APOLLO ELEVEN

A timeless touchdown on a dusty sea

APOLLO ELEVEN

continued

The silvery disc still glides across the sky with calendar precision just as it has throughout the ages, and lovers still kiss in secluded rendezvous under its dim light. But the earth's moon is no longer quite the same moon that it was before July 20.

Man claimed the moon two months ago; he is going to re-establish that claim two months from now. And he will go again and again, consolidating his claim, establishing permanent bases and, eventually, constructing celestial workshops on its barren surface.

Aware of the significance, some 500 million people in more than 40 countries on five continents watched intently as Neil Armstrong's ghostly figure climbed down the nine rungs of the lunar module's ladder and took what he called "one giant leap for mankind."

In taking that first step onto the moon's surface, Armstrong was by himself. He was the latest in a long line of bold explorers—sober, fascinated, reporting carefully on what he observed.

But no sooner had another man, "Buzz" Aldrin, joined him on the surface, than explorer Armstrong momentarily became just human-being Armstrong and he couldn't restrain himself.

"Isn't it fun?" he said to his companion.

Man not only was walking safely in the hostile lunar environment, he was enjoying it.

In just eight years, the United States had carried out President Kennedy's challenge, attaining the goal he had set for the nation—and for the world—the moon in the decade of the 1960s.

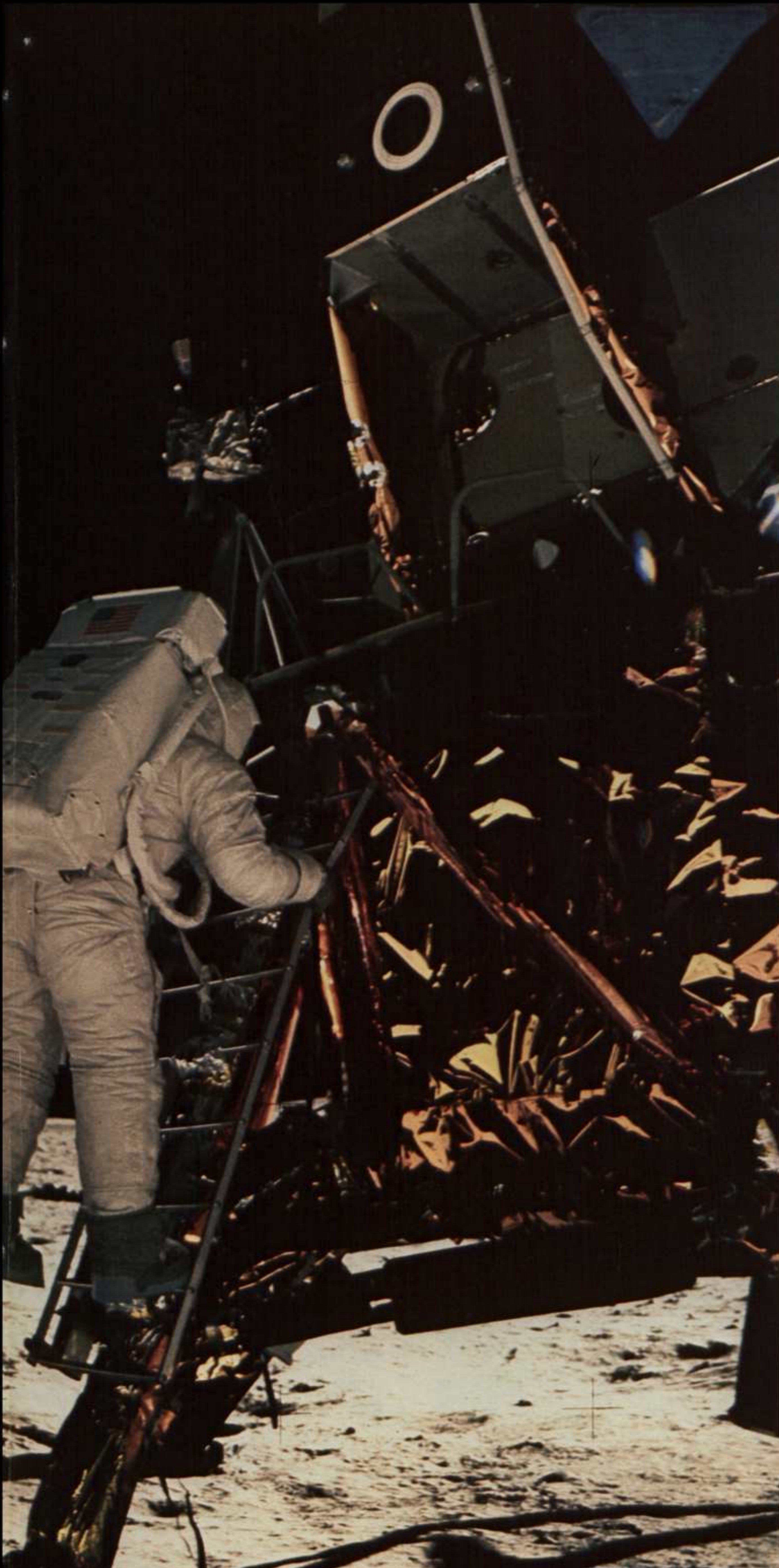
Meeting that goal, however, called upon the resources of the entire nation. Thousands of new products and techniques had to be developed. Although Projects Mercury and Gemini, the first two ladders in this country's climb to the moon, drew mainly on then-existing technology, Apollo missions required materials and products that were largely new.

