

# Chapter 5 - Aircraft Welding

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## **Chapter 5 - Section A**

### Study Aid Questions

#### Fill in the Blanks

1. There are 3 types of welding: \_\_\_\_\_, \_\_\_\_\_ and, \_\_\_\_\_ welding.
2. The oxy acetylene flame, with a temperature of \_\_\_\_\_ Fahrenheit is produced with a torch burning \_\_\_\_\_ and mixing it with \_\_\_\_\_.
3. Shielded metal arc welding is the most common type and often referred to as \_\_\_\_\_ welding.
4. Gas metal arc welding (GMAW) was formerly called \_\_\_\_\_.
5. When welding mild steel, stainless steel, or titanium the welder setting needs to be set to \_\_\_\_\_ . When welding aluminum and magnesium \_\_\_\_\_ must be selected.
6. Electric resistance welding, either \_\_\_\_\_ or \_\_\_\_\_ welding is typically used to join thin sheet metal components.
7. The gas used with Plasma Arc Welding is \_\_\_\_\_. The torch also uses secondary gas such as \_\_\_\_\_ or \_\_\_\_\_ that assists in shielding the puddle.
8. Argon is \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ and nontoxic.
9. The oxygen hose is \_\_\_\_\_ and has \_\_\_\_\_ threads indicated by the absence of a groove.

10. The size of the tip opening not \_\_\_\_\_ determines how much heat is applied to the work.
11. All cylinders should be stored and transported in the \_\_\_\_\_ position, especially acetylene because they contain an absorbent material saturated with \_\_\_\_\_.
12. The higher the welding tip number the \_\_\_\_\_ the hole in the tip.
13. Three flame types commonly used for welding are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
14. The oxidizing flame burns at approximately \_\_\_\_\_ °F and is produced by burning an excess of \_\_\_\_\_.
15. A \_\_\_\_\_ may be caused by touching the tip to the work, \_\_\_\_\_ the tip, by a \_\_\_\_\_ tip, or by dirt or slag in the end of the tip.
16. Turn off the flame by closing the \_\_\_\_\_ valve on the torch first. Then close the \_\_\_\_\_ valve on the torch.
17. Low \_\_\_\_\_, low \_\_\_\_\_ steels are the ferrous materials that are gas welded most frequently.
18. As in aluminum welding, \_\_\_\_\_ is needed to break down surface oxides and ensure a sound weld.
19. The principle use of \_\_\_\_\_ solder in aircraft work is in the fabrication process of high pressure \_\_\_\_\_ lines.
20. The heat control of a TIG welder may be preset by a machine setting or variable by use of a \_\_\_\_\_ or a \_\_\_\_\_ control.

21. The grinding of a Tungsten electrode used in TIG welding should be done \_\_\_\_\_,  
not \_\_\_\_\_.
22. When welding aluminum the welding machine is set to an \_\_\_\_\_ output waveform because it  
causes a \_\_\_\_\_ that breaks up \_\_\_\_\_.
23. A good indication and measure of weld quality for titanium is the weld \_\_\_\_\_. A bright  
\_\_\_\_\_ weld indicates that the shielding is satisfactory.
24. What four types of welds commonly used in flat position welding:  
  
\_\_\_\_\_  
\_\_\_\_\_
25. Stresses developed by heating and cooling during welding need to be relieved or \_\_\_\_\_  
and \_\_\_\_\_ of the sheets will occur.
26. If a partial replacement of a tube is necessary, make an \_\_\_\_\_ sleeve splice, especially  
where you want a smooth tube surface.
27. Dents at a cluster weld can be repaired by welding a \_\_\_\_\_  
over the dented area.
28. A damaged tubular section can be repaired using welded \_\_\_\_\_ reinforcements.
29. The spring-steel part of a spring-steel leave is \_\_\_\_\_ and should not  
be \_\_\_\_\_ on.
30. The preferred method to repair an engine mount member is by using a \_\_\_\_\_  
replacement tube.

