

PSYCHOLOGY

## Efficiency in Cockpit

**Suggestions for re-design of airplanes to provide better hearing and seeing and less fatigue for pilots and crew may improve their fighting.**

► **CHANGES** in plane designs to aid the hearing and vision of American combat fliers were recommended to the Institute of Aeronautical Sciences meeting in New York.

"Both seeing and hearing, if accompanied by prolonged attentive effort, especially under conditions of unfavorable plane design, are capable of contributing to pilot and air crew fatigue and loss of efficiency," declared Prof. Walter R. Miles, Yale University psychologist. Collaborators with Prof. Miles in preparing the report were Commander Leon D. Carson, head of the Medical Research Section in the Navy's Bureau of Aeronautics, and Prof. Stanley S. Stevens, one of the directors of the Psycho-Acoustic Laboratory at Harvard University.

Plane gunners should be moved much nearer the aiming window, the scientists suggested. The position of the gunner now gives him the same sort of vision as he would have in a tunnel, since his eyes are some distance away from the window.

Sections of gun mounting, electrical switches and other gadgets which lattice the aiming window are also a hazard to vision and life, the scientists warned. They believe it will be possible to reduce the amount of structure in front of gunners.

Clearing away these obstructions to vision and moving the gunner nearer

the window will "increase his angle of uninterrupted view, make visual pursuit of his targets easier, and reduce the blinding effect from the flashes of his own guns," Prof. Miles explained.

In the cockpit, the instrument panels have too large an illuminated area. They are usually illuminated too intensely and with a color that disturbs night vision. Indirect red light was recommended by Prof. Miles and his associates as best.

Discussion of vision from the cockpit disclosed that transparent enclosures often become discolored with exposure to sunlight or become checked due to temperature changes and vibration.

"Rapid strides in development of better plastics are being made," he ex-

plained, "and it should be possible soon to mold transparent cockpit enclosures of better grades of optical plastics in one piece. Surface hardening of such molded parts is desirable."

The ears of flying personnel take even greater abuse than their eyes, the scientists reported. Noise from air turbulences around the plane is in some ways more disturbing than the noise from the propeller itself. The interior of a glider plane, for example, is a very noisy place when traveling at 150 miles per hour. Conversation is difficult if not impossible.

Several methods were suggested for overcoming the distracting noises of combat flying.

"Judicious use of sound treatment in the plane, conversion to high-fidelity microphones and earphones, and the development of acoustic devices to shield the mouth and the ears of the personnel," Prof. Miles said, "will permit the aviator to carry on in the best noises which the aeronautical engineers are now planning to produce."

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AERONAUTICS—PHYSIOLOGY

## Cooperation in Design

**Engineer and biologist must work together if men are to be successful in handling the formidable airplanes now possible.**

► **ENGINEER** and biologist must cooperate if human beings are to be really successful in handling the formidable flying machines which aeronautical invention has given them, Prof. D. W. Bronk, University of Pennsylvania biophysicist, told his audience at a lecture sponsored by the national science honor society, Sigma Xi. The biologist, and in particular the biophysicist, has as his task the discovery of the performance limits of the units of the human nervous system. The engineer must adapt his machine to a controlling organism operating within those limits.

As an example of these performance limits, Prof. Bronk cited the now familiar "blackout" experienced by dive bombers in pulling out of a steep, fast dive. It is known that the centrifugal effect of this sudden upswerve drains the blood away from the brain, and "blackout" results.

Basic reason for this momentary unconsciousness, the speaker revealed, is

oxygen starvation on the part of the brain cells. Brain cells are at all times very greedy for oxygen; they never have more than a few seconds' supply on hand. So anything that cuts off fresh supplies, even for a little while, creates a physiological crisis—threatens a shut-down for lack of an essential material.

Prof. Bronk described some of the exceedingly delicate instruments used in modern physiological research to obtain data on the needs and capacities of nerve and brain cells. The brain cells' chronic state of incipient oxygen starvation was discovered by means of a microscopic metallic electrode that can be inserted into various regions of the nervous system with relatively little damage. Differences in the minute electrical current transmitted tell tales of fluctuations in amount of oxygen present, and hence of the relative state of efficiency of the cell at the moment.

