



Science News-Letter

The Weekly Summary of Current Science

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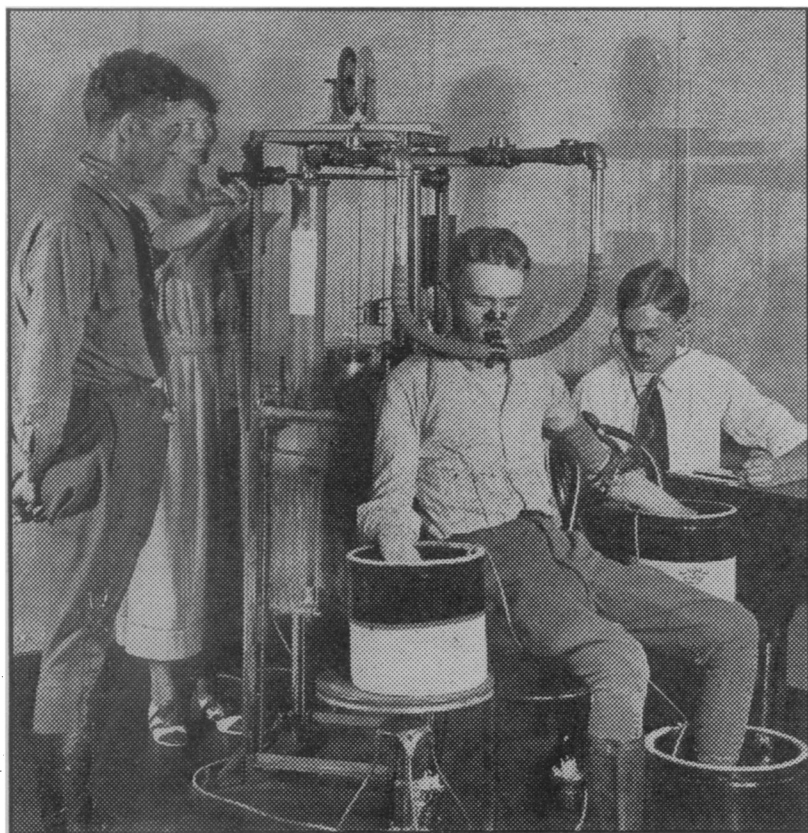
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PHYSIOLOGY-PSYCHOLOGY

Are You fit to Drive an Airplane?



ALTITUDE CLASSIFICATION TEST. Making electrocardiograms during test. Official Photograph, U. S. Army Corps

By **GLADYS MOON JONES**

How often have you said, "If this old bus just had wings I would fly over this torn-up street." It seems difficult to manage an automobile through the city's bottle-necks. It takes physical and moral stamina.

Suppose your automobile should begin to fly. Could you pilot it? Could you handle an aeroplane? You could learn how to drive one perhaps, but have you the physical and mental qualifications essential in a competent flyer?

Specialists in aviation medicine have come to know more definitely just

what an A1 pilot must be. Several opinions held during the war have been modified. Most important of these are the age and ear requirements. It was formerly thought that only young men could fly successfully. Twenty-four was old in aviation. Now, however, you may be as old as thirty-five and still make a good flyer.

If you can negotiate communication with your co-pilot or co-passenger, you may be deaf and still make a good aviator.

Aviation hygiene is an important new subject. Today's physician is studying the matter. Tomorrow's

will advise us before we hop off and prevent our suffering from physical causes as well as from aerial diseases, dope poisoning, deafness, altitude faintness and other troubles. Day-before-yesterday's country doctor, who drove around with his horse and buggy at eight miles an hour, picked up those who had fallen from the higher plane of perfect health. More often than not, he was too late. However, he went out of fashion with his equipage. Medical men have long since seen that warnings before the fall were simpler and more efficacious than mending the troubles afterward.

