AVIATION

M. I. T. Metcalf Blind Landing Passes First Flight Tests

Using Micro-waves of 17 Inches Device Provides Static-Free Path for Landing; Only One Instrument

PERFECTION of a virtually foolproof blind landing system for airplanes seems assured within the next year or two, following successful tests at East Boston Airport of major elements in a new radio-beam method developed by Massachusetts Institute of Technology scientists and Irving R. Metcalf of the Civil Aeronautics Authority.

Radio micro-waves only 17 inches long, the shortest ever applied to aeronautical radio, provide a straight, static-free path down which an airplane can make a normal "straight" landing glide to land smack in the middle of the runway, no matter how thick the weather outside the cockpit. The plane is in the proper position for a landing at all times during the glide.

There is only one instrument for the pilot to watch, and it may be used to simplify regular instrument flying as well. The apparatus, when finally assembled, will be extremely light. It is the first blind landing system whose principle—the straight glide path—meets the requirements of hardboiled Army fliers.

Actual flying tests were conducted by the scientists in a small plane owned by the C. A. A. which proved that a "spotlight" beam of extremely high frequency radio waves can be used effectively as part of a trail blazer for airplanes trapped in fog.

Three lighted dots in a cathode ray tube instrument in the pilot's dash board tell him whether he is on course or, if he is not, in what way his position is wrong. When the three lights are lined up horizontally, with the middle dot properly centered, the plane is on course.

The plane's gyroscopes, indicating bank and climb, control movements of the outer lights. The center light is controlled by four overlapping "spotlight" beams of radio micro-waves. When the plane follows the straight glide path—the area in which the four beams meet—the signals of the separate radio beams will be equalized, and the center light will remain on center. If the plane rises or falls, or moves to left or right of the path, the relative signal strength of one of the beams will increase, and the spot will be deflected in that direction.

The Metcalf-M.I.T. system has other advantages as well as inherent simplicity. The signals are not reflected from the ground and hence are independent of ground conditions. Because the instrument follows the relative strengths of four signals sent out by the same transmitter, the absolute volume of the four signals makes no difference. This is not true of previous blind landing systems, which have required cumbersome, sensitive apparatus to overcome this difficulty.

Originally suggested by Mr. Metcalf, the system's development has been made possible by the cooperation of Profs. Edward L. Bowles, W. L. Barrow, W. M. Hall, and Charles S. Draper. Army, Stanford University and Sperry Gyroscope Company experts have also cooperated.

The basic idea was first used by Mr. Metcalf in guiding a landing by three visible lights on the ground. One light was at ground level, at the center of the runway. Two other lights were located on either side of the runway, at an appropriate height from the ground. If the pilot lined up the three lights in a row, he made a good landing. C. A. A. pilots made scores of semi-blind landings with this system, observing the lights through a ground glass screen.

The straight glide path is superior to the curved path provided by earlier systems using radio waves reflected from the ground. In following a curved glide path, the pilot must often change his angle of descent. Moreover, the curve flattens out toward the ground. Just as the plane is closest to making an actual landing, therefore, it is moving forward much faster than at the top of the glide.

Radio micro-waves held many advantages for the new system, but the problem was to find a transmitter which would generate sufficient micro-wave energy to activate a receiving set at least two miles away. Tests indicate that the new klystron tube, developed at Stanford University, holds the answer. Signals generated with a tube operating at 300 watts output were picked up with a crude one-tube receiver on a plane eight miles away.

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PLANT PHYSIOLOGY

Growth-Retarding Substance Discovered in Plants

A GROWTH - RETARDING substance, having effects opposite to those of the already well-known growth-promoting substances or auxins, has been discovered by Drs. Wm. S. Stewart, Wm. Bergren and C. E. Redemann of the California Institute of Technology. Placed in contact with living plant tissues, it slows down their growth. (*Science*, Feb. 24)

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