

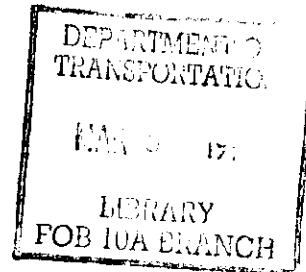
AC NO: 139.49-1

DATE: 11/12/74



ADVISORY CIRCULAR

PROGRAMS FOR TRAINING OF FIRE FIGHTING AND RESCUE PERSONNEL



**DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION**

Initiated by: AAS-720

AC NO: 139.49-1

DATE: 11/12/74



ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION

SUBJECT: PROGRAMS FOR TRAINING OF FIRE FIGHTING AND RESCUE PERSONNEL

1. **PURPOSE.** This circular outlines suggested training programs for airport fire fighting and rescue personnel. A showing by an applicant for an airport operating certificate that airport fire fighting and rescue personnel have satisfactorily completed appropriate portions of these training programs is an acceptable means, but not the only means, of showing compliance with Section 139.49(i) of Part 139 of the Federal Aviation Regulations (FAR).
 2. **SCOPE.** The circular covers two areas of training. This involves operating airport fire fighting and rescue equipment and the principles of aircraft fire fighting and rescue techniques. It includes a basic program for practical training, subjects for classroom or individual study, information on courses and safety procedures for fire training.
 3. **APPLICATION.** This guidance is intended for use by airport operators under the Airport Certification Program. It is also considered useful for other airports that maintain fire fighting and rescue services.
 4. **REFERENCES.**
 - a. FAR Part 139 - Certification and Operations: Land Airports Serving CAB-Certificated Air Carriers
 - b. AC 150/5200-12, Fire Department Responsibility in Protecting Evidence at the Scene of an Aircraft Accident
 - c. AC 150/5200-17, Emergency Plan
 - d. AC 150/5200-21, Announcing the Availability of U.S. Air Force Technical Order (T.O.) 00-105E-9, Aircraft Emergency Rescue Information
-

Initiated by: AAS-720

- e. AC 150/5210-6B, Aircraft Fire and Rescue Facilities and Extinguishing Agents
 - f. AC 150/5210-9, Airport Fire Department Operating Procedures During Periods of Low Visibility
 - g. AC 150/5210-10, Airport Fire and Rescue Equipment Building Guide
 - h. AC 150/5210-11, Response to Aircraft Emergencies
 - i. AC 150/5230-3, Fire Prevention During Aircraft Fueling Operations
 - j. AC 150/5280-1, Airport Operations Manual
5. HOW TO OBTAIN THE REFERENCED PUBLICATIONS.
- a. Additional copies of this circular and the circulars listed above may be obtained from the Department of Transportation, Utilization and Storage Section, M-443.2, Washington, DC 20590.
 - b. Copies of FAR Part 139 may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, at a cost of \$3.00 per copy plus 75¢ for foreign mailing. Check or money order should be made payable to the Superintendent of Documents. No C.O.D. orders are accepted.


BASCOM N. LOCKETT, JR.
Acting Director, Airports Service

TABLE OF CONTENTS

	<u>Page No.</u>
CHAPTER 1. INTRODUCTION	1
1. Discussion of Performance, Personnel and Methods	1
2. Phases of Training	1
CHAPTER 2. SCHEDULE	3
3. Training Schedule for Airports	3
4. Subjects for Practical Training	3
CHAPTER 3. STUDY	5
5. Subjects for Classroom or Individual Study	5
6. Elements of Subjects	5
APPENDIX 1. BIBLIOGRAPHY (2 pages)	1
APPENDIX 2. INFORMATION ON COURSES AND TRAINING (3 pages)	1
APPENDIX 3. SAFETY PROCEDURES FOR LIVE-TRAINING FIRES (1 page)	1

