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ABSTRACT

The outline will serve as a guide to the high school student interested in the field of sheet metal work. Intended for the 12th grade level, the course is organized into three instructional blocks: (1) general repairs, (2) line maintenance, (3) brazing and soldering, followed by a posttest. The advanced course is 135 hours in length and offers instruction in sheet metal techniques in manufacturing and repairing miscellaneous parts for aircraft and shop equipment. A bibliography lists basic and supplementary reference materials and films. A posttest sample concludes the course description. (MW)

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**AUTHORIZED COURSE OF INSTRUCTION FOR THE** **QUINMESTER PROGRAM**



**INDICATED BY PUBLIC SCHOOLS**

Course Outline  
SHEET METAL WORK 3 - 9857  
(Aircraft Sheet Metal General Repairs)  
Department 48 - Quin 9857.01

**DIVISION OF INSTRUCTION • 1973**

ED 097517

D A D E C O U N T Y P U B L I C S C H O O L S  
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Department 48 - Quin 9857.01

county office of  
VOCATIONAL AND ADULT EDUCATION

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**Miami, Florida 33132**

**April, 1973**

**Published by the School Board of Dade County**

Course Description

|                          |                        |                         |   |
|--------------------------|------------------------|-------------------------|---|
| <u>9857</u>              | <u>48</u>              | <u>9857.01</u>          | <u>Aircraft Sheet Metal General Repairs</u> |
| State Category<br>Number | County Dept.<br>Number | County Course<br>Number | Course Title                                |

This is an advanced quinmester course in sheet metal techniques in manufacturing and repairing miscellaneous parts for aircraft and shop equipment. Use of brazing and soldering equipment will be included. This is a three quinmester credit course.

Indicators of Success: Prior to entry into this course, the student will display mastery of the skills indicated in 9855.01.

Clock Hours: 135

## PREFACE

The following quinmester course outline will serve as a guide to the high school student who wishes to pursue the field of sheet metal work. This is a first quinmester course for the twelfth grade.

This course outline consists of four blocks of instruction which are subdivided into several units each. The course is 135 hours in length.

Prior to entry into this course the student must display mastery of the skills indicated in Quin 9855.01.

Great emphasis will be placed on the use of visual aids, mock-ups, cutaways, transparencies, films, instructional sheets and manipulative shop practice.

This outline was developed through the cooperative efforts of the instructional and supervisory personnel, the Quinmester Advisory Committee, and the Vocational Curriculum Materials Service, and has been approved by the Dade County Vocational Curriculum Committee.

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with Suggested Hourly Breakdown

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| <b>BLOCK</b>   |      |
| I. GENERAL REPAIRS (60 Hours)                        |      |
| Repairing Miscellaneous Parts . . . . .              | 1    |
| Manufacturing and Repairing Shop Equipment . . . . . | 1    |
| Making Modification on Aircraft . . . . .            | 1    |
| II. LINE MAINTENANCE (60 Hours)                      |      |
| Making Repairs as Needed . . . . .                   | 1    |
| Interpreting Specifications . . . . .                | 1    |
| III. BRAZING AND SOLDERING (15 Hours)                |      |
| Brazing Steel Parts . . . . .                        | 2    |
| Silver Soldering . . . . .                           | 2    |
| Soft Soldering . . . . .                             | 2    |
| IV. QUINMESTER POST-TEST                             |      |
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## GOALS

The student must be able to demonstrate:

1. The skills and knowledge necessary to do aircraft sheet metal general repairs.
2. Ability to manufacture and repair shop equipment.
3. Ability to perform line maintenance aircraft general repairs.
4. Ability to refer to federal aviation administration publication and interpret their meanings.
5. Skills used for sheet metal repairs.
6. Ability to do simple brazing and soldering operations.



