



AVIATION HIGH SCHOOL

Learn Science, Technology, Engineering,
and Math through an exciting introduction
to the aviation industry

STUDENT NOTEBOOK

Brittany D. Hagen, Sarah K. Anderson, Leslie M. Martin, and Paul R. Snyder



AVIATION SUPPLIES & ACADEMICS, INC.
NEWCASTLE, WASHINGTON

Brittany D. Hagen
Sarah K. Anderson
Leslie M. Martin
Paul R. Snyder

AVIATION HIGH SCHOOL

Learn Science, Technology, Engineering,
and Math through an exciting introduction
to the aviation industry

STUDENT NOTEBOOK

Aviation High School Student Notebook: Learn Science, Technology, Engineering, and Math through an exciting introduction to the aviation industry

by Brittany D. Hagen, Sarah K. Anderson, Leslie M. Martin, and Paul R. Snyder

AVIATION SUPPLIES & ACADEMICS, INC.
7005 132nd Place SE
Newcastle, Washington 98059
asa@asa2fly.com | 425-235-1500 | asa2fly.com

Copyright © 2021 Aviation Supplies & Academics, Inc.

All Rights Reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopy, recording, or otherwise, without the prior written permission of the copyright holder. While every precaution has been taken in the preparation of this book, the publisher and Brittany D. Hagen, Sarah K. Anderson, Leslie M. Martin, and Paul R. Snyder assume no responsibility for damages resulting from the use of the information contained herein.

None of the material in this book supersedes any operational documents or procedures issued by the Federal Aviation Administration, aircraft and avionics manufacturers, flight schools, or the operators of aircraft.

ASA-AVHS-SN

ISBN 978-1-61954-932-6

Additional formats available:

eBook PDF ISBN 978-1-61954-935-7

eBook EPUB ISBN 978-1-61954-933-3

eBundle ISBN 978-1-61954-936-4 (print + eBook PDF download code)

Printed in the United States of America

2025 2024 2023 2022 2021 9 8 7 6 5 4 3 2 1

Cover images—Top: iStock.com/yongyuan. Bottom row (left to right): iStock.com/Jetlinerimages; iStock.com/Jetlinerimages; Pixabay; iStock.com/Dushlik; Mr. teerapon tiuekhom/Shutterstock.com.

Charts and other excerpts from the Piper Archer III PA-28-181 Pilot's Operating Handbook, report VB-1563 and VB-2749, are courtesy Piper Aircraft, Inc., and are for illustrative purposes only.

Library of Congress Cataloging-in-Publication Data:

Names: Anderson, Sarah K. (Sarah Katherine), author. | Martin, Leslie M., author. | Snyder, Paul R., author. | Hagen, Brittany D. (Brittany Dawn), author.

Title: Aviation high school student notebook : learn science, technology, engineering and math through an exciting introduction to the aviation industry / by Sarah K. Anderson, Leslie M. Martin, Paul R. Snyder, Dr., Brittany D. Hagen.

Description: Newcastle, Washington : Aviation Supplies & Academics, Inc., [2021] | Audience: Ages 14 - 18 | Audience: Grades 10-12

Identifiers: LCCN 2019055351 | ISBN 9781619549326 (trade paperback) | ISBN 9781619549333 (ebook) | ISBN 9781619549357 (pdf) | ISBN 9781619549364 (eBundle)

Subjects: LCSH: Aeronautics—Study and teaching (Secondary)—United States—Notebooks, sketchbooks, etc. | Airplanes—Piloting—Study and teaching (Secondary)—United States—Notebooks, sketchbooks, etc. | LCGFT: Notebooks.

Classification: LCC TL560.1 .A736 2021 | DDC 629.130071/273—dc23

LC record available at <https://lccn.loc.gov/2019055351>

CONTENTS

CHAPTER 1: AVIATION TRAINING REQUIREMENTS 1

- Lesson 1: Pilot Certificates and Ratings 3
- Lesson 2: Training Programs 8
- Lesson 3: Aviation Medicals 11
- Lesson 4: Aviation Organizations 16
- Lesson 5: Review: Aviation Training Requirements 18
- Lesson 6: Chapter 1 Exam 19

CHAPTER 2: AIRCRAFT BASICS 21

- Lesson 1: Parts of an Airplane 23
- Lesson 2: Aircraft Flight Instruments 30
- Lesson 3: Fundamental Maneuvers 33
- Lesson 4: Normal Takeoffs and Landings 36
- Lesson 5: Traffic Patterns 39
- Lesson 6: Helicopter Basics 42
- Lesson 7: Review: Aircraft Basics 43
- Lesson 8: Chapter 2 Exam 44

