ARCHER II
PA-28-181

PILOT'S OPERATING HANDBOOK

AND

FAA APPROVED AIRPLANE FLIGHT MANUAL

AIRPLANE SERIAL NO. 28 - 8390087

AIRPLANE REGIST. NO. OE-KBS

PA-28-181
REPORT: VB-1120

FAA APPROVED BY: Ward Evans
WARD EVANS
D.O.A. NO. SO-1
PIPER AIRCRAFT CORPORATION
VERO BEACH, FLORIDA

DATE OF APPROVAL:
JULY 2, 1979

FAA APPROVED I N NORMAL AND UTILITY CATEGORIES BASED ON CAR 3. THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY CAR 3 AND CONSTITUTES THE APPROVED AIRPLANE FLIGHT MANUAL AND MUST BE CARRIED IN THE AIRPLANE AT ALL TIMES.

21.04.2018 added AFMS Fuel STC
05.07.2018 added AFMS G5 Instrument
30.04.2019 added GNS430W Upgrade
30.04.2019 added AFMS GFC500 Autopilot

PIPER

WARNING

EXTREME CARE MUST BE EXERCISED TO LIMIT THE USE OF THIS HANDBOOK TO APPLICABLE AIRCRAFT. THIS HANDBOOK IS VALID FOR USE WITH THE AIRPLANE IDENTIFIED ON THE FACE OF THE TITLE PAGE. SUBSEQUENT REVISIONS SUPPLIED BY PIPER MUST BE PROPERLY INSERTED.

Published by
TECHNICAL PUBLICATIONS
Piper Aircraft, Inc.
Issued: July 2, 1979

APPLICABILITY

Application of this handbook is limited to the specific Piper PA-28-181 model airplane designated by serial number and registration number on the face of the title page of this handbook.

This handbook cannot be used for operational purposes unless kept in a current status.

REVISIONS

The information compiled in the Pilot's Operating Handbook, with the exception of the equipment list, will be kept current by revisions distributed to the airplane owners. The equipment list was current at the time the airplane was licensed by the manufacturer and thereafter must be maintained by the owner.

Revision material will consist of information necessary to update the text of the present handbook and/or to add information to cover added airplane equipment.

I. Revisions

Revisions will be distributed whenever necessary as complete page replacements or additions and shall be inserted into the handbook in accordance with the instructions given below.

1. Revision pages will replace only pages with the same page number.
2. Insert all additional pages in proper numerical order within each section.
3. Page numbers followed by a small letter shall be inserted in direct sequence with the same common numbered page.

II. Identification of Revised Material

Revised text and illustrations shall be indicated by a black vertical line along the outside margin of the page, opposite revised, added or deleted material. A line along the outside margin of the page opposite the page number will indicate that an entire page was added.

Black lines will indicate only current revisions with changes and additions to or deletions of existing text and illustrations. Changes in capitalization, spelling, punctuation or the physical location of material on a page will not be identified.

ORIGINAL PAGES ISSUED

The original pages issued for this handbook prior to revision are given below:

Title, ii through vii, 1-1 through 1-21, 2-1 through 2-10, 3-1 through 3-15, 4-1 through 4-21, 5-1 through 5-29, 6-1 through 6-43, 7-1 through 7-24, 8-1 through 8-18, 9-1 through 9-14, and 10-1 through 10-2.

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS

Current Revisions to the PA-28-181 Archer II Pilot's Operating Handbook, REPORT: VB-1120 issued July 2, 1979.

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 1 (PR800529)	1-3	Revised para. 1.7 (c).	
	2-3	Revised para. 2.7 (d) (8).	
	2-4	Revised para. 2.9 (a).	
	2-10	Added placards.	
	3-3	Revised wording.	
	3-10	Revised wording.	
	4-8	Corrected spelling.	
	4-11	Revised para 4.9.	
	4-20	Revised wording.	
	6-i	Revised Table of Contents.	
	6-6	Revised Figure 6-5.	
	6-12	Revised Figure 6-15.	
	6-12a thru 6-12d	Added pages and added new info.	
	6-13	Revised para. no.	
	6-22	Added item 97 b.	
	6-23	Added item 105.	
	6-25	Relocated items to pg. 6-26; added new item 145.	
	6-26	Relocated items to pg. 6-27; added new items 147, 149; re-numbered items.	
	6-27	Relocated items to pg. 6-28; renumbered items.	
	6-28	Relocated items to pg. 6-29b and pg. 6-29a.	
	6-29	Relocated items to pg. 6-29a.	
	6-29a	Added new pg.; relocated items from pg. 6-29 and item 203 from pg. 6-28.	
	6-29b	Added new pg. and new items 219, 227, 229.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 1 (cont)	6-29c	Added new pg. and new items 231 thru 241.	
	6-29d	Added new pg. and new item 243; relocated and renumbered items from pg. 6-30.	
	6-30	Relocated and renumbered items from pg. 6-31.	
	6-31	Relocated items from pg. 6-32; added new items 265 and 267.	
	6-32	Relocated item from pg. 6-33; renumbered items.	
	6-33	Relocated and renumbered items from pg. 6-34; added new item 285.	
	6-34	Renumbered items; added new items 289, 291, 295.	
	6-35	Renumbered items; relocated item to pg. 6-36; added item from pg. 6-34.	
	6-36	Renumbered items; relocated item to pg. 6-37.	
	6-37	Renumbered items; relocated item to pg. 6-38.	
	6-38	Renumbered items; relocated item from pg. 6-37.	
	6-39	Renumbered items.	
	6-41	Relocated item to pg. 6-42; added new item 429.	
	6-42	Relocated item to pg. 6-43; renumbered items; added items 431 and 433.	
	6-43	Added item from pg. 6-42.	
	7-i	Added para. 7.39 to Table of Contents.	
	7-20	Revised material.	
	7-24	Added para. 7.39.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 1 (cont)	7-25	Added pg.; added new info.	
	8-12	Revised para. 8.21 (a) (b).	
	8-12a	Added pg.; added new info.	
	8-12b	Added pg.; relocated material from pg. 8-12 and 8-13; added cautions and revised info. (c).	
	8-13	Relocated info. to pg. 8-12; added info. from pg. 8-14.	
	8-14	Relocated info. to pg. 8-13; added info. from pg. 8-15.	Ward Evans Ward Evans May 29, 1980
	8-15	Relocated info. to pg. 8-14.	
	10-2	Added para. 10.3 (j).	
Rev. 2 (PR800822)	9-i	Added supplement 5 and pages	
	9-15 thru 9-18	Added supplement 5 (Century 21 Autopilot).	Ward Evans Ward Evans Aug. 22, 1980
Rev. 3 (PR810114)	Title	Revised approval.	
	ii	Revised warning.	
	2-3	Revised para. 2.7 (d) (6).	
	2-4	Revised para. 2.9 (c).	
	3-i	Changed para. 3.23 title, page nos.	
	3-6	Changed alternator failure to electrical failures; add info., moved info. to pg. 3-7.	
	3-7	Relocated info. from pg. 3-6; moved info. to pg. 3-8.	
	3-8	Relocated info. from pg. 3-7.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 3 (cont)	3-13	Revised, retitled para. 3.23 with added info.	
	3-14	Added para. 3.24; moved para. 3.25 and 3.27 to pg. 3-15, and para. 3.29 to pg. 3-16.	
	3-15	Relocated para. 3.25 and 3.27 from pg. 3-14; moved para. 3.31 to pg. 3-16.	
	3-16	New page, relocated para. 3.29 from pg. 3-14 and para. 3.31 from pg. 3-15.	
	3-17	New page, added relocated info.	
	6-19	Added item 61.	
	6-29a	Added item 204.	
	6-31	Revised item 267.	
	6-33	Added item 274; revised item 275; moved items 283 and 285 to pg. 6-34.	
	6-34	Relocated items 283 and 285 from pg. 6-33; moved items 291 thru 295 to pg. 6-35.	
	6-35	Relocated items 291 thru 295 from pg. 6-34; moved items 301 and 303 to pg. 6-36.	
	6-36	Relocated items 301 and 303 from pg. 6-35; moved item 309 to pg. 6-37.	
	6-37	Relocated item 309 from pg. 6-36; moved items 317 and 319 to pg. 6-38.	
	6-38	Relocated items 317 and 319 from pg. 6-37; moved item 327 to pg. 6-39.	
	6-39	Relocated item 327 from pg. 6-38; moved items 333 thru 337 to pg. 6-40.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 3 (cont)	6-40	Relocated items 333 thru 337 from pg. 6-39; moved items 409 thru 417 to pg. 6-41.	
	6-41	Relocated items 409 thru 417 from pg. 6-40; moved items 423 thru 429 to pg. 6-42.	
	6-42	Relocated items 423 thru 429 from pg. 6-41; moved items 435 thru 441 to pg. 6-43.	
	6-43	Relocated items 435 thru 441 from pg. 6-42; moved info. to pg. 6-44.	
	6-44	New page; relocated info. from pg. 6-43.	
	7-7	Revised para. 7.13.	
	7-10	Revised para. 7.15.	
	7-11	Revised figure 7-11.	
	7-12	Cont. para. 7.15 revision.	
	7-13	Cont. para. 7.15 revision.	
	7-20	Revised para. 7.25.	
	9-i	Added supplement 6.	
	9-15 thru 9-18	Retyped supplement 5.	
	9-19 thru 9-20	Added supplement 6 (Piper Control Wheel Clock)	Ward Evans Ward Evans Jan. 14, 1981
Rev. 4 (PR810625)	1-4	Revised para. 1.13.	
	5-1	Moved info. to pg. 5-2.	
	5-2	Relocated info. from pg. 5-1; added Warning.	
	6-6	Revised Figure 6-5.	
	6-16	Revised item 21.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 4 (cont)	6-21	Revised items 85 and 87; moved item 95 to pg. 6-22.	
	6-22	Relocated item 95 from pg. 6-21.	
	6-25	Revised item 137.	
	6-31	Renumbered and moved item to pg. 6-31b.	
	6-31a	New page.	
	6-31b	Added items 268 and 269; relocated renumbered item from pg. 6-31.	
	6-33	Added item 276; moved item 281 to pg. 6-34.	
	6-34	Relocated item 281 from pg. 6-33.	
	6-35	Revised item 291.	
	6-42	Revised items 427, 429 and 431; moved item 433 to pg. 6-43.	
	6-43	Relocated revised item 433 from pg. 6-42.	
	6-44	Removed info.	Ward Evans Ward Evans June 25, 1981
	7-7	Revised para. 7.11.	
	7-10	Revised para. 7.15.	
Rev. 5 (PR811116)	3-i, 4-i	Revised Table of Contents.	
	4-4, 4-7, 4-8	Revise Normal Procedure checklist.	
	4-12	Relocated para. 4.13 info. to pg. 4-13; added Note; revised info.	
	4-13	Relocated Note to pg. 4-14; added para. 4.13 info. from pg. 4-12.	
	4-14	Relocated para. 4.17 info. to pg. 4-15; added Note from pg. 4-13.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 5 (cont)	4-15	Relocated para. 4.21 to pg. 4-16; added para. 4.17 info. from pg. 4-14.	
	4-16	Relocated para. 4.23 and para. 4.25 to pg. 4-17; added para. 4.21 from pg. 4-15; added Note; revised info.	
	4-17	Relocated para. 4.27 info. to pg. 4-18; added para. 4.23 and para. 4.25 from pg. 4-16.	
	4-18	Relocated para. 4.29 info. to pg. 4-19; relocated para. 4.31 to pg. 4-19 and pg. 4-20; added para. 4.27 info. from pg. 4-17.	
	4-19	Relocated info. to pg. 4-20; added para. 4.29 and para. 4.31 info. from pg. 4-18; revised para. 4.31.	
	4-20	Relocated para. 4.37 and para. 4.39 to pg. 4-21; added info. from pg. 4-18 and pg. 4-19.	
	4-21	Relocated para. 4.41 to pg. 4-22; added para. 4.37 and para. 4.39 from pg. 4-20.	
	4-22	Added pg.; added para. 4.41 from pg. 4-21.	
	6-i	Revised Table of Contents.	
	6-13	Revised para. 6.11.	
	6-33	Relocated item 279 to pg. 6-34; renumbered old item 277; added new item 277.	
	6-34	Relocated item 289 to pg. 6-35; added item 279 from pg. 6-33.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 5 (cont)	6-35	Relocated items 297 and 299 to pg. 6-36; added items 289 from pg. 6-34.	
	6-36	Relocated item 307 to pg. 6-37; added items 297 and 299 from pg. 6-35.	
	6-37	Relocated items 313 and 315 to pg. 6-38; added item 307 from pg. 6-36.	
	6-38	Relocated item 325 to pg. 6-39; added items 313 and 315 from pg. 6-37.	
	6-39	Relocated item 329 to pg. 6-40 and renumbered item; relocated item 331 to pg. 6-40; revised item 328; added new item 329.	
	6-40	Relocated items 405 and 407 to pg. 6-41; added re-numbered items 330 and 331 from pg. 6-39.	
	6-41	Relocated items 419 and 421 to pg. 6-42; added revised item 405 from pg. 6-40; added item 407 from pg. 6-40.	
	6-42	Relocated item 431 to pg. 6-43; added items 419 and 421 from pg. 6-41.	
	6-43	Relocated item 443 to pg. 6-44; added item 431 from pg. 6-42.	
	6-44	Added item 443 from pg. 6-43; added new item 445.	Ward Evans
	7-20	Revised info.	Ward Evans
	9-18	Revised item (c) (4).	Nov. 16, 1981
	9-19	Revised item (a).	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 6 (PR820721)	iii	Revised handbook info.	
	1-i	Removed para. 1.21 - conversion factor index.	
	1-4	Added info. to para. 1.11.	
	2-1	Revised para. 2.1.	
	2-4	Added info. to para. 2.11.	
	2-9	Corrected placard error.	
	3-i	Expanded emerg. procedure index; moved info. to new pg. 3-ii.	
	3-ii	New pg.; relocated info. from pg. 3-i.	
	4-i	Expanded normal procedure index; moved info. to new pg. 4-ii.	
	4-ii	New pg.; relocated info. from pg. 4-i.	
	4-1	Revised para. 4.1.	
	6-i	Revised index pg.	
	6-6	Revised fig. 6-5 info.	
	6-7	Revised fig. 6-7 info.	
	6-9	Added info. to fig. 6-9.	
	6-10	Added info. to fig. 6-11.	
	6-12a	Revised para. 6.9.	
	7-20	Revised para. 7.25.	
	7-21	Revised para. 7.31; moved para. 7.33 info. to pg. 7-22.	
	7-22	New pg.; relocated info. from pg. 7-21.	
	9-i	Updated Supplement index pg.	
	9-13	Revised Supplement 4 (pitch trim).	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 6 (cont)	9-21 thru 9-40	Added new Supplement 7.	
	9-41 thru 9-66	Added new Supplement 8.	Ward Evans Ward Evans July 21, 1982
Rev. 7 (PR821115)	1-12 thru 1-21	Deleted para. 1.21 and pages.	
	5-3 thru 5-7	Revised para. 5.5.	
	7-12	Relocated info. from pg. 7-13.	
	7-13	Moved info. to pg. 7-12, added Caution.	
	8-2	Revised para. 8.3.	
	8-3	Revised para. 8.3 and 8.5, relocated info. from pg. 8-4.	
	8-4	Moved revised para. 8.5 to pg. 8-3, relocated info. from pg. 8-5.	Ward Evans Ward Evans Nov. 15, 1982
	8-5	Moved info. to pg. 8-4.	
Rev. 8 (PR830720)	1-9	Deleted MEA.	
	1-12	Deleted pg. 1-12, para. 1.21.	
	2-10	Moved fuel placards to pg. 2-11.	
	2-11	Added new page (GAMA placard).	
	6-9	Revised fig. 6-9.	
	8-2	Revised para. 8.3.	
	8-3	Revised para. 8.5.	
	9-67 thru 9-70	Added Supplement 9.	Ward Evans Ward Evans July 20, 1983

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 9 (PR840629)	vii	Revised Table of Contents.	
	1-3	Revised para. 1.7.	
	1-7, 1-8	Revised item (b).	
	2-3	Revised para. 2.7.	
	3-1	Revised para. 3.1.	
	4-4, 4-6	Revised procedures.	
	4-11	Revised para. 4.9.	
	4-15	Revised para. 4.19.	
	5-29	Revised Fig. 5-37.	
	6-1	Revised para. 6.1.	
	6-2	Revised para. 6.3.	
	6-5	Revised para. 6.5.	
	6-16	Revised item (b).	
	7-3	Revised para. 7.7.	
	7-8	Revised para. 7.13.	
	7-10	Revised para. 7.15.	
	7-14	Revised para. 7.17.	
	7-21	Revised para. 7.33.	
	8-12	Revised para. 8.21.	Ward Evans
	10-i	Revised Table of Contents.	
	10-1, 10-2	Changed Safety to Operating.	Ward Evans June 29, 1984
Rev. 10 (PR850705)	4-18	Added info. to para. 4.27.	
	5-20 thru 5-25	Revised charts.	
	7-7	Revised para. 7.11.	
	7-9	Relocated info. from pg. 7-10.	
	7-10	Added info. to para. 7.15.	
	7-20	Added info. to para. 7.25.	D.H. Trompler Sept. 16, 1985
Rev. 11 (PR861020)	9-i	Revised Table of Contents.	
	9-71 thru 9-76	Added Supplement 10. (Aux. Vac. System)	D.H. Trompler 12/3/86 Date

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approval Signature and Date
Rev. 12 (PR881215)	8-1	Revised para. 8.1.	
	8-2	Revised para. 8.1 and 8.3.	
	8-3	Revised para. 8.3.	
	8-12	Revised para. 8.19.	
	9-i	Added Supplement 10 to T.O.C.	
	9-9	Revised Section 3, para. (a).	D.H.Trompler Jan. 10, 1989
Rev. 13 (PR900202)	vi-j	Added Rev. 13 to Log of Revisions.	
	1-6 & 1-7	Revised para. 1.19.	
	4-6	Revised para. 4.5.	
	5-4	Revised para. 5.5.	
	6-10	Revised fig. 6-11.	
	6-12b	Revised para. 6.9.	
	6-12c	Added fig. 6-17 title.	
	7-24	Moved para. 7.39 to pg. 7-26.	
	7-25	Revised para. 7.37. Added Narco ELT 910 information.	
	7-26	Added page. Relocated para. 7.39 from pg. 7-24. Revised para. 7.39.	
	8-12	Revised para's. 8.19 & 8.21.	
	8-12a	Revised Fuel Grade Chart.	
	9-5	Added Sec. 6 & 7.	
	9-10	Revised Preflight (b)(1).	
	9-35	Revised item 10.	
	9-37	Revised item 4.	
	9-53	Removed text.	
	9-54	Revised item 13.	
	9-61	Revised item 10.	D. H .Trompler Mar. 26, 1990

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date
Rev. 14 (PR930107)	vi-k	Added log of revision page	
	vi-l	Added log of revision page	
	9-i	Added Supplement 11 to T.O.C.	
	9-77	Added Supplement 11	W. R. MOREU Jan. 07, 1993
Rev. 15 (PR940329)	7-i	Revised T.O.C.	
	7-26	Relocated para. 7.39 from pg. 7-26 to page 7-27	
	7-26	Revised para. 7.37 added ELT info.	
	7-27	Added page.	W. R. MOREU March 29, 1994
	7-28	Added Page.	
Rev. 16 (PR980402)	vi-k	Added Rev. 16 to L of R.	
	2-3	Revised Para. 2.7.	
	3-6	Revised Para. 3.3.	
	7-9	Revised Fig. 7-9.	
	7-10	Revised Para. 7.15.	PETER E. PECK April 2, 1998
	9-75	Revised illustration.	
Rev. 17 (PR190401)	ii	Updated copyright.	
	vi-k	Added Rev. 17 to L of R.	
	5-3	Revised Para. 5.5.	
	6-i	Revised Table of Contents.	Eric A. Wright April 1, 2019
	8-10	Revised Para. 8.15.	

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approved Signature and Date

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revisions	FAA Approval Signature and Date

TABLE OF CONTENTS

TABLE OF CONTENTS

SECTION 1

GENERAL

SECTION 1

GENERAL

1.1 INTRODUCTION

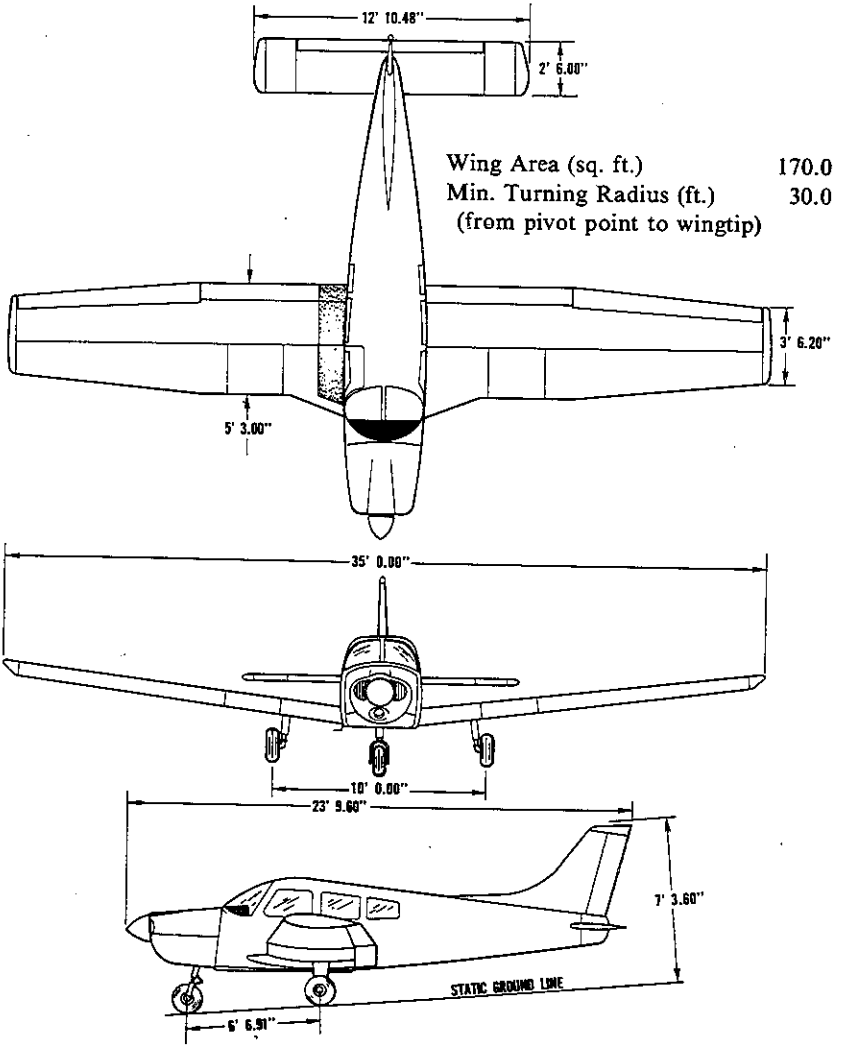
This Pilot's Operating Handbook is designed for maximum utilization as an operating guide for the pilot. It includes the material required to be furnished to the pilot by C.A.R. 3 and FAR Part 21, Subpart J. It also contains supplemental data supplied by the airplane manufacturer.

This handbook is not designed as a substitute for adequate and competent flight instruction, knowledge of current airworthiness directives, applicable federal air regulations or advisory circulars. It is not intended to be a guide for basic flight instruction or a training manual and should not be used for operational purposes unless kept in a current status.

Assurance that the airplane is in an airworthy condition is the responsibility of the owner. The pilot in command is responsible for determining that the airplane is safe for flight. The pilot is also responsible for remaining within the operating limitations as outlined by instrument markings, placards, and this handbook.

Although the arrangement of this handbook is intended to increase its in-flight capabilities, it should not be used solely as an occasional operating reference. The pilot should study the entire handbook to familiarize himself with the limitations, performance, procedures and operational handling characteristics of the airplane before flight.

The handbook has been divided into numbered (arabic) sections, each provided with a "finger-tip" tab divider for quick reference. The limitations and emergency procedures have been placed ahead of the normal procedures, performance and other sections to provide easier access to information that may be required in flight. The "Emergency Procedures" Section has been furnished with a red tab divider to present an instant reference to the section. Provisions for expansion of the handbook have been made by the deliberate omission of certain paragraph numbers, figure numbers, item numbers and pages noted as being intentionally left blank.



THREE VIEW
Figure 1-1

1.3 ENGINES

(a) Number of Engines	1
(b) Engine Manufacturer	Lycoming
(c) Engine Model Number	O-360-A4M or O-360-A4A
(d) Takeoff Power - 5 Minute Limit (BHP)	180
(e) Takeoff Engine Speed - 5 Minute Limit (RPM)	2700
(f) Maximum Continuous Power (BHP)	178
(g) Maximum Continuous Engine Speed (RPM)	2650
(h) Bore (inches)	5.125
(i) Stroke (inches)	4.375
(j) Displacement (cubic inches)	361.0
(k) Compression Ratio	8.5:1
(l) Engine Type	Four Cylinder, Direct Drive, Horizontally Opposed, Air Cooled

1.5 PROPELLERS

(a) Number of Propellers	1
(b) Propeller Manufacturer	Sensenich
(c) Model	76EM8S5-0-62
(d) Number of Blades	2
(e) Propeller Diameter (inches)	
(1) Maximum	76
(2) Minimum	76
(f) Propeller Type	Fixed Pitch

1.7 FUEL

AVGAS ONLY

(a) Fuel Capacity (U.S. gal.) (total)	50
(b) Usable Fuel (U.S. gal.) (total)	48
(c) Fuel	
(1) Minimum Octane	100 Green or 100LL Blue Aviation Grade
(2) Alternate Fuel	Refer to latest issue of Lycoming Instruction No. 1070.

1.9 OIL

(a) Oil Capacity (U.S. quarts)		8
(b) Oil Specification		Refer to latest issue of Lycoming Service Instruction 1014.
(c) Oil Viscosity per Average Ambient Temp. for Starting		
	Single	Multi
(1) Above 60° F	S.A.E. 50	S.A.E. 40 or 50
(2) 30° F to 90° F	S.A.E. 40	S.A.E. 40
(3) 0° F to 70° F	S.A.E. 30	S.A.E. 40 or 20W-30
(4) Below 10° F	S.A.E. 20	S.A.E. 20W-30

1.11 MAXIMUM WEIGHTS

	Normal	Utility
(a) Maximum Ramp Weight (lbs.)	2558	2138
(b) Maximum Takeoff Weight (lbs.)	2550	2130
(c) Maximum Landing Weight (lbs.)	2550	2130
(d) Maximum Weights in Baggage Compartment (lbs.)	200	0

1.13 STANDARD AIRPLANE WEIGHTS

Refer to Figure 6-5 for the Standard Empty Weight and the Useful Load.

1.15 BAGGAGE SPACE

(a) Compartment Volume (cubic feet)	24
(b) Entry Width (inches)	22
(c) Entry Height (inches)	20

1.17 SPECIFIC LOADINGS

(a) Wing Loading (lbs. per sq. ft.)	15.0
(b) Power Loading (lbs. per hp)	14.2

1.19 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

The following definitions are of symbols, abbreviations and terminology used throughout the handbook and those which may be of added operational significance to the pilot.

(a) General Airspeed Terminology and Symbols

CAS	Calibrated Airspeed means the indicated speed of an aircraft, corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.
KCAS	Calibrated Airspeed expressed in ``Knots.''
GS	Ground Speed is the speed of an airplane relative to the ground.
IAS	Indicated Airspeed is the speed of an aircraft as shown on the airspeed indicator when corrected for instrument error. IAS values published in this handbook assume zero instrument error.
KIAS	Indicated Airspeed expressed in ``Knots.''
TAS	True Airspeed is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature and compressibility.
V_A	Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.
V_{FE}	Maximum Flap Extended Speed is the highest speed permissible with wing flaps in a prescribed extended position.

VNE/MNE	Never Exceed Speed or Mach Number is the speed limit that may not be exceeded at any time.
VNO	Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air and then only with caution.
VS	Stalling Speed or the minimum steady flight speed at which the airplane is controllable.
VSO	Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration.
VX	Best Angle-of-Climb Speed is the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
VY	Best Rate-of-Climb Speed is the airspeed which delivers the greatest gain in altitude in the shortest possible time.

(b) Meteorological Terminology

ISA	International Standard Atmosphere in which: The air is a dry perfect gas; The temperature at sea level is 15° Celsius (59° Fahrenheit); The pressure at sea level is 29.92 inches Hg (1013.2 mb); The temperature gradient from sea level to the altitude at which the temperature is -56.5°C (-69.7°F) is -0.00198C (-0.003564°F) per foot and zero above that altitude.
OAT	Outside Air Temperature is the free air static temperature, obtained either from inflight temperature indications or ground meteorological sources, adjusted for instrument error and compressibility effects.

Indicated Pressure Altitude	The number actually read from an altimeter when the barometric subscale has been set to 29.92 inches of mercury (1013.2 millibars).
Pressure Altitude	Altitude measured from standard sea-level pressure (29.92 in. Hg) by a pressure or barometric altimeter. It is the indicated pressure altitude corrected for position and instrument error. In this handbook, altimeter instrument errors are assumed to be zero.
Station Pressure	Actual atmospheric pressure at field elevation.
Wind	The wind velocities recorded as variables on the charts of this handbook are to be understood as the headwind or tailwind components of the reported winds.

(c) Power Terminology

Takeoff Power	Maximum power permissible for takeoff.
Maximum Continuous Power	Maximum power permissible continuously during flight.

(d) Engine Instruments

EGT Gauge	Exhaust Gas Temperature Gauge

(e) Airplane Performance and Flight Planning Terminology

Climb Gradient	The demonstrated ratio of the change in height during a portion of a climb, to the horizontal distance traversed in the same time interval.
Demonstrated Crosswind Velocity (Demo. X-Wind)	The demonstrated crosswind velocity is the velocity of the crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during certification tests.
Accelerate-Stop Distance	The distance required to accelerate an airplane to a specified speed and, assuming failure of an engine at the instant that speed is attained, to bring the airplane to a stop.
Route Segment	A part of a route. Each end of that part is identified by: (1) a geographical location; or (2) a point at which a definite radio fix can be established.

(f) Weight and Balance Terminology

Reference Datum	An imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station	A location along the airplane fuselage usually given in terms of distance from the reference datum.
Arm	The horizontal distance from the reference datum to the center of gravity (C.G.) of an item.

Moment	The product of the weight of an item multiplied by its arm. (Moment divided by a constant is used to simplify balance calculations by reducing the number of digits.)
Center of Gravity (C.G.)	The point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.
C.G. Arm	The arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.
C.G. Limits	The extreme center of gravity locations within which the airplane must be operated at a given weight.
Usable Fuel	Fuel available for flight planning.
Unusable Fuel	Fuel remaining after a runout test has been completed in accordance with governmental regulations.
Standard Empty Weight	Weight of a standard airplane including unusable fuel, full operating fluids and full oil.
Basic Empty Weight	Standard empty weight plus optional equipment.
Payload	Weight of occupants, cargo and baggage.
Useful Load	Difference between takeoff weight, or ramp weight is applicable, and basic empty weight.
Maximum Ramp Weight	Maximum weight approved for ground maneuver. (It includes weight of start, taxi and run up fuel.)

Maximum Takeoff Weight	Maximum weight approved for the start of the takeoff run.
Maximum Landing Weight	Maximum weight approved for the landing touchdown.
Maximum Zero Fuel Weight	Maximum weight exclusive of usable fuel.

TABLE OF CONTENTS

SECTION 2

LIMITATIONS

SECTION 2

LIMITATIONS

2.1 GENERAL

This section provides the "FAA Approved" operating limitations, instrument markings, color coding and basic placards necessary for operation of the airplane and its systems.

This airplane must be operated as a normal or utility category airplane in compliance with the operating limitations stated in the form of placards and markings and those given in this section and this complete handbook.

Limitations associated with those optional systems and equipment which require handbook supplements can be found in Section 9 (Supplements).

2.3 AIRSPEED LIMITATIONS

SPEED	KIAS	KCAS
Never Exceed Speed (VNE) - Do not exceed this speed in any operation.	154	148
Maximum Structural Cruising Speed (VNO) - Do not exceed this speed except in smooth air and then only with caution.	125	121

SPEED	KIAS	KCAS
Design Maneuvering Speed (VA) - Do not make full or abrupt control movements above this speed.		
At 2550 lbs. G.W.	113	111
At 1634 lbs. G.W.	89	89

CAUTION

Maneuvering speed decreases at lighter weight as the effects of aerodynamic forces become more pronounced. Linear interpolation may be used for intermediate gross weights. Maneuvering speed should not be exceeded while operating in rough air.

Maximum Flaps Extended Speed (VFE) - Do not exceed this speed with the flaps extended.	102	100

2.5 AIRSPEED INDICATOR MARKINGS

MARKING	IAS
Red Radial Line (Never Exceed)	154 KTS
Yellow Arc (Caution Range - Smooth Air Only)	125 KTS to 154 KTS
Green Arc (Normal Operating Range)	55 KTS to 125 KTS
White Arc (Flap Down)	49 KTS to 102 KTS

2.7 POWER PLANT LIMITATIONS

(a) Number of Engines	1
(b) Engine Manufacturer	Lycoming
(c) Engine Model No.	O-360-A4M or O-360-A4A with carburetor setting 10-3878
(d) Engine Operating Limits	
(1) Takeoff Power - 5 Minute limit (BHP)	180
(2) Takeoff Engine Speed - 5 Minute Limit (RPM)	2700
(3) Maximum Continuous Power (BHP)	178
(4) Maximum Continuous Engine Speed (RPM)	2650
(5) Maximum Oil Temperature	245°F
(6) Oil Pressure	
Minimum (red line)	25 PSI
Maximum (red line)	90 or 100 PSI
(7) Fuel Pressure	
Minimum (red line)	0.5 PSI
Maximum (red line)	8 PSI
(8) Fuel (AVGAS ONLY) (minimum grade)	100 or 100LL Aviation Grade
(9) Number of Propellers	1
(10) Propeller Manufacturer	Sensenich
(11) Propeller Model	76EM8S5-0-62
(12) Propeller Diameter	
Minimum	76 IN.
Maximum	76 IN.
(13) Propeller Tolerance (static RPM at maximum permissible throttle setting, sea level, ISA)	Not above 2340 RPM Not below 2240 RPM

NOTE

Refer to the airplane maintenance manual for test procedure to determine approved static rpm under non-standard conditions.

POWER PLANT INSTRUMENT MARKINGS

(a)	Tachometer	
	Green Arc (Normal Operating Range)	500 to 2650 RPM
	Yellow Arc (5 Minute Limit)	2650 to 2700 RPM
	Red Line (Takeoff Power)	2700 RPM
(b)	Oil Temperature	
	Green Arc (Normal Operating Range)	75° to 245°F
	Red Line (Maximum)	245°F
(c)	Oil Pressure	
	Green Arc (Normal Operating Range)	60 PSI to 90 PSI
	Yellow Arc (Caution Range) (Idle)	25 PSI to 60 PSI
	Yellow Arc (Ground Warm-Up)	None or 90 PSI to 100 PSI
	Red Line (Minimum)	25 PSI
	Red Line (Maximum)	90 or 100 PSI
(d)	Fuel Pressure	
	Green Arc (Normal Operating Range)	0.5 PSI to 8 PSI
	Red Line (Minimum)	0.5 PSI
	Red Line (Maximum)	8 PSI

WEIGHT LIMITS

		Normal	Utility
(a)	Maximum Ramp (lbs.)	2558	2138
(b)	Maximum Weight (lbs.)	2550	2130
(c)	Maximum Baggage (lbs.)	200	0

NOTE

Refer to Section 5 (Performance) for maximum weight as limited by performance.

2.13 CENTER OF GRAVITY LIMITS

(a) Normal Category

Weight Pounds	Forward Limit Inches Aft of Datum	Rearward Limit Inches Aft of Datum
2550	88.6	93.0
2050 (and less)	82.0	93.0

(b) Utility Category

Weight Pounds	Forward Limit Inches Aft of Datum	Rearward Limit Inches Aft of Datum
2130	83.0	93.0
2050 (and less)	82.0	93.0

NOTES

Straight line variation between points given.

The datum used is 78.4 inches ahead of the wing leading edge at the inboard intersection of the straight and tapered section.

It is the responsibility of the airplane owner and the pilot to insure that the airplane is properly loaded. See Section 6 (Weight and Balance) for proper loading instructions.

2.15 MANEUVER LIMITS

(a) Normal Category - All acrobatic maneuvers including spins prohibited.
(b) Utility Category - Approved maneuvers for bank angles exceeding 60°.

	Entry Speed
Steep Turns	113 KIAS
Lazy Eights	113 KIAS
Chandelles	113 KIAS

2.17 FLIGHT LOAD FACTORS

	Normal	Utility
(a) Positive Load Factor (Maximum)	3.8 G	4.4 G
(b) Negative Load Factor (Maximum)	No inverted maneuvers approved	

2.19 TYPES OF OPERATION

The airplane is approved for the following operations when equipped in accordance with FAR 91 or FAR 135.

(a) Day V.F.R.
(b) Night V.F.R.
(c) Day I.F.R.
(d) Night I.F.R.
(e) Non Icing

2.21 FUEL LIMITATIONS

(a) Total Capacity	50 U.S. GAL.
(b) Unusable Fuel The unusable fuel for this airplane has been determined as 1.0 gallon in each wing in critical flight attitudes.	2 U.S. GAL.
(c) Usable Fuel The usable fuel in this airplane has been determined as 24.0 gallons in each wing.	48 U.S. GAL.

2.23 NOISE LEVEL

The noise level of this aircraft is 73.9 d B(A).

No determination has been made by the Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, into, or out of, any airport.

The above statement not withstanding the noise level stated above has been verified by and approved by the Federal Aviation Administration in noise level test flights conducted in accordance with FAR 36, Noise Standards - Aircraft Type and Airworthiness Certification. This aircraft model is in compliance with all FAR 36 noise standards applicable to this type.

2.25 PLACARDS

In full view of the pilot:

"THIS AIRPLANE MUST BE OPERATED AS A NORMAL OR UTILITY CATEGORY AIRPLANE IN COM-PLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARK-INGS AND MANUALS.

ALL MARKINGS AND PLACARDS ON THIS AIRPLANE APPLY TO ITS OPERATION AS A UTILITY CATEGORY AIRPLANE. FOR NORMAL AND UTILITY CATEGORY OPERATION REFER TO THE PILOT'S OPERATING HANDBOOK.

NO ACROBATIC MANEUVERS ARE APPROVED FOR NORMAL CATEGORY OPERATIONS. SPINS ARE PROHIBITED FOR NORMAL AND UTILITY CATEGORY."

In full view of the pilot:

TAKEOFF CHECK LIST

Fuel on proper tank
Electric fuel pump on
Engine gauges checked
Flaps - set
Carb. heat off
Mixture set
Primer locked
Seat backs erect
Fasten belts/harness
Trim tab - set
Controls- free
Door - latched
Air Conditioner off

LANDING CHECK LIST

Fuel on proper tank
Mixture rich
Electric fuel pump on
Seat backs erect
Flaps - set
Fasten belts/harness
Air Conditioner off

The "AIR COND OFF" item in the above takeoff and landing check lists is mandatory for air conditioned aircraft only.

In full view of the pilot, in the area of the air conditioner control panel when the air conditioner is installed:

"WARNING — AIR CONDITIONER MUST BE OFF TO INSURE NORMAL TAKEOFF CLIMB PERFORMANCE."

Adjacent to upper door latch:

"ENGAGE LATCH BEFORE FLIGHT."

On inside of the baggage compartment door.

"BAGGAGE MAXIMUM 200 LBS."
"UTILITY CATEGORY OPERATION - NO BAGGAGE OR AFT PASSENGERS ALLOWED. NORMAL CATEGORY OPERATION - SEE PILOT'S OPERATING HANDBOOK WEIGHT AND BALANCE SECTION FOR BAGGAGE AND AFT PASSENGER LIMITATIONS."

In full view of the pilot:

"V_A = 113 KIAS AT 2550# (SEE P.O.H.)"

"DEMO. X-WIND 17 KTS."

In full view of the pilot:

"OIL COOLER WINTERIZATION PLATE TO BE REMOVED WHEN AMBIENT TEMPERATURE EXCEEDS 50° F."

In full view of the pilot:

"UTILITY CATEGORY OPERATION ONLY."
(1) NO AFT PASSENGERS ALLOWED.
(2) ACROBATIC MANEUVERS ARE LIMITED TO THE FOLLOWING:

	ENTRY SPEED
SPINS PROHIBITED	—
STEEP TURNS	113 KIAS
LAZY EIGHTS	113 KIAS
CHANDELLES	113 KIAS

In full view of the pilot:

"WARNING — TURN OFF STROBE LIGHTS WHEN IN CLOSE PROXIMITY TO GROUND OR DURING FLIGHT THROUGH CLOUD, FOG OR HAZE."

On tachometer face:

"AFTER 5' MIN: REDUCE POWER TO 2650 RPM."

Adjacent to the fuel filler caps:

FUEL - 100 or 100LL AVIATION GRADE.
or
FUEL - 100-130 AVIATION GRADE MIN.
USABLE CAPACITY 24 GAL.
USABLE CAPACITY TO BOTTOM OF FILLER NECK INDICATOR 17 GAL.

Adjacent to the filler caps (serial numbers 28-8390036 and up):

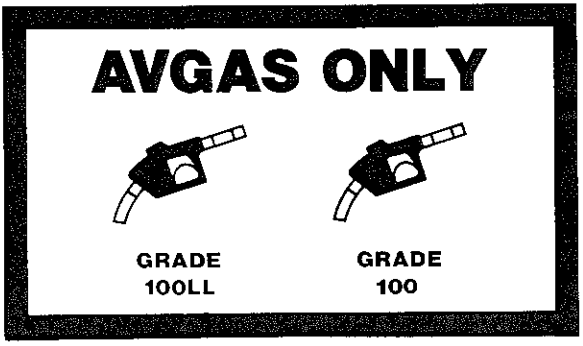


TABLE OF CONTENTS

SECTION 3

EMERGENCY PROCEDURES

TABLE OF CONTENTS (cont)

SECTION 3 (cont)

SECTION 3

EMERGENCY PROCEDURES

3.1 GENERAL

The recommended procedures for coping with various types of emergencies and critical situations are provided by this section. All of required (FAA regulations) emergency procedures and those necessary for the operation of the airplane as determined by the operating and design features of the airplane are presented.

