

R E P O R T R E S U M E S

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AN AVIATION COURSE FOR JUNIOR COLLEGES.  
CESSNA AIRCRAFT CO., WICHITA, KANS.

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THE COURSE IS IN TWO PARTS. IN PART 1, A PROGRAM OF 60 HOURS COVERS SUCH TOPICS AS FLIGHT PRINCIPLES, AIRCRAFT OPERATION AND PERFORMANCE, NAVIGATION, THE FLIGHT COMPUTER, RADIO GUIDANCE AND COMMUNICATION, WEATHER, FLIGHT INFORMATION PUBLICATIONS, FEDERAL AVIATION REGULATIONS, THE AIRWAY SYSTEM, FLIGHT INSTRUMENTS, AND FLIGHT PLANNING. THE TOPICS OF PART 2 ARE HISTORY OF AVIATION, AVIATION TODAY, AVIATION AND THE INDIVIDUAL, AND THE GOVERNMENT IN AVIATION. THE SYLLABUS INCLUDES BRIEF LESSON PLANS, A REFERENCE BIBLIOGRAPHY, SUGGESTIONS TO TEACHERS, AND SOURCES OF INSTRUCTIONAL FILMS. (WO)

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# **AN AVIATION COURSE FOR JUNIOR COLLEGES**

UNIVERSITY OF CALIF.  
LOS ANGELES

JUN 1 1967

CLEARINGHOUSE FOR  
JUNIOR COLLEGE  
INFORMATION

# AN AVIATION COURSE FOR JUNIOR COLLEGES

*Air Age Education Division*

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*CESSNA AIRCRAFT COMPANY*



## INTRODUCTION

The COURSE GUIDE FOR JUNIOR COLLEGE AVIATION is based on the belief that every student in this nation's junior colleges should be given the opportunity to become literate in the dominant transportation of our nation and world; he should be given minimum factual knowledge which will help him gain insight into the implications of aviation on the social, political, economic, and technical facets of society; he should have the opportunity to survey the many vocational and career possibilities for himself in this growing industry; he should become aware of aviation's potential to serve him as a user of transportation in his work and recreation; and he should recognize his civic responsibilities in supporting and promoting the aviation industry at community, state, and national levels.

This course guide includes topics for study which go beyond the usual ground school type aviation course: such topics as history and background of flight, airports, manufacturing of aircraft, economic importance of aviation, government as it relates to aviation, and global aviation. The ground school portions are presented in such a way that those students wishing to do so may take the Federal Aviation Agency's written test for private pilots. Whether the Federal Aviation Agency's test is taken or not, the student will have a sound understanding of the mechanics of flight and the general aviation industry.

We recommend that teachers of this course should have some aviation background, preferably a private pilots license. In lieu of this, we believe an adequate job can be done by teachers of social studies who have taken an aerospace education workshop (offered by over 175 colleges and universities each summer), and have also taken a ground school course to familiarize themselves with the aeronautics portions of the content.

Finally, schools will find much support from the Cessna distributors and dealers in their local areas.

## CONTENTS

The Aviation Course for Junior Colleges is logically divided into parts: (1) general information about aviation, and (2) aeronautical knowledge of the airplane and flight itself. We recommend the two-part division because the entire subject of aviation is such an encompassing one that organization in some manner is almost necessary to preserve some continuity.

That part of the course dealing with aeronautical knowledge is planned to take 60 hours of the 90 hour semester; the general information portion will take the remaining 30 hours. The teacher may offer the two parts in whatever order he chooses; our recommendation is that the aeronautical part be taught first. Recommended time elements are given for the 60 hour part.

For those students wishing to take the FAA Private Pilot written exam at the conclusion of the 60 hour portion of the course, the teacher should contact the General Aviation District Office through any local FAA office. Arrangements can be made for group testing.

The general information part is not broken down in time elements, allowing the teacher to exercise his preference in presenting his own emphasis and scope to the topics listed.

ORDER OF PRESENTATION

HOURS

PART ONE

I. Principles of Flight	5 hours
II. Aircraft and Engine Operation	4 hours
III. Aircraft Performance	4 hours
IV. Navigation and Chart Reading	10 hours
V. Flight Computer	4 hours
VI. Radio Guidance in VFR Flying	3 hours
VII. Radio Communications	1 hour
VIII. Flight Information Publications - Airports	2 hours
IX. Weather	10 hours
X. Federal Aviation Regulations	10 hours
XI. Structure of Airway System	1 hour
XII. Flight Instruments	3 hours
XIII. Attitude Instrument Flying	2 hours
XIV. Flight Planning	1 hour
	<hr/>
	60 hours

PART TWO

I. Historical Background of Aviation	
II. Aviation Today - Local, National, and Worldwide	
A. Airports	
B. Manufacturing	
C. Economic importance	
D. Global aviation	
III. Aviation and the Individual	
IV. Government in Aviation	

REFERENCE BIBLIOGRAPHY FOR GROUND COURSES

<u>PUBLICATION</u>	<u>COST</u>	<u>SOURCE</u>
*AERONAUTICAL CHARTS AND RELATED PUBLICATIONS	Free	(8)
AIRMAN'S INFORMATION MANUAL		
PART 1	\$ 2.00	(1)
PART 2	\$ 2.00	(1)
PART 3	\$ 9.00	(1)
*AVIATION PUBLICATIONS; CIVIL AVIATION, NAVAL AVIATION, AIR FORCE. Price List 79	Free	(1)
AVIATION WEATHER 1965	\$ 2.25	(1)
AOPA FOUNDATION "THE AOPA 360° RATING"	\$10.00 per 100 copies	(2)
CHARTS		
* APPROACH AND LANDING	\$ .10	(3)
ENROUTE HIGH ALTITUDE CHART	\$ .25	(3)
ENROUTE LOW ALTITUDE CHART	\$ .25	(3)
LOCAL	\$ .25	(3)
SECTIONAL	\$ .30	(3)
* VFR/IFR PLANNING CHART	\$ 2.00	(3)
WORLD AIR CHART	\$ .25	(3)
*COMMERCIAL PILOT EXAMINATION GUIDE, 1966	\$ .75	(1)
DAILY WEATHER MAP (SUNDAY PREFERRED)	\$ .03	(1)
*ESSA	Free	(8)
EXAM-O-GRAMS IFR PILOT	Free	(4)
EXAM-O-GRAMS VFR PILOT	Free	(4)
CESSNA 150 OWNER'S MANUAL	Free	(5)
E-6B COMPUTER	\$10.00 average	(6)

