MODULE 07A

FOR B1 CERTIFICATION

MAINTENANCE PRACTICES

Aviation Maintenance Technician Certification Series

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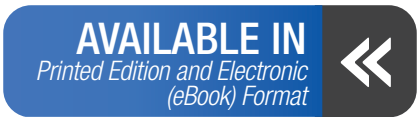

AVIATION MAINTENANCE TECHNICIAN CERTIFICATION SERIES

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WELCOME

The publishers of this Aviation Maintenance Technician Certification Series welcome you to the world of aviation maintenance. As you move towards EASA certification, you are required to gain suitable knowledge and experience in your chosen area. Qualification on basic subjects for each aircraft maintenance license category or subcategory is accomplished in accordance with the following matrix. Where applicable, subjects are indicated by an "X" in the column below the license heading.

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We wish you good luck and success in your studies and in your aviation career!

REVISION LOG

VERSION	EFFECTIVE DATE	DESCRIPTION OF CHANGE
001	2016 01	Module Creation and Release
002	2016 08	Module Revisions
003	2019 10	Refined content sequencing to Appendix 1.
003.1	2021 10	Corrected description of file types (Sub-Module 07, Pages 3.15-3.16)

Version 003 - The following content was added for clarity:

Sub-Module 01	International Fire Classification
Sub-Module 02	Tool Care
Sub-Module 06	Accuracy of Drilled Holes; Formula for Determining Bow
Sub-Module 08	Cleco Fasteners
Sub-Module 11	Types of Lubricants
Sub-Module 13	Bowden Cables
Sub-Module 14	Composite Bonding; Ultrasonic Inspection
Sub-Module 16	Example Mass And Balance Computations
Sub-Module 17	Storage Methods
Sub-Module 18	Rewrite of Non-destructive Testing Methods
Sub-Module 19	Heavy Landing Inspection Checklist

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FIRE EXTINGUISHERS

Water extinguishers are the best type to use on Class A fires. Water has two effects on fire: it deprives fire of oxygen and cools the material being burned.

Since most petroleum products float on water, water-type fire extinguishers are not recommended for Class B fires.

Extreme caution must be used when fighting electrical fires with water-type extinguishers. Not only must all electrical power be removed or shut off to the burning area, but residual electricity in capacitors, coils, and so forth must be considered to prevent severe injury and possibly death from electrical shock.

Never use water-type fire extinguishers on Class D fires. Because metals burn at extremely high temperatures, the cooling effect of water causes an explosive expansion of the metal. Water fire extinguishers are operated in a variety of ways. Some are hand pumped, while some are pressurized.

The pressurized types of extinguishers may have a gas charge stored in the container with the water, or it may contain a "soda-acid" container where acid is spilled into a container of soda inside the extinguisher. The chemical reaction of the soda and the acid causes pressure to build inside the fire extinguisher, forcing the water out.

Carbon dioxide (CO_2) extinguishers are used for Class A, B, C electrical fires, by extinguishing the fire by depriving it of oxygen. (***Figure 1-5***) Additionally, like water-type extinguishers, CO_2 cools the burning material.

Figure 1-5. Carbon dioxide fire extinguisher.

Never use CO_2 on Class D fires. As with water extinguishers, the cooling effect of CO_2 on the hot metal can cause explosive expansion of the metal.

When using CO_2 fire extinguishers, all parts of the extinguisher can become extremely cold, and remain so for a short time after operation. Wear protective equipment or take other precautions to prevent cold injury (such as frostbite) from occurring.

Extreme caution must be used when operating CO_2 fire extinguishers in closed or confined areas. Not only can the fire be deprived of oxygen, but so too can the operator.

CO_2 fire extinguishers generally use the self-expelling method of operation. This means that the CO_2 has sufficient pressure at normal operating pressure to expel itself. This pressure is held inside the container by some type of seal or frangible disk, which is broken or punctured by a firing mechanism, usually a pin. This means that once the seal or disk is broken, pressure in the container is released, and the fire extinguisher is spent, requiring replacement. (***Figure 1-6***)

Halogenated hydrocarbon extinguishers are most effective on Class B and C electrical fires. They can be used on Class A and D fires but they are less effective. Halogenated hydrocarbon, (commonly called Freon™ by the industry), are numbered according to chemical formulas with Halon™ numbers.

Carbon tetrachloride (Halon 104), chemical formula CCl_4, has a toxicity rating of 3. As such, it is extremely toxic. (***Figure 1-7***)

Hydrochloric acid vapor, chlorine and phosgene gas are produced whenever carbon tetrachloride is used on ordinary fires. The amount of phosgene gas is increased whenever carbon tetrachloride is brought in direct contact with hot metal, certain chemicals, or continuing electrical arcs. It is not approved for any fire extinguishing use. Old containers of Halon 104 found in or around shops or hangars should be disposed of in accordance with regulations and local laws and ordinances.