Emergency procedures associated with those optional systems and equipment which require handbook supplements are provided in Section 9 (Supplements).

The first portion of this section consists of an abbreviated emergency check list which supplies an action sequence for critical situations with little emphasis on the operation of systems.

The remainder of the section is devoted to amplified emergency procedures containing additional information to provide the pilot with a more complete understanding of the procedures.

These procedures are suggested as a course of action for coping with the particular condition described, but are not a substitute for sound judgment and common sense. Pilots should familiarize themselves with the procedures given in this section and be prepared to take appropriate action should an emergency arise.

Most basic emergency procedures, such as power off landings, are a normal part of pilot training. Although these emergencies are discussed here, this information is not intended to replace such training, but only to provide a source of reference and review, and to provide information on procedures which are not the same for all aircraft. It is suggested that the pilot review standard emergency procedures periodically to remain proficient in them.

THIS PAGE INTENTIONALLY LEFT BLANK

3.3 EMERGENCY PROCEDURES CHECK LIST

ENGINE FIRE DURING START

Starter ..... crank engine
Mixture ..... idle cut-off
Throttle ..... open
Electric fuel pump ..... OFF
Fuel selector ..... OFF
Abandon if fire continues.

ENGINE POWER LOSS DURING TAKEOFF

If sufficient runway remains for a normal landing, land straight ahead.

If insufficient runway remains:
Maintain safe airspeed.
Make only shallow turn to avoid obstructions.
Flaps as situation requires.

If sufficient altitude has been gained to attempt a restart:
Maintain safe airspeed.
Fuel selector ..... switch to tank containing fuel
Electric fuel pump ..... check ON
Mixture .....check RICH
Carburetor heat ..... ON
Primer ..... locked
If power is not regained, proceed with power off landing.

ENGINE POWER LOSS IN FLIGHT

Fuel selector ..... switch to tank containing fuel
Electric fuel pump ..... ON
Mixture ..... RICH
Carburetor heat ..... ON
Engine gauges ..... check for indication of cause of power loss
Primer ..... check locked
If no fuel pressure is indicated, check tank selector position to be sure it is on a tank containing fuel.

When power is restored:
Carburetor heat ..... OFF
Electric fuel pump ..... OFF
If power is not restored prepare for power off landing.
Trim for 76 KIAS.

POWER OFF LANDING

Locate suitable field.
Establish spiral pattern.
1000 ft. above field at downwind position for normal landing approach.
When field can easily be reached slow to 66 KIAS for shortest landing.

Touchdowns should normally be made at lowest possible airspeed with full flaps.

When committed to landing:
Ignition ..... OFF
Master switch ..... OFF
Fuel selector ..... OFF
Mixture ..... idle cut-off
Seat belt and harness ..... tight

FIRE IN FLIGHT

Source of fire ..... check

Electrical fire (smoke in cabin):
Master switch ..... OFF
Vents ..... open
Cabin heat ..... OFF
Land as soon as practicable.

Engine fire:
Fuel selector ..... OFF
Throttle ..... CLOSED
Mixture ..... idle cut-off
Electric fuel pump ..... check OFF
Heater and defroster ..... OFF
Proceed with power off landing procedure.

LOSS OF OIL PRESSURE

Land as soon as possible and investigate cause.
Prepare for power off landing.

LOSS OF FUEL PRESSURE

Electric fuel pump ..... ON
Fuel selector ..... check on full tank

HIGH OIL TEMPERATURE

Land at nearest airport and investigate the problem.
Prepare for power off landing.

ELECTRICAL FAILURES

NOTE

When operating with light electrical load and a fully charged battery, the Alternator Inop. Light may illuminate due to minimal alternator output. If the alternator is functional, a slight increase in electrical load should extinguish the Inop. indication.

ALT annunciator light illuminated:
Ammeter.....Check to verify inop. alt.

If ammeter shows zero:
ALT switch.....OFF

Reduce electrical loads to minimum:
ALT circuit breaker.....Check and reset
.....as required
ALT switch .....ON

If power not restored:
ALT switch.....OFF

If alternator output cannot be restored, reduce electrical loads and land as soon as practical. The battery is the only remaining source of electrical power.

ELECTRICAL OVERLOAD (Alternator over 20 amps above known electrical load)

FOR AIRPLANES WITH INTERLOCKED BAT AND ALT SWITCH OPERATION

Electrical load .....Reduce

If alternator loads are reduced:
ALT switch.....OFF

Land as soon as practical. Battery is the only remaining source of power. Anticipate complete electrical failure.

ELECTRICAL OVERLOAD (Alternator over 20 amps above known electrical load)

FOR AIRPLANES WITH SEPARATE BAT AND ALT SWITCH OPERATION

ALT switch ..... ON
BAT switch ..... OFF

If alternator loads are reduced:
Electrical load ..... Reduce to Minimum

Land as soon as practical.

NOTE

Due to increased system voltage and radio frequency noise, operation with ALT switch ON and BAT switch OFF should be made only when required by an electrical system failure.

If alternator loads are not reduced:
ALT switch ..... OFF
BAT switch ..... As required

Land as soon as possible. Anticipate complete electrical failure.

SPIN RECOVERY

Throttle ..... idle
Ailerons ..... neutral
Rudder ..... full opposite to direction of rotation
Control wheel ..... full forward
Rudder ..... neutral (when rotation stops)
Control wheel ..... as required to smoothly regain level flight altitude

OPEN DOOR

If both upper and side latches are open, the door will trail slightly open and airspeeds will be reduced slightly.

To close the door in flight:
Slow airplane to 87 KIAS.
Cabin vents ..... close
Storm window ..... open

If upper latch is open ..... latch
If side latch is open ..... pull on armrest while moving latch handle to latched position

If both latches are open ..... latch side latch then top latch

CARBURETOR ICING

Carburetor heat ..... ON
Mixture ..... adjust for maximum smoothness

ENGINE ROUGHNESS

Carburetor heat ..... ON

If roughness continues after one min:
Carburetor heat ..... OFF
Mixture ..... adjust for maximum smoothness
Electric fuel pump ..... ON
Fuel selector ..... switch tanks
Engine gauges ..... check
Magneto switch ..... L then R then BOTH

If operation is satisfactory on either one, continue on that magneto at reduced power and full RICH mixture to first airport.

Prepare for power off landing.

3.5 AMPLIFIED EMERGENCY PROCEDURES (GENERAL)

The following paragraphs are presented to supply additional information for the purpose of providing the pilot with a more complete understanding of the recommended course of action and probable cause of an emergency situation.

3.7 ENGINE FIRE DURING START

Engine fires during start are usually the result of overpriming. The first attempt to extinguish the fire is to try to start the engine and draw the excess fuel back into the induction system.

If a fire is present before the engine has started, move the mixture control to idle cut-off, open the throttle and crank the engine. This is an attempt to draw the fire back into the engine.

If the engine has started, continue operating to try to pull the fire into the engine.

In either case (above), if fire continues more than a few seconds, the fire should be extinguished by the best available external means.

The fuel selector valves should be OFF and the mixture at idle cut-off if an external fire extinguishing method is to be used.

3.9 ENGINE POWER LOSS DURING TAKEOFF

The proper action to be taken if loss of power occurs during takeoff will depend on the circumstances of the particular situation.

If sufficient runway remains to complete a normal landing, land straight ahead.

If insufficient runway remains, maintain a safe airspeed and make only a shallow turn if necessary to avoid obstructions. Use of flaps depends on the circumstances. Normally, flaps should be fully extended for touchdown.

If sufficient altitude has been gained to attempt a restart, maintain a safe airspeed and switch the fuel selector to another tank containing fuel. Check the electric fuel pump to insure that it is ON and that the mixture is RICH. The carburetor heat should be ON and the primer checked to insure that it is locked.

If engine failure was caused by fuel exhaustion, power will not be regained after switching fuel tanks until the empty fuel lines are filled. This may require up to ten seconds.

If power is not regained, proceed with the Power Off Landing procedure (refer to the emergency check list and Paragraph 3.13).

3.11 ENGINE POWER LOSS IN FLIGHT

Complete engine power loss is usually caused by fuel flow interruption and power will be restored shortly after fuel flow is restored. If power loss occurs at a low altitude, the first step is to prepare for an emergency landing (refer to Paragraph 3.13). An airspeed of at least 76 KIAS should be maintained.

If altitude permits, switch the fuel selector to another tank containing fuel and turn the electric fuel pump ON. Move the mixture control to RICH and the carburetor heat to ON. Check the engine gauges for an indication of the cause of the power loss. Check to insure the primer is locked. If no fuel pressure is indicated, check the tank selector position to be sure it is on a tank containing fuel.

When power is restored move the carburetor heat to the OFF position and turn OFF the electric fuel pump.

If the preceding steps do not restore power, prepare for an emergency landing.

If time permits, turn the ignition switch to L then to R then back to BOTH. Move the throttle and mixture control levers to different settings. This may restore power if the problem is too rich or too lean a mixture or if there is a partial fuel system restriction. Try other fuel tanks. Water in the fuel could take some time to be used up, and allowing the engine to windmill may restore power. If power loss is due to water, fuel pressure indications will be normal.

If engine failure was caused by fuel exhaustion, power will not be restored after switching fuel tanks until the empty fuel lines are filled. This may require up to ten seconds.

If power is not regained, proceed with the Power Off Landing procedure (refer to the emergency check list and Paragraph 3.13).

3.13 POWER OFF LANDING

If loss of power occurs at altitude, trim the aircraft for best gliding angle 76 KIAS (Air Cond. off) and look for a suitable field. If measures taken to restore power are not effective, and if time permits, check your charts for airports in the immediate vicinity; it may be possible to land at one if you have sufficient altitude. If possible, notify the FAA by radio of your difficulty and intentions. If another pilot or passenger is aboard, let him help.

When you have located a suitable field, establish a spiral pattern around this field. Try to be at 1000 feet above the field at the downwind position, to make a normal landing approach. When the field can easily be reached, slow to 66 KIAS with flaps down for the shortest landing. Excess altitude may be lost by widening your pattern, using flaps or slipping, or a combination of these.

Touchdown should normally be made at the lowest possible airspeed.

When committed to a landing, close the throttle control and shut OFF the master and ignition switches. Flaps may be used as desired. Turn the fuel selector valve to OFF and move the mixture to idle cut-off. The seat belts and shoulder harness (if installed) should be tightened. Touchdown should be normally made at the lowest possible airspeed.

3.15 FIRE IN FLIGHT

The presence of fire is noted through smoke, smell and heat in the cabin. It is essential that the source of the fire be promptly identified through instrument readings, character of the smoke, or other indications since the action to be taken differs somewhat in each case.

Check for the source of the fire first.

If an electrical fire is indicated (smoke in the cabin), the master switch should be turned OFF. The cabin vents should be opened and the cabin heat turned OFF. A landing should be made as soon as possible.

If an engine fire is present, switch the fuel selector to OFF and close the throttle. The mixture should be at idle cut-off. Turn the electric fuel pump OFF. In all cases, the heater and defroster should be OFF. If radio communication is not required, select master switch OFF. Proceed with power off landing procedure.

NOTE

The possibility of an engine fire in flight is extremely remote. The procedure given is general and pilot judgment should be the determining factor for action in such an emergency.

3.17 LOSS OF OIL PRESSURE

Loss of oil pressure may be either partial or complete. A partial loss of oil pressure usually indicates a malfunction in the oil pressure regulating system, and a landing should be made as soon as possible to investigate the cause and prevent engine damage.

A complete loss of oil pressure indication may signify oil exhaustion or may be the result of a faulty gauge. In either case, proceed toward the nearest airport, and be prepared for a forced landing. If the problem is not a pressure gauge malfunction, the engine may stop suddenly. Maintain altitude until such time as a dead stick landing can be accomplished. Don't change power settings unnecessarily, as this may hasten complete power loss.

Depending on the circumstances, it may be advisable to make an off airport landing while power is still available, particularly if other indications of actual oil pressure loss, such as sudden increases in temperatures, or oil smoke, are apparent, and an airport is not close.

If engine stoppage occurs, proceed with Power Off Landing.

3.19 LOSS OF FUEL PRESSURE

If loss of fuel pressure occurs, turn ON the electric fuel pump and check that the fuel selector is on a full tank.

If the problem is not an empty tank, land as soon as practical and have the engine driven fuel pump and fuel system checked.

3.21 HIGH OIL TEMPERATURE

An abnormally high oil temperature indication may be caused by a low oil level, an obstruction in the oil cooler, damaged or improper baffle seals, a defective gauge, or other causes. Land as soon as practical at an appropriate airport and have the cause investigated.

A steady, rapid rise in oil temperature is a sign of trouble. Land at the nearest airport and let a mechanic investigate the problem. Watch the oil pressure gauge for an accompanying loss of pressure.

3.23 ELECTRICAL FAILURES

Loss of alternator output is detected through zero reading on the ammeter. Before executing the following procedure, insure that the reading is zero and not merely low by actuating an electrically powered device, such as the landing light. If no increase in the ammeter reading is noted, alternator failure can be assumed.

The electrical load should be reduced as much as possible. Check the alternator circuit breakers for a popped circuit.

The next step is to attempt to reset the overvoltage relay. This is accomplished by moving the ALT switch to OFF for one second and then to ON. If the trouble was caused by a momentary overvoltage condition (16.5 volts and up) this procedure should return the ammeter to a normal reading.

If the ammeter continues to indicate "0" output, or if the alternator will not remain reset, turn off the ALT switch, maintain minimum electrical load and land as soon as practical. All electrical load is being supplied by the battery.

3.24 ELECTRICAL OVERLOAD (Alternator over 20 amps above known electrical load)

If abnormally high alternator output is observed (more than 20 amps above known electrical load for the operating conditions) it may be caused by a low battery, a battery fault or other abnormal electrical load. If the cause is a low battery, the indication should begin to decrease toward normal within 5 minutes. If the overload condition persists attempt to reduce the load by turning off non-essential equipment. For airplanes with interlocked BAT and ALT switch operation, when the electrical load cannot be reduced turn the ALT switch OFF and land as soon as practical. The battery is the only remaining source of electrical power. Also anticipate complete electrical failure.

For airplanes with separate BAT and ALT switch operations, turn the BAT switch OFF and the ammeter should decrease. Turn the BAT switch ON and continue to monitor the ammeter. If the alternator output does not decrease within 5 minutes, turn the BAT switch OFF and land as soon as practical. All electrical loads are being supplied by the alternator.

NOTE

Due to higher voltage and radio frequency noise, operation with the ALT switch ON and the BAT switch OFF should be made only when required by an electrical failure.

3.25 SPIN RECOVERY

Intentional spins are prohibited in this airplane. If a spin is inadvertently entered, immediately move the throttle to idle and the ailerons to neutral.

Full rudder should then be applied opposite to the direction of rotation followed by control wheel full forward. When the rotation stops, neutralize the rudder and ease back on the control wheel as required to smoothly regain a level flight attitude.

3.27 OPEN DOOR

The cabin door is double latched, so the chances of its springing open in flight at both the top and side are remote. However, should you forget the upper latch, or not fully engage the side latch, the door may spring partially open. This will usually happen at takeoff or soon afterward. A partially open door will not affect normal flight characteristics, and a normal landing can be made with the door open.

If both upper and side latches are open, the door will trail slightly open, and airspeed will be reduced slightly.

To close the door in flight, slow the airplane to 87 KIAS, close the cabin vents and open the storm window. If the top latch is open, latch it. If the side latch is open, pull on the armrest while moving the latch handle to the latched position. If both latches are open, close the side latch then the top latch.

3.29 CARBURETOR ICING

Under certain moist atmospheric conditions at temperatures of -5° C to 20° C, it is possible for ice to form in the induction system, even in summer weather. This is due to the high air velocity through the carburetor venturi and the absorption of heat from this air by vaporization of the fuel.

To avoid this, carburetor preheat is provided to replace the heat lost by vaporization. Carburetor heat should be full on when carburetor ice is encountered. Adjust mixture for maximum smoothness.

3.31 ENGINE ROUGHNESS

Engine roughness is usually due to carburetor icing which is indicated by a drop in RPM, and may be accompanied by a slight loss of airspeed or altitude. If too much ice is allowed to accumulate, restoration of full power may not be possible; therefore, prompt action is required.

Turn carburetor heat on (See Note). RPM will decrease slightly and roughness will increase. Wait for a decrease in engine roughness or an increase in RPM, indicating ice removal. If no change in approximately one minute, return the carburetor heat to OFF.

If the engine is still rough, adjust the mixture for maximum smoothness. The engine will run rough if too rich or too lean. The electric fuel pump should be switched to ON and the fuel selector switched to the other tank to see if fuel contamination is the problem. Check the engine gauges for abnormal readings. If any gauge readings are abnormal, proceed accordingly. Move the magneto switch to L then to R, then back to BOTH. If operation is satisfactory on either magneto, proceed on that magneto at reduced power, with mixture full RICH, to a landing at the first available airport.

If roughness persists, prepare for a precautionary landing at pilot's discretion.

NOTE

Partial carburetor heat may be worse than no heat at all, since it may melt part of the ice, which will refreeze in the intake system. When using carburetor heat, therefore, always use full heat, and when ice is removed return the control to the full cold position.

TABLE OF CONTENTS

SECTION 4

NORMAL PROCEDURES

TABLE OF CONTENTS (cont)

SECTION 4 (cont)

SECTION 4

NORMAL PROCEDURES

4.1 GENERAL

This section describes the recommended procedures for the conduct of normal operations for the Archer II. All of the required (FAA regulations) procedures and those necessary for operation of the airplane as determined by the operating and design features of the airplane are presented.

Normal procedures associated with those optional systems and equipment which require handbook supplements are provided by Section 9 (Supplements).

These procedures are provided to present a source of reference and review and to supply information on procedures which are not the same for all aircraft. Pilots should familiarize themselves with the procedures given in this section in order to become proficient in the normal operations of the airplane.

The first portion of this section consists of a short form check list which supplies an action sequence for normal operations with little emphasis on the operation of the systems.

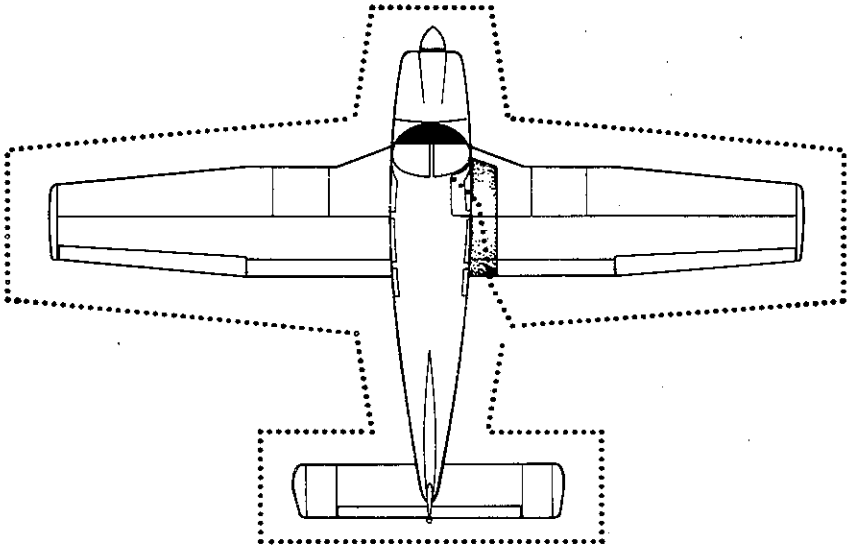
The remainder of the section is devoted to amplified normal procedures which provide detailed information and explanations of the procedures and how to perform them. This portion of the section is not intended for use as an in-flight reference due to the lengthly explanations. The short form check list should be used for this purpose.

4.3 AIRSPEEDS FOR SAFE OPERATIONS

The following airspeeds are those which are significant to the safe operation of the airplane. These figures are for standard airplanes flown at gross weight under standard conditions at sea level.

Performance for a specific airplane may vary from published figures depending upon the equipment installed, the condition of the engine, airplane and equipment, atmospheric conditions and piloting technique.

(a) Best Rate of Climb Speed ..... 76 KIAS
(b) Best Angle of Climb Speed ..... 64 KIAS
(c) Turbulent Air Operating Speed (See Subsection 2.3) ..... 113 KIAS
(d) Maximum Flap Speed ..... 102 KIAS
(e) Landing Final Approach Speed (Flaps 40°) ..... 66 KIAS
(f) Maximum Demonstrated Crosswind Velocity ..... 17 KTS



WALK-AROUND
Figure 4-1

4.5 NORMAL PROCEDURES CHECK LIST

PREFLIGHT CHECK

Control wheel ..... release belts
Avionics ..... OFF
Master switch ..... ON
Fuel quantity gauges ..... check
Master switch ..... OFF
Ignition ..... OFF
Exterior ..... check for damage
Control surfaces ..... check for interference - free of ice, snow, frost
Hinges ..... check for interference
Wings ..... free of ice, snow, frost
Stall warning ..... check
Fuel tanks ..... check supply visually - secure caps

Fuel tank sumps ..... drain and check for water sediment and proper fuel
Fuel vents ..... open
Main gear struts ..... proper inflation (4.50 in.)
Tires ..... check
Brake blocks ..... check
Pitot head ..... remove cover - holes clear
Windshield ..... clean
Propeller and spinner ..... check
Fuel and oil ..... check for leaks
Oil ..... check level
Dipstick ..... properly seated
Cowling ..... secure
Inspection covers ..... secure
Nose wheel tire ..... check
Nose gear strut ..... proper inflation (3.25 in.)
Air inlets ..... clear
Alternator belt ..... check tension
Tow bar and control locks ..... stow
Baggage ..... stowed properly - secure
Baggage door ..... close and secure
Fuel strainer ..... drain and check for water sediment and proper fuel
Primary flight controls ..... proper operation
Cabin door ..... close and secure
Required papers ..... on board
Seat belts and harness ..... fasten/adjust-check inertia reel

BEFORE STARTING ENGINE

Brakes ..... set
Carburetor heat ..... full COLD
Fuel selector ..... desired tank
Radios ..... OFF

STARTING ENGINE WHEN COLD

Throttle ..... 1/4" open
Master switch ..... ON
Electric fuel pump ..... ON
Mixture ..... full RICH

Starter ..... engage
Throttle ..... adjust
Oil pressure ..... check

If engine does not start within 10 sec. prime and repeat starting procedure.

STARTING ENGINE WHEN HOT

Throttle ..... 1/2" open
Master switch ..... ON
Electric fuel pump ..... ON
Mixture ..... full RICH
Starter ..... engage
Throttle ..... adjust
Oil pressure ..... check

STARTING ENGINE WHEN FLOODED

Throttle ..... open full
Master switch ..... ON
Electric fuel pump ..... OFF
Mixture ..... idle cut-off
Starter ..... engage
Mixture ..... advance
Throttle ..... retard
Oil pressure ..... check

STARTING WITH EXTERNAL POWER SOURCE

Master switch ..... OFF
All electrical equipment ..... OFF
Terminals ..... connect
External power plug ..... insert in fuselage

Proceed with normal start
Throttle ..... lowest possible RPM
External power plug ..... disconnect from fuselage
Master switch ..... ON - check ammeter
Oil pressure ..... check

WARM-UP

Throttle ..... 800 to 1200 RPM

TAXIING

Chocks ..... removed
Taxi area ..... clear
Throttle ..... apply slowly
Brakes ..... check
Steering ..... check

GROUND CHECK

Parking brake ..... set
Throttle ..... 2000 RPM
Magnetos ..... max. drop 175 RPM - max. diff. 50 RPM
Vacuum ..... 5.0" Hg. ± .1
Oil temp ..... check
Oil pressure ..... check
Air conditioner ..... check
Annunciator panel ..... press-to-test
Carburetor heat ..... check
Engine is warm for takeoff when throttle can be opened without engine faltering.
Electric fuel pump ..... OFF
Fuel pressure ..... check
Throttle ..... retard

BEFORE TAKEOFF

Master switch ..... ON
Flight instruments ..... check
Fuel selector ..... proper tank
Electric fuel pump ..... ON
Engine gauges ..... check
Carburetor heat ..... OFF
Seat backs ..... erect
Mixture ..... set
Primer ..... locked

Belts/harness ..... fastened/adjusted
Empty seats ..... seat belts snugly fastened
Flaps ..... set
Trim tab ..... set
Controls ..... free
Doors ..... latched
Air conditioner ..... OFF

TAKEOFF

NORMAL

Flaps ..... set
Tab ..... set
Accelerate to 52 to 65 KIAS
Control wheel ..... back pressure to rotate to climb attitude

SHORT FIELD, OBSTACLE CLEARANCE

Flaps ..... 25° (second notch)
Accelerate to 41 to 49 KIAS depending on aircraft weight.
Control wheel ..... back pressure to rotate to climb attitude
After breaking ground, accelerate to 45 to 54 KIAS depending on aircraft weight.
Accelerate to best flaps up angle of climb speed - 64 KIAS, slowly retract the flaps and climb past the obstacle.
Accelerate to best flaps up rate of climb speed - 76 KIAS.

SOFT FIELD

Flaps ..... 25° (second notch)
Accelerate to 41 to 49 KIAS depending on aircraft weight.
Control wheel ..... back pressure to rotate to climb attitude
After breaking ground, accelerate to 45 to 54 KIAS depending on aircraft weight.
Accelerate to best flaps up rate of climb speed 76 KIAS.
Flaps ..... retract slowly

CLIMB

Best rate (flaps up) ..... 76 KIAS
Best angle (flaps up) ..... 64 KIAS
En route ..... 87 KIAS
Electric fuel pump ..... OFF at desired altitude

CRUISING

Reference performance charts and Avco-Lycoming Operator's Manual.
Normal max. power 75%
Power ..... set per power table
Mixture ..... adjust

DESCENT

NORMAL

Throttle ..... 2500 rpm
Airspeed ..... 122 KIAS
Mixture ..... RICH
Carburetor heat ..... ON if required

POWER OFF

Carburetor heat ..... ON if required
Throttle ..... closed
Airspeed ..... as required
Mixture ..... as required
Power ..... verify with throttle every 30 seconds

APPROACH AND LANDING

Fuel selector ..... proper tank
Seat backs ..... erect
Belts/harness ..... fasten/adjust
Electric fuel pump ..... ON
Mixture ..... set

Flaps ..... set - 102 KIAS max
Air conditioner ..... OFF
Trim to 75 KIAS. Final approach speed (flaps 40°) ..... 66 KIAS

STOPPING ENGINE

Flaps ..... retract
Electric fuel pump ..... OFF
Air conditioner ..... OFF
Radios ..... OFF
Throttle ..... full aft
Mixture ..... idle cut-off
Magnetos ..... OFF
Master switch ..... OFF

PARKING

Parking brake ..... set
Control wheel ..... secured with belts
Flaps ..... full up
Wheel chocks ..... in place
Tie downs ..... secure

4.7 AMPLIFIED NORMAL PROCEDURES (GENERAL)

The following paragraphs are provided to supply detailed information and explanations of the normal procedures necessary for the safe operation of the airplane.

4.9 PREFLIGHT CHECK

The airplane should be given a thorough preflight and walk-around check. The preflight should include a check of the airplane's operational status, computation of weight and C.G. limits, takeoff distance and in-flight performance. A weather briefing should be obtained for the intended flight path, and any other factors relating to a safe flight should be checked before takeoff.

CAUTION

The flap position should be noted before boarding the aircraft. The flaps must be placed in the UP position before they will lock and support weight on the step.

Upon entering the cockpit, release the seat belts securing the control wheel. Turn OFF all avionics equipment. Turn ON the master switch and check the fuel quantity gauges for sufficient fuel. After the fuel quantity check is made turn the master switch OFF and check that the ignition switch is OFF.

To begin the exterior walk-around, check for external damage and operational interference of the control surfaces or hinges. Insure that the wings and control surfaces are free of snow, ice, frost or any other foreign materials.

An operational check of the stall warning system should now be made. Turn the master switch ON. Lift the detector while checking to determine if the horn is actuated. The master switch should be returned to the OFF position after the check is complete.

A visual check of the fuel tank quantity should be performed. Remove the filler cap from each tank and visually check the supply and color. Be sure to secure the caps properly after the check is complete.

The fuel system sumps and strainer should be drained daily prior to the first flight and after refueling. Check for proper fuel and the accumulation of contaminants such as water or sediment. Each fuel tank is equipped with an individual quick drain located at the lower inboard rear corner of the tank. The fuel strainer is equipped with a quick drain located on the front lower corner of the firewall. Each of the fuel tank sumps should be drained first. Then the fuel strainer should be drained twice, once with the fuel selector valve on each tank. Each time fuel is drained, sufficient fuel should be allowed to flow to ensure removal of contaminants. This fuel should be collected in a suitable container, examined for contaminants, and then discarded.

CAUTION

When draining any amount of fuel, care should be taken to ensure that no fire hazard exists before starting the engine.

Each quick drain should be checked after closing it to make sure it has closed completely and is not leaking.

Check all of the fuel tank vents to make sure they are open.

Next, complete a check of the landing gear. Check the main gear shock struts for proper inflation. There should be 4.50 inches of strut exposure under a normal static load. The nose gear should be checked for 3.25 inches of strut exposure. Check all tires for cuts and wear and insure proper inflation. Make a visual check of the brake blocks for wear or damage.

Remove the cover from the pitot head on the underside of the left wing. Check the pitot head to make sure the holes are open and clear of obstructions.

Don't forget to clean and check the windshield.

The propeller and spinner should be checked for defects or nicks.

Lift the cowling and check for any obvious fuel or oil leaks. Check the oil level. Make sure that the dipstick has properly seated after checking. Secure the cowling and check the inspection covers.

Check the air inlets for foreign matter and the alternator belt for proper tension.

Stow the tow bar and check the baggage for proper storage and security. The baggage compartment doors should be closed and secure.

Upon entering the aircraft, ascertain that all primary flight controls operate properly. Close and secure the cabin door and check that all the required papers are in order and in the airplane.

Fasten and adjust the seat belts and shoulder harness and check the function of the inertia reel by pulling sharply on the strap. Fasten seat belts on empty seats.

NOTE

If the fixed shoulder harness (non-inertia reel type) is installed, it must be connected to the seat belt and adjusted to allow proper accessibility to all controls, including fuel selector, flaps, trim, etc., while maintaining adequate restraint for the occupant.

If the inertia reel type shoulder harness is installed, a pull test of its locking restraint feature should be performed.

4.11 BEFORE STARTING ENGINE

Before starting the engine the brakes should be set ON and the carburetor heat lever moved to the full COLD position. The fuel selector should then be moved to the desired tank. Check to make sure that all the radios are OFF.

4.13 STARTING ENGINE

(a) Starting Engine When Cold

Open the throttle lever approximately 1/4 inch. Turn ON the master switch and the electric fuel pump.

Move the mixture control to full RICH and engage the starter by rotating the magneto switch clockwise. When the engine fires, release the magneto switch, and move the throttle to the desired setting.

If the engine does not fire within five to ten seconds, disengage the starter, prime the engine and repeat the starting procedure.

(b) Starting Engine When Hot

Open the throttle approximately 1/2 inch. Turn ON the master switch and the electric fuel pump. Move the mixture control lever to full RICH and engage the starter by rotating the magneto switch clockwise. When the engine fires, release the magneto switch and move the throttle to the desired setting.

(c) Starting Engine When Flooded

The throttle lever should be full OPEN. Turn ON the master switch and turn OFF the electric fuel pump. Move the mixture control lever to idle cut-off and engage the starter by rotating the magneto switch clockwise. When the engine fires, release the magneto switch, advance the mixture and retard the throttle.

(d) Starting Engine With External Power Source

An optional feature called the Piper External Power (PEP) allows the operator to use an external battery to crank the engine without having to gain access to the airplane's battery.

Turn the master switch OFF and turn all electrical equipment OFF. Connect the RED lead of the PEP kit jumper cable to the POSITIVE (+) terminal of an external 12-volt battery and the BLACK lead to the NEGATIVE (-) terminal. Insert the plug of the jumper cable into the socket located on the fuselage. Note that when the plug is inserted, the electrical system is ON. Proceed with the normal starting technique.

After the engine has started, reduce power to the lowest possible RPM, to reduce sparking, and disconnect the jumper cable from the aircraft. Turn the master switch ON and check the alternator ammeter for an indication of output. DO NOT ATTEMPT FLIGHT IF THERE IS NO INDICATION OF ALTERNATOR OUTPUT.

NOTE

For all normal operations using the PEP jumper cables, the master switch should be OFF, but it is possible to use the ship's battery in parallel by turning the master switch ON. This will give longer cranking capabilities, but will not increase the amperage.

CAUTION

Care should be exercised because if the ship's battery has been depleted, the external power supply can be reduced to the level of the ship's battery. This can be tested by turning the master switch ON momentarily while the starter is engaged. If cranking speed increases, the ship's battery is at a higher level than the external power supply.

4.15 WARM-UP

Warm-up the engine at 800 to 1200 RPM for not more than two minutes in warm weather and four minutes in cold. Avoid prolonged idling at low RPM, as this practice may result in fouled spark plugs.

Takeoff may be made as soon as the ground check is completed, provided that the throttle may be opened fully without backfiring or skipping, and without a reduction in engine oil pressure.

Do not operate the engine at high RPM when running up or taxiing over ground containing loose stones, gravel or any loose material that may cause damage to the propeller blades.

4.17 TAXIING

Before attempting to taxi the airplane, ground personnel should be instructed and approved by a qualified person authorized by the owner. Ascertain that the propeller back blast and taxi areas are clear.

Power should be applied slowly to start the taxi roll. Taxi a few feet forward and apply the brakes to determine their effectiveness. While taxiing, make slight turns to ascertain the effectiveness of the steering.

Observe wing clearances when taxiing near buildings or other stationary objects. If possible, station an observer outside the airplane.

Avoid holes and ruts when taxiing over uneven ground.

Do not operate the engine at high RPM when running up or taxiing over ground containing loose stones, gravel or any loose material that may cause damage to the propeller blades.

4.19 GROUND CHECK

Set the parking brake.

The magnetos should be checked at 2000 RPM. Drop off on either magneto should not exceed 175 RPM and the difference between the magnetos should not exceed 50 RPM. Operation on one magneto should not exceed 10 seconds.

Check the vacuum gauge; the indicator should read 5.0" ± .1" Hg at 2000 RPM.

Check the annunciator panel lights with the press-to-test button. Also check the air conditioner.

Carburetor heat should also be checked prior to takeff to be sure the control is operating properly and to clear any ice which may have formed during taxiing. Avoid prolonged ground operation with carburetor heat "ON" as the air is unfiltered.

The electric fuel pump should be turned OFF after starting or during warm-up to make sure that the engine driven pump is operating. Prior to takeoff the electric pump should be turned ON again to prevent loss of power during takeoff should the engine driven pump fail. Check both oil temperature and oil pressure. The temperature may be low for some time if the engine is being run for the first time of the day. The engine is warm enough for takeoff when the throttle can be opened without the engine faltering.

4.21 BEFORE TAKEOFF

All aspects of each particular takeoff should be considered prior to executing the takeoff procedure.

Turn ON the master switch and check and set all of the flight instruments as required. Check the fuel selector to make sure it is on the proper tank (fullest). Turn ON the electric fuel pump and check the engine gauges. The carburetor heat should be in the OFF position.

All seat backs should be erect.

The mixture should be set and the primer checked to insure that it is locked. The seat belts and shoulder harness should be fastened and adjusted. Fasten the seat belts snugly around the empty seats.

NOTE

If the fixed shoulder harness (non-inertia reel type) is installed, it must be connected to the seat belt and adjusted to allow proper accessibility to all controls, including fuel selector, flaps, trim, etc., while maintaining adequate restraint for the occupant.

If the inertia reel type shoulder harness is installed, a pull test of its locking restraint feature should be performed.

Exercise and set the flaps and trim tab. Insure proper flight control movement and response.

All doors should be properly secured and latched.

On air conditioned models, the air conditioner must be OFF to insure normal takeoff performance.

4.23 TAKEOFF

The normal takeoff technique is conventional for the Archer II. The tab should be set slightly aft of neutral, with the exact setting determined by the loading of the airplane. Allow the airplane to accelerate to 48 to 53 KIAS depending on the weight of the aircraft and ease back on the control wheel to rotate to climb attitude.

The procedure used for a short field takeoff with an obstacle clearance or a soft field takeoff differs slightly from the normal technique. The flaps should be lowered to 25° (second notch). Allow the aircraft to accelerate to 41 to 49 KIAS depending on the aircraft weight and rotate the aircraft to climb attitude. After breaking ground, accelerate to 45 to 54 KIAS, depending on aircraft weight. Continue to climb while accelerating to the flaps-up rate of climb speed, 76 KIAS if no obstacle is present or 64 KIAS if obstacle clearance is a consideration. Slowly retract the flaps while climbing out.

4.25 CLIMB

The best rate of climb at gross weight will be obtained at 76 KIAS. The best angle of climb may be obtained at 64 KIAS. At lighter than gross weight these speeds are reduced somewhat. For climbing en route, a speed of 87 KIAS is recommended. This will produce better forward speed and increased visibility over the nose during the climb.

When reaching the desired altitude, the electric fuel pump may be turned off.

4.27 CRUISING

The cruising speed of the Archer II is determined by many factors, including power setting, altitude, temperature, loading and equipment installed in the airplane.

The normal maximum cruising power is 75% of the rated horsepower of the engine. Airspeeds which may be obtained at various altitudes and power settings can be determined from the performance graphs provided by Section 5.

Use of the mixture control in cruising flight reduces fuel consumption significantly, especially at higher altitudes. The mixture should be leaned during cruising operation above 5000 ft. altitude and at pilot's discretion at lower altitudes when 75% power or less is being used. If any doubt exists as to the amount of power being used, the mixture should be in the full RICH position for all operations under 5000 feet.

To lean the mixture, disengage the lock and pull the mixture control until the engine becomes rough, indicating that the lean mixture limit has been reached in the leaner cylinders. Then enrich the mixture by pushing the control towards the instrument panel until engine operation becomes smooth.

If the airplane is equipped with the optional exhaust gas temperature (EGT) gauge, a more accurate means of leaning is available to the pilot. Best economy mixture is obtained by moving the mixture control aft until peak EGT is reached. Best power mixture is obtained by leaning to peak EGT and then enrichening until the EGT is 100° F. rich of the peak value. Under some conditions of altitude and throttle position, the engine may exhibit roughness before peak EGT is reached. If this occurs, the EGT corresponding to the onset of engine roughness should be used as the peak reference value.

Always remember that the electric fuel pump should be turned ON before switching tanks, and should be left on for a short period thereafter. In order to keep the airplane in best lateral trim during cruising flight the fuel should be used alternately from each tank. It is recommended that one tank be used for one hour after takeoff, then the other tank be used for two hours; then return to the first tank, which will have approximately one and one half hours of fuel remaining if the tanks were full at takeoff. The second tank will contain approximately one half hour of fuel. Do not run tanks completely dry in flight. The electric fuel pump should be normally OFF so that any malfunction of the engine driven fuel pump is immediately apparent. If signs of fuel starvation should occur at any time during flight, fuel exhaustion should be suspected, at which time the fuel selector should be immediately positioned to the other tank and the electric fuel pump switched to the ON position.

4.29 DESCENT

NORMAL

To achieve the performance on Figure 5-29 the power on descent must be used. The throttle should be set for 2500 RPM, mixture full rich and maintain an airspeed of 122 KIAS. In case carburetor ice is encountered apply full carburetor heat.

POWER OFF

If a prolonged power off descent is to be made, apply full carburetor heat prior to power reduction if icing conditions are suspected. Throttle should be retarded and mixture control leaned as required. Power response should be verified approximately every 30 seconds by partially opening and then closing the throttle (clearing the engine). When leveling off enrichen mixture, set power as required and select carburetor heat off unless carburetor icing conditions are suspected.

4.31 APPROACH AND LANDING

Check to insure the fuel selector is on the proper (fullest) tank and that the seat backs are erect. The seat belts and shoulder harness should be fastened and adjusted and the inertia reel checked.

NOTE

If the fixed shoulder harness (non-inertia reel type) is installed, it must be connected to the seat belt and adjusted to allow proper accessibility to all controls, including fuel selector, flaps, trim, etc., while maintaining adequate restraint for the occupant.

If the inertia reel type shoulder harness is installed, a pull test of its locking restraint feature should be performed.

Turn ON the electric fuel pump and turn OFF the air conditioner. The mixture should be set in the full RICH position.

The airplane should be trimmed to an initial approach speed of about 75 KIAS with a final approach speed of 66 KIAS with flaps extended. The flaps can be lowered at speeds up to 102 KIAS, if desired.

The mixture control should be kept in full RICH position to insure maximum acceleration if it should be necessary to open the throttle again. Carburetor heat should not be applied unless there is an indication of carburetor icing, since the use of carburetor heat causes a reduction in power which may be critical in case of a go-around. Full throttle operation with carburetor heat on can cause detonation.

The amount of flap used during landings and the speed of the aircraft at contact with the runway should be varied according to the landing surface and conditions of wind and airplane loading. It is generally good practice to contact the ground at the minimum possible safe speed consistent with existing conditions.

Normally, the best technique for short and slow landings is to use full flap and enough power to maintain the desired airspeed and approach flight path. Mixture should be full RICH, fuel on the fullest tank, and electric fuel pump ON. Reduce the speed during the flareout and contact the ground close to the stalling speed. After ground contact hold the nose wheel off as long as possible. As the airplane slows down, gently lower the nose and apply the brakes. Braking is most effective when flaps are raised and back pressure is applied to the control wheel, putting most of the aircraft weight on the main wheels. In high wind conditions, particularly in strong crosswinds, it may be desirable to approach the ground at higher than normal speeds with partial or no flaps.

4.33 STOPPING ENGINE

At the pilot's discretion, the flaps should be raised and the electric fuel pump turned OFF.

NOTE

The flaps must be placed in the UP position for the flap step to support weight. Passengers should be cautioned accordingly.