TRUE or FALSE

- \_\_\_\_\_ 1. Friction stir welding is one of the most common welding techniques.
- \_\_\_\_\_ 2. Gas welding was the most common welding method for thick (over 3/16") till the 1950s.
- \_\_\_\_\_ 3. The temperature generated by SMAW is hotter than gas welding.
- \_\_\_\_\_ 4. GMAW (MIG) welding is an improvement over SMAW (stick) welding.
- \_\_\_\_\_ 5. GTAW (TIG) uses a consumable rod and a filler.
- \_\_\_\_\_ 6. Plasma cutting systems can cut aluminum and stainless steel.
- \_\_\_\_\_ 7. The acetylene pressure gauge should never be set higher than 20 psi for welding or cutting.
- \_\_\_\_\_ 8. The acetylene hose is red and has left hand threads.
- \_\_\_\_\_ 9. The flash back arrestor prevents the reverse flow of gas.
- \_\_\_\_\_ 10. A backfire is a momentary backward flow of the gases at the torch tip.
- \_\_\_\_\_ 11. Welding eyewear used for gas welding can also be used for arc welding processes.
- \_\_\_\_\_ 12. Welding tips have a number of holes and cutting tips have one hole.
- \_\_\_\_\_ 13. Open the torch oxygen valve a quarter to a half turn when lightening the torch.
- \_\_\_\_\_ 14. The neutral flame burns higher than the carburizing flame. True/false
- \_\_\_\_\_ 15. When shutting down the welding equipment the oxygen valve is closed first.
- \_\_\_\_\_ 16. For welding thick metals or heavy plate, a technique called backhand welding can be used.
- \_\_\_\_\_ 17. Maintain a slight excess of acetylene for most steels, and a neutral flame for stainless
- \_\_\_\_\_ 18. Gas welding of some aluminum alloys can be accomplished successfully.
- \_\_\_\_\_ 19. Welding magnesium is done with a slightly carburizing flame.
- \_\_\_\_\_ 20. Pure tungsten electrodes have better electron emission characteristics than Thoriated electrodes.
- \_\_\_\_\_ 21. When TIG welding aluminum the welding equipment is switched to a AC output waveform.
- \_\_\_\_\_ 22. Tig welding of titanium is performed using AC straight polarity.
- \_\_\_\_\_ 23. Expansion and contraction caused by heat during the welding process have a tendency to buckle and warp thin sheet metal sheets.
- \_\_\_\_\_ 24. Tack welding at intervals of the joint could control the expansion of the sheets that are welded.
- \_\_\_\_\_ 25. A damaged tubular section can be repaired using a formed steel patch plate.

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Chapter 5, Section A - Aircraft Welding

name: \_\_\_\_\_

**Chapter 5 - Section B**

Knowledge Application Questions

1. What is the preferred method of welding magnesium?

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2. What is a safety hazard associated with welding magnesium?

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3. What must be done in the weld zone to successfully weld titanium?

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4. Why is it necessary to use flux in all silver soldering?

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5. What type of flame is used for silver soldering?

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6. What type of repair could be made for a dented steel tube cluster joint?

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7. What method can be used to insert a tight fitting inner sleeve into a tubular repair?

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8. How is a soft flame obtained without reducing thermal output?

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9. What is the most extensively used method of welding aluminum?

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10. What valve should be turned off first when extinguishing a torch?

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11. What procedure will control expansion when welding a joint?

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12. What safety precaution should be taken when gas welding has been completed?

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13. What must be done with heat-treated aluminum alloys after a welding repair has been made?

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14. What is the result of insufficient penetration?

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15. What type of welding causes less buckling and warping than gas welding?

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16. What is gas shielded arc welding?

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17. What are some advantages of gas shielded arc welding?

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Chapter 5, Section B - Aircraft Welding

name: \_\_\_\_\_

## **Chapter 5 - Section C**

### Final Chapter Exam

1. Edge notching is generally recommended in butt welding above a certain thickness of aluminum because it:
  - a. helps hold the metal in alignment during welding
  - b. aids in the removal or penetration of oxides on the metal surface
  - c. aids in getting full penetration of the metal and prevents local distortion
  
2. Which statement concerning a welding process is true?
  - a. The inert arc welding process uses an inert gas to protect the weld zone from the atmosphere.
  - b. In the metallic arc welding process, filler material, if needed, is provided by a separate metal rod of the proper material held in the arc
  - c. In the oxyacetylene welding process, the filler rod used for steel is covered with a thin coating of flux
  
3. Where should the flux be applied when oxyacetylene welding aluminum?
  - a. Painted only on the surface to be welded
  - b. Painted on the surface to be welded and applied to the welding rod
  - c. Applied only to the welding rod
  
