EQUIPMENT FOR RELEASING LURE-TOXICANT TREATED TWINE FROM AIRCRAFT FOR CONTROL OF SELECTED INSECTS

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EQUIPMENT FOR RELEASING LURE-TOXICANT TREATED TWINE FROM AIRCRAFT FOR CONTROL OF SELECTED INSECTS

BY
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INTRODUCTION

Synthetic lure materials combined with toxicants or sterilants, can be an effective tool for control of specific insects. Effective, efficient equipment and practices are needed to distribute these lure-toxicant or lure-sterilant materials to attract and control specific insects.

Equipment was developed to meter short pieces of treated twine from aircraft. The purpose was to drop pieces of sufficient length to drape over foliage and attract insects into the canopy of vegetation. Figure 1 shows the main components for metering twine. The twine dispenser equipment (figs. 2, 3, 4, and 5) was designed to fit in the baggage compartment of a Cessna 182 aircraft or the cargo rack of a helicopter landing frame. A Standard Type Certificate was issued by the Federal Aviation Administration to use this equipment in a Cessna 182 aircraft.

When in operation, treated twine from a container passes through an opening of the lid, through a Teflon tube, between feed rolls, and is then directed between guide plates to a cutter bar. A rotating knife cuts the twine into pieces as it moves down past the cutter bar. A corrugated roll, below the cutter, guides the twine from the metering unit, and the pieces of twine then drop out the bottom of the equipment. A cowling located on the outlet of the feed unit outside the plane was designed to allow the twine pieces to drop directly into the airstream. The cutting unit is located outside the baggage door opening.

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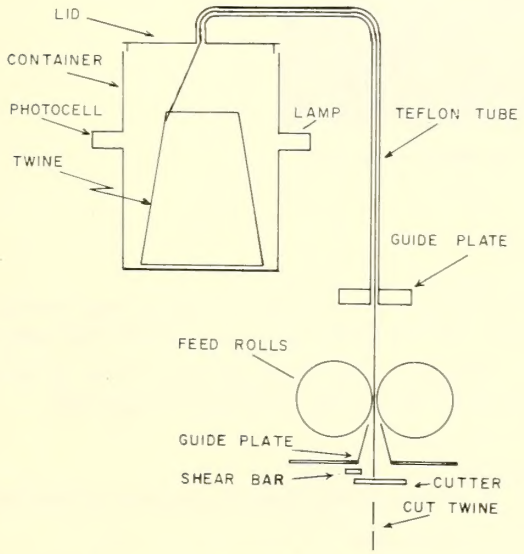

FIGURE 1.—Schematic of dispenser.

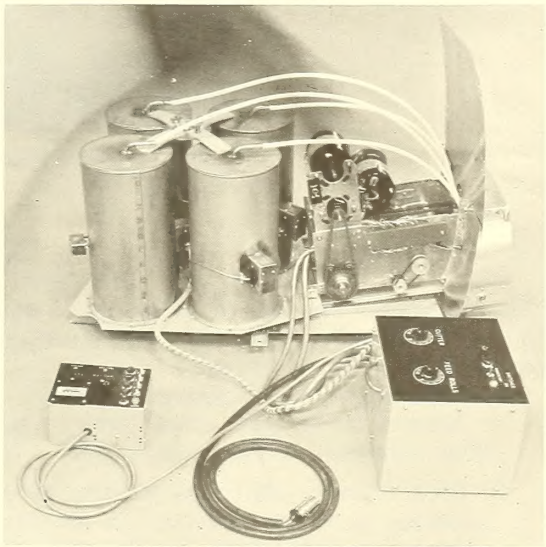

FIGURE 2.—Twine dispenser equipment assembled and displayed outside of aircraft.

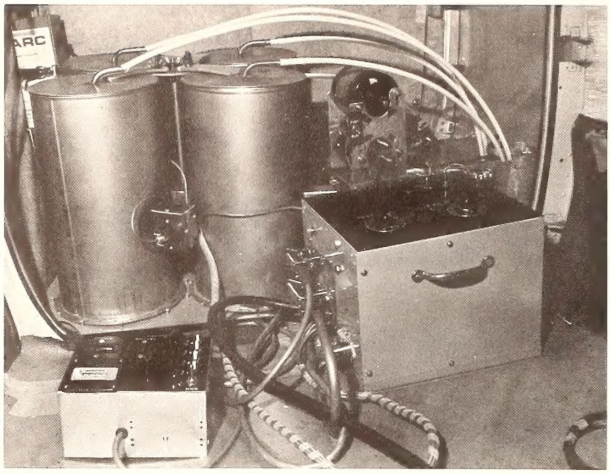

FIGURE 3.—Twine dispenser equipment mounted in Cessna 182 baggage compartment.

