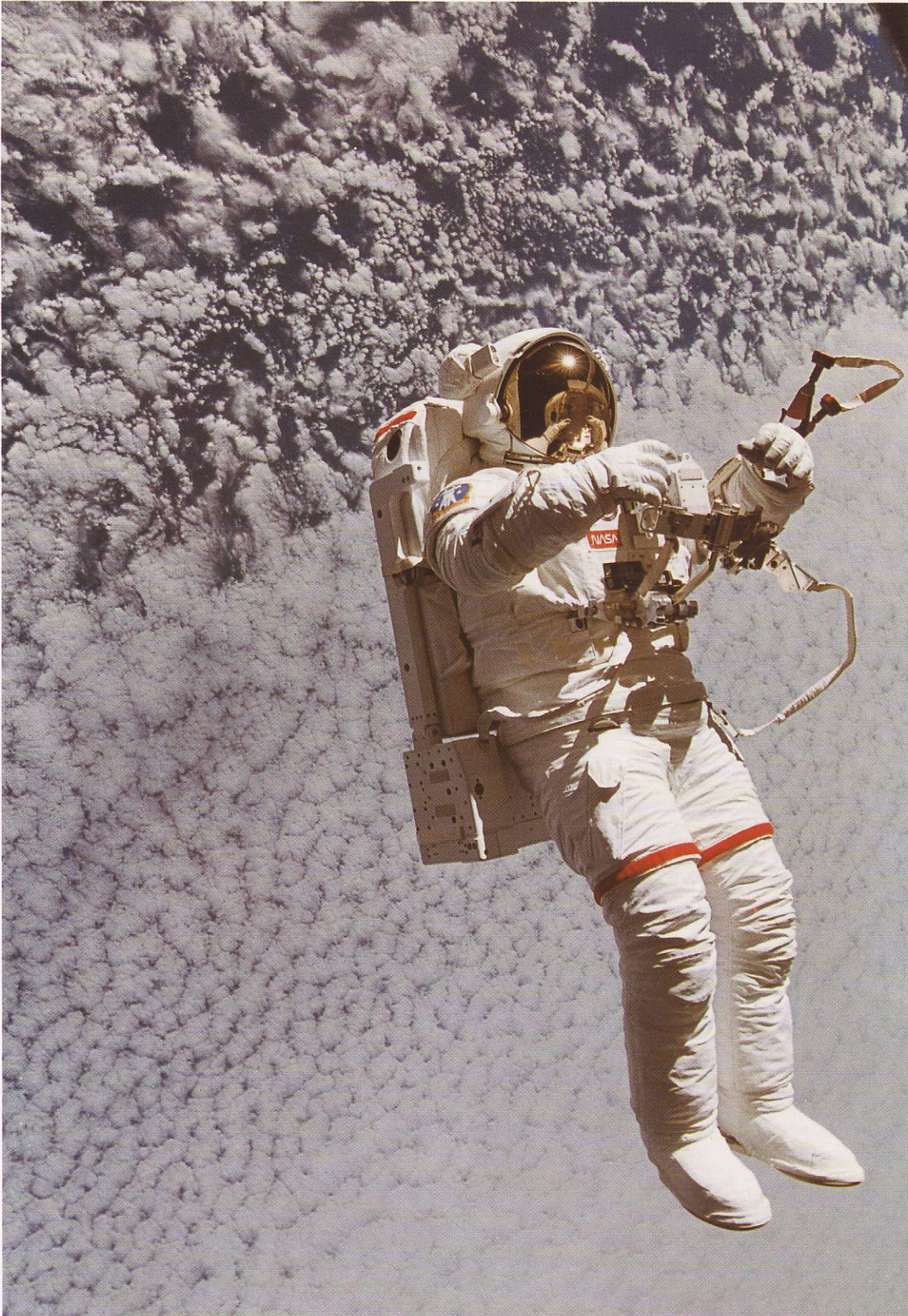




National Aeronautics and
Space Administration

Astronaut Test Flies EVA Self-Rescue Device





Astronaut Mark C. Lee successfully test flies the Simplified Aid for Extravehicular activity Rescue (SAFER) a few meters from the cabin of the Space Shuttle *Discovery*. He is one of two mission specialists who participated in a spacewalk, or extravehicular activity (EVA), during the STS-64 Space Shuttle mission in September, 1994. The spacewalk represents the first use of SAFER. A team at the NASA Johnson Space Center planned and developed SAFER as a self-rescue device for future use on the International Space Station in the event that a tethered astronaut breaks away during an EVA and a Shuttle is not available to assist in the rescue.

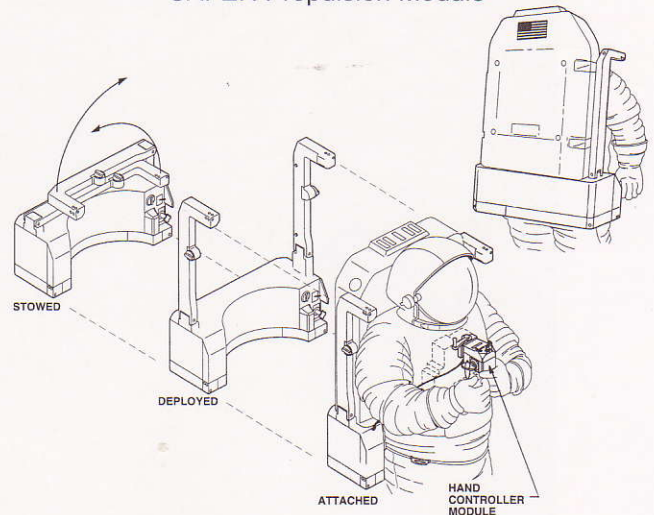
SAFER, is a small, self-contained, propulsive backpack device that can provide free-flying mobility for a space-walker. Attached to the spacesuit's display and control module is a hand controller, similar to a joystick, which operates various combinations of thrusters that can propel the astronaut back to the safety of the Space Station. Each of the 24 fixed-position thrusters expel nitrogen gas with a force of 3.6 newtons. The astronaut can move the unit up and down, back and forth, side to side, yaw, pitch, and roll by manipulating the hand controller. SAFER includes an attitude control which automatically maintains a rotational position selected by the astronaut.

SAFER has a 1.4 kg supply of nitrogen, which provides a 3.05 meter-per-second change in velocity before the supply is exhausted. The Shuttle's nitrogen system can recharge SAFER in orbit, and the battery pack which powers SAFER is replaceable during an EVA.