Flight Surgeons New Specialists

When flight surgeons came along with the development of aviation during and since the World War, they too, at first, gave most of their attention to those who crashed. Now, with their confreres, general and special practitioners, they are preaching prevention. They have proved that from the very first pilot test, preventive hygiene means a great reduction of danger to man and plane. They have found that people who walk the earth untroubled by minor variations from the normal encounter aggravated conditions in rarefied air and rapidly changing temperatures.

Would-be pilots are of two general classes with respect to altitude: fainters and non-fainters. The Army knows its unrestricted men, those who can go safely only to 15,000 feet and those who are still restricted to 8,000 feet. All flying above 18,000 feet must be done with oxygen. The limit of consciousness without oxygen is about 25,000 feet. Even with oxygen the limit of altitude is between 40,000 and 45,000 feet. This is because the effects of altitude depend not on oxygen percentage, but on oxygen pressure. If pure oxygen is breathed

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Are You Fit for the Air?

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we may still get so high that its pressure is too low to sustain life.

If Lieut. James H. Doolittle of the Army can do an outside loop at about 350 miles an hour, causing his eyeballs to become so extended that they touch his goggles, it does not follow that every one should try it. The best pilots "go black" at 250 miles an hour on a turn.

Just what per cent. of the youth of this country is potentially Lindberghian is a question of intelligence tests and physical tests. Out of 547 midshipmen of the class of 1927 at Annapolis, 353 passed the Navy's pilot tests. An official estimate is that fifty per cent. of those who apply for training at Pensacola get there. Of these thirty per cent. pass the pilot tests. And of this thirty per cent. approximately twenty per cent. make A1 pilots. From these estimates the ambitious boy can figure for himself that he has about one in twenty-five chances to succeed in aviation.

A flier does not have to go into the air to learn what the pilot testers call his reaction times or how his co-ordination is effected by overwork, loss of sleep, exposure, digestive disturbances and alcohol.

Lindbergh, the pioneer, learned much about his remarkable physical machine by trying it out on his mail route, but many a good man has crashed to his death trying to know what could have been told on the ground after a few physiological and psychological tests. Medical officers would have us get over calling those "heroes" who unnecessarily expose themselves to mortal danger.

The hypersensitive individual is easily confused by rapid changes in position in respect to his environment. The tested pilot becomes immunized to rapid changes in motion. He is able to interpret his sensations so that

he shows little reaction to rotation or other rapid changes in position. An apparatus was developed during the war known as the Ruggles orientator. Some one wrote in to the Army asking for a picture of "that whirling bath tub." And that is what it looks like. An experiment is being conducted now in the Navy Bureau of Aeronautics, which predicts even more accurate success for this orientator. Attached to the Ruggles "tub" is an instrument, operated electrically, which will make a graphic record of the testee's reaction times. Eight different pens are set to make the graphs on paper marked off in tenths of seconds. The resulting graphic demonstration shows the automaticity of the man being tested.

Aviation medicine is practiced in three directions: the selection, the classification, and the care of the flyer. As a result of this specialization in the Army and Navy, the percentage of aviation accidents due to physical causes has decreased in a surprising manner. Since we have had well trained flight surgeons and soundly based and conducted examinations, the fatalities per flying hour have been reduced in a period of four years from one fatality to every 950 hours to one for every 3,460 hours.

Visual Judgment Necessary

According to Comm. Robert G. Davis, Medical Corps, U. S. Navy, the eyes are the most important factor of flying physical requirements. The flyer must see out sidewise when he is looking straight ahead.

Visual acuity alone will not suffice as there must be a perfect balance of each extrinsic muscle allowing the maximum of binocular vision with no tendencies to diplopia or nystagmus. Dust, oil, wind and glare are prone to produce congestion of the lids and conjunctivae, which if allowed to progress may greatly impair visual

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Are You Fit for the Air?

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judgment in depth perception for landings or formations in the air.

Everyone who has learned to drive even the slow old automobile knows how important visual judgment is. It may be impaired by an attack of influenza, prolonged application of the eyes to close technical problems and by general staleness.

