SPACE

Astronaut Escape Suit

A new flight suit may permit an astronaut to escape from his space capsule during lower levels of reentry without injury from heat and blast exposure.

➤ A NEW Air Force flight suit and helmet, if pressurized, may permit an astronaut to escape from his space capsule during lower levels of reentry without injury from extreme heat and windblast exposure.

The suit, presently without a pressure system, can protect a pilot, forced to eject from supersonic high-altitude aircraft, from heat and windblast severe enough to sear human flesh and strip it from the bone, Col. John Paul Stapp, chief scientist of the Aerospace Medical Division, Brooks Air Force Base, Tex., told SCIENCE SERVICE.

The suit has an outer layer of 13½-ounce white dacron sailcloth over a layer of cotton knit underwear cloth covering a layer of tightly woven aluminized nylon. A layer of knit cotton is worn next to the skin. All zippers and seams are in the back, presenting an unbroken line in the front.

The suit was designed primarily to provide an adequate escape system for pilots of the rocket-powered supersonic X-15 aircraft in which weight and space limitations do not permit an enclosed capsule-type sonic ejection system.

Preliminary tests with rocket sled rides above 1,300 miles per hour (more than one and one-half times the speed of sound) indicate that the new suit, adapted with a pressure system, may make it possible for the ejected astronaut to withstand the tremendous heat, shock waves and gravity stresses from estimated windblast pressures of more than 45 pounds per square inch.

The hazards of windblast exposure in flights have been recognized since World War II. For subsonic flight, a nine-ounce cotton-duck flying suit with front zipper enclosures has provided adequate protection during ejection at lower altitudes. However, the standard suit proved grossly inadequate for sonic and supersonic craft.

Experiments with an anesthetized chimpanzee in 1957, wearing a standard flight suit, during a 27-second rocket sled ride at 1,337 statute miles per hour resulted in the almost complete disintegration of the suit during the last three seconds of acceleration. This exposed the skin to severe heat and shock wave stress.

The new dacron suit was specially fitted to another chimp for a faster sled ride a year later. However, the chimp was disqualified from the experimental run because of an infection. The back-up chimp was a bit larger and one arm of the suit had to be modified by removing the insulation and lining layers. The chimp made the ride without any damage except for burns on the arm covered by the modified area of the suit.

During this ride, the chimp had been exposed to 400 degrees Fahrenheit and windblast pressure more than 35 pounds per square inch.

The new suit was designed by Dr. Charles Lombard, physiologist, at Protection, Inc., Los Angeles. Dr. Lombard, now with Northrop Co., specializes in research aimed at protection of pilots and other personnel exposed to stresses of aviation and aerospace flight.

The most recent test with a suit covering a man-sized dummy has indicated beyond doubt that man would survive with full protection an escape from craft even at speeds several times that of present supersonic planes.

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FLIGHT SUIT READY FOR TEST

SPACE

Upside Down in Space

➤ THE NEXT ASTRONAUT to circle the earth in space will see the world upside down.

This will happen when he flies his space capsule upside down as part of new maneuvers to test an astronaut's ability to control the Mercury spacecraft.

Astronaut M. Scott Carpenter will be freer than Astronaut John H. Glenn Jr. in trying different attitudes of the capsule, including upside-down flying, Dr. Robert B. Voas, psychologist to the astronauts at the Space Task Group Center, Langley Field, Va., told SCIENCE SERVICE.

He said Astronaut Carpenter will try to fly upside down both while facing forward and backward to test the effect on him and his ability to maneuver the capsule.

Astronaut Glenn's competence in handling the manual attitude controls has prompted National Aeronautics and Space Administration officials to have the new maneuvers tested.

Dr. Voas said the astronaut will be handling the capsule manually most of the time as well as operating his communication and enviromental systems as Astronaut Glenn did. Like Glenn, he will also be expected to handle manually, if necessary, the sequential system of such tasks as firing the retro, or braking, rockets and releasing the parachute on descent to earth.

Astronaut Carpenter will likely have field glasses, and a camera to try to take pictures of the glowing particles seen at sunrise on each of the three orbits by Astronaut Glenn. Carpenter, flying backward most of the time, will turn his capsule around as he comes into the sunrise to be in a better position to take the pictures.

The astronaut will also, as Glenn, do exercises to see how these affect him while weightless. He may try to eat non-crumbling solid foods such as chunks of chocolate, cubed foods made with meat, or tablets of malted milk. Astronaut Glenn ate without ill effects some applesauce from a squeeze tube especially developed for the weightless environment. However, he did not try solid foods.

Several three-orbit flights are scheduled for this year. Later Mercury flights will make up to 18 orbits and last a full day. Dr. Voas said that if flights of more than three orbits are tried before the 24-hour flights, they will most likely be of up to six or seven orbits. Any trip between this and 18 laps would not bring the astronaut over a favorable landing spot.

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SPACE

Rogallo Landing Wing Designed for Gemini

See Front Cover

➤ AN EARLY MODEL of the "Rogallo Wing," seen on the front cover, will be used for landing the two-man Gemini space capsule on dry land.

The wing configuration, here attached to a mock-up Mercury capsule, will be folded inside the spacecraft and during reentry will be deployed like a parachute and glide the capsule down to earth.

The first programmed flights of Gemini will use a ring sail parachute for recovery.

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