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The logo for the UK Space Conference 2017 is a circular emblem with a red, white, and blue striped border. The text "UK SPACE" is written in a large, bold, white sans-serif font across the top, "CONFERENCE" is in a smaller font below it, and "2017" is at the bottom.

UK SPACE  
CONFERENCE  
2017

#UKSPACE2017

# Microgravity & Space Experimentation

## Future Research Needs & Developing Platforms

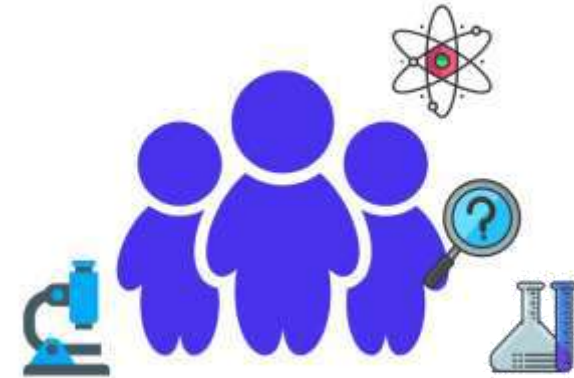
- 1) ESA Microgravity & Space Experimentation Study
- 2) Survey Results: Researcher's Needs
- 3) New Space Platforms
- 4) Remaining Work: Microgravity Solutions in a Post-ISS World





# ESA Microgravity & Space Experimentation Study

**What microgravity platforms will be available to researchers after the ISS?**



1. **IDENTIFY:** Microgravity & Space Research **Community** in Europe
2. **GATHER:** Research Needs & **Requirements**
3. **IDENTIFY:** New / **Future Platforms** for Space Experimentation
4. **LINK:** Platform **Characteristics to Requirements**
5. **DEVELOP:** Operational **Scenarios** (+ Cost & Availability)

# Microgravity & Space Experimentation Survey

## Total Survey Respondents:

Primary Survey (Basic) = **310** respondents

Secondary Survey 2 (Detailed) = **110** respondents

17 questions focused on detailed needs for future research payloads



The screenshot shows a survey interface with a dark blue header containing the Telespazio logo and the text 'ESA Space Research Study Identification of User Needs & Possible Platforms for Future Microgravity & Space Experimentation Secondary Survey'. Below the header, question 5 asks for the best mass range for future experiment/payload hardware, with five radio button options: <5 kg, 5-20 kg, 20-50 kg, 50-100 kg, and >100 kg. An 'Undefined' option is also present at the bottom.

 **TELESPAZIO**  
a LEONARDO and THALES company

ESA Space Research Study  
Identification of User Needs & Possible Platforms for Future Microgravity & Space Experimentation

Secondary Survey

5. Which of the following mass range(s) would best fit to your future experiment / payload hardware? (select all that apply)

