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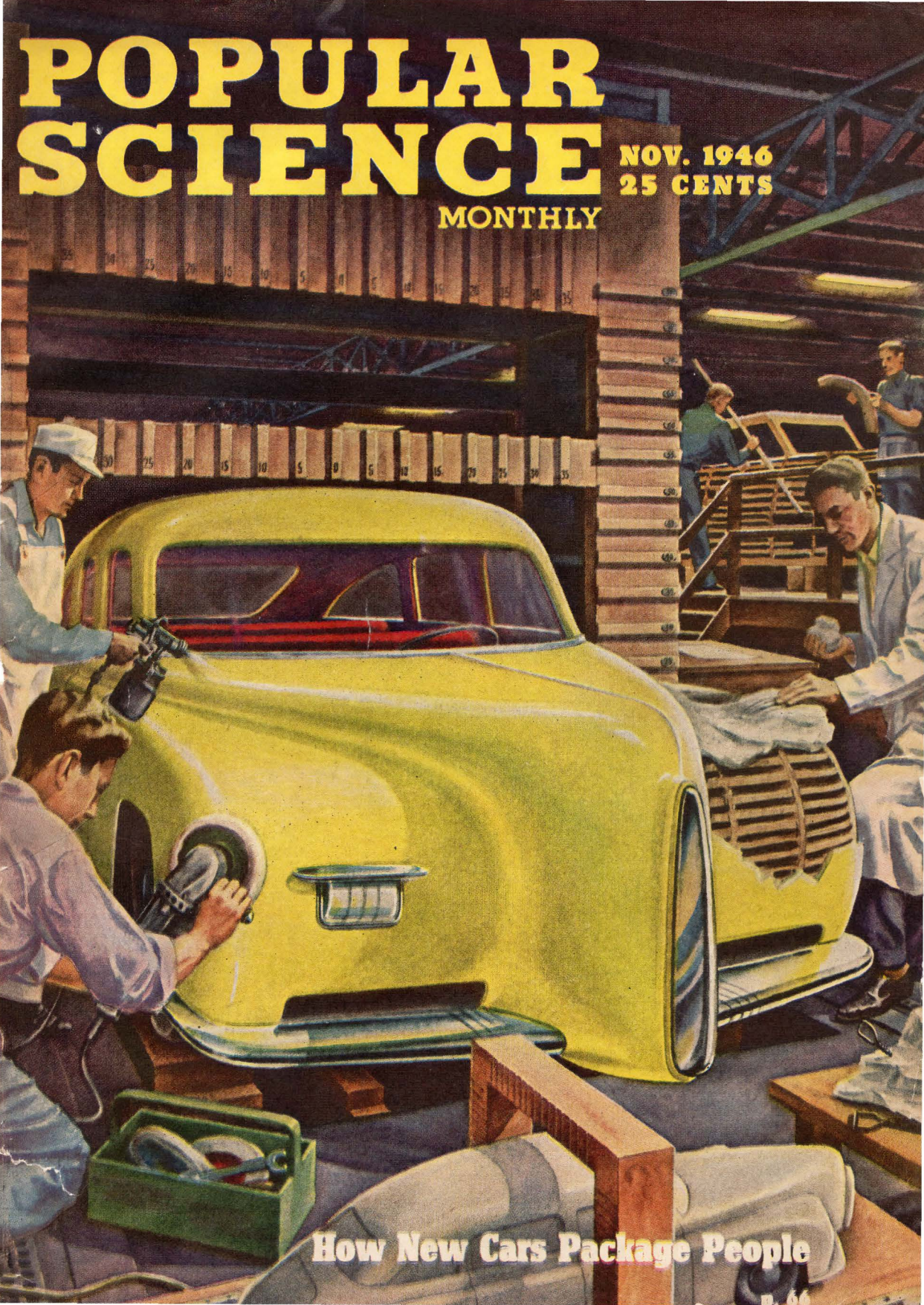