4. What purpose does flux serve in welding aluminum?
  - a. Removes dirt, grease, and oil
  - b. Minimizes or prevents oxidation
  - c. Ensures proper distribution of the filler rod
  
5. Why are aluminum plates 1/4 inch or more thick usually preheated before welding?
  - a. Reduces internal stresses and assures more complete penetration
  - b. Reduces welding time
  - c. Prevents corrosion and ensures proper distribution of flux
  
6. How should a welding torch flame be adjusted to weld stainless steel?
  - a. Slightly carburizing
  - b. Slightly oxidizing
  - c. Neutral
  
7. Oxides form rapidly when alloys or metals are hot. So it is important when welding aluminum to use a:
  - a. solvent
  - b. filler
  - c. flux
  
8. In gas welding, the amount of heat applied to the material being welded is controlled by the
  - a. amount of gas pressure used
  - b. size of the tip opening
  - c. distance the tip is held from the work
  
9. The shielding gases generally used in the Gas Tungsten Arc (GTA) welding of aluminum consist of
  - a. a mixture of nitrogen and carbon dioxide
  - b. nitrogen or hydrogen, or a mixture of nitrogen and hydrogen
  - c. helium or argon, or a mixture of helium and argon

10. Acetylene at a line pressure above 15 PSI is
  - a. dangerously unstable.
  - b. used when a reducing flame is necessary.
  - c. usually necessary when welding metal over 3/8-inch thick.
  
11. If too much acetylene is used in the welding of stainless steel,
  - a. a porous weld will result
  - b. the metal will absorb carbon and lose its resistance to corrosion
  - c. oxide will be formed on the base metal close to the weld
  
12. In Gas Tungsten Arc (GTA) welding, a stream of inert gas is used to:
  - a. prevent the formation of oxides in the puddle
  - b. concentrate the heat of the arc and prevent its dissipation
  - c. lower the temperature required to properly fuse the metal
  
13. When a butt welded joint is visually inspected for penetration?
  - a. the penetration should be 25 to 50 percent of the thickness of the base metal
  - b. the penetration should be 100 percent of the thickness of the base metal
  - c. look for evidence of excessive heat in the form of a very high bead
  
14. Why is it necessary to use flux in all silver soldering operations?
  - a. To chemically clean the base metal of oxide film
  - b. To prevent overheating of the base metal
  - c. To increase heat conductivity
  
15. A welding torch backfire may be caused by:
  - a. a loose tip
  - b. using too much acetylene
  - c. a tip temperature that is too cool
  
16. Which statement best describes magnesium welding?
  - a. Magnesium can be welded to other metals
  - b. Filler rod should be nickel steel
  - c. Filler rod should be the same composition as base metal
  
17. Engine mount members should preferably be repaired by using a:
  - a. larger diameter tube with fishmouth and no rosette welds
  - b. larger diameter tube with fishmouth and rosette welds
  - c. smaller diameter tube with fishmouth and rosette welds
  
18. What method of repair is recommended for a steel tube longeron dented at a cluster?
  - a. Welded split sleeve
  - b. Welded outer sleeve
  - c. Welded patch plate



19. Welding over brazed or soldered joints is:
- not permitted.
  - permissible for mild steel.
  - permissible for most metals or alloys that are not heat treated.
20. A resurfaced soldering iron cannot be used effectively until after the working face has been:
- fluxed
  - polished
  - tinned
21. In selecting a torch tip size to use in welding, the size of the tip opening determines the:
- amount of heat applied to the work
  - temperature of the flame
  - melting point of the filler metal
22. Why should a carburizing flame be avoided when welding steel?
- It removes the carbon content
  - It hardens the surface
  - A cold weld will result
23. The most important consideration(s) when selecting welding rod is:
- current setting or flame temperature
  - material compatibility
  - ambient conditions
24. A very thin and pointed tip on a soldering copper is undesirable because it will:
- transfer too much heat to the work
  - have a tendency to overheat and become brittle
  - cool too rapidly
25. Which statement is true in regard to welding heat-treated magnesium?
- The welded section does not have the strength of the original metal
  - Flux should not be used because it is very difficult to remove and is likely to cause corrosion
  - Magnesium cannot be repaired by fusion welding because of the high probability of igniting the metal