<5 kg

5 - 20 kg

20 - 50 kg

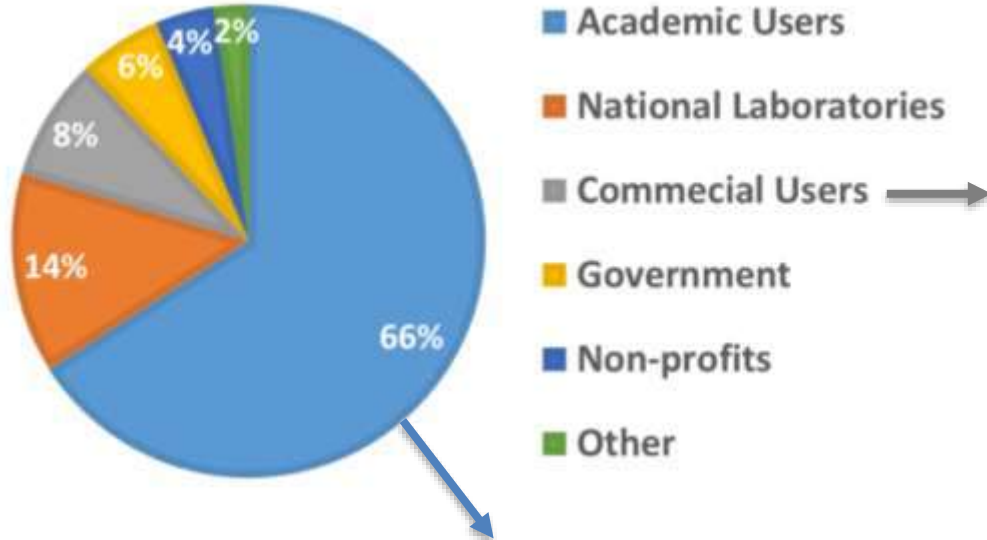
50 - 100 kg

>100 kg

Undefined

# Respondents' Background

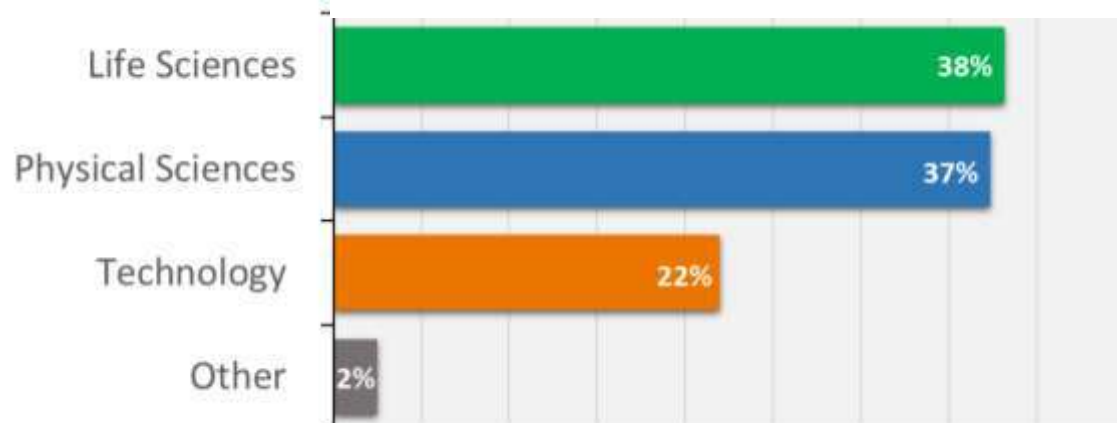
## Affiliation



## Commercial Domains

**72 %** Space Technology  
**12 %** Manufacturing & Construction

## Academic Fields of Interest



## Per Country

Germany	51
United Kingdom	49
Italy	43
France	38
Belgium	26
The Netherlands	18
Spain	15
Switzerland	15
Ireland	8
Poland	8
Denmark	6
Czech Republic	5
Greece	4

# Results – Primary Survey

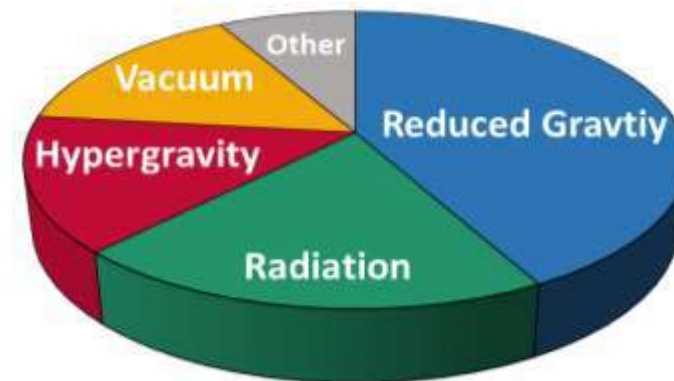
(310 Respondents)