Extinguishing Materials	Class of Fire							
	Combustibles	Liquids/Gas	Electrical	Metals	Self-Generating	Self-Expelling	Cartridge of N_2 Cylinder	Stored Pressure
Water and Anti-Freeze	X						X	X
Soda-Acid (water)	X				X			
Wetting Agent	X						X	
Foam	X	X			X			
Loaded Stream	X	X+					X	X
Multipurpose Dry Chemical	X+	X	X				X	X
Carbon Dioxide		X+	X			X		
Dry Chemical		X	X				X	X
Bromotrifluoromethane—Halon 1301		X	X			X		
Bromochlorodifluoromethane—Halon 1211		X	X					X
Dry Powder (Metal Fires)				X			X	

+ Smaller sizes of these extinguishers are not recognized for use on these classes of fires.

Figure 1-6. Extinguisher operation and methods of expelling.

Group	Definition	Examples
6 (Least toxic)	Gases or vapors which in concentrations up to 20% by volume for durations of exposure of up to approximately 2 hours do not appear to produce injury.	Bromotrifluoromethane (Halon 1301)
5a	Gases or vapors much less toxic than Group 4 but more toxic than Group 6.	Carbon Dioxide
4	Gases or vapors which in concentrations of the order of 2 to 2½% for durations of exposure of up to approximately 2 hours are lethal or produce serious injury.	Dibromodifluormethane (Halon 1202)
3	Gases or vapors which in concentrations of the order of 2 to 2½% for durations of exposure of the order of 1 hour are lethal or produce serious injury.	Bromochloromethane (Halon 1011) Carbon Tetrachloride (Halon 104)
2	Gases or vapors which in concentrations of approximately ½ to 1% for durations of exposure of up to approximately ½ hour are lethal or produce serious injury.	Methyl Bromide (Halon 1001)

Figure 1-7. Toxicity table.

Methyl bromide (Halon 1001), chemical formula CH_3Br, is a liquefied gas with a UL toxicity rating of 2. This chemical is very toxic, it is corrosive to aluminum alloys, magnesium, and zinc. Halon 1001 is not recommended for aircraft use.

Chlorobromomethane (Halon 1011), chemical formula CH_2ClBr, is a liquefied gas with a UL toxicity rating of 3. Like methyl bromide, Halon 1011 is not recommended for aircraft use. Dibromodifluoromethane (Halon 1202), chemical formula CBr_2F_2, has a UL toxicity rating of 4. Halon 1202 is not recommended for aircraft use.

Bromochlorodifluoromethane (Halon 1211), chemical formula $CBrClF_2$, is a liquefied gas with a UL toxicity rating of 5. It is colorless, noncorrosive and evaporates rapidly, leaving no residue. It does not freeze or cause cold burns, and will not harm fabrics, metals or other materials it contacts. It acts rapidly on fires by producing a heavy blanketing mist that eliminates oxygen from the fire source. But more importantly, it interferes chemically with the combustion process of the fire. It has outstanding properties in preventing reflash after the fire has been extinguished.

Bromotrifluoromethane (Halon 1301), chemical formula CF_3Br, is also a liquefied gas with a UL toxicity rating of 6. It has all the characteristics of Halon 1211. A significant difference between the two is that Halon 1211 forms a spray similar to CO_2, while Halon 1301 has a vapor spray that is more difficult to direct.

Note: Environmental Agencies have restricted Halon to its 1986 production level due to its effect on the ozone layer. Dry powder extinguishers, while effective on Class B, C electrical fires, are the best for use on Class D fires.

The method of operation of dry powder fire extinguishers varies from gas cartridge charges, or stored pressure within the container which forces the powder charge out of the container, to tossing the powder on the fire by hand, by scooping pails or buckets of the powder from large containers or barrels.

