter Session

Please have your phone to hand or a web browser page at the ready

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July 2026

Mentimeter

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July 2026

Q&A

Thank you

Thank you for joining.

Keep the conversation going

- Future webinars will follow.
- Join the LinkedIn group, where we'll share updates and funding opportunities.
- Do say hello and share what you're working on. Post a "give/get" if seeking collaborators.

Connect this afternoon and beyond

- Use B2Match for dedicated networking sessions, 2 - 4pm today.
- The platform stays open throughout the year for 1:1 meetings.

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CATAPULT Satellite Applications

The Microgravity Opportunity: from Lab to In-Space Manufacturing

16th July 2026

Joaquin Perez-Grande
Partnerships and Policy Manager
Satellite Applications Catapult

Meganne Christian
Mission Manager, In-Space Manufacturing
Satellite Applications Catapult

We work with

UKRI Innovate UK

The Satellite Applications Catapult

Vision

To enable a world-leading space sector to solve some of the world's greatest challenges

Purpose

To grow the UK economy by supporting our best companies to accelerate the invention and adoption of space data and technology

A Mission-Led Organisation

Our Missions focus efforts on the highest-impact challenges and opportunities for the UK Space sector

About our Missions
sa.catapult.org.uk/missions

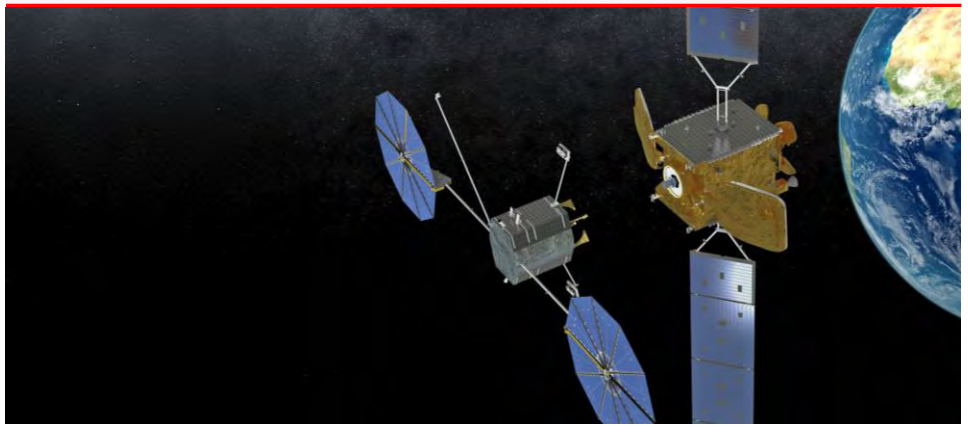
Beyond Earth Mission Overview

Purpose: The aim of the Beyond Earth Mission is to unlock high value markets emerging from the in-space economy.

Goal: Establish the UK as an integral supply chain actor and service provider within the global ISAM market by 2035.

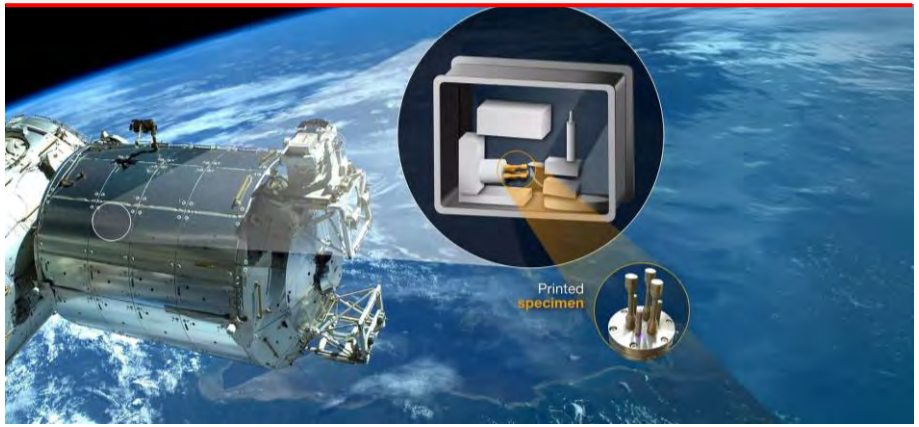
INTERVENTIONS

In-Space Logistics, Servicing & Assembly



Support integration of UK capability (e.g. robotics, proximity operations, spacecraft manufacturing) into the global ISAM supply chain.

In-Space Manufacturing and R&D



Support the UK to become a globally recognised hub for in-space R&D in biopharma and advanced materials.

In-Space Manufacturing and R&D

Opportunities for new drug development enabled by space could generate large revenues for the pharmaceutical sector. UK companies are actively engaged in these applications.

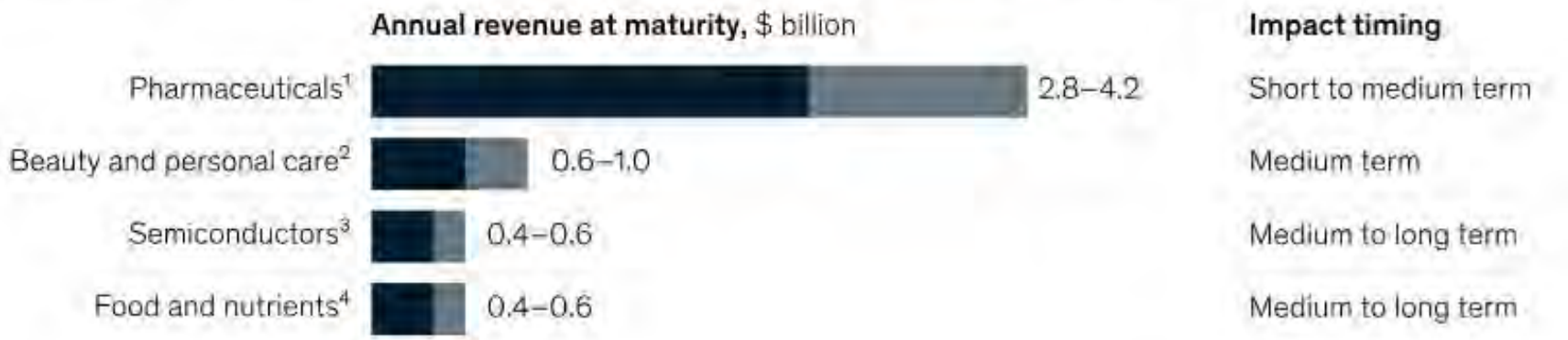
Advanced Materials

Products such as **semiconductor wafers** and **low loss fibres** command high price per kg and are often used in high-value market such as quantum, telecoms, aerospace, and defence.

Biopharma

- **Drug Discovery and Design** through crystallisation and formulation studies
- **Drug Screening and Pre-Clinical Testing** through tissue and organoid platforms
- **Regenerative and Personalised Medicine** through organ grafts, and stem cell therapies

Revenue growth forecasts of selected industries if they collaborate with space companies



Non-Space economic benefits: ~$5bn (2035)

There’s never been a better time to manufacture in space

CATAPULT
Satellite Applications

MAB

Asteria Space

FRONTIER
Space Technologies

CosmicMaker

BSGN
Business in Space Growth Network

VAST

The case for microgravity in biopharma

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Space provides a **unique environment** for the development of better protein crystals, stem cells, tissues and organoids

While research in space isn't new, **access to space** is increasing dramatically and driving a renewed interest into the benefits for biopharma

Over **3,000 experiments** have been conducted on the ISS, resulting in over **$2 billion of investment** in the life sciences sector

ISS research informs new FDA-approved cancer therapy

CATAPULT Satellite Applications

From a two-hour injection to one minute every three weeks

Challenge

Keytruda®, a cancer drug by Merck, needs intravenous (IV) infusions because protein crystals formed on Earth are irregular and difficult to concentrate, increasing time at hospital. 350k doses in the UK / year.

How space helped

Samples flown to the ISS formed more uniform protein crystals. This helped Merck redesign the formulation so it could dissolve efficiently in a small subcutaneous injection rather than an IV infusion.

Benefits

The new formulation can be delivered in one minute instead of hours, reducing hospital time for patients and easing pressure on healthcare systems. The injectable version received FDA approval in 2025.