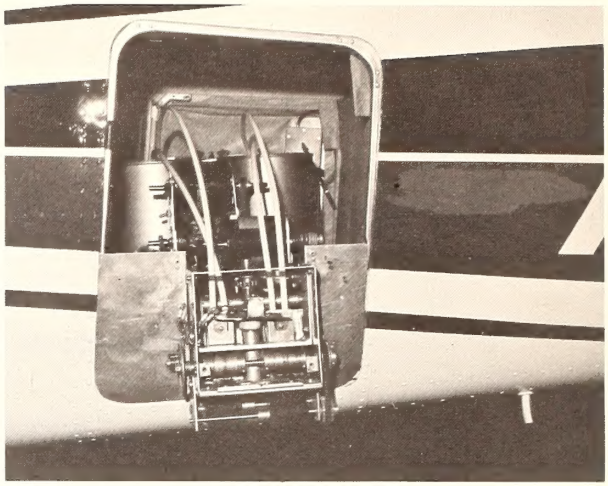

FIGURE 4.—Twine dispenser viewed through door opening.

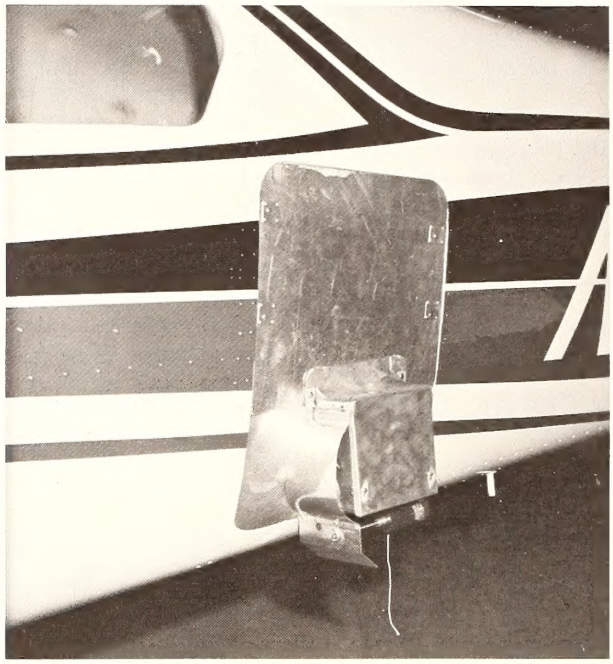

FIGURE 5.—Twine dispenser extending outside of aircraft.

EQUIPMENT

The equipment consists of an operator's control, regulator (electrical control unit for dispenser), twine containers, and dispenser unit.

Operator's control unit includes:

1. Manual switch with panel lamp to control off-on operation of the metering unit.
2. Five manual switches to change from automatic to manual selection of container to meter twine. Pilot lamps, one for each switch, are provided to show from which container twine is being metered.
3. A digital reset electro-mechanical counter, one for the feed rolls and one for the cutter.
4. A digital reset elapsed time meter to show the total operating time of the dispenser.
5. A 2-ampere fuse.

Regulator unit includes:

1. A lamp to indicate when power is connected.
2. A 30-A fuse.
3. A rheostat to control the speed of the motor which drives the feed rolls.

4. A rheostat to control the speed of the motors which drive the cutter.

5. A toggle switch to disconnect automatic transfer of metering twine from one container to the next.

6. A manual momentary switch to select the desired twine metering containers.

7. A toggle switch connected to two separate windings of the motors to drive the cutter fast or slow.

8. A rheostat to control the light intensity of lamps in twine holder containers.

Twine container units include:

1. Photocell with light to actuate the panel light on operator's control unit while twine is being metered.

Metering dispenser unit includes:

1. Two electric motors connected through right angle bevel drive, belts, and chain drive to the cutter.
2. An electric motor connected to the cutter through belt drives.
3. An oiler to reduce wear on the high-speed cutter.

