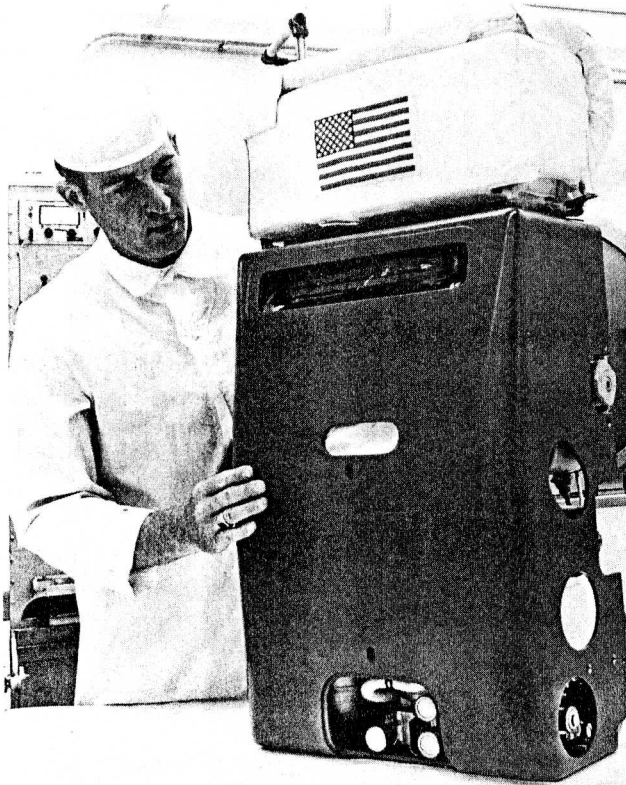


PORTABLE LIFE SUPPORT SYSTEM

The portable life support system provides an astronaut with a livable atmosphere inside his space suit during excursions on the lunar surface and in space. Worn on the back and connected to the suit's waist by umbilicals, it permits up to four hours of extravehicular activity.

The backpack supplies oxygen for breathing and suit ventilation, and refrigerated water and oxygen for body cooling. It pressurizes the suit to 3.9 psi and removes contaminants from the oxygen circulating through the suit. It also has a communication-telemetry set, controls to operate it, and devices to monitor its functions.

For the lunar mission, the LM will have two of these life support packs. The LM will carry enough supplies to refill each pack's oxygen tank and water reservoir, and replace its battery and two lithium hydroxide cannisters three times. This will allow a total of four extravehicular trips.



R-113

Portable Life Support System

The life support pack, with its controls, weighs 84 pounds; it is 26 inches high, 17.8 inches wide, and 10.5 inches deep. It is powered by a 16.8-volt silver-zinc battery. A fiberglass cover protects the pack against micrometeoroids.

Five subsystems make up the portable life support system: primary oxygen supply, oxygen-ventilating circuit, water transport loop, feedwater loop, and space suit communication system. An oxygen purge system with an additional 30-minute supply of oxygen for emergency or backup use is mounted on the pack, but operates separately.

A thermal insulator made of fire-resistant Beta cloth and aluminized Kapton covers the pack and its shell to restrict heat leakage in or out, depending on the moon's temperature. A similar insulator covers the oxygen purge system.

A remote control unit, which is attached to the suit chest, has switches for the life support pack's water pump and oxygen fan, five-position communication selector switch, a radio volume control, an oxygen quantity gage, and an oxygen purge system lever.

FUNCTIONAL DESCRIPTION

PRIMARY OXYGEN SUPPLY

This subsystem supplies oxygen for breathing and pressurizes the space suit and helmet. The oxygen is automatically fed into the suit to maintain a pressure of 3.9 psi. Slightly more than 1 pound (1.06) of gaseous oxygen is stored at between 850 and 950 psi in a tank nearly 6 inches in diameter and slightly more than 17 inches long. The tank is replenished from the LM oxygen supply.

OXYGEN-VENTILATING CIRCUIT

This subsystem circulates oxygen through the space-suit pressure garment and purifies recirculating oxygen. It also helps cool the astronaut by evaporating moisture that accumulates on his skin.

Oxygen entering the backpack from the suit passes through a lithium hydroxide cartridge, where chemicals trap carbon dioxide exhaled by the astronaut. It then goes through an activated-charcoal bed that removes trace contaminants, including body odors. The oxygen flow is cooled by a porous-plate sublimator, a self-regulating heat-rejection device developed by Hamilton Standard. Water in the sublimator absorbs the heat and seeps through the pores of the sublimator's sintered-nickel plates exposed to a passageway where space vacuum enters. The water freezes, forms an ice layer across the plates, then turns from ice to vapor. The rate of this sublimating process is governed by the amount of heat being rejected.

