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NEW DEVELOPMENTS IN AERONAUTICS

STILL greater airplane speeds and added safety and economy for private, transport and military planes are foreseen as the result of research conducted during the past year by the National Advisory Committee for Aeronautics.

In the past four years as a direct result of NACA research applied by manufacturers, airplanes have had their speeds boosted by 75 miles per hour with no increased power required. Now airplane designers and manufacturers making their annual visit to the NACA laboratories at Langley Field learned of new researches that seem likely to give another spurt to improved airplane design.

Some of the possibilities are: New methods of lateral control, replacing ailerons standard for twenty-five years, will greatly accelerate the use of airplanes by private pilots. The most promising are flaps called spoilers that when raised lengthwise above the wings by the pulling of a lever will allow shorter take-offs and shorter, safer landings by relatively unskilled flyers.

Through the simple device of making one seemingly insignificant part of a seaplane float pointed instead of square, flying boats carrying fifty passengers across the Atlantic are foreseen. The new float proved its worth in the NACA world's largest towing basin at Langley Field.

Autogiros are capable of flying two hundred miles per hour, wind tunnel tests show, whereas last year it was generally agreed that this "vertical windmill" type of aircraft, radically different from the airplane, would be useful only for slow speeds.

The speed of airplanes, already increased 75 miles an hour by NACA research upon better engine location and reduced air resistance of engines, will soon be increased another 50 miles per hour. This is promised by refined design of the way wings and fuselage are arranged. This means that transports cruising at 250 instead of 200 miles per hour will be possible in the next few years.

Air sucked in at the tops of airplane wings through slots will probably be used to increase the lifting power of the wings at low speeds without increasing air resistance. The effectiveness of putting suction fans into the wings was demonstrated by NACA engineers who flowed streams of smoke around a model. Use of a few per cent. of the power of the engine in this way will allow the control of the thin "boundary layer" of air over the top surface of the airplane's wing, and increase the lifting power 150 per cent. This will greatly aid in the take-off and the landing, allowing planes to get off the ground more quickly with heavier loads, and then get down safely over high obstructions into smaller landing fields.

More power from aeronautical engines without increased size and probably reduced fuel consumption is a future development. This will come through the use of forced air cooling by blowers, injection directly to the cylinders of safety fuel that will not detonate violently or "knock," and use of two-cycle engines. It was predicted that the next big advance in aviation would be in engine improvement.

Fuel economy is foreseen as a result of a NACA spark-ignition test engine in which safety fuel is injected directly into the combustion cylinder. In ordinary engines, gasoline is mixed with air in a carburetor. This new engine, when cooled by forced air draft, runs on only about four tenths (0.41) of a pound of fuel per horsepower hour compared with five or six tenths of a pound in the case of typical gasoline aviation engines now used. This approaches the fuel economy of the diesel engine (about .36 pound per horsepower hour) and NACA engineers consider it possible that a new safety fuel injection engine can be developed that will make unnecessary the further development of diesel aviation engines.

Violent vibration of airplane parts, called "flutter," has been explained mathematically by Dr. T. Theodorsen, of the NACA staff. Sometimes flutter has wrenched airplanes to pieces in midair, destroying their wings or tail surfaces. Now designers using Dr. Theodorsen's formulae can be sure that flutter will not occur in any airplane part that they intend to build.

The National Advisory Committee for Aeronautics is an independent agency of the federal government charged with undertaking research for the air of all aeronautical activities, military and commercial. Present at the recent meeting were Orville Wright and Colonel Charles A. Lindbergh, who are among the members of the committee. Dr. Joseph S. Ames, president of the Johns Hopkins University, is chairman, and Dr. G. W. Lewis is director of research.

THE SKULLS OF LIVING AND FOSSIL ANIMALS

"THEY never come back."—The old axiom of the sporting world applies to bones in evolving lines of animals as well. There has been, throughout the long history of vertebrate animal development, a steady tendency for the bones of the skull to become fewer and more specialized. The lessening in number of bones has been accomplished partly through sheer disappearance, partly through the fusion into one bone of two or more originally separate bone units.

At a joint meeting of the American Society of Mammalogists and the American Association of Physical Anthropologists, Professor William K. Gregory, of the American Museum of Natural History, presented the results of an extensive study on the skulls of living and fossil animals, conducted jointly with Miss Marcelle Roigneau and a number of graduate students.

The basis of the dictum supported by the researches of Professor Gregory and his associates is what he calls "Williston's Law," a generalization that originated with the late Professor S. W. Williston, of the University

of Chicago. Professor Williston noted the much larger number of bones in the skulls of certain ancient reptiles, as compared with their modern successors and with the mammals, including man. Professor Gregory has further extended Professor Williston's generalization and tested its truth for the whole vertebrate animal group.