<u>PUBLICATION</u>	<u>COST</u>	<u>SOURCE</u>
*FAA AVIATION NEWS	\$ 1.50 annually	(1)
*FAA WHAT IT IS AND WHAT IT DOES	Free	(7)
FEDERAL AVIATION REGULATIONS		
PART 1 May 15, 1962	\$ .25	(1)
PART 43 July 6, 1964	\$ .20	(1)
PART 45 April 20, 1964	\$ .20	(1)
PART 61 November 1, 1962	\$ .50	(1)
PART 71 December 12, 1962	\$ .20	(1)
PART 91 September 30, 1963	\$ .50	(1)
PART 141 September 17, 1962	\$ .25	(1)
FLIGHT PLAN FORMS FAA FORM 398 (6-62)	Free	(7)
*FLIGHT TEST GUIDE - PRIVATE PILOT, AIRPLANE, SINGLE ENGINE 1966	\$ .20	(1)
FLIGHT TRAINING GUIDE, PRIVATE PILOT (Airplane) 1964	\$ 1.00	(1)
FLIGHT TRAINING HANDBOOK 1965 AC61-21	\$ .70	(1)
*GROUND INSTRUCTOR EXAMINATION GUIDE BASIC-ADVANCED 1963 (Being Revised)	\$ .45	(1)
*GROUND INSTRUCTOR EXAMINATION GUIDE INSTRUMENT 1965	\$ .50	(1)
*HURRICANE INFORMATION	Free	(8)
KEY TO AVIATION WEATHER FORECASTS 1966	\$ .05	(1)
PERSONAL AIRCRAFT INSPECTION HAND- BOOK 1964	\$ .50	(1)
PLANE SENSE AC20-5 1963	Free	(7)
PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE 1965 Published 1966	\$ 2.75	(1)

<u>PUBLICATION</u>	<u>COST</u>	<u>SOURCE</u>
REFRESHER COURSES - PRIVATE and COMMERCIAL PILOTS 1964 AC-10	\$ .15	(1)
*STANDARD AIRCRAFT TAXI SIGNALS 1959	\$ .10	(1)
*STATUS OF THE FEDERAL AVIATION REGULATIONS	Free	(7)
STUDENT PILOT GUIDE AC-61-12A October 1965	\$ .15	(1)
*TORNADO WATCH L.S. 6514 December 1965	Free	(8)
*UNITED STATES AIR FORCE DICTIONARY 1956	\$ 4.00	(1)
WAKE TURBULENCE AC-90-23A	Free	(7)
*WEATHER IN SPACE 1963	\$ .10	(1)
*ARE YOU "WEATHER WISE"?	Free	(7)

\*Publications not included in the curriculum but desirable for  
the Aviation Library.

SOURCES FOR  
REFERENCE BIBLIOGRAPHY FOR GROUND COURSES

- (1) Superintendent of Documents  
Government Printing Office  
Washington, D.C. 20402
- (2) AOPA Foundation, Inc.  
4650 East-West Highway  
Bethesda, Maryland 20014
- (3) Director - Coast and Geodetic Survey  
Washington Science Center  
Rockville, Maryland 20852
- (4) FAA Aeronautical Center  
Flight Standards Technical Division AC-700  
Operations Branch AC-740  
P.O. Box 25082  
Oklahoma City, Oklahoma 73125
- (5) Cessna Aircraft  
Air Age Education  
P. O. Box 1521  
Wichita, Kansas 67201
- (6) Flight School or Aviation Publications Sales
- (7) Federal Aviation Agency  
Printing Branch HQ-438  
Washington, D. C. 20553
- (8) Department of Commerce  
Environmental Science Services Administration  
Rockville, Maryland 20852

## SUGGESTIONS TO TEACHER

1. Exam-O-Grams needed for the students 1 through 37

Exam-O-Grams included in PRIVATE PILOT'S HANDBOOK OF  
AERONAUTICAL KNOWLEDGE: 1, 3, 7, 8, 9, 10, 11, 12 & 13.

Additional Exam-O-Grams needed: 2, 4, 5, 6, 14 through 37.

Exam-O-Grams (Instrument) needed for the Instructor: 5, 7,  
10, 14, 15 and 16.

2. Availability of classroom and standard size E6B Computers  
are available from numerous commercial sources.

3. Mail orders from the Superintendent of Documents are filled  
within a month to a month and a half on the average.

Telephone orders are promptly filled. Call Order Clerk  
Superintendent of Documents Office, Washington, D. C.

4. The Sunday (any Sunday) Weather Map has the explanation of  
the symbols and other information on the back. It should  
be ordered at least three weeks in advance. The smallest  
quantity that can be ordered from Superintendent of Documents  
is 50 maps or a quarterly subscription can be obtained for  
\$2.40.

5. "The AOPA 360<sup>0</sup>" Rating" manual can be obtained from

AOPA Foundation, Inc. Teachers should write directly to AOPA Foundation. Individual copies can be obtained for 10 cents each.

6. The Denault Computers - Fixed Pitch and Variable Pitch - (a computer used to determine aircraft performance on air fields of high elevation and high density altitude) are 50 cents and are available from

FEDERAL AVIATION AGENCY  
OFFICE OF HQ OPERATIONS  
PRINTING BRANCH HQ 438  
WASHINGTON, D. C. 20553

However, the KOCH chart which is found on page 99 of the PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE and on the back of most sectional maps is a suitable substitute.

7. AIRMAN'S INFORMATION MANUAL Parts 2, 3 and 3A should be available to the students. One copy would probably be sufficient. It would be very desirable for each student to have a copy of Part 1.
  8. Charts that are to be used for display purposes are often given to the displaying agency by the Coast and Geodetic Survey. The VFR/IFR PLANNING CHART is a desirable chart for display. Obsolete charts are free, if available.
- Universities, junior colleges, and high schools can purchase charts at a 50% discount, from Coast and Geodetic Survey.