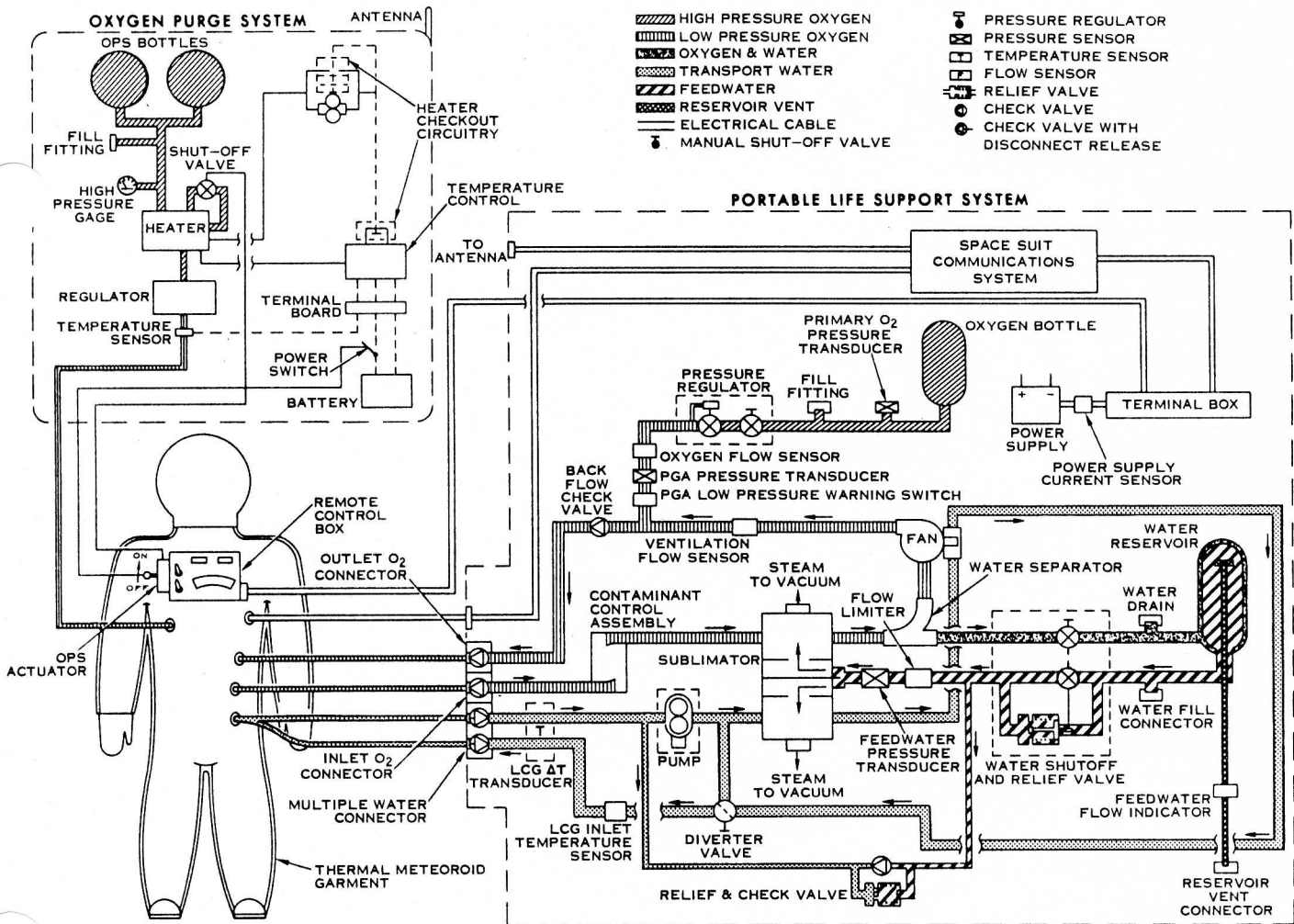
Excess water entering the oxygen flow, mainly from astronaut respiration and perspiration, is removed by a water separator and stored outside

the bladder section of the water reservoir. A fan recirculates oxygen to the space suit at a rate of 6 cubic feet per minute.

Six extra lithium hydroxide cartridges are carried in the LM to replace used cartridges.

WATER TRANSPORT LOOP

This loop cools the astronaut by removing his metabolic heat and any heat that leaks into the suit from the hot lunar surface. A battery-operated pump continuously circulates 1.35 pounds of chilled water at a rate of 4 pounds per minute through a network of plastic tubing integrated in the liquid cooling garment worn under the space suit. The pack dissipates metabolic heat at an average of 1,600 Btu per hour and can handle peak rates up to 2,000 Btu.



Portable Life Support System Schematic

