THE NAVY'S DEVELOPMENT OF INSECTICIDE DISPERSAL EQUIPMENT FOR HELICOPTERS

WILLIAM S. MURRAY
Entomologist, Fifth Naval District

The purpose of this paper is to acquaint you with the Navy's development of insecticide dispersal equipment for helicopters. The Navy needs a fast and efficient method of insecticide dispersal for personnel stationed at bases and outposts throughout the world where vector-borne diseases are an ever present threat. A recent malaria outbreak in Port Lyautey exemplified this need.

Aircraft continue to meet basic operational requirements, but slow, powerful models, such as the Stearman trainer are no longer being made. Instead, there are

three general types of smaller military aircraft produced in quantity; light reconnaissance-type planes, jets, and helicopters. Reconnaissance-type aircraft have a limited payload. Jets are much too fast. Helicopters, however, are well adapted for insect control by virture of their maneuverability and capacity to hover. Wider use of helicopters by the services has brought about a reduction of maintenance costs. Payloads are being increased. One relatively new model, the Sikorsky HR_2S, carries a 4,000 pound payload. Therefore, at the present rate of achievement, it appears that increased capacity and versatility can be expected.

The basic research toward the development of dispersal equipment is being conducted in the Fifth Naval District at the U. S. Naval Medical Research Laboratory, Camp Lejeune, North Carolina, under the immediate direction of Cdr. G. S. Stains, MSC, USN. Cooperation in the use of helicopters is obtained from the Marine Corps Air Facility, New River, North Carolina.

The goal of the research is the development of lightweight, spray and granular insecticide dispersal equipment. System components are to be made essentially of standard stock parts, and are to be adjustable to fit any of the larger military helicopters. The spray apparatus will consist initially of two well-braced 15-foot aluminum spray booms, one on either side of the fuselage. Fifty Spraying Systems size 12 cone nozzles, with self-contained check valves, will be evenly spaced along the booms. Fifty-five-gallon drums will contain the spray material inside the aircraft and will be secured by special quick-releasing brackets. Valves and pumps will be installed in the line so as to be readily accessible.

The goal of a 400-foot effective swath width with a maximum spray expenditure of only two quarts per acre has been established to effect maximum relative payload.

Granular materials are to be dispersed from a hopper below which twin rotating impellers will be mounted, one on either side of the helicopter. A prototype impeller has been constructed and will soon undergo extensive testing.

One hundred feet has been tentatively set as the minimum acceptable swath width for granular insecticides. Helicopters will disperse the material at 50- to 100-foot elevations during particle distribution tests.

There are a variety of interesting but perplexing problems that must be investigated before the final equipment will be perfected. Some problems arise in attempting to construct all-purpose equipment of minimum size and weight which will effectively handle both liquid and granular insecticides. Other problems originate from the unusual construction of helicopters. For example, helicopter rotor heads may be single or double; when double, they are either closely or widely separated. Rotor heads are horizontal or, in the case of the tail rotor, vertical. Research data on conventional aircraft concerning swath width, spray spectrum, foliage penetration, and other similar factors, will have to be re-evaluated for modern military helicopters.

To illustrate, conventional aircraft depend partly upon oncoming air pressures to reduce nozzle output to fine droplets. Slow moving, or hovering, helicopters will have to compensate for the loss of such air pressures by the maintenance of greater pump pressure through more numerous nozzles of smaller orifice size. Exactly how many nozzles, their spacing, the direction of their facing and the positioning of the spray booms in relation to the rotor downdraft will comprise much of the basic research.

Granular insecticides require specialized equipment for uniform particle distribution. Among those granular materials used as carriers for insecticides there are common clays, highly absorptive clays, vermiculite, perlite, and tobacco by-products.

The larger, porous, more absorptive granules represent less carrier weight, and

thus an increase in relative payload. However, these larger, lighter particles are readily affected by wind resistance upon ejection from the impeller, limiting desirable swath width. Most granules in this group give up their insecticide rather soon upon immersion.

By comparison, the smaller, dense, less absorptive granules represent less payload, but maintain their momentum longer when ejected from the impeller, thus effecting wider and more uniform swath widths. Most of the denser granules yield their insecticide slowly over a period of time upon immersion which is advantageous in larval mosquito control.

Exceeding the limit of absorption with any of the granules may produce a non-free flowing product which further complicates dispersal equipment problems.

In concluding, I shall refer to a newspaper article which indicates the versatility and potentialities of the helicopter in various roles. The article reports a recent demonstration to top-ranking Navy officials of a remote controlled Kaman HTK helicopter equipped with electronic brain. The last paragraph states:

"Not the least feature of the experimental plane is its potential for ground reconnaissance. The forward part of the plane is equipped with a very small television camera which transmits a conventional TV image to the ground control station. This also permits the operator to control the plane when it is out of his line of sight."

As a result of military research and development, a remote controlled helicopter for inspection and control operations may eventually be part of your mosquito control equipment. One of the Navy's current objectives is the development of insecticide dispersal equipment for that helicopter.