9. From the High School and Junior College Survey dated May 11, 1966, and updated August 31, 1966, Cessna Aircraft Company, it was determined that the most successful programs were those that contained a flight experience.

The flight experiences are generally conducted by the local aircraft dealer. It is suggested that the course instructor contact the local dealer concerning his willingness to cooperate in the program and establish a schedule so that students can contact the dealer at their own option at the proper time in the course.

Two optional flight experiences are recommended. One short flight around the local area at the beginning of the course and another flight of approximately 1 1/2 hours duration which is flown in a four-place aircraft with three students by a FAA Certified Flight Instructor. Each student prepares a flight plan for the entire trip but actually flies only one 30 minute leg of this three legged flight from the left hand seat.

This flight is recommended to take place after the navigation section of the ground course. At this stage of the program, the student should have enough aeronautical knowledge to plan and navigate the trip. The fees for these voluntary flight

experiences are generally paid by the student.

The aircraft dealer receives the full amount of this fee in order to pay for the operating expenses for the aircraft and the insurance covering both the aircraft and the passengers.

10. For teachers who are teaching the aviation course for the first time, the 60 hour ground school portion can be naturally grouped for review or course planning into the following sections:

CHAPTERS I, II & III

CHAPTERS IV & V

CHAPTERS VI, VII & VIII

CHAPTER IX

CHAPTER X

CHAPTERS XI, XII, XIII & XIV

The Commercial Pilot Examination Guide is also suggested as a good reference for review questions.

## 16 MM FILM SOURCES

1. Air Force Film Library Center  
8900 S. Broadway  
St. Louis 25, Missouri

Two weeks notice required.

Return postage paid by the agency making the request.

Publication listing films available may be received.

2. Navy Films for Public and Television Showings  
Department of the Navy  
Office of Information  
Washington, D.C. 20425

13 Naval Districts are sources for film.

No charge for film. Borrowing agency pays return postage.

Publication listing films available may be received.

3. Association Films, Inc.  
347 Madison Ave.  
New York 17, New York

Free except for postage. Catalog available on request.

4. United World  
Free Film Service  
2301 Classen Boulevard  
Oklahoma City, Oklahoma

Free except for Postage. Catalog available on request.

5. Audio Visual Director  
Sterling Movies, U.S.A.  
Central Booking Exchange  
100 West Monroe St.  
Chicago 3, Illinois

Free except for postage. Catalog available on request.

6. Southwestern Bell Telephone Company  
Southwest Bell Film Library  
c/o Southwest Soundfilm  
1709 S. Lamar  
Dallas 15, Texas

Free except for postage. Catalog available on request.

7. Federal Aviation Agency  
Film Library AC-142-1  
Aeronautical Center  
P.O. Box 1082  
Oklahoma City, Oklahoma

Free

8. Texas Christian University Film Library  
T. C. U. Campus  
Fort Worth, Texas

\$1.00 per film plus postage both ways. Some 35 mm films available. Catalog available upon request.

9. Walt Disney Productions  
Educational Film Division

1. 500 S. Buena Vista Ave.  
Burbank, California
2. 237 W. Northwest Highway  
Park Ridge, Illinois
3. 477 Madison Avenue  
New York 22, New York

Films available on a Lease Fee Basis.

## I - PRINCIPLES OF FLIGHT

MATERIAL NEEDED: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE; AIRMAN'S INFORMATION MANUAL, PART 1; Exam-O-Grams 3, 17, 26, 27, 28; FLIGHT TRAINING HANDBOOK.

REFERENCE MATERIAL FOR THE INSTRUCTOR: PERSONAL AIRCRAFT INSPECTION HANDBOOK; FLIGHT TRAINING HANDBOOK, Pages 7-13, 15-19, 23-24, 30-39, 53-61, 115-117, 139-143.

LESSONS: Pages 1-14 PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE; Exam-O-Gram 3 and AIRMAN'S INFORMATION MANUAL Pages 37-39; Exam-O-Gram 17, 26, 27, 28; FLIGHT TRAINING HANDBOOK Page 25.

## II - AIRCRAFT AND ENGINE OPERATION

MATERIAL NEEDED: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL

KNOWLEDGE: Exam-O-Gram 10.

REFERENCE MATERIAL FOR THE INSTRUCTOR: PERSONAL AIRCRAFT

INSPECTION HANDBOOK; FLIGHT TRAINING HANDBOOK, Pages  
24-27, 116.

LESSON: Pages 78-87 PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL

KNOWLEDGE; Exam-O-Gram 10.

### III - AIRCRAFT PERFORMANCE

MATERIAL NEEDED: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE; Exam-O-Grams 11, 13, 33, 37; Excerpt from Cessna OWNER'S MANUAL on Weight and Balance, 3-4, 3-5, 3-6; FLIGHT TRAINING HANDBOOK; Fixed Pitch and Variable Pitch Computer - Denault Computer, if available, or the KOCH chart on page 99 of PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE.

REFERENCE MATERIAL FOR THE INSTRUCTOR: PERSONAL AIRCRAFT INSPECTION HANDBOOK; FLIGHT TRAINING HANDBOOK, Pages 1-5, 7-8.

LESSONS: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE Weight and Balance, Pages 97-98, Exam-O-Gram 13, Excerpt from Cessna OWNER'S MANUAL 3-4, 3-5, 3-6; Loads and Load Factor, Pages 11 and 14, Exam-O-Gram 28; FLIGHT TRAINING HANDBOOK, Pages 1-5; Aircraft Performance, Pages 98-104 of PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE, Exam-O-Grams 11, 33, 37; Use of Fixed Pitch and Variable Pitch Computers, or the KOCH chart.

Use the following five pages on WEIGHT AND BALANCE before using the Excerpts from the Cessna OWNER'S MANUAL.

## WEIGHT AND BALANCE

Weight and balance limits are placed on airplanes for two principal reasons: First, the effect of the weight on the primary and secondary structures; and second, the effect of the location of this weight on flight characteristics, particularly in stall and spin recovery, and on stability. Gross weight is also a factor in take-off and landing performances.

