OPERATIONAL NOTES

P. BRUCE BROCKWAY, JR.

A UTILITY AIRBOAT FOR USE IN MOSQUITO CONTROL

BRYAN T. WHITWORTH [1]

Mosquito Abatement District Number One, Glenn County, California, is a very small district, with an area of only five square miles, and with only one city: Willows, which has a population of 5,000. The land outside the city, within the District, and for many miles outside the District, is devoted primarily to agriculture, with rice production dominating. The extensive swampy rice fields closely approach the edges of the populated areas, and the mosquito problem areas are very large in relation to the relatively low tax income, currently $29,000.00 per year, which is available for mosquito control purposes. An austerity budget is necessary always, imposing an economic limitation which requires that operations be limited to those which will afford reasonable protection from mosquitoes to the greatest number of people. In addition to the rice paddies, which will produce a brood of *Aedes* mosquitoes when first flooded (usually in May), followed by subsequent production of *Culex tarsalis* and *Anopheles freeborni* as the summer progresses, there are extensive pastures which characteristically produce *Aedes* species following the frequent irrigations, with *Culex tarsalis* also appearing in areas where residual water stands long enough. The residential areas and the farmsteads also produce the *Culex* species characteristic of such places.

The rice-growing and pasture areas are treated by aircraft during the summer season when large acreages must be sprayed, but the financial resources of the District will not permit the use of aircraft early in the season when the rice fields are first flooded, and when substantial reductions in mosquitoes can be obtained by selectively treating only those sources which are closest to the populated communities. These areas are, however, too large to be treated by hand, too wet and soft for wheeled vehicles, and too important as mosquito sources to disregard.

After considering various means of treating the aforementioned sources, it appeared reasonable to try using a light-weight, flat-bottomed, shallow draft boat. Consideration was given to the use of a pole for propelling the craft, but this idea was abandoned because of the damage to the rice plants which would be caused by poling. The shallowness of the water and the delicate nature of the young rice plants suggested the use of an air propeller, and the airboat herein described was therefore developed.

For the purposes of the District, its was apparent that the boat should be portable, and light enough so that one man could load it into a pickup truck for transport, or could portage for short distances over dry land; and it was imperative that the boat be inexpensive. Because the design was purposely kept simple, construction required only 12 man-hours. The total cost for materials was $101.93, itemized as follows: Wood, glue and nails—$28.61, propeller and hub—$24.20, engine—$46.95, material for propeller guard—$2.17.

The design is that of a simple pram or scow (Fig. 1), 8 feet long, 4 feet wide (just wide enough to fit neatly between the sides of a pickup truck), and with sides 16" high. The frame is of 1½ x 1½ fir, and the hull is of 3-ply water-proof fir plywood. The 3½ hp. "Craftsman" 4-cycle gasoline engine (Fig. 1) has an aluminum block and is equipped with a recoil starter for safety and convenience. The motor with propeller and guard attached weighs only 38 pounds, and is readily demountable to facilitate loading and unloading the outfit from the truck.

The 2-bladed air propeller is of laminated wood, 26" long with a pitch of 14". It was secured from UNIVAIR, P.O. Box 5306, Denver 17, Colorado, with a hub specified to fit the shaft of the "Craftsman" engine. Speed of the engine is governed by the load, and the 3½ hp. engine can turn this propeller at a speed sufficient to drive the boat 10 mph, with one man as cargo. Propellers are available as either tractors or pushers, so rotation must be specified to match the engine when ordering. An adjustable throttle might add convenience for some uses, but so far has not been necessary. Steering is accomplished by rotating the engine on its mount, through a range of about 220°. By designing a more complicated engine mount and adding a guard for the aft side of the propeller in addition to the forward area, (which would increase weight and add to the cost of the boat), it would be possible to rotate the engine a full 360°, thus allowing for operation in reverse, but this, too, has not been found necessary.

Engines of higher horsepower and larger propellers which will yield higher speeds are available at higher, but still reasonable, cost, but the equipment described here was chosen as a good matching combination of boat-motor-propeller. It operates with little vibration and produces adequate thrust. The wake produced is minimal and not likely to damage the rice. Greater speed and less wake doubtless could be obtained by use of

[1] Manager-Entomologist, Mosquito Abatement District #1, Willows, California.