The air conditioner and radios should be turned OFF, and the engine stopped by disengaging the mixture control lock and pulling the mixture control back to idle cut-off. The throttle should be left full aft to avoid engine vibration while stopping. Then the magneto and master switches must be turned OFF.

4.35 PARKING

If necessary, the airplane should be moved on the ground with the aid of the nose wheel tow bar provided with each airplane and secured behind the rear seats. The aileron and stabilator controls should be secured by looping the safety belt through the control wheel and pulling it snug. The flaps are locked when in the UP position and should be left retracted.

Tie downs can be secured to rings provided under each wing and to the tail skid. The rudder is held in position by its connections to the nose wheel steering and normally does not have to be secured.

4.37 STALLS

The stall characteristics of the Archer II are conventional. An approaching stall is indicated by a stall warning horn which is activated between five and ten knots above stall speed. Mild airframe buffeting and gentle pitching may also precede the stall.

The gross weight stalling speed of the Archer II with power off and full flaps is 49 KIAS. With the flaps up this speed is increased 6 KTS. Loss of altitude during stalls varies from 100 to 350 feet, depending on configuration and power.

NOTE

The stall warning system is inoperative with the master switch OFF.

During preflight, the stall warning system should be checked by turning the master switch ON, lifting the detector and checking to determine if the horn is actuated. The master switch should be returned to the OFF position after the check is complete.

4.39 TURBULENT AIR OPERATION

In keeping with good operating practice used in all aircraft, it is recommended that when turbulent air is encountered or expected, the airspeed be reduced to maneuvering speed to reduce the structural loads caused by gusts and to allow for inadvertent speed build-ups which may occur as a result of the turbulence or of distractions caused by the conditions. (See Subsection 2.3)

4.41 WEIGHT AND BALANCE

It is the responsibility of the owner and pilot to determine that the airplane remains within the allowable weight vs. center of gravity envelope while in flight.

For weight and balance data, refer to Section 6 (Weight and Balance).

TABLE OF CONTENTS

SECTION 5

PERFORMANCE

SECTION 5

PERFORMANCE

5.1 GENERAL

All of the required (FAA regulations) and complementary performance information applicable to the Archer II is provided by this section.

Performance information associated with those optional systems and equipment which require handbook supplements is provided by Section 9 (Supplements).

5.3 INTRODUCTION TO PERFORMANCE AND FLIGHT PLANNING

The performance information presented in this section is based on measured Flight Test Data corrected to I.C.A.O. standard day conditions and analytically expanded for the various parameters of weight, altitude, temperature, etc.

The performance charts are unfactored and do not make any allowance for varying degrees of pilot proficiency or mechanical deterioration of the aircraft. This performance, however, can be duplicated by following the stated procedures in a properly maintained airplane.

Effects of conditions not considered on the charts must be evaluated by the pilot, such as the effect of soft or grass runway surface on takeoff and landing performance, or the effect of winds aloft on cruise and range performance. Endurance can be grossly affected by improper leaning procedures, and inflight fuel flow and quantity checks are recommended.

REMEMBER! To get chart performance, follow the chart procedures.

The information provided by paragraph 5.5 (Flight Planning Example) outlines a detailed flight plan using the performance charts in this section. Each chart includes its own example to show how it is used.

WARNING

Performance information derived by extrapolation beyond the limits shown on the charts should not be used for flight planning purposes.

5.5 FLIGHT PLANNING EXAMPLE

(a) Aircraft Loading

The first step in planning the flight is to calculate the airplane weight and center of gravity by utilizing the information provided by Section 6 (Weight and Balance) of this handbook.

The basic empty weight for the airplane as licensed at the factory has been entered in Figure 6-5. If any alterations to the airplane have been made effecting weight and balance, reference to the aircraft logbook and Weight and Balance Record (Figure 6-7) should be made to determine the current basic empty weight of the airplane.

Make use of the Weight and Balance Loading Form (Figure 6-11) and the C.G. Range and Weight graph (Figure 6-15) to determine the total weight of the airplane and the center of gravity position.

After proper utilization of the information provided, the following weights have been determined for consideration in the flight planning example.

The landing weight cannot be determined until the weight of the fuel to be used has been established [refer to item (g)(1)].

(1) Empty Weight	1412 lbs.
(2) Occupants (2 x 170 lbs.)	340 lbs.
(3) Baggage and Cargo	360 lbs.
(4) Fuel (6 lb./gal. x 48)	288 lbs.
(5) Takeoff Weight	2400 lbs.
(6) Landing Weight (a)(5) minus (g)(1), (2400 lbs. minus 129 lbs.)	2271 lbs.

The takeoff weight is below the maximum of 2550 lbs. and the weight and balance calculations have determined that the C.G. position is within the approved limits.

(b) Takeoff and Landing

After determining the aircraft loading, all aspects of takeoff and landing must be considered.

Conditions of the departure and destination airport must be acquired, evaluated and maintained throughout the flight.

Apply the departure airport conditions and takeoff weight to the appropriate Takeoff Performance graph (Figure 5-7 or 5-9) to determine the length of runway necessary for the takeoff and/or the barrier distance.

The landing distance calculations are performed in the same manner using the existing conditions at the destination airport and, when established, the landing weight.

The conditions and calculations for the example flight are listed below. The takeoff and landing distances required for the example flight have fallen well below the available runway lengths.

	Departure Airport	Destination Airport
(1) Pressure Altitude	2000 ft.	2300 ft.
(2) Temperature	21°C	21°C
(3) Wind Component (Headwind)	10 KTS	5 KTS
(4) Runway Length Available	7000 ft.	4500 ft.
(5) Runway Required	950 ft.*	825 ft.**

NOTE

The remainder of the performance charts used in this flight plan example assume a no wind condition. The effect of winds aloft must be considered by the pilot when computing climb, cruise and descent performance.

*reference Figure 5-13
**reference Figure 5-37

(c) Climb

The next step in the flight plan is to determine the necessary climb segment components.

The desired cruise pressure altitude and corresponding cruise outside air temperature values are the first variables to be considered in determining the climb components from the Time, Distance and Fuel to Climb graph (Figure 5-17). After the time, distance and fuel for the cruise pressure altitude and outside air temperature values have been established, apply the existing conditions at the departure field to the graph (Figure 5-17). Now, subtract the values obtained from the graph for the field of departure conditions from those for the cruise pressure altitude.

The remaining values are the true fuel, distance and time components for the climb segment of the flight plan corrected for field pressure altitude and temperature.

The following values were determined from the above instructions in the flight planning example.

(1) Cruise Pressure Altitude	6000 ft.
(2) Cruise OAT	13°C
(3) Time to Climb (11.5 min. minus 3 min.)	8.5 min.*
(4) Distance to Climb (16 minus 4.5 naut. miles)	11.5 naut. miles*
(5) Fuel to Climb (2 gal. minus 1 gal.)	1 gal.*

(d) Descent

The descent data will be determined prior to the cruise data to provide the descent distance for establishing the total cruise distance.

Utilizing the cruise pressure altitude and OAT, determine the basic time, distance and fuel for descent (Figure 5-31). These figures must be adjusted for the field pressure altitude and temperature at the destination airport. To find the necessary adjustment values, use the existing pressure altitude and temperature conditions at the destination airport as variables to find the time, distance and fuel

*reference Figure 5-17

values from the graph (Figure 5-31). Now, subtract the values obtained from the field conditions from the values obtained from the cruise conditions to find the true time, distance and fuel values needed for the flight plan.

The values obtained by proper utilization of the graphs for the descent segment of the example are shown below.

(1) Time to Descend (16 min. minus 7.5 min.)	8.5 min.*
(2) Distance to Descend (35 minus 14.5 naut. miles)	20.5 naut. miles*
(3) Fuel to Descend (2 gal. minus 1 gal.)	1 gal.*

(e) Cruise

Using the total distance to be traveled during the flight, subtract the previously calculated distance to climb and distance to descend to establish the total cruise distance. Refer to the appropriate Avco Lycoming Operator's Manual when selecting the cruise power setting. The established pressure altitude and temperature values and the selected cruise power should now be utilized to determine the true airspeed from the appropriate Speed Power graph (Figure 5-21 or 5-23).

Calculate the cruise fuel flow for the cruise power setting from the information provided by the Avco Lycoming Operator's Manual.

The cruise time is found by dividing the cruise distance by the cruise speed and the cruise fuel is found by multiplying the cruise fuel flow by the cruise time.

The cruise calculations established for the cruise segment of the flight planning example are as follows:

(1) Total Distance	314 naut. miles
(2) Cruise Distance (e)(1) minus (c)(4) minus (d)(2), (314 minus 11.5 minus 20.5)	282 naut. miles

*reference Figure 5-31

(3) Cruise Power	65% rated power
(4) Cruise Speed	110 KTS TAS*
(5) Cruise Fuel Consumption	7.6 GPH
(6) Cruise Time	
(e)(2) divided by (e)(4), (282 naut. miles divided by 110 KTS)	2.56 hrs.
(7) Cruise Fuel	
(e)(5) multiplied by (e)(6), (7.6 GPH multiplied by 2.56 hrs.)	19.5 gal.

(f) Total Flight Time

The total flight time is determined by adding the time to climb, the time to descend and the cruise time. Remember! The time values taken from the climb and descent graphs are in minutes and must be converted to hours before adding them to the cruise time.

The following flight time is required for the flight planning example.

(1) Total Flight Time	
(c)(3) plus (d)(1) plus (e)(6), (.14 hrs. plus .14 hrs. plus 2.56 hrs.)	2.84 hrs.

(g) Total Fuel Required

Determine the total fuel required by adding the fuel to climb, the fuel to descend and the cruise fuel. When the total fuel (in gallons) is determined, multiply this value by 6 lb./gal. to determine the total fuel weight used for the flight.

The total fuel calculations for the example flight plan are shown below.

(1) Total Fuel Required	
(c)(5) plus (d)(3) plus (e)(7), (1 gal. plus 1 gal. plus 19.5 gal.)	21.5 gal.
(21.5 gal. multiplied by 6 lb./gal.)	129 lbs.

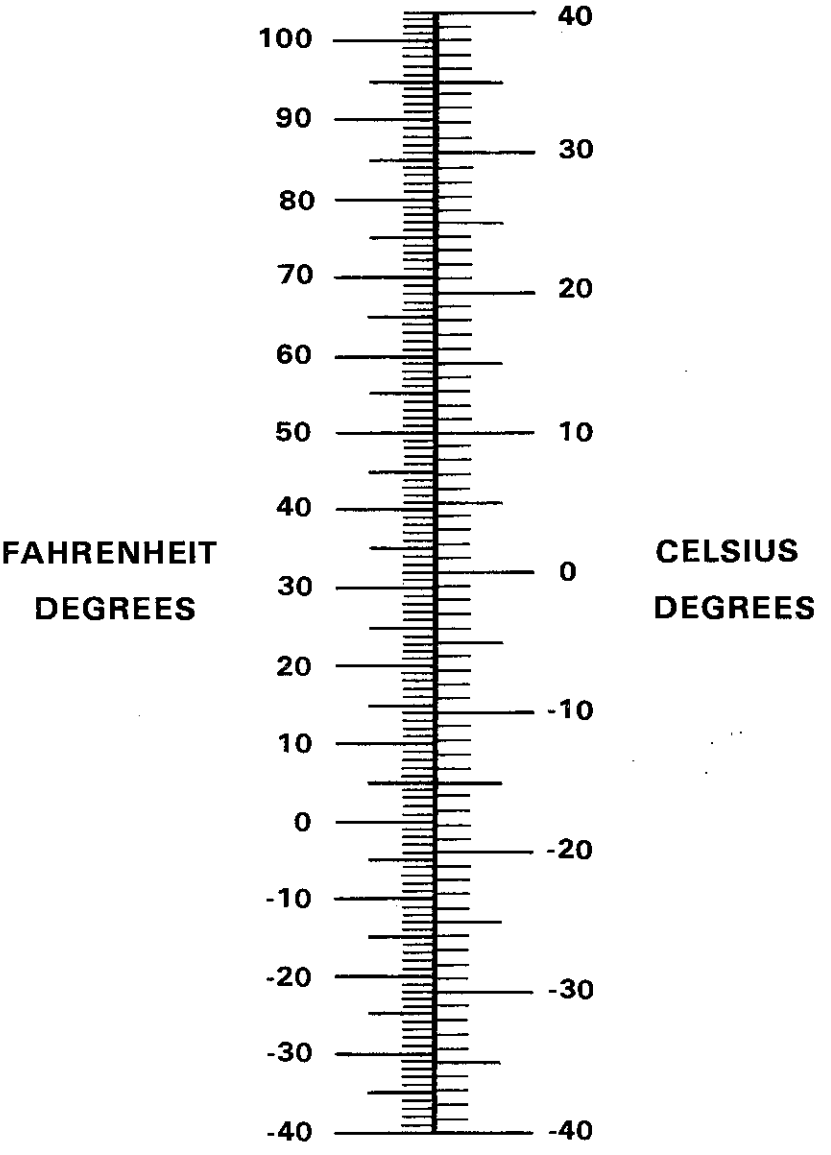
*reference Figure 5-23

THIS PAGE INTENTIONALLY LEFT BLANK

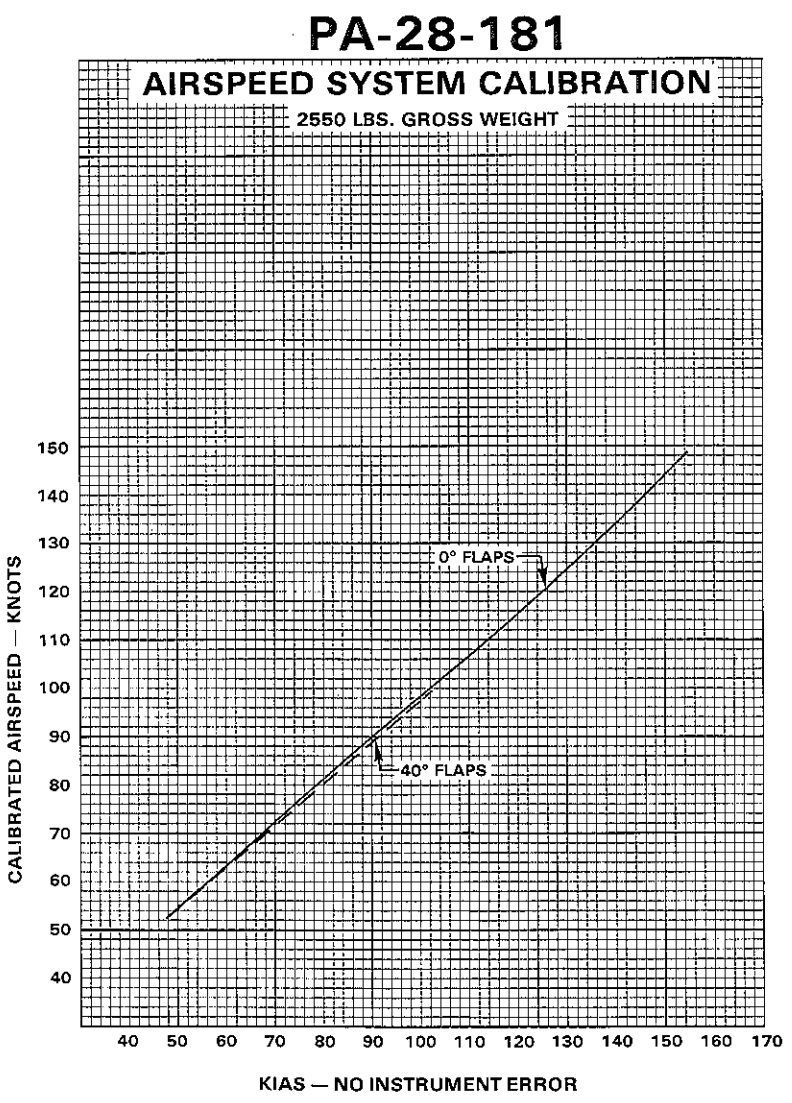
5.7 PERFORMANCE GRAPHS

LIST OF FIGURES

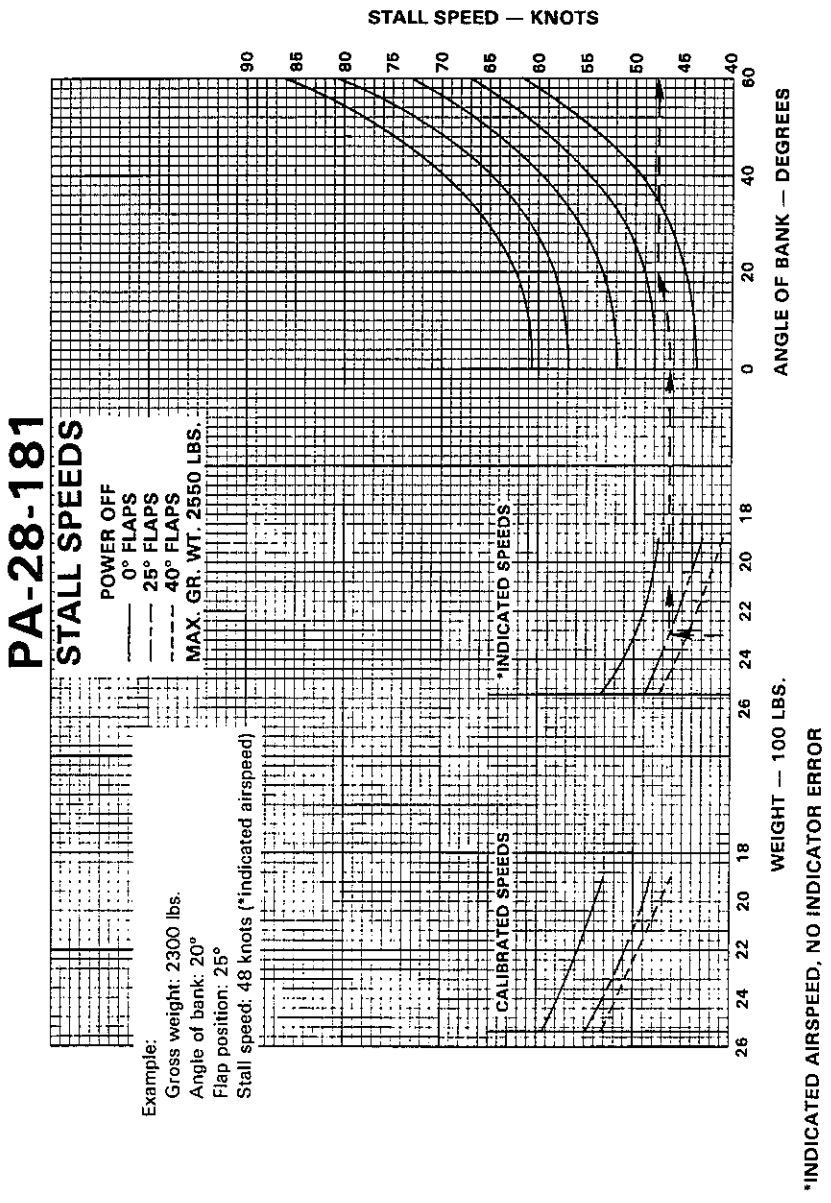
THIS PAGE INTENTIONALLY LEFT BLANK



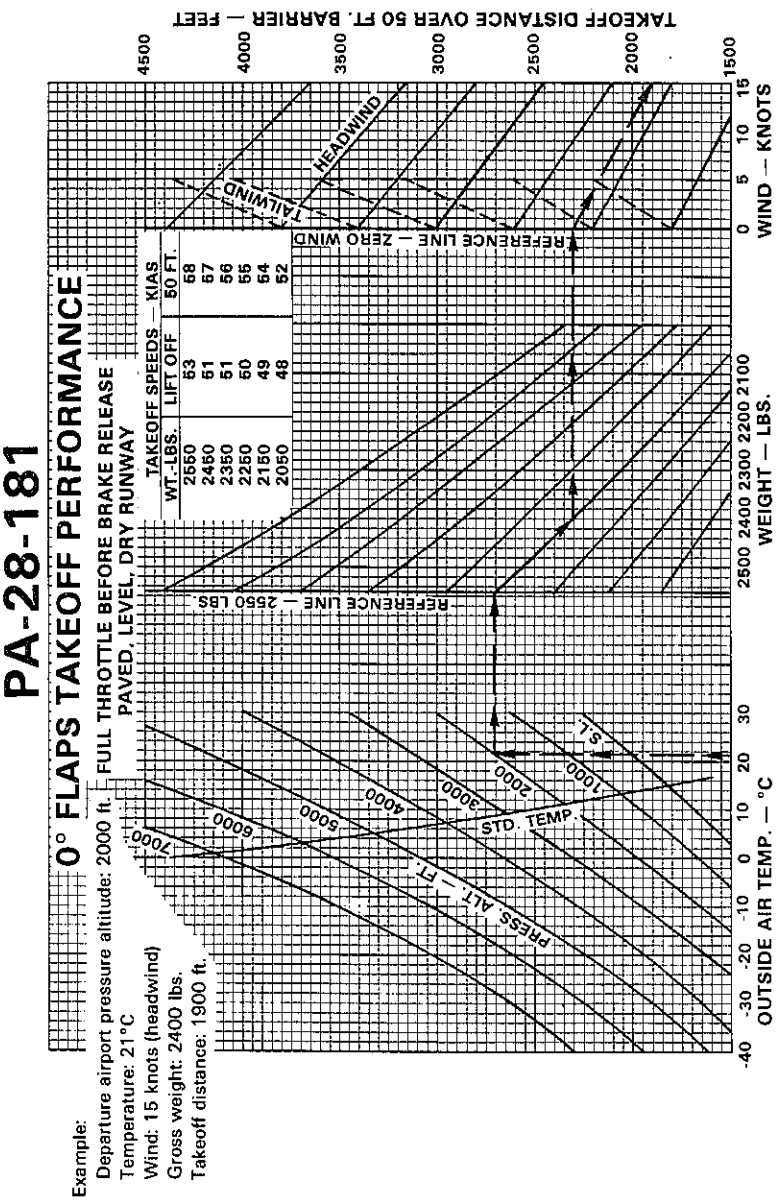
TEMPERATURE CONVERSION
Figure 5-1



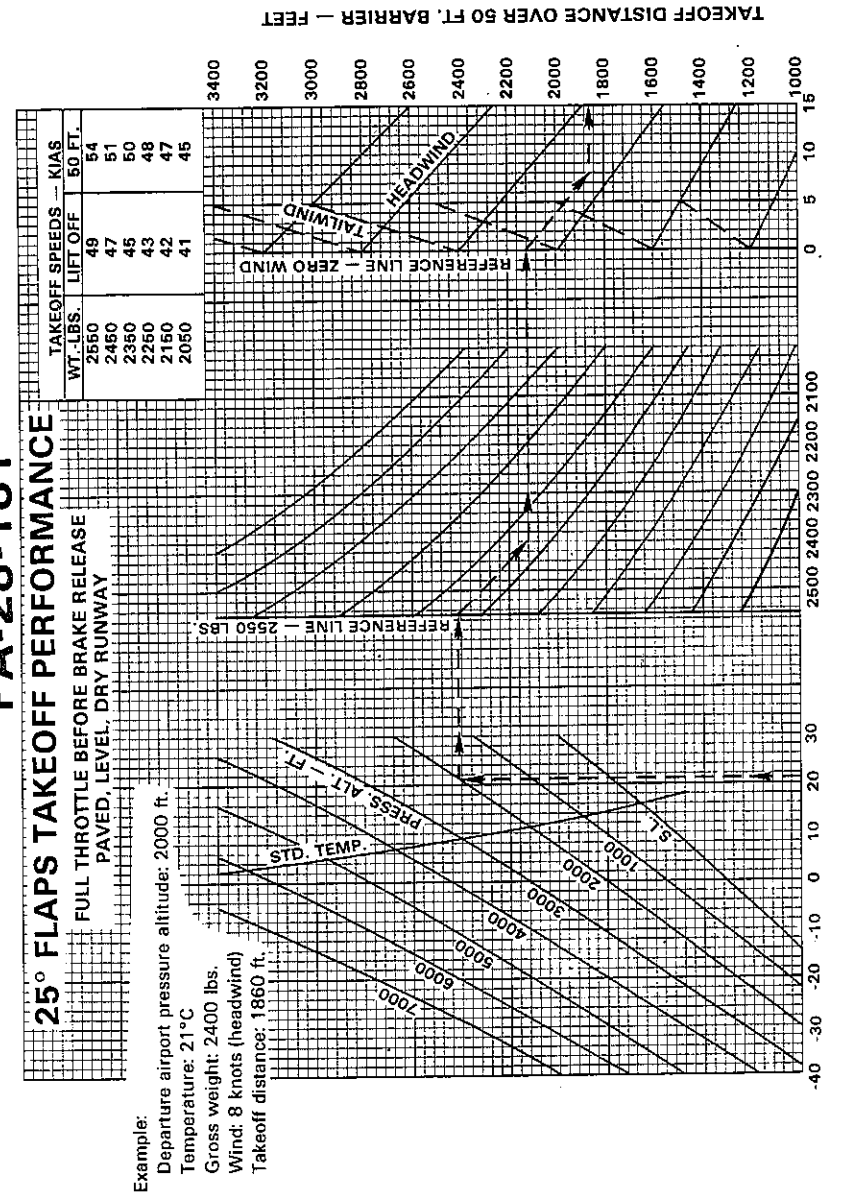
AIRSPEED SYSTEM CALIBRATION
Figure 5-3



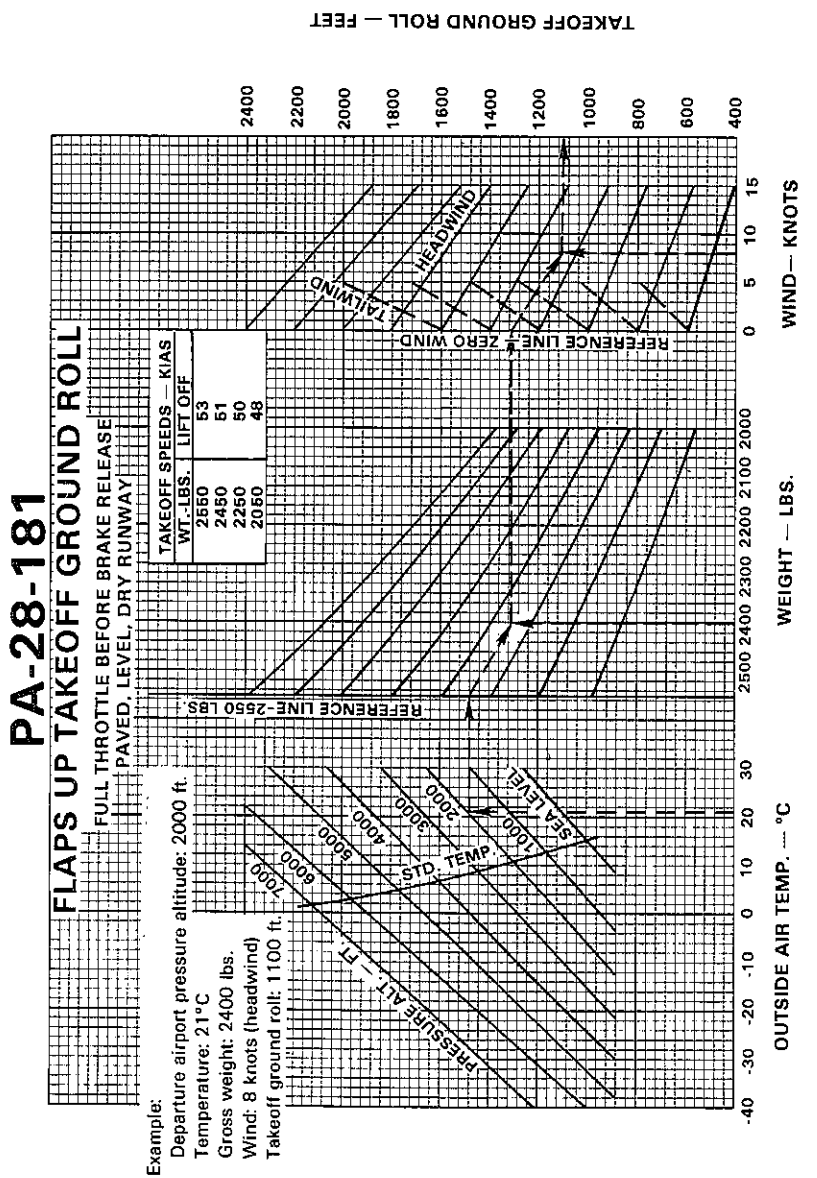
STALL SPEEDS
Figure 5-5



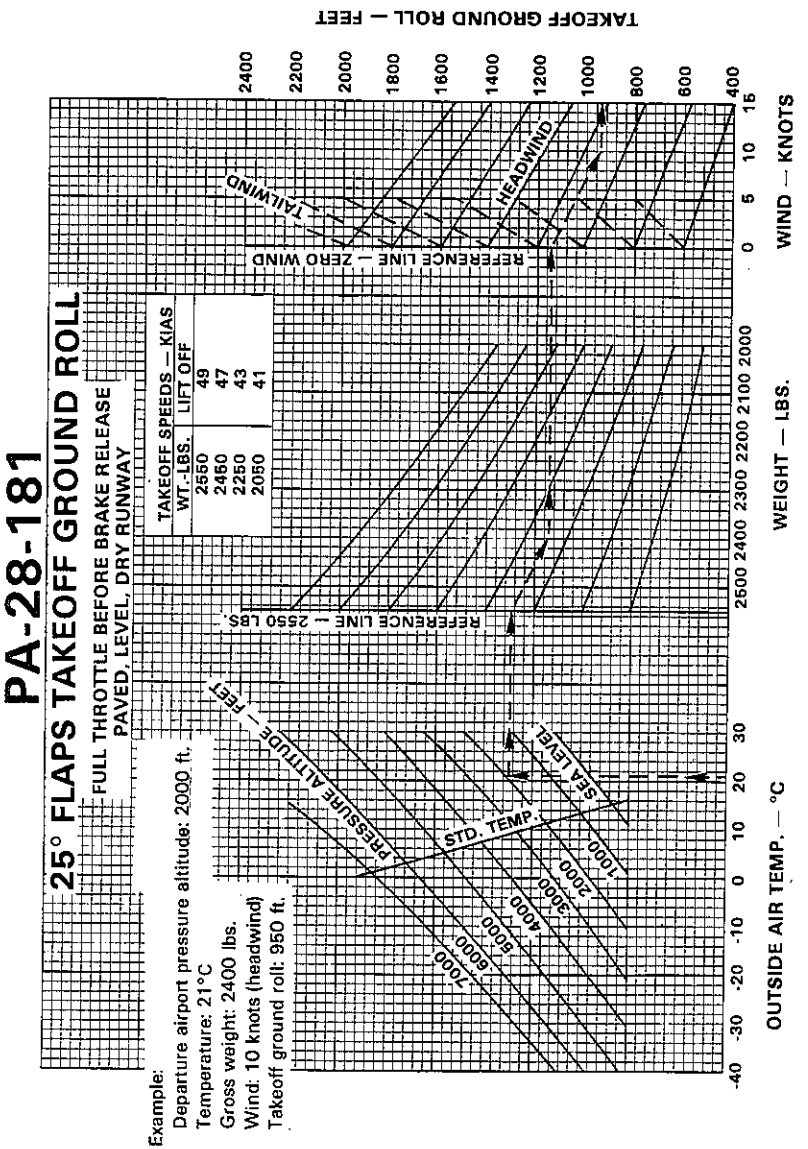
FLAPS UP TAKEOFF PERFORMANCE
Figure 5-7



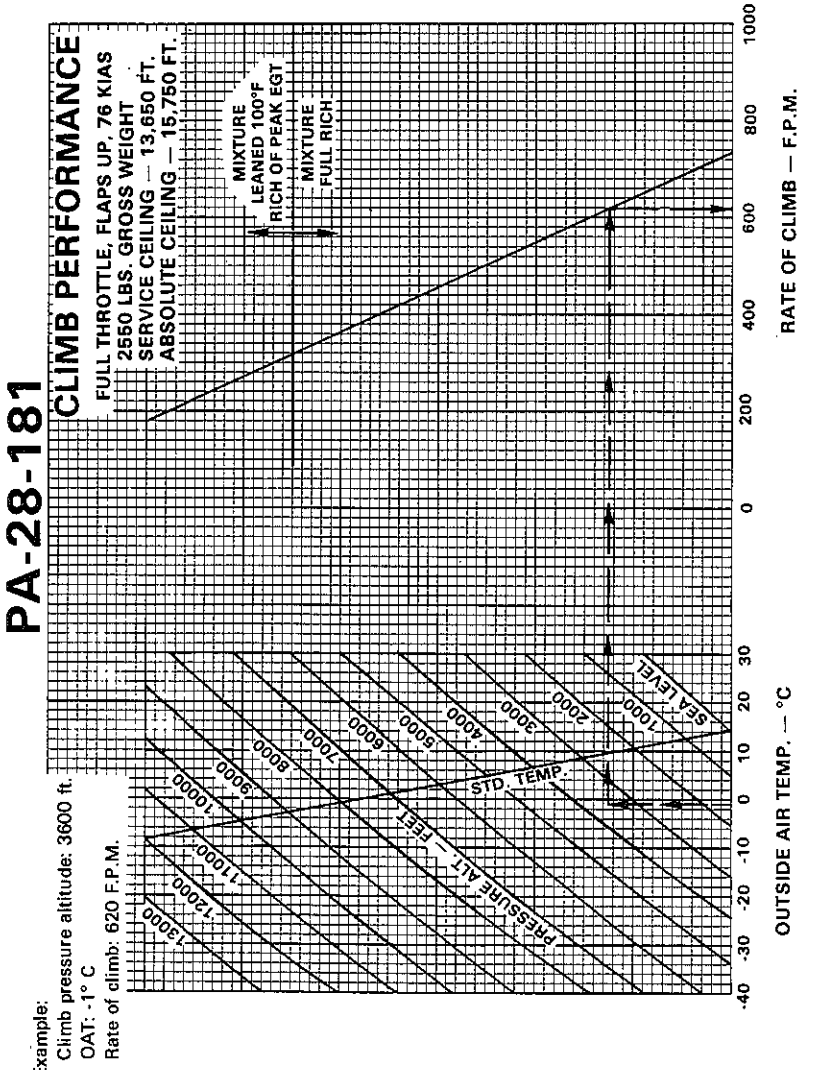
25° FLAPS TAKEOFF PERFORMANCE
Figure 5-9



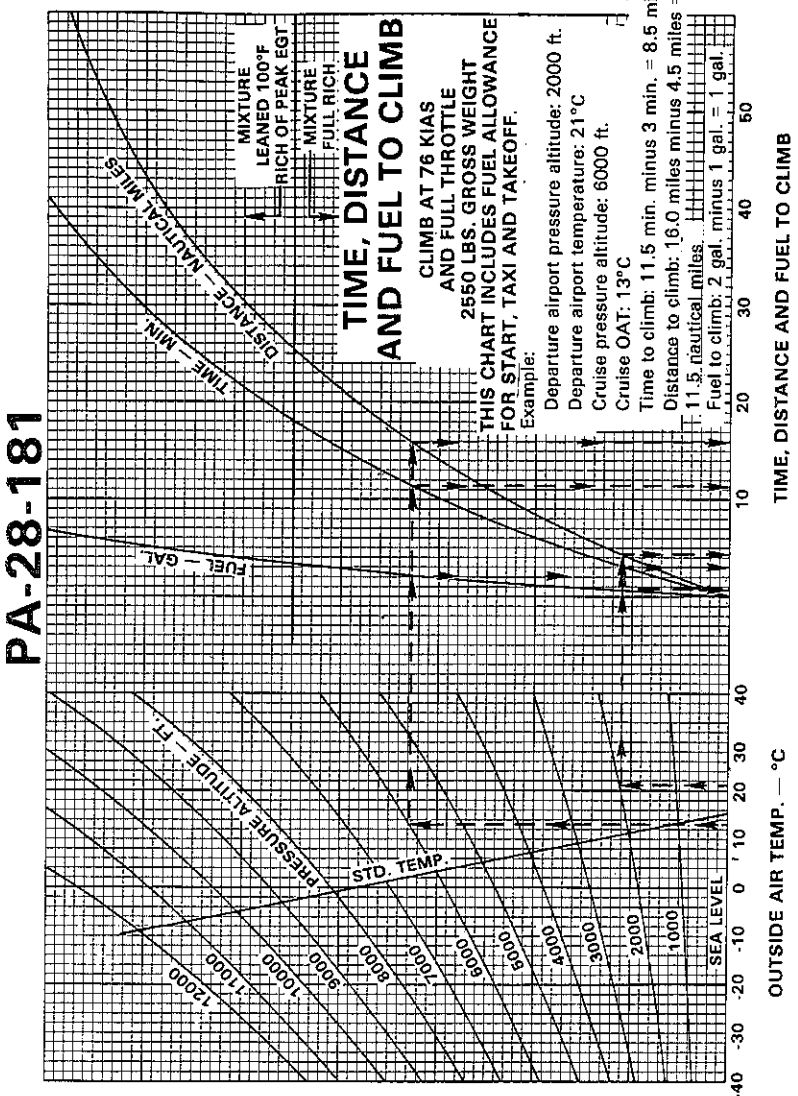
FLAPS UP TAKEOFF GROUND ROLL
Figure 5-11



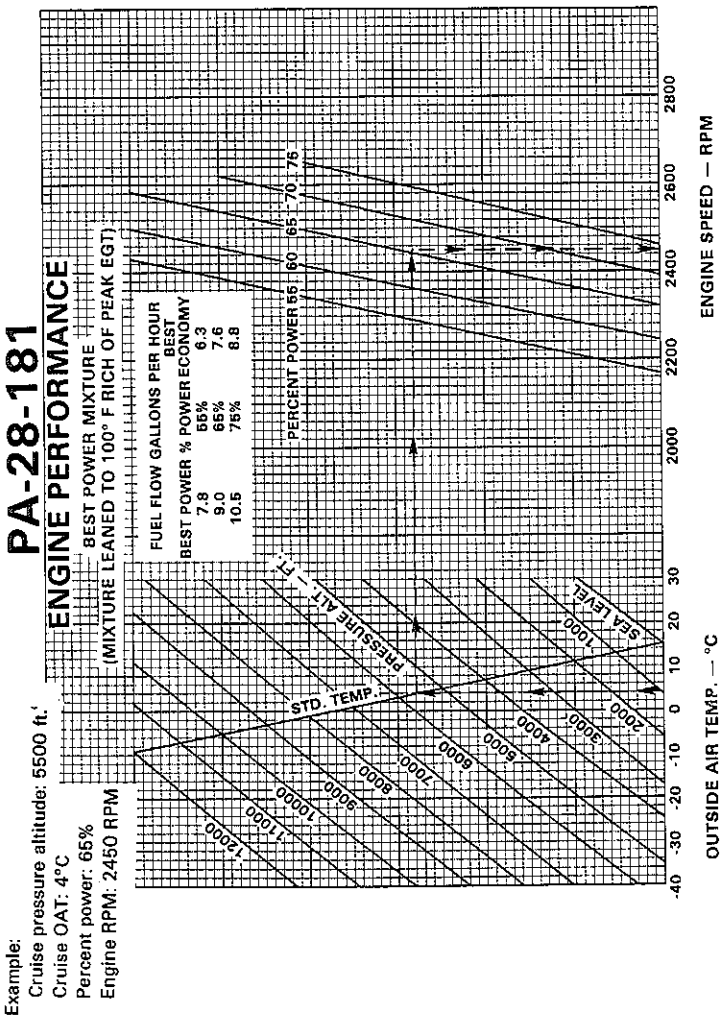
25° FLAPS TAKEOFF GROUND ROLL
Figure 5-13



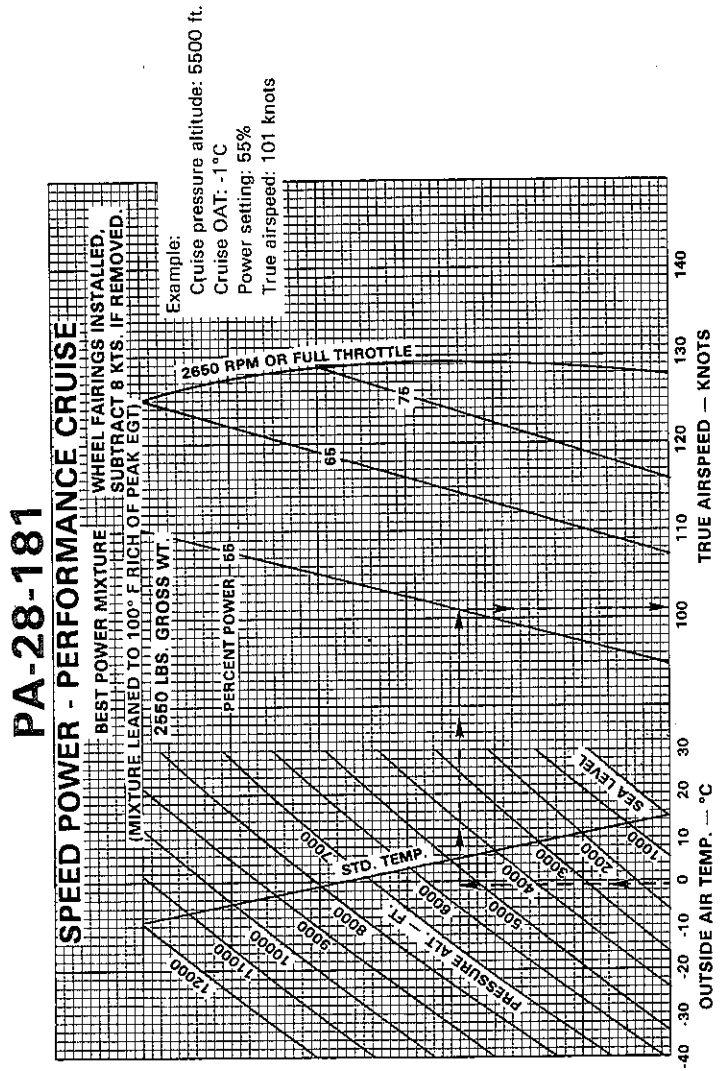
CLIMB PERFORMANCE
Figure 5-15



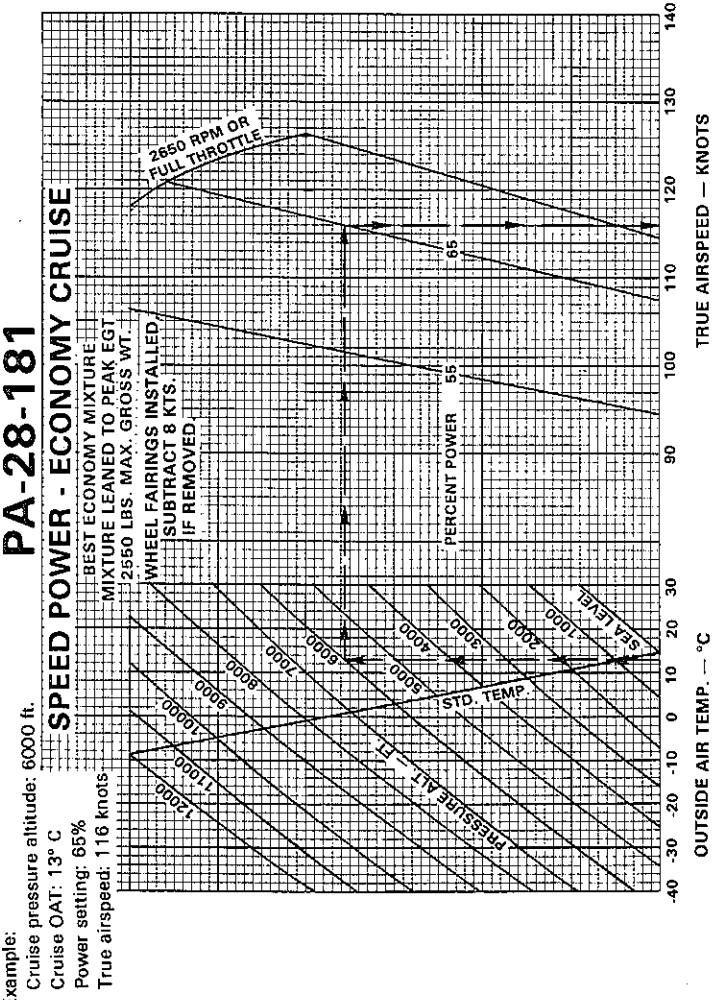
TIME, DISTANCE AND FUEL TO CLIMB
Figure 5-17