ESA astronaut removes Protein Crystallization hardware from an ISS incubator for the CASIS PCG-5 investigation, which crystallized a monoclonal antibody developed by Merck Research Labs.

https://www.nasa.gov/missions/station/iss-research/space-station-research-informs-new-fda-approved-cancer-therapy/

Ultra-smooth protein-based retinal implants

From a two-hour injection to one minute every three weeks

Challenge

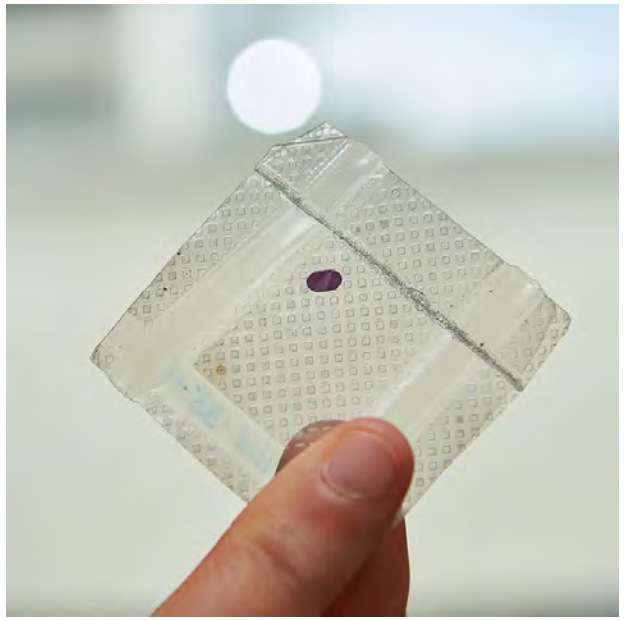
LambdaVision's artificial retina relies on ultra-thin protein films, but gravity-driven convection on Earth makes it difficult to deposit uniform layers, reducing implant performance. 1.5M people affected.

How space helped

Space Tango CubeLab on the ISS was used to carry out layer-by-layer film assembly in microgravity, eliminating convection and producing more uniform coatings that can be analysed in real time.

Benefits

Films were twice as smooth, brighter and more reliable. This has sped up human trials for vision restoration, showing how high-value biomedical materials can be manufactured in microgravity.



LambdaVision's tiny protein-based retinal implant. The implant is the small purple dot, about the size of a paper punch.

Media Credit: Peter Morenus/UConn Photo.

https://issnationallab.org/press-releases/release-ng20-lambdavision-retinal-implant/

Biopharma Microgravity Workshop (April 2025)

Objective

Convene industry and academic experts to explore the barriers to adopting microgravity R&D, and emergent opportunities to promote the development of new products and therapies.

Outcome

A shared understanding of the barriers led to the creation of a collaborative roadmap to overcome them, shaping a strategic vision for the **UK to lead in microgravity-enabled healthcare.**

Five workstreams were identified, which are being taken forward through a **Microgravity Life Sciences Working Group.**

Participants

Organised by Satellite Applications Catapult, Cranfield University, Medicines Discovery Catapult and Weston Strategy Labs

26 stakeholders from 17 organisations

Download the whitepaper

https://sa.catapult.org.uk/news/unlocking-the-potential-of-microgravity-a-new-frontier-for-the-biopharmaceutical-industry/

Despite promise, commercial adoption remains low

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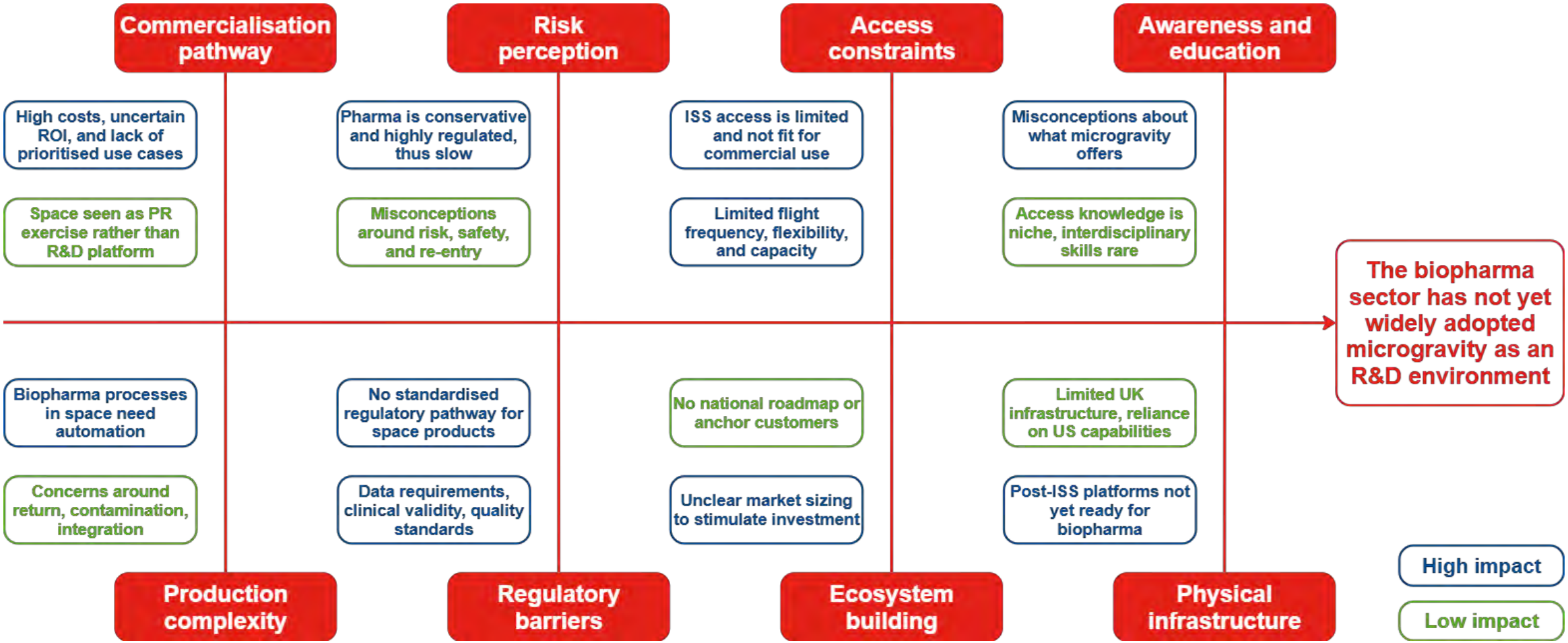
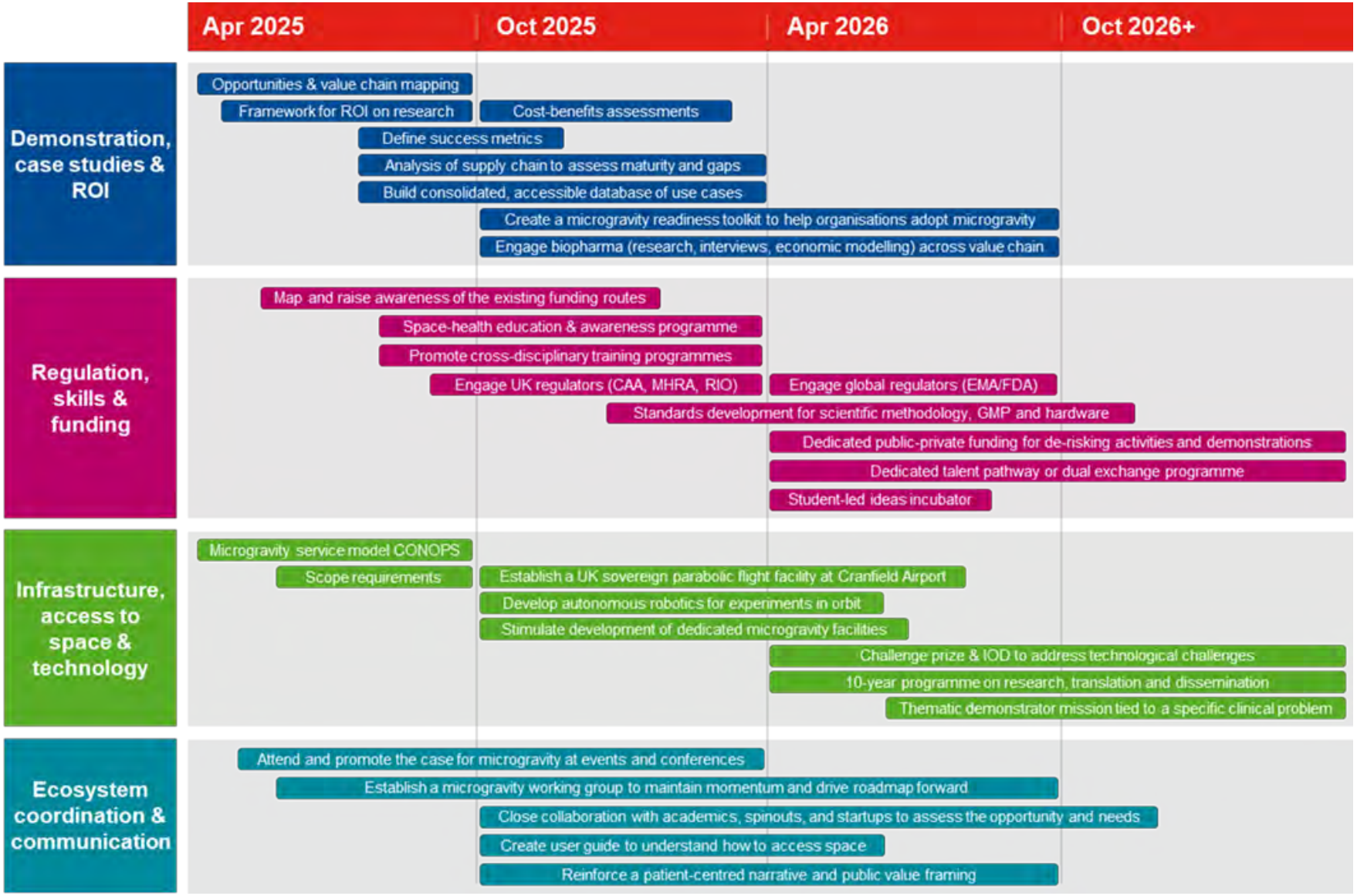
Microgravity has already shown benefits for patients on Earth. The challenge is making it accessible and commercially viable.