The recovery from a stall in any airplane becomes progressively more difficult as its center of gravity is moved aft. An airplane loaded excessively nose heavy will be difficult to taxi, particularly in high winds; can be nosed over easily by use of the brakes; and will be difficult to land without bouncing, since it tends to pitch in on the wheels as it is slowed down to flare out for landing.

In loading an airplane the structure affected must be considered. Seats, baggage compartments, and even cabin floors are designed for a certain load, or concentration of load, and no more.

Current weight and balance data is required to be carried in each certificated airplane, from which a pilot may compute its actual or permissible loading. This data is usually carried in conjunction with the Airplane Flight Manual, if one is available for the airplane concerned. Normally this information may be found in the OWNER'S MANUAL which every manufacturer places in the airplane.

## WEIGHT AND BALANCE (Continued)

The center of gravity of an object is, in simple language, the point at which it balances. Ranges of weights and centers of gravity within which the airplane may be safely operated must be established. The manufacturer of an airplane who builds his airplane to meet the AIRWORTHINESS STANDARDS for NORMAL, UTILITY, AND ACROBATIC CATEGORY is governed by Part 23 of the Federal Aviation Regulations. The requirements for AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES are covered in Part 25 of the Federal Aviation Regulations.

**TERMINOLOGY:** The following terminology is used in the practical application of weight and balance control:

**MAXIMUM WEIGHT:** The maximum weight is the maximum authorized weight of the aircraft and its contents as listed in the specifications.

**EMPTY WEIGHT:** The empty weight of an airplane includes all operating equipment that has a fixed location and is usually installed in the aircraft. The fuel and the oil that cannot be drained from the systems are included in the empty weight.

**DATUM:** The datum is an imaginary vertical plane from which all horizontal measurements are taken for balance purposes with the aircraft in level flight attitude.

**ARM (or moment arm):** The arm is the horizontal distance in inches from the datum to the center of gravity of an item.

**MOMENT:** Moment is the product of a weight multiplied by its arm.

**WEIGHT AND BALANCE (Continued)**

To solve problems involving weight and balance we shall use the following formula to determine the CENTER OF GRAVITY:

$$\frac{\text{TOTAL MOMENTS}}{\text{TOTAL WEIGHT}} = \text{CENTER OF GRAVITY ( C. G. )}$$

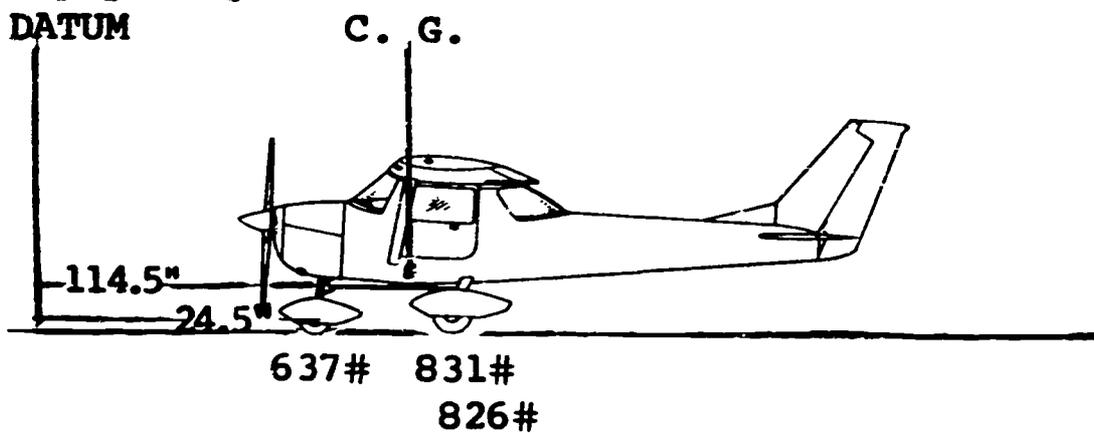
(TOTAL MOMENTS DIVIDED BY THE TOTAL WEIGHT IS EQUAL TO THE CENTER OF GRAVITY)

**EXAMPLE OF THE FORMULA:**

Weight of the Left Wheel . . . . .	826 pounds
Weight of the Right Wheel . . . . .	831 pounds
Weight of the Nose Wheel . . . . .	637 pounds
Datum Line to the Nose Wheel . . . . .	24.5 inches
Datum Line to the center line of the Main Gear	114.5 inches

**(HYPOTHETICAL EXAMPLE)**

1. Empty Weight C.G. Location



637# x 24.5" =	15,606.5	inch pounds
831# x 114.5" =	95,149.5	inch pounds
<u>826# x 114.5" =</u>	<u>94,577.0</u>	inch pounds
2,294#	205,333.0	inch pounds
<u>205,333.0</u>	<u>2,294</u>	= 89.5" C. G. Location

2. Allowable C. G. travel with respect to the Datum Line  
for Normal and Maximum Weight:

For 2640 pounds . . . . .	89.7 - 100 inches
For 3500 pounds . . . . .	94.0 - 100 inches

WEIGHT AND BALANCE (Continued)

SOLVE THE FOLLOWING PROBLEMS:

Use 6 pounds per gallon as the weight of gasoline

Use 7.5 pounds per gallon as the weight of oil

ITEM	WEIGHT	ARM	MOMENT
1. Empty Weight	2,294#	89.5"	_____
Oil (4 gallons)	_____	59.0"	_____
Fuel (25 gallons)	_____	113.0"	_____
Pilot	170#	89.0"	_____
C. G. Location	_____	(90.5" answer)	
2. Empty Weight	2,294#	89.5"	_____
Oil (4 gallons)	_____	59.0"	_____
Fuel (72 gallons)	_____	113.0"	_____
Pilot	170#	89.0"	_____
Passenger	170#	89.0"	_____
C. G. Location	_____	(92.4" answer)	
3. Empty Weight	2,294#	89.5"	_____
Oil (4 gallons)	_____	59.0"	_____
Fuel (72 gallons in main tank)	_____	113.0"	_____
Fuel (10.6 gallons in auxiliary tank)	_____	113.0"	_____
Pilot and Passenger in front	340#	89.0"	_____
Passengers in two rear seats	340#	126.5"	_____
Baggage	0#	150.0"	<u>0 inch pounds</u>
C. G. Location	_____	(96.1" answer)	

## WEIGHT AND BALANCE (Continued)

In most civilian airplanes it is not possible to fill all seats, cargo space, and fuel tanks, and still remain within approved weight and balance limits. In some four-place and six-place airplanes, the fuel tanks may not be filled to capacity when a full complement of passengers and their baggage are to be carried.

