ation, and excludes coverage after such operations have been completed.

Completed operations coverage is an option and is highly recommended as a part of your coverage.

COVERAGE A—BODILY INJURY LIABILITY

Payment on behalf of the insured of all sums which the insured shall become legally obligated to pay as damages because of bodily injury, sickness or disease. including death at any time resulting therefrom, sustained by any person, caused by accident and arising out of—operations, if the accident occurs after such opeartions have been completed or abandoned and occurs away from premises owned, rented or controlled by the named insured, provided, operations shall not be deemed incomplete because improperly or defectively performed or because further operations may be required pursuant to an agreement, provided further, the following shall not be deemed to be "operations" within the meaning of this paragraph: (1) pick-up or delivery, except from or onto a railroad car, (2) the maintenance of vehicles owned or used by or in behalf of the insured and, (3) the existence of tools, uninstalled equipment and abandoned or unused materials.

COVERAGE B—PROPERTY DAMAGE LIABILITY

Payment on behalf of the insured of all sums which the insured shall become legally obligated to pay as damages because of injury to or destruction of property, including the loss of use thereof, caused by accident and arising out of—operations, if the accident occurs after such operations have been completed or abandoned and occurs away from premises owned, rented or controlled by the named insured, provided, operations shall not be deemed incomplete because improperly or defectively performed or because further operations may be required pursuant to an agreement; provided further, the following shall not be deemed to be "operations" within the meaning of this paragraph: (1) pick-up or delivery, except from or onto ra railroad car, (2) the maintenance of vehicles owned or used by or in behalf of the insured, and (3) the existence of tools, uninstalled equipment and abandoned or unused materials.

The coverage as outlined is on the basis of *accident*—by accident, we mean a sudden event, chance, unintended by the insured and identifiable in time and place.

Since in your operation, claims could occur after a lapse of time, it is recommended that you discuss *occurrence* with your agent. By occurrence, we mean an event, or continuous or repeated exposure to conditions, which unexpectedly cause injury during the policy period.

In the foregoing, we have outlined coverages applicable for your operations to protect you against third party claims. In other words, this protects you against losses involving the public. For your protection against losses due to accidents involving your employees, I recommend Workmen's Compensation and Employer's Liability insurance to cover all employees. The limits are statutory. The contract provides compensation benefits as specified by the Florida Law as well as liability protection for you as the employer.

I have not dealt comprehensively with all lines of coverage, but I have emphasized the liability as this could prove to be the most costly where claims and losses are concerned. Consideration should, of course, be given to automobile coverages, real and personal property coverages and an adequate accident and health program. At the conclusion, I shall be glad to discuss these additional coverages.

The ultimate goal of surveying and programing insurance for your society is to protect the assets and credit of the society against losses and claims resulting from its operations, to eliminate or reduce known hazards, and to see that you are not exposed to loss or claim which could have been readily and adequately insured.

I would like to emphasize the importance of selecting a professional agent to advise and assist you with coverages. By using this service, you will have the benefit of a complete survey for your exposures with needed recommendations of coverage. And do give your insurance counselor the time, at least quarterly, to discuss any phases of your program which need attention.

Time—if any

We have a very few minutes left in the time allotted me. I wonder if there are any questions you would like to ask concerning this discussion.

If not—

I thank you for your kind attention.

Crop Damage: A Hazard of Herbicide Use

by

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Pesticides serve most areas of American Life with benefits ranging from the aesthetic to the economic. Herbicides, chemical tools for weed control, have a vital role in agriculture, domestic and urban comfort, industry and public utilities, public health, recreation, and water control and navigation.

It is important to distinguish between a chemical's *toxicity,* the capacity of injury, and a chemical's *hazard,* the risk or probability of injury. Herbicides are intended to be toxic to vegetation. The use of these chemicals relies on selectivity based on physiological, mechanical and/or timing principles which minimize hazard to the treated crop or to nearby vegetation in non-crop applications. The degree of inherent toxicity of an herbicide to vegetation depends on the specific chemical—plant situation. Herbicide hazard is related directly to the selection and manner of using chemicals in a particular situation. What are the hazards to near-by crops when herbicides are used for control of aquatic vegetation?

AGRICULTURAL CROP HAZARDS

The most common and most important hazard concerns visible damage in which crop appearance, quality and yield are affected. Misuse of herbicides can be especially hazardous in vegetable crop areas. The most toxic and hazardous chemical in general use, 2,4-dichlorophenoxyacetic acid (2,4-D), will be used as an example. The potency of 2,4-D is both well documented and well known. Plant response to its inherent toxicity depends on the particular species. Members of certain families, i.e., the *Malvaceae* and *Solanaceae,* are highly susceptible. Injury is most severe during periods of good growth, especially in young plants.