The future we need to build: a roadmap for adoption

CATAPULT Satellite Applications



Engaging stakeholders: UK-Beyond Earth Network

A network of five space clusters to **accelerate space-enabled R&D.** UK-BEN maps the microgravity ecosystem, engages with organisations through events and drives collaborative R&D

UK-BEYOND EARTH NETWORK

UK - BEN I Powered by **Satellite Applications Catapult**

Leading the **Microgravity Life Sciences Working Group:**

- Support the development of the **business case**
- Facilitate **knowledge exchange**
- Build a cohesive cross-sectoral **ecosystem**
- Support evolution of **regulatory frameworks**
- Improve accessibility of **space infrastructure**

- **North West Space Cluster**
- Space Wales
- Harwell Space Cluster
- Westcott Space Cluster
- Space East
- Hertfordshire Futures

A year of progress in microgravity R&D

UK-BEYOND EARTH NETWORK

UK - BEN | Powered by **Satellite Applications Catapult**

A community-led programme of events, publications and engagements

Knowledge Exchange

UK-BEN and Plastron event “Microgravity: Just Another Research Environment”. 50 attendees, 3 project ideas

Planning a workshop to engage with life sciences organisations that have already been to space

Business Case

Catapult x IBIC Microgravity Biopharma Accelerator. 2 projects being accelerated

UK Microgravity Demonstration Programme Expression of Interest

Regulation

Engaging with health system value chain to understand regulation and embed microgravity into regulations.

UKSA, MHRA, RIO and CAA joint statement published in March and blog update in June

Ecosystem

Attended Making Pharma, J&J Space Day, Health from Space, Global Microgravity Research Forum, ELRIG Drug Discovery

Building a marketplace of microgravity providers

IBIC Collaboration: Microgravity Biopharma Accelerator

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We are working with the Industrial Biotechnology Innovation Catalyst (IBIC) to translate academic research into commercial microgravity R&D

The opportunity

Turn academic research into industrial applications

Position microgravity as another research environment

Support growing biotech companies across the North West

Develop credible and fundable microgravity R&D projects

INDUSTRIAL BIOTECHNOLOGY INNOVATION CATALYST

UK-BEYOND EARTH NETWORK

Why it matters

De-risks microgravity-enabled biotech innovation

Strengthens North West leadership in life sciences

Helps validate use cases and turn them into funded projects

Builds a scalable model for growing the UK's microgravity economy

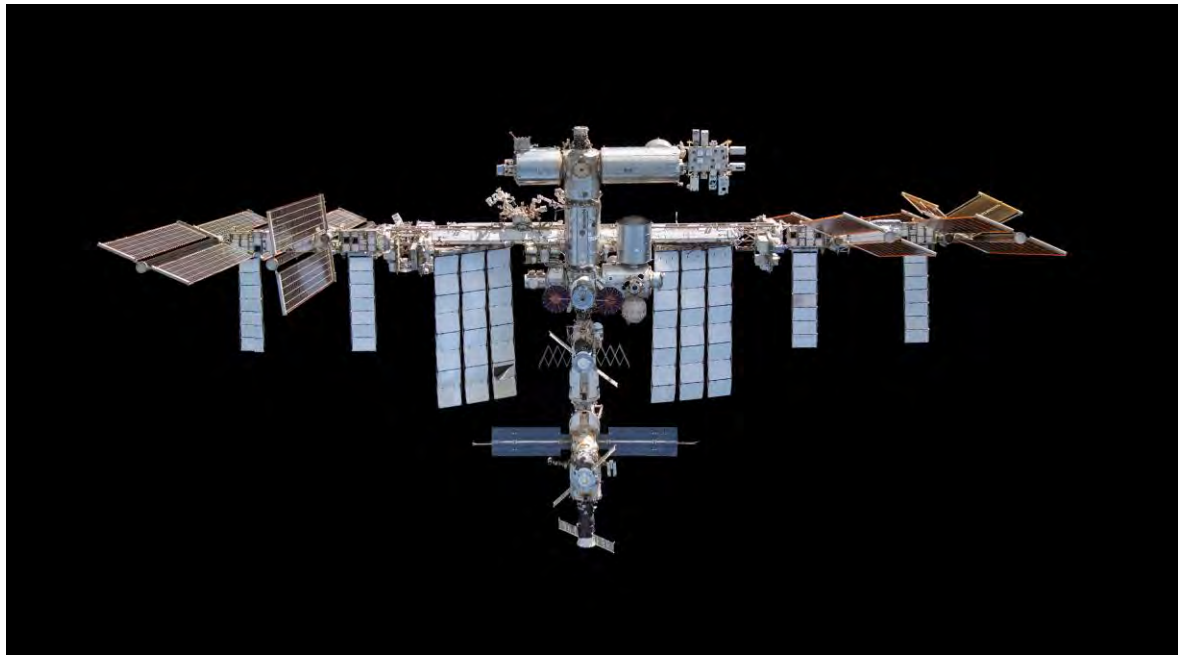
UK Microgravity Demonstration Programme

CATAPULT Satellite Applications

We are inviting UK organisations to propose microgravity research or manufacturing projects on the International Space Station.

Support available:

- Support for 2–3 high-impact projects
- ~15–30% funding contribution
- Technical, commercial & mission delivery support



Who Should Apply

Companies, research orgs, consortia with clear microgravity advantage + commercial potential

Key Challenge Being Addressed

Reducing barriers such as cost, technical complexity, and access to space missions.

Next Steps

Submit Expression of Interest (EOI)

Shortlisted projects progress to feasibility discussions

Microgravity Demonstration EOI

From interest to implementation

CATAPULT Satellite Applications

Microgravity-enabled biotechnology and drug discovery in the UK is moving from scientific curiosity towards implementation and commercialisation.

One year later, we now have

A defined collaborative roadmap

An active working group operating across five delivery pillars

Funded pilots in development

Ongoing regulatory engagement

A growing and more coordinated ecosystem

Microgravity Demonstration EOI

Read the whitepaper

Join the MLS LinkedIn Group

Listen to our podcast

Thank you

Visit our website to find out more and to get in touch with our teams.

