Federal Aviation Agency

ADVISORY CIRCULAR

AC NO: AC 137-1
AGRICULTURAL AIRCRAFT OPERATIONS
EFFECTIVE: 11/29/65

SUBJECT: AGRICULTURAL AIRCRAFT OPERATIONS

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1. PURPOSE.

   a. This advisory circular explains and clarifies the requirements of Federal Aviation Regulations Part 137, Agricultural Aircraft Operations.

   b. It provides additional information, not regulatory in nature, which will assist interested persons in understanding the operating privileges and limitations of this part.

2. GENERAL. FAR Part 137 is the first Federal Aviation Regulation developed specifically for agricultural aircraft operations. Prior to the adoption of this part, such operations were governed primarily by certificates of waiver issued under old Civil Air Regulations Part 60 and Part 8, and more recently under FAR Part 91. Upon the effective date of FAR Part 137, January 1, 1966, all operators except operators of public aircraft conducting agricultural aircraft operations will be required to obtain an operating certificate as provided for under FAR Part 137.

3. APPLICABILITY OF FAR PART 137.

   a. FAR Part 137 is applicable to all operators conducting agricultural aircraft operations (hereafter agricultural aircraft operators will be referred to as operators). The definition of the term "agricultural aircraft operation," as defined in section 137.3, includes forest firefighting activities, e.g., "fire bombers." Therefore, operators conducting such activities are required to obtain an Agricultural Aircraft Operator Certificate.

   b. FAR Part 137 has been limited to those rules particularly applicable to operations conducted under this part. It does not repeat rules of a general nature such as those contained in FAR Part 91, nor does it relieve the operator from compliance with rules of general applicability contained in other parts of the Federal Aviation Regulations.

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c. There are other regulations which are applicable to the agricultural aircraft operator and he may wish to obtain a copy of FAR Part 21, Certification Procedures for Products and Parts. Copies of this publication may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., for $0.35.

d. The term "public emergency" as used in FAR 137.1(b) means an emergency requiring relief in the public interest and of such magnitude that if immediate action is not taken life, property, and/or the economic welfare of a substantial number of the human population or a significant geographical area would be jeopardized by the circumstances of that emergency. Any situation which is solely a matter of convenience or economic advantage to the operator is not deemed to be a public emergency as referred to in FAR Part 137.

4. APPLICATION FOR AGRICULTURAL AIRCRAFT OPERATOR CERTIFICATE.

a. Application for an Agricultural Aircraft Operator Certificate should be submitted in duplicate to the General Aviation District Office responsible for the area in which the applicant's home base of operation is located. Application forms may be obtained from any GADO.

b. All business names and business offices to be used by the operator should be shown on the application, as only one certificate will be issued to any person. Person is defined in the regulations as an individual, firm, partnership, corporation, company, association, joint-stock association, or governmental entity.

c. Examples of business names, offices, and mailing addresses are listed in Appendix 1, pages 1 and 2.

d. An applicant for a Private Agricultural Aircraft Operator Certificate should show his name and regular mailing address on the application.

5. AMENDMENT OF CERTIFICATE. If an applicant desires to have the prohibition against dispensing economic poisons added to or removed from his operating certificate, he should make application in the same manner as for an original certificate. The same procedure should be followed in applying for other changes to the Agricultural Aircraft Operator Certificate.

6. CERTIFICATION REQUIREMENTS.

a. The applicant should contact the General Aviation District Office for his particular area and make the necessary arrangements concerning an appointment for inspection and examination on such items as pilot certificate, aircraft, and the knowledge and skill tests. As specified in FAR 137.19(a), an applicant is not required to demonstrate knowledge of all items specified under that section if he applies for an Agricultural Aircraft Operator Certificate containing a prohibition against dispensing economic poisons.

b. When required by FAR 137.19(e), the applicant or person who will supervise agricultural aircraft operations will be examined by an FAA inspector to determine that he possesses satisfactory knowledge and skill to enable him to safely conduct those operations. The knowledge and skill tests are designed primarily for the new or inexperienced aerial applicator pilot. The Federal Aviation Agency is primarily concerned with the safety aspects of agricultural aircraft operations and the examinee should prepare himself for the knowledge and skill tests with that in mind. The U.S. Department of Agriculture developed a handbook entitled "Aerial Application of Agricultural Chemicals." 1/ The examinee may wish to obtain a copy of that publication to assist him in preparing for these tests.

7. KNOWLEDGE TEST. When required by FAR 137.19(e), the knowledge test consists of the items specified in FAR 137.19(e)(1). The following information is pertinent to the requirements contained in that section and includes basic safety information considered good operating practices.

a. Steps to be Taken Prior to Starting Operations. In addition to the preflight action required by FAR 91.5, it is suggested that the following steps be taken prior to starting agricultural aircraft operations:

(1) A survey of the working area by the applicator pilot, including the area over which turnarounds will be made. If obstructions to flight include structures, trees, wires, or unfavorable terrain, etc., and the pilot has not previously or recently worked the particular area, the conduct of a ground survey is desirable. Also, a ground survey is suggested when the pilot finds it necessary to fly his aircraft under wires.

