May 1966

Brief 66-10201

NASA TECH BRIEF

Self-Contained Clothing System Provides Protection Against Hazardous Environments

The problem:

To design a self-contained protective clothing system to protect personnel against hazardous environments involving toxic and corrosive atmospheres and thermal extremes in the temperature range from −210° to +140° F.

The solution:

Design the clothing with an environmental control system and a complete protection envelope consisting of an outer garment, inner garment, underwear, boots, gloves, and helmet.

How it's done:

The outer garment, which is a multilayer laminate of tetrafluoroethylene, ethylene propylene, and nylon, provides flexibility with the necessary environmental protection. The outer garment is completely sealed with cuff rings to gloves, boots, and helmet. The inner garment of acrylic fiber fur allows freedom and additional insulation.

The helmet is of a double-wall vinyl construction, providing air passages, insulation, and impact resistance. It is designed with a communication system and an oral-nasal breathing mask. The visor is constructed of sealed and separated layers of formed plexiglass to reduce fogging and increase insulation.

The environmental control system, contained in a backpack, includes a liquid air storage dewar that provides a comfortable suit environmental level at high temperatures. At low temperatures, a bypass heat exchanger allows air to be supplied directly to the mask, thus giving longer use. Direct breathing for up to 10 minutes can be attained by the evaporation of the liquid air through a direct-breathing heat exchanger and delivered to a demand regulator. The cooling requirement is achieved with a temperature-control valve which reduces the high-pressure gas flow, thereby acting as an expansion valve. The water content of the ventilating gas is reduced by condensing on the cryogenic heat exchangers.

Notes:

1. The clothing system provides protection against red fuming nitric acid, nitrogen tetroxide, hydrazine, monomethyl hydrazine, unsymmetrical dimethyl hydrazine, liquid oxygen, and liquid nitrogen.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama, 35812
   Reference: B66-10201

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C., 20546.

Source: The Garrett Corporation
under contract to
Marshall Space Flight Center
(M-FS-536)

Category 05