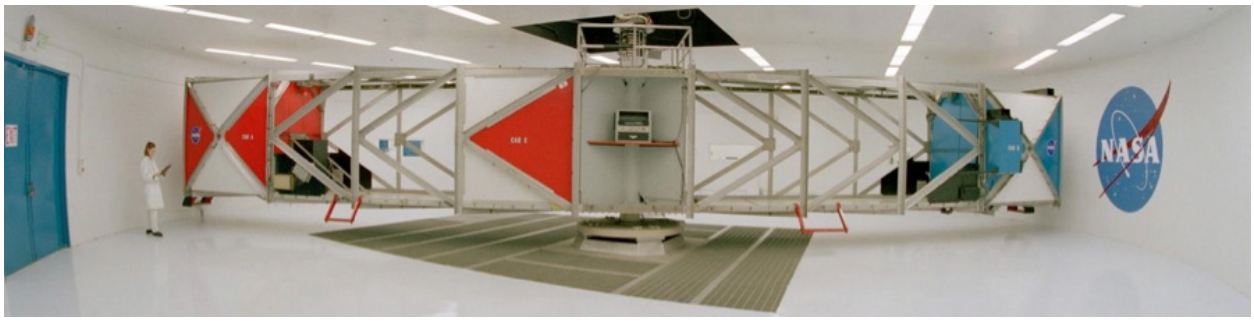
National Aeronautics and Space Administration

Life Science Acceleration Research Facilities

Dedicated to improving our understanding of the effects of gravity on living systems

NASAfacts



20-G Centrifuge (8.84-Meter Radius Centrifuge)

At NASA Ames Research Center in Moffett Field, California, the Life Science Acceleration Research Facilities are a unique suite of acceleration systems that enables researchers to evaluate the effects of high g-forces on various biological specimens, hardware, and humans.

The four centrifuges can be configured to accommodate different types of experimental payloads. The Life Science Acceleration Research Facilities, combined with resident staff expertise and supporting resources, allow researchers to conduct hypergravity studies at Ames that cannot be performed at any other NASA center.

A wide range of variables can be evaluated during studies of acute or chronic exposure to a hypergravity environment, including mechanical, fluid, thermal, electrical, and electronic systems. Biological specimens can range from humans to microbes and may include small animals, plants, tissue cultures, and microecosystems.

The Flight Systems Implementation Branch of the Space Biosciences Division at NASA Ames Research Center operates and supports the planning and implementing of experiments using the acceleration facilities.

The staff assists investigators with planning and implementing studies. Resident science advisors provide counsel to investigators to help maximize the accomplishment of research objectives.

For more information, visit:
www.nasa.gov/ames/research/space-biosciences

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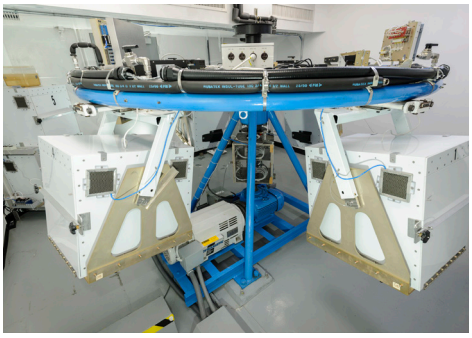
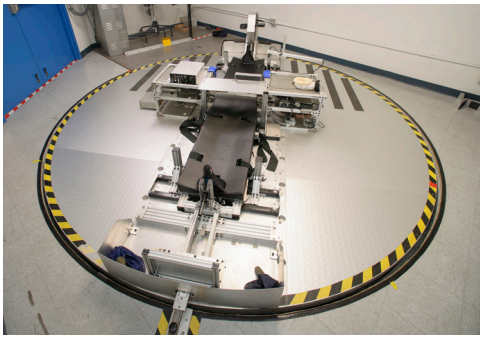
1-Meter Radius Centrifuge



1.22-Meter Radius Centrifuge



Human Performance Centrifuge (1.98-Meter Radius Centrifuge)

Life Science Acceleration Research Facilities

The 1.22-Meter Radius Centrifuge is designed for temperature controlled small animal and plant research. Each of the specimen cabs are powered habitat enclosures that include continuous data, video, and temperature monitoring. The system accommodates rotational and stationary controls, with four stationary cabs also located within the centrifuge room.

The 1-Meter Radius Centrifuge provides a unique acceleration facility enabling researchers to evaluate the effects of hypergravity on various biological specimens. The centrifuge is configurable with one or two rotating arms, each arm supporting one to four specimen habitats. The habitats can be configured to accommodate small animal, plant and hardware payloads and support experiment unique payloads at different acceleration levels during a single experiment. Powered habitat enclosures include continuous data, video, and temperature monitoring. The system accommodates rotational and center stationary controls.

Human Performance Centrifuge (1.98-Meter Radius Centrifuge) accommodates supine human subjects and produces forces up to 5 g at the subject's feet while maintaining 1 g at the subject's head, allowing for study of gravity gradient effects. An ergometer system can be added for protocols requiring subject exercise.

The 20-G Centrifuge (8.84-Meter Radius Centrifuge) is used for studying the effects of hypergravity on humans and non-human subjects and also for evaluating flight hardware. It is the only human-rated NASA centrifuge that can produce sustained launch/return accelerations. There are three enclosures. The first enclosure contains a modified fighter jet seat for human subjects. The second enclosure can be configured to meet an investigator's needs and currently contains a generic space capsule seat. Both of these enclosures provide launch acceleration and vibration loads to human subjects and can be configured to support other human or non-human studies. A third enclosure is near-center and may be used for on center controls for angular acceleration or to study gravity gradient effects. In addition, the open portions of the centrifuge arms between cabs can be utilized for both human and non-human payloads. Swing baskets attached to movable support frames are available for locations along the centrifuge arms and allow multiple g-load application during a single test run for non-human experiments.

Ames Facility	Payload	Payload Capacity	Acceleration	Radius	Max RPM*	Exposure
1.22-Meter Radius Centrifuge	Small animals, plants, tissue cultures	4 enclosures (up to 87.1 kg each)	1-3G (4G with extension)	Variable from 0.93 meter to 1.22 meter with extensions (2) to 1.60 meter	42.3 RPM	Acute or chronic (with stops for animal husbandry)
1-Meter Radius Centrifuge	Small animals, plants, hardware	1-4 enclosures (up to 5 kg per enclosure)	1-3G	< 0.5 meter or 1 meter	60 RPM max. for 1-meter radius; 90 RPM max. for < 0.5 meter radius	Acute or chronic (with stops for animal husbandry)
Human Performance Centrifuge (1.98-Meter Radius Centrifuge)	Humans	1-2 subjects (227 kg total)	1-5G (at subject's feet)	1.98 meter, fixed	50 RPM	Acute
20-G Centrifuge (8.84-Meter Radius Centrifuge)	Humans, rodents, microbes, plants, hardware	3 unique enclosures. (544 kg total)	1-20G (Human-rated to 12.5G)	8.84 meter, variable (enclosures are fixed)	50 RPM	Acute or chronic

*RPM = Revolutions Per Minute

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