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## Fashionable Space Travel

The fashionable space walk involved in checking or repairing a part on a spaceship appeared to be permanently relegated to the genre of not-scientifically-correct-space-themed movies. But a NASA-funded project at the Massachusetts Institute of Technology (MIT) might soon produce an astronaut fashion makeover that will let modern astronauts do their thing in a spacesuit as fashionable as any ever worn by a movie star.

The traditional Michelin-tire cartoon look encapsulates the astronaut in a 300-pound suit of pressurized armor. Each suit is custom made so that movable human joints are in perfect alignment with the suit's movable mechanical joints. This perfect—but very expensive—alignment gives the astronaut the

ability to walk and perform work without letting in the vacuum of space.

perform out-of-spaceship activities for long periods of time, a new spacesuit paradigm was obviously needed.

For the last seven years, Dava Newman and Jeff Hoffman, both professors in the MIT Department of Aeronautics and Astronautics Engineering, performed NASA-funded research to develop a new lightweight spacesuit that future astronauts

could wear. With the help of their students and an outside local design firm, they created and tested the BioSuit that Newman models in the photographs.

The design of the current spacesuit's look originally came from the goal of keeping aquanauts from the crushing depths they endured in the course of deep ocean dives. The keep-pressure-out suit of the aquanaut underwent redesign to the keep-pressure-in suit that our astronauts now wear.

The new MIT BioSuit wraps very tight layers of material around the human body to create a physical and flexible counter-pressure suit that protects the astronaut from the vacuum of space. If the new suit receives a small puncture, astronauts can temporarily repair it, on the spot, using a special bandaging tourniquet-style repair.

This suit is still a project under construction. Newman indicates that the designers hope to have a BioSuit ready for the full vacuum of space in time for the first trip to Mars. She expects the final design to be a hybrid suit with a gas-pressured torso

section, helmet, and oxygen tanks.

For the BioSuit to work in the vacuum of space, it must encapsulate the human body with a pressure that is almost equal to one-third the atmospheric pressure found here on earth (101.325 kilopascals). The newest BioSuit design inconsistently provides 30 kilopascals. The designers just need a slight pressure increase, coupled with con-



sistent performance, to make the BioSuit ready for the rigors of outer space.

To physically move muscles and joints while wearing the BioSuit, an astronaut will expend about one-third the physical energy needed to perform the same activity here on earth. During long space flights, the artificial atmospheric suit could be worn most of the time to help keep astronauts in shape and keep them from losing muscle mass. ©

## Recalling the Facts

1. In what way is this new spacesuit different from the ones that our astronauts currently wear during spacewalks?
2. What atmospheric pressure should this new spacesuit exert against a human body to make it safe for an astronaut to work in the vacuum of space?

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Photos by MIT photographer Donna Coveney

ability to walk and perform work without letting in the vacuum of space.

The problem: The suit not only makes a bad fashion statement, it is also an exhausting piece of space equipment to wear and work in. Astronauts currently deplete three-quarters of their energy getting the suit's joints to bend and move. To