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## Spring 2019

### U.S. Research in Microgravity and Gravitational Research: Low Earth Orbit and Beyond

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#### Our Mission

The next step in human spaceflight is return to the moon. Humans have not ventured beyond the Van Allen belts in decades. In order to prepare for extended human missions beyond Low Earth Orbit (LEO) much still needs to be done. New technology affords opportunities for research and scientific discovery enabling humans to move deeper into space safely. New transportation capabilities provide greater access to the space environment. Using microgravity platforms in low Earth, such as the International Space Station National Laboratory, and advanced exploration systems such as the lunar gateway leverage our national ability to surmount a wide range of complex and difficult biomedical, physical science, and engineering-related challenges. ***Strategic, productive and uninterrupted commitments to research by the U.S. government are critical to exploiting the space environment for advancing U.S. science and innovation agendas.***



#### RECOMMENDATION #1

***As plans mature to build a viable economy in space in Low Earth Orbit (LEO) we recommend developing a national microgravity strategy that clearly identifies how space life and physical sciences gravitational research fits in the context of the national science and innovation agenda, including input from both NASA and other relevant government agencies. We strongly encourage creating a forum for collaboration among the federal agencies involved in these areas of research.***

*Policy is needed to provide guidance on how the research enterprise fits in the context of the national science and innovation agenda. Terrestrial and exploration benefits make the nation's space gravitational research portfolio an increasingly relevant piece of this conversation, both within NASA and other Government agencies. Continuing to seek a balance of research that both enables exploration and is enabled by exploration, as called out by the National Academies' *Decadal Survey on Biological and Physical Sciences in Space*, is vital. The research needs to be integrated into a "whole" enterprise undertaken by the United States, but is difficult without a national policy and strategy.*

#### RECOMMENDATION #2

***Designate continuation of a space-based National Laboratory beyond the functional or programmatic life of the ISS, including a pathway for federally funded researchers to utilize commercially provided space research platforms.***

Under NASA's stewardship, microgravity research continues to enable both exploration and discovery-based research in our federal, academic, and private laboratories. The International Space Station (ISS) National Laboratory, which encompasses the entire U.S. segment of the ISS, is managed by NASA and the Center for the Advancement of Science in Space (CASIS) through a co-operative agreement.

### RECOMMENDATION #3

***Accelerate research funding levels with federal agencies, including NASA, that are utilizing the ISS for research. Acceleration of federal research funding or increase in seed grant funding will propagate into the U.S. ecosystem of scientific breakthroughs and innovation, and creating more jobs in STEM fields.***



As U.S. crew time availability increases on the International Space Station (ISS) with the addition of another crew member, and the upcoming increase of vehicles carrying crew and cargo to the ISS, the capacity to do more research is available; however, the ISS research budget remains stagnant and does not ramp up to take advantage of the increased capabilities. The more the U.S can stimulate demand in LEO, using federal grants and other initiatives, the more likely there will be successes in innovation and discovery that benefit the nation providing value back to the nation for the ISS investment. ***The outcomes from space life and physical sciences research on the ISS are essential to enable***

***execution of space exploration missions and help facilitate research pathways that have high value applications on Earth.***

NASA's Space Life and Physical Sciences Research and Applications (SLPSRA) Division research budget is embedded within the same ISS Research line item that bears significant costs for the operation of on-orbit facilities. This operational budget pressure leaves a SLPSRA program that cannot a) provide adequate assistance to other agencies seeking to utilize LEO for research and b) support sufficient extramural grants to ensure a stable community of scientists and engineers prepared to lead future space exploration research.

#### Summary:

Gravitational research is a continuum of efforts that extend from laboratories and analog environments on the ground, through other low-gravity platforms like parabolic aircraft and suborbital rockets, and into extended-duration spaceflight. Research on the ISS is a component of this continuum, and the capabilities it provides are essential to addressing many of the most important research questions identified by the National Academies. However, similar to other sciences such as astrophysics, gravitational research is platform agnostic, and should be aligned to address fundamental and applied research themes that benefit from gravitational research. Gravitational research, is currently in the ISS budget line, and receives a small fraction of the overall ISS budget. The budget should be increased over the President' Budget Request by \$100M and is it time to reconsider placement of SLPSRA in other organizations of NASA? If we are to explore, if we are to accelerate innovation and science in Low Earth Orbit, the research investment needs to be commensurate with the vehicle and platform investments.

2004 OBPR Budget (Biology & Physical Sciences)	2019 SLPSRA Appropriated (Biology and Physical Sciences)
\$512M	\$81M

#### About the Organization

The American Society for Gravitational and Space Research (ASGSR), founded in 1984, provides a forum to foster research, education and professional development in the multidisciplinary fields of gravitational research. ASGSR brings together a diverse group of scientists, engineers and students from academia, government and industry to promote research, education, training and development in the areas of Space Life and Physical Sciences research. The knowledge gained leads to a better understanding of the effects of gravity on living and physical systems on Earth and enables human space exploration.

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