CHAPTER 1. INTRODUCTION

1. DISCUSSION OF PERFORMANCE, PERSONNEL AND METHODS.

- a. The provision under Section 139.49(i) of FAR Part 139 for airports to have available personnel who are familiar with the operation of equipment and understand the basic principles of fire fighting and rescue techniques, places primary emphasis on performance. The training task is, consequently, regarded as an element of performance. It is also noted that personnel for this function may be volunteers, provided through contracts with the military services or other agencies, or salaried employees of the airport itself.
- b. In considering methods of training, it is recognized that the training and education sought or achieved by career fire service personnel may differ, especially in extent, from the practices of personnel serving on a volunteer or part-time basis.
- c. The training schedule in this circular comprises a method for developing basic training programs.
- d. Other methods include the various training programs already established by some airports, state aeronautics commissions, municipalities and through military/civil arrangements, etc., though differing in detail because of scope and size of distinct career program activities, they attain a similar objective.

2. PHASES OF TRAINING. Training generally involves three phases of development, but not necessarily in sequence.a. Phases

- (1) Initial training for the inexperienced.
- (2) Proficiency training and practice in techniques.

b. Typical Means of Attainment

Through practical experience on the job, by the "delivery engineer" of manufacturers from whom equipment is purchased, or instruction by fire department training officers.

From operating equipment on the airport, practice on live-training fires locally, at fire courses held elsewhere and at military installations such as Air Force bases (Ref. App. 2, par. 3).

Phases

Typical Means of Attainment

(3) Study of the elements of fire and extinguishing agents in general as related to aviation, technological developments, career progression and professional education attainments.

Through study of various training and technical materials, fire department programs, accredited fire science technology courses and State Fire College extension service programs.

CHAPTER 2. SCHEDULE

3. TRAINING SCHEDULE FOR AIRPORTS. The schedule that follows is based on experience and concepts which indicate that: (a) some of the routine functions performed by truck crew members are essentially basic elements of training; (b) proficiency can be maintained by performing practical exercises on a scheduled, continuing basis; (c) inexperienced personnel should follow an intensive schedule until the practical training course is completed, preferably within a 3-month period; and (d) in applying these principles it has been found helpful to maintain records of the training accomplished giving due consideration to experience.

4. SUBJECTS FOR PRACTICAL TRAINING. The subjects include:

<u>Subject</u>	<u>Suggested Frequency</u>
a. Inspecting, cleaning and maintaining the aircraft fire fighting and rescue equipment by the driver/operator. This should include a "walk-around" type of inspection plus a starting/operating check for safe and effective operation.	Daily
b. Testing communications equipment, battery levels and battery charging equipment.	Daily
c. Crew familiarization training in the operation of vehicles, the fire fighting and rescue equipment.	Monthly
d. Topography training and vehicle driving exercises involving the aircraft surface maneuvering areas on the airport. This should include the use of primary and alternate routes for response, exercises during daytime, nighttime and periods of low visibility, plus checking gates in the airport fences.	Quarterly
e. Orientation training on aircraft, principally of the types operating at the airport, assisted where feasible by airline representatives. This should include aircrew evacuation methods and means for occupant escape/rescue, aircrew extraction, entrance doors, emergency exits, cargo compartment doors, emergency slides and the procedures in Air Force Technical Order 00-105E-9 pertaining to commercial aircraft.	Semiannually or more often if new aircraft become operational at the airport.

11/12/74

<u>Subject</u>	<u>Suggested Frequency</u>
f. Familiarization training between the airport fire services and municipal fire services surrounding the airport.	Semiannually
g. Individual/crew practice on live-training fires.	<u>1</u> /Semiannually
h. Drill or practice on breathing apparatus, forceable entry equipment and first aid methods.	Quarterly
i. Training for crew/vehicle response according to outline in par. 5a and 5a(4), AC 150/5210-11, with response to the midpoint of the furthest runway from the assigned post within 3, 4, or 4½ minutes, as applicable. (Experience gained by military services on the safety aspects of test exercises indicates that such tests should be prearranged with appropriate airport authorities. In this case, it is suggested that the exercises be conducted by airport management and coordinated with the fire department units involved.)	Semiannually

1/With scheduling being coordinated with the local air pollution authorities.