## SPECIFIC BLOCK OBJECTIVES

### BLOCK I - GENERAL REPAIRS

The student must be able to:

1. Demonstrate the ability to make general repairs on the aircraft.
2. Exhibit the ability required in manufacturing and repairing shop equipment.
3. Exhibit the ability required in making modification in aircraft and interpret specifications for modifications.

### BLOCK II - LINE MAINTENANCE

The student must be able to:

1. Exhibit the ability to do general repairs on the line maintenance aircrafts and equipments.
2. Exhibit the skills and knowledge to interpret specification set forth by the F.A.A. and the aircraft manufacture.

### BLOCK III - BRAZING AND SOLDERING

The student must be able to:

1. Demonstrate the ability to do simple brazing operations.
2. Demonstrate the ability to do simple soldering operations.
3. State the hazards of brazing and soldering.

### BLOCK IV - QUINMESTER POST-TEST

The student must be able to:

1. Satisfactorily complete the quinmester post-test.

## Course Outline

### SHEET METAL WORK 3 - 9857 (Aircraft Sheet Metal General Repairs)

Department 48 - Quin 9857.01

#### I. GENERAL REPAIRS

##### A. Repairing Miscellaneous Parts

1. Doors
2. Hatches
3. Wash room
4. Decking
5. Seats
6. Hinges
7. Door hatches
8. Galley
9. Brackets and fixtures
10. Cowling
11. Firewall
12. Instrument panel

##### B. Manufacturing and Repairing Shop Equipment

1. Making metal containers
  - a. Waste cans
  - b. Parts pans
  - c. Parts wash pan
  - d. Tank
2. Making metal utility items
  - a. Funnels
  - b. Tool kit boxes
  - c. Hose carts
  - d. Ladder and steps
  - e. Air ducts

##### C. Making Modification on Aircraft

1. Interpreting federal publication and specification
2. Interpreting manufacturer's manuals and specification

#### II. LINE MAINTENANCE

##### A. Making Repairs as Needed

1. Repairing flight controls
2. Repairing air frame damage
3. Repairing Nacelles and cowling
4. Repairing hulls, tanks and floats

##### B. Interpreting Specifications

1. Complying with F.A.A. requirements
2. Complying with manufacturer's recommendations and specifications

### III. BRAZING AND SOLDERING

#### A. Brazing Steel Parts

1. Preparation of material for brazing
2. Function and application of flux
3. Special techniques used in brazing
4. Use of brazing in aircraft repairs

#### B. Silver Soldering

1. Preparation of parts for silver soldering
2. Function and application of flux
3. Special techniques used in silver soldering
4. Use of silver in aircraft parts

#### C. Soft Soldering

1. Soldering copper
2. Tinning the copper
3. Types of soft solder
4. Soldering techniques
5. Post soldering treatment

### IV. QUINMESTER POST-TEST

BIBLIOGRAPHY  
(Aircraft Sheet Metal General Repairs)

Basic Reference:

None

Supplementary References:

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15. Template Layout. Glendale, California: Aero Publishers, 1942. Pp. 306.
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17. United States Naval Air Technical Training Command. Aircraft Structural Maintenance, Naupers 10308B. Washington, D.C.: United States Government Printing Office, 1969. Pp. 414.

Films:

1. Airframe Mechanic, The. 16 mm. 10 min. B/W. Sound. 1959. Jam Handy.
2. Airplane Structures. 16 mm. 45 min. B/W. Sound. 1945. Jam Handy.
3. Building PBV. 16 mm. 45 min. B/W. 1943. Consolidated Aircraft Corporation.
4. Forming Aluminum. 16 mm. 20 min. B/W. 1966. Alcoa.
5. How To Rivet Aluminum. 16 mm. 20 min. B/W. 1942. Alcoa.

A P P E N D I X

Quinmester Post-Test Sample

Name \_\_\_\_\_ Date \_\_\_\_\_ Score \_\_\_\_\_

## Multiple Choice Test Items

Each statement needs a word, a figure, or a phrase to make it correct. Only one of the choices listed is correct. Place the number of the choice you make in the space provided at the right edge of the sheet.

