

AIRFRAME & POWERPLANT MECHANICS

POWERPLANT WORKBOOK

Written, Oral, and Practical

ALIGNS WITH

FAA-H-8083-32B & FAA-H-8083-32B-ATB

Airframe & Powerplant Mechanics Powerplant Handbook

by Thomas Wild



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PREFACE

This Student Workbook is designed as a companion to the Aviation Maintenance Mechanics Powerplant Handbook FAA-H-8083-32 and FAA-H-8083-32B-ATB. Each chapter of this workbook matches the equivalent chapter in the Handbook and contains study questions, exercises, and a final exam for that chapter. Each is designed to enhance your understanding of the material in the textbook and to better prepare you for success with your actual FAA written exams and later in your career as a professional aviation maintenance technician.

Each chapter of this Workbook is presented in 3 parts:

1. Study Aid Questions are fill in the blank, multiple choice, true or false, or matching formats designed to reinforce the most important concepts presented in the Handbook.
2. Knowledge Application Questions; giving you an opportunity to actually use the material presented in each chapter to solve common problems.
3. Final Chapter Exam, in multiple choice format designed to further reinforce your study skills and to be used by instructors as end of chapter exam and as an evaluation of your progress.

The answers to Sections A&B questions may be found in the back of this workbook and can so be used by students as a part of your personal study habits. The answers to Section C - Final Chapter Exams, are available only to instructors as part of the instructor support package for the H-8083 textbook series, thus preserving the value of the exam as a valid instructional tool.

Each page in this book is perforated allowing students to tear out and turn in assigned sections which may be given as homework or in-class exercises.

For further information about this Workbook, its corresponding Textbook, or to order additional copies in print or electronic format, please contact Aircraft Technical Book Company at (970) 726-5111, or email to orders@actechbooks.com, or visit our web site at www.actechbooks.com.

TABLE OF CONTENTS

Chapter 1	Aircraft Engines	1
Chapter 2	Engine and Fuel Metering Systems	9
Chapter 3	Induction and Exhaust Systems	19
Chapter 4	Ignition and Electrical Systems	29
Chapter 5	Starting Systems	39
Chapter 6	Engine Lubrication	49
Chapter 7	Propellers	57
Chapter 8	Engine Removal and Replacement	67
Chapter 9	Engine Fire Protection Systems	77
Chapter 10	Reciprocating Engine Maintenance Operation	87
Chapter 11	Light Sport Aircraft Engines	97
Answers	Section A and B Answers	107

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Section A

Study Aid Questions - Fill In The Blanks

1. _____ is the principal fluid used for propulsion in every type of aircraft powerplant except the _____.
2. Specific fuel consumption for gas turbines is the _____ measured in _____ / _____ divided by (lbs.); and for reciprocating engines it is the fuel flow (lbs./hr.) divided by _____.
3. The foundation of an engine is the _____.
4. _____ in an engine not only results in fatigue failure of the metal structures, but also causes the moving parts to _____.
5. The purpose of the _____ rings are to prevent the escape of combustion gases past the piston during engine operation.
6. What are the three major types of propeller shafts?
_____, _____, _____.
7. The physicist defines work as; work is _____ times _____.
8. _____ can be considered as the result of the engine and the propeller working together.
9. A significant feature of gas turbine engines is that separate sections are devoted to each _____ and all functions are performed _____ without interruption.
10. The Indicated Mean Effective Pressure (IMEP), is the _____ produced in the _____ during the operating cycle and is an expression of the theoretical, frictionless power known as _____.
11. Volumetric efficiency is a ratio expressed in terms of _____.
12. Volumetric efficiency is a comparison of the volume of fuel/air charge (corrected for temperature and pressure), inducted into the _____ to the _____.
13. The standard sea level temperature is _____ or _____. At this temperature the pressure of one atmosphere is _____ lbs/sq-inch. This pressure will support a column of mercury _____ inches high.
14. Four types of gas turbine engines are used to propel and power aircraft, are
_____, _____, _____, _____.
15. The two principal types of compressors currently being used in gas turbine aircraft engines are
_____, _____.

AIRCRAFT ENGINES

Section A True or False

- _____ 1. The centrifugal-flow compressor consists basically of an impeller (rotor), a diffuser (stator), and a compressor manifold.
- _____ 2. The centrifugal-flow compressor has two main elements, a rotor and a stator.
- _____ 3. The diffuser is the divergent section of the engine after the compressor and before the combustion section.
- _____ 4. The combustion section houses the combustion process, which raises the temperature of the air passing through the engine.
- _____ 5. The primary function of the combustion section is to burn the fuel/air mixture, thereby removing heat energy from the air and transferring it to the engine.
- _____ 6. A very important requirement in the construction of combustion chambers is providing the means for draining unburned fuel which prevents gum deposits in the fuel manifold, nozzles, and combustion chambers.
- _____ 7. The turbine transforms a portion of the kinetic (velocity) energy of the exhaust gases into mechanical energy to drive the gas generator compressor and accessories.
- _____ 8. After the combustion chamber has introduced the heat energy into the mass airflow and delivered it evenly to the turbine inlet nozzles, it becomes the job of the nozzles to prepare the mass air flow for driving the compressor rotor.
- _____ 9. The turbine wheel is a dynamically balanced unit consisting of blades attached to a rotating disk.
- _____ 10. Many turbine blades are cast as a single crystal which gives the blades better strength and heat properties.
- _____ 11. A turbine stage consists of a row of stationary vanes or nozzles, followed by a row of rotating blades.
- _____ 12. The minimum number of bearings required to support one shaft is two deep groove ball bearing (thrust and radial loads) and four straight roller bearing (radial load only).

Section A Matching

Which of the following components are associated with a Reciprocating Engine Cylinder. Answers can be in any order.

- | | | | |
|-------------------|---------------------|---------------|------------------|
| A. Exhaust Valve | E. Camshaft | I. Push Rods | M. Valve Springs |
| B. Connecting Rod | F. Intake Valve | J. Piston | N. Valve Guides |
| C. Crankshaft | G. Rocker Arm Shaft | K. Crankcase | O. Turbine |
| D. Valve Seats | H. Rocker Arm | L. Compressor | |

- | | | | | |
|----------|----------|----------|----------|-----------|
| 1. _____ | 3. _____ | 5. _____ | 7. _____ | 9. _____ |
| 2. _____ | 4. _____ | 6. _____ | 8. _____ | 10. _____ |

Section B

Knowledge Application Questions

1. Aircraft using propellers create thrust by?
2. What is the purpose of the piston compression rings?
3. Describe an opposed type of reciprocating engine.
4. Explain the operation of hydraulic valve lifters/tappets.
5. What is the formula for calculating indicated horsepower?
6. List the typical sections that a gas turbine engines consist of.
7. What is the formula for determining force or thrust developed by a gas turbine engine?
8. Describe thermal efficiency.
9. What methods are used with turbine blades and inlet guide vanes to increase the exhaust temperatures entering the turbine section of the engine?
10. Describe centrifugal-flow compressor components, pressure rise, and limits.

Chapter 1, Section B - Aircraft Engines

Name: _____

Date: _____