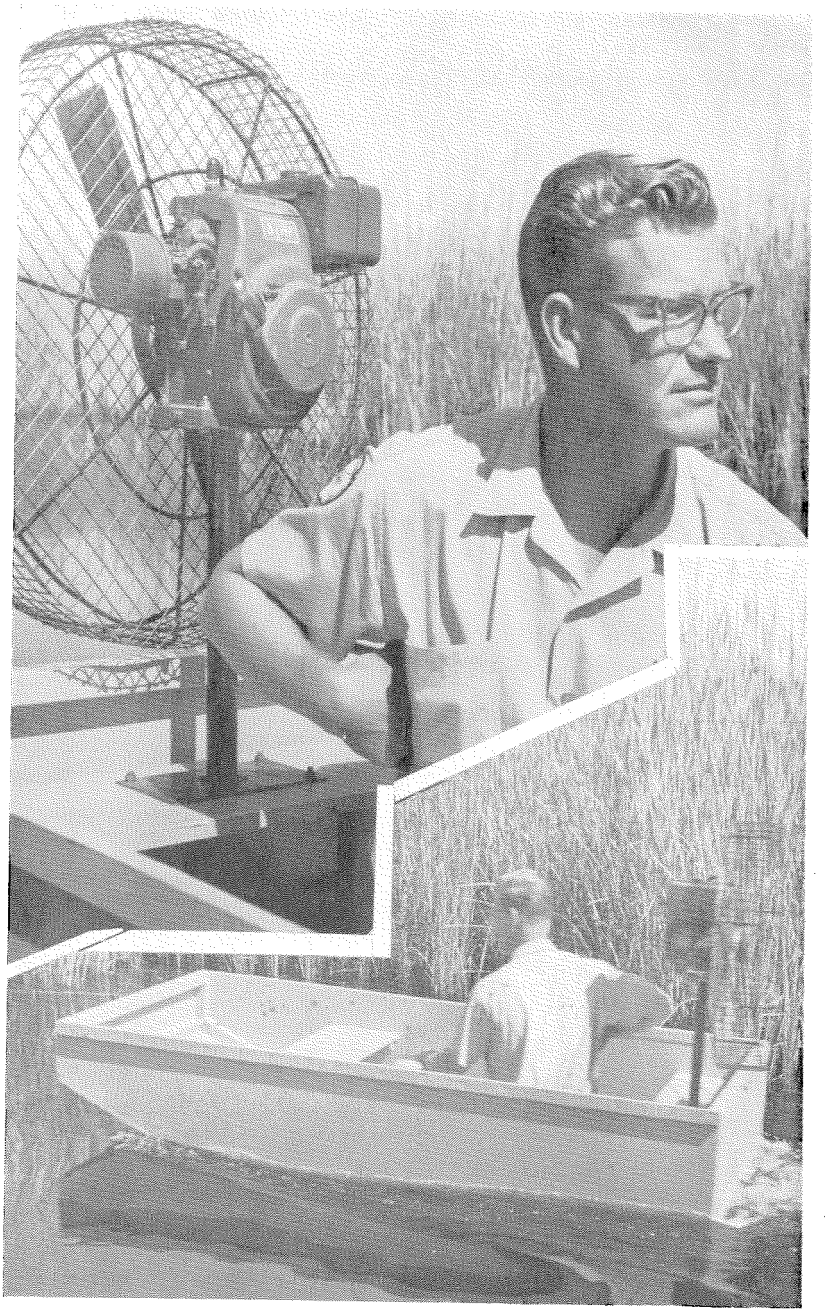

FIG. 1.—"Utility airboat," (Photographs by Mulhern).

a commercially available aluminum boat of about the same dimensions.

The airboat handles well after a short period of practice with the tiller. The larvicide has been generally applied from a hand sprayer, using a side-to-side sweeping motion of the wand. It could be released into the propeller blast if preferred.

NOTE: Early in 1965, during the training program that was held at the South Cook County Mosquito Abatement District, Bob Hedeen, the Manager-Entomologist, and Brice Johns, the District's Engineer, demonstrated an improved egg separator that Brice had developed for SCCMAD. The separator is unique in many ways, one special feature being the fact that it was electronically operated, rather than on a gear ratio plan. Brice has written the following description of the unit. He also has diagrams and pictures, which are available to anyone who wishes to copy the apparatus.

P. B. B., JR.

REDESIGNED MOSQUITO EGG SEPARATION MACHINE

BRICE E. JOHNS, P. E.

The South Cook County Mosquito Abatement District recently completely overhauled the timing mechanism of its egg separation machine, changing from gear timing to electronic timing.

The District machine, originally developed at the University of Illinois by Horsfall, *et al.* (1956), was a hand operated machine. Shortly after the organization of this District, the prototype of the power driven machine was built by a local firm for the District. The timing mechanism was a series of gears, cams and switches to give approximately twenty-five revolutions and then reverse and repeat.

During the last few years, this gear and switch arrangement gradually deteriorated and was replaced by relays and enclosed switches. In December, 1964, with a failure of the centrifugal switch, the old machinery was completely removed and a completely new system installed.

The heart of the new system is three Amperite delay relays wired so as to give the desired time circuits. On starting the machine, a 45-second delay relay is activated; the machine will operate for the delay time in the first direction of rotation. At the end of 45 seconds, the machine stops, and a 10-second relay starts and holds the electric motor off until the drum stops turning from momentum. The machine then starts again and runs in the opposite direction for 45 seconds, timed by the third delay relay, and then stops. The 10-second relays take over control again for the drum coasting period and the machine then repeats the procedure.

As the delay relays are only momentary contact relays and have only single contact poles, they are used in conjunction with the DPDT conventional relays that hold the circuit and cancel each other out on signal from the delay relays. The heavy duty relays are used with the motor circuits to stop and start and determine direction of the split phase motor.

Wiring diagrams are available at the District.

SOME RECENT BULLETINS THAT MAY BE OF ASSISTANCE TO OTHERS IF THEY DESIRE TO SEND FOR THEM:

The first one is titled *"The Hose Handbook"* published January, 1962, by the Rubber Manufacturers Association, Incorporated, 444 Madison Avenue, New York 22, New York. This handbook describes the various rubbers as used in hoses and briefly outlines their general properties and intended uses. Yarns and methods of weaving are also well described. The book is full of helpful information, including hints on storage and care for a longer life of a hose. This association (Rubber Manufacturers) has established a standard for quality and these standards are described for particular sizes of hoses. One of the most useful parts of this publication is the Glossary of Hose Terms.

A second booklet concerns flexible hose lines for fluid systems. This is printed and copyrighted by the Aeroquip Corporation of Jackson, Michigan. It gives a very good description of the various types of flexible hose lines and the couplings recommended for specific purposes. Special hose fittings and hand assembly of some of the couplings are well described.