CHAPTER 3. STUDY

5. SUBJECTS FOR CLASSROOM OR INDIVIDUAL STUDY. This portion of the program involves the use of publications which complement the practical training program. In addition to the material referenced in this paragraph, Appendix 1, Bibliography, contains an explanation of publications which may also be useful on a selective basis.
- a. The material considered basic to this development includes FAR Part 139, the advisory circulars listed under paragraph 4, References, (including the Air Force Technical Order in 4d, Items 1 and 2 in Appendix 1, Bibliography; and
 - b. the manufacturer's operations and maintenance manuals on aircraft fire fighting and rescue vehicles.
6. ELEMENTS OF SUBJECTS. This information is arranged in a manner to assist in methodical and useful study. The elements include:
- a. Aircraft Fire Fighting and Rescue Vehicles.
 - (1) Starting and operating procedures, the fuel system and fuel level indicating devices.
 - (2) Panel controls.
 - (3) Design for acceleration, safe speeds and vehicle control characteristics.
 - (4) Braking characteristics.
 - (5) Instructions for periodic service and maintenance.
 - (6) Cooling/winterization systems.
 - (7) Lighting and electrical systems.
 - b. Fire Fighting System and Equipment.
 - (1) Fire extinguishing agent quantity indicating devices.
 - (2) Methods for checking the level/quantity of extinguishing agents.
 - (3) Controls and sequence of operating the fire extinguishing system, automatic controls and manual override mechanisms, pumps, nozzles, turrets, safety valves, bleeder valves,

flushing devices, refilling extinguishing agent tanks/cylinders, pressurization controls and the instructions for servicing and maintaining the equipment.

c. Communications Equipment.

- (1) Emergency alarm systems.
- (2) Means for transmitting/receiving messages.
- (3) Notification procedures.
- (4) Dispatching fire equipment.
- (5) Methods and communications equipment available for requesting assistance from surrounding medical services, fire departments.

d. Information on Topography.

- (1) Maps - special features concerning response, e.g., underpasses, bridge capacities.
- (2) The airport layout plan.

e. Aircraft Emergency Rescue Information.

- (1) Aircraft charts covering miscellaneous emergency procedures and equipment.
- (2) Safety procedures in aircraft ramp operations involving jet engine exhaust danger blast area and the intake danger area.
- (3) First aid kits on aircraft.

f. The Familiarization/Mutual Aid Training Program for Fire Departments.

- (1) General training arrangements.
- (2) Arrangements for disaster control between civil defense and airport authorities.
- (3) The airport emergency plan.
- (4) Overall communications procedures.

- (5) Territory involved.
- (6) Response procedures.
- g. Review of Safety Procedures in Exercises Involving Live-Training Fires.
 - (1) Fuel characteristics.
 - (2) Fuel dispensing methods.
 - (3) The use of proximity suits.
 - (4) Weather data and environmental considerations.
- h. Data on Breathing Apparatus.
 - (1) Principles of design.
 - (2) Safety features.
 - (3) Advantages, how and why they are used.
 - (4) Toxic gases and situations.
- i. Hazardous Materials Involved in Air Transportation.
 - (1) Emergency procedures explained in AC 150/5200-17 and The International Fire Service Training Association Manual, I.F.S.T.A. #206.
 - (2) Procedures for requesting radiological assistance from regional teams maintained by the Atomic Energy Commission.
- j. Review of the Basic Information on Aircraft Fire Fighting and Rescue Services including:
 - (1) Federal Aviation Regulation Part 139, involving personnel for the function, airport indexes, equipment, extinguishing agents and operations.
 - (2) The referenced FAA advisory circulars containing guidance on aircraft fire fighting and rescue services.
 - (3) The National Fire Codes, Volume 10, involving training, operating procedures, aircraft fuel servicing, testing foam vehicles and various related technical subjects pertaining to aircraft fire protection on airports.