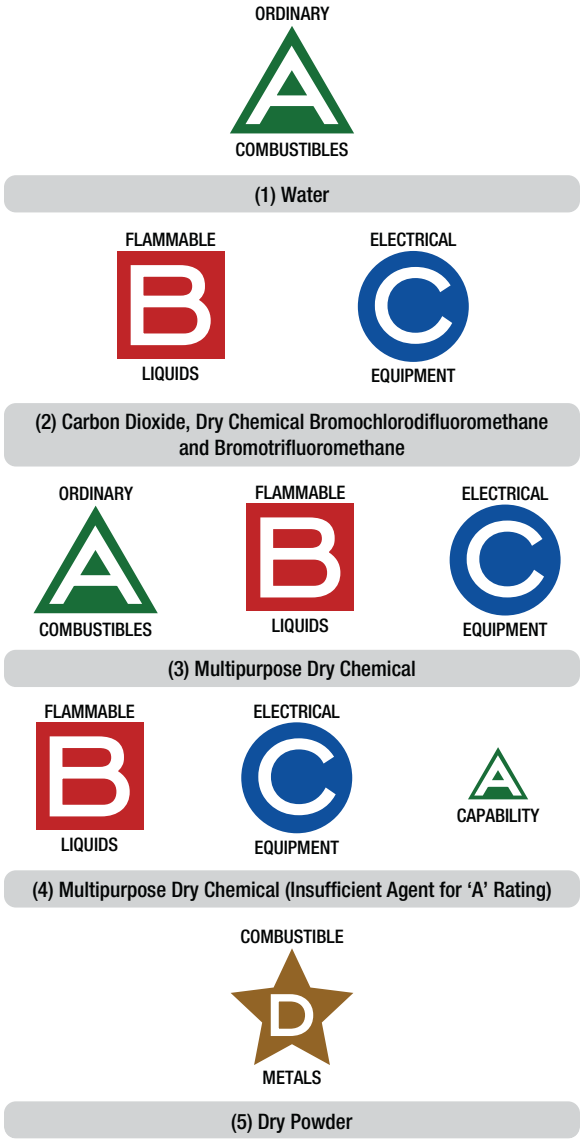

Figure 1-8. Typical extinguisher markings.

Dry powder is not recommended for aircraft use (except on metal fires as a fire extinguisher) because the leftover chemical residues and dust often make cleanup difficult, and can damage electronic or other delicate equipment.

IDENTIFYING FIRE EXTINGUISHERS

Fire extinguishers should be marked to indicate suitability for a particular class of fire. The markings on ***Figure 1-8*** should be placed on the fire extinguisher and in a conspicuous place in the vicinity of the fire extinguisher. When the location is marked, however extreme care must be taken to ensure that the fire extinguisher kept at that location is in fact the type depicted by the marking. In other words, if a location is marked for a Class B fire extinguisher, ensure that the fire extinguisher in that location is in fact suitable for Class B fires. Markings should be applied by decalcomanias (decals), painting, or similar methods. They should be legible and as durable as necessary for the location. For example, markings used outside need to be more durable than those in the hangar or office spaces.

Where markings are applied to the extinguisher, they should be located on the front of the shell (if one is installed) above or below the extinguisher nameplate. Markings should be large enough and in a form that is easily seen and identifiable by the average person with average eyesight at a distance of at least 3 feet.

Where markings are applied to wall panels, and so forth, in the vicinity of extinguishers, they should be large enough and in a form that is easily seen and identifiable by the average person with average eyesight, at a distance of at least 25 feet. (***Figure 1-9 and Figure 1-10***)

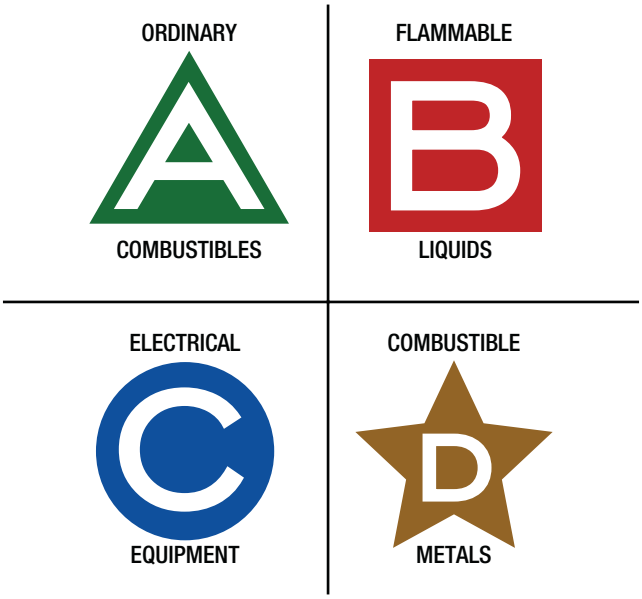

Figure 1-9. United States identification codes of fire extinguishers.

