EQUIP TIPS

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FOREST SERVICE U. S. DEPARTMENT OF AGRICULTURE

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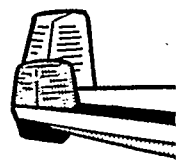
EQUIPMENT DEVELOPMENT AND TESTING CENTER
701 N. Santa Anita Avenue, Arcadia, California 91006

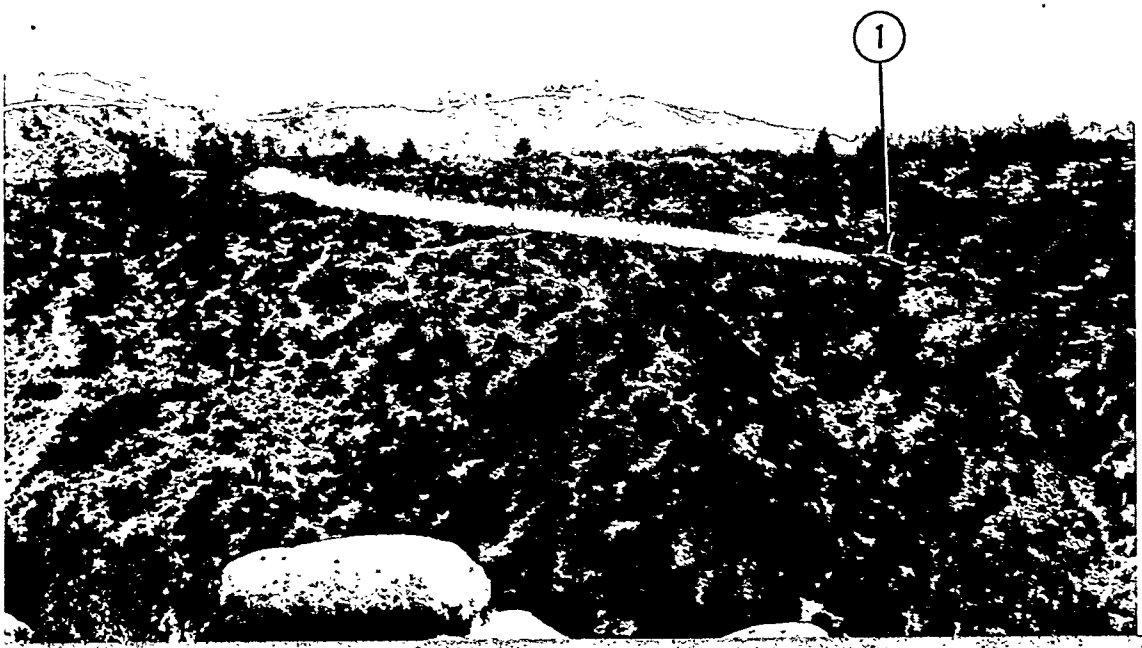


T-34 SMOKE MARKER

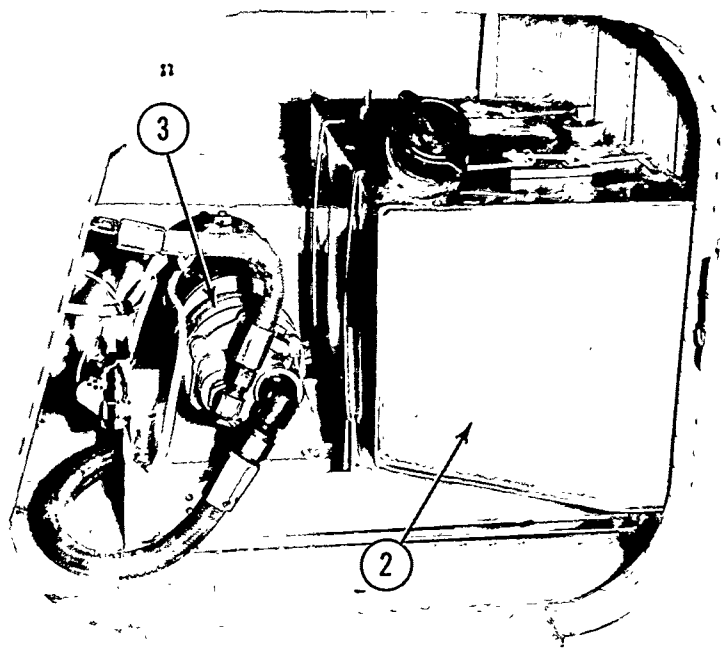
Arcadia Equipment Development and Testing Center has completed installation and development testing of a smoke marker unit for T-34B lead plane aircraft. Initial field tests were conducted in the Southwestern Region on actual fires. Final field tests will be done in the Northwest Region.