A major exception was the application Du Pont products found in Apollo — products the company's scientific community had developed over the years for commercial use: "Teflon" fluorocarbon fibers and film, "Mylar" polyester film, "Kapton" polyimide film, nylon, "Nomex" nylon yarns, "Freon" fluorocarbons, "Dacron" polyester fiber, neoprene, "Lycra" spandex fiber, "Armalon" TFE-fluorocarbon resin coated glass fabrics, "Pyralin" high-temperature resistant sheet materials, and others. A tough breed of materials for a hostile environment.

When Armstrong and Aldrin walked out into the moon's early morning sunlight, the temperature on the sunny side of their spacesuits was a comfortable 50 to 60 degrees Fahrenheit. When they stepped into the shadow of the lunar module, they stepped into a moon refrigerator with a temperature of 150 below zero.

As they walked, hopped and loped

historic come down for a high flyer



around in the lunar dirt, Armstrong and Aldrin were protected from the hostile environment by a 21-layer spacesuit made almost entirely with raw materials developed by Du Pont —materials chosen for this unique application by ILC Industries of Dover, Delaware, the designer and manufacturer of the $100,000 suits.

The outermost layer of the moonsuit, which covered about 50 per cent of the suit's surface at hard-wear points, was made of a fabric woven from a "Teflon" fiber. Beneath that and covering the other half of the outer surface was a fiberglass fabric woven from a glass yarn coated with a "Teflon" TFE-fluorocarbon resin.

Next came two layers of aluminized "Kapton" film to provide the first insulation against the hot lunar sunlight. Beneath that, was the main body of thermal insulation—five layers of aluminized "Mylar" film interleaved with four layers of non-woven fabric of "Dacron" polyester fibers. These layers not only kept the sun's heat out, they helped protect Armstrong and Aldrin from excessive loss of their own body heat when they worked in the shade of the lunar module.

The fourteenth layer from the outside was a neoprene-coated nylon fabric designed as a rip-stop layer, one of the layers which together served to protect the astronauts from any micrometeorites—high-speed space dust—that might have hit them.

Beneath the neoprene-coated nylon

continued

was a nylon oxford fabric serving as a restraint for the pressure bladder which kept the oxygen, used to provide an artificial atmosphere for the astronauts, contained within the spacesuit. The pressure bladder itself, the next layer, was made of a neoprene-coated nylon twill. The neoprene, which made the twill impermeable to the oxygen, also protected the bladder from the corrosive effect of the pure oxygen atmosphere.

The layer beneath the bladder was a system of nylon coil spacers encased in a nylon mesh to permit a regulated flow of oxygen throughout the spacesuit, to help provide cooling by evaporation of any perspiration.

All of these layers were then lined with a "Nomex" nylon comfort liner.

The final three layers formed a sort of long underwear that enclosed the astronauts from the ankles to the neck and wrists. The underwear's outer layer was a "Lycra" fabric; its middle layer was a network of fine vinyl tubes circulating the cooling water used to carry away excess body heat when evaporation was not enough; the innermost layer was a nylon chiffon, intended to be soft against the astronauts' skin. The role of the stretchable "Lycra" was to hold the cooling-water tubes snugly against the skin.

Du Pont products, however, not only walked out onto the moon with the astronauts, they surrounded them during every portion of their flight.

The trousers, jackets and booties they wore during most of their flight were made of fabric of a 100 per cent "Teflon" fiber. "Velcro" fasteners of nylon and "Teflon" FEP-monofilament on their boots and the spacecraft floor enabled Armstrong, Aldrin and Michael Collins to stand in one place instead of floating around weightless in the spacecraft cabin.

The couches they sat and slept on were made of "Armalon". The wall panels in the command module were "Pyralin" sheets impregnated with polyimide resin. "Krytox" oils and greases were used in both spacecraft—the command module "Columbia", the lunar module "Eagle"—and in the spacesuits.

Also, more than 15 miles of wiring in the command module were insulated with "Teflon". "Kapton" film provided the insulation on about 14 miles of wiring in the lunar module. Both the command and lunar modules were insulated against the sun's radiant energy and loss of internal heat by combinations of "Kapton" and "Mylar". And, the fire control system in the command module was loaded with "Freon" fluorocarbon agents.