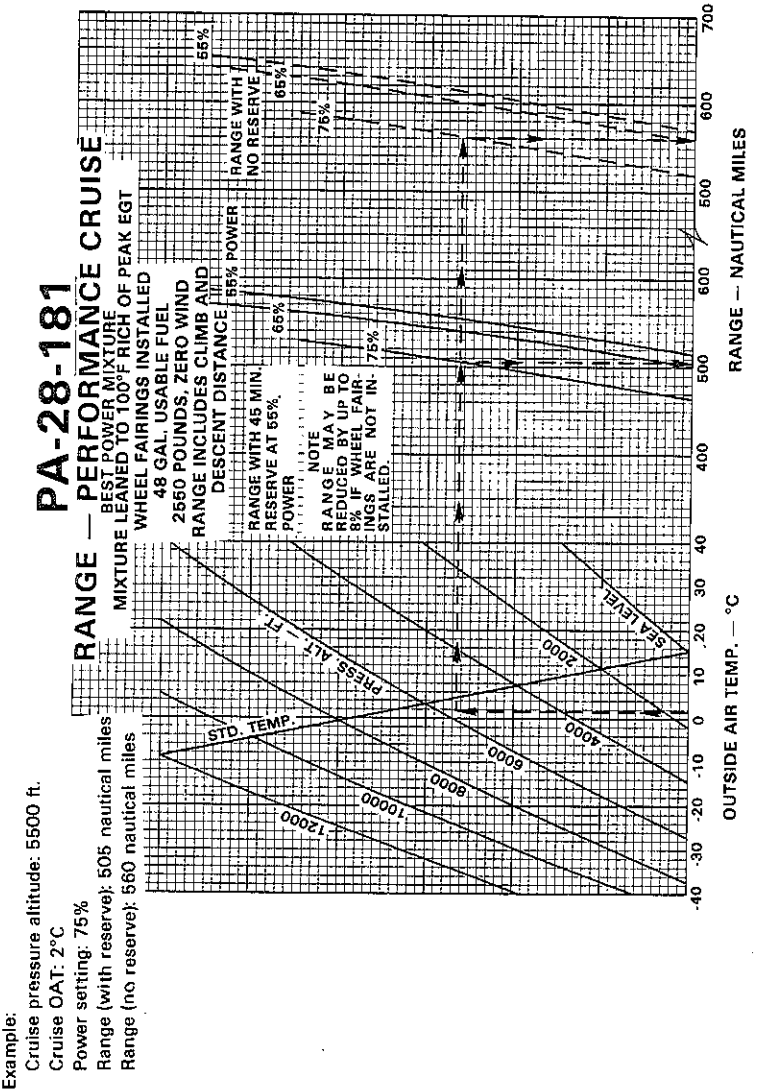
ENGINE PERFORMANCE
Figure 5-19



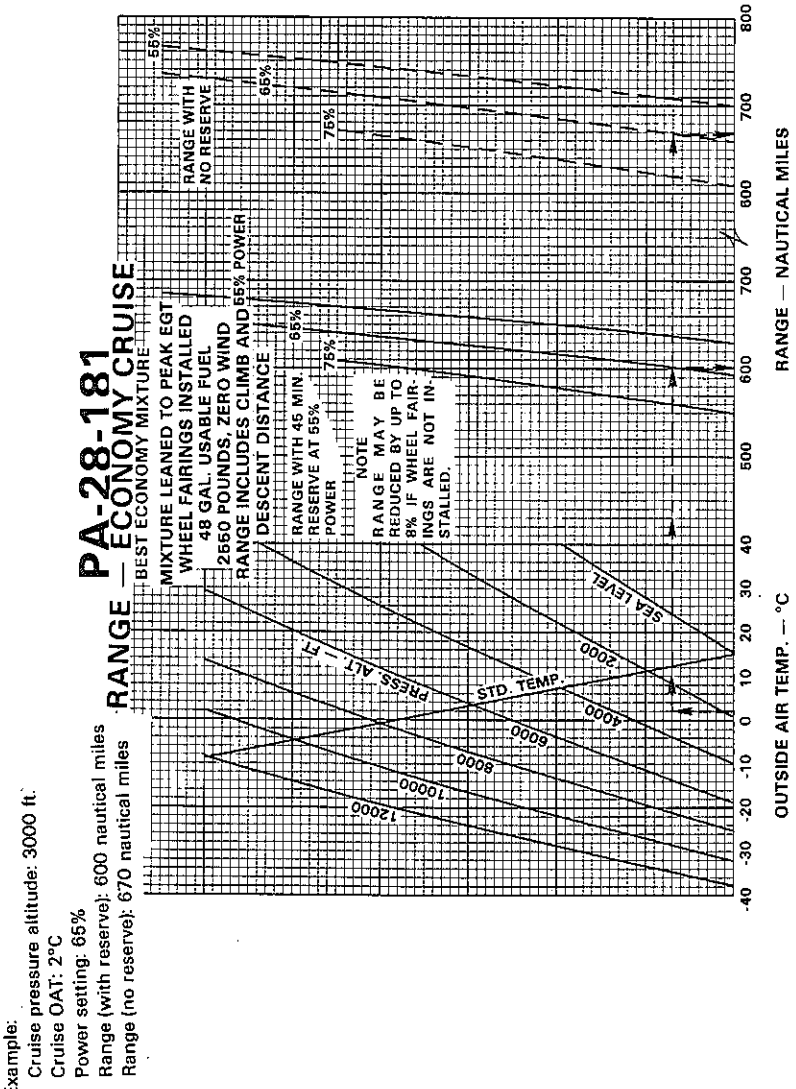
SPEED POWER - PERFORMANCE CRUISE
Figure 5-21



SPEED POWER - ECONOMY CRUISE
Figure 5-23

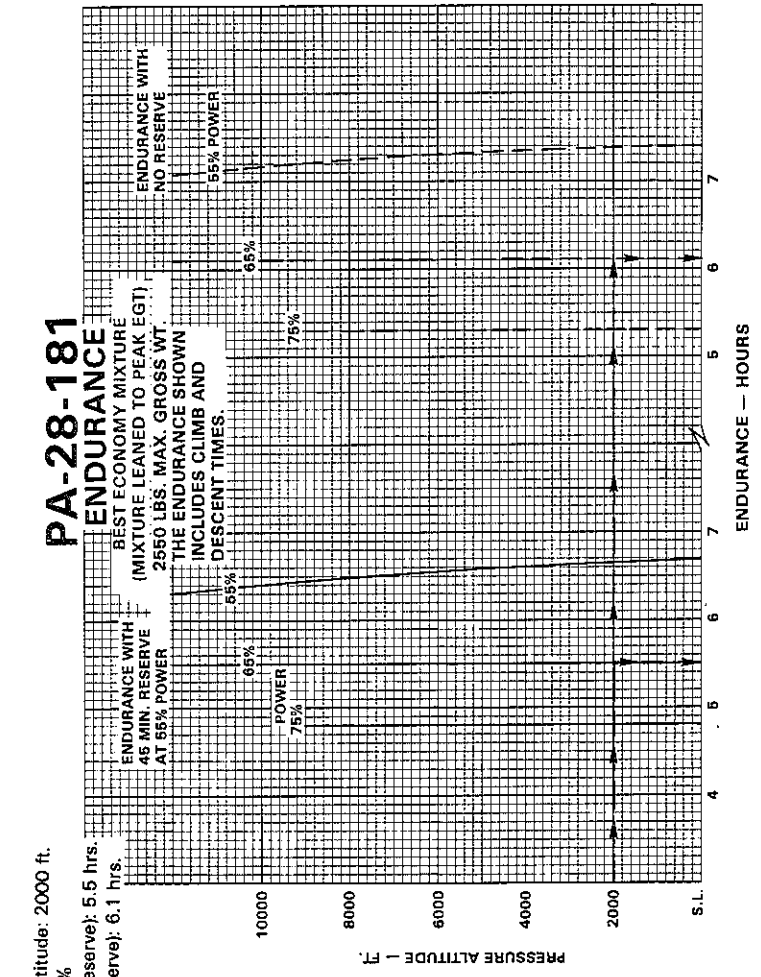


BEST POWER MIXTURE RANGE
Figure 5-25

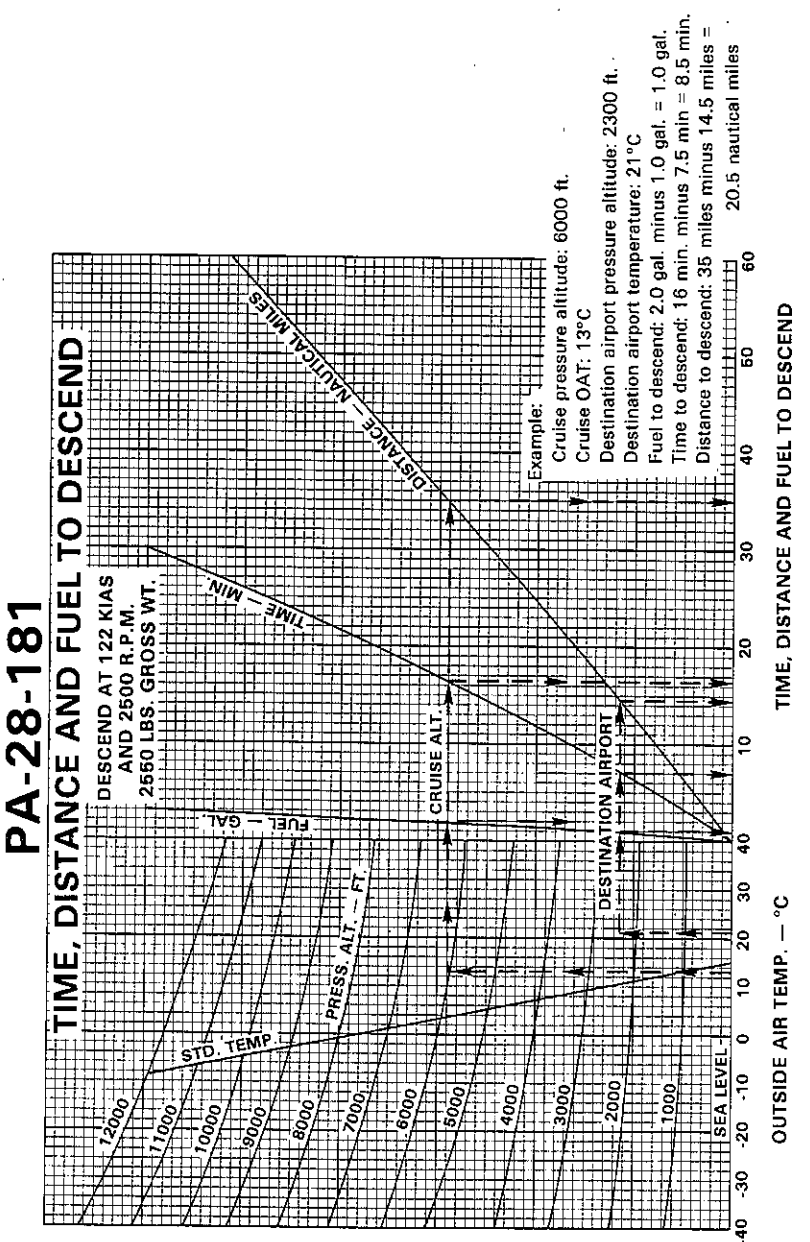


Example:
Cruise pressure altitude: 3000 ft.
Cruise OAT: 2°C
Power setting: 65%
Range (with reserve): 600 nautical miles
Range (no reserve): 670 nautical miles

BEST ECONOMY MIXTURE RANGE
Figure 5-27

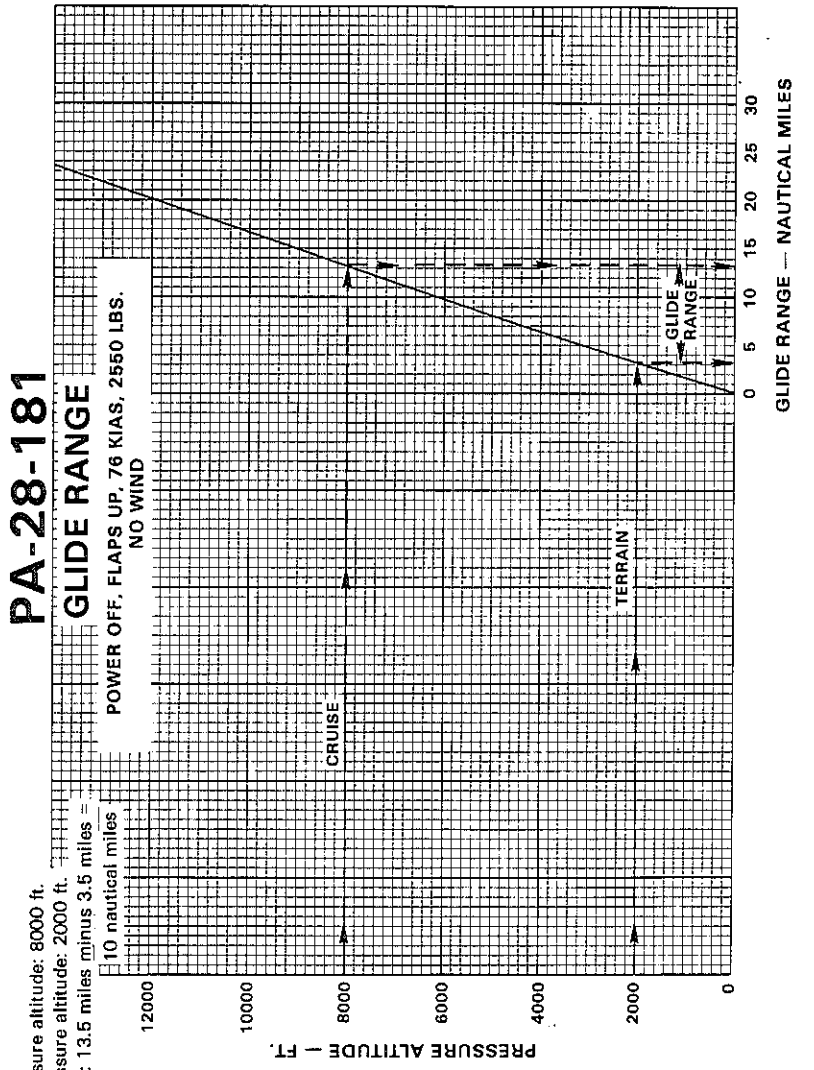


ENDURANCE
Figure 5-29

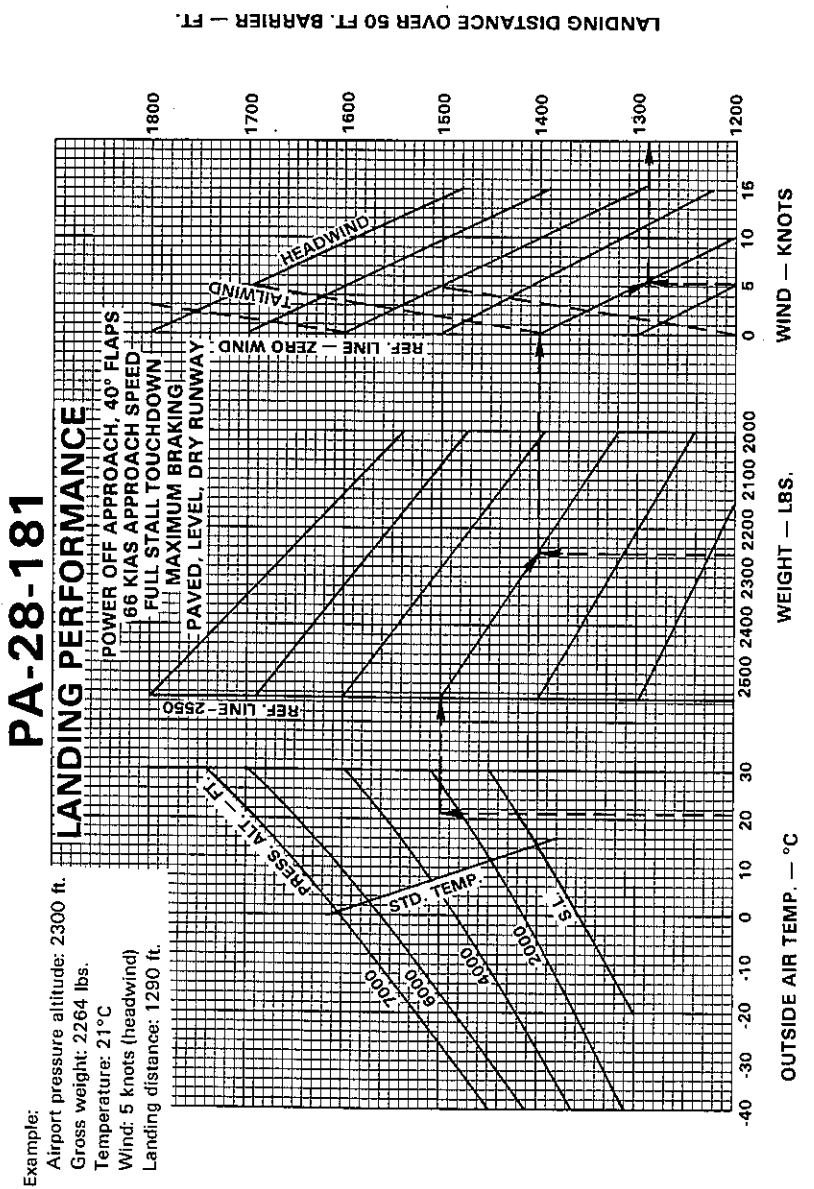


TIME, DISTANCE AND FUEL TO DESCEND

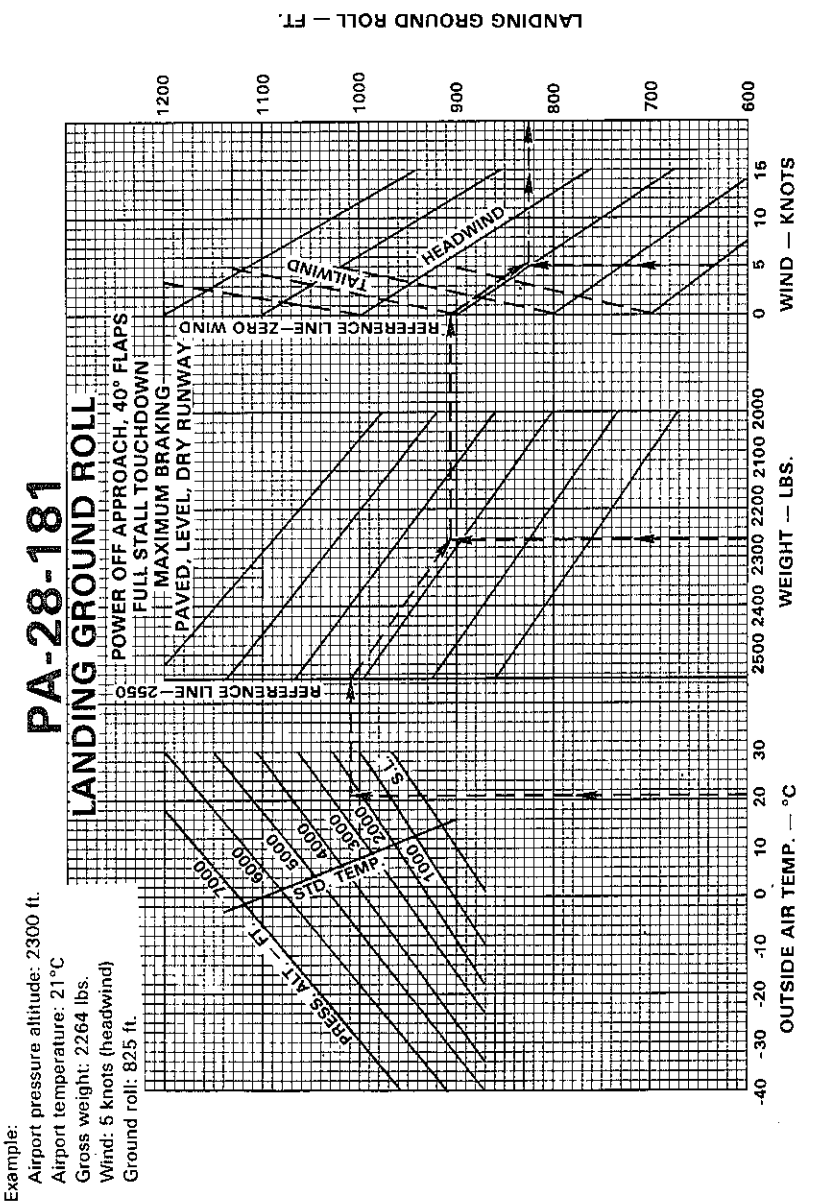
Figure 5-31



GLIDE RANGE
Figure 5-33



LANDING PERFORMANCE
Figure 5-35



LANDING GROUND ROLL
Figure 5-37

TABLE OF CONTENTS

SECTION 6

WEIGHT AND BALANCE

*For 1982 and preceding models only.
**For 1983 and subsequent models only.

SECTION 6

WEIGHT AND BALANCE

6.1 GENERAL

In order to achieve the performance and flying characteristics which are designed into the airplane, it must be flown with the weight and center of gravity (C.G.) position within the approved operating range (envelope). Although the airplane offers flexibility of loading, it cannot be flown with the maximum number of adult passengers, full fuel tanks and maximum baggage. With the flexibility comes responsibility. The pilot must ensure that the airplane is loaded within the loading envelope before he makes a takeoff.

Misloading carries consequences for any aircraft. An overloaded airplane will not take off, climb or cruise as well as a properly loaded one. The heavier the airplane is loaded, the less climb performance it will have.

Center of gravity is a determining factor in flight characteristics. If the C.G. is too far forward in any airplane, it may be difficult to rotate for takeoff or landing. If the C.G. is too far aft, the airplane may rotate prematurely on takeoff or tend to pitch up during climb. Longitudinal stability will be reduced. This can lead to inadvertent stalls and even spins; and spin recovery becomes more difficult as the center of gravity moves aft of the approved limit.

A properly loaded airplane, however, will perform as intended. Before the airplane is licensed, a basic empty weight and C.G. location is computed (basic empty weight consists of the standard empty weight of the airplane plus the optional equipment). Using the basic empty weight and C.G. location, the pilot can easily determine the weight and C.G. position for the loaded airplane by computing the total weight and moment and then determining whether they are within the approved envelope.

The basic empty weight and C.G. location are recorded in the Weight and Balance Data Form (Figure 6-5) and the Weight and Balance Record (Figure 6-7). The current values should always be used. Whenever new equipment is added or any modification work is done, the mechanic responsible for the work is required to compute a new basic empty weight and C.G. position and to write these in the Aircraft Log Book and the Weight and Balance Record. The owner should make sure that it is done.

A weight and balance calculation is necessary in determining how much fuel or baggage can be boarded so as to keep within allowable limits. Check calculations prior to adding fuel to insure against improper loading.

The following pages are forms used in weighing an airplane in production and in computing basic empty weight, C.G. position, and useful load. Note that the useful load includes usable fuel, baggage, cargo and passengers. Following this is the method for computing takeoff weight and C.G.

6.3 AIRPLANE WEIGHING PROCEDURE

At the time of licensing, Piper Aircraft Corporation provides each airplane with the basic empty weight and center of gravity location. This data is supplied by Figure 6-5.

The removal or addition of equipment or airplane modifications can affect the basic empty weight and center of gravity. The following is a weighing procedure to determine this basic empty weight and center of gravity location:

(a) Preparation

(1) Be certain that all items checked in the airplane equipment list are installed in the proper location in the airplane.

(2) Remove excessive dirt, grease, moisture, foreign items such as rags and tools from the airplane before weighing.

(3) Defuel airplane. Then open all fuel drains until all remaining fuel is drained. Operate engine on each tank until all undrainable fuel is used and engine stops. Then add the unusable fuel (2.0 gallons total, 1.0 gallons each wing).

CAUTION

Whenever the fuel system is completely drained and fuel is replenished it will be necessary to run the engine for a minimum of 3 minutes at 1000 RPM on each tank to ensure no air exists in the fuel supply lines.

(4) Fill with oil to full capacity.

(5) Place pilot and copilot seats in fourth (4th) notch, aft of forward position. Put flaps in the fully retracted position and all control surfaces in the neutral position. Tow bar should be in the proper location and all entrance and baggage doors closed.

(6) Weigh the airplane inside a closed building to prevent errors in scale readings due to wind.

(b) Leveling

(1) With airplane on scales, block main gear oleo pistons in the fully extended position.

(2) Level airplane (refer to Figure 6-3) deflating nose wheel tire, to center bubble on level.

(c) Weighing - Airplane Basic Empty Weight

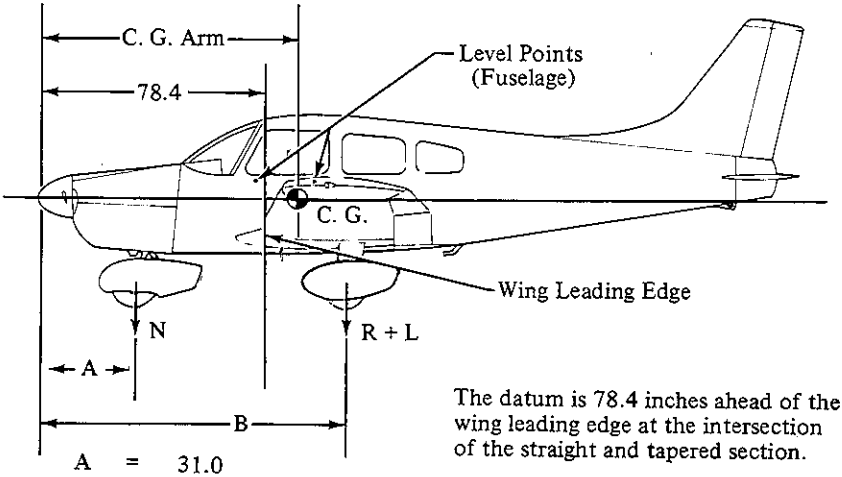
(1) With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.

Scale Position and Symbol		Scale Reading	Tare	Net Weight
Nose Wheel	(N)			
Right Main Wheel	(R)			
Left Main Wheel	(L)			
Basic Empty Weight, as Weighed (T)		—	—	

WEIGHING FORM
Figure 6-1

(d) Basic Empty Weight Center of Gravity

(1) The following geometry applies to the PA-28-181 airplane when it is level. Refer to Leveling paragraph 6.3 (b).



The datum is 78.4 inches ahead of the wing leading edge at the intersection of the straight and tapered section.

A = 31.0

B = 109.7

LEVELING DIAGRAM
Figure 6-3

(2) The basic empty weight center of gravity (as weighed including optional equipment, full oil and unusable fuel) can be determined by the following formula:

$$\text{C.G. Arm} = \frac{N\,(A) + (R + L)\,(B)}{T} \quad \text{inches}$$

Where: $T = N + R + L$

6.5 WEIGHT AND BALANCE DATA AND RECORD

The Basic Empty Weight, Center of Gravity Location and Useful Load listed in Figure 6-5 are for the airplane as licensed at the factory. These figures apply only to the specific airplane serial number and registration number shown.

The basic empty weight of the airplane as licensed at the factory has been entered in the Weight and Balance Record (Figure 6-7). This form is provided to present the current status of the airplane basic empty weight and a complete history of previous modifications. Any change to the permanently installed equipment or modification which affects weight or moment must be entered in the Weight and Balance Record.

MODEL PA-28-181 ARCHER II

Airplane Serial Number _____

Registration Number _____

Date _____

AIRPLANE BASIC EMPTY WEIGHT

Item	Weight (Lbs)	x	C.G. Arm (Inches Aft of Datum)	=	Moment (In-Lbs)
Standard Empty Weight* (Actual / Computed)					
Optional Equipment					
Basic Empty Weight					

*The standard empty weight includes full oil capacity and 2.0 gallons of unusable fuel.

AIRPLANE USEFUL LOAD

(Ramp Weight) - (Basic Empty Weight) = Useful Load

Normal Category (2558 lbs.) - (lbs.) = lbs.

Utility Category (2138 lbs.) - (lbs.) = lbs.

THIS BASIC EMPTY WEIGHT, C.G. AND USEFUL LOAD ARE FOR THE AIRPLANE AS LICENSED AT THE FACTORY. REFER TO APPROPRIATE AIRCRAFT RECORD WHEN ALTERATIONS HAVE BEEN MADE.

WEIGHT AND BALANCE DATA FORM
Figure 6-5

WEIGHT AND BALANCE RECORD
Figure 6-7

PA-28-181	Serial Number 28-8390087	Registration Number OE-KBS	Page Number 1

Date	Item No.	Description of Article or Modification	Added (+) Removed (-)	Weight Change			Running Basic Empty Weight	
				Wt. (Lb.)	Arm (In.)	Moment /100	Wt. (Lb.)	Moment /100
		As Licensed						
10.12.86		lt. Weight and Balance Report v. 10.12.86					1632	1430.42
26/04/95		WEIGHING ACCOMPLISHED BY DIAMOND HAUPTLAGE					1621,42	1436,80
24/04/98		G5 AI Installation					1629,79	1435,77
30.4.99		Wiegung / AP Installation					1612,0	1414,5

AAC Austrian Aircraft C
Thomas Schimpf
Permit No. 66636

Weight and Balance Change Report

Aircraft Type	: PA28-181	Serial Number	: 28-8390087
Registration	: OE-KBS	Date	: 29.03.2022
WO	: V20176/22		

Description: Installation of Garmin GNC 255A

	+/-	WEIGHT (kg)	ARM (m)	MOMENT (kg m)
BASIC WEIGHT AS OF 30.04.2019		731,20	2,228	1628,927
INSTALLED				
Garmin GNC 255A	+	1,8	1,6	2,88
REMOVED				
B/K KX 155	-	2,40	1,6	3,84
Altimeter	-	0,37	1,6	0,592
NEW W&B		730,23	2,228	1627,375

Name: Roman Steinmetz

Sign:

AAC – Austrian Aircraft Corp. GmbH,
A-2540 Bad Vöslau, Flugplatz
AT.145.004

PA-28-181	Serial Number	Registration Number	Page Number

Date	Item No.	Description of Article or Modification	Added (+) / Removed (-)	Weight Change			Running Basic Empty Weight	
				Wt. (Lb.)	Arm (In.)	Moment / 100	Wt. (Lb.)	Moment / 100

WEIGHT AND BALANCE RECORD (cont)
Figure 6-7 (cont)

6.7 WEIGHT AND BALANCE DETERMINATION FOR FLIGHT

(a) Add the weight of all items to be loaded to the basic empty weight.
(b) Use the Loading Graph (Figure 6-13) to determine the moment of all items to be carried in the airplane.
(c) Add the moment of all items to be loaded to the basic empty weight moment.
(d) Divide the total moment by the total weight to determine the C.G. location.
(e) By using the figures of item (a) and item (d) (above), locate a point on the C.G. range and weight graph (Figure 6-15). If the point falls within the C.G. envelope, the loading meets the weight and balance requirements.

	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Basic Empty Weight	1590.0	87.5	139125
Pilot and Front Passenger	340.0	80.5	27370
Passengers (Rear Seats)*	340.0	118.1	40154
Fuel (48 Gallon Maximum)	288.0	95.0	27360
Baggage (200 Lbs. Maximum)*		142.8	
Ramp Weight (2558 Lbs. Normal, 2138 Lbs. Utility Maximum)	2558	91.5	234009
Fuel Allowance For Engine Start, Taxi and Run Up	-8	95.0	-760
Takeoff Weight (2550 Lbs. Normal, 2130 Lbs. Utility Maximum)	2550.0	91.5	233249

The center of gravity (C.G.) of this sample loading problem is at 91.5 inches aft of the datum line. Locate this point (91.5) on the C.G. range and weight graph. Since this point falls within the weight - C.G. envelope, this loading meets the weight and balance requirements.

IT IS THE RESPONSIBILITY OF THE PILOT AND AIRCRAFT OWNER TO ENSURE THAT THE AIRPLANE IS LOADED PROPERLY.

*Utility Category Operation - No baggage or rear passengers allowed.

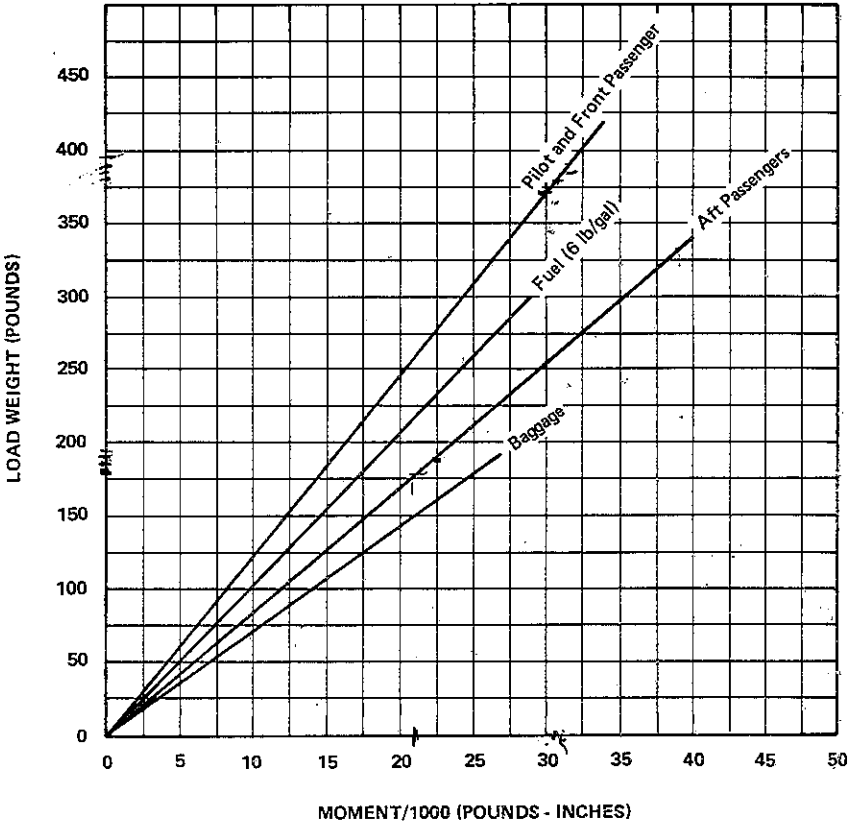
SAMPLE LOADING PROBLEM (NORMAL CATEGORY)
Figure 6-9

	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Basic Empty Weight	1630.4	87.75	1930.64
Pilot and Front Passenger		80.5	
Passengers (Rear Seats)*		118.1	
Fuel (48 Gallon Maximum)		95.0	
Baggage (200 Lbs. Maximum)*		142.8	
Ramp Weight (2558 Lbs. Normal, 2138 Lbs. Utility Maximum)			
Fuel Allowance For Engine Start, Taxi and Run Up	-8	95.0	-760
Takeoff Weight (2550 Lbs. Normal, 2130 Lbs. Utility Maximum)			

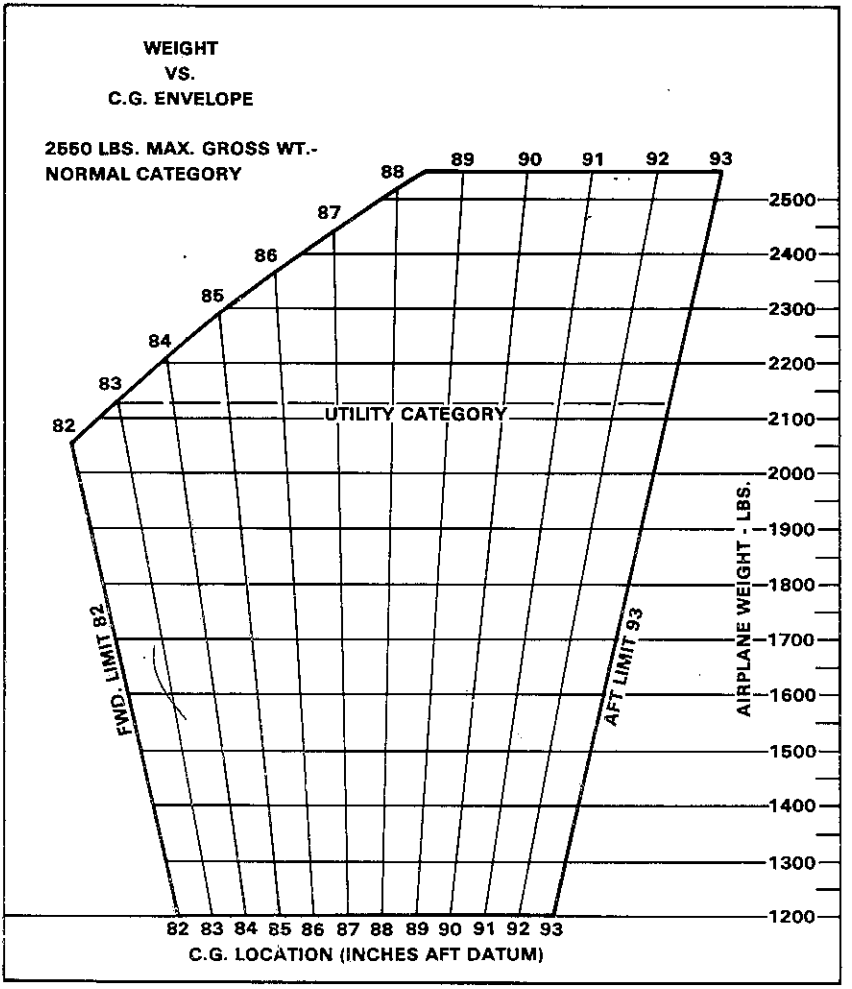
Totals must be within approved weight and C.G. limits. It is the responsibility of the airplane owner and the pilot to insure that the airplane is loaded properly. The Basic Empty Weight C.G. is noted on the Weight and Balance Data Form (Figure 6-5). If the airplane has been altered, refer to the Weight and Balance Record for this information.

*Utility Category Operation - No baggage or rear passengers allowed.

WEIGHT AND BALANCE LOADING FORM
Figure 6-11



LOADING GRAPH
Figure 6-13



C.G. RANGE AND WEIGHT
Figure 6-15

6.9 INSTRUCTIONS FOR USING THE WEIGHT AND BALANCE PLOTTER

This plotter is provided to enable the pilot quickly and conveniently to:

(a) Determine the total weight and C.G. position.

(b) Decide how to change his load if his first loading is not within the allowable envelope.

Heat can warp or ruin the plotter if it is left in the sunlight. Replacement plotters may be purchased from Piper dealers and distributors.

The "Basic Empty Weight and Center of Gravity" location is taken from the Weight and Balance Form (Figure 6-5), the Weight and Balance Record (Figure 6-7) or the latest FAA major repair or alteration form.

The plotter enables the user to add weights and corresponding moments graphically. The effect of adding or disposing of useful load can easily be seen. The plotter does not cover the situation where cargo is loaded in locations other than on the seats or in the baggage compartments.

Brief instructions are given on the plotter itself. To use it, first plot a point on the grid to locate the basic weight and C.G. location. This can be put on more or less permanently because it will not change until airplane is modified. Next, position the zero weight end of any one of the loading slots over this point. Using a pencil, draw a line along the slot to the weight which will be carried in that location. Then position the zero weight end of the next slot over the end of this line and draw another line representing the weight which will be located in this second position. When all the loads have been drawn in this manner, the final end of the segmented line locates the total load and the C.G. position of the airplane for takeoff. If this point is not within the allowable envelope it will be necessary to remove fuel, baggage, or passengers and / or to rearrange baggage and passengers to get the final point to fall within the envelope

Fuel burn-off does not significantly affect the center of gravity.