SAFER stows in the airlock for launch and landing with the upper towers folded. The unit measures 35.6 cm high, 66 cm wide, and 25 cm deep, and has a mass of 37.6 kg. The height of the unit increases to 88.9 cm when the arms are fully extended. Before an EVA, the astronaut unfolds SAFER's arms and attaches the unit so that it cradles the spacesuit's portable Life Support System backpack.

Three SAFER units will be stored on board the Space Station. These models will differ from the test model in several areas: the operational model will be smaller and include a stowage area for the hand control unit; the fuel

SAFER Propulsion Module



will be contained in highly pressurized tanks that can not be recharged in orbit. If used, a new unit will be brought up by the Shuttle. The used units will be brought back to Earth and recharged for future use.

For the Classroom

1. Demonstrate the principle of the SAFER unit's propulsion system by inflating and releasing a balloon.
2. Define yaw, pitch, and roll. Research and find other examples of things that yaw, pitch, and roll.
3. Research Space Shuttle missions where astronauts experimented with gas-propelled maneuvering units. Compare and contrast your findings with SAFER.
4. Read science fiction stories where characters wear propulsion packs as a means of transportation.
5. Create a chart of other professions that use rescue devices. Have students build models of the rescue devices, demonstrate how they are used, and explain scientific principles that make each work.

Electronic Resources

Additional information is available over the World Wide Web at the following address:
<http://shuttle.nasa.gov/>