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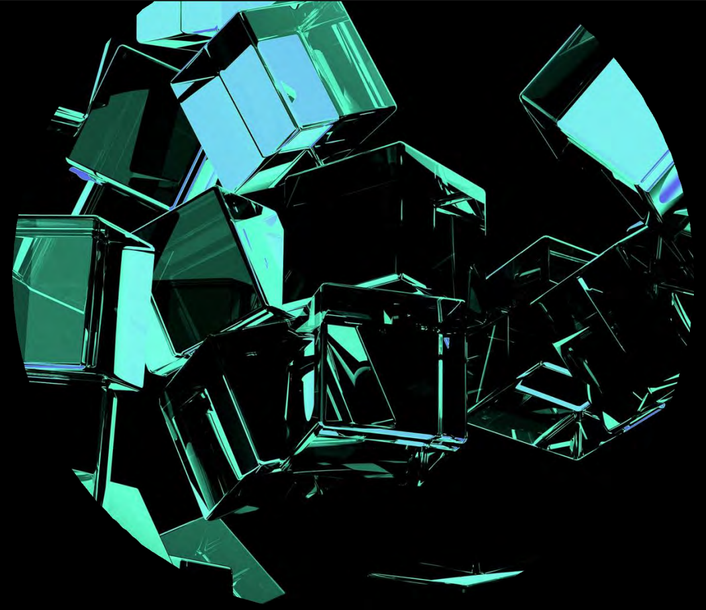
@SatAppsCatapult

www.sa.catapult.org.uk

We are one of nine Catapults across the UK, to find out more about the network visit **www.catapult.org.uk**

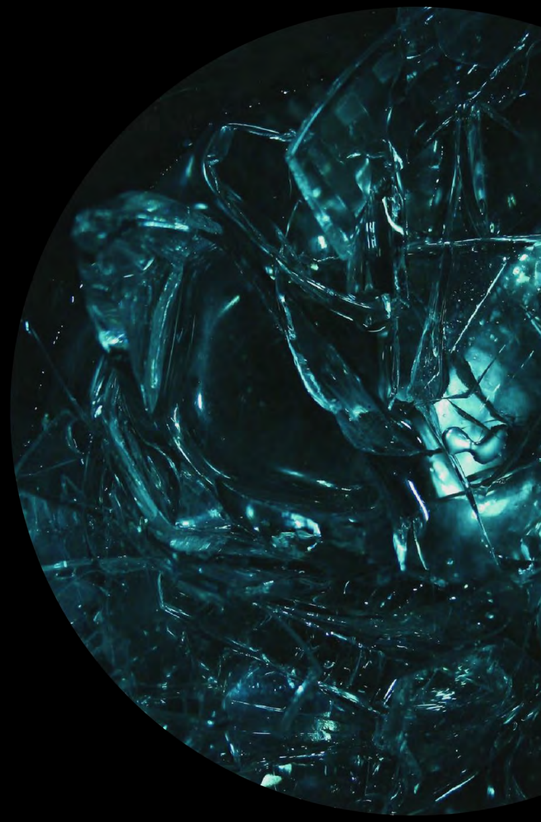


BioOrbit

Drug Production in Space: What are the benefits and the reality?

The Microgravity Opportunity – from Lab to In-Space Production

molly@bioorbit.com



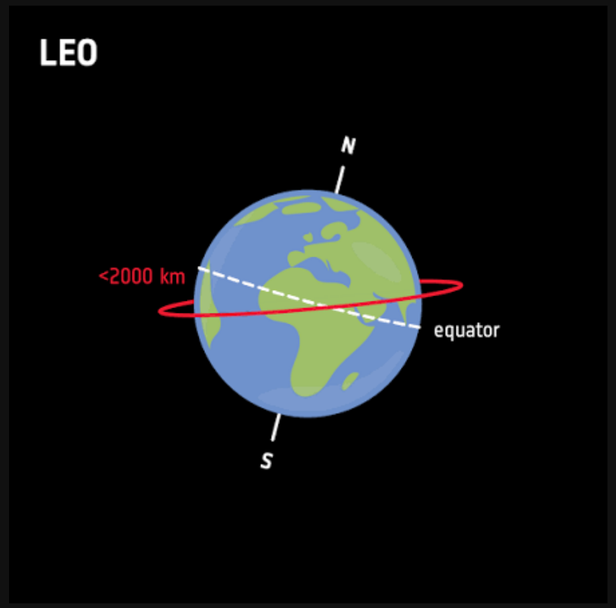
SERAPHIM SPACE ACCELERATOR

AIRBUS

UK SPACE AGENCY ACCELERATOR

esa BUSINESS INCUBATION CENTRE United Kingdom

WHAT IS LOW EARTH ORBIT (LEO)
JUST LOOK UP



- LEO is an orbital region spanning from 160 to 2,000 km above Earth
- It is where the International Space Station (ISS) and most artificial satellites reside above our heads
- By comparison to the moon, it is close to Earth, therefore LEO requires the lowest launch energy while providing high-speed, low-latency communication

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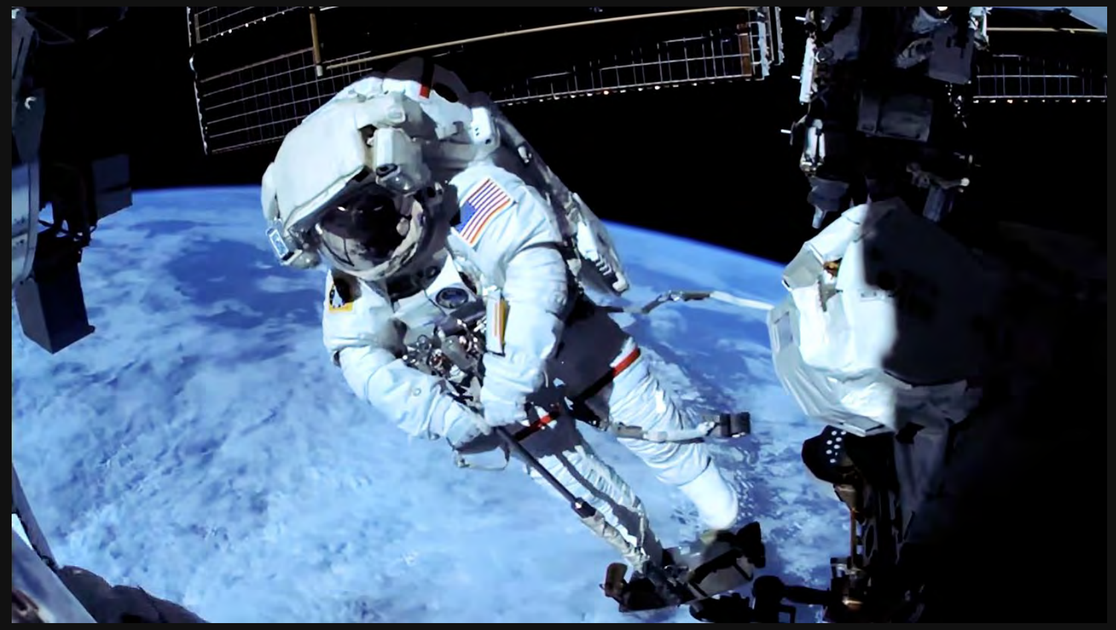
REASONS TO GO TO LOW EARTH ORBIT (LEO)
VANTAGE POINT

- 400 km above our heads
- Orbits the Earth every 90 minutes
- Covers 80% of the populated areas of Earth every 3 days
- Most unique vantage point for observing weather, land and sea mass, performing technology demonstrations and much more!