SAMPLE PROBLEM

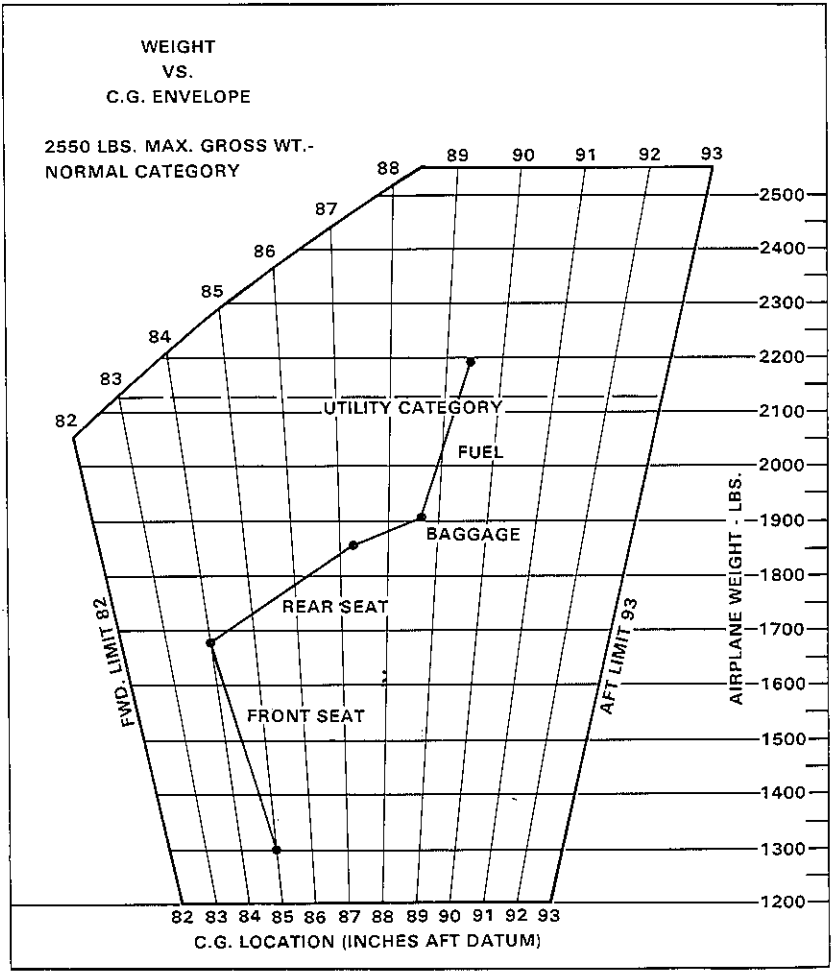
A sample problem will demonstrate the use of the weight and balance plotter.

Assume a basic weight and C.G. location of 1300 pounds at 85.00 inches respectively. We wish to carry a pilot and 3 passengers. Two men weighing 180 and 200 pounds will occupy the front seats, and two children weighing 80 and 100 pounds will ride in the rear. Two suitcases weighing 25 pounds and 20 pounds respectively, will be carried in the rear compartment. We wish to carry 48 gallons of fuel. Will we be within the safe envelope?

(a) Place a dot on the plotter grid at 1300 pounds and 85.00 inches to represent the basic airplane. (See illustration Figure 6-17.)
(b) Slide the slotted plastic into position so that the dot is under the slot for the forward seats, at zero weight.
(c) Draw a line up the slot to the 380 pound position (180 + 200) and put a dot.
(d) Continue moving the plastic and plotting points to account for weight in the rear seats (80 + 100), baggage compartment (45), and fuel tanks (288).
(e) As can be seen from the illustration, the final dot shows the total weight to be 2193 pounds with the C.G. at 89.44. This is well within the envelope.

As fuel is burned off, the weight and C.G. will follow down the fuel line and stay within the envelope for landing.

SAMPLE PROBLEM



SAMPLE PROBLEM
Figure 6-17

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

SECTION 7

DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

SECTION 7

DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

7.1 THE AIRPLANE

The PA-28-181 Archer II is a single-engine, low-wing monoplane of all metal construction. It has four-place seating, two hundred pound baggage capacity, and a 180 horsepower engine.

7.3 AIRFRAME

The basic airframe, except for a tubular steel engine mount, steel landing gear struts, and other miscellaneous steel parts, is of aluminum alloy con-struction. The extremities - the wing tips, the cowling, the tail surfaces - are of fiberglass or ABS thermoplastic. Aerobatics are prohibited in this air-plane since the structure is not designed for aerobatic loads.

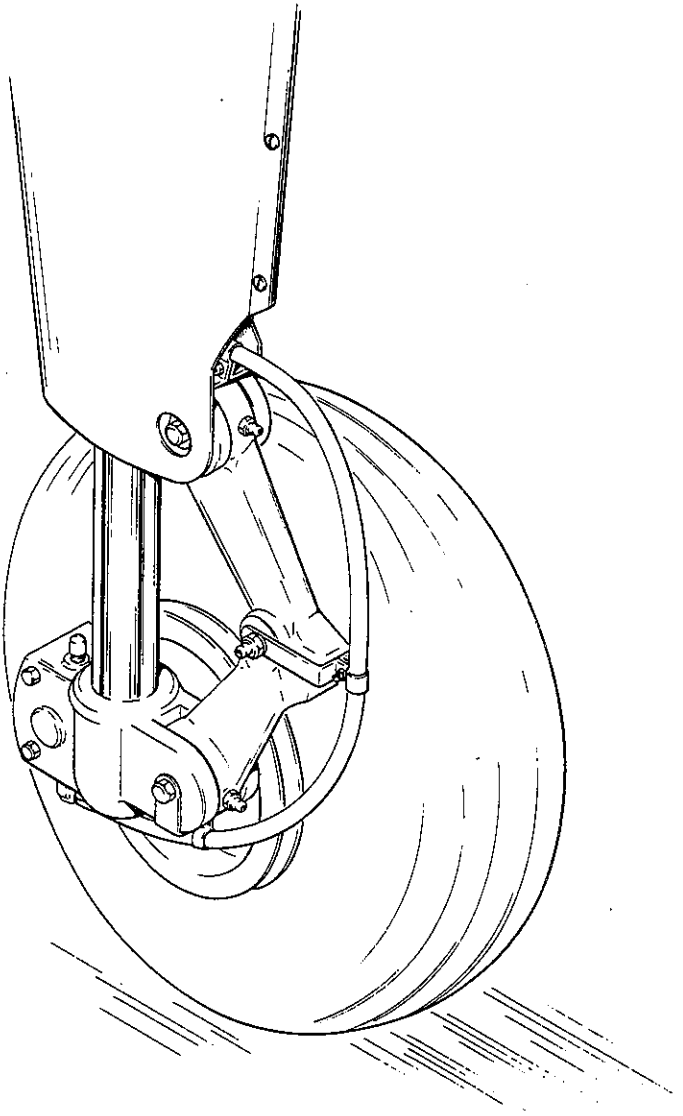
The semi-tapered wings have a laminar flow type NACA 652-415 airfoil. The wings are attached to each side of the fuselage by insertion of the butt ends of the respective main spars into a spar box carry-through which is an integral part of the fuselage structure, providing, in effect, a continuous main spar with splices at each side of the fuselage. There are also fore and aft attachments at the rear spar and at an auxiliary front spar.

7.5 ENGINE AND PROPELLER

The Archer II is powered by a four cylinder, direct drive, horizontally opposed engine rated at 180 horsepower at 2700 rpm. It is furnished with a starter, a 60 ampere, 14 volt alternator, a shielded ignition, vacuum pump drive, a fuel pump, and a dry, automotive type carburetor air filter.

The exhaust system is made entirely from stainless steel and is equipped with dual mufflers. A heater shroud around the mufflers is provided to supply heat for the cabin and windshield defrosting.

The fixed-pitch propeller is made from a one-piece alloy forging.



MAIN WHEEL ASSEMBLY
Figure 7-1

7.7 LANDING GEAR

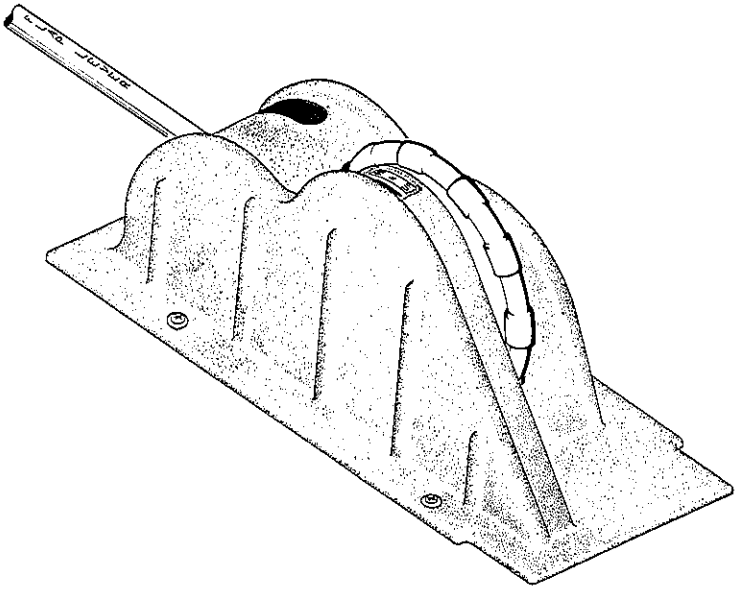
The three landing gears use Cleveland 6.00 x 6 wheels, the main gear wheels (Figure 7-1) being provided with brake drums and Cleveland single disc hydraulic brake assemblies. All three wheels use 6.00 x 6, four-ply rating, Type III tires with tubes.

A spring device is incorporated in the rudder pedal torque tube assembly to provide rudder trim. A bungee in the nose gear steering mechanism reduces steering effort and dampens bumps and shocks during taxiing. By using the rudder pedals and brakes the nose gear is steerable through a 30 degree arc each side of center. Later aircraft have the bungee removed from the nose gear steering mechanism and are steerable through a 20 degree arc each side of center. A shimmy dampener is also included in the nose gear.

The three struts are of the air-oil type, with a normal extension of 3.25 inches for the nose gear and 4.50 inches for the main gear.

The standard brake system consists of dual toe brakes attached to the rudder pedals and a hand lever and master cylinder located below and behind the left center of the instrument sub-panel. The toe brakes and the hand brake have their own brake cylinders, but they share a common reservoir. The brake fluid reservoir is installed on the top left front face of the fire wall. The parking brake is incorporated in the master cylinder and is actuated by pulling back on the brake lever, depressing the knob attached to the left side of the handle, and releasing the brake lever. To release the parking brake, pull back on the brake lever to disengage the catch mechanism and allow the handle to swing forward (refer to Figure 7-5).

THIS PAGE INTENTIONALLY LEFT BLANK



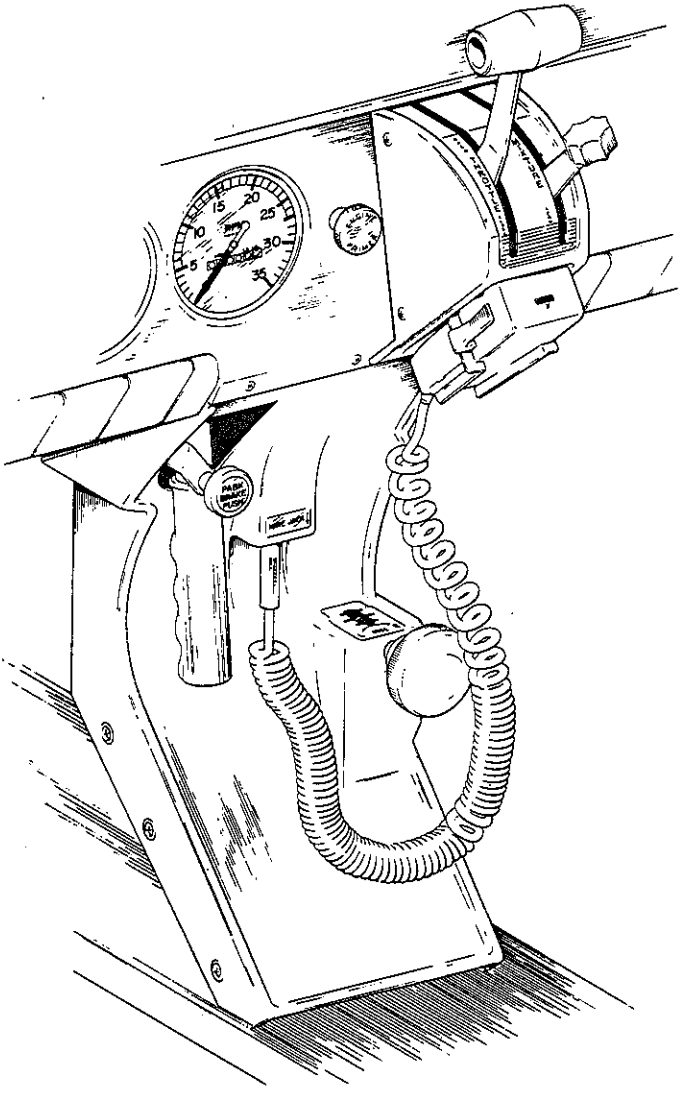
FLIGHT CONTROL CONSOLE
Figure 7-3

7.9 FLIGHT CONTROLS

Dual controls are provided as standard equipment, with a cable system used between the controls and the surfaces. The horizontal tail (stabilator) is of the all-movable slab type with a trim tab mounted on the trailing edge of the stabilator to reduce the control system forces. This tab is actuated by a control wheel on the floor between the front seats (Figure 7-3).

A rudder trim adjustment is mounted on the right side of the pedestal below the throttle quadrant and permits directional trim as needed in flight (refer to Figure 7-5).

The flaps are manually operated and spring-loaded to return to the up position. A past-center lock incorporated in the actuating linkage holds the flap when it is in the up position so that it may be used as a step on the right side. The flap will not support a step load except when in the full up position, so it must be completely retracted when used as a step. The flaps have three extended positions, 10, 25 and 40 degrees.



CONTROL QUADRANT AND CONSOLE
Figure 7-5

7.11 ENGINE CONTROLS

Engine controls consist of a throttle control and a mixture control lever. These controls are located on the control quadrant on the lower center of the instrument panel (Figure 7-5) where they are accessible to both the pilot and the copilot. The controls utilize teflon-lined control cables to reduce friction and binding.

The throttle lever is used to adjust engine RPM. The mixture control lever is used to adjust the air to fuel ratio. The engine is shut down by the placing of the mixture control lever in the full lean position. For information on the leaning procedure, see Section 4.27 of this Handbook.

The friction adjustment lever on the right side of the control quadrant may be adjusted to increase or decrease the friction holding the throttle and mixture controls or to lock the controls in a selected position.

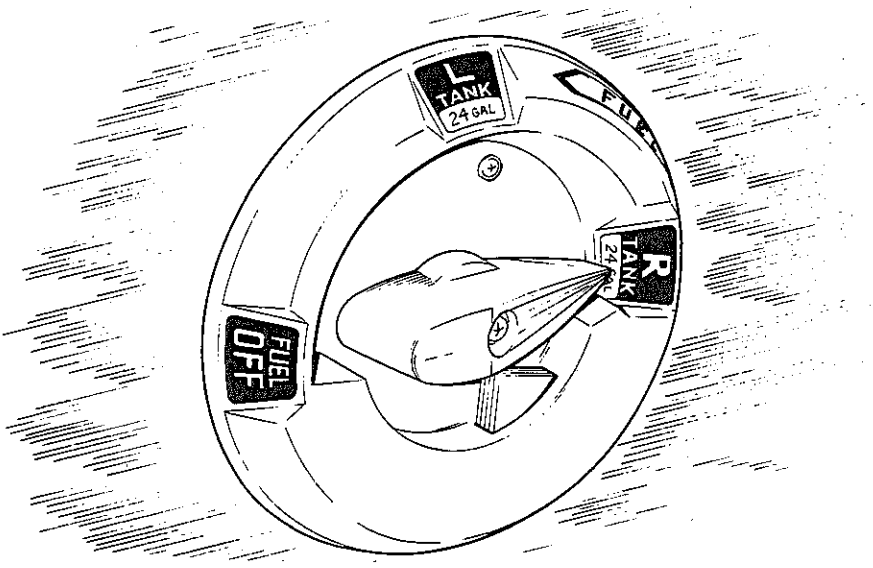
The carburetor heat control lever is located to the right of the control quadrant on the instrument panel. The control is placarded with two positions: "ON" (down), "OFF" (up).

7.13 FUEL SYSTEM

Fuel is stored in two twenty-five gallon (24 gallons usable) tanks which are secured to the leading edge structure of each wing by screws and nut plates. Each tank is equipped with a filler neck indicator tab to aid in determining fuel remaining when the tanks are not full. Usable capacity to the bottom of the indicator tab is 17 gallons.

The fuel selector control (Figure 7-7) is located on the left side-panel, forward of the pilot's seat. The button on the selector cover must be depressed and held while the handle is moved to the OFF position. The button releases automatically when the handle is moved back into the ON position.

An auxiliary electric fuel pump is provided in case of failure of the engine driven pump. The electric pump should be on for all takeoffs and landings, and when switching tanks. The pump switch is located in the switch panel above the throttle quadrant.



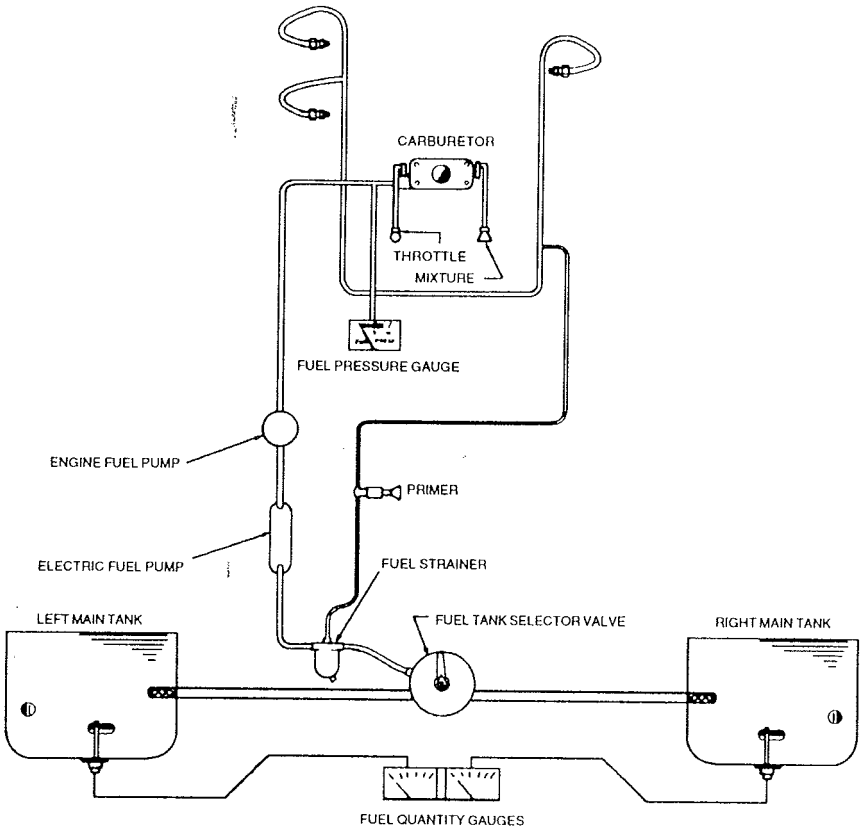
FUEL SELECTOR
Figure 7-7

The fuel drains should be opened daily prior to first flight to check for water or sediment and proper fuel. Each tank has an individual drain at the bottom, inboard rear corner.

A fuel strainer, located on the lower left front of the fire wall, has a drain which is accessible from outside the nose section. The strainer should also be drained before the first flight of the day. Refer to paragraph 8.21 for the complete fuel draining procedure.

Fuel quantity and pressure are indicated on gauges located in a cluster on the left side of the instrument panel.

An engine priming system is provided to facilitate starting. The primer pump is located to the immediate left of the throttle quadrant (refer to Figure 7-5).



FUEL SYSTEM SCHEMATIC
Figure 7-9

7.15 ELECTRICAL SYSTEM

The electrical system includes a 14-volt, 60 amp alternator, a 12-volt battery, a voltage regulator, an overvoltage relay and a master switch relay (Figure 7-11). The battery is mounted in a plastic box immediately aft of the baggage compartment. The regulator and overvoltage relay are located on the forward left side of the fuselage behind the instrument panel.

Electrical switches are located on the right center instrument panel, and the circuit breakers are located on the lower right instrument panel. A rheostat switch on the left side of the switch panel controls the navigational lights and the radio lights. The similar switch on the right side controls and dims the panel lights.

Standard electrical accessories include a starter, electric fuel pump, stall warning indicator, cigar lighter, fuel gauge, ammeter, and annunciator panel.

The annunciator panel includes alternator and low oil pressure indicator lights. When the optional gyro system is installed, the annunciator panel also includes a low vacuum indicator light. The annunciator panel lights are provided only as a warning to the pilot that a system may not be operating properly, and that he should check and monitor the applicable system gauge to determine when or if any necessary action is required.

NOTE

When operating with light electrical load and a fully charged battery, the Alternator Inop. Light may illuminate due to minimal alternator output. If the alternator is functional, a slight increase in electrical load should extinguish the Inop. indication.

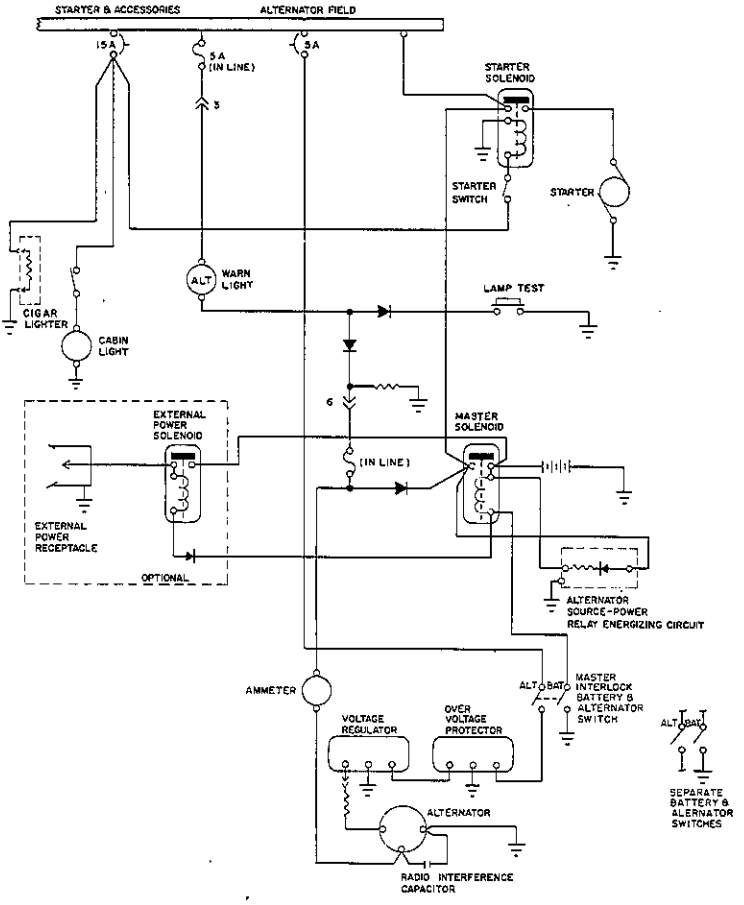
Optional electrical accessories include navigation lights, wing recognition light, anti-collision light, landing light, instrument lighting, and cabin dome light. Circuits will handle the addition of communications and navigational equipment.

An optional light, mounted in the overhead panel, provides instrument and cockpit lighting for night flying. The light is controlled by a rheostat switch located adjacent to the light. A map light window in the lens is actuated by an adjacent switch.

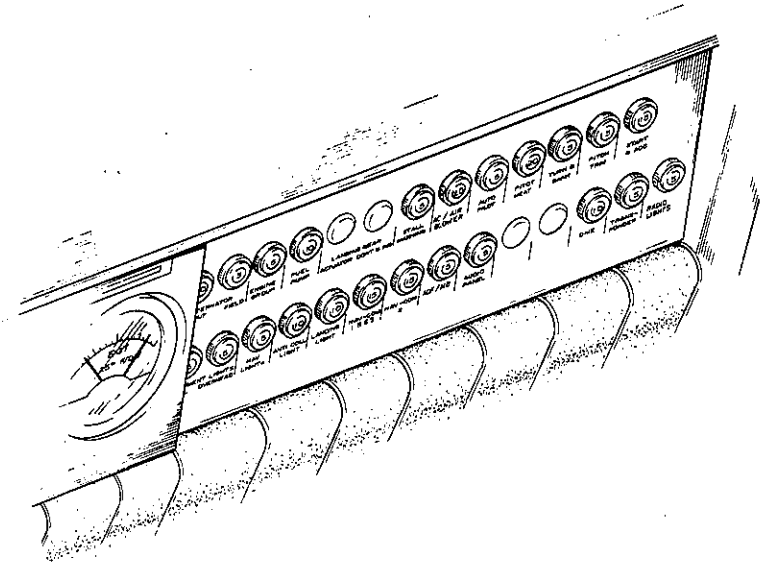
An optional wing tip/recognition light system consists of 2 lights (one in each wing tip) and is operated by a split landing light/recognition light rocker type switch mounted on the switch panel.

WARNING

Anti-collision lights should not be operating when flying through cloud, fog or haze, since the reflected light can produce spatial disorientation. Strobe lights should not be used in close proximity to the ground such as during taxiing, takeoff or landing.



ALTERNATOR AND STARTER SCHEMATIC
Figure 7-11



CIRCUIT BREAKER PANEL
Figure 7-13

NOTE

On airplanes with interlocked BAT and ALT switches, the ALT switch is mechanically interlocked with the BAT switch. When the ALT switch is turned ON, the BAT switch will also be turned ON. On airplanes with separate BAT and ALT switch operation, the switches may be positioned independently as desired.

Unlike previous generator systems, the ammeter does not indicate battery discharge; rather it displays in amperes the load placed on the alternator. With all electrical equipment off (except master switch) the ammeter will be indicating the amount of charging current demanded by the battery. As each item of electrical equipment is turned on, the current will increase to a total appearing on the ammeter. This total includes the battery. The average continuous load for night flight, with radios on, is about 30 amperes. This 30 ampere value, plus approximately two amperes for a fully charged battery, will appear continuously under these flight conditions. The

amount of current shown on the ammeter will tell immediately if the alternator system is operating normally, as the amount of current shown should equal the total amperage drawn by the equipment which is operating.

CAUTION

Do not use cigar lighter receptacles as power sources for any devices other than the cigar lighters supplied with the airplane. Any other device plugged into these receptacles may be damaged.

For abnormal and/or emergency operation and procedure, see Section 3.

7.17 VACUUM SYSTEM

The vacuum system is designed to operate the air driven gyro instruments. This includes the directional and attitude gyros when installed. The system consists of an engine driven vacuum pump, a vacuum regulator, a filter and the necessary plumbing.

The vacuum pump is a dry type pump which eliminates the need for an air/oil separator and its plumbing. A shear drive protects the pump from damage. If the drive shears, the gyros will become inoperative.

The vacuum gauge, mounted on the right instrument panel to the right of the radios, provides valuable information to the pilot about the operation of the vacuum system. A decrease in pressure in a system that has remained constant over an extended period may indicate a dirty filter, dirty screens, possibly a sticking vacuum regulator or leak in system (a low vacuum indicator light is provided in the annunciator panel). Zero pressure would indicate a sheared pump drive, defective pump, possibly a defective gauge or collapsed line. In the event of any gauge variation from the norm, the pilot should have a mechanic check the system to prevent possible damage to the system components or eventual failure of the system.

A vacuum regulator is provided in the system to protect the gyros. The valve is set so the normal vacuum reads 5.0 ± .1 inches of mercury, a setting which provides sufficient vacuum to operate all the gyros at their rated RPM. Higher settings will damage the gyros and with a low setting the gyros will be unreliable. The regulator is located behind the instrument panel and is accessible from below the instrument panel.

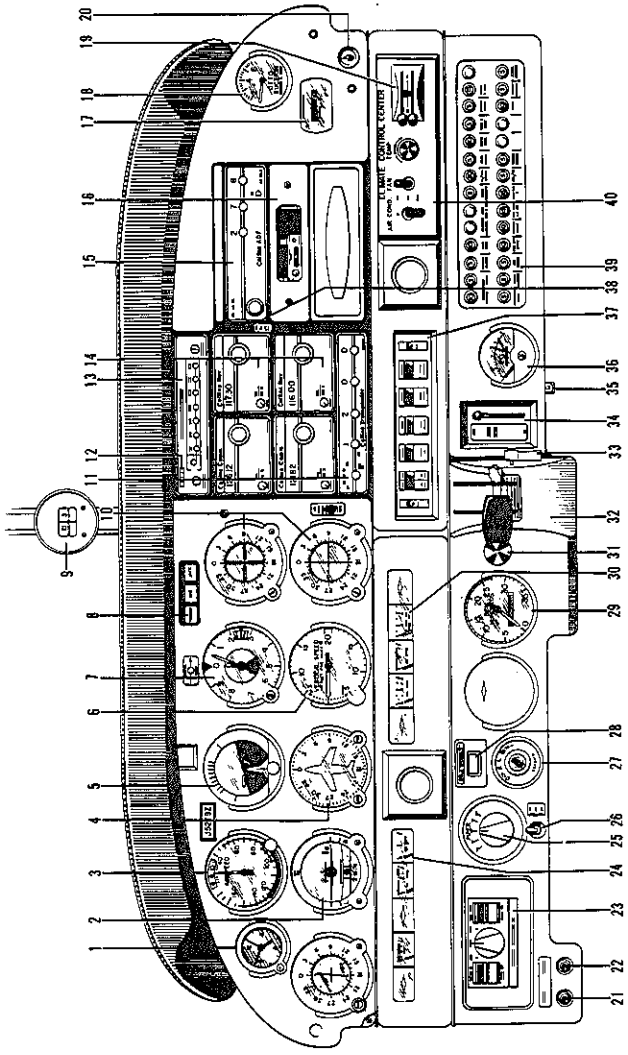
7.19 INSTRUMENT PANEL

The instrument panel (Figure 7-15) is designed to accommodate instruments and avionics equipment for VFR and IFR flights.

The radios and the circuit breakers are located on the upper and lower right panel respectively, and have circuits provided for the addition of optional radio equipment. An optional radio master switch is located near the top of the instrument panel between the radio stacks. It controls the power to all radios through the aircraft master switch. An emergency bus switch is also provided to provide auxiliary power to the avionics bus in event of a radio master switch circuit failure. The emergency bus switch is located behind the lower right shin guard left of the circuit breaker panel. An engine cluster is located to the right of the pilot control wheel and includes a fuel pressure gauge, a right and left main fuel quantity gauge, an oil temperature gauge and an oil pressure gauge.

Standard instruments include a compass, an airspeed indicator, a tachometer, an altimeter, an ammeter, an engine cluster, and an annunciator panel. The compass is mounted on the windshield bow in clear view of the pilot. The annunciator panel is mounted in the upper instrument panel to warn the pilot of a possible malfunction in the alternator, oil pressure, or vacuum systems.

Instrument options available for the panel includes a suction gauge, vertical speed indicator, attitude gyro, directional gyro, clock, tru-speed indicator and turn and slip indicator or turn coordinator. The attitude gyro and directional gyro are vacuum operated through the use of a vacuum pump installed on the engine, while the turn and slip indicator is electrically operated. The vacuum suction gauge is on the far right of the instrument panel.



1. CLOCK
2. TURN INDICATOR
3. AIRSPEED INDICATOR
4. DIRECTIONAL GYRO
5. ATTITUDE GYRO
6. VERTICAL SPEED INDICATOR
7. ALTIMETER
8. ANNUNCIATOR PANEL
9. MAGNETIC COMPASS
10. OMNI & GLIDE SLOPE INDICATORS
11. TRANSPONDER
12. MARKER BEACON
13. AUDIO SELECTOR PANEL
14. VHF TRANSCEIVERS
15. ADF RECEIVER
16. DME RECEIVER
17. ENGINE HOUR METER
18. SUCTION GAUGE
19. HEAT & DEFROST CONTROL
20. CIGAR LIGHTER
21. MIKE JACK
22. PHONE JACK
23. AUTOPILOT
24. ENGINE INSTRUMENT CLUSTER
25. OMNI COUPLER
26. NAV SWITCH
27. MAGNETO & STARTER SWITCH
28. PITCH CONTROL
29. TACHOMETER
30. FUEL GAUGES
31. PRIMER
32. THROTTLE QUADRANT
33. FRICTION LOCK
34. CARBURETOR HEAT CONTROL
35. EMERGENCY BUS SWITCH
36. EGT INDICATOR
37. INSTRUMENT PANEL LIGHTS
38. RADIO MASTER SWITCH
39. CIRCUIT BREAKER PANEL
40. CLIMATE CONTROL

INSTRUMENT PANEL
Figure 7-15

7.21 PITOT-STATIC SYSTEM

The system supplies both pitot and static pressure for the airspeed indicator, altimeter, and the optional vertical speed indicator (Figure 7-17).

Pitot and static pressure are picked up by a pitot head installed on the bottom of the left wing and carried through pitot and static lines within the wing and fuselage to the gauges on the instrument panel.

An alternate static source is available as optional equipment. The control valve is located below the left side of the instrument panel. When the valve is set in the alternate position, the altimeter, vertical speed indicator and airspeed indicator will be using cabin air for static pressure. The storm window and cabin vents must be closed and the cabin heater and defroster must be on during alternate static source operation. The altimeter error is less than 50 feet unless otherwise placarded.

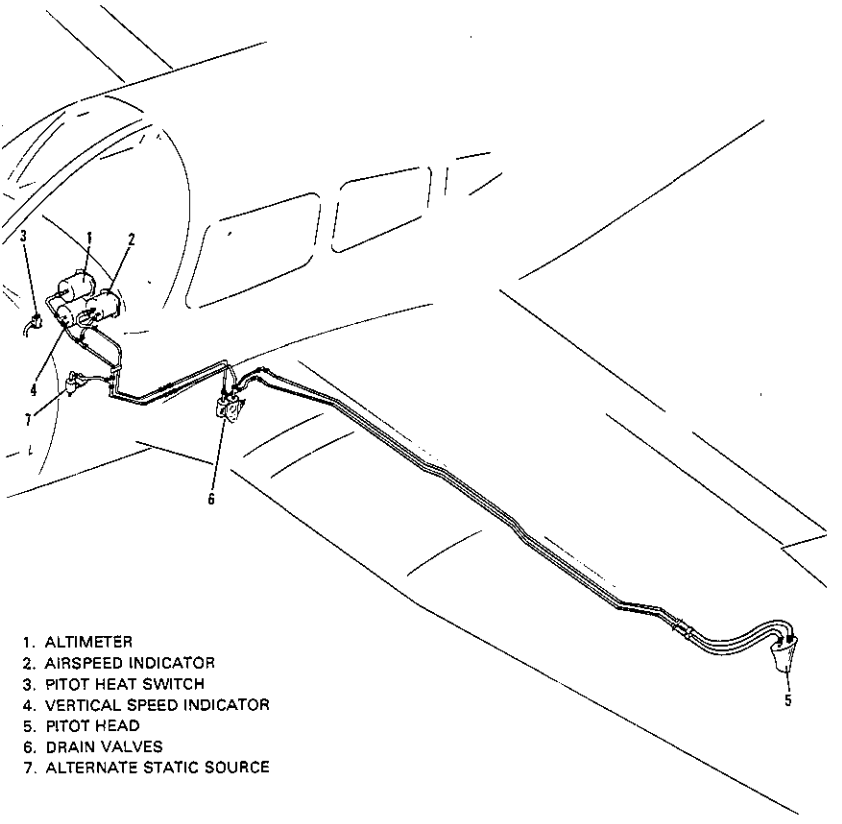
Both the pitot and static lines can be drained through separate drain valves located on the left lower side of the fuselage interior.

A heated pitot head, which alleviates problems with icing and heavy rain, is available as optional equipment. The switch for the heated pitot head is located on the electrical switch panel to the left of the right control wheel.

To prevent bugs and water from entering the pitot and static pressure holes, a cover should be placed over the pitot head. A partially or completely blocked pitot head will give erratic or zero readings on the instruments.

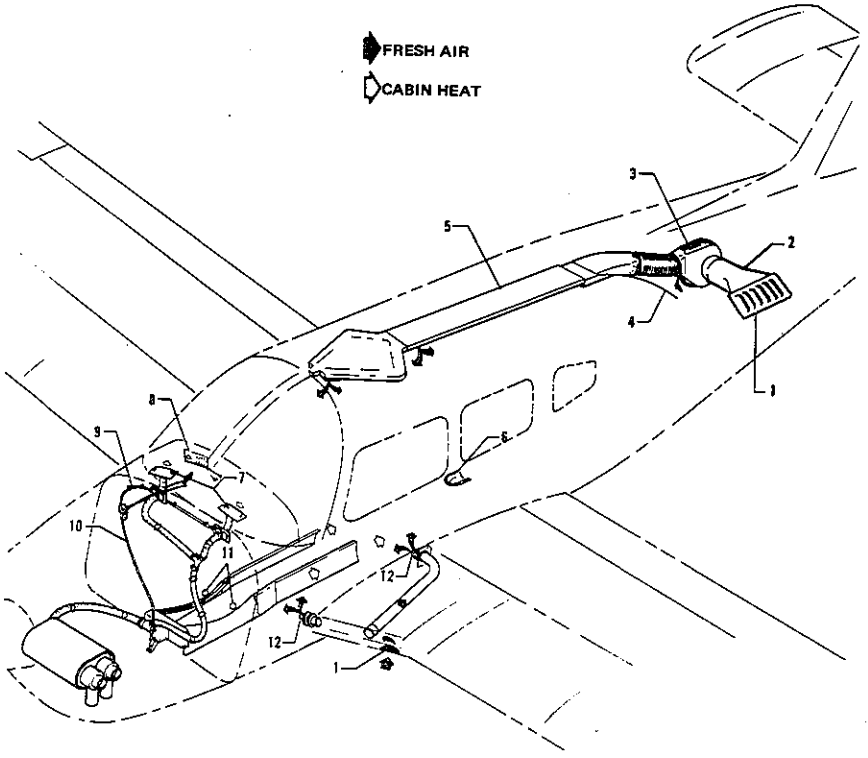
NOTE

During the preflight, check to make sure the pitot cover is removed.



1. ALTIMETER
2. AIRSPEED INDICATOR
3. PITOT HEAT SWITCH
4. VERTICAL SPEED INDICATOR
5. PITOT HEAD
6. DRAIN VALVES
7. ALTERNATE STATIC SOURCE

PITOT-STATIC SYSTEM
Figure 7-17



1. FRESH AIR INLET
2. INLET DUCT
3. FRESH AIR BLOWER
4. BULKHEAD ASSEMBLY
5. FRESH AIR DUCT
6. CABIN EXHAUST OUTLET
7. DEFROSTER OUTLET
8. BLOWER SWITCH PANEL
9. DEFROSTER CONTROL
10. HEATER CONTROL
11. CABIN HEAT DIVERSION CONTROL
12. FRESH AIR CONTROL

HEATING AND VENTILATING SYSTEM
Figure 7-19

7.23 HEATING AND VENTILATING SYSTEM

Heat for the cabin interior and the defroster system is provided by a heater muff attached to the exhaust system (Figure 7-19). The amount of heat desired can be regulated with the controls located on the far right side of the instrument panel.

The air flow can be regulated between the front and rear seats by levers located on top of the heat ducts next to the console.

Fresh air inlets are located in the leading edge of the wing near the fuselage. An adjustable outlet is located on the side of the cabin near the floor at each seat location; overhead air outlets are offered as optional equipment. Air is exhausted through an outlet under the rear seat. A cabin air blower, incorporated in the ventilating system, is also available as optional equipment. An optional overhead ventilating system with a cabin air blower is available on models without air conditioning. This blower is operated by a FAN switch with 3 positions - "OFF," "LOW," "HIGH."

CAUTION

When cabin heat is operated, heat duct surface becomes hot. This could result in burns if arms or legs are placed too close to heat duct outlets or surface.

7.25 CABIN FEATURES

For ease of entry and exit and pilot-passenger comfort, the front seats are adjustable fore and aft. The rear seats may be removed to provide room for bulky items. Rear seat installations incorporate leg retainers with latching mechanisms which must be released before the rear seats can be removed. Releasing the retainers is accomplished on earlier models by turning the latching mechanisms 90° with a coin or screwdriver. Releasing the retainers is accomplished on later models by depressing the plunger behind each rear leg. Armrests are also provided for the front seats. All seats are available with optional headrests and optional vertical adjustment may be added to the front seats.

A cabin interior includes a pilot storm window, two sun visors, ash trays, two map pockets, and pockets on the backs of each front seat.

Shoulder harnesses with inertia reels are provided for each front seat occupant and, depending on the model, are provided as standard or optional equipment for the occupants of the rear seats. A check of the inertia reel mechanism can be made by pulling sharply on the strap and checking that the reel will lock in place under sudden stress. This locking feature prevents the strap from extending, and holds the occupant in place. Under normal movement the strap will extend and retract as required. On earlier aircraft provided with a single strap adjustable shoulder harness located above the side window for each front seat, the shoulder strap is routed over the shoulder adjacent to the window and attached to the lap belt in the general area of the occupant's hip. Adjust this fixed strap so that all controls are accessible while maintaining adequate restraint for the occupant. Optional shoulder straps are available for the rear occupants. Shoulder harnesses should be routinely worn during takeoff, landing, and whenever an inflight emergency situation occurs.

7.27 BAGGAGE AREA

A 24 cubic foot baggage area, located behind the rear seats, is accessible either from the cabin or through an outside baggage door on the right side of the aircraft. Maximum capacity is 200 pounds. Tie-down straps are provided and should be used at all times.

NOTE

It is the pilot's responsibility to be sure when the baggage is loaded that the aircraft C.G. falls within the allowable C.G. Range (refer to Section 6 - Weight and Balance).

7.29 STALL WARNING

An approaching stall is indicated by a stall warning horn which is activated between five and ten knots above stall speed. Mild airframe buffeting and gentle pitching may also precede the stall. Stall speeds are shown on graphs in the Performance Section. The stall warning horn emits a continuous sound and is activated by a lift detector installed on the leading edge of the left wing. During preflight, the stall warning system should be checked by turning the master switch ON, lifting the detector and checking to determine if the horn is actuated.

