Although the program will not be inaugurated immediately, it is being announced now so that those in war work will stay on their war research jobs without fear that they may not be able to continue their graduate training later.

The new program will be able to furnish assistance to only a fraction of all graduate students. It is planned so as not to divert to full time study those who in the postwar year will be needed part-time to help teach in over-burdened colleges and universities.

Science News Letter, April 7, 1945

AERONAUTICS

Take-Offs in 4 Seconds

"Rato" puts airplanes into the air in record-breaking short time, only 200 feet from starting point on the deck of carriers. Long runways may be thing of the past.

➤ BRITISH naval planes literally leap from the decks of the Royal Navy's aircraft carriers these days. The secret is new and powerful rockets that can put planes in the air in four seconds after a run of only 200 feet from a dead start. Only recently developed through the cooperative efforts of British government and industry, rocket-assisted take-off will probably soon be nicknamed "RATO", since it is a close relative to jet-assisted take-off, commonly called "JATO."

Unlike JATO, which is now used to lift the weight of heavy flying boats off the water during take-off, RATO is a successful solution to the problem of reducing take-off time and distance which has puzzled aeronautical engineers for years. In a detailed description of rocket assisted take-off, published in *Flight* magazine, C. B. Bailey-Watson predicts that RATO will do away with the long airport runways, which it is now believed tomorrow's giants of the sky must have.

In using RATO, a rocket firing point is plainly marked on the carrier deck several feet ahead of the point where the take-off run begins. The actual footage in many cases is around 100 feet but it varies with the weight of the plane and the velocity of prevailing winds. When ready, the pilot moves his plane down the deck of the flat-top exactly as he would do in making an unassisted take-off. The moment he comes abreast of the rocket firing marker, he presses an electric button in the cockpit. This sets off two to four rockets. Split seconds later he is in the air, where he proceeds to jettison the spent rocket tubes before setting out on his mission.

Weighing 66 pounds, each standard RATO rocket consists of a cold-drawn steel tube with a wall about as thick as a pie crust, 41 inches long, and five inches in diameter. This tube is loaded with 26 pounds of cordite, a smokeless powder, used as the propellent charge. In operation, the gases generated by the rapidly burning cordite after it is fired are expelled at high velocity through a venturi tube incorporating a four-inch nozzle.

RATO equipment is constructed so that when the airplane takes to the air four seconds after the rockets are fired the propellent charge is completely consumed, and the tubes can be dropped. If the tubes were not jettisoned they would interfere with the speed and efficient operation of the plane. The maximum thrust of the rockets is developed about a tenth of a second after firing. The mean thrust developed by the rockets is about 4,400 pounds. This almost equals the thrust produced by several high-horsepower airplane engines.

RATO rockets produce no flame, and very little smoke during the take-off, although an onlooker will hear a loud crack, like the snap of a whip, when the rockets are set off electrically, and a very little flame can be seen from their nozzles just before the propellent charge is exhausted.

In the United States, naval aircraft are using rocket-assisted take-off equipment, Mr. Bailey-Watson stated, but did not explore the matter further. Following a successful experimental installation of RATO on a Vought-Sikorsky Chesapeke, the British adapted it for use on the single-engine carrier-based Seafire, Swordfish, and Barracuda planes.

The Seafire uses two rockets mounted in a box container on the top of each wing near the fuselage; four rockets in all. The rockets are set at such an angle that their lines of thrust pass near the plane's center of gravity, and so that the hot rocket gases cannot damage the airplane tail structure. The rocket mechanisms are attached to the fuselage just ahead of the cockpit by tubular struts extending from the forward end of the box container.

The Barracuda carries two pairs of rockets attached beneath the wing on either side of the fuselage, with the rocket tubes extending well beyond the trailing edge. Swordfish require only two rockets to lift them from the deck.

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A hundred gallons of crude *petroleum* yields approximately 44 gallons of gasoline, 36 gallons of fuel oils, 6 gallons of kerosene, 3 gallons of lubricants, and 8 gallons of coke, asphalt, wax and other products.

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