(2) Investigation of the area immediately surrounding the working area in an attempt to locate sensitive areas such as poultry farms, beehives, and animal corrals, etc. The engine and propeller noise emitted as the pilot executes a pullup and turnaround over these areas has been known to result in extensive damage and/or injury to these enterprises. The surrounding area may require investigation for fish ponds, lakes, and streams as certain economic poisons have a lethal effect upon fish and wildlife.

1/ Aerial Application of Agricultural Chemicals
Agricultural Handbook No. 287
Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
$0.20

(3) In many areas throughout the United States, large housing or other densely populated areas have been developed upon land previously used as farm, orchard, or range land. When the agricultural pilot applies economic poisons or other agricultural materials to an area immediately adjacent to such areas, the resulting engine noise and possible drift may result in complaints by persons living in those areas. Accordingly, it is suggested that the operator advise the occupants of such areas prior to conducting dispensing operations.

(4) It is suggested that the applicator pilot acquaint himself with applicable state and local laws relative to such topics as honey bees, maximum wind velocity, droplet size, and the economic poison to be dispensed.

b. Safe Handling of Economic Poisons. The examinee will be required to demonstrate satisfactory knowledge regarding the methods utilized to safeguard the pilot against contamination and the safe handling of economic poisons such as PARATHION. (The name of another economic poison may be substituted by the examiner if it is more commonly used in the geographical area where the applicant will conduct operations.) For information on the relative toxicity of economic poisons, an LD_{50} index and an explanation for its uses is included in Appendix 2, pages 1-4.

(1) An aerial applicator pilot who is engaged in the actual application of economic poisons should not assist in the mixing or loading of highly toxic poisons.

(2) A briefing of ground crews concerning economic poisons is desirable and such crews should wear protective clothing such as rubber gloves, apron, boots, and respirator when handling materials that require it. If a respirator is required, it should be the type which will protect the wearer against the particular pesticide being handled. A publication entitled "Respiratory Devices for Protection Against Certain Pesticides" may be obtained from Entomology Research Division, Agricultural Research Service, Beltsville, Maryland 20750.

(3) Flagmen, when used, should be briefed concerning the potential hazard of the pesticide to be used and should be equipped with appropriate protective equipment, when required.

(4) Persons working closely with or handling pesticides should change clothes and bathe at the end of the operation, or immediately if pesticide gets on the skin. Clean work clothes should be worn daily.

(5) If water is obtained from streams or ponds for mixing purposes, the pesticide should not be allowed to contaminate the water source. If the pesticide is spilled on the ground, the contaminated area may be covered with dirt until other protective measures can be taken.

(6) It is suggested that aircraft and spray equipment be cleaned daily or as often as required to remove accumulation of pesticide residue. When aircraft are cleaned, the drainage should not be allowed to run into a sewer, ditch, pond, or stream.

c. Disposal of Used Pesticide Containers.

(1) Large metal drum containers can be safely disposed of by returning them to the supplier or by selling them to a firm equipped to handle toxic materials. Glass containers may be broken. If metal containers cannot be returned to the supplier or to a firm equipped to handle toxic materials, they may be rendered unusable by cutting holes in the top, bottom, and sides. Metal containers may also be decontaminated by burning or rinsing with a solution of water and detergent. The U.S. Department of Agriculture published a pamphlet, "Safe Disposal of Empty Pesticide Containers and Surplus Pesticides," 1/ which contains detailed information on the subject. The pamphlet may be obtained from the source indicated in the footnote below.

(2) Paper bags, cardboard boxes, and plastic containers may be burned, when permitted by local law, after determining that the resulting smoke will not drift over homes, people, and/or livestock. Containers previously used for weedkillers should not be burned. When these herbicides volatilize, the resulting vapor may damage nearby plants, crops, and shrubbery. Also, herbicides or defoliants containing chlorates may explode when heated.

d. General Effects of Economic Poisons and Agricultural Chemicals on Plants, Animals, and Persons. The label on economic poisons manufactured for interstate use contains instructions pertinent to the effects on plants, animals, and persons. Therefore, when required by FAR 137.19(a), the examinee will be expected to show a satisfactory knowledge concerning the general effects and precautions to be observed in handling and using those poisons.

e. Primary Symptoms of Persons Poisoned from Economic Poisons. The requirements contained in FAR 137.19(e)(1)(iv) should not be interpreted as Agency encouragement or endorsement of self-diagnosis.