7.31 FINISH

All exterior surfaces are primed with etching primer and finished with acrylic lacquer.

An optional polyurethane finish is available.

7.33 AIR CONDITIONING*

The air conditioning system is a recirculating air system. The major items include: evaporator, condenser, compressor, blower, switches and temperature controls.

The evaporator is located behind the left rear side of the baggage compartment. This cools the air that is used for air conditioning.

The condenser is mounted on a retractable scoop located on the bottom of the fuselage and to the rear of the baggage compartment area. The scoop extends when the air conditioner is ON and retracts to a flush position when the system is OFF.

The compressor is mounted on the forward right underside of the engine. It has an electric clutch which automatically engages or disengages the compressor to the belt drive system of the compressor.

An electrical blower is mounted on the aft side of the rear cabin panel. Air from the baggage area is drawn through the evaporator by the blower and distributed through an overhead duct to individual outlets located adjacent to each occupant.

The switches and temperature control are located on the lower right side of the instrument panel in the climate control center panel. The temperature control regulates the desired temperature of the cabin. Turn the control clockwise for increased cooling, counterclockwise for decreased cooling.

*Optional equipment

Located inboard of the temperature control is the fan speed switch and the air conditioning ON-OFF switch. The fan can be operated independently of the air conditioning. However, it must be on for air conditioner operation. Turning either switch off will disengage the compressor clutch and retract the condenser door. Cooling air should be felt within one minute after the air conditioner is turned on.

NOTE

If the system is not operating in 5 minutes, turn the system OFF until the fault is corrected.

The FAN switch allows operation of the fan with the air conditioner turned OFF to aid cabin air circulation if desired. A LOW or HIGH flow of air can be selected to the air conditioner outlets located in the overhead duct. The outlets can be adjusted or turned off by each occupant to regulate individual cooling effect.

The "DOOR OPEN" indicator light is located to the left of the radio stack in front of the pilot. The light illuminates whenever the condenser door is open and remains on until the door is closed.

A circuit breaker located on the circuit breaker panel protects the air conditioning electrical system.

Whenever the throttle is in the full throttle position, it actuates a micro switch which disengages the compressor and retracts the scoop. This is done to obtain maximum power and maximum rate of climb. The fan continues to operate and the air will remain cool for approximately one minute. When the throttle is retarded approximately 1/4 inch, the clutch will engage and the scoop will extend, again supplying cool, dry air.

7.35 PIPER EXTERNAL POWER*

An optional starting installation known as Piper External Power (PEP) is accessible through a receptacle located on the right side of the fuselage aft of the wing. An external battery can be connected to the socket, thus allowing the operator to crank the engine without having to gain access to the airplane's battery.

*Optional equipment

7.37 EMERGENCY LOCATOR TRANSMITTER*

The Emergency Locator Transmitter (ELT) when installed, is located in the aft portion of the fuselage just below the stabilator leading edge and is accessible through a plate on the right side of the fuselage. This plate is attached with slotted-head nylon screws for ease of removal; these screws may be readily removed with a variety of common items such as a dime, a key, a knife blade, etc. If there are no tools available in an emergency the screw heads may be broken off by any means. The ELT is an emergency locator transmitter which meets the requirements of FAR 91.52.

A battery replacement date is marked on the transmitter to comply with FAA regulations, the battery must be replaced on or before this date. The battery must also be replaced if the transmitter has been used in an emergency situation or if the accumulated test time exceeds one hour, or if the unit has been inadvertently activated for an undetermined time period.

NOTE

If for any reason a test transmission is necessary, the test transmission should be conducted only in the first five minutes of any hour and limited to three audio sweeps. If the tests must be made at any other time, the tests should be coordinated with the nearest FAA tower or flight service station.

NARCO ELT 10 OPERATION

On the ELT unit itself is a three position switch placarded "ON," "OFF" and "ARM." The ARM position sets the ELT so that it will transmit after impact and will continue to transmit until its battery is drained. The ARM position is selected when the ELT is installed in the airplane and it should remain in that position.

*Optional equipment

To use the ELT as a portable unit in an emergency, remove the cover and unlatch the unit from its mounting base. The antenna cable is disconnected by a left quarter-turn of the knurled nut and a pull. A sharp tug on the two small wires will break them loose. Deploy the self-contained antenna by pulling the plastic tab marked ``PULL FULLY TO EXTEND ANTENNA.'' Move the switch to ON to activate the transmitter.

In the event the transmitter is activated by an impact, it can only be turned off by moving the switch on the ELT unit to OFF. Normal operation can then be restored by pressing the small clear plastic reset button located on the top of the front face of the ELT and then moving the switch to ARM.

A pilot's remote switch located on the left side panel is provided to allow the transmitter to be turned on from inside the cabin. The pilot's remote switch is placarded ``ON'' and ``ARMED.'' The switch is normally in the ARMED position. Moving the switch to ON will activate the transmitter. Moving the switch back to the ARMED position will turn off the transmitter only if the impact switch has not been activated.

The ELT should be checked to make certain the unit has not been activated during the ground check. Check by selecting 121.50 MHz on an operating receiver. If there is an oscillating chirping sound, the ELT may have been activated and should be turned off immediately. This requires removal of the access cover and moving the switch to OFF, then press the reset button and return the switch to ARM. Recheck with the receiver to ascertain the transmitter is silent.

NARCO ELT 910 OPERATION

On the ELT unit itself is a three position switch placarded ON, OFF and ARM. The ARM position sets the ELT so that it will transmit after impact and will continue to transmit until its battery is drained. The ARM position is selected when the ELT is installed in the airplane and it should remain in that position.

A pilot's remote switch, placarded ON and ARM, is located on the left side panel to allow the transmitter to be armed or turned on from inside the cabin. The switch is normally in the ARM position. Moving the switch to ON will activate the transmitter. A warning light, located above the remote switch, will blink continuously whenever the ELT is activated.

NOTE

The warning light will not blink if the ELT is activated by an incident that also results in severance of the airplane's power supply lines.

Should the ELT be activated inadvertently it can be reset by either positioning the remote switch to the ON position for two seconds, and then relocating it to the ARM position, or by setting the switch on the ELT to OFF and then back to ARM.

In the event the transmitter is activated by an impact, it can be turned off by moving the ELT switch OFF. Normal operation can then be restored by resetting the switch to ARM. It may also be turned off and reset by positioning the remote switch to the ON position for two seconds, and then to the ARM position.

The transmitter can be activated manually at any time by placing either the remote switch or the ELT switch to the ON position.

Ground Check

The ELT should be checked during postflight to make certain the unit has not been activated. Check by selecting 121.50 MHz on an operating receiver. If a downward sweeping audio tone is heard, the ELT may have been activated. Set the remote switch to ON. If there is no change in the volume of the signal, your airplane is probably transmitting. Setting the remote switch to ARM will automatically reset the ELT and should silence the signal being received on 121.50 MHz.

7.39 CARBURETOR ICE DETECTION SYSTEM *

A carburetor ice detection system is available as an option on this airplane. The system consists of a control box mounted on the instrument panel, a probe sensor mounted in the carburetor and a red warning light to indicate the presence of ice in the carburetor. If ice is present apply full carburetor heat. Refer to Paragraph 3.29, Carburetor Icing, in the emergency procedures. To adjust the system for critical ice detection first turn on the airplanes master switch and then turn on the ice detection unit. Turn the sensitivity knob fully counterclockwise causing the carb ice light to come on. Now rotate the sensitivity knob back (clockwise) until the ice light just goes out. This establishes the critical setting.

WARNING

This instrument is approved as optional equipment only and Flight Operations should not be predicated on its use.

Not implemented

*Optional equipment

7.37 EMERGENCY LOCATOR TRANSMITTER (Continued)

ARTEX 110-4 ELT OPERATION

On the ELT unit itself is a two position switch placarded ON and OFF. The OFF position is selected when the transmitter is installed at the factory and the switch should remain in that position whenever the unit is installed in the airplane.

A pilots remote switch, placarded ON and ARM is located on the pilots lower left instrument panel to allow the transmitter to be armed or turned on from inside the cabin. The switch is normally in ARM position. Moving the switch to ON will activate the transmitter. A warning light located above the remote switch will alert you when ever the ELT is activated.

Should the ELT be activated inadvertently it can be reset by either positioning the remote switch to the ON then immediately relocating it to the ARM position, or by setting the switch on the ELT to ON and then back to OFF.

In the event the transmitter is activated by an impact, it can be turned off by moving the ELT switch OFF. Normal operation can then be restored by resetting the switch to ARM. It may also be turned off and reset by positioning the remote switch to the ON and then immediately to the ARM position.

The transmitter can be activated manually at any time by placing either the remote switch or the ELT switch to the ON position.

NOTE:

Three sweeps of the emergency tone and an illuminated warning light indicates a normally functioning unit. The warning light must illuminate during the first 3 second test period. If it does not illuminate, a problem is indicated such as a "G" switch failure.

The ELT should be checked during postflight to make certain the unit has not been activated. Check by selecting 121.50 MHz on an operating receiver. If a downward sweeping audio tone is heard the ELT may have been activated. Set the remote switch to ON. If there is no change in the volume of the signal, your airplane's ELT is probably transmitting. Setting the remote switch back to OFF will automatically reset the ELT and should stop the signal being received on 121.50 MHz.

7.39 CARBURETOR ICE DETECTION SYSTEM *

A carburetor ice detection system is available as an option on this airplan The system consists of a control box mounted on the instrument panel, a prol sensor mounted in the carburetor and a red warning light to indicate t presence of ice in the carburetor. If ice is present apply full carburetor he Refer to Paragraph 3.29, Carburetor Icing, in the emergency procedures. adjust the system for critical ice detection first turn on the airplanes mast switch and then turn on the ice detection unit. Turn the sensitivity knob ful counterclockwise causing the carb ice light to come on. Now rotate t sensitivity knob back (clockwise) until the ice light just goes out. Th establishes the critical setting.

WARNING

This instrument is approved as optional equipment only and Flight Operations should not be predicated on its use.

Not implemented

*Optional equipment

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

SECTION 8

AIRPLANE HANDLING, SERVICING AND MAINTENANCE

SECTION 8

AIRPLANE HANDLING, SERVICING AND MAINTENANCE

8.1 GENERAL

This section provides guidelines relating to the handling, servicing, and maintenance of the Archer II. For complete maintenance instructions, refer to the PA-28-181 Service Manual.

Every owner should stay in close contact with an authorized Piper Service Center or Piper's Customer Service Department to obtain the latest information pertaining to their airplane, and to avail themselves of Piper Aircraft's support systems.

Piper Aircraft Corporation takes a continuing interest in having owners get the most efficient use from their airplane and keeping it in the best mechanical condition. Consequently, Piper Aircraft, from time to time, issues service releases including Service Bulletins, Service Letters and Service Spares Letters, and others relating to the airplane.

Service Bulletins are of special importance and Piper considers compliance mandatory. These are sent directly to the latest FAA-registered owners in the United States (U.S.) and Piper Service Centers worldwide. Depending on the nature of the release, material and labor allowances may apply. This information is provided to all authorized Service Centers.

Service Letters deal with product improvements and servicing techniques pertaining to the airplane. They are sent to Piper Service Centers and, if necessary, to the latest FAA-registered owners in the U.S. Owners should give careful attention to Service Letter information.

Service Spares Letters offer improved parts, kits, and optional equipment which were not available originally, and which may be of interest to the owner.

Piper Aircraft Corporation offers a subscription service for Service Bulletins, Service Letters, and Service Spares Letters. This service is available to interested persons, such as owners, pilots, and mechanics at a nominal fee, and may be obtained through an authorized Piper Service Center or Piper's Customer Services Department.

Maintenance manuals, parts catalogs, and revisions to both, are available from Piper Service Centers or Piper's Customer Services Department.

Any correspondence regarding the airplane should include the airplane model and serial number to ensure proper response.

8.3 AIRPLANE INSPECTION PERIODS

Piper Aircraft Corporation has developed inspection items and required inspection intervals (i.e.: 50, 100, 500, and 1000 hours) for the specific model aircraft. Appropriate forms are contained in the applicable Piper Service/Maintenance Manual, and should be complied with by a properly trained, knowledgeable, and qualified mechanic at a Piper Authorized Service Center or a reputable repair shop. Piper Aircraft Corporation cannot accept responsibility for the continued airworthiness of any aircraft not maintained to these standards, and/or not brought into compliance with applicable Service Bulletins issued by Piper Aircraft Corporation, instructions issued by the engine, propeller, or accessory manufacturers, or Airworthiness Directives issued by the Federal Aviation Administration (FAA).

A programmed inspection, approved by the FAA, is also available to the owner. This involves routine and detailed inspections to allow maximum utilization of the airplane. Maintenance inspection costs are reduced and the maximum standard of continued airworthiness is maintained. Complete details are available from Piper Aircraft Corporation.

In addition, but in conjunction with the above, the FAA requires periodic inspections on all aircraft to keep the Airworthiness Certificate in effect. The owner is responsible for assuring compliance with these inspection requirements and for maintaining proper documentation in logbooks and/or maintenance records.

A spectographic analysis of the engine oil is available from several sources. This inspection, if performed properly, provides a good check of the internal condition of the engine. To be accurate, induction air filters must be cleaned or changed regularly, and oil samples must be taken and sent in at regular intervals.

8.5 PREVENTIVE MAINTENANCE

The holder of a Pilot Certificate issued under FAR Part 61 may perform certain preventive maintenance described in FAR Part 43. This maintenance may be performed only on an aircraft which the pilot owns or operates and which is not used to carry persons or property for hire, except as provided in applicable FAR's. Although such maintenance is allowed by law, each individual should make a self-analysis as to whether he has the ability to perform the work.

All other maintenance required on the airplane should be accomplished by appropriately licensed personnel.

If maintenance is accomplished, an entry must be made in the appropriate logbook. The entry should contain:

(a) The date the work was accomplished.
(b) Description of the work.
(c) Number of hours on the aircraft.
(d) The certificate number of pilot performing the work.
(e) Signature of the individual doing the work.

8.7 AIRPLANE ALTERATIONS

If the owner desires to have his aircraft modified, he must obtain FAA approval for the alteration. Major alterations accomplished in accordance with Advisory Circular 43.13-2, when performed by an A & P mechanic, may be approved by the local FAA office. Major alterations to the basic airframe or systems not covered by AC 43.13-2 require a Supplemental Type Certificate.

The owner or pilot is required to ascertain that the following Aircraft Papers are in order and in the aircraft.

(a) To be displayed in the aircraft at all times:
  (1) Aircraft Airworthiness Certificate Form FAA-8100-2.
  (2) Aircraft Registration Certificate Form FAA-8050-3.
  (3) Aircraft Radio Station License if transmitters are installed.

(b) To be carried in the aircraft at all times:
  (1) Pilot's Operating Handbook.
  (2) Weight and Balance data plus a copy of the latest Repair and Alteration Form FAA-337, if applicable.
  (3) Aircraft equipment list.

Although the aircraft and engine logbooks are not required to be in the aircraft, they should be made available upon request. Logbooks should be complete and up to date. Good records will reduce maintenance cost by giving the mechanic information about what has or has not been accomplished.

8.9 GROUND HANDLING

(a) Towing

The airplane may be moved on the ground by the use of the nose wheel steering bar that is stowed below the forward ledge of the baggage compartment or by power equipment that will not damage or excessively strain the nose gear steering assembly. Towing lugs are incorporated as part of the nose gear fork.

CAUTION

When towing with power equipment, do not turn the nose gear beyond its steering radius in either direction, as this will result in damage to the nose gear and steering mechanism.

CAUTION

Do not tow the airplane when the controls are secured.

In the event towing lines are necessary, ropes should be attached to both main gear struts as high up on the tubes as possible. Lines should be long enough to clear the nose and/or tail by not less than fifteen feet, and a qualified person should ride in the pilot's seat to maintain control by use of the brakes.

(b) Taxiing

Before attempting to taxi the airplane, ground personnel should be instructed and approved by a qualified person authorized by the owner. Engine starting and shut-down procedures as well as taxi techniques should be covered. When it is ascertained that the propeller back blast and taxi areas are clear, power should be applied to start the taxi roll, and the following checks should be performed:

(1) Taxi a few feet forward and apply the brakes to determine their effectiveness.
(2) While taxiing, make slight turns to ascertain the effectiveness of the steering.
(3) Observe wing clearance when taxiing near buildings or other stationary objects. If possible, station an observer outside the airplane.
(4) When taxiing over uneven ground, avoid holes and ruts.
(5) Do not operate the engine at high RPM when running up or taxiing over ground containing loose stones, gravel, or any loose material that may cause damage to the propeller blades.

(c) Parking

When parking the airplane, be sure that it is sufficiently protected from adverse weather conditions and that it presents no danger to other aircraft. When parking the airplane for any length of time or overnight, it is suggested that it be moored securely.

(1) To park the airplane, head it into the wind if possible.
(2) Set the parking brake by pulling back on the brake lever and depressing the knob on the handle. To release the parking brake, pull back on the handle until the catch disengages; then allow the handle to swing forward.

CAUTION

Care should be taken when setting brakes that are overheated or during cold weather when accumulated moisture may freeze a brake.

(3) Aileron and stabilator controls should be secured with the front seat belt and chocks used to properly block the wheels.

(d) Mooring

The airplane should be moored for immovability, security and protection. The following procedures should be used for the proper mooring of the airplane:

(1) Head the airplane into the wind if possible.
(2) Retract the flaps.
(3) Immobilize the ailerons and stabilator by looping the seat belt through the control wheel and pulling it snug.
(4) Block the wheels.
(5) Secure tie-down ropes to the wing tie-down rings and to the tail skid at approximately 45 degree angles to the ground. When using rope of non-synthetic material, leave sufficient slack to avoid damage to the airplane should the ropes contract.

CAUTION

Use bowline knots, square knots or locked slip knots. Do not use plain slip knots.

NOTE

Additional preparations for high winds include using tie-down ropes from the landing gear forks and securing the rudder.

(6) Install a pitot head cover if available. Be sure to remove the pitot head cover before flight.
(7) Cabin and baggage doors should be locked when the airplane is unattended.

8.11 ENGINE AIR FILTER

(a) Removing Engine Air Filter

(1) Remove the lower cowl.
(2) Remove the wing nuts securing the filter. Remove the filter.

(b) Cleaning Engine Air Filter

The induction air filter must be cleaned at least once every 50 hours, and more often, even daily, when operating in dusty conditions. Extra filters are inexpensive, and a spare should be kept on hand for use as a rapid replacement.

To clean the filter:
(1) Tap the filter gently to remove dirt particles, being careful not to damage the filter. DO NOT wash the filter in any liquid. DO NOT attempt to blow out dirt with compressed air.
(2) If the filter is excessively dirty or shows any damage, replace it immediately.
(3) Wipe the filter housing with a clean cloth and install the filter. The usable life of the filter should be restricted to one year or 500 hours, whichever comes first.

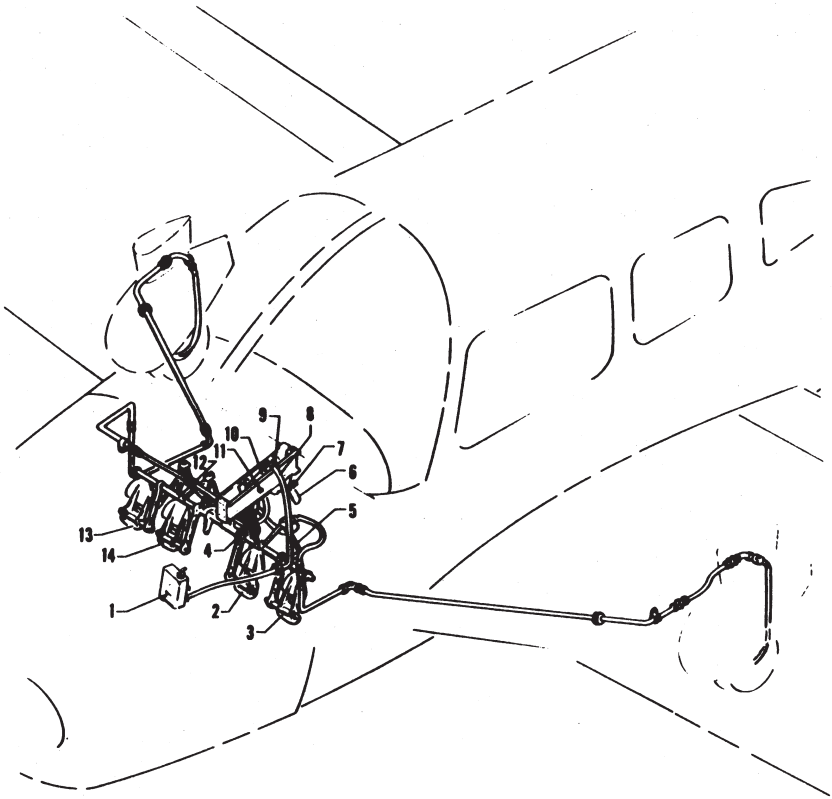
(c) Installation Of Engine Air Filter

After cleaning or when replacing the filter, install the filter in the reverse order of removal.

8.13 BRAKE SERVICE

The brake system is filled with MIL-H-5606 (petroleum base) hydraulic brake fluid. The fluid level should be checked periodically or at every 50-hour inspection and replenished when necessary. The brake reservoir is located on the fire wall in the engine compartment. If the entire system must be refilled, fill with fluid under pressure from the brake end of the system. This will eliminate air from the system.

No adjustment of the brake clearances is necessary. If after extended service brake blocks become excessively worn, they should be replaced with new segments.



1. BRAKE RESERVOIR
2. RIGHT BRAKE AND RUDDER PEDAL
3. LEFT BRAKE AND RUDDER PEDAL
4. RIGHT BRAKE CYLINDER
5. LEFT BRAKE CYLINDER
6. BRAKE HANDLE
7. HANDLE LOCK BUTTON
8. LINE, INLET
9. CLEVIS PIN
10. MASTER CYLINDER ASSEMBLY
11. BOLT ASSEMBLY
12. TORQUE TUBE
13. COPILOT'S RIGHT BRAKE AND RUDDER PEDAL
14. COPILOT'S LEFT BRAKE AND RUDDER PEDAL

BRAKE SYSTEM
Figure 8-1

8.15 LANDING GEAR SERVICE

The three landing gears use Cleveland Aircraft Products 6.00 x 6, four-ply rating, type III tires with tubes. (Refer to paragraph 8.23).

Wheels are removed by taking off the hub cap, cotter pin, axle nut, and the two bolts holding the brake segment in place. Mark tire and wheel for reinstallation; then dismount by deflating the tire, removing the three through-bolts from the wheel and separating the wheel halves.

Landing gear oleos on the Archer II should be serviced according to the instructions on the units. The main oleos should be extended under normal static load until 4.50 ± 0.50 inches of oleo piston tube is exposed, and the nose gear should show 3.25 ± 0.25 inches. Should the strut exposure be below that required, it should be determined whether air or oil is required by first raising the airplane on jacks. Depress the valve core to allow air to escape from the strut housing chamber. Remove the filler plug and slowly raise the strut to full compression. If the strut has sufficient fluid, it will be visible up to the bottom of the filler plug hole and will then require only proper inflation.

Should fluid be below the bottom of the filler plug hole, oil should be added. Replace the plug with valve core removed; attach a clear plastic hose to the valve stem of the filler plug and submerge the other end in a container of hydraulic fluid. Fully compress and extend the strut several times, thus drawing fluid from the container and expelling air from the strut chamber. To allow fluid to enter the bottom chamber of the main gear strut housing, the torque link assembly must be disconnected to let the strut be extended a minimum of 10 inches (the nose gear torque links need not be disconnected). Do not allow the strut to extend more than 12 inches. When air bubbles cease to flow through the hose, compress the strut fully and again check fluid level. Reinstall the valve core and filler plug, and the main gear torque links, if disconnected.

With fluid in the strut housing at the correct level, attach a strut pump to the air valve and with the airplane on the ground, inflate the oleo strut to the correct height.

In jacking the aircraft for landing gear or other service, two hydraulic jacks and a tail stand should be used. At least 250 pounds of ballast should be placed on the base of the tail stand before the airplane is jacked up. The hydraulic jacks should be placed under the jack points on the bottom of the wing and the airplane jacked up until the tail skid is at the right height to attach the tail stand. After the tail stand is attached and the ballast added, jacking may be continued until the airplane is at the height desired.

The steering arms from the rudder pedals to the nose wheel are adjusted at the nose wheel by turning the threaded rod end bearings in or out. Adjustment is normally accomplished at the forward end of the rods and should be done in such a way that the nose wheel is in line with the fore and aft axis of the plane when the rudder pedals and rudder are centered. Alignment of the nose wheel can be checked by pushing the airplane back and forth with the rudder centered to determine that the plane follows a perfectly straight line. The turning arc of the nose wheel is 30.0° + 2° in either direction and is limited by stops on the bottom of the forging.

The rudder pedal arm stops should be carefully adjusted so that the pedal arms contact the stops just after the rudder hits its stops. This guarantees that the rudder will be allowed to move through its full travel.

8.17 PROPELLER SERVICE

The spinner and backing plate should be frequently cleaned and inspected for cracks. Before each flight the propeller should be inspected for nicks, scratches, and corrosion. If found, they should be repaired as soon as possible by a rated mechanic, since a nick or scratch causes an area of increased stress which can lead to serious cracks or the loss of a propeller tip. The back face of the blades should be painted when necessary with flat black paint to retard glare. To prevent corrosion, the surface should be cleaned and waxed periodically.

8.19 OIL REQUIREMENTS

The oil capacity of the engine is 8 quarts and the minimum safe quantity is 2 quarts. It is recommended that the oil be drained and renewed, and the screen cleaned, every 25 hours. However, if the full flow (cartridge type) oil filter is used, the oil and filter should be drained and renewed every 50 hours of operation. The interval between oil and oil filter change is not to exceed four (4) months. The following grades are recommended for the specified temperatures:

Average Ambient Air Temperature	MIL-L-6082B Mineral SAE Grade	MIL-L-22851 Ashless Dispersant SAE Grades
All Temperatures	--	15W-50 or 20W-50
Above 80°F	60	60
Above 60°F	50	40 or 50
30°F to 90°F	40	40
0°F to 70°F	30	30, 40 or 20W-40
Below 10°F	20	30 or 20W-30

When operating temperatures overlap indicated ranges, use the lighter grade oil.

NOTE

Refer to the latest issue of Lycoming Service Instruction 1014 (Lubricating Oil Recommendations) for further information.

8.21 FUEL SYSTEM

(a) Servicing Fuel System

At every 50 hour inspection, the fuel screens in the strainer, in the electric fuel pump, and at the carburetor inlet must be cleaned.

(b) Fuel Requirements (AVGAS ONLY)

The minimum aviation grade fuel for the PA-28-181 is 100. Since the use of lower grades can cause serious engine damage in a short period of time, the engine warranty is invalidated by the use of lower octanes.

Whenever 100 or 100LL grade fuel is not available, commercial grade 100/130 should be used. (See Fuel Grade Comparison Chart.) Refer to the latest issue of Lycoming Service Instruction No. 1070 for additional information.

A summary of the current grades as well as the previous fuel designations is shown in the following chart:

FUEL GRADE COMPARISON CHART

Previous Commercial Fuel Grades (ASTM-D910)			Current Commercial Fuel Grades (ASTM-D910-75)			Current Military Fuel Grades (MIL-G-5572F)		
Grade	Color	Max. TEL ml/U.S. gal	Grade	Color	Max. TEL ml/U.S. gal	Grade	Color	Max. TEL ml/U.S. gal
80/87	red	0.5	80	red	0.5	80/87	red	0.5
91/96	blue	2.0	*100LL	blue	2.0	none	none	none
100/130	green	3.0	100	green	**3.0	100/130	blue	2.0
115/145	purple	4.6	none	none	none	115/145	purple	4.6

* -Grade 100LL fuel in some overseas countries is colored green and designated as "100L".

** -Commercial fuel grade 100 and grade 100/130 having TEL content of up to 4 ml/U.S. gallons are approved for use in all engines certificated for use with grade 100/130 fuel.

The operation of the aircraft is approved with an anti-icing additive in the fuel. When an anti-icing additive is used it must meet the specification MIL-I-27686, must be uniformly blended with the fuel while refueling, must not exceed .15% by volume of the refueled quantity, and to ensure its effectiveness should be blended at not less than .10% by volume. One and one half liquid ozs. per ten gallon of fuel would fall within this range. A blender supplied by the additive manufacturer should be used. Except for the information contained in this section, the manufacturer's mixing or blending instructions should be carefully followed.

CAUTION

Assure that the additive is directed into the flowing fuel stream. The additive flow should start after and stop before the fuel flow. Do not permit the concentrated additive to come in contact with the aircraft painted surfaces or the interior surfaces of the fuel tanks.

CAUTIONS

Some fuels have anti-icing additives pre-blended in the fuel at the refinery, so no further blending should be performed.

Fuel additive can not be used as a substitute for preflight draining of the the fuel system drains.

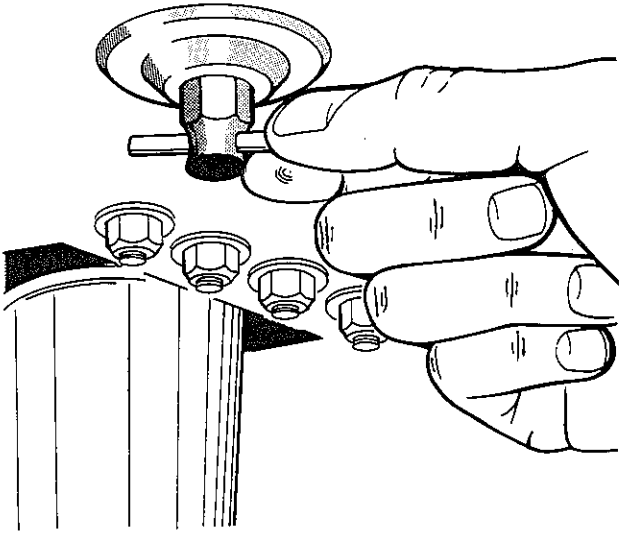
(c) Filling Fuel Tanks

Observe all required precautions for handling gasoline. Fuel is stored in two twenty-five gallon (24 gal. usable) tanks.

There is approximately 17 gallons in the fuel tank when fuel level is even with bottom of filler neck indicator.

(d) Draining Fuel Strainer, Sumps and Lines

The fuel system sumps and strainer should be drained daily prior to the first flight and after refueling to avoid the accumulation of contaminants such as water or sediment. Each fuel tank is equipped with an individual quick drain located at the lower inboard rear corner of the tank. The fuel strainer is equipped with a quick drain located on the front lower corner of the fire wall. Each of the fuel tank sumps should be drained first. Then the fuel strainer should be drained twice, once with the fuel selector valve on each tank. Each time fuel is drained, sufficient fuel should be allowed to flow to ensure removal of contaminants. This fuel should be collected in a suitable container, examined for contaminants, and then discarded.



FUEL DRAIN
Figure 8-3

CAUTION

When draining any amount of fuel, care should be taken to ensure that no fire hazard exists before starting the the engine.

Each quick drain should be checked after closing it to make sure it has closed completely and is not leaking.

(e) Draining Fuel System

The bulk of the fuel may be drained from the system by opening the valve at the inboard end of each fuel tank. Push up on the arms of the drain valve and turn counterclockwise to hold the drain open. The remaining fuel in the system may be drained through the filter bowl. Any individual tank may be drained by closing the selector valve and then draining the desired tank.

8.23 TIRE INFLATION

For maximum service from the tires, keep them inflated to the proper pressures - 18 psi for the nose gear and 24 psi for the main gear. All wheels and tires are balanced before original installation, and the relationship of tire, tube and wheel should be maintained upon reinstallation. Unbalanced wheels can cause extreme vibration in the landing gear; therefore, in the installation of new components, it may be necessary to rebalance the wheels with the tires mounted. When checking tire pressure, examine the tires for wear, cuts, bruises, and slippage.

8.25 BATTERY SERVICE

Access to the 12-volt battery is through an access panel at the right rear side of the baggage compartment. The battery box has a plastic tube which is normally closed off with a cap and which should be opened occasionally to drain off any accumulation of liquid. The battery should be checked for proper fluid level. DO NOT fill the battery above the baffle plates. DO NOT fill the battery with acid - use water only. A hydrometer check will determine the percent of charge in the battery.

If the battery is not up to charge, recharge starting at a 4 amp rate and finishing with a 2 amp rate. Quick charges are not recommended.

8.27 CLEANING

(a) Cleaning Engine Compartment

Before cleaning the engine compartment, place a strip of tape on the magneto vents to prevent any solvent from entering these units.

(1) Place a large pan under the engine to catch waste.

(2) With the engine cowling removed, spray or brush the engine with solvent or a mixture of solvent and degreaser. In order to remove especially heavy dirt and grease deposits, it may be necessary to brush areas that were sprayed.

CAUTION

Do not spray solvent into the alternator, vacuum pump, starter, or air intakes.

(3) Allow the solvent to remain on the engine from five to ten minutes. Then rinse the engine clean with additional solvent and allow it to dry.

CAUTION

Do not operate the engine until excess solvent has evaporated or otherwise been removed.

(4) Remove the protective tape from the magnetos.

(5) Lubricate the controls, bearing surfaces, etc., in accordance with the Lubrication Chart.

(b) Cleaning Landing Gear

Before cleaning the landing gear, place a plastic cover or similar material over the wheel and brake assembly.

(1) Place a pan under the gear to catch waste.
(2) Spray or brush the gear area with solvent or a mixture of solvent and degreaser, as desired. Where heavy grease and dirt deposits have collected, it may be necessary to brush areas that were sprayed, in order to clean them.
(3) Allow the solvent to remain on the gear from five to ten minutes. Then rinse the gear with additional solvent and allow to dry.
(4) Remove the cover from the wheel and remove the catch pan.
(5) Lubricate the gear in accordance with the Lubrication Chart.

(c) Cleaning Exterior Surfaces

The airplane should be washed with a mild soap and water. Harsh abrasives or alkaline soaps or detergents could make scratches on painted or plastic surfaces or could cause corrosion of metal. Cover areas where cleaning solution could cause damage. To wash the airplane, use the following procedure:

(1) Flush away loose dirt with water.
(2) Apply cleaning solution with a soft cloth, a sponge or soft bristle brush.
(3) To remove exhaust stains, allow the solution to remain on the surface longer.
(4) To remove stubborn oil and grease, use a cloth dampened with naphtha.
(5) Rinse all surfaces thoroughly.
(6) Any good automotive wax may be used to preserve painted surfaces. Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning or polishing. A heavier coating of wax on the leading surfaces will reduce the abrasion problems in these areas.

(d) Cleaning Windshield and Windows

(1) Remove dirt, mud and other loose particles from exterior surfaces with clean water.
(2) Wash with mild soap and warm water or with aircraft plastic cleaner. Use a soft cloth or sponge in a straight back and forth motion. Do not rub harshly.
(3) Remove oil and grease with a cloth moistened with kerosene.

CAUTION

Do not use gasoline, alcohol, benzene, carbon tetrachloride, thinner, acetone, or window cleaning sprays.

(4) After cleaning plastic surfaces, apply a thin coat of hard polishing wax. Rub lightly with a soft cloth. Do not use a circular motion.
(5) A severe scratch or mar in plastic can be removed by rubbing out the scratch with jeweler's rouge. Smooth both sides and apply wax.

(e) Cleaning Headliner, Side Panels and Seats

(1) Clean headliner, side panels, and seats with a stiff bristle brush, and vacuum where necessary.
(2) Soiled upholstery, except leather, may be cleaned with a good upholstery cleaner suitable for the material. Carefully follow the manufacturer's instructions. Avoid soaking or harsh rubbing.

CAUTION

Solvent cleaners require adequate ventilation.

(3) Leather should be cleaned with saddle soap or a mild hand soap and water.

(f) Cleaning Carpets

To clean carpets, first remove loose dirt with a whisk broom or vacuum. For soiled spots and stubborn stains use a noninflammable dry cleaning fluid. Floor carpets may be removed and cleaned like any household carpet.

8.29 COLD WEATHER OPERATION

For cold weather operation a winterization plate is installed on the inlet opening of the oil cooler duct on the right rear engine baffle. This plate should be installed whenever the ambient temperature reaches 50° F or less. The plate should be removed and stored in the cockpit when the ambient temperature exceeds 50° F.

It is recommended that an optional Engine Breather Tube Winterization Kit be installed for cold weather operation. This kit is available through your Piper Dealer/Distributor.

TABLE OF CONTENTS

SECTION 9

SUPPLEMENTS

SECTION 9

SUPPLEMENTS

9.1 GENERAL

This section provides information in the form of Supplements which are necessary for efficient operation of the airplane when equipped with one or more of the various optional systems and equipment not provided with the standard airplane.

All of the Supplements provided by this section are "FAA Approved" and consecutively numbered as a permanent part of this Handbook. The information contained in each Supplement applies only when the related equipment is installed in the airplane.

THIS PAGE INTENTIONALLY LEFT BLANK

SUPPLEMENT 6

PIPER CONTROL WHEEL CLOCK INSTALLATION

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional Piper Control Wheel Clock is installed. The information contained within this supplement is to be used in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional Piper Control Wheel Clock is installed.

SECTION 2 - LIMITATIONS

No changes to the basic limitations provided by Section 2 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 3 - EMERGENCY PROCEDURES

No changes to the basic Emergency Procedures provided by Section 3 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 4 - NORMAL PROCEDURES

(a) SETTING
While in the CLOCK mode, the time and the date can be set by the operation of the RST button. T

(b) DATE SETTING

Pressing the RST button once will cause the date to appear with the month flashing. Pressing the ST-SP button will advance the month at one per second, or at one per push, until the right month appears.

Pressing the RST button once again will cause the date to flash, and it can be set in a similiar manner.

(c) TIME SETTING

The RST button must now be pressed two times to cause the hours digits to flash. The correct hour can be set in as described above.

Pressing the RST button once again will now cause the minutes digits to flash. The minutes should be set to the next minute to come up at the zero seconds time mark. The RST button is pressed once more to hold the time displayed. At the time mark, the ST-SP button is pressed momentarily to begin the time counting at the exact second.

If the minutes are not advanced when they are flashing in the set mode, pressing the RST button will return the clock to the normal timekeeping mode without altering the minutes timing. This feature is useful when changing time zones, when only the hours are to be changed.

(d) AUTOMATIC DATE ADVANCE

The calendar function will automatically advance the date correctly according to the four year perpetual calendar. One day must be added manually on Feb. 29 on leap year. The date advances correctly at midnight each day.

(e) DISPLAY TEST

Pressing both the RST and ST-SP buttons at the same time will result in a display test function.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

TABLE OF CONTENTS

Aircraft Make:	Piper
Aircraft Model:	PA28-181
Aircraft Serial Number:	28-8390087
Repair Station:	AIR RADIO SERVICE, Vienna
Approval Nr.:	I-09
W/O, E/O Nr.:	5041/04/2

APPROVED

AIRPLANE FLIGHTMANUAL SUPPLEMENT

GARMIN GTX 330 Mode S Transponder

This document must be carried in the aircraft at all times. It describes the operating procedures for the GARMIN GTX 330 Mode S Transponder System when it has been installed in accordance with GARMIN Installation Manual P/N 190-00207-02 Rev. E and above mentioned Air Radio Service engineering order.

For aircraft with a FAA Approved Airplane Flight Manual, this document serves as the FAA Approved Flight Manual Supplement for the GARMIN GTX 330. For aircraft that do not have an approved flight manual, this document serves as the FAA Approved Supplemental Flight Manual for the GARMIN GTX 330.

The Information contained herein supplements or supersedes the basic Airplane Flight Manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this document, consult the basic Airplane Flight Manual.

Austro Control GmbH (ACG) APPROVED

Christian Schleifer

Date: 24 MAR 2004

City: Vienna State: AUSTRIA

SECTION 1 - GENERAL

1. The Garmin GTX 330 panel mounted Mode S Transponder is a radio transmitter and receiver that operates on radar frequencies, receiving ground radar or TCAS interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz. The GTX 330 is equipped with IDENT capability that activates the Special Position Identification (SPI) pulse for 18 seconds. Mode S transmit/receive capability also requires 1090 MHz transmitting and1030 MHz receiving for Mode S functions.

2. In addition to displaying the code, reply symbol and mode of operation, the GTX 330 screen will display pressure altitude, density altitude, temperature, and timer functions, depending on equipment connections and configuration selection. The unit also features an altitude monitor, Traffic Information Service (TIS) traffic advisories and flight timers. A voice or tone audio output announces altitude deviation, TIS traffic advisory and count down timer expiration.

SECTION 2 - LIMITATIONS

1. Display of TIS traffic information is advisory only and does not relieve the pilot responsibility to "see and avoid" other aircraft. Aircraft maneuvers shall not be predicated on the TIS displayed information.

2. Display of TIS traffic information does not constitute a TCAS I or TCAS II collision avoidance system as required 14 CFR Part 121 or part 135.

3. Title 14 of the Code of Federal Regulations (14 CFR) state that "When an Air Traffic Control (ATC) clearance has been obtained, no pilot-in-command (PIC) may deviate from that clearance, except in an emergency, unless he obtains an amended clearance." Traffic information provided by the TIS up-link does not relieve the PIC of this responsibility.

4. The 400/500 Series Garmin Display Interfaces (Pilot's Guide Addendum) P/N 190-00140-13 Rev. A or later revision must be accessible to the flight crew during flight.

5. 400/500 Series Main software 4.00 or later FAA approved software is required to operate the TIS interface and provide TIS functionality.

SECTION 3 - EMERGENCY PROCEDURES

No change.

SECTION 4 - NORMAL PROCEDURES

1. DETAILED TRANSPONDER OPERATING PROCEDURES

   Normal transponder operating procedures are described in the GARMIN GTX 330 Pilot's Guide, P/N 190-00207-00, Rev. A, or later appropriate revision.

2. DISPLAY OF TRAFFIC INFORMATION SERVICE (TIS) DATA

   TIS surveillance data uplinked by Air Traffic Control (ATC) radar through the GTX 330 Mode S Transponder will appear on the interfaced display device (Garmin 400 or 500 series products). For detailed operating instructions and information regarding the TIS interface, refer to the 400/500 Series Garmin Display Interfaces (Pilot's Guide Addendum) P/N 190-00140-13 Rev. A or later appropriate revision.