- (4) The International Fire Service Training Association Manual #206, involving the history of aircraft fire fighting and rescue services, operating procedures on military and civil aircraft, safety procedures, extinguishing agents, tactics and pre-fire planning.

APPENDIX 1. BIBLIOGRAPHY

1. National Fire Codes (NFC) Volume 10, TRANSPORTATION, National Fire Protection Association, 470 Atlantic Avenue, Boston, Massachusetts 02210. Price: \$5.75
Contains standards and manuals on aviation, industrial trucks, marine fire protection, motor vehicles and highway fire protection. With regard to aviation, the volume contains the "400 series" standards/manuals including: 402 AIRCRAFT RESCUE PROCEDURES, 403 AIRCRAFT RESCUE SERVICES, 407 AIRCRAFT FUEL SERVICING, 410F AIRCRAFT CABIN CLEANING and 421 AIRCRAFT INTERIOR FIRE PROTECTION SYSTEMS.
2. AIRCRAFT FIRE PROTECTION AND RESCUE PROCEDURES. The international Fire Service Training Association, IFSTA #206, Fire Protection Publications, Oklahoma State University, Stillwater, Oklahoma 74074. Price: \$5.00
Supplies information pertaining to aircraft in general, methods of fire attack, rescue procedures, fire fighting and rescue equipment extinguishing agents, dangerous materials, radioactive materials, communications, pre-fire planning, training and operations.
3. Schmidt, William T., WORK BOOK for class and home study in conjunction with IFSTA #206 Manual, Indiana Vocational Technical College Book Store 1534 W. Sample Street, South Bend, Indiana 46619. Price: \$3.00
4. FIRE SERVICE TRAINING PROGRAMS, IFSTA #203, The International Fire Service Training Association, Fire Protection Publications, Oklahoma State University, Stillwater, Oklahoma 74074. Price: \$5.50
5. INTERNATIONAL CIVIL AVIATION ORGANIZATION TRAINING MANUAL, Doc. 7192-AN/857, Part 16, Aerodrome Fire Services Personnel, available from ICAO, Attention: Distribution Officer, International Aviation Building, 1080 University Street, Montreal 101, Quebec, Canada. Price: \$0.75
Issued to promote the uniform application of ICAO Standards and Recommended Practices and Procedures, to provide guidance in establishing training programs and to encourage a high standard of professional training.
6. AIRCRAFT ACCIDENT REPORTS in narrative format, issued irregularly. Copies available from: National Transportation Safety Board, Publications Branch, Washington, D.C. 20591.

7. Cohn, B.M. et al, MINIMUM NEEDS FOR AIRPORT FIRE FIGHTING AND RESCUE SERVICES, Jan. 1971, FAA Report No. AS-71-1, AD 720-512.
Presents an engineering study, made in connection with work to certify airports under the Airport and Airway Development Act of 1970. Includes information on philosophy of protection, crash fire service effectiveness, comments on survivability, escape path requirements, crash fires, fire fighting, factors affecting response time, cost information and a discussion on using part-time fire fighters. 1/
8. Salzberg, F. and Campbell, J., AIRCRAFT GROUND FIRE SUPPRESSION AND RESCUE SYSTEMS--CURRENT TECHNOLOGY REVIEW, IIT Research Institute Technical Report AGFSRS 70-1, Wright-Patterson Air Force Base, Ohio 45433, Oct. 1969, AD 703-393.
This study gives an overview of the state-of-the-art of aircraft ground fire suppression and rescue. The subjects considered include hostile characteristics of liquid fuel fire, effectiveness of agents and fire suppression equipment. 1/
9. Geyer, G.B., EVALUATION OF AIRCRAFT GROUND FIRE FIGHTING AGENTS AND TECHNIQUES, Feb. 1972, Report No. FAA-RD-71-57, AD 741-881.
Presents an analysis of aircraft crash fire fighting systems through a survey of known or newly developed extinguishing agents, and dispensing equipment. Involves laboratory studies and large-scale outdoor experiments. 1/
10. Schilder, C.B., A PROPOSED METHOD FOR EVALUATING FIRE PREVENTION EFFORTS BY THE AIRPORT MANAGER OF NON-HUB AIRPORTS, 1970, AD 739-027.
This is a research report, presented in partial fulfillment of the requirements for the Degree of Master of Engineering, Industrial Engineering Department of Texas A&M University. It proposes a self-evaluation questionnaire as a theoretical method for determining fire prevention efforts of an airport manager. 1/

