

PHYSIOLOGY

High Altitude Cuts Vision

Pilots can see only half as far from high altitudes in an empty, cloudless sky. The eye does not remain focused at infinity unless there is something to focus on.

► **FLYING HIGH** in a clear, cloudless sky cuts down how far you can see, contrary to what you might expect.

This is one of the new problems of high-altitude flying when man changes to an environment for which evolution has not prepared him. It is a problem British aviation medical experts are concerned about, Air Commodore T. C. Macdonald, A.F.C., R.A.F., director of hygiene and research at the Air Ministry, London, told members of the Aero Medical Association meeting in Washington.

The maximum range at which the eyes can pick up an object when flying at high altitudes in an empty, cloudless sky is reduced by one-half, he declared.

The condition is called "empty field myopia." It has nothing to do with high speed, lack of oxygen or decompression. Air Commodore Macdonald explained it as follows:

The normal eye when at rest is supposed to focus at infinity. But complete relaxation to the far point is possible only when there is detail present at the far point on which the eye can focus. When this is absent, as in the empty, cloudless sky, the eye involuntarily exerts about one diopter of accommodation. The point of focus, instead of being at infinity is then at distance of about a yard (one meter).

The pilot under such circumstances can only focus at infinity with the aid of an optical trick or by glancing at an object at least 30 feet away. This latter trick is possible in some aircraft but is not easy in aircraft with very swept-back wings.

Second problem British aero-medical scientists are concerned over is the need for them to play medical detectives. This was highlighted in the studies to learn how victims of the two Comet crashes last year actually died.

A "Sherlock Holmes type of thinking," plus carefully devised experiments to test the thinking, were needed to solve the Comet crash problems.

One of these was that bodies of the Elba crash victims showed scalding or burning of clothed areas, whereas three or four bodies of the Naples crash victims showed darkening of exposed areas of the skin. In no case in either crash was there any singeing or scorching of clothes or hair. The problem was whether the two types of marks were caused by the same agents.

The darkened skin of the Naples victims, the scientists finally learned, was due to suntanning after death. For this finding, the scientists had to "rediscover" the little known physiological fact that melanin, a pigment in the skin, can darken when ex-

posed to long-ray ultraviolet light after death. This was confirmed by experiment. The bodies of the Naples victims were afloat for some 22 hours and exposed to sunlight during that time.

The Elba conditions, it was found by experiment with dead animals, could be produced when a dead body lies in water with a burning layer of kerosene on the surface.

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PHYSICS

Miniature Cyclotrons

► **THE "EFFECTIVE"** masses of whirling electrons in solid matter can be directly measured for the first time in miniature atom smashers.

Working like giant cyclotrons, but on a scale as small as the atom itself, the electrons are stopped in their paths in less than one revolution.

Semiconductors, the wonder materials used in transistors and solar batteries, are being investigated with this new, powerful tool for studying the structure of solids. Dr. Benjamin Lax of Massachusetts Institute of Technology's Lincoln Laboratory reported measurements on the masses of charged carriers, electrons and "holes," in germanium, silicon and indium-antimony to the American Physical Society meeting in Baltimore.

Very high frequencies applied to pure and perfect single crystals of these materials kept at temperatures near 459.72 degrees below Fahrenheit are used in the experiments.

An electron in a solid, Dr. Lax found, "has the extraordinary property that its mass depends on the direction in which it moves." In germanium, the "effective" mass of an electron moving in one direction may be 20 times its mass in another direction, Dr. Lax and his two MIT co-workers, Dr. Herbert J. Zeiger and Richard N. Dexter, have discovered.

In giant atom smashers, a charged particle whirls around, under the influence of a magnetic field, in a circular path. Its frequency, or rate of rotation, depends on the mass of the particle. If an electric field, or kick, having the same frequency, is applied to the particle as it speeds around in its orbit, the particle will gain energy resonantly.

Similar experiments can be performed on electrons in a solid, Dr. Lax said. The mass and, therefore, the frequency of rotation of the electron in a solid, depends on the position of the crystal in relation to the field applied to the crystal.

DENTISTRY

Cavity Sealer Promises To Reduce Dental Drilling

► **THE DENTIST** will not have to drill as much when filling large cavities if a new cavity sealing material lives up to its present promise.

The material can bind a plastic filling to a flat surface inside the cavity, thus eliminating the extensive drilling needed to make dovetails inside large cavities to anchor the filling.

The substance was described by Drs. M. G. Buonocore, W. Wileman, and F. Brudevold of the Eastman Dental Dispensary, Rochester, N. Y., at the meeting of the International Association for Dental Research in Chicago.

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When an electron is missing from its usual place in the crystal, the resulting vacancy, or "hole," behaves as a positive particle with its own peculiar mass properties. Dr. Lax and his co-workers have observed these also. They find that there are two types of holes, a light one and a heavy one.

Experiments similar to those reported by the MIT scientists have been performed at the University of California.

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TECHNOLOGY

World's Smallest Storage Battery

► **A STORAGE** battery no larger than a postage stamp and about as thick as a cookie has been developed by Yardney Electric Corporation, New York, to power a secret defense device.

Believed to be the smallest rechargeable battery in the world, the tiny cell weighs one-sixth of an ounce.

Zinc and silver oxide electrodes are used in the cell, which has one-fourth the ampere-hour capacity of a penlight battery that is 16 times bigger. The device is expected to find use in portable communications equipment, electric wrist watches and may revolutionize photography and model airplane equipment.

The battery could operate an electric-powered watch for more than a year without recharging, the company said.

It was described as maintenance-free and spill-proof with a long shelf life. Tests show it gives dependable performance in a wide temperature range and under severe mechanical stress. Dimensions of the cell, which was demonstrated at the Institute of Radio Engineers meeting in New York, are $\frac{1}{8}$ by $1\frac{1}{8}$ by $\frac{3}{16}$ inches.

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