Damage to susceptible crops is first characterized by epinasty and/or deformities of expanding and new leaves. Later, new foliage may develop normally. Plants without visible symptoms, and those apparently recovered, may have sustained damage not manifested until harvest when losses in yield and quality are detected. After exposure, snapbean or tomato may not have clear, definitive symptoms of 2,4-D injury or may develop new, apparently normal foliage and may experience normal flowering and fruit set. But, at harvest, the bean pods may be deformed and lack seed; the tomato fruit may be misshapen and lack well-developed locules or

seed. The specific symptoms and response depend on the amount of chemical and duration of exposure; the plant species, morphology and age; and, the cultural and climatic conditions. The damage syndrome may be incomplete and is not identical for all plants.

Contamination of agricultural crops with illegal residues is a new and important hazard. State and Federal regulations prohibit the commercial utilization and embargo transportation of agricultural products containing excessive amounts of approved chemicals or any amount of unauthorized chemicals. Hence, detection of 2,4-D on snapbean pods renders the crop technically unfit for sale. Similarly, 2,4-D drifted from a spraying operation to a pasture or haylot could leave a residue which would ban the hay for use or sale to milk producers. Precautions to guard against drift contaminations become increasingly necessary with the development of improved analytical facilities and greater vigilance of control agencies.

NON-AGRICULTURAL CROP HAZARDS

The crops of urban areas, ornamental plants, home gardens and nurseries, may also be damaged by herbicides which escape the spraying site. Hibiscus, grape, and many annual flowers, shrubs, trees and vegetable garden plants are susceptible to 2,4-D and other herbicides. The value of these crops is often difficult to determine.

DETECTION OF HERBICIDE INJURY

The primary evaluation of herbicide injury depends on visual symptoms of plant response although the presence of most herbicides can be detected or confirmed by sensitive, sophisticated analytical equipment. Detection and identification of symptoms is not always sure or simple since diseases, viruses and cultural and climatic conditions can cause responses similar to herbicide injury It is likely that many cases of minor damage are not perceived.

CAUSES OF HERBICIDE HAZARDS TO CROPS

The fundamental cause of hazard is traceable to personnel and operating procedures. Failings of poorly trained and inadequately supervised spray personnel include: nonawareness of locations of susceptible crops; faulty selection of chemical, formulation or dosage for weed and/or crop situation; improper application equipment or operation thereof; and, nonobservance of wind direction and velocity precautions.

The immediate cause of damage usually falls into the following categories. Most commonly, particles of the spray solution drift physically as an aerosol or mist from the application equipment to sensitive vegetation. Occasionally, the spray solution is misdirected and applied to susceptible plants. Vaporization subsequent to application and vapor drift from the sprayed site is rarely a common hazard if the proper formulation of chlorophenoxy herbicides is used. Another uncommon hazard is crop injury associated with soil applied or residual chemicals.

AVOIDING HERBICIDE HAZARDS

1. Adequate training and regular supervision of spray personnel is the basis for safe, effective and economical weed control operations. Spray operators must understand their responsibility and learn the results of safe and careless application.

2. The proper operation of appropriate equipment is essential. To minimize drift, boat and ground equipment should provide large droplets under low pressure at relatively high gallonages. Brushbooms or boomless nozzles, properly adjusted, are preferable to hand guns. Hand guns deliver a wide range of droplet sizes which increase drift hazard; they should be employed only where other equipment cannot operate. Aerial application, particularly of chlorophenoxy materials, requires constant caution. Aerial spraying should be suspended when wind velocities exceed 5 mph. except in isolated areas or in well controlled circumstances. Aircraft wingtip vortices "drag" spray aerosols to turn altitudes. Strong temperature inversions and turbulent air movement prevent effective spray control. Flight patterns should conform to crop conditions and ferry flights should avoid crop areas. Crop damage can be detected miles downwind following faulty aerial operations.

3. The herbicide, formulation and dosage rate must be selected for the weed and/or crop situation.

a. Contact or contact-type herbicides such as DNBP or PCP offer minimal drift, volatility or soil residue hazards when applied to weeds with proper equipment.

b. Translocated herbicides with limited persistence at herbicidal rates, amitrole, dalapon, diquat and paraquat, are not hazardous if spray drift does not reach crop plants.

c. Soil sterilants like substituted ureas and s-triazines maintain residual soil toxicity in relation to the application rate and soil type. Application to ditchbanks or slopes should be avoided if there is likelihood that rainfall will move the chemical physically or in solution to the vicinity of valuable plants.

d. The chlorophenoxy materials (2,4-D, 2, 4,5-T, MCPA, silvex) have characteristics of "b" and "c". Amine salt or low-volatile formulations avoid volatility and vapor movement subsequent to application. The principal chlorophenoxy hazard is from drift during application. Invert emulsions or special nozzles (i.e., flooding tips) may be required for some situations.

e. Herbicides injected in water, acrolein, arsenicals, blended solvents, diquat, endothals, paraquat, are rarely hazardous if applied correctly at the proper rate. Potential users of canal waters for irrigation or pesticide spraying must be advised to delay water use for the appropriate interval.

f. The possibility of fixing or accumulating herbicides in "b", "d" and "e" in bottom muds cannot be ignored. Hazards following prolonged herbicide use are not well known.