#### IV - NAVIGATION AND CHART READING

MATERIAL NEEDED: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL

KNOWLEDGE: Exam-O-Grams 12, 18, 23, 24, 25, 27;

plotter or protractor and a ruler; scratch paper;

Local, Sectional, WAC Charts.

REFERENCE MATERIAL FOR THE INSTRUCTOR: FLIGHT TRAINING

HANDBOOK, Pages 86-90.

LESSON: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE,

Pages 59-78; Exam-O-Grams 12, 18, 23, 24, 25, 27.

Emphasize the association in the WIND TRIANGLE that

GROUND SPEED is measured on the TRUE COURSE and that

TRUE AIRSPEED is measured on the TRUE HEADING. Use

Local, Sectional and WAC Charts for symbols and chart

reading.

## V - FLIGHT COMPUTER

MATERIAL NEEDED: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE; E6B Computer; Dallas Sectional Chart; Plotter or Protractor and a Ruler.

REFERENCE MATERIAL FOR THE INSTRUCTOR: See below.

LESSONS: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE, Pages 129-144. After working the material in the textbooks, use the Dallas Sectional Chart; Pilot's Planning Sheet, Page 75; and the Winds Aloft Forecasts, Page 55 (disregard the stations such as MKC) to work a few fictitious problems.

## VI - RADIO GUIDANCE IN VFR FLYING

MATERIAL NEEDED: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE; Exam-O-Grams 15, 16, 19, 26; Dallas Sectional.

REFERENCE MATERIAL FOR THE INSTRUCTOR: FLIGHT TRAINING HANDBOOK, Pages 90-98; Instrument Pilot Exam-O-Grams 7, 14.

LESSON: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE, Pages 106, 148-157; Exam-O-Grams 15, 16, 19, 26. Use the Dallas Sectional Chart to set up fictitious problems using VOR.

## VII - RADIO COMMUNICATIONS

MATERIAL NEEDED: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE; AIRMAN'S INFORMATION MANUAL, PART 1; Exam-O-Grams 14, 35.

REFERENCE MATERIAL FOR THE INSTRUCTOR: AIRMAN'S INFORMATION MANUAL, Parts 2 and 3.

LESSON: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE, Pages 144-148; AIRMAN'S INFORMATION MANUAL, Part 1, Pages 21-23, 53; Frequency Utilization Plan in AIRMAN'S INFORMATION MANUAL, Page 12. Use the Dallas Sectional Chart and choose a few airports to determine frequency utilization. Check Parts 2 and 3 of AIRMAN'S INFORMATION MANUAL for frequencies. If there is a discrepancy, check the publication dates. The information from the most recent publication should be the information used. Exam-O-Grams 14, 35.

VIII - FLIGHT INFORMATION PUBLICATIONS - AIRPORTS

MATERIAL NEEDED: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL  
KNOWLEDGE; AIRMAN'S INFORMATION MANUAL, PART 1;  
Dallas Sectional.

REFERENCE MATERIAL FOR THE INSTRUCTOR: AIRMAN'S INFORMA-  
TION MANUAL, Parts 2, 3 and 3A.

LESSONS: Check information in textbook, page 105, against  
first page in AIRMAN'S INFORMATION MANUAL for correct  
section divisions; pages 105-128. Cross Check:

AIRMAN'S INFORMATION MANUAL	PRIVATE PILOT'S HANDBOOK
Part 1 - 7-8, 12	106
Part 1 - 5-6, 11-12	107
Part 1 - 39, 37	109
Part 1 - 53-54	110
Part 1 - 66, 72	111
Part 1 - 78	112
Part 1 - 1-4	114
Part 3 - v-vi	115
Part 3 - v-vi, 8	116
Part 1 - 67	117
Part 3 - 103	118
Part 3 - 132	119
Part 3A (All)	120

VIII - FLIGHT INFORMATION PUBLICATIONS (Continued)

AIRMAN'S INFORMATION MANUAL

PRIVATE PILOT'S HANDBOOK

Part 2 - iii and Part 3 - vii	121
Part 2 - iv and Part 3 - vii-viii	122
Part 2 - iv and Part 3 - viii-ix	123
Part 2 - 171-188	124-126
Part 3 - 36-40	127

Depart Abilene Municipal for Fort Worth-Greater Southwest International and determine the radio frequencies to be used for communication on take-off, navigation enroute, and communication on arrival for transmitting and receiving. If you desired weather information from the Fort Worth Radio, what are the possible frequencies you might transmit and receive on? Make other imaginary flights, some to airports without a tower. Check for services and fuel available.

Check the AIRMAN'S INFORMATION MANUAL, Part 3, for DATES OF LATEST EDITIONS OF charts.

## IX - WEATHER

MATERIAL NEEDED: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE; AIRMAN'S INFORMATION MANUAL, PART 1, Pages 31-41; Exam-O-Grams 5, 9, 20, 21, 26, 32, 34, 36, 37; Daily Weather Map (any Sunday because of the explanation on the back); WAKE TURBULENCE.

REFERENCE MATERIAL FOR THE INSTRUCTOR: AVIATION WEATHER 1965 INSTRUMENT: Exam-O-Grams 5, 10, 15 and 16; KEY TO AVIATION WEATHER FORECASTS.