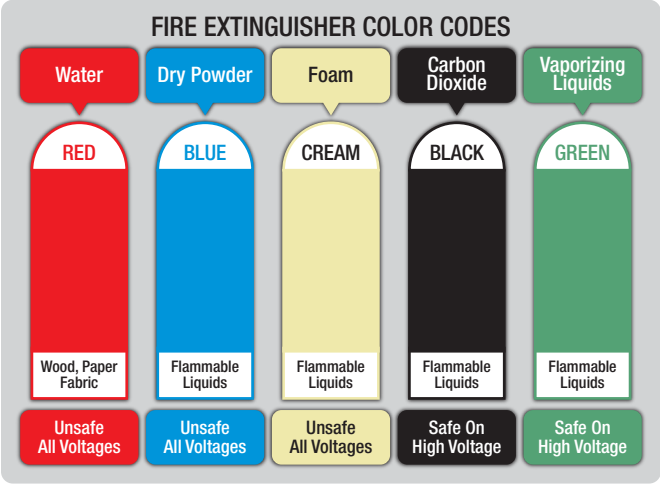

Figure 1-10. European and Australian identification codes of fire extinguishers.

INSPECTION OF FIRE EXTINGUISHERS

Fire extinguishers should be checked periodically utilizing a checklist. If a checklist is unavailable, check the following as a minimum:

- Proper location of appropriate extinguisher
- Safety seals unbroken
- All external dirt and rust removed
- Gauge or indicator in operable range
- Proper weight
- No nozzle obstruction
- No obvious damage

Airport or other local fire departments can usually help in preparing and often can provide extinguisher checklists. In addition, these fire departments can be helpful in answering questions and assisting in obtaining repairs to or replacement of fire extinguishers.

USING FIRE EXTINGUISHERS

When using a fire extinguisher, make sure you have the correct type for the fire. Most extinguishers have a pin to pull that will allow the handle to activate the agent. Stand back and aim at the base of the fire or flames. Squeeze the lever and sweep side to side until the fire is extinguished.

FLIGHT LINE SAFETY

HEARING PROTECTION

The flight line is a place of dangerous activity. Technicians who perform maintenance on the flight line must constantly be aware of what is going on around them. The noise on a flight line comes from many places. Aircraft are only one source of noise. There are auxiliary power units (APUs), fuel trucks, baggage handling equipment, and so forth. Each has its own frequency of sound. Combined all together, noises on the ramp or flight line can cause hearing loss.

There are many types of hearing protection available. Hearing protection can be external or internal. The external protection is the earmuff/headphone type. The internal type fit into the auditory canal. Both types will reduce the sound level reaching the eardrum and reduce the chances of hearing loss. Hearing protection should also be used when working with pneumatic drills, rivet guns, or other loud or noisy tools or machinery. Because of their high frequency, even short duration exposure to these sounds can cause a hearing loss. Continued exposure will cause permanent hearing loss.

FOREIGN OBJECT DAMAGE (FOD)

FOD is any damage caused by any loose object to aircraft, personnel, or equipment. These loose objects can be anything from broken runway concrete to shop towels to safety wire.

To control FOD, keep ramp and operation areas clean, have a tool control program, and provide convenient receptacles for trash, used hardware, shop towels, and other consumables.

The modern gas turbine engine will create a low pressure area in front of the engine that will cause any loose object to be drawn into the engine. The exhaust of these engines can propel loose objects great distances with enough force to damage anything that is hit. The importance of an FOD program cannot be overstressed when a technician considers the cost of engines, components, or the cost of a human life. Never leave tools or other items around the intake of a turbine engine.

SAFETY AROUND AIRPLANES

As with the previously mentioned items, it is important to be aware of propellers. Do not assume the pilot of a taxiing aircraft can see you. Technicians must stay where the pilot can see them while on the ramp area. Turbine engine intakes and exhaust can also be very hazardous areas. There should be no smoking or open flames anywhere near an aircraft in operation. Be aware of aircraft fluids that can be detrimental to skin. When operating support equipment around aircraft, be sure to allow space between it and the aircraft and secure it so it cannot roll into the aircraft. All items in the area of operating aircraft must be stowed properly.

SAFETY AROUND HELICOPTERS

Every type of helicopter has its own differences. These differences must be learned to avoid damage to the helicopter or injury to the technician. When approaching a helicopter while the blades are turning, observe the rotor head and blades to see if they are level. This will allow maximum clearance as you approach the helicopter. Observe the following:

- Approach the helicopter in view of the pilot.
- Never approach a helicopter carrying anything with a vertical height that blades could hit. This could cause blade damage and personal injury.
- Never approach a single masterhead helicopter from the rear. The tail rotor is invisible when operating.
- Never go from one side of the helicopter to the other by going around the tail. Always go around the nose of the helicopter.

When securing the rotor on helicopters with elastometric bearings, check the maintenance manual for the proper method. Using the wrong method could damage the bearings.