4. Prudent field operations include the following steps:

a. Area reconnaissance to determine location of all economic and valuable susceptible crops prior to start of spraying.

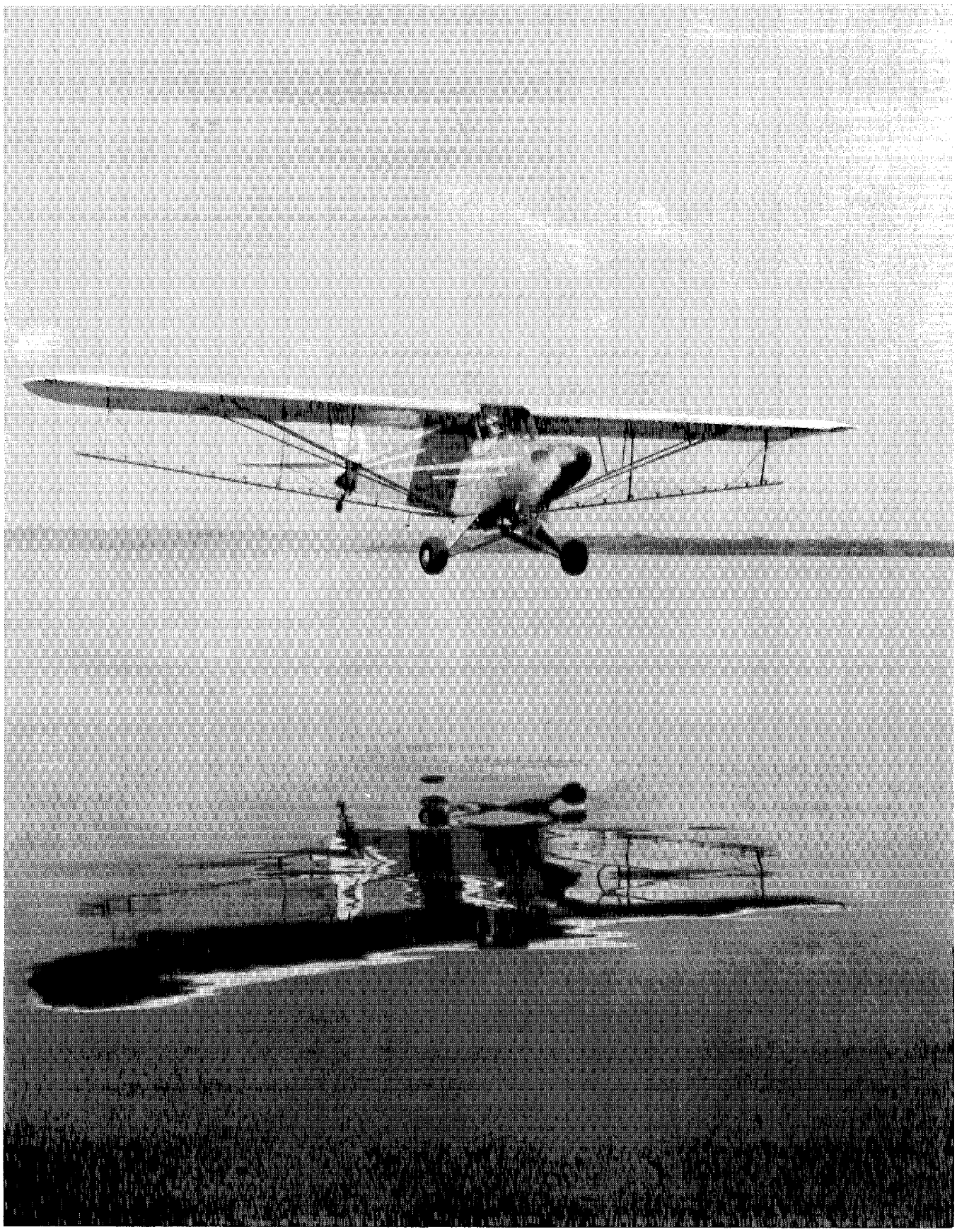
b. Development of a sketchmap to establish safe wind directions and velocities for an operational program based on the reconnaissance. These requirements may be relatively constant in stable agricultural and urban areas but are subject to annual and seasonal variations in most farming areas.

c. Accurate, periodic measurements and "log" recording of wind direction and velocity, air temperature and other climatic conditions during spraying. The crew position at the time of recording these data should be logged or marked on the sketch map.

d. Supervision of spraying operations with particular attention to care of application and adherence to requirements. A field chemical inventory balanced against the area sprayed provides an overall control on the application rate and promotes economy.