A typical stale flyer complains of having lost some of his keenness and flying judgment. He is discouraged, not sure of himself in the air, has lost his appetite and dreams of unpleasant flying experiences. He is irritable, short of breath and attributes his condition to trivial causes. If his condition becomes worse he must be permanently grounded. His symptoms are those of neurocirculatory asthenia or effort syndrome.

Edward C. Schneider, of Wesleyan University, Middletown, Conn., who years ago made experiments on Pike's Peak in a study of altitude, is one of the authoritative physiologists who have been researching in aviation medicine. He defines staleness as "a neural condition founded on chemical changes within the body."

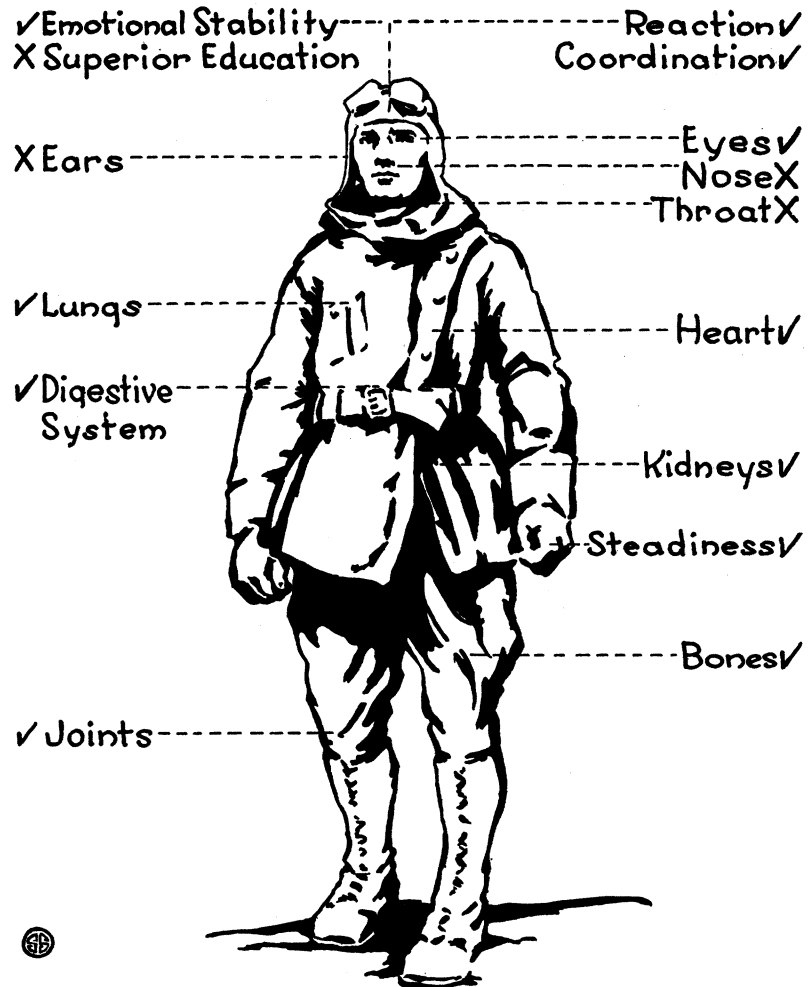
Ear Considered Less Important

The inner ear was originally considered most important in this country, but not according to the present theory. Equilibrium is important, but it is a function of vision, deep muscle sense, sensations from bones, joints and tendons, gravity effects, and tactile sensations as well as the inner ear.

However, the ears of the flyer demand constant attention. The necessity of equal air pressure on each side of the drum is thoroughly appreciated by the aviator. Equalization of pressure can be obtained in a measure by swallowing. Experienced flyers carry out the practice on rapid descents. Unless the eustachian tubes are easily opened the flyer should be kept out of the air. Marked unequal drum pressures produce severe pains and probable perforation. Scarred or congested drums are disqualifying on selective examinations. Some aviators have found protection in a powder puff sewed in each flap of the helmet.