LESSONS: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE, Pages 15-59; Exam-O-Grams 5, 9, 20, 21, 26, 32, 34, 36, 37. Use the Weather Map before going into Forecasts on Page 50; AIRMAN'S INFORMATION MANUAL, Pages 31-41. When studying sequence reports (Pages 56-57 in the PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE) refer to the AIRMAN'S INFORMATION MANUAL pages 25-30 concerning the NOTAM CODE. (Part 1)

## X - FEDERAL AVIATION REGULATIONS

MATERIAL NEEDED: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE; Federal Aviation Regulations, Parts 1, 43, 45, 61, 71, 91; AIRMAN'S INFORMATION MANUAL, Part 1; Exam-O-Grams No. 1, 2, 4, 6, 7, 22, 26, 29, 30, 31, 36, 37; Dallas Sectional Map from the PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE; STUDENT PILOT GUIDE AC61-12A; PLANE SENSE.

REFERENCE MATERIAL FOR THE INSTRUCTOR: FAR Part 141; PRIVATE PILOT AIRPLANE FLIGHT TRAINING GUIDE; FLIGHT TRAINING HANDBOOK, Page 98.

LESSONS: Cover the following in the classroom.

FAR Part 1:

Administrator, Aircraft, Airplane, Airport, Airport traffic area, Air traffic, Air traffic clearance, Air traffic control, Category, Ceiling, Class, Commercial operator, Controlled Airspace (Refer to FAR 71.7, 71.9, 71.11 & 71.13 and PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE, Page 114), Critical altitude, Critical attitude, Flight level, Flight plan, Flight time, Flight visibility, IFR conditions, IFR over-the-top, Instrument, Large aircraft, Load factor, Medical Certificate, Night operate, Over-the-top, Pilotage, Pilot in Command, Positive control,

X - FEDERAL AVIATION REGULATIONS (Continued)

Reporting point, Restricted area, Second in command,  
Small aircraft, Standard atmosphere, Time in service -  
Type, VFR over-the-top, ATC, CAS, IAS, ICAO, IFR,  
MSL, TAS,  $V_F$ ,  $V_{FE}$ ,  $V_H$ ,  $V_{LE}$ ,  $V_{LO}$ ,  $V_{NE}$ ,  $V_S$ , VFR, VOR,  
and VORTAC. Part 1 is a reference section to be used  
as the definitions are used in other sections.

FAR Part 43:

43.3, 43.9, 43.11, PLANE SENSE Pages 4-5.

FAR Part 45:

45.11, 45.21, 45.23, PLANE SENSE Pages 11-13, 45.25,  
45.33

FAR Part 61:

61.3; 61.5; 61.7; 61.9 a and e; 61.13; 61.15 a, b  
and f; 61.16 a, b and c; 61.17 h; 61.19; 61.20; 61.21;  
61.23; 61.25; 61.26; 61.27 a and b; 61.29; 61.35 a,  
61.39; 61.43; 61.47; 61.51; 61.61; 61.63 a; 61.65;  
61.73; STUDENT PILOT GUIDE AC61-12A Pages 4-11;  
61.81; 61.83; 61.85; 61.87; 61.101 STUDENT PILOT  
GUIDE AC61-12A Pages 11-22.

FAR Part 71:

71.3 (Use Dallas Sectional Chart); 71.5 a, b(1),  
and c(1), d; 71.7 (Use Dallas Sectional); 71.9;  
71.11 (Use Dallas Sectional); 71.19.

FAR Part 91:

91.3; 91.5 and Exam-O-Gram number 6; 91.7; 91.9;

**X - FEDERAL AVIATION REGULATIONS (Continued)**

91.13; 91.15; 91.17; 91.21; 91.27 and PLANE SENSE  
Pages 6-14; 91.29; 91.31; 91.33 a, b and c; 91.39;  
91.63 and PLANE SENSE Page 17; 91.65; 91.67 and  
Exam-O-Grams 22 and 29; 91.71; 91.73; 91.75; 91.77;  
91.79 and Exam-O-Gram 1, 91.81; 91.83 a and b, also  
Exam-O-Gram 6; 91.85; 91.87 a, b, c, e, f and h;  
91.89; 91.93; 91.95 (Use Dallas Sectional Chart);  
91.105 and Exam-O-Grams 1 and 7; 91.107 and Exam-O-  
Gram 37; 91.109 and Exam-O-Gram 2; 91.163; 91.165;  
91.167; 91.173 and PLANE SENSE Pages 18-19; 91.175.

**AIRMAN'S INFORMATION MANUAL Part 1:**

Pages 5, 7, 8, Frequency Utilization Plan page 12,  
Page 15 Radar-General, 17, 18 down to AIRWAY BEACONS,  
30, 41, 42, 43, 49 Exam-O-Grams 30 and 31, 50 down  
to FLIGHT PLAN - IFR, 53, 54, 55 (SPECIAL VFR  
FLIGHT CLEARANCE PROCEDURES), 56 (5 a, b and c), 65  
(RADAR ASSISTANCE TO VFR AIRCRAFT), 71, 72, 73, 74  
down to APPROACH CONTROL, 78, PRIVATE PILOT'S HAND-  
BOOK OF AERONAUTICAL KNOWLEDGE Page 112, 89, 90, 91  
down to COAST GUARD RESCUE COORDINATION CENTERS.

## XI - STRUCTURE OF AIRWAY SYSTEM

MATERIAL NEEDED: AIRMAN'S INFORMATION PART 1; Dallas

Sectional Chart; FEDERAL AVIATION REGULATIONS PART 71.

REFERENCE MATERIAL FOR THE INSTRUCTOR: Enroute Low Altitude  
and Enroute High Altitude Charts.

LESSONS: Use the AIRMAN'S INFORMATION MANUAL Pages 57, 71  
with the Dallas Sectional Chart to better understand  
the Victor Airways. Explain that L/MF (LOW and MEDIUM  
FREQUENCY RANGES) colored airways are decreasing in  
number because of the replacement of the L/MF facilities  
with Radio Beacons and VOR. Review FAR Part 71.5 for  
the extent of the Federal Airways. Explain that the  
airways are utilized by all pilots, but that pilots  
flying under instrument flight rules follow the airways.

## XII - FLIGHT INSTRUMENTS

MATERIAL NEEDED: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL  
KNOWLEDGE; the AOPA 360<sup>o</sup> Rating; Exam-O-Grams 8, 12.