OPERATION OF DISPENSER

The dispenser is installed in an aircraft with power cable connected to the 12-V d.c. electrical system. Each twine container is loaded with a spool of twine, in this case 16-ply, 2½-lb wrapping string was used. The end of each spool of twine is threaded first through the lid into the Teflon tube, then between the metering feed rolls.

The electrical system for operating the equipment is shown in figure 6. Switch 5 on the operator's control unit is used to start and stop metering of twine.

Twine metering operation may be started from any one of the four containers. Twine can be metered from a container until a light beam from lamps 6, 7, 8, or 9 actuates a photocell on the opposite side of the container. The photocell is actuated when most of the twine has been removed. Relay 1 is energized and motor 3 automatically runs until a roller is pushed against twine and power starts removal of twine from the next container. This procedure occurs until twine is fed from all four containers.

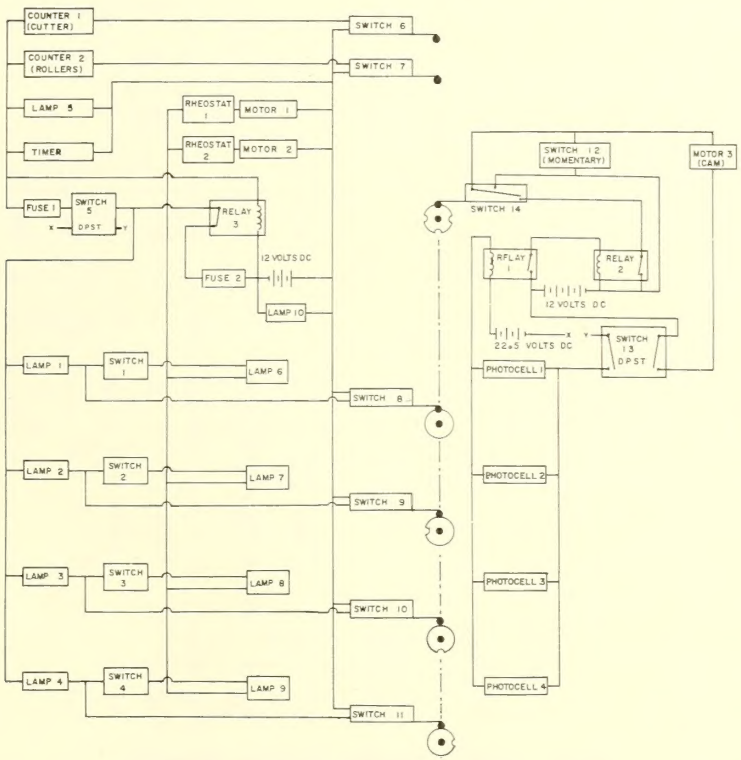

FIGURE 6.—Electrical diagram of twine dispenser.

If desired, the automatic change from one container to the next can be transferred to manual operation using momentary switch 12 on the regulator. When manual operations are employed, switches 1, 2, 3, and 4 on the operator's control unit next to the lamps are placed in the "off" position. Each actuation of momentary switch 12 operates the drive system, which moves the pressure roller to feed twine from the next container.

The containers were designed so most of the twine would be dispensed during the automatic control operation before the sensor in the twine container triggered an electrical circuit to start twine metering from the next container. This was done to allow replenishing spools of twine in the containers while the container is already threaded. The twine is cut from the used spool, replaced by a new spool, the twine pieces are tied together, and the lid is replaced.

Connecting the power cable from the regulator unit to a direct current power supply lights a lamp on the regulator panel to show power is present.

Separate lamps 1, 2, 3, and 4 on the operator's control unit show which container is being used to meter twine. Manual switches 1, 2, 3, and 4, located beside each indicating lamp, are turned off when the twine is automatically transferred from one container to the next.

Starting and stopping the metering of twine is controlled by the main switch (5) on the operator's control unit. Lamp 5, next to the main switch, lights up when the switch is on, indicating twine is being metered.

Manual switch 13 on the regulator panel is placed in the "on" position when the equipment is to be operated. The sequence of actuating the momentary switch permits metering twine from any one of the four containers. Metering cycle is moved to containers 1, 2, 3, and 4 in sequence, then the cycle is repeated.