How New Cars Package People

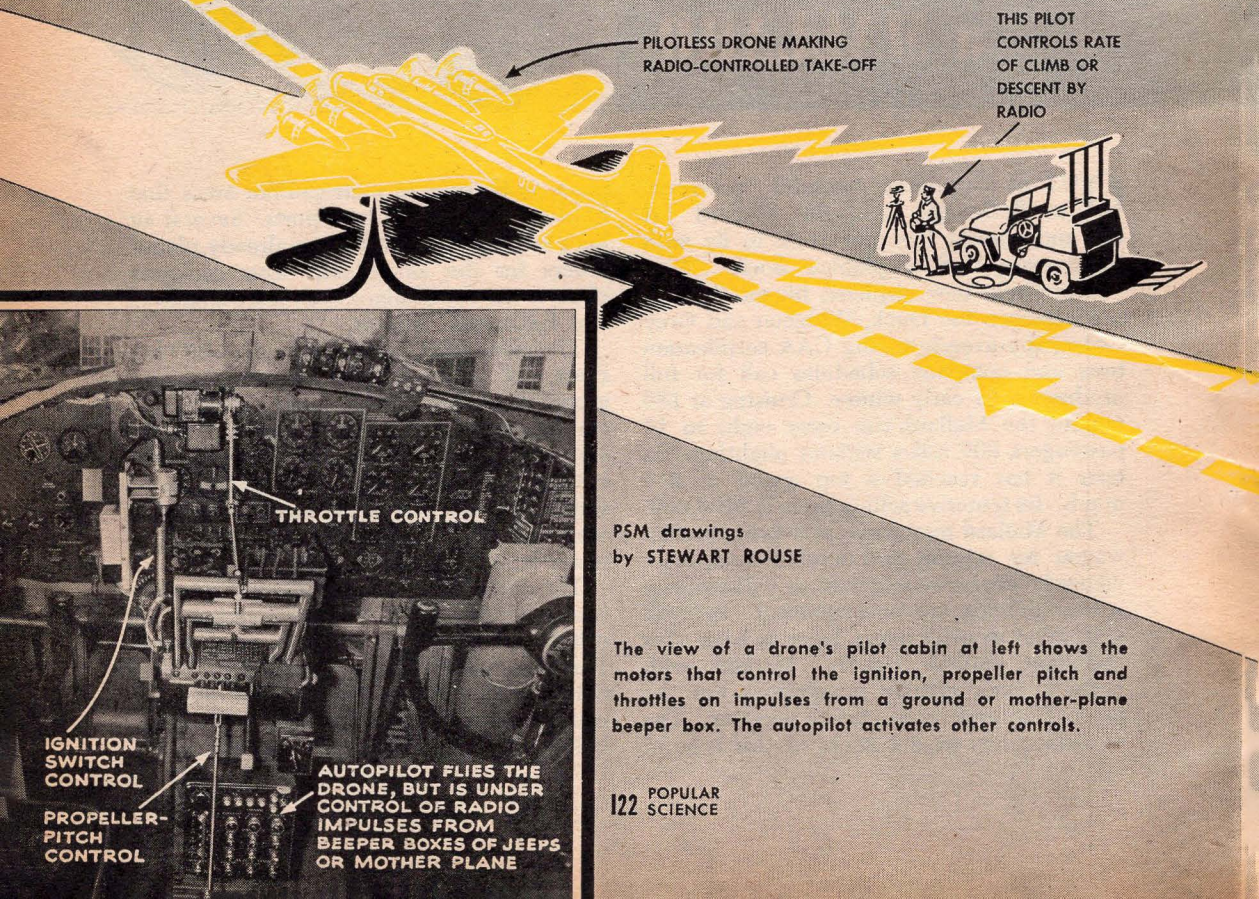
HOW to FLY a DRONE

CREWLESS, radio-controlled airplanes can now reach almost any point on earth, according to Brig. Gen. William L. Richardson, chief of the Army Air Forces Guided Missiles Division.