REFERENCE MATERIAL FOR THE INSTRUCTOR: See below.

LESSONS: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE  
Pages 87-95; Exam-O-Grams 8, 12; the AOPA 360<sup>o</sup> Rating  
Pages M2-M7.

### XIII - ATTITUDE INSTRUMENT FLYING

MATERIAL NEEDED: The AOPA 360° Rating

REFERENCE MATERIAL FOR THE INSTRUCTOR: FLIGHT TRAINING  
HANDBOOK Pages 74-81.

LESSONS: The AOPA 360° Rating Pages M7-M12. Analyze each figure on Pages M10-11. Start again with the first figure and increase power. What effect will it have on the instruments? Decrease power will have what effect? Change one at a time: aileron, rudder, elevator and analyze the effect on the instruments.

#### XIV - FLIGHT PLANNING

MATERIALS NEEDED: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE; FLIGHT PLAN BLANKS; Dallas Sectional Chart, REFRESHER COURSES FOR PRIVATE AND COMMERCIAL PILOTS.

REFERENCE MATERIAL FOR THE INSTRUCTOR: See below.

LESSONS: PRIVATE PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE

Pages 157-160. Instructor gives the students the information needed to fill out a Flight Plan for a flight from Abilene, Texas, to Dallas, Texas, on the Dallas Sectional Chart. Each student fills in the information on the Flight Plan both front and back.

REFRESHER COURSES FOR PRIVATE AND COMMERCIAL PILOTS

Pages 4-8.

## PART II

### I. Historical Background of Aviation

- A. Ancient references to man's desire to fly: Archytas' Flying Pigeon, Wan Hu and his rocket chair, Myths and Legends.
- B. Balloons
- C. Gliders and Kites to 1903
- D. Technological advances of aviation
  - 1. 1903 - 1920
  - 2. 1920 - 1945
  - 3. 1945 to present

- Sources:
- 1. History of Flight, American Heritage Series  
American Heritage Publishing Company  
551 5th Avenue  
New York, New York 10017
  - 2. Flight, Life Science Library  
Time-Life Books  
Time and Life Building  
Rockefeller Center  
New York, New York 10020
  - 3. Encyclopedia and other general references
  - 4. National Aerospace Education Council  
616 Shoreham Building  
806 15th Street N.W.  
Washington, D.C. 20005  
Aviation Education Bibliography - Information on history of aviation
  - 5. National Air Museum  
Smithsonian Institution  
Washington, D.C. 20560  
Historical Aircraft and Flyers

- Films:
1. "Man in Flight", color 31 minutes  
Walt Disney 16mm Films  
350 S. Buena Vista Street  
Burbank, California
  2. "We Saw It Happen", B/W 58 or 88 minutes Free loan.  
United Aircraft  
Public Relations Department  
East Hartford, Connecticut 06108

Other films listed in the above listed  
Aviation Education Bibliography

- Memberships:
1. American Aviation Historical Society, a non-profit corporation dedicated to the preservation and dissemination of the recorded history of aviation. Annual dues to the Society include the quarterly Journal. \$6.00 per year.  
P. O. Box 45-435  
Los Angeles, California 90045
  2. Cross & Cockade, Journal of the Society of World War 1 Aero Historians, a non-profit organization whose purpose is to gather and publish factual information about any aspect of the 1914 - 1918 War in the Air. Subscriptions \$6.00 per year. Checks payable to Cross & Cockade.  
George H. Cooke  
10443 South Memphis Avenue  
Whittier, California 90604

## II. General Aviation Today - Local, National and Worldwide

### A. Airport

1. Functions and facilities
2. Management
3. Financing and planning - Present and future needs
4. Goods and services processed through the local airport
5. Transportation of people - who flies and why (By survey of airplane population at the local airport(s) and their uses)

- B. Manufacturers of airframes, power-plants, and other components
  - 1. Types of general aviation planes on the market
  - 2. Costs and operational requirements of each category
- C. Economic importance of general aviation
  - 1. Employment
  - 2. Material
  - 3. Size and composition of general aviation fleet  
Hours and miles flown; purposes, or type of flying
- D. Global Aviation
  - 1. Maps and mapmaking
  - 2. Civil Aviation, worldwide
  - 3. International Civil Aviation Organization
  - 4. International Air Transport Association

- Sources:
- 1. Federal Aviation Agency, Library Service Division  
800 Independence Avenue, S.W.  
Washington, D.C. 20553  
Bibliographies available on these subjects:  
Airports and Heliports: Design, Construction.  
and Maintenance.  
Free. List #9 July 1963  
Airport Management. Free. List #3 March, 1962
  - 2. Superintendent of Documents  
Government Printing Office  
Washington, D.C. 20402  
FAA Statistical Handbook - Summary of official  
statistical data on Civil Aviation in the U.S.
  - 3. Air Transportation Association of America  
1000 Connecticut Avenue, N.W.  
Washington, D.C. 20036  
Facts and Figures. Free

4. National Aerospace Education Council  
616 Shoreham Building  
806 15th Street, N.W.  
Washington, D.C. 20005  
U.S. Aircraft, Spacecraft, Missiles, latest  
edition \$2.00
5. Airport Operators Council  
1700 K Street, N.W.  
Washington, D.C. 20006  
Airports of the Future
6. Federal Aviation Agency  
Aeronautical Reference Branch  
Attn: MS-158  
Washington, D.C. 20025  
Publications of the FAA. Free. Listing of 78  
titles for purchase from Government Printing Office.  
The FAA. Free  
Dulles International Airport. Free.
7. International Air Transport Association  
1060 University Street  
Montreal 3, Quebec, Canada  
Facts About IATA. Free  
The Airport and the Community. Free  
The IATA Clearinghouse. Free  
Economics of Air Transport. \$.35
8. International Civil Aviation Organization  
International Aviation Building  
Montreal, Quebec, Canada  
ICAO: What It Is, What It Does, How It Works.  
Free.
9. National Business Aviation Association  
Suite 401, Pennsylvania Building  
425 13th Street, N.W.  
Washington, D.C. 20004  
Bulletins on business aviation
10. Utility Airplane Council  
1725 DeSales Street, N.W.  
Washington, D.C. 20036  
List of manufacturers