1/ Agricultural Research Service
U.S. Department of Agriculture
Washington, D.C. 20250

Rather, it is a requirement that the agricultural operator pilot possess sufficient knowledge of the primary symptoms of poisoning to motivate him to seek immediate professional medical attention when such symptoms appear. An excellent reference concerning emergency information for treating poisoning is the "Clinical Handbook of Economic Poisons." 1/

(1) The properties of the specific organophosphate involved, the size of the dose, and the manner of exposure affect the severity and order of appearance of the signs and symptoms of toxicity, but any or all of the following may occur: nausea, vomiting, blurred vision, excessive sweating, excessive secretion of saliva, bronchial constriction, tightness in the chest, slowing of the heart, muscle twitching, followed by convulsions, coma, paralysis, respiratory failure, death. Certain of these symptoms may be deceptive. For instance, the pupil of the eye usually constricts, and the heart rate usually decreases. In the early stages of poisoning, however, the pupil may enlarge and the heart may beat faster. Symptoms may be delayed, appearing for instance late at night or on the day following exposure. It should be remembered that repeated, small exposures may constitute as great a danger as the large, single dose. Any attempt to suppress mild symptoms of organophosphate poisoning with atrophine or other antidote to avoid loss of time at work is extremely dangerous. Atropine does improve the paralysis or muscle weakness, and it is possible to over-correct other symptoms such as the effects on the eyes. The antidote 2-PAM should be used only under a physician's direction.

(2) The chlorinated compounds owe their insecticidal activity and their immediate or acute human toxicity to an action on the nervous system. Symptoms and signs take the form of nausea, dizziness, headache, tremor, and weakness, and in the case of large doses, convulsions, difficult breathing, cyanosis (surface of the body turns blue), and circulatory collapse. The exact mechanism by which these effects are produced is unknown, and there is not a specific treatment.

f. Emergency Measures. The first step after known or suspected contamination of the skin is a thorough washing with soap and water. Alcohol is a better decontamination agent, particularly if the area of the contamination is limited. In any event, speed is important. It has been found that 30 minutes after a test application of parathion to the skin, vigorous scrubbing with soap and water will remove 80 percent or more of the material, and alcohol will remove most of the

1/ Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
$0.55

remainder. After 5 hours, however, 40 percent of a test dose cannot be washed off with soap and water, and 10 percent will remain after scrubbing with alcohol. 1/ Decontamination is especially important for the pilot who may have become contaminated by chemicals spilled in an accident. First aid in organophosphate intoxication consists of the administration of atropine in accordance with instructions issued by a physician. Treatment in the field should never go beyond a few doses of atropine, in addition to such other emergency measures as are needed, such as artificial respiration, etc. The patient should then be rushed to a physician or a hospital for further treatment.

g. Location of Poison Control Centers. The location of Poison Control Centers in the United States may be found in the most recent issue of the Directory on Poison Control Centers, 2/ a publication by the U.S. Department of Health, Education, and Welfare or by contacting the nearest office of the U.S. Department of Health, Education, and Welfare.

h. Aircraft Operating Limitations - Performance Capabilities.

(1) When required by FAR 137.19(e), the examinee will be tested to determine that he possesses adequate knowledge of operating limitations for the aircraft to be used in accordance with the applicable requirements contained in FAR 91.31. Special emphasis will be placed on weight and balance information if the examinee will conduct operations utilizing helicopters. For such operations, the examinee should understand that the H/V (Height-Velocity) diagrams do not provide information for weights above the maximum certificated gross weight and operations at these increased weights require corresponding reductions in the V_{ne} to preclude such factors as rotor blade fatigue, and blade stall.

(2) Questions concerning aircraft performance capability, provided performance data have been established for the aircraft to be used, will include such items as:

(a) Stall speeds at maximum certificated gross weight (MCGW), straight ahead, poweroff, flaps up, (V_{s1}),

1/ Denatured, 95 percent Grain Alcohol

2/ Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
$0.20

(b) Best rate and best angle (V_x) of climb speed (V_y),

(c) Maneuvering speeds,

(d) Density altitude, and its affect on performance, and

(e) Takeoff distance required to clear a 50-foot obstacle MCGW, with zero wind.

i. Safe Flight and Application Procedures.

(1) Hazards associated with dispensing sulphur or other solid agricultural materials containing a high percentage (30 percent or more) of sulphur are described in Appendix 3, pages 1 and 2.

(2) When conducting operations over sloping terrain, caution should be exercised relative to the direction of swath runs. Flying up the slope may result in stalling the aircraft prior to reaching the end of the swath run, or contribute to an inadvertent stall during the pullup or turnaround.

(3) Turnarounds (procedure turns) are normally made on the downwind side of the centerline of the swath. However, unfavorable terrain, wires, guy wires, poles, trees, or other obstructions may necessitate their being made on the upwind side. If a no-wind condition exists, it is usually the best procedure to make the turn into an open area (if available) in the event of power loss or failure.