1/These publications are available from the National Technical Information Service, Springfield, Virginia 22151. Price: \$3.00 each.

APPENDIX 2. INFORMATION ON COURSES AND TRAINING

1. This appendix contains a list of organizations and institutions involved in courses on fire fighting and other information on training. The courses include:
 - a. Basic Crash Rescue Classes for Crew Members and Special Classes for Airport Fire Department Officers, conducted by the American Association of Airport Executives. This involves the Great Lakes Chapter and the South Central Chapter. Inquiries should be addressed to: American Association of Airport Executives, 2029 K Street, N.W., Washington, D.C. 20006.
 - b. Accredited Aircraft Fire Protection and Rescue Procedures Training, offered by the Indiana Vocational Technical College, 1534 W. Sample Street, South Bend, Indiana, 46619, Richard M. Wysong, Dean.
 - c. Crash Rescue Courses and Seminars, under programs of the Florida State Fire College, Ocala, Florida 32670.
 - d. General fire and instructor training by the University of Maryland, Fire Service Extension Department, College of Engineering, College Park, Maryland 20742.
 - e. Crash Rescue Training Courses and Instructions, conducted jointly under the State of Montana, Department of Intergovernmental Relations, Aeronautics Division, Helena, Montana 59601. Address inquiries to: W.E. Hunt, Administrator, Montana Division of Aeronautics, Helena, Montana 59601. 1/
 - f. The Crash Rescue Training Course, accredited by the Denver Community College, conducted under the City of Denver Fire Department at the Stapleton International Airport Fire Station, 8800 Smith Road, Denver, Colorado 80207. 1/
 - g. Crash Rescue Training, conducted jointly by the South Dakota Air National Guard and the City of Sioux Falls Fire Department at Joe Foss Field, Sioux Falls, South Dakota 57104. 1/
 - h. Crash Rescue Training, conducted jointly by the Montana Air National Guard and the City of Great Falls Fire Department at Great Falls International Airport, Great Falls, Montana 59401. 1/
- 1/Assistance in coordinating and conducting training courses is being rendered by the FAA regional airport certification staffs.