Spools of twine are treated with lure-toxicant material before the spools are placed in the metering containers.

The equipment weighs 85 lb and is easily mounted in an aircraft. It operates on 12-V d.c. and draws up to 24-A current. The three motors which drive the cutter and feed rolls, however, use approximately 23-A current, and the momentary starting load may require a maximum of 25-A current. The motor driving the cam requires approximately 0.2-A current.

Calibration is done easily at the laboratory. A nomograph chart (fig. 7) is provided to assist in calibrating the equipment.

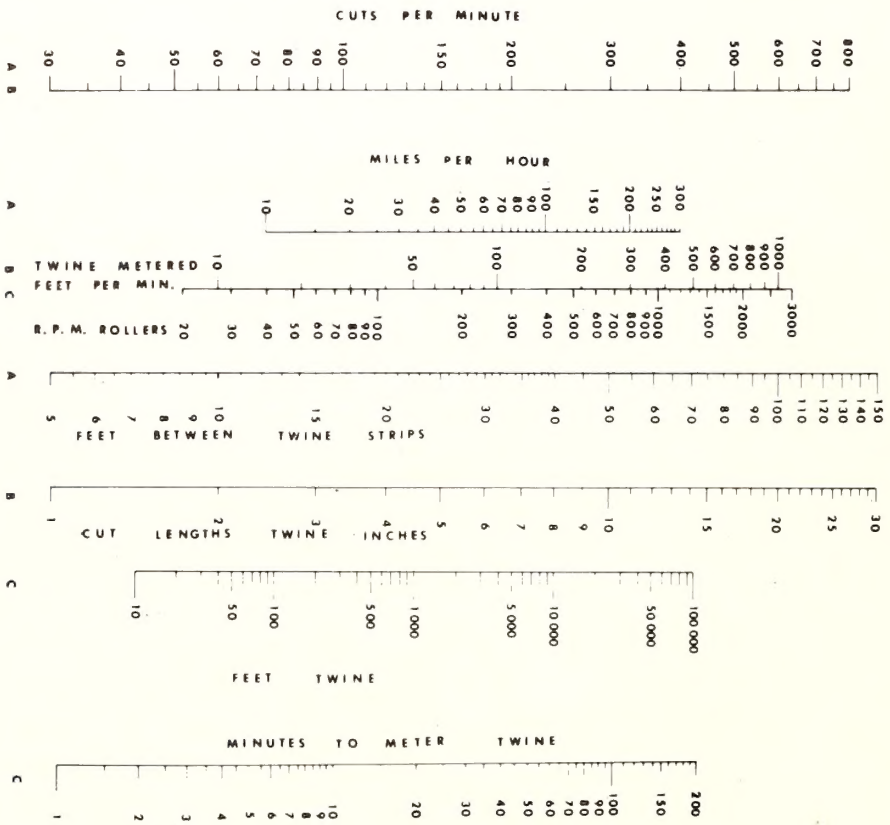

FIGURE 7.—Calibration chart for twine dispenser.