(4) The inexperienced aerial applicator pilot should not look back at his swath during a swath run. To do so may result in allowing the aircraft to fly into the ground or other obstruction.

(5) If the aircraft is equipped with a push-pull device for starting and stopping the flow of agricultural material, the pilot should, for obvious reasons, be especially alert not to inadvertently close the throttle and further open the hopper or tank at the end of a swath run.

(6) The inexperienced aerial applicator pilot may have a tendency to apply forward pressure on the elevator control or cyclic control (if helicopter) as he flies under wires. Such a tendency should be avoided because once any part of the structure of the aircraft (wheels, skids) become entangled in crop foliage, it may be difficult, if not impossible, to prevent the aircraft from being "pulled" into contact with the ground. The vertical fin may also contact the wires as the aircraft passes underneath them.

(7) When two or more aircraft are used simultaneously in working a field, safety requires the pilots conducting the operations to make prearrangements concerning those operations. Midair collisions have occurred between aircraft conducting team operations.

8. SKILL TEST.

a. When required, the examinee will demonstrate a safe performance of the maneuvers specified in FAR 137.19(e)(2). The test of skill may be conducted over any area mutually agreeable to the examinee and the FAA inspector, or the chief supervisor, as applicable. The examiner may, at his discretion, ride with the examinee if a suitable aircraft is provided, or he may observe the flight from the ground. The aircraft's dispersal tank(s) or hopper(s) may be loaded with any suitable material, e.g., water, lime, etc., to the maximum certificated takeoff weight or the maximum weight established for the special purpose load, whichever is greater.

b. The applicant will be evaluated on his piloting skill and operational judgment as demonstrated during execution of the following:

(1) Short field and soft field takeoffs (airplanes and gyroplanes only) -

(a) One takeoff at minimum speed, and

(b) One takeoff at best angle-of-climb speed.

(2) Approaches to the working area -

(a) Satisfactory air survey of area of obstructions, and

(b) Proper method of beginning operations; normally, start operation crosswind on downwind side of field.

(3) Flareout -

(a) Should not touch ground or crop during flareout, and

(b) Should be consistently at same height and position over field on several flareouts.

(4) Swath runs -

(a) Consistent altitude (maximum of five feet altitude variation),

(b) Demonstrate at least four swath runs,

(c) Looking back at swath during swath run is disqualifying, and

(d) Flight should be executed so as not to fly through cloud of spray or dust of previous swath. Successive swath runs spaced so as to place the wing tip into or overlapping the swirl of the previous swath is not disqualifying.

(5) Pullups and turnarounds -

(a) Consistent height in turnarounds (obstructions permitting),

(b) Smooth and coordinated; any uncoordinated use of controls will be unsatisfactory performance,

(c) Turn in proper direction relative to wind, obstructions, and field layout,

(d) Obstruction clearance prior to starting turn, and

(e) Proper throttle and hopper or tank control manipulation at beginning and end of swath run.

(6) Rapid deceleration (quick stops) in helicopter only.

9. Letter of Competency or Logbook Entry - Knowledge and Skill Tests.

a. A designated chief supervisor of operations may issue a Letter of Competency to a pilot upon satisfactory completion of the knowledge and skill tests, or he may record it in the pilot's logbook. When recorded in the pilot's logbook, it is suggested that the entry be made as follows: "Dusty R. Swath satisfactorily completed the knowledge and skill tests as specified under FAR 137.19(e)." A logbook entry certified by a chief supervisor of operations may include the certification statement, his signature, his airman certificate, number and grade of certificate (Commercial, ATR), and the date the test was completed.

b. An example of the Letter of Competency is included in Appendix 4, page 1.

10. PUBLIC AIRCRAFT.

a. An aircraft used exclusively in the service of any government, or of any political subdivision thereof, and not engaged in carrying persons or property for compensation or hire, is a public aircraft within the meaning of the Federal Aviation Act of 1958. Operators of such aircraft include the U.S. Air Force, U.S. Forest Service, and U.S. Department of Agriculture. Certain states such as New Jersey, California, Florida, and Minnesota also utilize public aircraft for the conduct of mosquito abatement operations.

b. Only a government or political subdivision thereof that is operating public aircraft may determine whether or not to certify its public aircraft in accordance with Subpart B - Certification Rules. The operator who may be under exclusive contract to that government or political subdivision thereof has no legal authority to make such a determination.