Nerve cells can be isolated, yet kept alive, and thus studied as single units,

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Prof. Bronk told his audience. Thus isolated, their structure can be analyzed by new electrical, optical and electron-microscopic methods. The electron microscope gives new vistas into the molecular architecture of the cell. The

electrical states tell of its internal responses to fluctuations in the supply of essential elements such as calcium and phosphorus, and other environmental influences.

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for thermostat setback except in the most severe climates.

This estimate was obtained from tests at the University of Illinois Research Home and reported to the meeting in Cincinnati of the American Society of Heating and Ventilating Engineers by Prof. A. P. Kratz, W. S. Harris and Prof. M. K. Fahnestock.

Approximately a 10% saving in burner operating time was also obtained under test conditions of a 66-degree thermostat setting from 10 p. m. until 5:30 a. m. when the setting was restored to 72 degrees. The heating system in the Research Home, a typical well-built house, was operated with flow control valve and low limit aquastat, maintaining a minimum boiler water temperature of 165 degrees Fahrenheit. Operated without the flow control valve and aquastat, only a slight saving of fuel was effected.

Except for the warming up period in the morning, reduced night temperature has no effect on the household temperature during the day, the researchers point out. Actual cooling of temperature during the night was six degrees or less.

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## BOTANY

## Seedless Tomatoes

**Number One victory vegetable produced in more attractive form by plants fumigated with growth-promoting acid.**

► TOMATOES, the Number One victory vegetable, can be induced to produce seedless, more solidly meaty fruits by treating the plants with the fumes of a growth-promoting acid, naphthoxyacetic acid, at or before the time the flowers open. Experiments along these lines, which may have important horticultural applications, were performed in the greenhouses of the great experimental farm of the U. S. Department of Agriculture at Beltsville, Md., by Dr. John W. Mitchell and Muriel R. Whitehead of the Bureau of Plant Industry. (*Botanical Gazette*).

Use of growth-promoting chemicals to induce formation of seedless tomatoes and other fruits had already been reported by other researchers. However, their methods involved the use of sprays, or even direct application of the substances to the flower-parts with brushes or by other hand means. Getting similar results merely by subjecting plants temporarily to self-distributing fumes from a few milligrams of the acid obviously saves a great deal of time and labor in the treatment.

In their experiments, Dr. Mitchell and Miss Whitehead placed a number of tomato plants in a closed chamber, so that the exact concentration of the fumes could be measured. They used 250 milligrams (1/120 troy ounce) of beta-naphthoxyacetic acid per thousand cubic feet of room space, evaporating it on a hot glass plate over an electric heater. After exposure to the fumes overnight, the plants were taken back to the greenhouse, where an equal number of untreated plants were placed with them for comparison purposes.

As the flowers opened, both treated and untreated plants were all carefully hand-pollinated. When the tomatoes were mature, they were compared for flavor, vitamins and total mineral content. Except for the fact that the to-

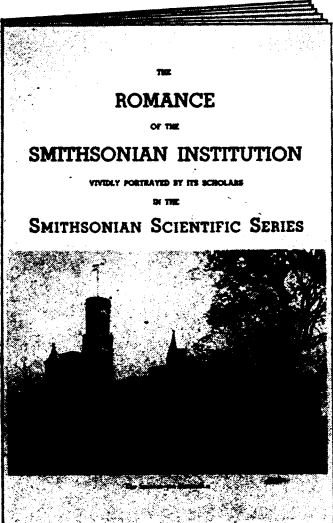
matoes from the treated plants were nearly or quite seedless, no difference could be detected between the two lots.

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## ENGINEERING

## Tenth of Fuel Oil Saved By Thermostat Setback

► HOME OWNERS can save about a tenth of their fuel oil by setting back the thermostat 6 to 10 degrees Fahrenheit at night, probably the practical limit



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