## Respondents' Experience

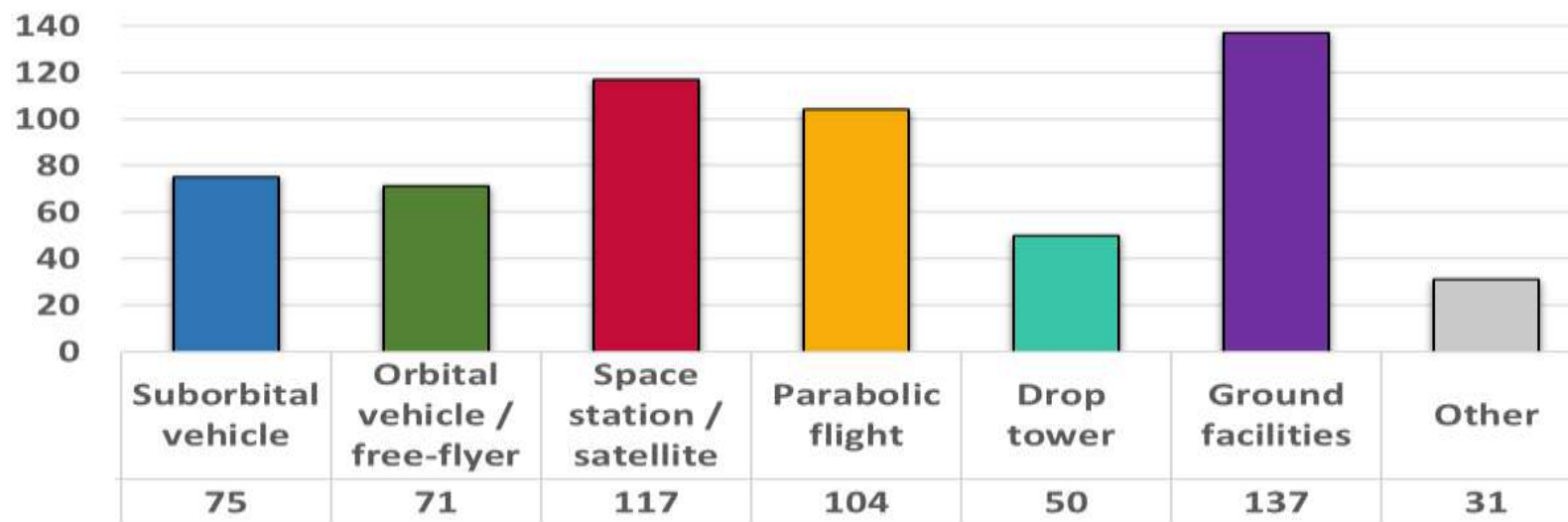
**52 %** Experienced with **research in space**

**87 %** Interested in **future space research**

## Future Users' Required Space Environments



## # Respondents with 1 or more Campaign(s) per Platform



# Results – Secondary Survey

(110 Respondents)

## Respondents' Experiments:



**86 %** Defined Experiments

**81 %** Multiple Experiments

## Experiment Duration(s)



## A Few Platform Differentiating Needs:



**60 %** Require Microgravity **Quality**  $> 10^{-3}$



**45 %** Require accommodation for Payload **Mass** btwn **5 - 20kg**



**44 %** Require **Frequent experimentation** (in separate cycles)

# Results – Secondary Survey (cont.)

(110 Respondents)

## Some Special Payload Requirements:



**37 %** Need **Late Payload Access** or **Early Retrieval**



**33 %** Required **Researcher Accompanied** Experiments



**24 %** Have **Hazardous / Toxic** Substance Payloads



**20 %** Required **Human** Test Subjects



**20 %** Required Payload **Deployment (Nano/CubeSat)**



# Future Platforms



# Future Platforms for Microgravity / Space Experimentation

Short Term (Suborbital Platforms: sRLV)



Design

Development / Testing

Operations

PLD Space: Arion 1



Exos Aerospace:  
SARGE



Virgin Galactic:  
SpaceShipTwo



Blue Origin: New Shepard

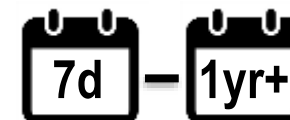


Up Aerospace:  
SpaceLoft XL



# Future Platforms for Microgravity / Space Experimentation

Medium Term (Orbital Platforms: Free-flyers, Capsules)