CHAPTER 3: AIRPORT OPERATIONS 47

- Lesson 1: Introduction to Airports 49
- Lesson 2: Airports 52
- Lesson 3: Marking and Signage 55
- Lesson 4: Airport Lighting 62
- Lesson 5: Guest Speaker—Operations 65
- Lessons 6 & 7: Airport Design Project—Introductory and Work Days 67
- Lesson 8: Airport Design Project—Presentations 73
- Lesson 9: Airport Operations Review Study Guide 77
- Lesson 10: Review: Airport Operations 82
- Lesson 11: Chapter 3 Exam 83

CHAPTER 4: WEIGHT & BALANCE and PERFORMANCE 85

- Lesson 1: Weight and Balance Introduction 87
- Lesson 2: Weight and Balance Computation 89
- Lesson 3: Current Event 96
- Lesson 4: Performance Introduction 99
- Lesson 5: Enroute, Climb, and Descent Performance Charts 108
- Lesson 6: Range, Endurance, and Glide Charts 119
- Lesson 7: Guest Speaker: Aviation Professional 125
- Lessons 8 & 9: Review: Weight & Balance and Performance 126
- Lesson 10: Chapter 4 Exam 128

CHAPTER 5: COMMUNICATION 129

- Lesson 1: Air Traffic Control History 131
- Lesson 2: Effective Communication 133
- Lesson 3: Air Traffic Control Jobs 135
- Lesson 4: Air Traffic Control Field Trip 137
- Lesson 5: Radio Transmissions 138
- Lesson 6: Air Traffic Control Simulation 140
- Lesson 7: Current Events in Air Traffic Control 141
- Lessons 8, 9, & 10: Air Traffic Management Group Research Project 142
- Lesson 11: Review: Communication 144
- Lesson 12: Chapter 5 Exam 145

CHAPTER 6: PEOPLE, EVENTS, and TRENDS in AVIATION 147

- Lesson 1: Aviation Pioneers 149
- Lesson 2: Aviation History—World War I through the Golden Age 153
- Lesson 3: Aviation History—World War II, the Cold War, and the Jet Age to Today 160
- Lesson 4: Famous People in Aviation—Introduction 165
- Lesson 5: Famous People in Aviation—FakeBook 167
- Lessons 6 & 7: Famous People in Aviation—Research Paper Workshop 169
- Lesson 12: Chapter 6 Exam 172

CHAPTER 7: AVIATION CAREERS 175

- Lesson 1: Career Article and Introduction 177
- Lesson 2: Career Investigation/Education & Training (Day 1) 179
- Lesson 3: Career Investigation/Education & Training (Day 2) 185
- Lesson 4: Career Investigation/Education & Training (Day 3) 187
- Lesson 5: Current Events 189

Lesson 6: University, Community College, and Training Options 193
Lessons 7 & 8: Scholarship Applications 198
Lesson 9: Guest Speaker 200

CHAPTER 8: AERODYNAMICS of FLIGHT 201

Lesson 1: Forces of Flight 203
Lesson 2: Introduction to Airfoils 206
Lesson 3: Lift—Newton and Bernoulli 209
Lesson 4: Drag and Design 212
Lesson 5: Stalls and Spins 215
Lesson 6: Review—Aerodynamics of Flight 217
Lesson 7: Chapter 8 Exam 222

CHAPTER 9: AIRCRAFT SYSTEMS 225

Lesson 1: Introduction to Aircraft Systems 227
Lesson 2: Engine 231
Lesson 3: Fuel Systems 233
Lesson 4: Flight Instruments Review 237
Lesson 5: Vacuum and Electrical Systems 239
Lesson 6: Review: Aircraft Systems 243
Lesson 7: Chapter 9 Exam 247

CHAPTER 10: FLIGHT MANEUVERS 249

Lesson 1: Fundamental Maneuvers: Straight-and-Level Flight, Climbs, Descents, Turns 251
Lesson 2: Normal Takeoffs and Normal Landings 253
Lesson 3: Short-Field Takeoff and Landing 255
Lesson 4: Soft-Field Takeoff and Landing 257
Lesson 5: Stalls: Power-On and Power-Off 259
Lesson 6: Steep Turns 262
Lesson 7: Flight by Reference to Instruments 263

CHAPTER 11: AIRSPACE 265

Lesson 1: Introduction to Airspace: Controlled vs. Uncontrolled 267
Lesson 2: Class C, D, and E Airspace 269
Lesson 3: Uncontrolled Airspace: Class G 271
Lesson 4: Special Use and Other Airspace 274
Lesson 5: Review: Airspace 280
Lesson 6: Chapter 11 Exam 285