BioOrbit

REASONS TO GO TO LOW EARTH ORBIT (LEO)
EXTREME CONDITIONS

- Temperatures swings from 120°C to -150°C because the ISS is either in direct sunlight or Earth's shadow
- A near-perfect vacuum
- Intense solar radiation
- Corrosive atomic oxygen



BioOrbit

REASONS TO GO TO LOW EARTH ORBIT (LEO)

MICROGRAVITY

- Continuous Free Fall
- Orbiting the Earth every 90 minutes
- ISS travels at 28,000 km/h to not fall to the Earth's surface

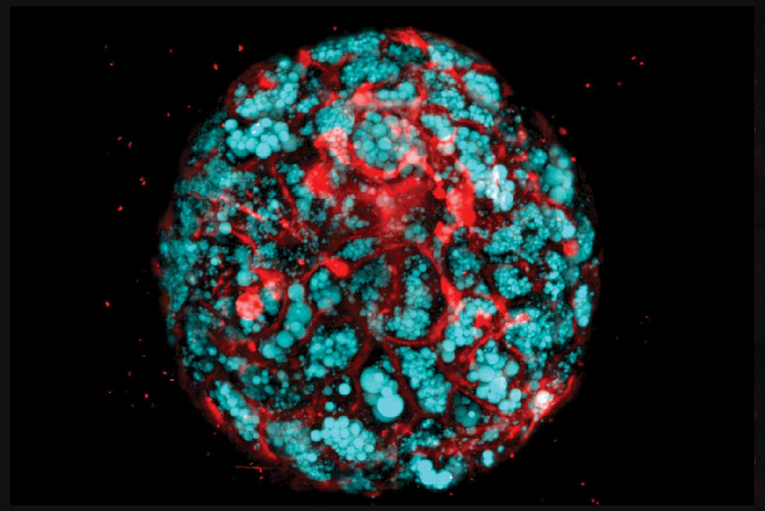
BioOrbit

EXPERIMENTATION IN THE MICROGRAVITY ENVIRONMENT **ON THE ISS**

- No sedimentation
- No convection currents
- Self-assembly changes
- Changes in gene expression
- Plants grow different

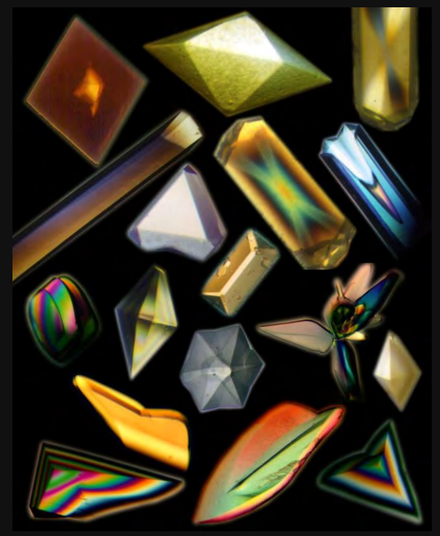
BioOrbit

WITHOUT **GRAVITY**



Superior 3D structures

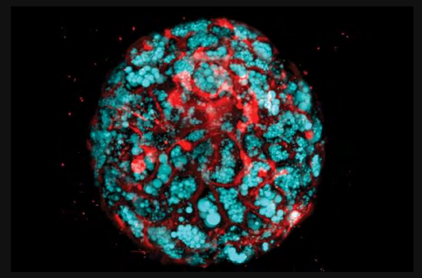
Physiological effects
mimic Earth diseases



Superior Crystallisation

BioOrbit

SUCCESS **STORIES**



Aspera Biomedicines

Anti-ADAR1

ADAR1 inhibitors slowed leukeamia organoid growth.
Anti-ADAR1 drugs are in preclinical trials.

AMGEN Lilly

Osteoporosis

2 FDA-approved mAbs used to block bone growth inhibitors.

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USE CASE OF **CRYSTALLISATION**
STRUCTURAL DETERMINATION

Frederick National Laboratory for Cancer Research

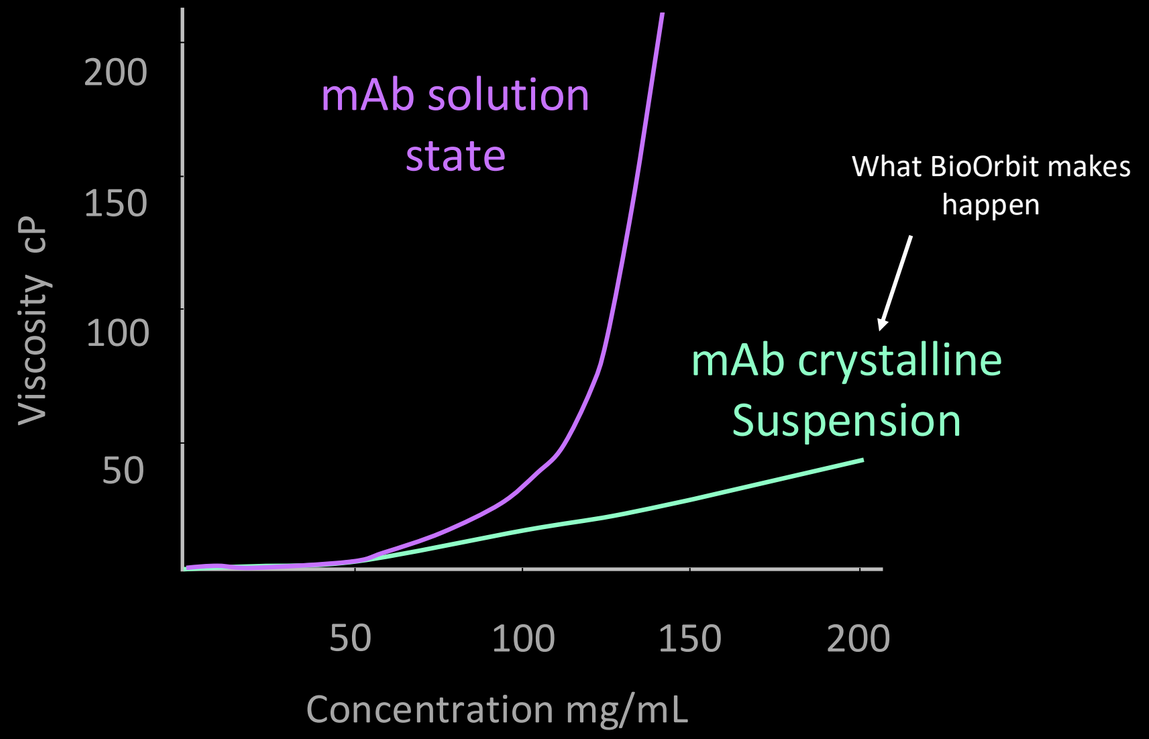
Mutant KRAS proteins
Developed drugs to prevent cancer growth by ‘locking’ KRAS proteins