11. FACSIMILE OF AGRICULTURAL AIRCRAFT OPERATOR CERTIFICATE. As used in this section, a facsimile includes reproductions produced by the following processes:

a. Photostat

b. Thermofax

c. Xerox

d. Verifax

e. Other similar processes

12. PROOF OF LEASE AND OWNERSHIP OR OTHER PROPERTY INTEREST - PRIVATE OPERATORS.

a. Federal Aviation Agency General Aviation Operations Inspectors conduct periodic field surveillance of agricultural aircraft operations for the specific purpose of observing aerial dispensing operations. During this surveillance, the private operator may be asked to present the lease, deed, or legal written instrument pertaining to the property on which agricultural materials are being applied. Such a request would be in accordance with the requirements contained in FAR 137.35(c).

b. For the purpose of section 137.35(c), the term "property interest in the crop" means an actual bona fide legal interest, not one which was created for the purpose of avoiding the requirements of this section. For example, a tenant farmer living on rented land, growing the crop, and sharing the proceeds with the owner, would normally have a bona fide property interest in the crop located thereon. However, for the purposes of this regulation, any property interest should be evidenced by a legal written instrument.

13. PILOT DEMONSTRATION OF KNOWLEDGE AND SKILL TO CERTIFICATE HOLDER OR CHIEF SUPERVISOR. It is suggested that the certificate holder or his designated chief supervisor develop questions from the topics listed under paragraph 7 of this advisory circular when required by FAR 137.41(c) to have his pilot(s) demonstrate the knowledge and skill requirements. The skill test consists of the maneuvers specified in FAR 137.19(e)(2).

14. AUTHORIZATION FROM AIR TRAFFIC CONTROL. Written authorization is not required by FAR 137.43 and 137.45. Authorization may be obtained by contacting the Air Traffic Control facility by aircraft radio, or arrangements may be made in person or by telephone for subsequent receipt of the authorization.

15. PRIOR COORDINATION WITH AIRPORT MANAGEMENT. Prior coordination, as required by FAR 137.45(a), may be accomplished orally. Written confirmation is not required.

16. AREAS OF THE AIRPORT NOT INTENDED FOR TAKEOFFS AND LANDINGS. Takeoffs or landings, when made from a ramp or taxiway, are not considered a normal operation for airplanes. However, certain areas of the ramp may be designated for use by helicopters.

17. PRIOR WRITTEN APPROVAL FROM THE APPROPRIATE OFFICIAL OR GOVERNING BODY. As referred to in FAR 137.51(b)(1), appropriate official or governing body includes the following:

a. Mayor
b. City Manager
c. Sheriff
d. Chief of Police
e. City Council
f. County Board of Supervisors
g. City Commissioner

18. NOTICE TO THE PUBLIC PRIOR TO CONDUCTING CONGESTED AREA OPERATIONS. It is suggested that notice of the intended operation be given to the public, as required by FAR 137.51(b)(2), at least 48 hours prior to starting dispensing operations.

19. PLAN OF OPERATION FOR CONGESTED AREA OPERATIONS. FAR 137.51(b)(3) requires that a plan for each complete operation must be submitted to and approved by the Federal Aviation Agency prior to conducting congested area operations. The operator should contact the General Aviation District Office which has jurisdiction over the area where the operation will be conducted relative to obtaining the required approval. To preclude any misunderstanding concerning the plan of operation, it is suggested that the operator submit his plan in writing containing such as the following:

a. An aerial photograph, large scale map, or diagram of the area to be worked appropriately marked to show all obstructions which could normally be expected to present a hazard during the operation, and areas which could be used for an emergency landing and dumping of agricultural materials.

b. The altitude(s) and airspeed(s) to be maintained during the operation.

c. The approximate dispensing rate per acre, and the name and type (solid, liquid) of material to be dispensed.

d. Date(s) and hours of the day during which dispensing operations will be conducted.

e. Coordination with Air Traffic Control.

f. Other limitations, safety or operating procedure considerations as may be required for the particular situation.

20. ACCELERATE STOP AND CLIMB PERFORMANCE. Prior to approving the conduct of operations over a congested area utilizing multiengine airplanes, the FAA inspector will require the operator to provide documentary evidence that the airplane to be used can be operated in accordance with the performance requirements specified in FAR 137.51(b)(5)(ii). Such evidence will also be required to determine compliance with FAR 137.51(b)(5)(i) if it is necessary to take off over a congested area during dispensing operations. If performance information has not previously been established for the airplane to be used, the FAA inspector may be consulted relative to making arrangements for an FAA engineering flight test to obtain the required performance data.

21. OPERATION OVER CONGESTED AREAS, LOAD JETTISONING, AND MEANS TO PREVENT INADVERTENT RELEASE OF TANK OR HOPPER. Airplanes used in operations conducted over congested areas must be equipped in accordance with the requirements specified in FAR 137.53(c)(2). It is suggested that the operator have jettisoning test data which contains information showing the aircraft is equipped to enable jettisoning at least one half the aircraft's maximum authorized load of agricultural materials within 45 seconds. If such data has not been determined, the operator should be prepared to demonstrate compliance with the jettisoning requirement by conducting an INFLIGHT load jettisoning demonstration. The aircraft demonstration will be observed by an FAA inspector who will time the discharge of material from the aircraft to determine compliance with the jettisoning requirement. Compliance with the requirement for preventing inadvertent release of the tank or hopper will normally be considered satisfactory, provided the aircraft is equipped with a device such as specified below:

a. Spring loaded cover over a pull lever.
b. "T" handle or pull rings in spring-loaded shield.
c. A push-pull device safetied with fine safety wire.
d. Other equivalent devices.