CHAPTER 12: WEATHER 287

- Lesson 1: Weather Theory (Day 1) 289
- Lesson 2: Weather Theory (Day 2) 292
- Lesson 3: Weather Products: METAR 295
- Lesson 4: Weather Products: TAF 301
- Lesson 5: Weather Products: AIRMETs and SIGMETs 306
- Lesson 6: Weather-Related Decision Making 315
- Lesson 7: Review: Weather 319
- Lesson 8: Chapter 12 Exam 320

CHAPTER 13: AEROMEDICAL FACTORS 323

- Lesson 1: IMSAFE Checklist 325
- Lesson 2: Hypoxia and Hyperventilation 326
- Lesson 3: Other Aeromedical Factors 328
- Lesson 4: Visual Illusions 330
- Lesson 5: Night Flight 334
- Lesson 6: Review: Aeromedical Factors 337
- Lesson 7: Chapter 13 Exam 339

CHAPTER 14: NAVIGATION and CROSS-COUNTRY FLIGHT PLANNING 341

- Lesson 1: E6B Introduction 343
- Lesson 2: Considerations for Planning a Cross-Country 345
- Lesson 3: Introduction to Navigation and Using Pilotage 348
- Lesson 4: Dead Reckoning 351
- Lesson 5: Radio Navigation 354
- Lesson 6: Cross-Country Planning 356
- Lesson 7: Cross-Country Scenario 360

CHAPTER 8

AERODYNAMICS OF FLIGHT

CONTENTS

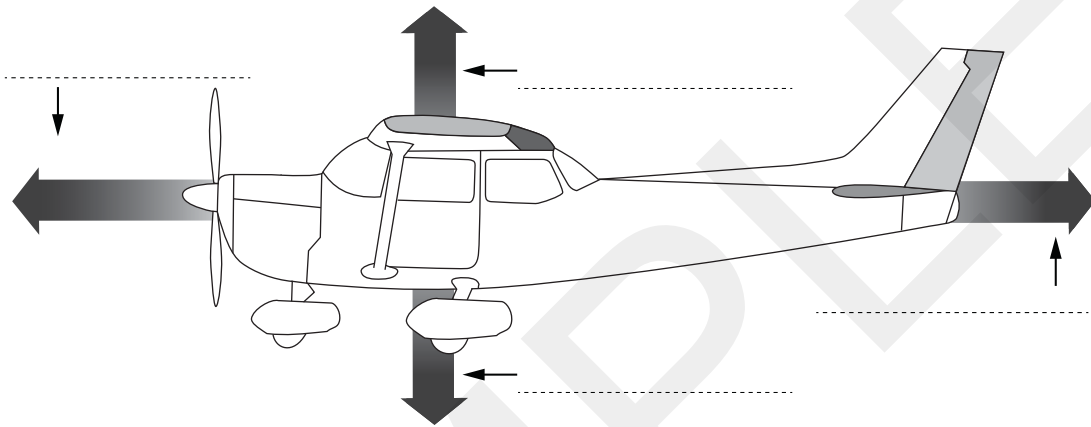
Check off each activity upon completion.

Lesson 1	Forces of Flight	
	Activity 1: The Four Forces	<input type="checkbox"/>
	Activity 2: Aerodynamics Graphic Organizer	<input type="checkbox"/>
	Activity 3: Home Group Questions	<input type="checkbox"/>
	Activity 4: Acrostic	<input type="checkbox"/>
Lesson 2	Introduction to Airfoils	
	Activity 1: Airfoil Definitions	<input type="checkbox"/>
	Activity 2: Labeling Airfoil Parts	<input type="checkbox"/>
	Activity 3: Wing Experiment Questions	<input type="checkbox"/>
Lesson 3	Lift—Newton & Bernoulli	
	Activity 1: Label Diagrams	<input type="checkbox"/>
	Activity 2: Comprehension Questions Homework	<input type="checkbox"/>
Lesson 4	Drag and Design	
	Activity 1: Semi-Truck Comparison	<input type="checkbox"/>
	Activity 2: Three-Column Organizer	<input type="checkbox"/>
	Activity 3: Interactive Lecture Diagram and Notes	<input type="checkbox"/>
Lesson 5	Stalls and Spins	
	Activity 1: Stalls Outline Table	<input type="checkbox"/>
	Activity 2: Spins Outline Table	<input type="checkbox"/>
Lesson 6	Review: Aerodynamics of Flight	
	Activity 1: Study Guide	<input type="checkbox"/>
Lesson 7	Chapter 8 Exam	
	Activity 1: Article Response and Rubric	<input type="checkbox"/>

LESSON 1

FORCES OF FLIGHT

ACTIVITY 1: The Four Forces



► Relationship of forces acting on an aircraft.