Sound Nervous System Necessary

Defects of nerves constitute the commonest causes of accidents and removal from flying status. Army and Navy fliers are subjected to a psychoanalytic test. By a complete study of the personality and a review of the entire life, the tendencies,



THINGS ABOUT AN AVIATOR THAT MUST BE PERFECT are checked; those parts that need not be are marked with an X

resistances and potentialities of the nervous system can be determined.

Therefore, when you go for your examination a conversation like this will be in order:

"What is the first, the very first memory you have?"

"I remember falling off the garden fence," answers the would-be aviator.

"Do you find yourself thinking of falling when you are on high places?" asks the examiner anxious to follow up and unearth a possible complex.

"No, never."

"Well, how about your early life in school? Did you enter into all games? Did you engage in fist fights with your playmates?"

So the questions go. The trends and reactions to stresses in the past life form the basis of a prophesy of the probable reactions to the stress of flying.

Much has been written about the abstinent, non-drinking, non-smoking life of Lindbergh. His cool-headedness was proved long before he hopped the Atlantic by no less than four parachute jumps from unmanageable planes. Such quick reaction

time is essential in a flyer. There is often a situation where almost automatic reaction is necessary. Reaction includes coordination of complicated arm and leg movements.

Chilling Must Be Prevented

It is necessary to prevent body chilling. Clothing is a most essential consideration. It varies according to the flight undertaken. Altitude, weather conditions and the degree of protection afforded by the type of plane are all to be considered. The temperature drops five degrees Fahrenheit for 1,000 feet of altitude. At thirty to forty thousand feet a temperature of seventy below zero is encountered. The body must be kept surrounded with warm layers of air between several layers of loose-fitting wool or silk. The mesh and not thickness prevents heat loss. Freedom of movement is essential and ready removability must be insured by a metallic rip arrangement. A thin layer of cold cream on the face is a marked protection.

Adequate physical exercise is necessary for every one and indispensable

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Are You Fit for the Air?

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for fliers. During the war physical trainers were attached to all aviation units and sports and games were part of the daily routine. A good athlete has much toward becoming a good aviator. Eye and limb coordination, mental alertness, high efficiency in respiration and circulation and morale are all to be gained by enjoyable exercise. The tone of thoracic and abdominal muscles is increased and metabolic activity of the tissues stimulated by swimming, rowing, golf, tennis, handball and other favorite recreations. A body kept hard by outdoor life, covered with loose clothing and given sufficient rest has the greatest known preventives against a tendency to circulatory asthenia. Before making a flight dietary indiscretions must be avoided and liquids limited to reduce kidney stimulation from cold.

Poisoning by dope presents a health hazard. Amyl and butyl acetate, gasoline, denatured alcohol and cellulose make up the standard dope used on the surface of fabrics covering the wings and bodies of airplanes. These are dangerous chemicals. Their concentrated fumes produce headaches and nausea. Death may occur suddenly with symptoms of vertigo. Soluble dope reaching the bowels is best eliminated by a persistent milk diet.

Another recent addition to aviation hazards has resulted from the employment of ethyl fluid which has as its base tetraethyl lead. Danger of lead poisoning requires the usual precautions taken in the lead trades.

Aeronautics in its progress is incorporating the modern equipment of technology and psychology, as well as preventive medical principles. The flight surgeon should keep his men physically and mentally fit to fly. He should know his men intimately and be quick to recognize any condition which the flyer himself may not think important.

Length of Flying Life

Every aviator should be examined every six months and after every illness. This will greatly prolong his usefulness. The English found during the early part of the war that stress of work at the front meant a limited amount of work in the air; that the limit of every flyer was approximately 150 to 300 hours. At the end of the war these figures were greatly improved and now they are better still. Lindbergh has spent around 2,000 hours in the air.