Among fishes, he found that the most primitive have as many as 180 skull bones, while higher forms have only about 100. The lowest members of the amphibia, or frog-toad-salamander group, had 90 to 95 bones in the skull; the higher modern ones, only 50. The earliest reptiles had skulls in some 80 pieces, while the most highly evolved modern ones, the snakes, possess 50-bone skulls.

The very strange reptiles that apparently started the mammalian line of development had something over 70 skull bones; the most primitive of mammals, the marsupials, have less than half that number; primates, which include monkeys and men, have about 30.

Primates are usually considered to be the highest of animals, and in most respects the claim is probably correct. But there are a few highly specialized animals outside this lordly group of ourselves and our next of kin that beat us at the skull-bone reduction game. Peccaries, which are little pig-like animals that live from Texas on southward into the American tropics, have their skulls so fused that they may be said to have only two bones apiece: the lower jaw, and the rest of the skull.

THE PLACEMENT OF MORONS

MORONS, poor weak-witted jetsam of our hit-or-miss human breeding, have a useful place in the world. And the common sense of peasant-stock immigrants can find that place better than most of our fine-spun social theories. So Dr. Charles Bernstein, of the State School for Mental Defectives at Rome, N. Y., indicated in an address before the meeting of the American Association for the Study of Mental Deficiency. According to Dr. Bernstein, "The second generation of foreign-born will show us what to do with our morons."

The foreign-born in our population, particularly the Poles and Italians, know what to do with morons, Dr. Bernstein continued. They put the sixteen-year-old girls of subnormal intelligence to work in their homes, doing housework and watching younger children. They put the boys of this class to work in the fields. The moron of the future will be our common laborer as he has been in the past. But he will be more stable.

The problem of delinquency among morons can be very largely solved by handling the morons as the Poles and Italians in this country do, Dr. Berstein seems to think. The biggest task now is to create the proper environment for them after they leave the state schools for mental defectives.

Stable morons who give no trouble come from stable, orderly homes. Nine tenths of the morons are in this class. The other tenth, which is made up of the group of delinquent mental defectives, comes from disorganized homes. The state must do something for this group. If they are returned to their disorganized homes after leaving the state schools their training in routine, orderly living will be undone and they will return to their delinquent ways.

For this group, particularly, Dr. Bernstein recommends way-stations of the sort established by the Rome State School over twenty years ago. When these children are released from the school they are placed in special homes, twenty of them living together under the supervision of a stable married couple. The boys are put to work on farms and the girls help with housework or in the country-town mills, when they can be given jobs without displacing other workers. Before the depression this was easy to do because the morons would work for low wages which the mentally normal boys and girls scorned.

These young people spend three years at the colony-home and are discharged at the age of seventeen, able to live an independent, orderly life. Out of 2,500 cared for in this way, less than one tenth failed to adjust themselves adequately when they left the colony.

THE TREATMENT OF SCHIZOPHRENIA

Two new and potent reducing medicines may prove to be the means of bringing certain mental disease patients back from their dream world to the real world of sanity. This possibility is indicated by a report by Drs. J. M. Looney and Roy G. Hoskins, of Boston, presented before the American Psychiatric Association in New York.

The medicines have the long chemical names of dinitrophenol and dinitro-ortho-cresol. They cause patients to lose weight by making their body fires burn faster, using excess body fat as fuel and burning it off. The process requires the patients to use up more oxygen, and it is this feature that suggested the use of the drugs for the treatment of the mental disease known as schizophrenia.

This mental ailment has been called a dream state, the patients resembling sleep-walkers who do not awaken. Not only are their minds in a dream state but the physiological processes of their bodies are slowed up, somewhat as they are slowed up in normal persons during sleep.

Dr. Hoskins had found previously, among other things, that such patients use less oxygen during their waking hours than do normal persons. Whether this decreased consumption of oxygen is a cause of the disease is not known; but it is significant that when normal persons are deprived of oxygen, they develop certain symptoms seen in schizophrenia. These symptoms include defective judgment, slowness of perception, inattentiveness, silly laughter, anger without adequate cause, destructiveness, mental confusion and even hallucinations and delusions. All these symptoms, characteristic of schizophrenia, have appeared in normal persons whose oxygen consumption was reduced.

Following this lead, Drs. Looney and Hoskins gave the new reducing medicines to ten schizophrenic patients. Two of them improved during the treatment, but not enough time has elapsed to show whether the improvement will be lasting and actually due to the influence of the drugs. However, since no significant harmful effects have been observed, the Boston investigators feel

justified in continuing the treatment long enough to determine its worth.

The fact that no harmful results followed the treatment with these medicines is important, because they are so powerful that if they are not given in proper doses they may produce serious results. Deaths have followed their use by persons who took them without a physician's guidance.