SECTION 5 - PERFORMANCE

No change.

SECTION 6 - WEIGHT AND BALANCE

See current weight and balance data.

Petersen Aviation, Inc.
984 K Road
Minden, Nebraska 68959

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

Piper PA-28 Series Aircraft

See Applicable Model and Serial Number List

Registration Number OE-KBS

Serial Number 28-8390087

This Supplement must be attached to the FAA Approved Airplane Flight Manual applicable to that particular airplane when the airplane has been modified in accordance with STC SA2660CE. The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

FAA APPROVED

for Margaret Kline, Manager
Aircraft Certification Office
Federal Aviation Administration
Wichita, Kansas

FAA Approved: October 17, 1990
Revision D: August 22, 2014

Petersen Aviation, Inc.
984 K Road
Minden, NE 68949

1. **Limitations Section:**

Fuel: Unleaded or Leaded Automotive Gasoline
91 minimum antiknock index, and 93UL (RON+MON)/2 per
ASTM D-439 or D-4814, and EN228 (minimum 98 RON).

Also approved for UL91 (D-7547 and UL94 (D-7592)

Intermixing with UL91, 93UL, UL94 & 100LL also approved

DO NOT USE FUEL CONTAINING ALCOHOL

Fuel Management:
When operating on auto gas, including when auto gas is intermixed with aviation gasoline:
a) Right fuel tank must be selected for takeoff and landing.
b) Left fuel tank is limited to cruise flight only, except in emergency situations.

Placards:
1. Part No. V674903-28, Item 12/24-9 on the instrument panel in full view of the pilot:

TAKEOFF AND LANDING ON RIGHT TANK WHEN OPERATING WITH AUTO GAS

---

2. Part No. V674903-91 Item 12/24-33 near existing Avgas placards at each fuel servicing port:

Fuel: Unleaded or Leaded Automotive Gasoline 91 minimum antiknock index, and 93UL (RON+MON)/2 per ASTM D-439 or D-4814, and EN228 (minimum 98 RON). Also approved for Aviation Grade UL91 (D-7547) and UL94 (D-7592). Intermixing with UL91, 93UL, UL94 & 100LL also approved DO NOT USE FUEL CONTAINING ALCOHOL

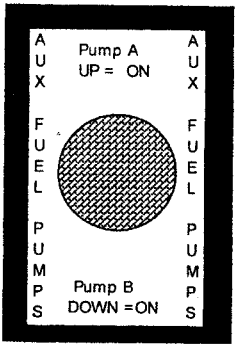
Petersen Aviation, Inc.
984 K Road
Minden, NE 68949

Log of Revisions				
Revision	**Date**	**Description**	**Page**	***FAA Approved by**
None	October 17, 1990	Original Issue	Pages 1 thru 3	E. L. Bollin
(A)	April 29, 2005	Revised All Pages. Added Log of Revisions.	Pages 1 thru 7	G.M. Baker
(B)	July 25, 2007	Revised pages 3 & 5 to address EASA concerns from STC validation. Repaginated all due to compression down to 6 pages.	Pages 1 thru 6	G.M. Baker
(C)	Aug. 17, 2010	Revised toggle placard	Page 4	G.M. Baker
(D)	August 22, 2014	Removed References to 12 & 24 volt systems. Revised Part Numbers and Fuel Placard.	Pages 1 thru 6	

*Manager
Aircraft Certification Office
Federal Aviation Administration
Wichita, Kansas

FAA Approved: October 17, 1990
Revision D: August 22, 2014

3. Part/Item No.12/24-15 on the instrument panel around the electric fuel pump toggle switch:



---

4. Procedures Placard 12/24-58 located on the instrument panel in full view of the pilot:

Refer to the Airplane Flight Manual Supplement for procedures when operating with auto gas.

5.Circuit Breaker Placards

Fuel Pump A	Fuel Pump B	Engine Primer
Item 12/24-10	Item 12/24-7	Item 12/24-59

The three placards specified above are used to mark the circuit breakers on the instrument panel.

Electrically Primed: Use all three placards listed above.

Manually Primed: Use two circuit breakers placards. Item 12/24-59 is NOT used.

2. PROCEDURES SECTION:

Emergency Procedures

Fuel Management

When operating on auto gas, including when auto gas is intermixed with aviation gasoline:

a) Right fuel quantity less than ¼ tank – Land using left fuel tank.

NOTE: Operating on the left tank may make the airplane more susceptible to vapor formation than the right tank.

Fuel System:

Fuel Pump Failure

SA2660CE equips PA-28's with two separate electric fuel pumps. If one pump fails, throw the three way fuel pump switch to engage the second, redundant electric fuel pump. If the other electric fuel pump is also inoperative, check to make sure the Master switch is ON, check circuit breakers.

If the engine is running rough or not at all, lower the nose, reduce throttle setting to 75% or less, Mixture to FULL RICH, Carb Heat ON, and switch fuel tanks. Choose a suitable off airport landing location or if possible continue flight to the nearest airport.

Normal Procedures:

Fuel Management:

When operating on auto gas, including when auto gas is intermixed with aviation gasoline:

a) Before Takeoff
   (1) Fuel Selector – Right Tank
b) Cruise
   (1) Fuel Selector – Use right and left tank positions to maintain lateral fuel balance.
   NOTE: Vapor formation is more likely when operating at ambient temperatures of 85F or above. Additional vapor margin is provided from the right tank due to its larger fuel supply line, and when the fuel quantity in the right tank is maintained at or above the ¼ full indication. Plan flight so as to have ¼ tank or more fuel remaining in the right tank for landing and possible go-around.
c) Before Landing
   (1) Fuel Selector – Right tank.

PROCEDURES SECTION: (CONT'D)

Normal Procedures:

Fuel System:
Auxiliary Fuel Pumps:
There are two pumps, Pump A and Pump B controlled by an electric switch on the pilot's instrument panel. Either Pump A or Pump B must be ON for takeoff, landing, ground taxi and climb operations. The selected fuel pump may be turned OFF (center position) during cruise operations only, provided proper fuel pressure values are maintained (See Limitations Section in basic Airplane Flight Manual). It is recommended that Pump A and Pump B be used alternately to obtain approximately even usage.

Before starting engine:

1) With Master switch ON, check auxiliary fuel pumps, Pump A and Pump B one at a time as follows:
   a. Listen for pump operation
   b. Verify proper fuel pressure is obtained.

2) Turn fuel pumps OFF

Engine Priming:
To prime the engine before starting:

Manual Priming

1) Aircraft equipped with manual engine priming pump. With the Mixture FULL RICH, pull the primer out then push it in 3 to 5 times. Make certain that the primer pump is in the closed and locked position (pushed in and rotated till locked) before activating a fuel pump or starting the engine.

Electrical Priming

2) Aircraft equipped with electric engine priming system:
   a. Turn Master Switch ON
   b. Turn fuel selector switch to the Right tank.
   c. Depress the electric priming switch with one hand.
      (this opens the primer solenoid valve)
   d. While depressing the fuel primer solenoid valve switch, throw the fuel pump toggle switch either up or down with the other hand to activate one Pump.
   e. Run the pump for only a short time (one to three seconds)
   f. Shut the pump off and release electric priming solenoid switch.
   g. Start the engine.
   h. After the engine starts, activate either the Pump A or Pump B switch so that a fuel pump remains on for taxi, takeoff, and climb.

Manual or Electrically Primed: After the engine starts and during warm up, allow the engine to run with the electric fuel pumps off to verify that the engine driven fuel pump is operating properly. Before taxi activate either Pump A or Pump B so that one of the electric fuel pumps remains on for taxi, takeoff, and climb.

----------END----------

Petersen Aviation, Inc.

Auto Fuel STC's
984 K Road
Minden, NE 68959

Phone 308-832-2050
Fax 308-832-2311
todd@gtmc.net
www.autofuelstc.cor

F. A. A.
APPROVED
Wichita Aircraft Certification
Office, ACE- 115W
Central Region
Date 04/20/05

Service Bulletin
PA-28-160, -161, -180, -181
Bulletin No. 05-3
Revision No. (-)
Date April 12, 2005

Subject:

VERIFYING THAT THE PRIMER CONTROL IS CLOSED AND LOCKED PRIOR TO ELECTRIC FUEL PUMP OPERATION.

Effectivity:

This Service Bulletin applies to all PA-28-160, -161, -180, -181 aircraft on which STC SA2660CE has been installed.

Reason:

It has come to our attention that an unlocked manual primer control may allow fuel to be directed both to the carb and directly to the cylinders via the priming system upon activation of the electric fuel pumps. This could result in an a mixture that is too rich for proper engine operation, or could increase the possibility of fire during engine startup. Worn o-rings in the primer could result in similar situations.

Instructions:

Following normal engine priming make certain that the primer control knob is in the closed and locked position (pushed in and rotated till locked) before activating a fuel pump or starting the engine. Check the integrity of the primer o-rings at each annual or 100 hour inspection.

GARMIN Ltd. or its subsidiaries
c/o GARMIN International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062 U.S.A.

FAA Approved
AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for the
GARMIN G5 ELECTRONIC FLIGHT INSTRUMENT
as installed in

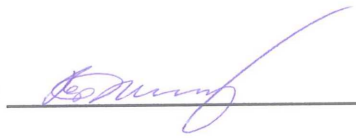
Piper PA28-181

Make and Model Airplane

Registration Number: OE-KBS Serial Number: 28-8390087

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped in accordance with Supplemental Type Certificate SA01818WI for the installation and operation of the Garmin G5 Electronic Flight Instrument. This document must be carried in the airplane at all times.

The information contained herein supplements or supersedes the information made available to the operator by the aircraft manufacturer in the form of clearly stated placards or markings, or in the form of an FAA approved Airplane Flight Manual, only in those areas listed herein. For limitations, procedures and performance information not contained in this document, consult the basic placards or markings, or the basic FAA approved Airplane Flight Manual.

FAA APPROVED BY: 

Robert Murray
ODA STC Unit Administrator
GARMIN International, Inc
ODA-240087-CE

DATE: 12/20/2017

Garmin International, Inc.
1200 E. 151st Street
Olathe, KS 66062 USA
Telephone: 913-397-8200
www.garmin.com

Garmin International, Inc

Log of Revisions

FAA Approved AIRPLANE FLIGHT MANUAL SUPPLEMENT

or

SUPPLEMENTAL AIRPLANE FLIGHT MANUAL

GARMIN G5 ELECTRONIC FLIGHT INSTRUMENT

REV NO.	PAGE NO(S)	DESCRIPTION	DATE OF APPROVAL	FAA APPROVED
1	ALL	Original Issue	7/22/2016	Robert Murray ODA STC Unit Administrator
2	ALL	Added information regarding G5 DG/HSI.	4/28/2017	Robert Murray ODA STC Unit Administrator
3	ALL	Added interface to 3rd party autopilots.	10/18/2017	Robert Murray ODA STC Unit Administrator
4	ALL	Added note to General section.	10/26/17	Paul Mast ODA STC Unit Administrator
5	ALL	Reformatted document. Updated system messages interface. Added DG/HSI reversion description.	See Cover	See Cover

This page intentionally left blank.

Table of Contents

This page intentionally left blank.

SECTION 1 – GENERAL

The G5 Electronic Flight Instrument can display the following information to the pilot depending on the installation and location of the G5 instrument.

- Primary attitude
- Primary slip and turn rate information
- Primary heading
- Secondary airspeed
- Secondary altimeter
- Secondary ground track

When installed in place of the attitude indicator, the primary function of the G5 is to provide attitude information to the pilot. When installed in place of the rate of turn indicator, the primary function of the G5 is to provide turn rate and slip ball information to the pilot. When installed in place of the directional gyro, the primary function of the G5 is to provide directional information to the pilot.

NOTE:

The pilot is reminded to perform appropriate flight and navigation instrument cross checks for the type of operation being conducted.

In case of a loss of aircraft electrical power, a backup battery (optional when installed as a DG/HSI) sustains the G5 Electronic Flight Instrument for up to four hours.

An optional GAD 29B may be installed to provide course and heading datum to an autopilot based on the data selected for display on the HSI.

Abbreviations and Terminology

The following glossary is applicable within the airplane flight manual supplement

ADI	Attitude Direction Indicator
AFMS	Airplane Flight Manual Supplement
ATT	Attitude
CDI	Course Deviation Indicator
DG	Directional Gyro
DR	Dead Reckoning
FAA	Federal Aviation Administration
GPS	Global Positioning System
GPSS	GPS Roll Steering
HDG	Heading
HSI	Horizontal Situation Indicator
ILS	Instrument Landing System
LOC	Localizer (no glideslope available)
LOI	Loss of Integrity
VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	VHF Omni-directional Range

SECTION 2 – LIMITATIONS

System Software Requirements

The G5 must utilize the following or later FAA approved software versions for this AFMS revision to be applicable:

Component	Software Version
G5 Electronic Flight Instrument	5.00

Use of Secondary Instruments

The original type design approved instruments for airspeed, altitude and vertical speed remain the primary indications for these parameters.

If the G5 Electronic Flight Instrument is installed in place of the rate of turn indicator, the original type design approved instrument for attitude remains in the primary indication for attitude.

If the G5 Electronic Flight Instrument is installed in place of the directional gyro, the original type design approved instruments for attitude remains the primary indication for attitude.

NOTE:

For aircraft approved for VFR-only operations, the G5 Electronic Flight Instrument may be installed as an attitude indicator and rate of turn indicator.

Kinds of Operations

No Change.

This page intentionally left blank.

SECTION 3 – EMERGENCY PROCEDURES

G5 Failure Indications

If a G5 function fails, a large red 'X' is typically displayed over the instrument(s) or data experiencing the failure. Upon G5 power-up, certain instruments remain invalid as equipment begins to initialize. All instruments should be operational within one minute of power-up. If any instrument remains flagged and it is not likely an installation related problem, the G5 should be serviced by a Garmin-authorized repair facility.

Attitude Failure

Attitude failure is indicated by removal of the sky/ground presentation, a red X, and a yellow "ATTITUDE FAIL" on the display.

Rate-of-turn and slip information will not be available.

1. Use standby instruments.
2. Seek VFR conditions or land as soon as practical.

Heading Failure, Loss of Magnetometer Data, or Magnetic Field Error

A heading failure, loss of magnetometer data, or magnetic field error is indicated by removal of the digital heading readout, a red X, and a yellow "HDG" on the display.

1. Use standby magnetic compass.

NOTE:

If the G5 DG/HSI has a valid GPS signal the G5 DG/HSI instrument will display the GPS track information in magenta.

GPS Failure

If GPS navigation receivers and/or navigation information are not available or invalid, the G5 will display Dead Reckoning mode (DR) or Loss of Integrity mode (LOI) on the HSI in the lower left corner.

If Alternate Navigation Sources (ILS, LOC, VOR) Are Available:

1. Use alternate navigation source.

If No Alternate Navigation Sources Are Available:

If DR is Displayed on HSI:

1. Use the amber CDI for course information.
2. Fly toward known visual conditions.

If LOI is Displayed on HSI:

1. Fly toward known visual conditions.

For aircraft equipped with a GAD 29B interfaced to an autopilot, GPSS will be displayed in amber text when GPSS emulation has been selected from the G5 menu.

1. Deselect GPSS from the G5 menu and select a different autopilot mode.

Attitude Aligning

During system initialization, the G5 displays the message 'ALIGNING' over the attitude indicator. The G5 will typically display valid attitude within the first minute of power-up. The G5 can also align itself while taxiing and during level flight.

If the "ALIGNING" indication occurs during flight and attitude remains displayed, the attitude display is acceptable for use for flight in instrument conditions. The message will clear when the attitude solution is within the systems internal accuracy tolerances. It is recommended to maintain wings level to reduce the time for the system to align.

Attitude Aligning / Keep Wings Level

If the "ALIGNING KEEP WINGS LEVEL" indication occurs during flight, the G5 has detected an invalid attitude solution and will not display any attitude information.

1. Use standby instruments to maintain wings level flight. The system will display attitude when internal accuracy tolerances have been met.
2. If attitude does not return, seek VFR conditions or land as soon as practical.

Loss of Electrical Power to the G5 Display

In the event of a loss of aircraft electrical power to the G5 attitude display, the indicator will continue to function on its internal battery. If an internal battery is installed on the optional G5 HSI, the indicator will continue to function on the internal battery if aircraft power is lost. Internal battery endurance is indicated on the G5 display in hours and minutes. The charging symbol will be removed and the internal battery will not be charged.

In the event the G5 attitude display powers down, the optional G5 HSI will automatically revert to displaying attitude information. It will not revert back to the DG/HSI format if the G5 attitude unit regains power. The DG/HSI presentation may be selected from the G5 menu on the G5 DG/HSI unit after reversion to the attitude display.

Loss of Electrical Power to the GAD 29B (If Installed)

In the event of a loss of aircraft electrical power to the optional GAD 29B, the heading and course datum will be unavailable to the autopilot and the autopilot may deviate from the intended path or may disconnect. GPS flight plan course information may be displayed on the HSI and VFR will be displayed in amber text on the HSI. GPSS will be displayed in amber text, if GPSS mode is selected.

1. Deselect GPSS from the G5 menu and select a different autopilot mode.
2. Lateral GPS course guidance may only be used in VFR conditions.

This page intentionally left blank.

SECTION 4 – NORMAL PROCEDURES

G5 Power Button and Knob

The G5 display will power on with the application of aircraft power. The G5 power button is used to turn the display on and off. Press and hold the power button to turn the display off.

The knob performs the following functions:

Press	Press to access the Menu. From the Menu, press to select the desired menu item. Press to accept the displayed value when editing numeric data or selecting from a list. Press to sync the heading or track bug for the HSI.
Turn	From the Menu, turn the Knob to move the cursor to the desired menu item. For the ADI, rotate to adjust the baro setting on the secondary altitude display. For the HSI, rotate to adjust the heading or track bug. Turn to select the desired value when editing numeric data or selecting from a list.

Backlight Intensity Adjustment

The power up state of the G5 backlight is in Auto adjustment mode.

To adjust the backlighting:

To select Manual mode from Auto mode:

1. While the unit is turned on, press the Power button.
2. Turn the knob to manually adjust the backlight intensity.
3. Press the knob to close the backlight page.

To select Auto mode from Manual mode:

1. While the unit is turned on, press the Power button.
2. Press the Power button again to select Auto.
3. Press the knob to close the backlight page.

Prior to Flight in Instrument Meteorological Conditions

1. Press the Power button on the G5 attitude indicator.
2. Verify the battery status indicator is green on the G5 attitude indicator.

Autopilot Operations with the G5 HSI

The G5 and optional GAD 29B offer various integration capabilities dependent upon the type of autopilot installed in a particular aircraft.

The G5 Electronic Flight Instrument installation in this aircraft provides the following autopilot functions (appropriate boxes will be checked):

- ☒ This installation does not interface with the autopilot (basic wing leveling autopilot or no autopilot is installed in the aircraft).
- ☐ A GAD 29B Adapter is installed in this aircraft.
  - ☐ Course / NAV Selection coupling to the autopilot.
  - ☐ Heading Bug coupling capability to the autopilot.
  - ☐ Roll Steering (GPSS) emulated via heading mode.

    OR
  - ☐ Roll Steering capable autopilot (GPSS menu function for emulation not applicable).

Course / NAV Selection Coupling to the Autopilot (If Configured)

When operating the autopilot in NAV mode, the deviation information from the installed navigation sources (i.e. GPS or NAV) is switched via the navigation source. The NAV source displayed on the HSI is the NAV source the autopilot is following. Many autopilots also use the course datum to determine the best intercept angles when operating in NAV mode.

Heading Bug Coupling Capability to the Autopilot (If Configured)

When operating the autopilot in HDG mode, the difference between the HDG bug location on the HSI and the actual aircraft heading creates an error signal which the autopilot will minimize by turning in the direction of the bug. If the bug is turned more than 180 degrees, the autopilot may turn the airplane in the opposite direction of the desired turn.

Roll Steering (GPSS) Emulated via HDG Mode (If Configured)

For autopilots that do not support digital GPSS signals, GPSS functionality may be emulated by operating the autopilot in HDG mode and selecting GPSS from the G5 menu. If the autopilot is already designed to receive roll steering information, the data is transmitted digitally from the navigator to the autopilot.

When GPSS is selected on the G5 menu, the heading bug on the HSI changes to a hollow outline and a crossed-out heading bug appears on the G5 HSI display indicating that the autopilot is not coupled to the heading bug. The bug is still controllable and may still be used for reference.

When GPSS is selected on the G5, GPSS turn commands are converted into a heading error signal to the autopilot. When the autopilot is operated in HDG mode, the autopilot will fly the turn commands from the GPS

navigator. If the GPSS data is invalid (for example, if there is no active GPS leg) or the selected HSI source on the G5 HSI is not GPS, the annunciated GPSS text will be yellow and a zero turn command will be sent to the autopilot.

This page intentionally left blank.

SECTION 5 – PERFORMANCE

No change.

This page intentionally left blank.

SECTION 6 – WEIGHT AND BALANCE

See current weight and balance data.

This page intentionally left blank.

SECTION 7 – SYSTEM DESCRIPTION

Refer to Garmin G5 Electronic Flight Instrument Pilot's Guide for Certified Aircraft, part number 190-01112-12 Rev A (or later approved revisions), for a description of the G5 electronic flight instrument. This reference material is not required to be on board the aircraft but does contain a more in depth description of all the functions and capabilities of the G5.

The ATT circuit breaker supplies power to the G5 instrument for normal power operation and to charge the internal battery.

The DG circuit breaker supplies power to the G5 instrument for normal power operation when configured as a DG, and to charge the internal battery (if installed).

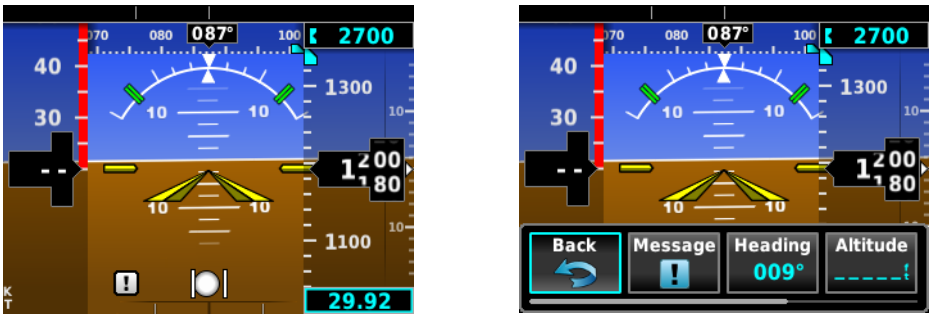
The HSI circuit breaker supplies power to the G5 instrument for normal power operation when configured as an HSI, and to charge the internal battery (if installed).

The GAD circuit breaker supplies power to the optional GAD 29 adapter for normal power operation.

System Messages

The G5 has the capability to display system messages to the crew along the bottom of the display. A system message is indicated through a white ⚠ indication on the G5.

Messages can be displayed by pressing the G5 knob, and selecting the Message menu item.



(For Reference Only)

The following table shows the meaning of each message. System messages are displayed in white text.

Message	Meaning
External Power Lost	Aircraft power has been removed from the G5.
Critical battery fault! Powering off	Battery has critical fault condition and the unit is about to power off to avoid damage to the battery.
Battery fault	Battery has a fault condition – unit needs service.
Battery charger fault	Battery charger has a fault condition – unit needs service.
Low battery	Battery charge level is low.
Hardware fault	Unit has a hardware fault – unit needs service.
Power supply fault	Unit power supply fault detected – unit needs service.
Unit temperature limit exceeded	Unit is too hot or too cold.
Network address conflict	Another G5 with the same address is detected on the network (most commonly a wiring error on one of the units).
Communication error	General communication error (most commonly appears in conjunction with Network Address Conflict message).
Factory calibration data invalid	Unit calibration data not valid – unit needs service.
Magnetic field model database out of date	Internal magnetic field database is out of date - software update required.
Magnetometer Hardware fault	The magnetometer has detected a fault – unit needs service. Heading data may not be available.
Using external GPS data	GPS data from another network LRU is being used. The unit's internal GPS receiver is enabled, but unable to establish a GPS fix.
Not receiving RS-232 data	The G5 is not receiving RS-232 data from the GPS navigator – system needs service.
Not receiving ARINC 429 data	The G5 is not receiving ARINC 429 data from the navigation source – system needs service.
GPS receiver fault	The G5 on-board GPS receiver has a fault.
ARINC 429 interface configuration error	The G5 ARINC 429 port is receiving information from an incorrect source – system needs service.
Software version mismatch	The G5 attitude indicator and the G5 HSI units have different software. Cross fill of baro, heading and altitude bugs is disabled.

These messages remain while the condition persists.

Aircraft Flight Manual Supplement (AFMS)

Multi Model List (MML)

Aircraft Registration No: OE-KBJ

Aircraft Serial Number: 28-8390087

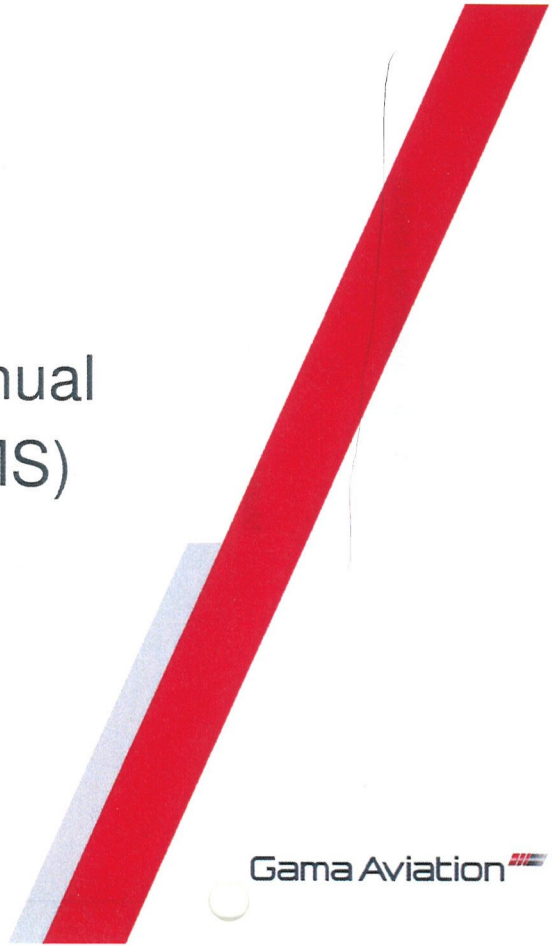
Garmin GNS-W GPS navigation system

EASA approval reference: 10037701 Rev 3

ADDITIONAL LIMITATIONS AND INFORMATION FOR CERTIFICATION

The limitations and information contained herein either supplement or, in the case of conflict, override those in the flight manual

Aircraft Flight Manual Supplement (AFMS)



Gama Aviation

Table of Contents

Amendment record		
Issue	Reason for Issue	DQ reference
1	Initial issue	-
2	Updated text per meeting with the CAA	11-120
3	Document updated to the GAEL template. Pilot's Guide: 190-00356-00 updated to Rev J	14-263
4	GNS-W is the RNAV primary system and TAW-B capability.	15-076
5	Updates per feedback from EASA	15-140
6	Typo correction page 5. Updated table in 1.2 for TAWS-B paragraph references.	15-153
7	Updated requirements for remote annunciation.	16-022
8	Amend second Comm and Nav/GPS requirements in 1.1. Add ADF and alternate equipment requirements in section 2.3	17-005

1 General

1.1. The aircraft is installed with a Garmin GPS, navigation/communication unit in the number one system position. A second VHF navigation or certified GPS system is installed in the number two system position. Garmin units approved within this supplement are: GNS430W, GNS430AW, GNS530W, GNS530AW, GNS530W-TAWS & GNS530AW-TAWS (hereafter referred to as the GNS-W).
GPS system status is via the annunciators built-in to the GNS-W unit, unless an MD41-14xx GPS Annunciation Unit is required due to the position of the GNS-W falling outside the 'Normal' or 'Primary Maximum' field of view. Alternatively, the aircraft may be equipped with an EFIS HSI containing the required GPS annunciators.

The GNS-W is a fully integrated panel mounted unit, which contains a VHF communications transceiver, a VOR/ILS receiver, and a Global Positioning System (GPS) and a navigation computer.

The GNS-W has Receiver Autonomous Integrity Monitoring (RAIM) to assess the integrity of Global Positioning System (GPS) signals. RAIM ensures that the available satellite geometry will allow the receiver to calculate a position within a specified protection limit:

- 4 NM for oceanic
- 2 NM for en route
- 1 NM for terminal
- 0.3 NM for non-precision approaches

The GNS-W interfaces with an E/HSI or CDI to provide desired course and cross track deviation display. The E/HSI can be used for GPS or radio navigation displays as selected by the pilot. A navigation source annunciator is located within the area containing primary flight instruments to indicate whether radio navigation or GPS information is being displayed. The GNS-W contains a navigation database of NDBs, VORs, Airports, airspace and SIDs/STARs. The database is maintained on a 28-day cycle. The GNS-W allows the pilot to create up to 20 flight plans, with up to 31 waypoints in each flight plan. The unit can store up to 1000 user waypoint locations.

The GNS-W uses a flashing "MSG" annunciator at the bottom of the screen (directly above the MSG key) to alert the pilot of any important information or warnings. While most messages are advisory in nature, warning messages may require the pilot's intervention.

Leg sequencing is automatic within the GNS-W. For installations with electronic HSIs the course pointer is automatically slewed to the next waypoint. For installations with electro/mechanical HSIs the course pointer is changed to the next waypoint by the pilot with a prompt provided by the GNS-W. The pilot will receive a visual MSG advising of approach to a waypoint and in mechanical HSI installations, a prompt to reset the course pointer to the next leg.

The GNS-W can provide external outputs to a compatible EFIS system (Garmin G600/500, Aspen EFD1000, Sandel SN3500 etc). Where required, an MD41-14xx annunciator acts as a "repeater" for icons/ displays on the GNS-W:

- VLOC: NAV or ILS information presented on the HSI or CDI
- GPS: GPS information presented on the HSI or CDI
- TERM: indicates aircraft is within 30 miles of departure or arrival airport
- APR: indicates the LPV or LNAV approach is active
- WPT: indicates reaching a waypoint
- MSG: indicates that GNS-W message(s) are active
- INTG: indicates GNS-W detected a position error or the GNS-W is unable to calculate the integrity of the position

1.2. GNS-W options on aircraft

The following table defines which sections of this AFMS are applicable to this installation on the aircraft:

Option	Installed or Enabled	AFMS Ref:
GNS430W / AW	☑	Sections 1 – 10 (excluding TAWS information)
GNS530W / AW	☐	Sections 1 – 10 (excluding TAWS information)
GNS530W TAWS / AW TAWS	☐	Sections 1 – 10 (excluding TAWS information)
GNS530W TAWS / AW TAWS with TAWS installed	☐	Sections 1 – 10
TAWS-B Capability	☐	Section 1.7, Section 2.11, Section 3.2 & Section 4.2
TAWS-B remote annunciation	☐	Section 1.7 para 3
Autopilot capable of coupled LPV approach	☐	Section 2.7

1.3. The GPS receiver meets the performance requirements of ETSO C146a (en route, terminal, and approach).

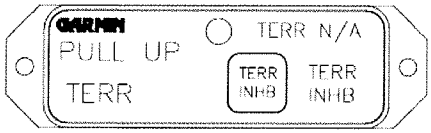
1.4. Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. Navigation data is based upon use of only the Global Positioning System (GPS) operated by the United States of America.

1.5. Pilot's Guide for GNS400W: 190-00356-00 Rev. J (or later version).
Pilot's Guide for GNS500W (including TAWS): 190-00357-00 Rev. J (or later version).
This pilot's guide must be immediately available to the flight crew whenever navigation is predicated on the use of the system. In addition to the Pilot's Guide, the appropriate Pilot's Guide Addendum and Supplements must be immediately available to the flight crew if lightning detection, Traffic Advisory System (TAS), or if primary means oceanic/remote navigation is conducted.

1.6 This change is does not introduce TAWS-B, however an existing GNS unit with TAWS-B installed under a pre-existing approved change can be upgraded to GNS-W unit.

1.7 **Installations with existing TAWS-B only**:

1. The primary function of the TAWS-B portion of the system is to provide terrain situational awareness. TAWS-B functions are:
    - Excessive Descent Rate Alert (GPWS mode 1)
    - Negative Climb Rate After Take-off Alert (GPWS mode 3)
    - Altitude advisory aural alert message "Five-Hundred" (GPWS mode 6)
    - Premature Descent Alert (PDA)
    - Forward Looking Terrain Avoidance (FLTA)
        - Reduced Required Terrain Clearance
        - Reduced Required Obstacle Clearance
        - Imminent Terrain Impact
        - Imminent Obstacle Impact
2. TAWS audio is routed to the direct un-switched input of each pilot's audio system.
3. TAWS visual warnings are shown on the GNS530W-TAWS or via a dedicated annunciation control panel (if installed).



These switches are dimmed via the instrument panel lighting bus or the unit's internal photocell; the annunciation colours/ control functions are:

Indicator/ control	Colour	Function
PULL UP lamp	RED	Indicates terrain warnings
TERR lamp	AMBER	Indicates terrain cautions
TERR N/A lamp	AMBER	Indicates TAWS inoperative
TEST switch	-	Provides press-to-test function for TAWS
TERR INHB lamp/ switch	WHITE	Inhibits FLTA/PDA alerting functions when pressed

2 Limitations

2.1. The GNS-W shall be the primary RNAV system on this aircraft and meets the requirements of:

- EASA AMC20-5 requirements for use of the Navstar Global positioning system
- RNAV5 requirements of EASA AMC20-4 (BRNAV)
- PRNAV operations in accordance with JAA TGL-10
- GPS non-precision approaches (NPA) in accordance with AMC20-27 (see 2.2 below)
- Localizer Precision with Vertical Guidance (LPV) approaches in accordance with AMC20-28.
- GPS primary means of navigation in oceanic and remote airspace.

NB: This AFMS does not constitute an operational approval for any of the above.

2.2. The aircraft complies with the criteria of AMC20-27 for RNP approaches to LNAV/VNAV minima, with the exception that VNAV is based on SBAS/GNSS geometric altitude.

2.3. IFR navigation predicated upon the GPS Receiver requires that:

a. The No.1 position GNS-W is serviceable upon dispatch of the aircraft
b. The second VHF navigation is serviceable upon dispatch of the aircraft
c. The DME is serviceable upon dispatch of the aircraft
d. Alternative communication systems are serviceable, e.g. the ATC transponder.
e. An ADF system is installed and operational when a procedure is to be flown that requires use of an NDB
f. A second VHF Com is installed and operational for all flights operated in notified airspace under Part CAT of EU965-2012.

2.4. GPS operation in oceanic and remote areas is only permitted when operation of the aircraft is limited to latitudes between 73° North and 60° South, unless magnetic variation is manually entered by the pilot.

2.5. Navigation predicated upon the GPS Receiver is prohibited unless the pilot verifies the data base is current or verifies each selected waypoint for accuracy by reference to current approved data.

2.6. Instrument approach navigation predicated upon the GPS receiver must be accomplished in accordance with approved approach procedures that are retrieved from the GPS database. Manual selection/ modification of waypoints is prohibited.

2.7 Autopilot-coupled instrument approaches must be flown in autopilot Approach mode (NAV mode in some systems) replicating a standard ILS approach.

2.8. Instrument approaches using the GPS receiver must be conducted in the GPS Approach mode (automatically selected at the final approach fix (FAF) and RAIM must be available at the FAF.

2.9. Use of the GPS receiver to fly approaches, not approved for GPS, is prohibited.

2.10. If not previously defined, the following default settings must be made in the "AUX Pages, SETUP Page, UNITS/POSITION" menu option prior to operation: refer to the pilot's guide for procedure if necessary:

- dis, spd kt (sets navigation units to "nautical miles" and "knots")
- alt, vs ft fpm (sets altitude units to "feet" and "feet per minute")
- map datum WGS 84 (sets map datum to WGS-84, see note below)
- posn deg-min (sets navigation grid units to decimal minutes)

NOTE: In some areas outside the United States, datum other than WGS-84 or NAD-83 may be used. If the GNS-W unit is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the GNS-W prior to its use for navigation.

2.11 **Installations with existing TAWS-B only**:

Navigation must not be predicated upon with the use of the TAWS.

NOTE: The terrain display is intended to serve as a situational awareness tool only. It may not provide either the accuracy or fidelity, or both, on which to solely base decisions and plan manoeuvres to avoid terrain or obstacles.

To avoid giving unwanted alerts, the TAWS must be inhibited when landing at an airport that is not included in the airport database.

Pilots are authorized to deviate from their current ATC clearance to the extent necessary to comply with terrain/obstacle warnings from TAWS.

The TAWS database has an area of coverage from North 75° Latitude to South 60° Latitude in all longitudes.

NOTE: The area of coverage may be modified, as additional terrain data sources become available.

3 Abnormal / Emergency Procedures

For detailed operating instructions, refer to the Pilot's Guide and optional displays addendum.

3.1 *'RAIM Position Warning'* message displayed or *'Loss of Integrity - Cross Check Nav'* message displayed. Discontinue use of the GNS-W and use another suitable source of navigation.

3.2 **Installations with existing TAWS-B only**:

If a terrain awareness CAUTION occurs, take positive corrective action until the alert ceases. Stop descending or initiate either a climb or a turn, or both, as necessary, based on analysis of all available instruments and information.

If a terrain awareness WARNING occurs, immediately initiate and continue a climb that will provide maximum terrain clearance, or any similar approved vertical terrain escape manoeuvre, until all alerts cease. Only vertical manoeuvres are recommended, unless either operating in visual meteorological conditions (VMC), or the pilot determines, based on all available

information, that turning in addition to the vertical escape manoeuvre is the safest course of action, or both.

The TAWS Forward Looking Terrain Avoidance (FLTA) and Premature Descent Alerts (PDA) functions may be inhibited to stop alerting for acceptable flight conditions (such as below glide slope manoeuvres). Pilots should use discretion when inhibiting TAWS and always remember to enable the system when appropriate. Only the FLTA and PDA alerts are disabled in the inhibit mode; GPWS modes 1, 3 and 6 remain active.

4 Normal Procedures

4.1 Refer to the GNS-W's Pilot's Guide.

Particularly in installations that do not have dedicated annunciators in the primary field of view, pilots must take care to ensure that they monitor carefully the annunciator and system status messages on the front of the GNS-W unit.

4.2 **Installations with existing TAWS-B only**:

During power-up, check that the terrain/obstacle database versions are displayed along with a disclaimer to the pilot. At the same time, as TAWS self-test begins, check that the "TAWS System Test OK" aural messages is generated.

If the unit's navigation information is not available or invalid, utilize remaining operational navigation equipment as required. In this situation, TAWS will not be available; a white 'TER N/A' or red 'TER FAIL' annunciator will be displayed in the lower left corner of the unit's display. If "RAIM position warning" message is displayed the unit will flag and no longer provide GPS based navigational guidance. The crew should revert to the unit's VOR/ILS receiver or an alternate means of navigation other than the unit's GPS receiver. TAWS will not be available and a white 'TER N/A' status annunciator will be displayed by the unit.

If the white "TER N/A" status annunciator is displayed by the unit, the system will no longer provide TAWS alerting or display relative terrain elevations. The crew must maintain compliance with procedures that ensure minimum terrain separation.

If the red "TER FAIL" status annunciator is displayed by the unit, the system will no longer provide TAWS alerting or display relative terrain elevations. The crew must maintain compliance with procedures that ensure minimum terrain separation.

If a "TAWS has failed" message is displayed by the unit, the system will no longer provide TAWS alerting or display relative terrain elevations. The crew must maintain compliance with procedures that ensure minimum terrain separation.

5 Performance

No change from basic aircraft handbook.

6 Weight and Balance/Equipment List

Refer to revised aircraft weight and balance information provided by the installation organisation.

7 System Descriptions

Refer to the Pilot's Guide.

8 Handling, Servicing and Maintenance

Refer to ICA document, as listed on the Gama Aviation (Engineering) Limited (GAEL) Master Documents List (MDL) for this change.

9 Supplements

None.

10 Safety Information

None.

This supplement is to be inserted in the aircraft Flight Manual and the record sheet amended accordingly.

GARMIN Ltd. or its subsidiaries
c/o GARMIN International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062 U.S.A.

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

GFC 500 Autopilot with ESP

Installed in

Piper PA-28-180 / 160 / 150 / 140

And

Piper PA-28-181 / 161 / 151

Dwg. Number: 190-02291-07 Rev. 5

This Supplement must be attached to the FAA Approved Airplane Flight Manual when the GFC 500 Autopilot system is installed in accordance with STC SA01866WI. The information contained herein supplements the information of the basic Airplane Flight Manual. For Limitations, Procedures, and Performance information not contained in this Supplement consult the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

Airplane Serial Number: 28-8390087

Airplane Registration Number: OE-KBS

FAA Approved By: _____

Robert G. Murray
ODA STC Unit Administrator
Garmin International, Inc
ODA-240087-CE

Date: 3/15/2011

Garmin International, Inc.
1200 E. 151st Street
Olathe, KS 66062 USA
Telephone: 913-397-8200
www.garmin.com

Garmin International, Inc

Log of Revisions

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

GFC 500 Autopilot with ESP

Installed in

Piper PA-28-180 / 160 / 150 / 140

And

Piper PA-28-181 / 161 / 151

REV NO.	PAGE NO(S)	DESCRIPTION	DATE OF APPROVAL	FAA APPROVED
1	ALL	Original Issue	03/16/2018	Erik Frisk Garmin ODA STC Unit Administrator
2	ALL	Added VNAV	07/27/2018	Paul Mast Garmin ODA STC Unit Administrator
3	ALL	Added PA-28-140	08/29/2018	Erik Frisk Garmin ODA STC Unit Administrator
4	ALL	Corrected Typographical Errors	01/18/20019	Robert G. Murray Garmin ODA STC Unit Administrator
5	All	Added G3X Information	See Cover	See Cover

This page intentionally left blank.

Table of Contents

SECTION 1 – GENERAL

The information in this supplement is FAA-approved material and must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual (POH/AFM) when the airplane has been modified by installation of the Garmin GFC 500 Autopilot system in accordance with Garmin International, Inc. approved data.