- i. Training of volunteer fire fighting and rescue personnel in practical techniques, the use of equipment, the nature of aircraft fuels and aircraft familiarization. This training is performed by fire department personnel at Standiford Field under the Louisville and Jefferson County Air Board, Lee Terminal, Standiford Field, P.O. Box 21176, Louisville, Kentucky 40221.
2. Services for fire protection career development, training materials and assistance in planning, including aircraft fire fighting and rescue are available from the Metropolitan Transportation Authority, Stewart Airport Fire Protection Training School, Newburgh, New York 12550. Address inquiries to Charles Nagy, Deputy Fire Chief, Director of School.
3. In connection with mutual aid agreements, the U.S. Air Force encourages and extends the use of Air Force base training facilities to surrounding municipal fire organizations, as explained in Air Force Regulation 92-1, Fire Protection Program.
4. Provision for the training of fire fighters (including volunteers) has been included in the Vocational Education Act of 1963, Title II - Vocational Education Section 202--Public Law 92-318, Education Amendments of 1972. Programs under this Act are administered by the Department of Health, Education and Welfare. Also, there is a provision for the training of fire fighters under the Rural Development Act of 1972, Public Law 92-419 under programs administered by the Department of Agriculture.
5. At locations where facilities for conducting live-training fires are maintained, authorities on training indicate that aircraft fires should be simulated by providing a fuel burning area as suggested below, to evaluate individual/crew performance in the techniques of fire fighting:
 - a. A liquid fuel fire in a pit approximately 1,000 square feet in area, with 90 percent "knockdown" (control) of the fire within 60 seconds; or
 - b. a test fire in a pit approximately 5,000 square feet in area, controlled within 60 seconds.
6. The quantity of fuel used in live-training fire exercises can be estimated by considering factors in the examples which follow.
 - a. The burning rate of jet fuel in a free-burning condition as in a pit has been calculated at 0.546 pounds per minute per square foot; the area in this case is 1,000 square feet; and the weight

of jet fuel is 6.7 pounds per gallon. Thus, the quantity consumed in one minute can be expressed as:

$$\frac{\text{burning rate} \times \text{pit area,}}{\text{fuel weight per gallon}}$$

$$\text{or } \frac{.546 \times 1,000}{6.7} = 81 \text{ gallons, then}$$

- b. to allow for initial burning time and to conduct a test exercise prior to complete "burn out," about 0.75 lb/min/sq ft will be used and the quantity of fuel needed for the exercise will be:

$$\frac{.75 \times 1,000}{6.7} = 110 \text{ gallons.}$$

7. As a matter of information for future training plans, under Public Law 93-498, the Federal Fire Prevention and Control Act of 1974, provision is made for training in aircraft fire fighting. The Act establishes in the Department of Commerce, an agency which shall be known as the National Fire Prevention and Control Administration. In connection with training programs, a stated purpose of the Act is to "supplement existing programs of research, training, and education, and to encourage new and improved programs and activities by State and local governments."

This Act also provides for the establishment of a National Academy for Fire Prevention and Control. The purpose of the Academy shall be to advance the professional development of fire service personnel and of other persons engaged in fire prevention and control activities. Among other things, the Academy program is to include "tactical training in the specialized field of aircraft fire control and crash rescue; and the training of present and future instructors..." in this and related subjects.

APPENDIX 3. SAFETY PROCEDURES FOR LIVE-TRAINING FIRES

1. This information was developed from procedures established by military and civil training units. The procedures are based on hazards associated with free-burning liquid fuel, experience gained from accidents during fueling operations and training exercises.
2. It is therefore, advisable, prior to the actual training, to brief all of the participants. This should include assignments, the type and extent of each practice drill, methods to be used, teamwork expected and objectives.
3. Safety measures should include the following:
 - a. Providing a first aid kit and arranging for emergency medical care in case of injury.
 - b. The use of proximity suits by all participants.
 - c. The locating of all observers in a safe upwind position away from the fire.
 - d. Providing portable fire extinguishers for emergency use.
 - e. Assuring that smoking is not permitted in the vicinity of the open fuel-spill area.
 - f. Having aircraft fire fighting and rescue vehicles ready for use and crew members/students on standby prior to discharging fuel into the pits.
 - g. Using jet fuel rather than other types of fuel having lower flash points such as gasoline.
 - h. Having fueling vehicles manned at all times during the exercise and locating the vehicles upwind and remote from the fire area, after fueling operations are completed.
 - i. Planning the exercise so that a minimum quantity of fuel is used for the drills and that all of the spilled fuel is consumed at the completion of the training fires.
 - j. Assuring that all persons remain on the upwind side of the fire area during spilling, igniting and burning operations.
 - k. Assuring that all burning embers are extinguished and heated surfaces are cooled prior to refueling for further fires.