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Calibration and Distribution Pattern Testing of Agricultural Aerial Application Equipment

American Society of Agricultural and Biological Engineers

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Calibration and Distribution Pattern Testing of Agricultural Aerial Application Equipment

Developed by the ASAE Agricultural Chemicals Application Committee; approved by the Power and Machinery Division Standards Committee; adopted by ASAE as a Tentative Standard June 1977; reconfirmed December 1978, December 1979, December 1980, December 1981; revised and reclassified as a full Standard January 1983; revised February 1988; reaffirmed December 1992, December 1993, December 1998, February 2004, February 2009, November 2013.

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1 Purpose and Scope

1.1 This Standard establishes uniform procedures for measuring and reporting application rates and distribution patterns from agricultural aerial application equipment.

1.2 The procedures covered deal with both fixed and rotary wing aircraft equipped with either liquid or dry material distribution systems.

1.3 These procedures and the statistics reported do not imply optimum conditions for satisfying biological requirements.

2 Definitions

2.1 For the purpose of this Standard the following definitions shall apply:

2.1.1 application rate: Application rates are as defined in ASAE Standard S327, Terminology and Definitions for Agricultural Chemical Application.

2.1.2 deposit rate: Deposit rates are as defined in ASAE Standard S327, Terminology and Definitions for Agricultural Chemical Application.

2.1.3 single-pass application: An application method where the aircraft applies one swath over the sample line.

2.1.4 one-direction application: An application method where successive adjacent swaths are made in the same direction of travel (racetrack application). This method produces a right-on-left wing overlap pattern.

2.1.5 progressive application: An application method where the aircraft applies adjacent swaths but travels in alternate directions for each swath (back and forth application). This method produces a right-on-right wing overlap alternately with a left-on-left wing overlap pattern.

2.1.6 swath spacing: The lateral distance between the aircraft centerlines for overlapping broadcast applications.

2.1.7 effective swath width: The swath spacing that will produce acceptable field deposition uniformity for intended application.

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2.1.8 nozzle orientation: The angle of spray discharge from the nozzles measured relative to the local airflow in flight. A nozzle orientation of 90° denotes spray discharge perpendicular to the direction of the local airflow while a nozzle orientation of 0° denotes spray discharge that is parallel and to the rear.

2.1.9 indicated airspeed: The speed as indicated by the airspeed indicator of the aircraft in flight.

3 Test Conditions

3.1 The physical characteristics of the liquid or dry material have an effect on the application rate and the distribution patterns. If inert test solutions or materials are substituted for the material to be applied, they must have physical characteristics similar to those of the material to be applied.

3.2 The distribution equipment to be tested should be in good mechanical condition and properly equipped and adjusted for the type of application to be simulated.

3.3 The tests should be conducted when wind speeds are less than 16 km/h (10 mph) measured at 2.5 m (8.2 ft) above the land surface or crop canopy. The distribution pattern test flights should be made parallel to or within 15° of the direction of the wind to minimize errors due to crosswinds. Output rate test flights should be made considering both headwind and tailwind components to minimize the effects of wind velocity on the ground speed of the aircraft.

3.4 The following provisions will help assure that the tests will be carried out in a safe and efficient manner.

3.4.1 Test site. The test site should be selected where the aircraft can have a minimum unobstructed approach (from power lines, buildings, trees, fences, etc.) and departure distance to and from the sample line of 300 m (1 000 ft). The site should allow orientation of a 30 m (100 ft) sample line at a right angle to the prevailing wind. The site should be located in an area where there is a minimum of other flying aircraft. Local airport and/or FAA authorities should be informed of scheduled activity so that proper notification can be made to other aircraft operating in the immediate area.

3.4.2 Toxic materials. When toxic materials are used, all safety precautions prescribed by the manufacturer and regulating authorities for handling, loading, application and disposal shall be observed.

3.4.3 Residues. Distribution equipment previously used in field applications should be cleaned and flushed of any residue prior to starting the test procedure. Special cleaning agents may be necessary to neutralize previously used pesticides or additives.

3.4.4 Safety precautions. Prior to initiating any tests, the pilot and all test site personnel shall be thoroughly briefed on test procedures. At the flight test area, all personnel shall stand clear of the aircraft flight path. Special safety precautions shall be observed when stationary aircraft tests are conducted with the engine running to prevent serious injury by a moving propeller or rotor. If toxic materials are used, personnel should remain clear of application and drift areas, and appropriate precautions shall be taken to prevent contamination of test personnel and test site.

4 Test Description and Procedure

4.1 A test shall consist of four parts: (1) determination of the output rate from the aircraft, (2) determination of the swath distribution pattern by measurement of the applied materials from suitable collectors, (3) determination of the maximum effective swath width and the corresponding uniformity of distribution for overlapped swaths and, (4) determination of application rate. Each part of the test shall be replicated to account for random variation.

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