22. NOTICE OF CHANGE OF ADDRESS. FAR 137.75 requires that the operator give written advance notice of any change in address(es) of his home base of operations. It is suggested that such notice be given to the General Aviation District Office having jurisdiction over his operation, and include the date the change becomes effective.

George S. Moore
Director
Flight Standards Service

APPENDIX 1. AGRICULTURAL AIRCRAFT OPERATOR CERTIFICATION

The following are examples as they should appear on FAA Form 3873, item 2. When a business or trade name is used by an individual or a partnership, the individual or all partners shall be identified by name, followed by d/b/a (the abbreviation for doing business as) and the business or trade name used. For example:

NAME AND ADDRESS OF APPLICANT	OPERATING AS		
John J. Doe d/b/a XYZ Aerial Applicators 1760 High Road Blue Sands, Arizona	Individual	Partnership	Corporation
John J. Doe, Joe E. Smith & Edward A. Brown d/b/a Aerial Farm Service Razorback Airport Razorback, Arkansas	Individual	Partnership	Corporation
Aero Crop Dusters, Inc. Little Field Sunny, California	Individual	Partnership	Corporation
Sun Valley Aviation, Inc., d/b/a Aero Spraying Service Municipal Airport High Peak, Colorado	Individual	Partnership	Corporation

For all others, the type of organization shall be specified; e.g., "unincorporated association." The name shall consist of a listing of the officers or directors; i.e., the name of the president and secretary-treasurer, followed by d/b/a and the organization name used. For example:

NAME AND ADDRESS OF APPLICANT	OPERATING AS
John J. Doe, President Richard R. Rowe, Secretary- Treasurer d/b/a Inlet Airways Association Municipal Airport Bayside, Virginia	Other - (Specify) "Unincorporated Association"

Only one certificate will be issued to any person; however, an organization may operate under more than one business name (on a single certificate) provided the certificate, FAA Form 1603, states the name and address of the principal business office and the name and address of other business offices that are to be used. For example:

PRINCIPAL NAME AND BUSINESS OFFICE		OTHER NAME AND BUSINESS OFFICE
INDIVIDUAL		
Don V. Raynell d/b/a Gulf Sprayers P.O. Box 345 Big City, Texas	and	Lone Star Dusters Sagebrush Airport Sagebrush, Texas
PARTNERSHIP		
John J. Doe & Ernest Q. Smith d/b/a East Coast Aviation P. O. Box 444 Bay City, Alabama	and	Delta Dusting Service Municipal Airport Little Rock, Arkansas
CORPORATION		
Farmers Aero Service, Inc., d/b/a Farmers Aero Service, Inc. Short Field Jackson, Ohio	and	Buckeye Sprayers Long Field East, Ohio

The application shall be signed by an authorized officer of the "parent" organization listed in item 4 of FAA Form 3873.

If the mailing address differs from the exact location of the principal business office, item 4 of FAA Form 3873 should be completed as follows:

NAME AND BUSINESS OFFICE	MAILING ADDRESS
Joe E. Smith d/b/a Swath Aerial Service Swath Airport Bluefield, Kansas	Joe E. Smith d/b/a Swath Aerial Service P. O. Box 666 Bluefield, Kansas

The following is used, when applicable, to identify the individual signing the application, FAA Form 3873. The information shall be typed on the title line under the signature as follows:

Individual	Owner, Doro Aviation Service
Partnership	Partner, Doro Aviation Service
Corporation	President, Vice President, or Secretary-Treasurer Twin Pines Aviation Company, Inc.
Other	President or Secretary-Treasurer Inlet Airways Company

APPENDIX 2. LD_{50} INDEX OF AGRICULTURAL CHEMICALS

The agricultural chemicals in common use are in most instances toxic to man as well as to the insects and plants he is attempting to control. That group of compounds known as the organic phosphates, such as parathion, phosdrin, malathion, etc., are generally the most toxic of all pesticides. (These are derived from phosphoric acid.) Accordingly, this group will normally present the greatest potential hazard to those handling them. Nearly all pesticides can have a cumulative effect; that is, symptoms may appear after repeated mild exposures. This cumulative affect may also be referred to as chronic toxic affect.

For the information of operators engaged in handling and using economic poisons, an LD_{50} index is presented here which shows the comparative toxicity of various chemicals. LD_{50} is the symbol used to denote the number of milligrams of chemical per kilogram of body weight of laboratory animals tested (usually rats), a single dose of which killed half of the animals tested. The higher the LD_{50} value, the lower the pesticide toxicity, or the larger the figure, the safer the chemical. For example: Compound No. 1, Dimethrin, is the least toxic while No. 125, 1080-sodium fluoroacetate, is the most toxic. The list refers to acute toxicity only, chronic toxicity is not considered.

