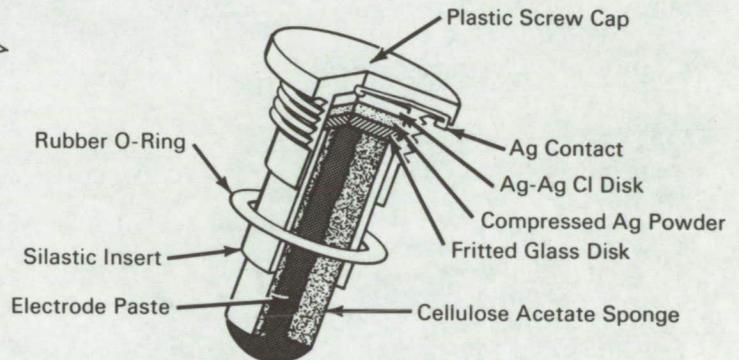


# NASA TECH BRIEF



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## Helmet System Broadcasts Electroencephalograms of Wearer



### The problem:

To develop an improved system for obtaining electroencephalograms (EEG's) of pilots and astronauts performing tasks under stress. In the past, electrodes were cemented to the scalp and were uncomfortable, irritated the scalp, and took as long as an hour to attach. Furthermore, the wires to the readout equipment restricted the subject's motions.

### The solution:

An EEG monitoring system consisting of non-irritating sponge-type electrodes, amplifiers, and a battery-powered wireless transmitter, all mounted in the subject's helmet. No preparation of the scalp is required. After a quick initial fitting, the helmet can be removed and replaced without further adjustment. There are no external wires.

### How it's done:

A flight helmet is modified to contain the EEG electrodes and the electronic components. The elements of the system fit conveniently in the helmet and do not impair its usefulness as a protective device.

The key element in this system is the EEG electrode, which consists of a flexible portion that rests against the scalp and a rigid portion that fits securely in the helmet and is connected to the amplifier. The flexible portion consists of a hollow-core cellulose acetate sponge impregnated with an electrode paste. The rigid portion consists of the following: a disk of fritted glass wetted with a saline solution; a disk of compressed silver powder; a disk of Ag-AgCl; and a solid silver contact which connects with the amplifier.

Fitted to the subject, the sponge portion containing the electrode paste contacts the scalp with a light

(continued overleaf)

steady pressure. This member can accommodate a certain amount of relative motion between the scalp and the helmet without altering the electrical properties of the connection or distorting the signal.

The remaining elements of the system are a pair of miniature biomedical amplifiers, a pair of commercially available FM subcarrier oscillators, a miniature PM transmitter operating at 108 MHz, and standard miniature mercury cells that provide 90 hours of continuous operation.

**Notes:**

1. The helmet shell comes in three basic sizes, and by selection of liner size and length of replaceable sponge, the helmet can be adapted to any subject. Initial fitting requires only about five minutes.

2. Experiments with a variety of subjects (some with thick hair, with and without hairoil, and some bald) have been made in the laboratory, in flights of a T-33 airplane, and in centrifuge runs. The data obtained have been consistent with EEG records obtained with carefully applied metallic electrodes.

3. A related innovation is described in NASA Tech Brief B65-10203, July 1965.

4. Inquiries may also be directed to:

Technology Utilization Officer  
Ames Research Center  
Moffett Field, California 94035  
Reference: B66-10536

**Patent status:**

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

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