JAXA Japan Aerospace Exploration Agency

Proteins associated with Muscle Dystrophy
Designed a drug now in Phase III

USE CASES OF **CRYSTALLISATION**
ULTRA HIGH CONCENTRATION DRUG FORMULATION

If the viscosity is too high, the drug won't go through the injector



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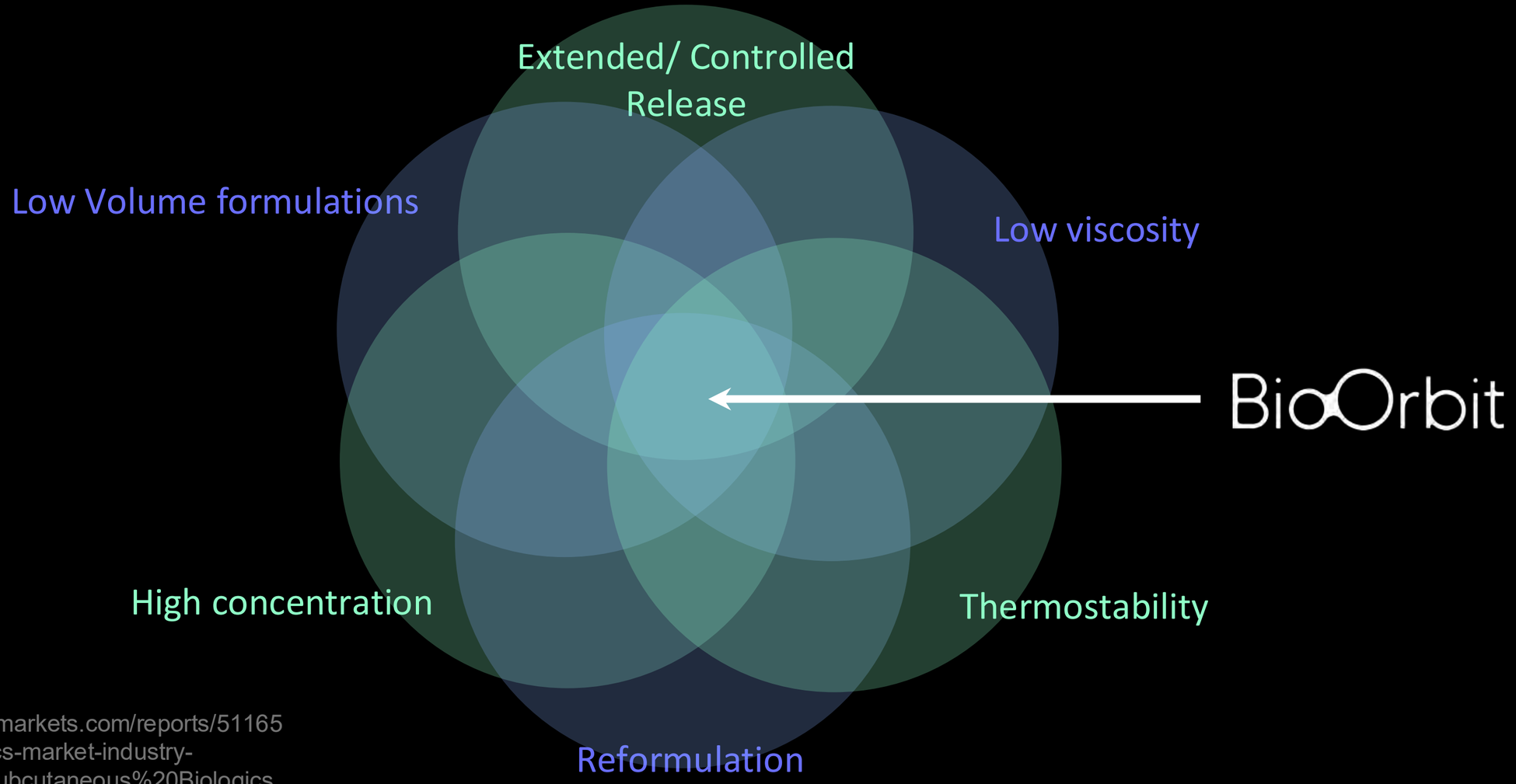
ONLY CRYSTALS ADDRESSES ALL OF THE KEY CHARACTERISTICS OF AN AT-HOME TREATMENT



https://www.researchandmarkets.com/reports/5116514/subcutaneous-biologics-market-industry-trends#:~:text=The%20Subcutaneous%20Biologics%20Market%20for,growth%20during%20the%20forecast%20period.

The benefits of microgravity have been demonstrated in Space

Pivotal Merck (MSD) paper studying Keytruda crystallization in Space

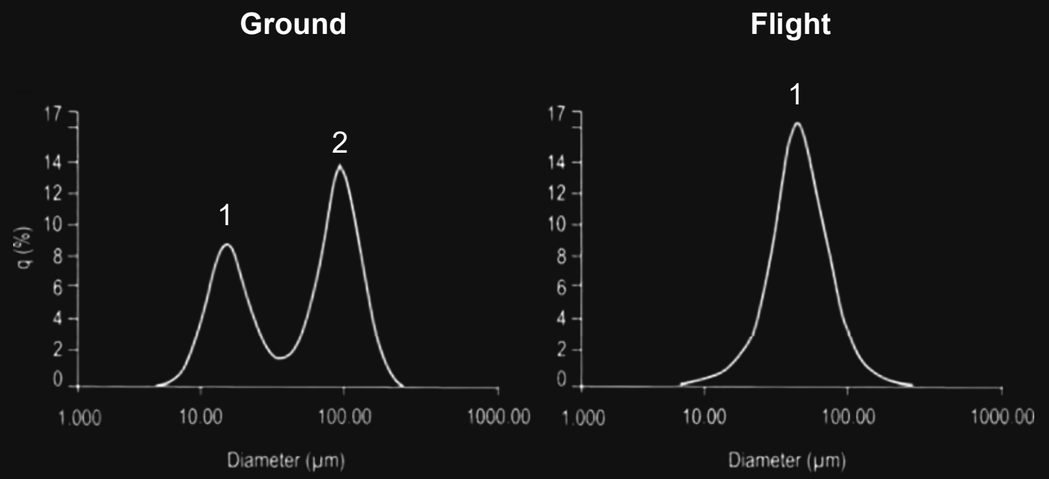
Pembrolizumab microgravity crystallization experimentation

npj Microgravity 5, 28 (2019)

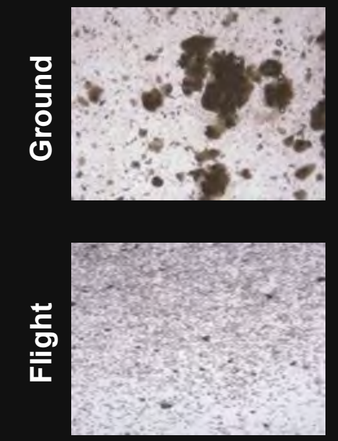
npj | microgravity

MSD

- Merck studied crystallization of Keytruda (PD-1 inhibitor) mAb on the ground and in flight
- They found improved size distribution in Space
- Potency in the ground and flown products was the same
- Findings were published in Nature Microgravity



Particle size analysis of ground-grown vs. in-flight-grown crystals



SONICC analysis (visual) of ground-grown vs. in-flight-grown crystals

Merck have taken a lead in exploring the manufacturing potential of space-based crystallization for reformulation

Sources: 1 – Adapted from Reichert et al (2019);

c&en

DRUG DEVELOPMENT

Pharma goes to space

Share

Researchers are capitalizing on microgravity in space to accelerate drug discovery and development

by ***Shi En Kim***

November 13, 2022 | A version of this story appeared in **Volume 100, Issue 40**

MERCK

Menu

Innovation

Proteins in space: taking our research to the final frontier

Merck Research Laboratories scientist Paul Reichert works with the International Space Station to drive innovation

June 29, 2022

Share this article

Bristol Myers Squibb®

News & Perspectives

Above and beyond: Our research returns to space

A team of Bristol Myers Squibb scientists is once again sending experiments into space, where microgravity conditions better support protein crystallization. The tiny crystals they're looking for could mean big things for patients.

Bloomberg

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Business

Redwire to Develop Space-Based Drug Development and Manufacturing Platform

28 July 2022, 12:00 BST

Share this article

Redwire to Develop Space-Based Drug Development and Manufacturing Platform

Eli Lilly and Company is first investigator using new platform

Business Wire

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MARKET **OPPORTUNITIES**

mAbs Therapy	2024	218 bn	Projected 2030	450 bn
Stem Cell Therapy	2024	17 bn	Projected 2030	42 bn
Bioreactors	2024	20 bn	Projected 2030	36 bn
Gene Therapy	2024	11 bn	Projected 2030	35 bn
Amyloidosis & Alzheimer's Therapy	2024	6 bn	Projected 2030	17 bn
Spheroid & Organoid development	2024	5 bn	Projected 2030	13 bn
3D Bioprinting	2024	4 bn	Projected 2030	10 bn

