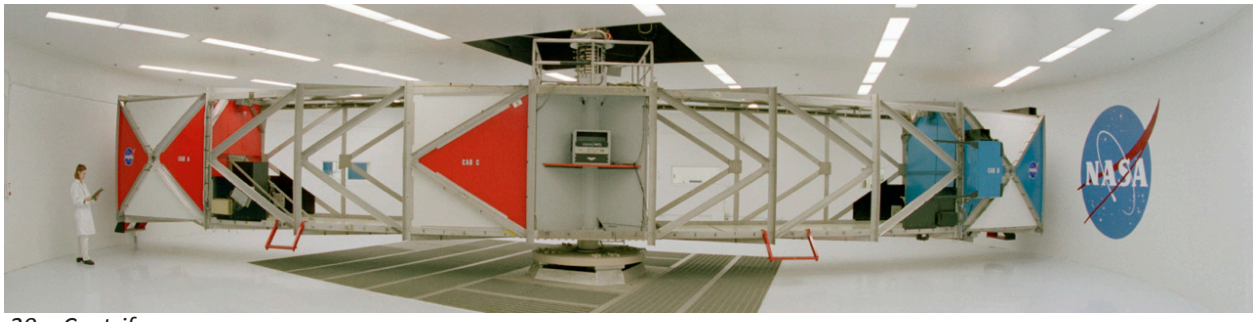
National Aeronautics and Space Administration

Life Science Acceleration Research Facilities

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

NASAfacts



20 g Centrifuge

At NASA's Ames Research Center in Moffett Field, Calif., a unique suite of acceleration systems enables researchers to evaluate of the effects of high *g*-forces on humans, hardware, and various biological specimens.

Five centrifuges, each configured to accommodate different types of experimental payloads, combined with resident staff expertise and supporting resources, allow researchers to conduct studies at Ames that cannot be performed in any other NASA facility.

A wide range of test articles can be evaluated during studies of acute or chronic exposure to a hyper *g* environment including mechanical, fluid, thermal, electrical, and electronic systems. Biological specimens range from microbes to humans and may include small animals, plants, tissue cultures, and micro-ecosystems.

The Flight Systems Implementation Branch of the Space Biosciences Division at Ames operates and supports 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.

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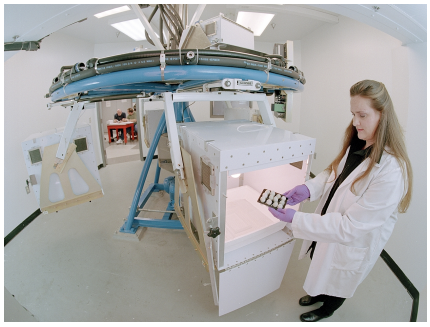
24-Foot Centrifuge



8-Foot Centrifuge

Human Performance Centrifuge

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The 20 g 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 facility that produces sustained launch/return accelerations. There are three enclosures: one contains a modified jet fighter seat for human subjects; the second can be configured to meet an investigator's needs and currently contains a generic space capsule seat providing both launch acceleration and vibration loads to the human subjects. Either of these enclosures 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.

The Human Performance 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 24-foot Centrifuge accommodates small animal, plant and hardware payloads. The configurable system can provide enclosures with different acceleration levels during a single experiment. Powered habitat enclosures include continuous data and video monitoring. The system accommodates rotational and stationary controls.

The 8-foot Centrifuge is designed for temperature controlled small animal and plant research. Powered, cooled habitat enclosures include continuous data and video monitoring. The system accommodates rotational and stationary controls.

The Low Vibration Rotational Device is a single arm centrifuge that provides smooth angular accelerations with minimal vibration. It may be used with an onboard tissue culture incubator to study the effects of acute or chronic hypergravity exposure on cell cultures. An identical incubator is located off-board to provide a 1 *g* stationary control.

Ames Facility	Payload	Payload Capacity	Acceleration	Radius	Max RPM*	Exposure
20 *g* Centrifuge	Humans, rodents, microbes, plants, hardware	3 unique enclosures, (1,200 lbs total)	1-20 *g* (Human-rated to 12.5 *g*)	29 feet, variable (enclosures are fixed)	50	Acute or chronic
Human Performance Centrifuge	Humans	1-2 subjects (500 lbs total)	1-5 *g* (at subject's feet)	6.5 feet, fixed	50	Acute
24-foot Centrifuge	Small animals, plants, hardware	20 enclosures (up to 100 lbs each)	1-3 *g*	12 feet, variable	30.5	Acute or chronic (with stops for animal husbandry)
8-foot Centrifuge	Small animals, tissue cultures	4 enclosures (up to 192 lbs each)	1-4 *g*	Fixed at 4 feet, except to achieve 4 *g* an extension is used	42.3	Acute or chronic (with stops for animal husbandry)
Low Vibration Rotational Device	Tissue cultures, hardware	1 enclosure (500 lbs)	1-5 *g*	10 feet, variable	45	Acute or chronic

*RPM = Revolutions Per Minute

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