



Fruit Fly Lab

Studying Fruit Flies in Space

Aboard the International Space Station

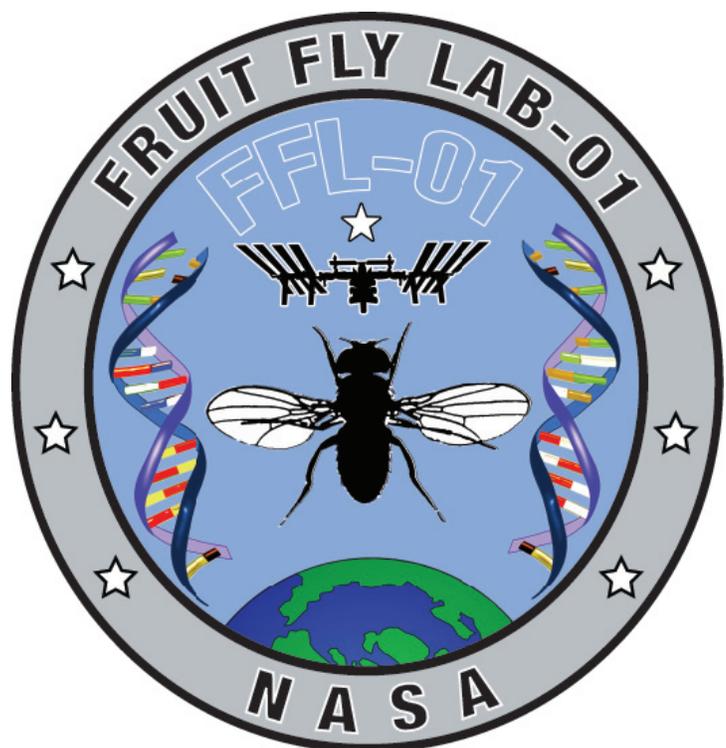
The Fruit Fly Lab provides a research platform aboard the International Space Station for long-duration fruit fly (*Drosophila melanogaster*) experiments in space. Such experiments will examine how microgravity and other aspects of space affect these insects, providing information relevant to long-term human spaceflight, in particular the response to illness. Approximately 77 percent of human disease genes closely match the fruit fly genome.

Fruit fly spaceflight experiments have contributed significantly to our understanding of the effects of microgravity on biological processes that are directly relevant to humans in space. Because of the fly's short life-span, fruit fly studies provide information of the whole biological system, including the effects of microgravity on the immune system, the development cycle (birth, growth, reproduction, aging), and behavior. Specific research questions are defined in the National Research Council's 2011 Decadal Survey Report, "Recapturing a Future for Space Exploration: Life and Physical Sciences Research for a New Era."

Historically, short-term fruit fly experiments have been transported into Earth's orbit aboard NASA's space shuttle. The International Space Station is the first essentially "permanent" orbiting science laboratory that offers the opportunity for longer-term experiments in space. In 2012, NASA's Ames

Research Center in Moffett Field, Calif., was authorized to develop the Fruit Fly Lab for research aboard the space station.

This hardware development project leverages the experience gained from prior flight experiments with fruit flies using a space shuttle-based system. Advanced capabilities of the new Fruit Fly Lab include providing environmental and behavioral monitoring for long duration studies that the previous system lacked. In the post-shuttle era, the hardware also must support safe transport of fruit flies on the commercial resupply service vehicle SpaceX Dragon.

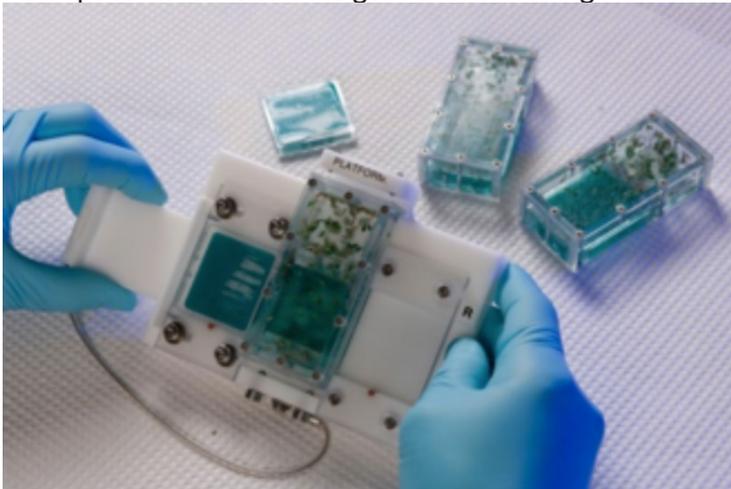


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Fruit Fly Lab Aboard the International Space Station

The new system has three major components: the Cassette that will safely transport fruit flies to the space station; the Food Changeout Platform that astronauts will use to change the fruit fly food without breaching containment, and allow extraction of the fruit fly larvae for preservation; and the Nanorack Centrifuge that will house the Cassettes, providing an artificial gravity environment onboard ISS. The Fruit Fly Lab will provide long-term housing for fruit flies aboard the station at microgravity and a controlled 1 *g* inside the on-orbit centrifuge.

The first Fruit Fly Lab mission, FFL-01, will launch on SpaceX-5 in 2014. The goal of the first flight is to



Fruit Fly Lab habitat hardware and change-out platform.

validate hardware performance, and for the station crew to demonstrate critical research operations on-orbit. More than a hundred flies will be aboard the space station for a total period of 30 days.

The Fruit Fly Lab will be open to principal inves-

tigators on the first full science mission, FFL-02, which will fly to the International Space Station on SpaceX-7 in early 2015.

Under the direction of the International Space Station Utilization Office and the Space Biology Project, the Fruit Fly Lab is being developed at Ames, benefiting from the expertise within the Space Biosciences Division. Lockheed Martin and Astrium, GmbH (Germany) are performing hardware development. Lockheed Martin is providing additional science and mission operations support.

This project is supported by the International Space Station Program at NASA's Johnson Space Center, Houston and the Space Biology Project at Ames. Funding for Space Biology comes from the Space Life and Physical Sciences Research and Applications Division within the Human Exploration and Operations Mission Directorate at NASA Headquarters.

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