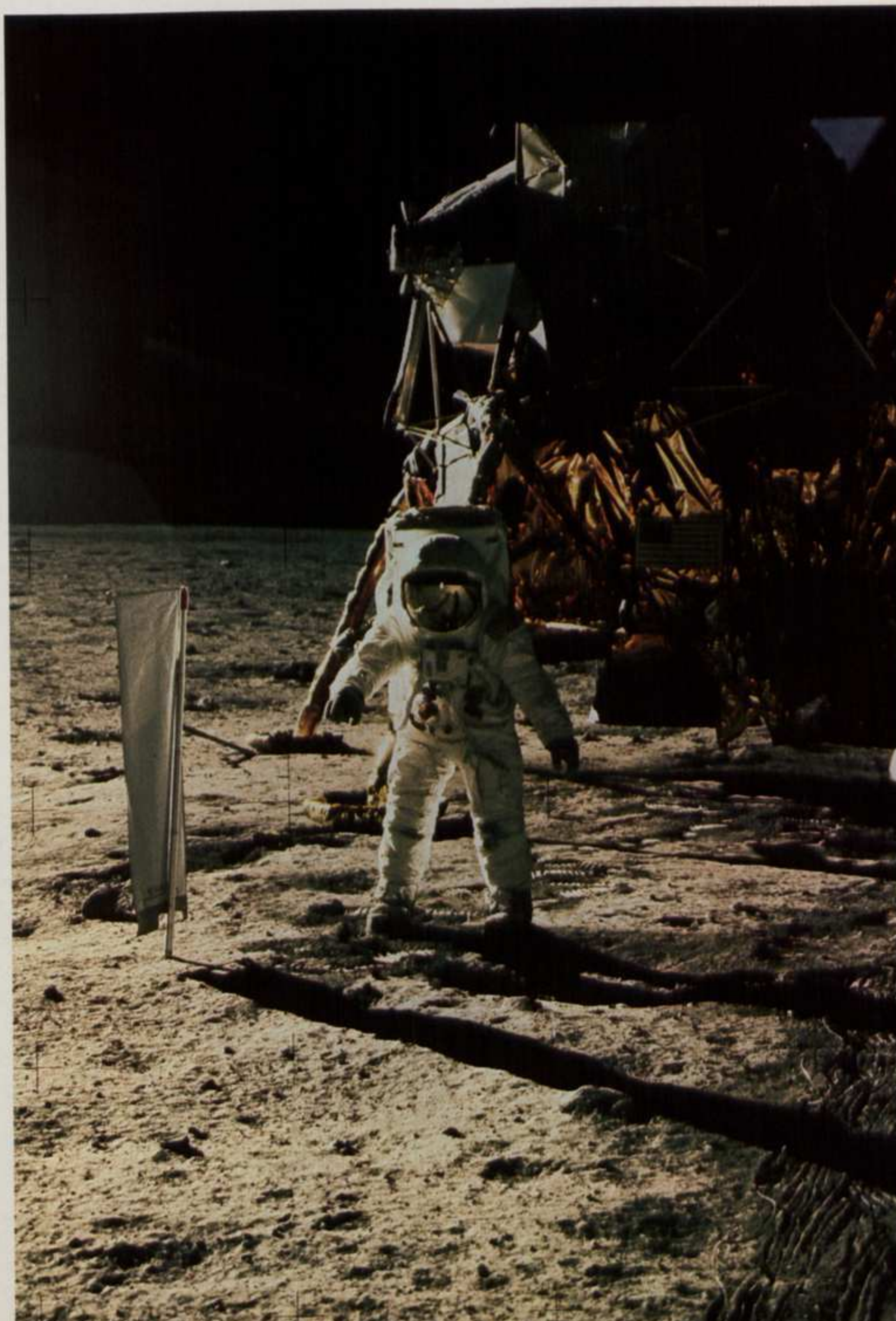
Ceramic microcircuits in the mission control center computers and the Saturn V instrumentation unit used printable conductor and resistor compositions supplied by the Electronic Products Division of the Electrochemicals Department.

For the people watching the flight from around the world, one of the

giant footprint for all mankind

Moon rocks were swaddled in "Teflon" film.

photographs courtesy NASA



most important applications was in the movie and television cameras that recorded the historic journey. These cameras depended on "Vespel" plastic parts of polyimide resin—a high-temperature resistant plastic.

But that was Apollo 11—now past, now history.

Ahead lies Apollo 12, scheduled for launch from Kennedy Space Center in mid-November. Apollo 12 will be targeted for the Ocean of Storms on the moon's western face. The same Du Pont products will be at work, helping protect the next team of astronauts—Charles "Pete" Conrad, Jr., and Alan L. Bean, Apollo 12's moonwalkers, and Richard F. Gordon, Jr., who will be orbiting overhead, taking care of the mothership needed to bring them all safely home. BL

these suits

were made for walking