Drones, as the radio-controlled craft are called, have many potentialities, civilian and military. Some day huge mother ships may guide fleets of long-distance, cargo-carrying airplanes across continents and oceans. Long-range drones armed with atomic bombs could be flown by accompanying mother ships to their targets and in for perfect hits. The basic principles of the drone have already been used in flight-testing new airplanes without risk to a test pilot. And early next month, in the first large-formation test of drones under combat conditions, 10 crewless B-17s will weave through flak barrages over Texas as the U. S. Army tries out its newest anti-aircraft equipment.

Through a five-pound control box—nicknamed "Yehudi" (PSM, Dec. '45, p. 93) for the little pilot who isn't there, but more commonly called a "beeper"—today's drone can be made to do virtually anything a piloted plane can do.

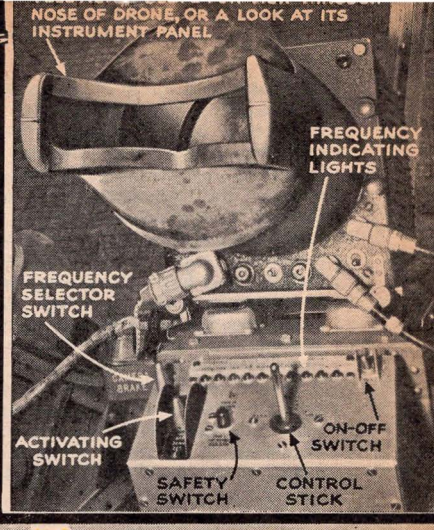
It takes three experienced pilots at control boxes to get a drone in the air, fly it and land it. Two control boxes mounted in jeeps guide the drone during take-offs



PSM drawings by STEWART ROUSE

The view of a drone's pilot cabin at left shows the motors that control the ignition, propeller pitch and throttles on impulses from a ground or mother-plane beeper box. The autopilot activates other controls.

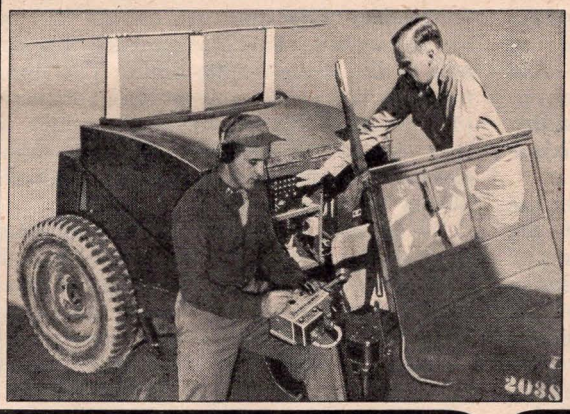
MOTHER SHIP CONTROLS DRONE BY RADIO DURING FLIGHT



The control box in a mother plane has a television receiver (right) that gives the beeper pilot a view of a drone's instrument panel or a look through its nose.

DRONE MANEUVERING UNDER MOTHER SHIP'S RADIO CONTROL

Drones are launched and landed by crews operating from two jeeps equipped like the one below. One is stationed at the head of the runway, the other one-third of the way along it.



Here a ground beeper pilot, watching a drone's approach, operates the controls to bring it in for a landing.

