

NASA's Johnson Space Center tests space suits and vehicles



NASA's reduced gravity plane

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[Amy Ross, Johnson Space Center Spacesuit Engineer.](#)

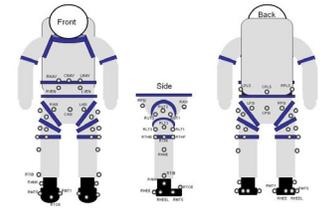
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Mockup of the new Orion spacecraft



Suited marker set used by NASA

You may have heard about Vicon motion capture systems being used for the blockbuster hit Gravity, making Sandra Bullock and George Clooney look like they were floating through space dodging satellite debris.

But what you may not know is that the same technology is used by NASA to prepare for real-life space missions. NASA's Johnson Space Center (JSC) in Houston, Texas has been using Vicon systems for more than eight years to test the designs of space suits and vehicles.

Although manned missions have been put on hold due to budget cuts, NASA is currently preparing for manned space exploration missions to Mars and the Moon in the coming years. Space vehicles, spacesuits and other hardware are very complex and costly to design and build, requiring numerous iterations to meet performance requirements and costing tens of millions of dollars. NASA's JSC needed a solution to help them design suits and vehicles that, when built, allow astronauts to function effectively.

Human-centered design

"The main issue was that we used to think of humans last," said Matthew Cowley,

senior design engineer at Johnson Space Center. "For example, we'd design and build a vehicle first, and then try to fit a person in it. But when we'd test them with real-life people in spacesuits we'd find that that they couldn't function or move around in the vehicles properly." This could cause problems not only for the mission itself, but for the astronauts involved. So NASA's aim was to find a technology that would enable human-centered design.

NASA chose Vicon systems based on their quality and reliability. They currently use Vicon's Nexus software along with several different types of Vicon cameras, including the Vicon MX System.

JSC engineers use the Vicon systems to ensure that new space suit designs allow astronauts to interact with vehicles and their environment unhindered. Examples include testing how astronauts and their space suits will perform if their vehicle breaks down and they have to walk several miles back to base with a limited oxygen supply. Or verifying whether the design of spacesuits and vehicles enables astronauts to reach and operate controls and safety equipment, such as fire extinguishers, while wearing their suits.

Design in motion

With Vicon systems JSC spacesuit engineers are able to acquire a lot more information to better analyze the motions of

different designs, helping them understand not only the gross mobility of the suit, but how each individual component contributes to overall mobility.

To test mobility, engineers used to have subjects move in certain directions, photograph them and then take measurements, which was more time consuming, less effective and less accurate. Now they can have the subjects move in the suit and perform functional tasks to understand which joints they use and how much that joint contributes to the motion.

"The use of motion capture when testing suits is incredibly accurate," said Amy Ross, Johnson Space Center spacesuit engineer. "Testing used to take hours and data analysis would sometimes take months, but now tests only last an hour or so and we can have data available much sooner."

With Vicon systems now in use, JSC can put humans first, allowing them to test how different designs will impact human performance in real-life environments in ways they never could before.

Technology Profile

Nexus software
Vicon MX System

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