1. Aircraft metal work is usually called sheet metal work. What is the difference between sheet and plate? (1) Sheet can be formed by hand and plate cannot, (2) Composition of metal, (3) Depends only on where it is used, (4) Thickness only ( )
2. Fuel tanks should be constructed capable of withstanding an internal pressure of: (1) 3-1/2 psl, (2) 5 psl, (3) 2-1/2 psl, (4) 15 psl. ( )
3. In bending sheet metal it is important that, if possible, it is to be bent: (1) 180° to the grain, (2) across the grain, (3) 45° to the grain, (4) parallel to the grain. ( )
4. A sheet metal technician is to repair a damaged aircraft spar, he must do the work in accordance with the instructions contained in the: (1) repair manual for the applicable spar, (2) manufacturer's structural handbook, (3) structural repair manual for the applicable aircraft, (4) general structural repair manual. ( )
5. If you discover a crack in the web of a bulkhead, you should use the same type repair as you would use: (1) on fully stressed skin, (2) on lightning hule repairs, (3) on staingers and longerons, (4) if the web were buckled. ( )
6. The beads on a former rib serve what purpose? (1) They lighten the rib, (2) They reinforce the flange, (3) They keep the flange rigid, (4) they stiffen the web. ( )
7. Which of the following is an advantage of the use of a former rib rather than a truss or reinforced rib? (1) It is lighter, (2) It is stronger, (3) It does not require lightening holes, (4) It is more adaptable for use in larger aircraft. ( )
8. The term brazing includes all but which of the following processes? (1) Bronze welding, (2) Hard soldering, (3) Silver soldering, (4) Stainless steel welding ( )
9. For brazing a joint in metal with a melting point of 1, 87° F, you should not use brazing alloy of graze? (1) A, (2) B, (3) C, (4) D

10. In brazing, flux must be added to the: (1) hot filler rod, (2) hot base metal, (3) cold filler rod, (4) cold base metal. ( )
11. A joint should not be brazed under which of the following conditions: (1) the base metal has too high a melting point, (2) the finished joint must withstand very high temperatures, (3) the metals to be joined are not the same, (4) the metals to be joined have been heat treated. ( )
12. When brazing brass you must be very careful to prevent the required oxidizing torch flame from burning which component of the alloy: (1) tin, (2) lead, (3) zinc, (4) copper. ( )
13. The filler rod used for brazing brass should have a melting point of approximately: (1) 1,450° F, (2) 1,600° F, (3) 1,700° F, (4) 1,800° F. ( )
14. Class (3) solder used to join two sheets of 1/8" copper contains silver, copper, and: (1) zinc, (2) nickel, (3) phosphorus, (4) cadmium. ( )
15. When the flux becomes liquid, the solder will flow when its temperature has been raised an additional: (1) 100° F, (2) 200° F, (3) 270° F, (4) 300° F. ( )
16. In a lap joint, for strength equal to that of the base metal in the heater zone, the amount of lap should be: (1) 2 to 4 times the metal thickness, (2) 3 to 5 times the metal thickness, (3) 4 to 6 times the metal thickness, (4) all of the above. ( )
17. Which type of torch flame is preferred for silver soldering: (1) soft neutral, (2) harsh neutral, (3) soft carburizing, (4) harsh carburizing. ( )
18. If an electrical connection that has been sealed with soft solder is accidentally placed under steady tension, the solder is likely to: (1) increase the electrical resistance of the circuit, (b) melt after a long period of use, (3) strengthen the connection and prevent failure, (4) yield and produce failure. ( )
19. Before being used, a soldering copper must be tinned in order to: (1) reshape the point, (2) sharpen the surface of the point, (3) place a thin film of solder over the entire surface of the point, (4) place a thin film of oxide on the surface of the point. ( )
20. Why is resin flux commonly used for soldering electrical connections: (1) to prevent corrosion caused by residual traces of flux, (2) to prevent contamination of the soldering iron, (3) to dissolve oxides from the solder and the work, (4) to harden the solder and prevent breakage.