Sierra Nevada: DreamChaser



ESA: Space Rider



SpaceX: DragonLab



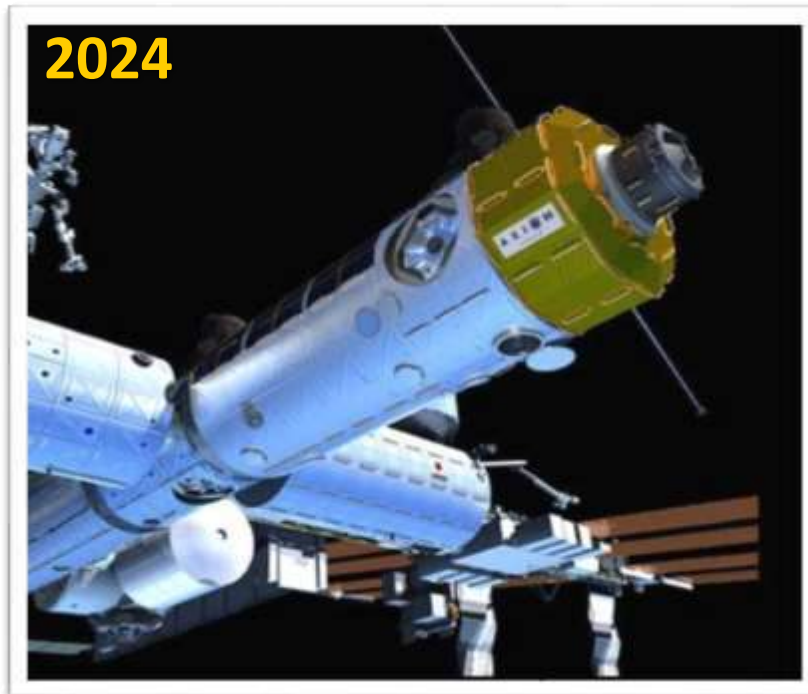


# Future Platforms for Microgravity / Space Experimentation

**Long Term (Orbital Platforms: Space Stations)**



**Axiom Space: Axiom Station**



**Bigelow Aerospace: B330**



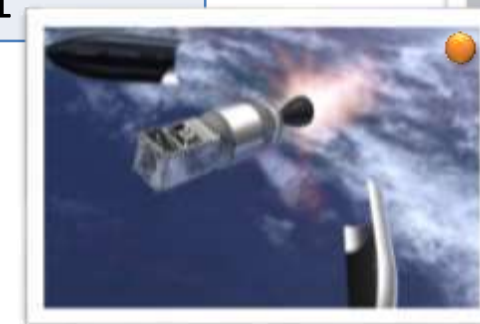


# Future Platforms for Microgravity / Space Experimentation

## Long Term: Small Satellite Launchers



Company	Vehicle	Status / Launch Date
RocketLab	<i>Electron</i> ●	Testing / 2017
Vector Space Systems	<i>Vector-R</i> ●	Testing / 2018
Zero 2 Infinity	<i>Bloostar</i> ●	Development / 2019
Virgin Galactic	<i>LauncherOne</i> ●	Development / --
PLD Space	<i>Arion 2</i> ●	Design / 2020
Orbital Access	<i>Orbital 500R</i> ●	Design / 2021



# What will the Future of Microgravity / Space Experimentation Look Like after the ISS?

## Remaining ESA Study work:

- Compare new & old platform capabilities
- Identify suite of platforms to best meet user needs
- Develop scenarios in which to make use of them

Results show a significant interest from users to date and suggest a number of alternative platforms may be available for future researchers.. though they still face significant technical and economic challenges.

Questions?

THANK **YOU** FOR YOUR ATTENTION





Contact us for more information:

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<http://telespazio-vega.com/>

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