DRONE LANDING UNDER RADIO CONTROL OF "BEEPER" PILOTS ON GROUND

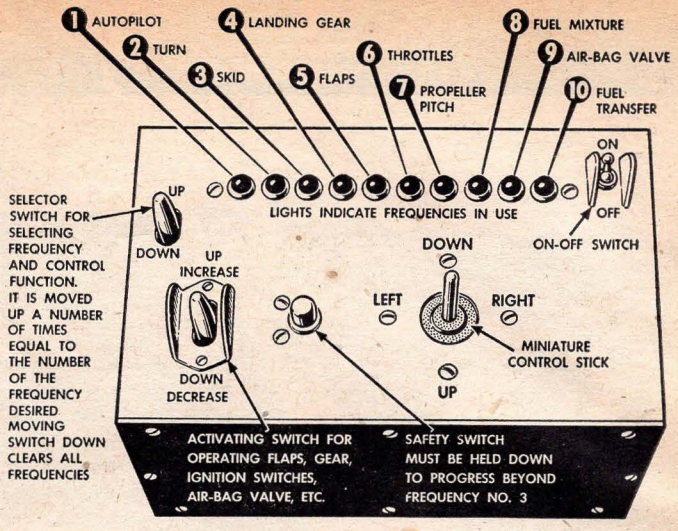
THIS PILOT CONTROLS DIRECTION OF DRONE'S FLIGHT

JEEP WITH RADIO-CONTROL EQUIPMENT

BINOCULARS FOR WATCHING DRONE'S LANDING APPROACH

ROUSE

At right is a diagram of the panel of a mother ship's control box. The row of lights at its top represents the 10 radio frequencies; their functions are indicated. The first three frequencies operate the automatic pilot and, through it, the drone in flight. The remaining seven control motor-driven equipment such as landing gear, throttles and flaps. Frequency No. 1 is generally used in actual flight maneuvers for climbing, turning and gliding, while No. 2 and No. 3 are supplementary flight frequencies. No. 2 permits co-ordinated left or right turns at constant altitude, and No. 3 allows skid turns In using frequencies above No 3, the safety switch in the centc. of the panel must be held in.



and landings. A third, in the nose of a mother ship, maneuvers it in actual flight. Basically all three control boxes are the same. They transmit radio signals on 10 different frequencies to control the drone's flight. With 10 frequencies to control different functions, the pilots at the beeper boxes, by manipulating switches and the miniature control stick, can make the radio plane climb, glide or turn. They can operate its flaps, ignition switches, landing gear, throttles, propeller pitch, fuel-mixture control, brakes and fuel-tank transfer.

The functions of the 10 frequencies are not fixed. Through adjustments of the radio brain and the motor-driven control equipment in the drone, they can be altered as needed. In the drones used at Bikini, for example, one of the 10 radio frequencies was used to open and close the valves on bags designed to catch gas samples. Ground beeper pilots seldom have to use all frequencies in drone take-offs and landings.

In take-offs and landings, the control-box jeeps are stationed at the runway, one at its head, the other one-third of the way along it and off to one side. The beeper pilot at the head of the runway controls the direction of the plane, manipulating its rudder to keep it lined up with the runway. He also applies the drone's brakes in landings.

The beeper operator in the second jeep controls the drone's elevators and throttles. On take-offs he regulates the length of run and the initial rate of climb. On landings he sets the glide path and determines the touch-down point.

Once the ground pilots get a drone 400 feet into the air, they relinquish control to a beeper pilot in the mother ship. The operator in the mother ship largely uses frequency No. 1 in maneuvering his charge. He handles the controls of the drone by movements of the miniature control stick on his beeper box. This box sends out his signals to the drone's radio brain. The brain transfers them to a conventional automatic pilot in the cabin of the drone, which in turn moves the pilotless plane's rudder, elevator and ailerons to correspond with the beeper pilot's commands.

To advance or retard a drone's throttles, the selector switch on the control box is pushed forward the correct number of times until it tunes in on the throttle frequency. Thereafter the throttles are activated by pushing the control box's activating switch up to advance or down to retard. An electric motor in the drone's cockpit moves the throttles, and similar motors operate the propeller-pitch controls and the ignition switches.

Above the beeper box is a television receiver. By pushing the correct buttons, the beeper pilot can get a television view of the drone's instrument panel or a view through the drone's nose of what lies in its path. In this way, the remote-control pilot can continue to fly the drone even though it has been lost to his sight in clouds.

At present, the remote-control range of a drone is limited to line of sight—if it is within the line of sight it can be controlled. This limits ground operation to about 10 miles and mother-ship control from 35 to 50 miles.