This list is not intended to be all inclusive. The figures given are the approximate dosage that will kill 50 percent of the population (LD_{50}) when fed to rats unless otherwise indicated.

COMPARATIVE INSECTICIDE, FUNGICIDE, HERBICIDE, AND RODENTICIDE TOXICITIES

Compound	Acute Oral Approx. LD_{50} Mg./Kg. (rats)
1. Dimethrin	40,000
2. Captan	15,000
3. Tedion or tetradifom	14,700 (gave no mortality)
4. piperonyl butoxide	11,500
5. ferbam	11,000
6. chlorbenside	10,000
7. perthane	8,500
8. dimethyl phthalate	8,200
9. Tabutrex	8,000
10. maneb	7,500
11. mirex	6,000
12. BHC (beta isomer)	6,000
13. methoxychlor	6,000
14. Neotran	5,800
15. piperonylcycloene	5,200
16. zineb	5,200
17. simazine	5,000 (mice)

Compound	Acute Oral Approx. LD_{50} Mg./Kg. (rats)
18. phenothiazine	5,000
19. Dithane	5,000
20. sabadilla	4,000
21. Prolan	4,000
22. ammate	3,900
23. Aramite	3,900
24. DDD or TDE	3,400
25. Pentac	3,160
26. fluorbenside	3,000
27. Dyrene	2,710
28. Phostex	2,500
29. ethyl hexanediol	2,400
30. ovex or Ovotran	2,050
31. sulfoxide	2,000
32. ronnel or Korlan	1,740
33. Thanite	1,600
34. Phygon	1,500
35. Cyprex	1,000-2,000
36. malathion	1,500
37. Genite	1,400
38. ziram	1,400
39. Sulphenone	1,400-3,650
40. fenson	1,350-1,740
41. Dilan	1,100
42. BHC (delta isomer)	1,000
43. Ruelene	950
44. chlorthion	930
45. Vapam	820
46. pyrethrins	820
47. Thiram	780
48. ryania	750
49. Karathane	714
50. chlorobenzilate	702
51. allethrin	680
52. Kelthane	575
53. Sevin or carbaryl	540
54. BHC (alpha isomer)	500
55. 2,4,D*	500
56. Dimite or DMC	500
57. dicapthon	475 (mice)
58. Dipterex or Dylox	450
59. Dibrom or naled	430
60. Bandane	396
61. nabam	395
62. chlordane	382

*non-toxic to mammals at phytotoxic dosages

	Compound	Acute Oral Approx. LD_{50} Mg./Kg. (rats)
63.	DN-111	330
64.	Bulan	330
65.	fenthion or Baytex	310
66.	red squill	300
67.	2,4,5,T*	300
68.	Zytron	270
69.	VC-13	270
70.	Strobane	250
71.	DDT	250
72.	dimethoate	245
73.	ethion (purified)	208
74.	cryolite	200
75.	sodium fluoride	200
76.	Morocide or binaparcryl	165
77.	warfarin	160
78.	Diazinon	150
79.	imidan	147
80.	rotenone	132
81.	ciodrin	125
82.	lindane (gamma BHC)	125
83.	Delnav	110
84.	Thiodan or endosulfan	110
85.	lead arsenate	100
86.	Kepone	95
87.	heptachlor	90
88.	Lethane 384	90
89.	Meta-Systox-R	85
90.	DDVP	80
91.	toxaphene	69
92.	Dimetilan	65
93.	heptachlor epoxide	61 (male rats)
94.	Co-Ral	56-230
95.	isolan	54
96.	EPN	52.9
97.	nicotine	50-60
98.	zinc phosphide	47
99.	dieldrin	46
100.	DNOSBO or Elegetol 318	40
101.	aldrin	40
102.	Trithion	30
103.	thallous sulfate	25
104.	Paris green	22
105.	calcium arsenate	20
106.	Phosphamidon	16.8
107.	strychnine	16.2
108.	methyl parathion	15.2
109.	Zectran	15-63

*non-toxic to mammals at phytotoxic dosages

	Compound	Acute Oral Approx. LD_{50} Mg./Kg. (rats)
110.	Guthion	15-25
111.	arsenic trioxide	13
112.	endrin	12.6
113.	Di-Syston	12.5
114.	demeton or Systox	12.0
115.	Bayer #25141	8.3
116.	parathion	8.3
117.	Antu	6.0
118.	Phosdrin	6.0
119.	sulfotepp	5.0
120.	Dimefox	5.0
121.	telodrin	4.8-5.5
122.	phorate or Thimet	3.7
123.	Tetram	3.0
124.	TEPP	1.6
125.	1080 or sodium fluoroacetate	1.2