One of the medicines, dinitro-ortho-cresol, turned the patients' skins yellow after a time, but there was no evidence of damage to the liver, and the yellow color disappeared two days after the medicine was stopped. This skin discoloration may prove a practical danger signal in the use of this drug.

ITEMS

THE complex overtones that distinguish various musical instruments and human voices are broken up into a "sound spectrum" by a new instrument demonstrated at the annual convention of the Institute of Radio Engineers in Philadelphia. This device performs the analysis of sound in about a tenth of a second, which with previous methods required hours of tedious work. The various frequencies of the sound are projected visually, spread out on a screen, just as a prism spreads light rays into the rainbow-like spectrum of light. The new device, which has received the convenience-name of "sound prism," was developed by Professor Knox McIlwain and O. H. Shuck, of the University of Pennsylvania. It is expected to be of great assistance to radio engineers, in determining how far apart in wave-lengths it is necessary to separate broadcasting stations to secure the natural transmission of sounds produced by various musical instruments. The necessary wave-length separation of radio stations for the natural transmission of sounds was discussed at the meeting of the National Association of Broadcasters. This may become a problem of great importance, since if it is necessary to provide a wide wave-length separation of stations, the broadcast band will be too small to accommodate all those now in existence.

DR. BALTH VAN DER POL, director of the Phillips Radio Works in Eindhoven, Holland, stated before a meeting of the Institute of Radio Engineers that radio tuning which separates stations according to their wave-lengths may not be sufficient to prevent interference if the power of broadcasting transmitters is sufficiently increased. He reported that interference has been noted in Holland between two distant high-power European broadcasting stations separated in wave-length by over 800 meters. If these conditions appear as the power of American broadcasting stations is increased, the Federal Radio Commission may have new problems to consider. Dr. van del Pol, who directs one of the largest radio research organizations in Europe, attributes the observed interference to an interaction or cross-modulation of the two high-power signals in the region of the upper atmosphere called the Kennelly-Heaviside layer.

THE Japanese, according to a report of the Radio Research Committee of Japan's National Research Council, seem to be in possession of a secret which enables wireless stations to transmit the human voice in a way that is entirely incomprehensible to the average listener-in. Dr. Shigetaro Chiba, of the research laboratory of the Tokyo Electric Company, says that his method is superior to other methods of secret telephony because of its simplicity and the good quality of speech when it is demodulated at the receiving end. The set he uses is equipped with a microphone constructed so that the speech current is inverted with respect to frequency, making it unintelligible. At the receiving end the same sort of equipment is used, which demodulates the speech by inverting it back to normal. Any one else listening in, however, hears a queer jumble which it is impossible to translate.

SERIOUS and sometimes fatal accidents which come as a result of a broken airplane propeller may now in a large part be prevented as the result of a careful study of vibrations. Almost all propeller failures come as a result of "fatigue," that is, cracks and fissures are slowly formed in the blades under conditions of excessive vibration. Eventually, if the blade is not repaired or replaced a break occurs, which means a forced landing. Drs. Hugh L. Dryden and L. B. Tuckerman, of the National Bureau of Standards, have been making a study of the causes of failures at the request of the Department of Commerce. They have devised an instrument which operates on the general principle of a Baldwin telephone receiver. It is placed on the propeller shaft and records electrically the amount of vibration in the propeller at any speed. Thus the critical speeds, those at which the vibration is the greatest, can be avoided by adjusting the throttle.

SOLID carbon dioxide, popularly named "dry ice," may, at a temperature of 112 degrees below zero Fahrenheit, compete with heat in securing "shrink fits" for machine parts. W. H. Swanger, of the National Bureau of Standards, who has been conducting experiments with solid carbon dioxide reports that machine shop practise may come to accept the new method of applying excessive cold instead of heat in shrinking metals. When it is necessary to secure a metal band to a shaft, the usual practise is to heat the band. Expansion allows it to be slipped into place, and as it cools it contracts to a tight fit. However, by "refrigerating" the inside part, or shaft, it can be shrunk materially. The band is slipped on and when the shaft warms to room temperature it expands again to normal size, and a tighter fit is secured.

EXPERIMENTS throwing light upon the effect of the emotions on the heart were reported by Dr. Theodore P. Wolfe, of New York City, to the American Psychiatric Association. When pleasure is felt, he found, there is an increased blood flow to the limbs and body surface and a decreased blood flow to the digestive organs. With unpleasurable feelings the reverse is true. This may be called, he explained, the scientific basis for the expression, "my heart dropped into my stomach." Merely the thought of moving an arm caused an increased blood flow to it, he found, although when someone else raised the patient's arm without his having thought about it, there was no increase of blood flow.