This equipment was installed primarily for marking targets for air tankers. However, it is expected additional uses for the unit will be found. Partial financing was provided by the Department of Interior. The photograph demonstrates the high visibility of a one-second burst of smoke, even though the lead plane (No. 1) is hard to see.

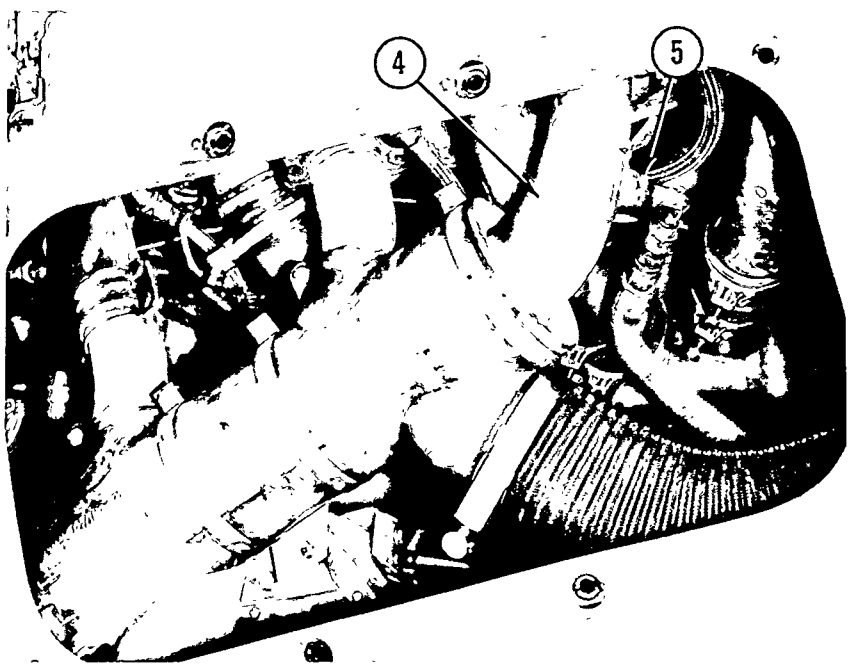
The smoke marker unit is designed to produce colored smoke by injecting a mixture of oil-soluble dye and oil into the hot exhaust system of a T-34B aircraft. The smoke is dense and heavy and will last 20 to 25 seconds in 20 to 25 mph winds. Bursts of 1/2 second will give over 80 linear feet of smoke trail at 120 mph air speed. The colored smoke can be released over a selected target by the lead



plane so the airtanker pilot can obtain a positive target fix. The drift of the smoke also aids the pilot in compensating for wind so that the optimum effect of each drop is obtained. The unit is comparable to skywriting equipment presently in use. The test program has indicated that the unit has the potential to increase airtanker operational effectiveness.

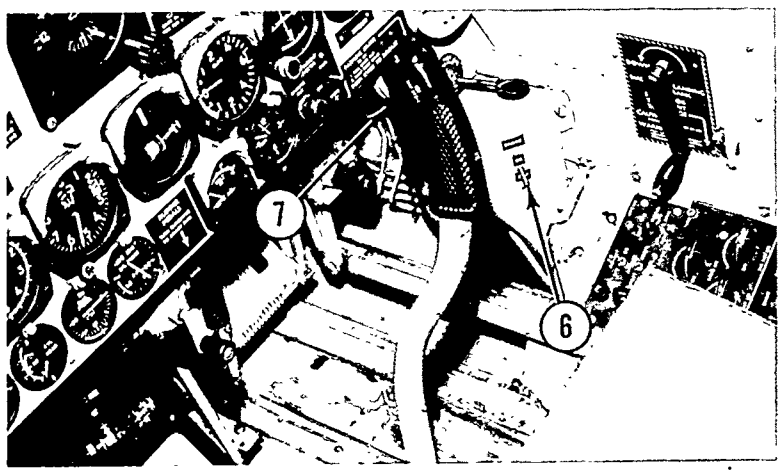


Equipment Installation. The tank (2) and pump (3) are mounted on a base that bolts down to the floor in the baggage compartment. The tank has a capacity of 9 gallons. The pump has a rating of 3-1/2 gallons of fluid at 1500 psi and is designed to handle hydraulic fluids. Each tank will run approximately 8 minutes and should produce 450 to 500 one-second bursts.