ACTIVITY 2: Aerodynamics Graphic Organizer

	What is it? (definition)	Important terms to know	How does it work?	Factors that impact it
Thrust				
Lift				
Drag				
Weight				

ACTIVITY 3: Home Group Questions

In your home group, answer the following questions.

1. What are the four forces that act on an aircraft?

2. What are three things that determine the weight of an airplane?

3. What are two things that determine the thrust of an airplane?

4. A high thrust-to-weight ratio means that the aircraft will have high _____
and a high _____.

5. Write a few sentences summarizing this activity and what you learned from it.

ACTIVITY 4: Acrostic

Write an acrostic based on one of the four forces: lift, weight, thrust, or drag.

LESSON 2

INTRODUCTION TO AIRFOILS

ACTIVITY 1: Airfoil Definitions

Define the following terms by looking them up in the *Pilot's Handbook of Aeronautical Knowledge* Chapter 5.

Leading edge: _____

Trailing edge: _____

Chord line: _____

Camber: _____

Angle of attack: _____

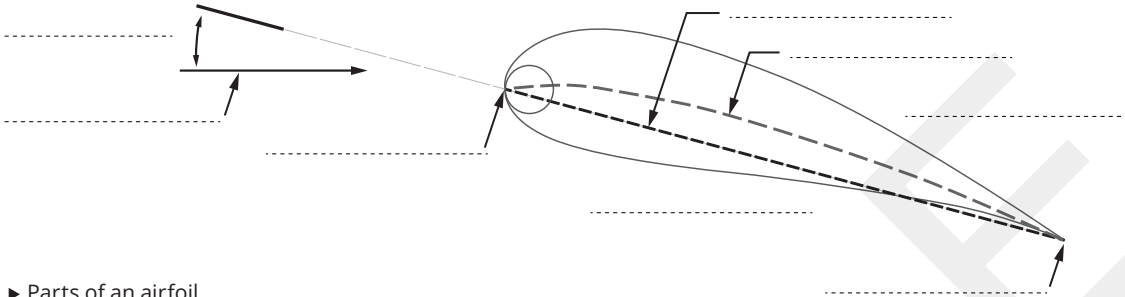
Relative wind: _____

High-pressure area: _____

Low-pressure area: _____

ACTIVITY 2: Labeling Airfoil Parts

In the drawing below, label the following parts of the airfoil: leading edge, trailing edge, chord line, camber, angle of attack, relative wind, high-pressure area, and low-pressure area.



► Parts of an airfoil.

ACTIVITY 3: Wing Experiment Questions

Directions: Cut your paper to create two pieces that are each 4 by 5 inches. Keep one piece of paper flat and form a slight arch, loop, or hill on top with the other. Tape the two pieces together.

1. Draw what your wing looks like.
2. How does it react when you blow over the top of the wing?

3. How does it react when you blow across the bottom of the wing?

4. Why is there a difference?

Create another wing with a different camber.

5. Draw what your wing looks like.

6. How does it react when you blow over the top of the wing?

7. Which wing performed better?

a. Why?

AVIATION HIGH SCHOOL

STUDENT NOTEBOOK

Brittany D. Hagen, Sarah K. Anderson, Leslie M. Martin, and Paul R. Snyder

This interactive *Aviation High School Student Notebook* addresses a growing need for future-ready competencies in aviation and provides an exciting and engaging context to learn Science, Technology, Engineering, and Math (STEM). You will be introduced to the innovative field of aviation, study the fundamentals of flight, and explore the various career opportunities available within the aviation industry.

Develop skills to pursue a career in the aviation and aerospace industry or gain knowledge you can apply to numerous other STEM fields. This *Student Notebook* will introduce you to 14 essential aviation topics divided into chapters:

- Aviation Training
- Aircraft Basics
- Airport Operations
- Aircraft Weight & Balance and Performance
- Aviation Communications
- People, Events, and Trends in Aviation
- Careers in Aviation
- Aerodynamics of Flight
- Aircraft Systems
- Flight Maneuvers
- Airspace
- Weather
- Aeromedical Factors
- Navigation and Flight Planning

Increase your understanding of key aeronautical concepts through a variety of daily activities as well as demonstrations using flight simulators and drones.



Aviation Supplies & Academics, Inc.
7005 132nd Place SE
Newcastle, Washington 98059 USA
425-235-1500 | asa2fly.com
ASA-AVHS-SN

YOUNG ADULT NONFICTION
USD \$24.95

ISBN 978-1-61954-932-6

52495 >



9 781619 549326