

J. G. Lawrence M.D.

INTER-DEPARTMENT COMMUNICATION
The Martin Company

28 February 1958

TO: B. W. Moss

CC: J. DeMike, O. J. Bush, R. Black, L. T. Bomer

FROM: R. H. Edgerley

Mail G-325

Ext. 8308

SUBJ: Visit to the Air Crew Equipment Laboratory, Naval Station,
Philadelphia, 21 Feb 1958

1. Purpose of the visit: to learn details of the new Navy lightweight full pressure suit to determine its feasibility for space flight.

2. Personnel contacted: J. Correale, D. Mancinelli, Dr. L. M. Libber, C. T. Koochembere, and others.

3. Of general interest is that disclosure by Mr. Koochembere that he has recently submitted a request to BuAer to allow him to set up a program for sealed cabin development and investigation of weightlessness. He expressed a desire to work with Martin on these projects should his request be approved.

4. The other people visited gave us information on the new full pressure suits of which the following is a summary. The Navy has two new suits in development -- the "Goodrich Lightweight suit and the Arrowhead-A X-6. They feel that the latter suit, weighing 9 lb, is actually the better one but have been forced to discontinue its consideration at least temporarily because one used in an F 8-U ruptured at very high altitude. This suit superficially looks like the old heavy full pressure suit and offers greater mobility than the Goodrich lightweight model when inflated. The Goodrich suit weighs 10 lb and consists of a rubber shell restrained by an outer silverized nylon fabric.

Both of these suits will require wearing a suit of ventilating underwear weighing about 3 lb and the use of a helmet weighing 5 to 6 lb; the old helmet weighs 6 and the newest one about 5. In addition, the Goodrich suit will require the use of boots coming about 3 or 4 inches above the ankle. Leather boots will probably be used.

Both suits supply pure oxygen on demand and at ambient pressure up to and including 35,000 feet. Above this altitude, the suit inflates and maintains a suit pressure of 35,000 feet. Breathing pressure is one inch of water above suit pressure. Although no work has been done on oxygen consumption, Air Force data on the MA-2 helmet are believed applicable. It would be perfectly feasible to wear this suit with the visor open breathing air from a sealed cabin.

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The suits can be ventilated either in the inflated or non-pressurized condition. Air or even an inert gas like nitrogen can be used for ventilation. At an ambient temperature of 150°F, the suit can be ventilated with 90°F air providing a ventilation rate is used of 900 (standard) liters/min. A sitting, resting subject can tolerate this for 6 hours without drinking water. If the suit is inflated, however, this will not work since suit inflation causes a doubling of the resting metabolic rate. The suits can be worn comfortably with no ventilation at ambient temperatures ranging from 50° to 65°F. For long periods, comfort without ventilation requires an ambient temperature of 60°F.

The new Goodrich suit offers less mobility when inflated than the old heavy one. The new suit does not, however, restrict normal pilot performance as concerns instruments and controls in front of the body and above the lap. When not inflated, mobility is quite comparable to an ordinary summer flight suit.

In explosive decompression tests, the Goodrich suit went from 18,000 feet to 25,000 feet in 110 milliseconds while the chamber went to 75,000 feet in the same time. The suit took over 3 seconds to go to 35,000 feet. If subsequent tests prove these figures representative, the suit would appear to offer very good protection against explosive decompression, providing of course that the wearer has the visor in place at the outset.

A single disconnect is used for oxygen, ventilation air, air for G-suit, and electrical wiring. Emergency bail out oxygen can be carried as an integral part of the suit if desired.

There is no provision for elimination of body wastes at present but work in progress is expected to allow urination by 1960 or before.

We conclude that this suit could be very useful for at least the earliest manned space flights, regardless of the status of sealed cabin development.

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