21. The process whereby two surfaces that have been previously tinned are joined and heated, causing the solder to run together and form a joint is called: (1) hard soldering, (2) dual soldering, (3) sweating, (4) dual tinning. ( )
22. How should you remove the flux from copper alloy that has been soft soldered? (1) Sandblast it lightly, (2) Boil it in caustic soda solution, (3) Rinse it thoroughly with fresh, cold water, (4) Place it in a solution of sulfuric acid, sodium bichromate, and water. ( )
23. Which of the following mixtures will restore the original color to the copper? (1) Sulfuric acid, nitric acid, hydrochloric acid and water, (2) Sulfuric acid, nitric acid, sodium bichromate and water, (3) Sulfuric acid, sodium bichromate and water, (4) Caustic soda and water ( )
24. You are using 1/8 inch rivets on a metal surface patch and using a single row pattern. What is the minimum acceptable overlap of the patch: (1) 3/4 inch, (2) 1 inch, (3) 1/2 inch, (4) 7/8 inch. ( )
25. When repairing a tear in stressed skin, the major consideration of the repair is: (1) to use material one size thicker, (2) the shear strength of the material, (3) to use the same rivet spacing as the nearby riveting, (4) to use one size larger rivet.
26. Bending a piece of metal until it almost reaches the breaking point is its: (1) minimum bend radius, (2) maximum bend radius, (3) maximum bend allowance, (4) minimum bend allowance. ( )
27. How many AN 470 ad-4-6- rivets will be required to attach a 10" x 5" splice plate if you use a single row pattern, minimum edge distance and 4d spacing? (1) 60 rivets, (2) 56 rivets, (3) 62 rivets, (4) 52 rivets ( )
28. You plan to use 1/8 inch diameter universal rivets to rivet together two pieces of .0625" thickness material. What should be the minimum length of the rivet? (1) 5/16 inch, (2) 1/4 inch, (3) 1/8 inch, (4) 7/16 inch ( )
29. A.D. notes are mandatory airworthiness directives set forth by whom? (1) Manufacturer's manuals, (2) F.A.R Part #39, (3) F.A.R. aircraft listing, (4) Manufacturer's service bulletins
30. "ALCLAD" aluminum is: (1) pure aluminum coated with an aluminum, (2) aluminum alloy coated with pure aluminum, (3) pure aluminum, (4) aluminum alloy only ( )
31. Which of the following documents has now replaced the old Aircraft Specification? (1) aircraft operations manual, (2) F.A.A. air directives, (3) aircraft inspection and repair, (4) type certificate data sheets ( )

32. If an assembly is to be heat treated and joined by riveting, when should the riveting operations be done? (1) Before heat treatment, (2) during the heat treatment process, (3) after heat treatment, (4) rivet partially then heat treat ( )
33. Brazing is different from welding in that: (1) welding you use a torch and brazing you use an iron, (2) welding you use flux and brazing doesn't use flux, (3) brazing melts the base metal, welding does not, (4) welding melts the base metal, brazing does not. ( )

ANSWER KEY TO QUINMESTER POST-TEST

- |         |         |
|---------|---------|
| 1. (4)  | 18. (4) |
| 2. (1)  | 19. (4) |
| 3. (2)  | 20. (1) |
| 4. (3)  | 21. (3) |
| 5. (1)  | 22. (4) |
| 6. (4)  | 23. (1) |
| 7. (1)  | 24. (3) |
| 8. (4)  | 25. (3) |
| 9. (4)  | 26. (1) |
| 10. (1) | 27. (2) |
| 11. (2) | 28. (1) |
| 12. (3) | 29. (2) |
| 13. (2) | 30. (2) |
| 14. (1) | 31. (4) |
| 15. (4) | 32. (3) |
| 16. (3) | 33. (4) |
| 17. (1) |         |