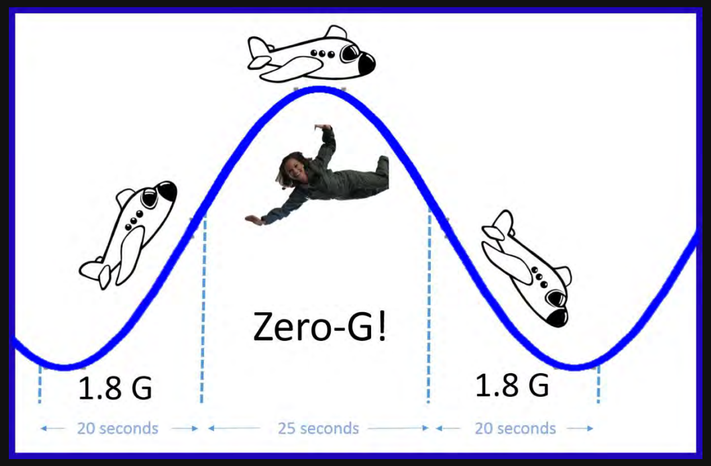
PRODUCTION IN SPACE

WHY CAN'T WE DO THIS **ON EARTH?**

Drop Towers

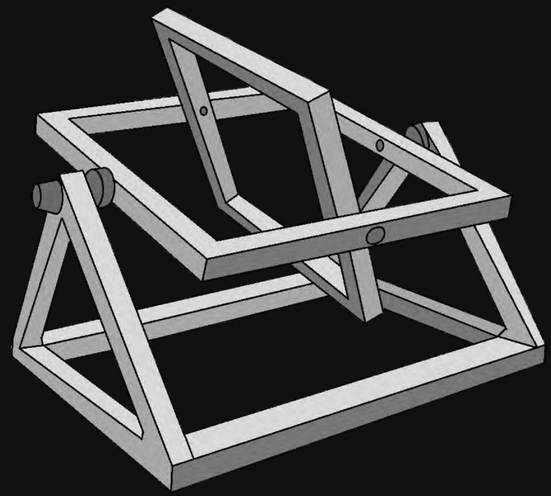
~10 seconds

Parabolic Flights



~30 seconds

Random Positioning Machine



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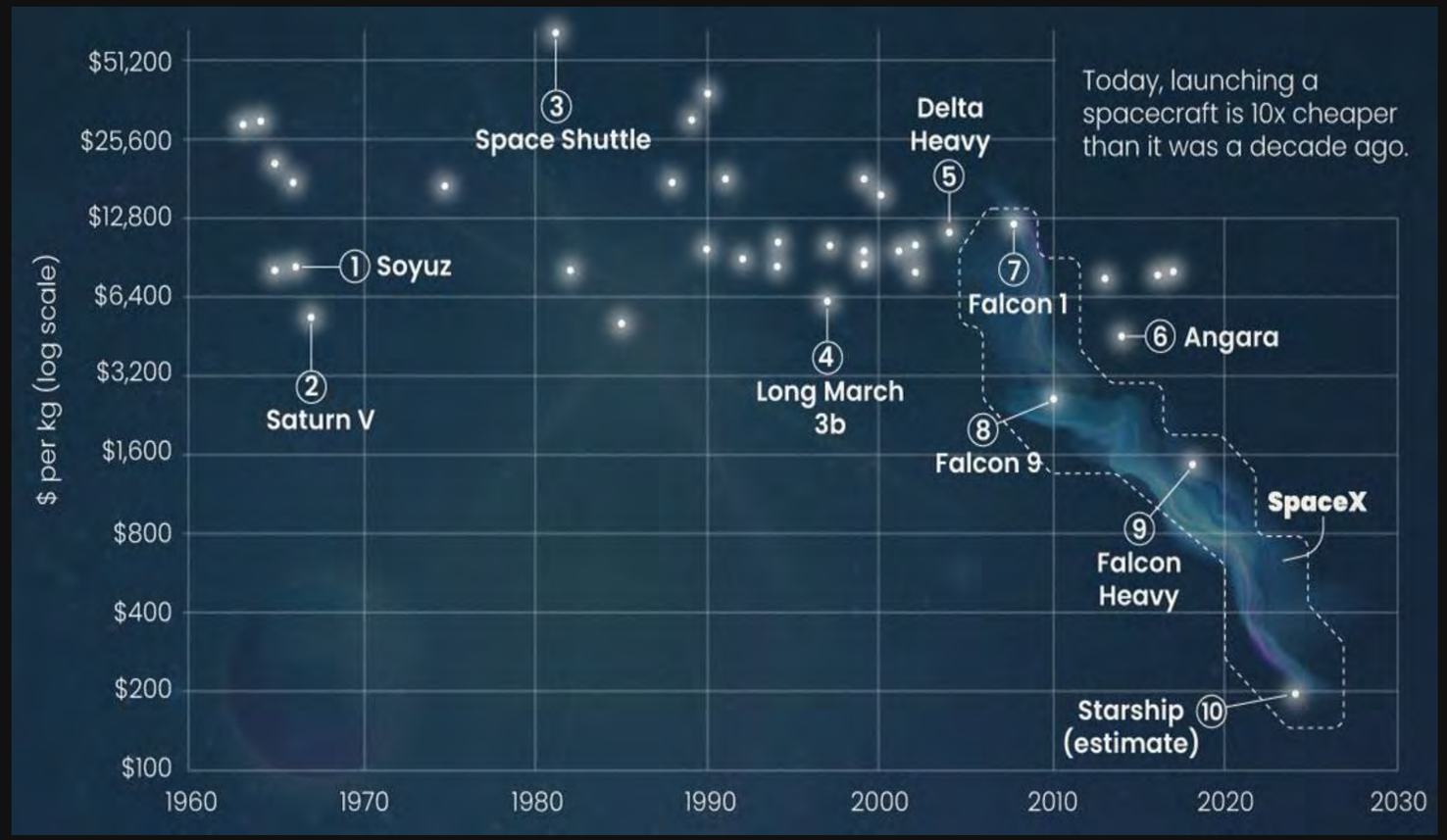
PRODUCTION IN SPACE

HOW DO WE BRING IT BACK?



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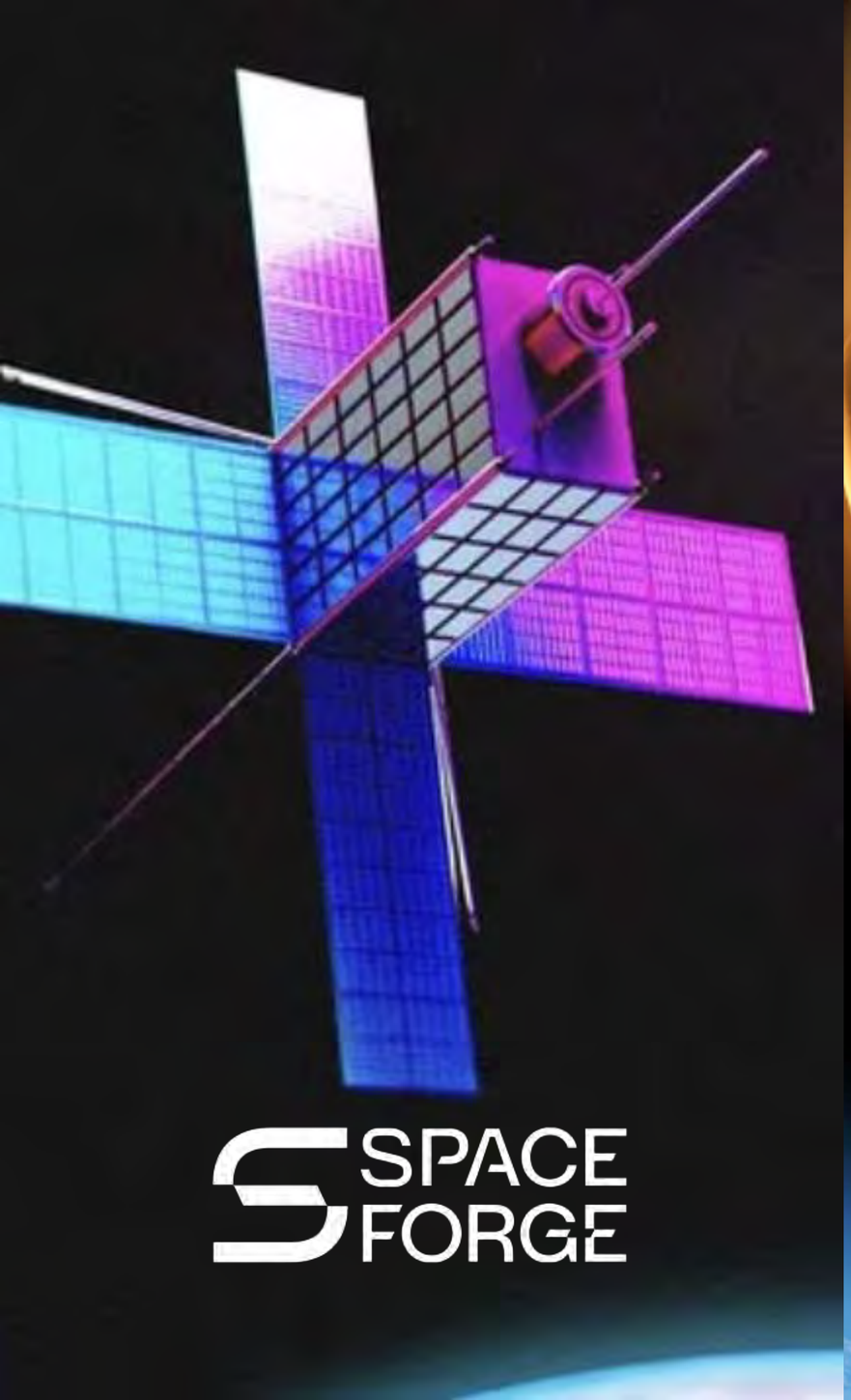
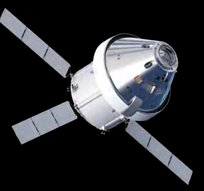

SPACE
FORGE

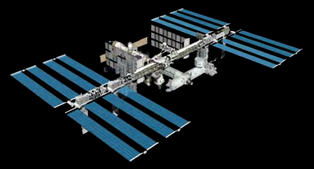

The
Exploration
Company


ATMOS
ATMOS

PRODUCTION IN SPACE
HOW COULD THIS SCALE?