Supply lines are 3/8-inch aluminum tubing and tee into flexible steel tubing that delivers fluid to each exhaust stack (4). The exhaust stack is tapped for a fitting (5) that houses a 1/8-inch orifice fitting with a small defusing shoe. A 1/4-inch plug has been provided for cleaning the orifice with a 1/8-inch drill that is manually turned.

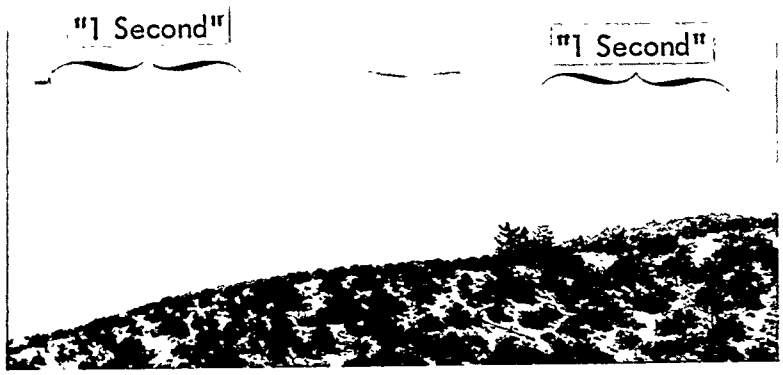
Electrical System. The equipment is wired into the electrical system of the aircraft. There are two switches and a 65-amp circuit breaker in the system to protect the aircraft and pump.



The master switch for the smoke system is located forward of the manual operation gear handle. It is a two-position toggle switch (6) that energizes the system. The trigger switch is part of the pistol grip on the stick (7) and actuates the pump. There is no lag in the system. Smoke is immediately released whenever the trigger switch is depressed.

Color Formula. A formula of one gallon of carbon tetrachloride to 4 gallons of #73 Carnea Shell oil and 8 pounds of DuPont oil-soluble dye was originally used. The carbon tetrachloride was used to cut the dye and not to control flash point. Carbon tetrachloride may produce harmful side effects so it will be replaced in the formula by another solvent as soon as possible. Red, yellow, and orange colors were used.

Procurement. The unit can be purchased from a contractor according to provisions in the original purchase order agreement. The agreement covers installation, materials, and adjustments f. o. b., Torrance, California. The purchase price is $1, 000 per unit for T-34B aircraft.



■ The lead plane releasing one second bursts at approximately one-half mile distance. Winds approximately 25 mph.

SUGGESTED USES

1. Mark targets by releasing smoke directly over target.
2. Indicate wind drift.
3. Indicate turbulence.
4. Identify lead plane by color of smoke used.
5. Indicate drop areas for cargo aircraft.
6. To identify emergency areas for aircraft crashes, rescue operations, helicopter operations, and to lead ground crews to safety.
7. Reduce radio communications by developing color code identification.

TEST RESULTS SUGGEST FOLLOWING LIMITATIONS

1. Because of weight and balance, limit crew to pilot only for lead plane work or when smoke formula is in the tank.
2. Use smoke in 1/2-second or 1-second bursts.
3. Fly pattern so power is applied before smoke is triggered in order to generate high enough exhaust temperatures.
4. Plan flight over target so that air speed is maintained over 100 knots before releasing smoke.
5. Keep cylinder head temperatures in the upper normal level. This is necessary to get exhaust stack temperatures high enough for good smoke density without excessive unburned formula leaving exhaust system. (The excess deposits on aircraft belly.) See item 3, above.
6. Do not operate unit on ground except in approved run-up area. Drifting material can damage other aircraft finishes.
7. Check augmenter tubes after each flight to see that both sides are operative.