Periodicals:

1. "Air Facts" (Monthly)  
Air Facts, Inc  
70 Nassau Street  
Princeton, New Jersey 08540
2. "Aviation Week and Space Technology"  
McGraw-Hill, Incorporated  
330 W. 42nd Street  
New York, New York 10036
3. "Flying" (Monthly)  
Ziff-Davis Publishing Company  
One Park Avenue  
New York, New York 10016
4. "Private Pilot Magazine" (Monthly)  
Gallant Publishing Company  
550 S. Citrus  
Covina, California 91722
- \* 5. "The AOPA Pilot" (Monthly)  
4650 East-West Highway  
Bethesda, Maryland 20014

Films:

1. Cessna Aircraft Company  
P. O. Box 1521  
Wichita, Kansas 67201  
"World On Wings" Color. 28 Minutes Production  
of Aircraft  
"Wings for Doubting Thomas" Color. 14 minutes  
Salesman learns to fly
2. National Air Taxi Conference  
1346 Connecticut Avenue, N.W.  
Washington, D.C. 20036  
"Air Taxi, U.S.A." Color. 24 minutes. Link  
between small towns and scheduled airlines.

\*The normal rate for this magazine is \$10.00 per year. Teachers may obtain this magazine for \$4.00 per year if they direct a letter to the attention of Mr. Arthur H. Frisch on official school letterhead stationery signed by a school official and accompanied by an official school check.

3. Lockheed-Georgia Company  
 Motion Picture Film Library  
 Zone 30, B-2 Building  
 Marietta, Georgia 30060  
"You Call the Shot" Color. 24 minutes. Sales executive, a Jet Star Airplane, and a very important customer.  
  
"Wings at Work" Color. 28 minutes. History of commercial aviation.
4. Shell Oil Company  
 Film Library  
 149-07 Northern Boulevard  
 Flushing, New York  
"Song of the Clouds" 16 mm Sound Color. 36 minutes. Story of international air transportation.

### III. Aviation and the Individual

- A. Vocational and Career Opportunities in Aviation
- B. Utility of Airplanes in Businesses and Professions

#### Sources:

1. Air Transport Association  
 1000 Connecticut Avenue, N.W.  
 Washington, D.C. 20036  
Career Opportunities with the Airlines. Free
2. Cessna Aircraft Company  
 P. O. Box 1521  
 Wichita, Kansas 67201  
"What Are You Going To Do with the Next Half Century?" \$ .25
3. Superintendent of Documents  
 Government Printing Office  
 Washington, D.C. 20402  
"Employment Outlook in Civil Aviation"  
 Occupational Outlook Handbook, No. 1450-96 \$ .15  
"Aircraft, Missiles, and Spacecraft"  
 Occupational Outlook Handbook, No. 1450-93 \$ .10  
  
 Occupational Outlook Quarterly, Dec. 1963 \$ .35  
  
 Monthly Labor Review, Nov. 1963 \$ .75

4. National Business Aircraft Association  
Suite 401, Pennsylvania Building  
425 13th Street, N.W.  
Washington, D.C. 20004  
Information on the business fleet.

Periodicals:

Same as those listed under Aviation Today - Local, National, and Worldwide.

IV. Government in Aviation

A. Federal

1. Legislation

2. Agencies: Federal Aviation Agency  
Civil Aeronautics Board

- B. State List of State Aeronautics Boards available from:  
National Association of State Aviation  
Officials  
Suite 405  
1029 Vermont Avenue, N.W.  
Washington, D.C. 20005

Sources:

1. Federal Aviation Agency  
800 Independence Avenue, S.W.  
Washington, D.C. 20553
2. Federal Aviation Agency  
Office of General Aviation Affairs, Aviation  
Education  
800 Independence Avenue, S.W.  
Washington, D.C. 20553  
Aviation Education Materials, 6/1966  
Aviation Education Services & Resources - FAA  
GA-20-2-66-18,000  
FAA Films & Filmstrips for Educators GA-20-10-6
3. List of Federal Aviation Agency Regional Offices

Alaskan Region

Public Affairs Officer, AL-5  
Federal Aviation Agency  
632 Sixth Avenue  
Anchorage, Alaska 99501

Central Region

Public Affairs Officer, CE-5  
Federal Aviation Agency  
4825 Troost Avenue  
Kansas City, Missouri 64110

Eastern Region

Public Affairs Officer, EA-5  
Federal Aviation Agency  
John F. Kennedy Internat'l Airport  
Federal Building  
Jamaica, New York 11430

Europe, Africa and Middle East

Assistant Administrator  
Federal Aviation Agency  
Amembassy-FAA  
APO New York 09667 or  
27 Blvd. du Regent  
Brussels, Belgium

Pacific Region

Public Affairs Officer, PC-5  
Federal Aviation Agency  
P. O. Box 4009  
Honolulu, Hawaii 96812

Southern Region

Public Affairs Officer  
Federal Aviation Agency  
P. O. Box 20636  
Atlanta, Georgia 30320

Southwest Region

Public Affairs Officer  
Federal Aviation Agency  
P. O. Box 1689  
Fort Worth, Texas 76101

Western Region

Public Affairs Officer  
Federal Aviation Agency  
5641 West Manchester Avenue  
P. O. Box 90007, Airport Station  
Los Angeles, California 90009

List of Federal Aviation Agency Centers

Aeronautical Center

Public Affairs Officer  
Federal Aviation Agency  
Aeronautical Center  
P. O. Box 1082  
Oklahoma City, Oklahoma 73101

National Aviation Facilities Experimental Center

Public Affairs Officer  
NAFEC  
Atlantic City, New Jersey 08405

Washington Air Route Traffic Control Center

Chief  
Washington ARTC Center  
Route 7 and Route 654  
Leesburg, Virginia 22075

4. Civil Aeronautics Board  
1825 Connecticut Avenue, N.W.  
Washington, D.C. 20025

Consult the Readers' Guide to Periodical Literature  
in the library for all listed topics.