CONSEQUENCES OF HERBICIDE DAMAGE

The initial reaction to herbicide damage reports may be slight, but repeated occurrences engender unfavorable publicity. Authenticated claims and judgments endanger an



organization's insurability while judgments which exceed insured limits deplete a budget. Eventually, wide-spread or frequent damage can lead to restrictive legislation. Laws which prescribe application conditions and responsibility for herbicide operations do not guarantee that damage will be avoided.

SUMMARY

Herbicides are valuable tools in our contemporary economy. Unless used properly, these chemicals can damage agricultural crops by affecting yield and quality or by depositing an illegal residue on the marketable product. The ornamental, home garden and nursery plants of urban areas also may be injured by herbicides. Accurate assessment of damage and its cause is not simple. Use hazards in aquatic weed control operations can be minimized by adequate training and supervision of personnel, appropriate application equipment, judicious chemical selection and prudent operational procedures. Repeated misuse of herbicides deteriorates an organization's public relations, insurability and budget. Restrictive legislation stemming from frequent or widespread damage may not be an infallible preventive of future damage.

Aerial Application of Herbicides

As Used by the Game and Fresh Water Fish Commission

by

JOHN W. WOODS

ABSTRACT

Florida's State Hyacinth Control Program started April 3, 1952. One of the first policies developed was the use of aerial applications of 2,4-D in areas where more than 15 acres of hyacinths were rafted. This policy could only be applied when hyacinths were in open areas and not near crops. Property releases were required when spraying in areas of crops and shrubs. Specialized aircraft and precautions are necessary for successful operations. The first aircraft used was a PA-18 Piper carrying a forty gallon tank. Other types of light aircraft were used for the next ten years until the present aircraft is a PA-25 Pawnee especially designed for maximum safety and economy in spraying. This aircraft can be fitted with a hopper for granular applications.

INTRODUCTION

Florida's State Hyacinth Control Program began April 3, 1952. When the Noxious Vegetation Control Project (F-2-1-2) was approved by the Game and Fish Commission this program was described in detail (Luethy 1955, Woods & Tabita, 1962). One of the first policies developed under this program was the use of aerial applications of 2,4-D when hyacinths were found in open areas fifteen acres or larger. When surveys indicated crops or shrubs were present near areas to be sprayed property releases were required. The first aircraft used by the Game and Fresh Water Fish Commission was a PA-18 Piper with a 40-gallon removable chemical tank. This plane with its 125 horsepower engine could cover 15 acres per forty gallon load.

The Commission has since used a PA-18A Super Cub with quick detachable Sorensen belly tank, a Cessna 180 and now operates the PA-25 Pawnee especially designed for spraying operations. Our Pawnee spray plane carries a 100-gallon pay load. This load is composed of 80 gallons diesel fuel and 20 gallons of 3.34 Ester of 2,4-D.

We have continued to use 2,4-D Ester in spite of its dangers for two reasons; (1) it gives excellent swath, and (2) the emulsifiers or other ingredients in 2,4-D amines destroy fabric. We have recently covered our plane with fiberglass and may be able to use Amine. The pay load covers approximately 20 acres of hyacinths when spraying is done at 75 m.p.h. from 6 to 7 feet above the vegetatioi. The pressure is adjusted to about 20 pounds pressure. This provides for a forty foot swath; 5 gallons total material and 3 pounds active ingredient per acre. The Pawnee can be quickly equipped with a hopper which will carry up to 600 pounds of granular material for dry applications. These rates of application can be varied from 100-350 pounds per acre when applied at treetop level. Applications made from this level provides about a 70 foot swath.

CONCLUSIONS

The PA-25 Piper Pawnee is a most feasible aircraft for our hyacinth control operations. It may be used for both dry and wet applications. Certain rules have been formulated and *must* be followed when using aerial applications of 2,4-D. They are as follows:

1. Preliminary survey necessary to locate crops or shrubs that could possibly be damaged in spraying operations.
2. Secure a release from property owners when crops or shrubs are found.
3. Use an aircraft capable of flying low at slow speeds.
4. Use a pilot informed of the possible dangers of drift and experienced in aerial applications.
5. Spray only when wind is 6 m.p.h. or less.

It should be particularly noted here the success of aerial application of 2,4-D in Florida by the Hyacinth Control Division of the Game and Fresh Water Fish Commission is due largely to the dedication of our veteran pilot, Mr. Phil Phillips. This writer must acknowledge appreciation of Mr. Vernon Myers presently in charge of hyacinth operations in supplying much of the data for this paper.

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