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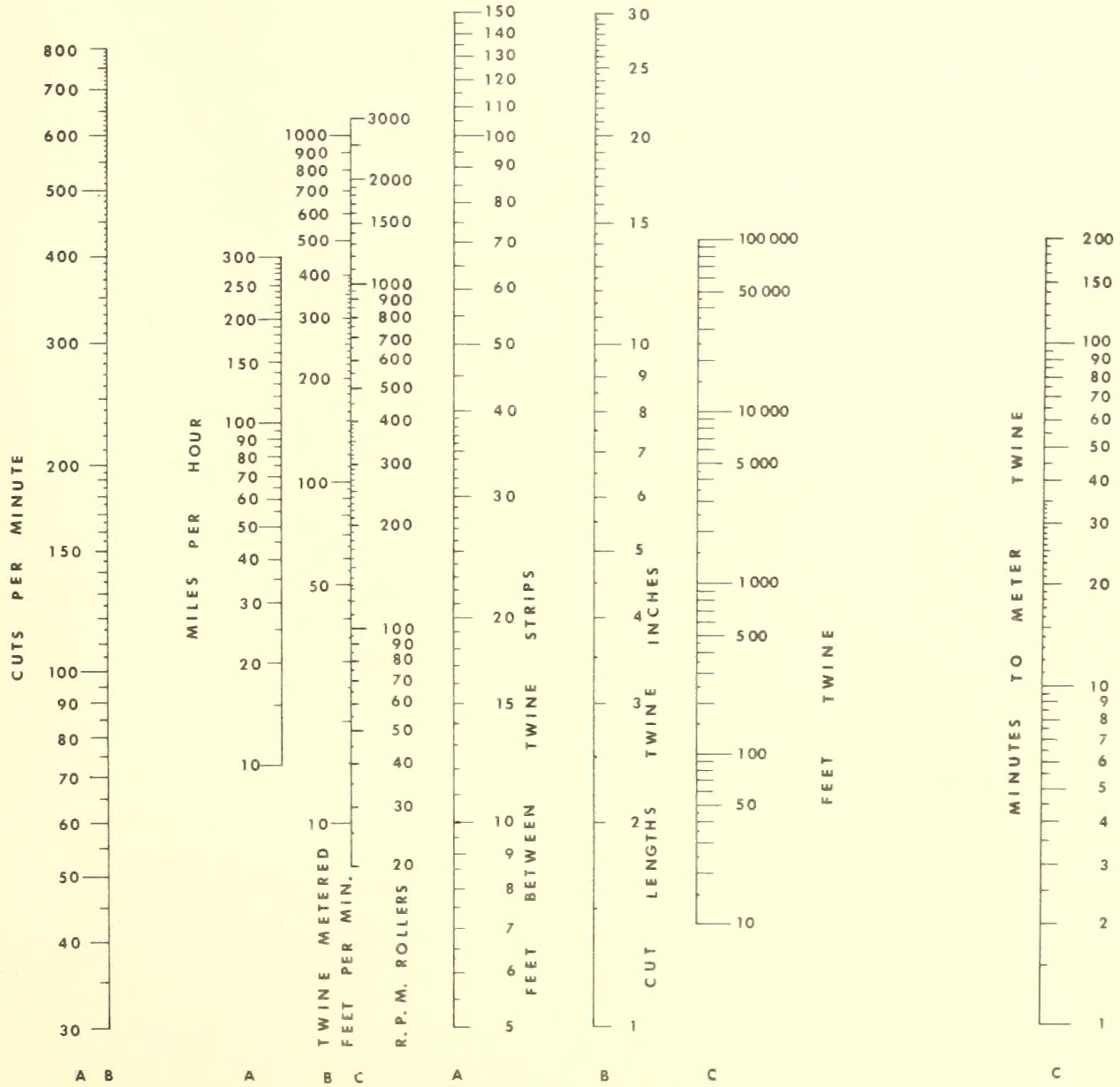
ERRATUM

ARS W-10, "Equipment for Releasing Lure-Toxicant Treated Twine From Aircraft for Control of Selected Insects"

Page 4. The figure below should replace the original figure 7.



TWINE-METERING CAPACITY

Twine output of the dispenser ranged from 260 to 400 twine pieces per minute. With the use of one change sprocket, the number of twine pieces can be increased to 800. The amount of twine metered ranges from 90 to 480 ft/min.

Releasing twine pieces from an aircraft operating at 150 miles per hour permits cutting twine in lengths ranging from 1.5 to 24 inches with distance between twine pieces ranging from 20 to 50 feet.

The nomograph shown in figure 7 was developed to aid in rapid adjustment of the dispenser. Cut pieces of twine per minute, "r.p.m." of rollers, and feet of twine metered were determined from the nomograph by selecting (1) aircraft speed in miles per hour. (2) feet between twine strips, and (3) minutes to meter twine. Example: If a straight line is drawn with an aircraft speed of 170 mi/h on scale *A* used as one point and 50 feet between cut string pieces on scale used as the other point, the line intersects scale *A* at 300 cuts per minute. Another line drawn between 300 on the scale of cuts per minute and 6 on scale *B*, cut lengths of twine in inches, intersects scale *B* (r.p.m. rollers) at 400. Another line drawn between 400 on the scale of r.p.m. rollers and 7 minutes on metering twine, intersects scale *C* at 1,000 feet of twine metered.

The 24-ply cotton wrapping twine, treated with an insect lure and toxicant material, was distributed effectively from the equipment when mounted in a Cessna 182 aircraft.

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