APPENDIX 3. HAZARDS ASSOCIATED WITH DISPENSING SULFUR OR OTHER SOLID AGRICULTURAL MATERIALS

Sulfur Dust Fires. Sulfur dust as used in sulfur dusting is very combustible. Sulfur itself has a very low ignition point and is highly combustible when atomized with air which occurs during dusting operations. Also, due to its excellent dielectric properties, sulfur picks up electric charges readily, which, under atmospheric conditions of low relative humidity, may result in combustion. There are actual cases of sulfur igniting when thrown from a workman's shovel due to static electricity. Although such occurrences are rare, they serve as examples of how easily sulfur can be ignited. In the industrial handling of sulfur (pulverizing, grinding, etc.) every effort is made to prevent the formation of a cloud of sulfur dust because of the danger of explosion. In airplane dusting operations, however, reverse conditions exist since, generally speaking, the objective is to form a cloud of sulfur in order to distribute the insecticide widely. Obviously, the problem of fire prevention in sulfur dusting operations is more complicated than in industry.

The importance of using extreme care in sulfur dusting operations cannot be overemphasized. Typical causes of sulfur fires and representative precautions are as follows:

a. Dusting with a dirty airplane coated with oil and sulfur dust is inviting trouble. Aircraft used for spreading sulfur should be kept as clean as possible at all times.

b. The engine exhaust system should be maintained free from leaks and the best grades of lubricating oil should be used in order to decrease carbon formation.

c. Care should be exercised while loading the hopper in order to prevent foreign matter such as wire, paper, etc., from getting in the hopper. Such foreign matter may cause a spark or clog the agitator shaft and cause it to overheat, thus starting a fire.

d. Smoking in the vicinity of sulfur dust should never be permitted.

e. Fires which occur while dusting with sulfur usually occur during conditions of low relative humidity. Relative humidity is usually lowest during the late morning and early afternoon. Therefore, as a further precuation against sulfur dust fires, dusting should be done only in the early morning or late evening, preferably during the early morning.

f. The throttle should not be opened suddenly except in case of emergency. A sudden blast of exhaust frequently throws sparks from the exhaust into the dust swath.

Due to the fact that the pullup at the end of the field directs the exhaust downward toward the dust swath, it is also suggested that the hopper gate be closed prior to effecting the pullup at the end of the field to minimize the possibility of fire. This may reduce the efficiency of the dusting operations slightly, however, the pilot can always make a trip across the ends to spread dust on the parts of the field missed by closing the gate early.

g. Compartments where dust might collect should be ventilated and be free of ignition sources such as electrical circuits unless special provisions are made to prevent sparks from short circuits or other sources such as unsealed circuit breakers.

h. The hazards of dusting with sulfur must not be minimized because of previous favorable experience. Remember, it takes only one act of carelessness or inattention to cause a disastrous fire.

Sparks From the Engine Exhaust. Fires due to hot carbon sparks from the engine exhaust can, of course, be prevented by keeping the exhaust discharge and sulfur dust apart. The engine exhaust system should be so arranged that it will not discharge exhaust gases under or along the bottom of the airplane. Sulfur will ignite at a temperature of approximately 500° F, depending upon its form. The temperature of the exhaust gases from an aircraft engine is, in general, about 1500° F when discharged from the cylinder. Although the gases will cool considerably in the exhaust manifold and will cool further upon coming in contact with the outside air, potential fire hazards still exist. It is therefore desirable to place the exhaust outlet as far away from the path of the sulfur discharge as possible. The exhaust discharge should, in addition, be so directed that it will not be blown into the dust swath when a pullup is effected.

Static Electricity. All aircraft engaged in spreading sulfur dust should be completely bonded by connecting all metal parts with electrical cable and also should be provided with sharp pointed static discharge rods on each wing tip in order to provide the maximum of protection against a spark discharge. Complete bonding of an airplane will prevent differences in electrical potential between various metal parts and will thereby prevent sparks from occurring between these parts. For this reason, even though it is sometimes not possible or practical to completely bond all parts of the wings and tail surfaces, at least the fuselage aft and in the vicinity of the hopper, the struts and fittings adjacent to the hopper and the hopper itself should be bonded.

APPENDIX 4. STATEMENT OF COMPETENCY LETTER

Date (January 1, 1966)

This is to certify that (Dusty R. Swath, 789 Front Street, Razorback, Arkansas), holder of (Commercial, ATR) Airman Certificate (No. 28063), has on this date satisfactorily completed the knowledge and skill tests for an agricultural aircraft pilot as specified under Federal Aviation Regulations 137.19(e).

He is qualified to serve as pilot-in-command in agricultural aircraft operated under Agricultural Aircraft Operator Certificate No. (SW-3-1 AG), held by (Razorback Spraying Service).

Signature of Designated Chief Supervisor of Operations