Provisional patent submitted





No humans required

Continuous production

Drug agnostic

Designed for GMP compliance

BOX-S

BOX-S unlocks pre/clinical trials

- Ideal for small quantities with quick turnaround
- All hardware returns
- 0.5-5kg per launch

BOX-R

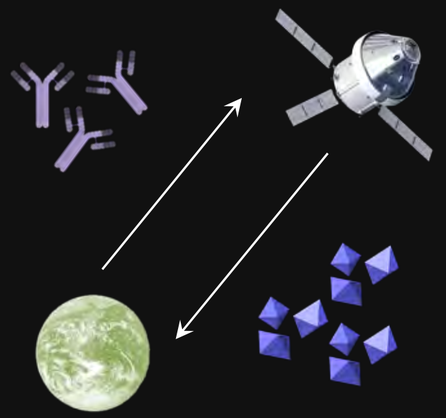
BOX-R unlocks mass production

- Ideal for 24/7 mass production
- BOX remains in space, fluid (green box) is replenished
- 10-100kg per BOX per year

BOX - BioOrbit Cryst(X)alisation platform (-S) Single use (-R) Refillable

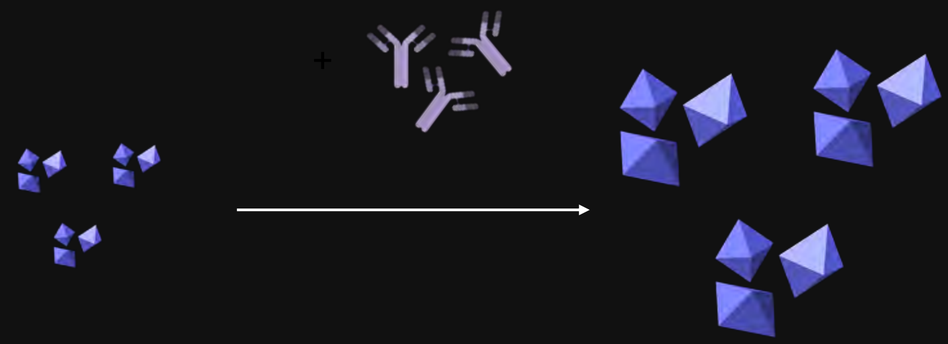
BioOrbit

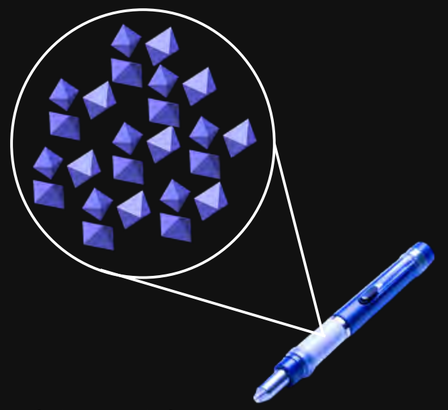
PRODUCTION IN SPACE
DO WE HAVE TO DO IT ALL IN SPACE?



Path 1 – The whole process takes place in space

Path 2 – Seed crystals are made in space and grown further on Earth





Complete crystals are concentrated and loaded into an auto-injector.

Credit: Varda Space Industries

BioOrbit

PRODUCTION IN SPACE
WHAT DO OPERATIONS LOOK LIKE?

1. Antibody Production
2. Add to BioOrbit hardware
3. Launch
4. Mission Operations
5. Return
6. Return to customer

BioOrbit

WHERE ARE YOU AT?

2026

BABY BOX-E
ISS
JUN 2026
Validate continuous production in LEO with a simple protein drug
Payload flown on SpaceX-34 May 2026 and returned June 2026

DRUG CRYSTALLISATION
2026-2027
Optimise crystallisation conditions of a target drug with a pharma partner

BABY BOX-E 2.0
VAST & ISS
Demonstrate continuous production of a mAb in microgravity and safe return for a second time

2027

BOX-T
ISS & VAST
Demonstrate screening of molecules for internal development and partner development

2028

CO-DEVELOPMENT

HOSPITAL TO HOME VIA SPACE

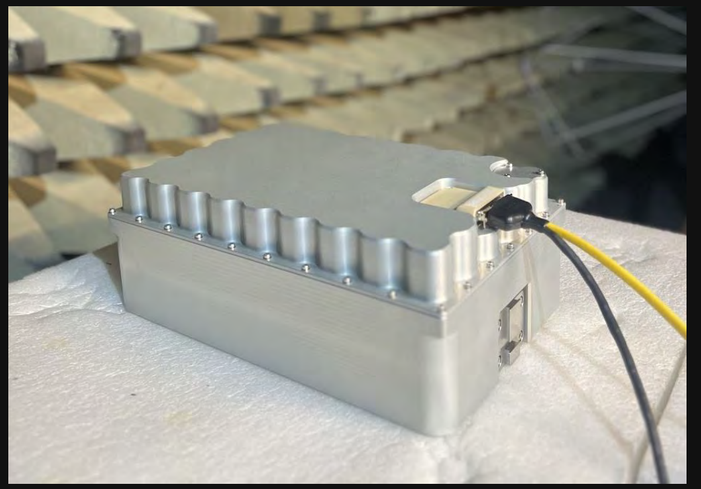
BioOrbit

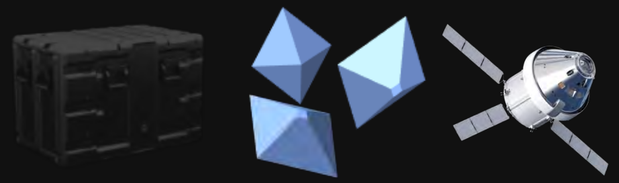
THIS IS NOT **SCI–FI**

THIS IS NOW

BIOORBIT COMPLETED OUR FIRST IN ORBIT-DEMO

BABY BOX-E
ISS 2026 – SPACEX-CRS-34

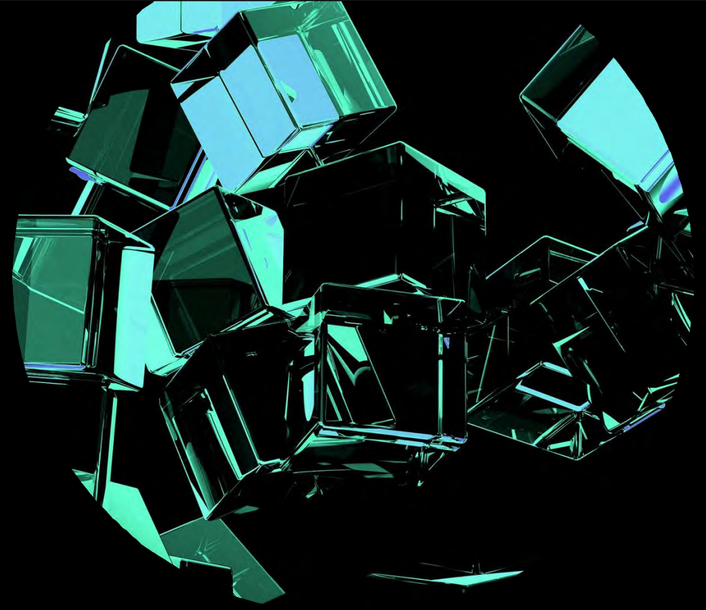




BOX-E
ISS & VAST, 2027

Currently open for partners with target molecules for testing

Contact us for more information



BioOrbit

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H O S P I T A L T O H O M E V I A S P A C E