The International Medical Requirements for Air Navigation have been adopted by practically all countries except the United States. The requirements of our Army and Navy are along the same lines. The medical requirements are stricter for pilots

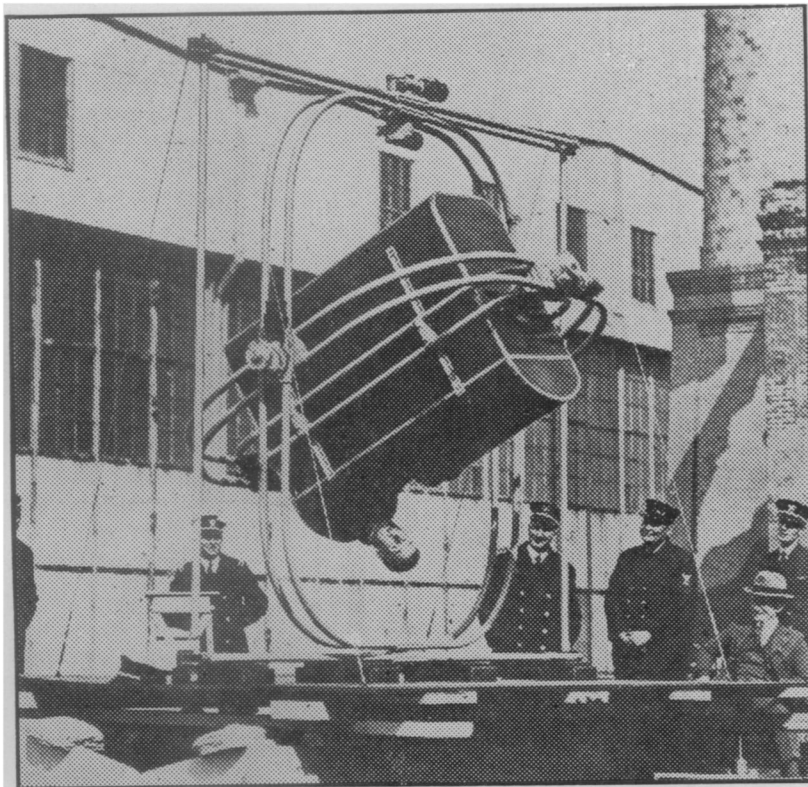
engaged in public transport. They are all required to be examined every six months.

The civil flight surgeon is the man of tomorrow. Aviation medicine is a specialty and only those with special training are qualified to make special examinations. With civilian transport companies carrying both passengers and freight; with the air full of commuters, the civilian physician will need to know aviation medicine. There are opportunities now for him.

There is no doubt that we shall all want to fly. Ernest L. Smith, Emory B. Bronte and Lieuts. Lester J. Maitland and Albert F. Hegenberger tested the radio beacon as a guide to a diminutive goal in the sea to prove that we can fly anywhere. The trans-Atlantic fliers tested engine-endurance to prove it. Lieut. Al Williams is trying to show how fast we can do it, and Lieut. James Doolittle, by his amazing outside loop, has shown how sportively we can fly.

The world is moving on at a great rate toward our getting up over the traffic-choked streets, where there is more room. Our children are going to consider travel by air as safe, perhaps safer, than travel on foot. Moreover, health airships and flying sanatoriums are going to be afloat. One in need of rest and change and ultra violet rays will be able to get them in the air no matter on what noisy and smoky part of the globe he has his habitat.

Science News-Letter, August 20, 1927



THE RUGGLES ORIENTATOR in which the candidate is whirled and tested. William Guy Ruggles, the inventor, is sitting at the lower right

A fringe of false hair was found in the tomb of an Egyptian Pharaoh who ruled about 3300 B. C.

Seeds from Canadian trees are being gathered and sent to England for reforestation work there.

A merit badge is now given to First Class Boy Scouts who obtain an elementary knowledge of meteorology.

An attempt to hack to pieces the face of the Egyptian sphynx was made by a Mohammedan sheik about 1380.

The papyrus plant, which once furnished Egypt with sheets of writing material, no longer grows in that region.

It has been stated that 90 per cent. of the accidents in horse races and riding are due to defective sight of the horse.