The information in this supplement supersedes or adds to the basic POH/AFM only as set forth below. Users of the manual are advised to always refer to the supplement for possibly superseding information and placarding applicable to operation of the airplane.

USE OF THE SUPPLEMENT

The following definitions apply to WARNINGS, CAUTIONS and NOTES found throughout the supplement:

WARNING

Operating procedures, techniques, etc., which may result in personal injury or loss of life if not carefully followed.

CAUTION

Operating procedures, techniques, etc., which may result in damage to equipment if not carefully followed.

NOTE

Operating procedures, techniques, etc., which is considered essential to emphasize.

ABBREVIATIONS AND TERMINOLOGY

The following glossary is applicable within the airplane flight manual supplement

AFCS	Automatic Flight Control System
AFM	Airplane Flight Manual
AFMS	Airplane Flight Manual Supplement
AGL	Above Ground Level
AHRS	Attitude and Heading Reference System
ALT	Altitude
AP	Autopilot
APR	Approach
ATC	Air Traffic Control
BC	Back Course Approach
CDI	Course Deviation Indicator
DA	Decision Altitude
DISC	Disconnect
DWG	Drawing
ESP	Electronic Stability and Protection
FAA	Federal Aviation Administration
FAF	Final Approach Fix
FD	Flight Director
GA	Go Around
GFC 500	Garmin Autopilot
GMC 507	Autopilot Mode Control Panel
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GS	Glideslope
GSA	Garmin Servo Actuator
HDG	AFCS heading mode
IAS	Indicated Airspeed
ILS	Instrument Landing System
INT	Interrupt
KIAS	Knots Indicated Airspeed
KT	Knot
LNAV	Lateral Navigation
LNAV+V	Lateral Navigation with Advisory Vertical Guidance
LNAV/VNAV	Lateral Navigation / Vertical Navigation Approach
LOC	Localizer (no glideslope available)
LP	Localizer Performance
LP+V	Localizer Performance with Advisory Vertical Guidance
LPV	Localizer Performance with Vertical Guidance
LVL	Level
MDA	Minimum Descent Altitude
MPH	Miles per Hour
PFT	Preflight Test
POH	Pilot's Operating Handbook
STC	Supplemental Type Certificate
TO	Takeoff
TRK	Track
VHF	Very High Frequency
VOR	VHF Omni-directional Range
VS	Vertical Speed

INSTALLED EQUIPMENT INTERFACES

The following is the list of installed equipment and functions associated with the GFC 500 Autopilot installation in this airplane.

Table 1-1: Table of Installed Equipment Interfaces

DEVICE TYPE	Manufacturer / Model If not installed, note N/A	Additional Information
GPS Navigator #1	GNS430W	Is Navigator #1 interfaced to GFC 500? ☑ YES ☐ NO
VHF Nav Radio #1	GNS430W	Is VHF Nav Radio #1 interfaced to GFC 500? ☑ YES ☐ NO
VHF Nav Radio #2		
Pitch Trim Servo	Garmin GSA28	

INSTALLED FEATURES CHECKLIST

The checked autopilot modes and features are available on this aircraft.

Basic AP Features

- ☒ Flight Director
- ☑ Electric Pitch Trim
- ☒ Overspeed Protection
- ☒ Underspeed Protection

Electronic Stability and Protection

- ☒ Pitch/Roll Attitude
- ☒ High Speed Protection
- ☑ Low Speed Protection

Vertical Autopilot Modes

- ☒ Pitch (PIT)
- ☒ Level (Zero vertical speed)
- ☒ Go Around (GA)
- ☒ Altitude Hold
- ☒ Vertical Speed
- ☒ Altitude Capture via Altitude Preselect
- ☒ Indicated Airspeed (IAS)
- ☑ Vertical Navigation (VNAV)
- ☑ GPS Approach Glidepath
- ☑ ILS Glideslope

Lateral Autopilot Modes

- ☒ Roll (ROL)
- ☒ Level (Wings Level)
- ☒ Go Around (GA)
- ☑ Heading
- ☒ Track
- ☑ GPS Navigation
- ☑ VHF Navigation
- ☑ Approach Mode
  - ☑ GPS
  - ☑ VOR/LOC

SECTION 2 – LIMITATIONS

The Garmin G5 Electronic Flight Instrument Pilot's Guide for Certified Aircraft, part number 190-01112-12 Rev B (or later approved revisions), must be immediately available to the flight crew (when G5 is installed).

The Garmin G3X Touch Pilot's Guide for Certified Aircraft, part number 190-02472-00, Rev A (or later approved revisions) must be immediately available to the flight crew (when G3X EFIS system is installed).

This AFMS is applicable to the software versions shown below:

Software Item	Software Version (or later FAA Approved version for this STC)
G5 Software Version	5.70
G3X Software Version	8.00

A pilot must be seated in the left pilot's seat, with seatbelt fastened, during all autopilot operations.

Do not use autopilot during takeoff and landing.

The GFC 500 AFCS preflight test must complete successfully prior to use of the autopilot, flight director or manual electric trim.

The maximum fuel imbalance with the autopilot engaged is 10 gallons.

The autopilot must be disengaged below 200 feet AGL during approach operations and below 800 feet AGL during all other operations.

The GFC 500 autopilot is approved for Category 1 precision approaches and non-precision approaches only.

Autopilot Engagement Speed	
Minimum	65 KIAS (75 MPH)
Maximum	140 KIAS (160 MPH)

This page intentionally left blank.

SECTION 3 – EMERGENCY PROCEDURES

Some emergency situations require immediate memorized corrective action. These steps are printed in bold in the emergency procedures and should be accomplished without the aid of the checklist.

AUTOPILOT MALFUNCTION / PITCH TRIM RUNAWAY

If the airplane deviates unexpectedly from the planned flight path:

1. **Control Wheel** ..... **GRIP FIRMLY**
2. **AP DISC / TRIM INT Button** ..... **PRESS AND HOLD**
   (Be prepared for high elevator control forces)
3. **Aircraft Attitude** ..... **MAINTAIN / REGAIN AIRCRAFT CONTROL**

NOTE

Do not release the AP DISC / TRIM INT Button until after pulling the AUTOPILOT Circuit Breaker.

4. Elevator Trim ..... RE-TRIM if necessary using Elevator Tab Wheel
5. AUTOPILOT Circuit Breaker ..... PULL

NOTE

Pulling the AUTOPILOT circuit breaker will render the autopilot and ESP inoperative.

6. AP DISC / TRIM INT Button ..... RELEASE

WARNING

In flight, do not overpower the autopilot. The trim will operate in the direction opposing the overpower force, which will result in large out-of-trim forces.

Do not attempt to re-engage the autopilot or use manual electric pitch trim until the cause of the malfunction has been corrected.

AUTOPILOT FAILURE / ABNORMAL DISCONNECT

(Red AP in autopilot status box on display, continuous aural disconnect tone.)

1. AP DISC / TRIM INT Button or G5 Knob or G3X Autopilot Status Bar..... PRESS AND RELEASE (to cancel disconnect tone)
2. Aircraft Attitude..... MAINTAIN / REGAIN AIRCRAFT CONTROL

NOTE

The autopilot disconnect may be accompanied by a red AFCS in the autopilot status box, indicating the automatic flight control system has failed. The flight director will not be available and the autopilot cannot be re-engaged with this annunciation present.

If the disconnect is accompanied by an amber AP with a red X, the autopilot will not be available however the flight director will still be functional.

In the event of a GMC failure, pressing the G5 knob or G3X Autopilot status bar will acknowledge the disconnect tone.

PITCH TRIM FAILURE

(Red PTRIM on G5 or G3X display.)

This failure will only occur if the optional pitch trim servo is installed.

1. Indicates a failure of the pitch trim servo.
2. Control Wheel ..... GRIP FIRMLY
3. AP DISC / TRIM INT Button ..... PRESS and RELEASE (Be prepared for high elevator control forces)
4. Elevator Trim..... AS REQUIRED USING ELEVATOR TAB WHEEL

NOTE

The autopilot may be re-engaged. Refer to the normal procedures section of this AFMS, MANUAL PITCH TRIM WITH AUTOPILOT ENGAGED.

ESP ACTIVATION

1. **Power..... AS REQUIRED**
2. **Aircraft Attitude..... MAINTAIN / REGAIN AIRCRAFT CONTROL**

NOTE

If ESP is active for approximately 10 seconds, the autopilot will automatically engage in LVL mode, an aural 'ENGAGING AUTOPILOT' will be played, (or a Sonalert tone will sound for installations without a supported audio panel) and the autopilot will roll the wings level and fly at zero-vertical speed. Refer to Section 7, System Description for further information.

ESP will be disabled by pressing and holding the AP DISC / TRIM INT button. Releasing the button will allow ESP to function.

OVERSPEED PROTECTION (MAXSPD)

(MAXSPD displayed on G5 or G3X, AIRSPEED – AIRSPEED Aural sounds.)

1. **Power** ..... **REDUCE**
2. **Aircraft Attitude and Altitude** ..... **MONITOR**

After overspeed condition is corrected:

3. Autopilot ..... RESELECT VERTICAL AND LATERAL MODES (if necessary)
4. Power ..... ADJUST as necessary

NOTE

Autopilot Overspeed Protection Mode provides a pitch up command to maintain 140 KIAS (160 MPH).

UNDERSPEED PROTECTION (MINSPD)

(MINSPD displayed on G5 or G3X, AIRSPEED – AIRSPEED Aural sounds.)

1. **Power** ..... **INCREASE POWER AS REQUIRED TO CORRECT UNDERSPEED**
2. **Aircraft Attitude and Altitude** ..... **MONITOR**

After underspeed condition is corrected:

3. Autopilot ..... RESELECT VERTICAL AND LATERAL MODES (if necessary)
4. Power ..... ADJUST as necessary

NOTE

Autopilot Underspeed Protection Mode provides a pitch down command to maintain 65 KIAS (75 MPH).

This page intentionally left blank.

SECTION 3A – NON-NORMAL PROCEDURES

AUTOPILOT ABNORMAL DISCONNECT

(Red AP in the G5 or G3X autopilot status box, continuous aural disconnect tone.)

1. AP DISC / TRIM INT Button ..... PRESS AND RELEASE (to cancel disconnect tone)
2. Aircraft Attitude ..... MAINTAIN / REGAIN AIRCRAFT CONTROL

NOTE

The autopilot disconnect may be accompanied by a red AFCS in the autopilot status box, indicating the automatic flight control system has failed. The flight director will not be available and the autopilot cannot be re-engaged with this annunciation present.

If the disconnect is accompanied by an amber AP with a red X, the autopilot will not be available however the flight director will still be functional.

AUTOPILOT PRE-FLIGHT TEST FAIL

(Amber AP with a red X in G5 or G3X autopilot status box.)

1. Indicates the AFCS system failed the automatic Pre-Flight test. The autopilot, ESP, and electric elevator trim are inoperative. Flight director will still function.

MANUAL AUTOPILOT DISCONNECT

If necessary, the autopilot may be manually disconnected using any one of the following methods:

1. AP DISC / TRIM INT Button ..... PRESS and RELEASE (Pilot's control wheel)
2. AP Key ..... PRESS
3. Pitch Trim Switch ..... ACTIVATE
4. AUTOPILOT Circuit Breaker ..... PULL

LOSS OF NAVIGATION INFORMATION

(Amber GPS, VOR, LOC, or BC flashes for 10 seconds on G5 or G3X.)

NOTE

If a navigation signal is lost while the autopilot is tracking it, the autopilot will roll the aircraft wings level and default to roll mode (ROL).

1. GMC 507 Mode Panel ..... SELECT HDG mode and SET desired heading
2. NAV Source ..... SELECT a valid NAV source
3. NAV Key ..... PRESS

If on an instrument approach at the time the navigation signal is lost:

4. Missed Approach Procedure ..... EXECUTE (as applicable)

LOSS OF AIRSPEED DATA

(Red X through airspeed tape on the G5 or G3X display, amber AP with a red X in autopilot status box.)

NOTE

If airspeed data is lost while the autopilot is tracking airspeed, the flight director will default to pitch mode (PIT).

1. AP DISC / TRIM INT Button ..... PRESS AND RELEASE (to cancel disconnect tone)
2. Aircraft Attitude ..... MAINTAIN / REGAIN AIRCRAFT CONTROL
3. Manual Elevator Trim ..... TRIM as required

NOTE

The autopilot cannot be re-engaged. The flight director is available however IAS mode cannot be selected. Loss of airspeed will be accompanied by a red PTRIM indication on the G5 or G3X (if a pitch trim servo is installed).

LOSS OF ALTITUDE DATA

(Red X through altitude tape on the G5 or G3X display.)

NOTE

If altitude data is lost while the autopilot is tracking altitude, the autopilot will default to pitch mode (PIT).

1. Autopilot ..... SELECT different vertical mode

LOSS OF GPS INFORMATION

(GPS position information is lost to the autopilot.)

NOTE

If GPS position data is lost while the autopilot is tracking a GPS, VOR, LOC or BC course, the autopilot will default to roll mode (ROL). The autopilot will default to pitch mode if GPS information is lost while tracking an ILS. The autopilot uses GPS aiding in VOR, LOC and BC modes.

1. Autopilot ..... SELECT different lateral and vertical mode (as necessary)

If on an instrument approach:

- AP DISC / TRIM INT button ..... PRESS, Continue the approach manually

  Or

- Missed Approach Procedure ..... EXECUTE (as applicable)

HEADING DATA SOURCE FAILURE

Without a heading source to the navigator, GPSS will not be provided to the autopilot for heading legs. Navigator map cannot be oriented heading up.

Track information will be displayed on the G5 or G3X.

1. Autopilot ..... SELECT different lateral mode

ELEVATOR MISTRIM (AUTOTRIM)

(Amber TRIM UP or TRIM DOWN displayed on the G5 or G3X.)

Indicates a mistrim of the elevator while the autopilot is engaged. If a pitch trim servo is not installed, refer to the normal procedures section of this AFMS, MANUAL PITCH TRIM WITH AUTOPILOT ENGAGED. If a pitch trim servo is installed, the autopilot will normally trim the airplane as required. However, during rapid acceleration, deceleration, configuration changes, or near either end of the elevator trim limits, momentary illumination of this message may occur. If the autopilot is disconnected while this message is displayed, high elevator control forces are possible.

WARNING

Do not attempt to overpower the autopilot in the event of a pitch mistrim. The autopilot servo will oppose pilot input and will cause pitch trim to run opposite the direction of pilot input. This will lead to a significant out-of-trim condition, resulting in large control wheel force when disengaging the autopilot.

If a pitch trim servo is not installed:

1. Refer to the normal procedures section of this AFMS, MANUAL PITCH TRIM WITH AUTOPILOT ENGAGED.

If a pitch trim servo is installed:

NOTE

Momentary display of the TRIM UP or TRIM DOWN message during configuration changes or large airspeed changes is normal.

1. Control Wheel ..... GRIP FIRMLY

WARNING

Be prepared for significant sustained control forces in the direction of the mistrim annunciation. For example, TRIM DOWN indicates nose down control wheel force will be required upon autopilot disconnect.

2. AP DISC / TRIM INT Button ..... PRESS AND RELEASE
3. Manual Elevator Trim ..... RE-TRIM as required

Electric pitch trim should be considered inoperative until the cause of the mistrim has been investigated and corrected.

This page intentionally left blank.

SECTION 4 – NORMAL PROCEDURES

GFC 500 POWER UP

During the preflight test the G5 or G3X will display PFT in the autopilot status box. When the GFC 500 passes preflight test, PFT will be removed from the autopilot status box.

FLIGHT DIRECTOR / AUTOPILOT NORMAL OPERATING PROCEDURES

Autopilot/Flight Director mode annunciations are displayed at the top of the G5 Electronic Flight Instrument or the top of the G3X Electronic Flight Instrument System PFD. Green text indicates active autopilot/flight director modes. Armed modes are indicated in white text. Normal mode transitions will flash inverse video for 10 seconds before becoming steady. Abnormal mode transitions will flash for 10 seconds in amber text before the default mode is annunciated as the active mode in green text. Default autopilot/flight director modes are Roll (ROL) and Pitch (PIT) modes.

The autopilot status box displays the autopilot engagement status as well as armed and active flight director modes.

Autopilot Engagement with Flight Director Off — Upon engagement, the autopilot will be set to hold the current attitude of the airplane if the flight director was not previously on. In this case, 'ROL' and 'PIT' will be annunciated.

Autopilot Engagement with Flight Director On — If the flight director is on, the autopilot will smoothly pitch and roll the airplane to capture the FD command bars. The prior flight director modes remain unchanged.

Autopilot Disengagement — The most common way to disconnect the autopilot is to press and release the AP DISC / TRIM INT button located on the control yoke. An autopilot disconnect tone will sound and an amber AP will be annunciated on the G5 or G3X autopilot status box. Other ways to disconnect the autopilot include:

- Pressing the AP Key on the GMC 507 Mode Controller
- Operating the Electric Pitch Trim Switch (located on the control wheel)
- Pulling the AUTOPILOT circuit breaker

In the event of unexpected autopilot behavior, press and holding the AP DISC / TRIM INT button will disconnect the autopilot and remove all power to the servos.

VERTICAL MODES

VERTICAL SPEED (VS) MODE

1. Altitude Preselect ..... SET to Desired Altitude
2. Press VS Key, autopilot synchronizes to the airplane's current vertical speed.
3. Vertical Speed Reference ..... ADJUST using UP / DN Wheel
4. Green ALT ..... VERIFY Upon Altitude Capture

INDICATED AIRSPEED (IAS) MODE

1. Altitude Preselect ..... SET to Desired Altitude
2. Press IAS Key, autopilot synchronizes to the airplane's current indicated airspeed.
3. AIRSPEED Reference ..... ADJUST using UP / DN Wheel
4. Adjust throttle as required ..... INCREASE POWER to climb
   DECREASE POWER to descend
5. Green ALT ..... VERIFY Upon Altitude Capture

ALTITUDE HOLD (ALT) MODE, MANUAL CAPTURE

1. When at the desired altitude ..... PRESS ALT key

   The autopilot will hold the altitude at which the ALT key was pressed.

   If climbing or descending at a high rate when the ALT key is pressed, the airplane will overshoot the reference altitude and then return to it. The amount of overshoot will depend on the vertical speed when the ALT key is pressed.

   The altitude reference is displayed in the autopilot status box. The reference may be changed by +/- 200 FT using the UP / DN wheel.

VERTICAL NAVIGATION (VNAV)

1. Navigation Source ..... SELECT CDI to GPS
2. Vertical Navigation Profile ..... LOAD into the GPS navigator's flight plan
3. Altitude Preselect ..... SET to the vertical clearance limit
   When ATC clearance received.
4. GMC 507 Mode Panel ..... PRESS VNAV within 5 minutes of the top of descent (TOD)

NOTE

Vertical navigation will not function for the following conditions:

- Selected navigation source is not GPS navigation. VNAV will not function if the navigation source is VOR or Localizer.
- VNAV is not enabled on the GPS Navigator
- If the altitude preselect is not set below the current aircraft altitude.
- No waypoints with altitude constraints in the flight plan
- Glideslope or Glidepath is the active flight director pitch mode.
- OBS mode is active
- Dead Reckoning mode is active
- Parallel track is active
- Aircraft is on the ground

Vertical navigation is not available between the final approach fix (FAF) and the missed approach point (MAP)

ALTV will be the armed vertical mode during the descent if the altitude preselect is set to a lower altitude than the VNAV reference altitude. This indicates the autopilot / flight director will capture the VNAV altitude reference. ALTS will be the armed mode during the descent if the altitude preselect is set at or above the VNAV reference altitude, indicating that the autopilot / flight director will capture the altitude preselect altitude reference.

GO AROUND

1. GO AROUND button ..... PRESS – Verify GA / GA on G5 or G3X autopilot will not disengage
2. Autopilot (if engaged) ..... VERIFY airplane pitches up following flight director command bars
3. Power ..... APPLY Go Around power
4. GMC 507 Mode Panel ..... PRESS NAV to couple to selected navigation source
   OR
   PRESS HDG to Fly ATC Assigned Missed Approach Heading
5. Altitude Preselect ..... VERIFY Set to appropriate altitude.

NOTE

The pilot is responsible for initial missed approach guidance in accordance with published procedure. When the GA button is pressed the Flight Director command bars will command go-around pitch attitude and wings level. The pilot must select the CDI to the appropriate navigation source and select the desired lateral and vertical flight director modes.

MANUAL PITCH TRIM WITH AUTOPILOT ENGAGED

(Amber TRIM UP or TRIM DOWN displayed on G5 or G3X.)

If the aircraft is not equipped with a pitch trim servo, the pilot must manually adjust the pitch trim when airspeed and aircraft configuration changes are made. A message will be displayed on the G5 or G3X display to indicate the pitch servo is holding sustained force, and the pilot must manually trim the aircraft.

1. If TRIM UP message is displayed ..... MANUALLY TRIM nose up
2. If TRIM DOWN message is displayed ..... MANUALLY TRIM nose down

LATERAL MODES

HEADING MODE (HDG)

1. HDG Key ..... PRESS
   The autopilot will turn the airplane in the direction of the heading bug.
2. HDG/TRK Knob ..... Rotate to set heading bug to desired heading.
3. When the airplane reaches the heading bug, the autopilot will roll the wings level to track the reference.

TRACK MODE (TRK)

1. TRK Key ..... PRESS
   The autopilot will turn the airplane in the direction of the track bug.
2. HDG/TRK Knob ..... Rotate to set track bug to desired track.
3. When the airplane reaches the track bug, the autopilot will roll the wings level to track the reference.

NAVIGATION (VOR)

1. Navigation Source. ..... SELECT CDI to VHF NAV
   Tune and identify the station frequency.
2. Course Pointer ..... SET CDI to the Desired Course
3. Intercept Heading ..... ESTABLISH in HDG, TRK or ROL mode
4. NAV Key ..... PRESS

NOTE

If the Course Deviation Indicator (CDI) is greater than one dot from center, the autopilot will arm the VOR mode. The pilot must ensure that the current heading will result in a capture of the selected course. If the CDI is one dot or less from center, the autopilot will enter the capture mode when the NAV key is pressed.

NAVIGATION (GPS)

1. Navigation Source ..... SELECT CDI to GPS
2. Waypoint ..... SELECT on Navigation Source
3. Course Pointer ..... VERIFY CDI set to the Desired Course
4. Intercept Heading ..... ESTABLISH in HDG or ROL mode
5. NAV Key ..... PRESS

NOTE

If the Course Deviation Indicator (CDI) is greater than one dot from center, the autopilot will arm the GPS mode. The pilot must ensure that the current heading will result in a capture of the selected course. If the CDI is one dot or less from center, the autopilot will enter the capture mode when the NAV key is pressed.

APPROACHES

ILS

1. Navigation Source ..... SELECT CDI to VHF Nav
   Tune and Identify an ILS station frequency.
2. CDI ..... SET to front LOC course
3. Ensure that the current heading will result in a capture of the selected course.
4. Press APR Key ..... VERIFY LOC and GS ARMED
5. Verify ..... Airplane Captures and Tracks LOC and GS
6. Set Missed Approach Altitude in Altitude preselect.
7. At Decision Altitude (DA),
   - AP DISC / TRIM INT button ..... PRESS, Continue visually for a normal landing

     Or
   - GO AROUND (GA) button..... PRESS, Execute Missed Approach Procedure
   - Apply GA power.

NOTE

Pressing the GA button will not disconnect the autopilot. Select NAV or HDG mode to fly the missed approach procedure.

If the Course Deviation Indicator (CDI) is greater than half scale deflection, the autopilot will arm the LOC mode. The pilot must ensure that the current heading will result in a capture of the selected course. If the CDI is within half scale deflection, the autopilot will enter the capture mode when the APR key is pressed.

When the selected navigation source is an ILS, glideslope coupling is automatically armed when the APR key is pressed. The glideslope cannot be captured until the localizer is captured. The autopilot can capture the glideslope from above or below the glideslope.

LOC (GS out)

1. Navigation Source ..... SELECT CDI to VHF Nav
   Tune and Identify an ILS station frequency.
2. Course Pointer ..... SET to front LOC course
3. Ensure that the current heading will result in a capture of the selected course.
4. Press NAV Key ..... VERIFY LOC ARMED
5. Verify ..... Airplane Captures and Tracks LOC Course
6. Once airplane is in ALT mode inbound to the FAF, set the altitude preselect to the next required step down altitude. Use VS mode to descend airplane along the vertical step downs and to the MDA.
7. When in ALT mode at the MDA, set missed approach altitude in the altitude preselect.
8. At Missed Approach Point,
   - AP DISC / TRIM INT button ..... PRESS, Continue visually for a normal landing

     Or
   - GO AROUND (GA) button..... PRESS, Execute Missed Approach Procedure
   - Apply GA power.
   - Set missed approach altitude in the altitude preselect.

NOTE

Pressing the GA button will not disconnect the autopilot. Select NAV or HDG mode to fly the missed approach procedure.

GPS Approach (LPV, LNAV/VNAV, LP+V, or LNAV+V)

1. Navigation Source ..... SELECT CDI to GPS
2. Course Pointer ..... VERIFY CDI set to the Desired Course
3. Ensure that the current heading will result in a capture of the selected course.
4. Press APR Key ..... VERIFY GPS and GP ARMED
5. Verify ..... Airplane Captures and Tracks GPS and GP
6. Press ALT Key to level off at the MDA for a LP+V or LNAV+V approach
7. At DA (LPV or LNAV/VNAV approach), or MDA and Missed Approach Point (LP+V or LNAV+V)
   - AP DISC / TRIM INT button ..... PRESS, Continue visually for a normal landing

     Or
   - GO AROUND (GA) button ..... PRESS, Execute Missed Approach Procedure
   - Apply GA power.
   - Set missed approach altitude in the altitude preselect.

NOTE

Pressing the GA button will not disconnect the autopilot. Select NAV or HDG mode to fly the missed approach procedure.

GPS Approach (LP, LNAV)

1. Navigation Source ..... SELECT GPS on the CDI
2. Course Pointer ..... VERIFY CDI set on the Desired Course
3. Ensure that the current heading will result in a capture of the selected course.
4. Press NAV Key ..... VERIFY GPS ARMED
5. Verify ..... Airplane Captures and Tracks GPS Course
6. Once airplane is in ALT mode inbound to the FAF, set the altitude preselect to the next required step down altitude. Use VS mode to descend airplane along the vertical step downs and to the MDA.
7. When in ALT mode at the MDA, set missed approach altitude in the altitude preselect.
8. At Missed Approach Point,
   - AP DISC / TRIM INT button ..... PRESS, Continue visually for a normal landing

     Or
   - GO AROUND (GA) button ..... PRESS, Execute Missed Approach Procedure
   - Apply GA power.
   - Set missed approach altitude in the altitude preselect.

NOTE

Pressing the GA button will not disconnect the autopilot. Select NAV or HDG mode to fly the missed approach procedure.

BC

1. Navigation Source..... SELECT CDI to VHF Nav
   Tune and Identify an ILS station frequency
2. Course Pointer ..... SET CDI to LOC Front Course
3. Ensure that the current heading will result in a capture of the selected course.
4. Press NAV Key ..... VERIFY BC ARMED
   (when heading is within 75 degrees of BC course)
5. Verify ..... Airplane Captures and Tracks BC Course
6. Once airplane is in ALT mode inbound to the FAF, set the altitude preselect to the next required step down altitude. Use VS mode to descend airplane along the vertical step downs and to the MDA.
7. When in ALT mode at the MDA, set missed approach altitude in the altitude preselect.
8. At Missed Approach Point:
   - AP DISC / TRIM INT button ..... PRESS, Continue visually for a normal landing

     Or
   - GO AROUND (GA) button..... PRESS, Execute Missed Approach Procedure
   - Apply GA power.
   - Set missed approach altitude in the altitude preselect.

NOTE

Pressing the GA button will not disconnect the autopilot. Select NAV or HDG mode to fly the missed approach procedure.

VOR Approach

1. Navigation Source..... SELECT CDI to VHF Nav
   Tune and identify the station frequency
2. Course Pointer .....SET CDI to the Desired Course
3. Ensure that the current heading will result in a capture of the selected course.
4. Press NAV Key ..... VERIFY VOR ARMED
5. Verify .....Airplane Captures and Tracks VOR Course
6. Once airplane is in ALT mode inbound to the FAF, set the altitude preselect to the next required step down altitude. Use VS mode to descend airplane along the vertical step downs and to the MDA.
7. When in ALT mode at the MDA, set missed approach altitude in the altitude preselect.
8. At Missed Approach Point:
   - AP DISC / TRIM INT button ..... PRESS, Continue visually for a normal landing
     Or
   - GO AROUND (GA) button..... PRESS, Execute Missed Approach Procedure
   - Apply GA power.
   - Set missed approach altitude in the altitude preselect.

NOTE

Pressing the GA button will not disconnect the autopilot. Select NAV or HDG mode to fly the missed approach procedure.

DISABLING ESP

ESP can be disabled on the G5 attitude indicator with the following procedure. ESP will default to "Enabled" on the next power cycle.

1. G5 Knob. ..... PRESS
2. ESP ..... SELECT
3. G5 Knob ..... PRESS

ESP can be disabled on the G3X with the following procedure. ESP will default to "Enabled" on the next power cycle.

1. Autopilot Status Box ..... TOUCH
2. ESP Button ..... TOUCH
3. Back Button ..... PRESS

SECTION 5 – PERFORMANCE

No Change.

This page intentionally left blank.

SECTION 6 – WEIGHT AND BALANCE

No change to loading information. Refer to current weight and balance report and equipment list for changes to empty weight/moment and installed equipment.

This page intentionally left blank.

SECTION 7 – SYSTEM DESCRIPTION

AFCS OVERVIEW

The GFC 500 is a digital Automatic Flight Control System (AFCS). It is a two-axis autopilot and flight director system which provides the pilot with the following features:

G5 Outputs to Autopilot — The G5 flight instrument (when installed) provides attitude, rate, and acceleration information to the servos. Additionally, indicated airspeed, vertical speed, pressure altitude and GPS information are sent to the autopilot for mode control.

G3X Outputs to Autopilot — The G3X electronic flight instrument system provides attitude, rate, and acceleration information to the servos. Additionally, indicated airspeed, vertical speed, pressure altitude and GPS information are sent to the autopilot for mode control.

Flight Director (FD) — The flight director processing occurs in the G5 or G3X instrument. Selected modes for the flight director are displayed on the G5 or G3X autopilot status box.

The flight director provides:

- Command Bars showing pitch/roll guidance
- Vertical / lateral mode selection and processing

Autopilot (AP) — Autopilot operation occurs within the pitch, roll, and optional pitch trim servo. It also provides servo monitoring, and automatic flight control in response to flight director steering commands, attitude and rate information, and airspeed.

Optional Electric Pitch Trim — The pitch trim servo provides manual electric pitch trim capability when the autopilot is not engaged. The trim servo provides automatic pitch trim when the autopilot is engaged and the airplane is in the air. Automatic trim functionality is disabled on the ground.

GMC 507 — Pilot commands to the autopilot and flight director are entered through the GMC 507 autopilot mode panel. The GMC 507 contains internal sensors which calculate the aircraft attitude, attitude rate and accelerations. These inertial sensors are completely independent from the sensors within the G5 or G3X and the rest of the autopilot system, and are not used for the flight director, autopilot, trim or ESP functions. They are used solely to provide independent monitoring of the GFC 500.

Airspeed and Altitude Information — The GFC 500 requires airspeed and altitude information from the G5 instrument or the G3X system.

Other components of the AFCS include the GSA 28 pitch, roll, and optional pitch trim servo that also contain autopilot processors, control wheel mounted elevator trim switch (if trim servo is installed), control wheel mounted autopilot disconnect and trim interrupt button (AP DISC / TRIM INT), and a Go-Around (GA) button.

Underspeed Protection (USP) — The GFC 500 will provide Underspeed Protection when the autopilot is engaged.

When the minimum airspeed of 65 KIAS (75 MPH) is reached, a visual MINSPD message will appear above the airspeed tape and the autopilot will lower the nose to maintain 65 KIAS (75 MPH). An aural "AIRSPEED, AIRSPEED" voice alert will sound for installations connected to an audio panel.

Underspeed Protection is inhibited when the airspeed exceeds 70 KIAS (80 MPH).

Overspeed Protection (OSP) — The GFC 500 will provide Overspeed Protection when the autopilot is engaged.

When the maximum airspeed of 140 KIAS (160 MPH) is reached, visual MAXSPD message will appear above the airspeed tape and the autopilot will raise the nose of the aircraft to avoid exceeding 140 KIAS (160 MPH). An aural "AIRSPEED, AIRSPEED" voice alert will sound for installations connected to an audio panel.

Overspeed Protection is inhibited when the airspeed is below 135 KIAS (155 MPH).

Coupled Go-Around — Pressing the GA button will not disengage the autopilot. Instead, the autopilot will attempt to capture and track the flight director command bars. If insufficient airplane performance is available to follow the commands, the autopilot will enter Underspeed Protection mode at the minimum airspeed.

Electronic Stability and Protection (ESP) — The GFC 500 will provide Electronic Stability and Protection when the autopilot is not engaged.

Electronic Stability and Protection (ESP) uses the autopilot servos to assist the pilot in maintaining the airplane in a safe flight condition within the airplane's normal pitch, roll and airspeed envelopes.

Electronic Stability and Protection is activated when the pilot allows the airplane to exceed one or more conditions beyond normal flight as defined below:

- Pitch attitude beyond normal flight (+20°, -15°)
- Roll attitude beyond normal flight (45°)
- High airspeed beyond normal flight (above V_{NE} + 1 KIAS [1 MPH])
- Low airspeed below normal flight (below V_s + 5 KIAS [5 MPH])

ESP requires:

- Pitch and Roll servos are installed and functioning
- Autopilot not engaged
- The GPS altitude above ground is more than 200 feet (for low airspeed mode)
- Aircraft is within the autopilot engagement envelope (+/-50° in pitch and +/-75° in roll)

Protection for excessive Pitch, Roll, and Airspeed is provided when the limit thresholds are first exceeded, which engages the appropriate servo in ESP mode at a nominal torque level to bring the airplane back within the normal flight envelope. If the airplane deviates further from the normal flight envelope, the servo torque will increase until the maximum torque level is reached in an attempt to return the airplane into the normal flight envelope. Once the airplane returns to within the normal flight envelope, ESP will deactivate the autopilot servos.

When the normal flight envelope thresholds have been exceeded for more than 10 seconds, ESP Autolevel Mode is activated. Autolevel Mode engages the autopilot to bring the airplane back into straight and level flight based on 0° roll angle and 0 FPM vertical speed. An aural, "ENGAGING AUTOPILOT" (or a Sonalert tone), sounds and the Flight Director mode annunciation will indicate LVL for the pitch and roll modes.

Any time an ESP mode is active, the pilot can interrupt ESP by using the Autopilot Disconnect (AP DISC / TRIM INT) switch, or simply override ESP by overpowering the autopilot servos. The pilot may also disable ESP through the G5 menu.

The engagement and disengagement attitude limits are displayed with double hash marks on the roll indicator depending on the airplane attitude and whether or not ESP is active in roll. When ESP is inactive (roll attitude within nominal limits) only the engagement limit indications are displayed in order to reduce clutter on the roll indicator.

Display symbology implemented for ESP is illustrated in the following figures.

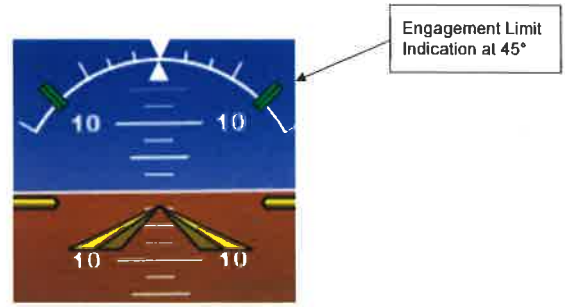


Figure 7-1: Nominal Roll Attitude ESP Engagement Limit Indications

Once ESP becomes active in roll, the engagement limit indication that was crossed (either Left or Right) will move to the lower disengagement limit indication. The opposite roll limit remains at the engagement limit.

Figure 7-2: Engagement Limit Indications Upon ESP Activation

Disconnect Methods

The following conditions will cause the autopilot to automatically disconnect:

- Electrical power failure, including pulling the AUTOPILOT circuit breaker.
- Internal autopilot system failure (including internal AHRS failure).

The following pilot actions will cause the autopilot to disconnect:

- Pressing the red AP DISC / TRIM INT button on the pilot's control wheel.
- Actuating the manual electric trim switch (if installed).
- Pushing the AP Key on the GMC 507 mode controller when the autopilot is engaged.
- Pulling the AUTOPILOT circuit breaker.

The red AP DISC / TRIM INT button on the pilot's control wheel will interrupt power to the manual electric trim for as long as the switch is depressed.

AUTOPILOT CONTROL UNIT AND DISPLAY

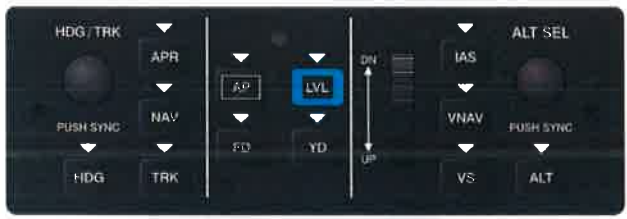


Figure 7-3: GMC 507 Control Unit (Reference Only)

Figure 7-4: G5 Display (Reference Only)

The following tables list the available AFCS vertical and lateral modes with their corresponding controls and annunciations. The UP/DN wheel can be used to change the vertical mode reference while operating in Pitch Hold, Vertical Speed, Altitude Hold, or IAS mode. Increments of change and maximum ranges of values for each of these references using the UP/DN wheel are also listed in the table.

AFCS VERTICAL MODES

Vertical Mode	Control	Annunciation	Reference Range	Reference Change Increment
Pitch Hold	(default)	PIT	20° Nose Up 15° Nose Down	0.5°
Selected Altitude Capture	*	ALTS		
Altitude Hold	**ALT** Key	ALT nnnnn		10 FT
Vertical Speed	**VS** Key	VS nnnn	-2000 to +2000 FPM	100 FPM
IAS Hold	**IAS** Key	IAS nnn	65 to 140 KIAS 75 to 160 MPH	1 KT 1 MPH
Vertical Path Tracking (VNAV)	**VNV** Key	VNAV		
VNAV Target Altitude Capture	**	ALTV		
Glidepath	**APR** Key	GP		
Glideslope		GS		
Takeoff or Go Around	**GA** Button	TO or GA	7°	
Level (LVL)	**LVL** Key	LVL	Zero Vertical Speed	
ESP High Pitch Engagement			ESP High Pitch Attitude engages at 20° nose up	
ESP Low Pitch Engagement			ESP Low Pitch Attitude engages at 15° nose down	
ESP High Airspeed Engagement			ESP High Airspeed engages at above V_{NE} + 1 KIAS (1 MPH)	
ESP Low Airspeed Engagement			When above 200 FT AGL, ESP Low Airspeed engages at below Vs + 5 KIAS (5 MPH). (This mode only available if height above terrain is available from a compatible Garmin GPS).	

* ALTS arms automatically when PIT, VS, IAS, or GA is active.

** ALTV arms automatically if the VNAV Target Altitude is to be captured instead of the Selected Altitude.

AFCS LATERAL MODES

Lateral Mode	Control	Annunciation	Maximum Roll Command Limit
Roll Mode	(default)	ROL	30°
Heading Select	**HDG** Key	HDG	30°
Track Select	**TRK** Key	TRK	30°
Navigation, GPS Arm/Capture/Track	**NAV** Key	GPS	30°
Navigation, VOR Enroute and Approach Arm/Capture/Track		VOR	30°
Navigation, LOC Arm/Capture/Track (No Glideslope)		LOC	30°
Backcourse Arm/Capture/Track		BC	30°
Approach, GPS Arm/Capture/Track (Glidepath Mode Automatically Armed, if available)	**APR** Key	GPS	30°
Approach, ILS Arm/Capture/Track (Glideslope Mode Automatically Armed)		LOC	30°
Takeoff or Go Around	**GA** Button	TO or GA	Wings Level
LVL (Level)	**LVL** Key	LVL	Wings Level
ESP Roll Attitude Engagement	ESP Roll Attitude engages at 45°		

The autopilot may be engaged within the following ranges:

Pitch 50° nose up to 50° nose down

Roll ±75°

If the above pitch or roll limits are exceeded while the autopilot is engaged, the autopilot will disconnect. Engaging the autopilot outside of its command limits, but within its engagement limits, will cause the autopilot to return the aircraft within command limits. The autopilot is capable of commanding the aircraft in the following ranges:

Pitch 20° nose up to 15° nose down

Roll ±30°

PREFLIGHT TEST

During the preflight test the G5 or G3X will display PFT in the autopilot status box. The PFT annunciation is removed at the completion of the preflight test. If GFC 500 fails the PFT, a yellow AP with a red X is displayed in the autopilot status box on the G5 or G3X.

MESSAGES AND ANNUNCIATIONS

Autopilot Messages	
AFCS Controller Key Stuck	The system has sensed a key input on the GMC 507 for 30 seconds or longer.
AFCS Controller Audio Database Missing	The audio database is missing from the GMC 507. The aural voice alerts will not be heard.
Servo Clutch Fault	One or more autopilot servos has a stuck clutch. The servo needs service.
Servo Trim Input Fault	The inputs to the trim system are invalid. The trim system needs service.
Autopilot Annunciations	
AFCS	Autopilot has failed. Autopilot and trim are inoperative and flight director is not available.
AP	Autopilot normal disconnect.
AP	Autopilot abnormal disconnect.
AP	Autopilot has failed. The autopilot is inoperative. FD modes may still be available.
MAXSPD	Autopilot Overspeed Protection mode is active. Autopilot will raise the nose to limit the aircraft's speed.
MINSPD	Autopilot Underspeed Protection mode is active. Autopilot will lower the nose to prevent the aircraft's speed from decreasing.
PFT	Autopilot preflight test is in progress.
PTRIM	Pitch Trim Fail – Manual Electric Pitch Trim is inoperative.
TRIM DOWN	Elevator Trim Down – Autopilot is holding elevator nose down force. The pitch trim needs to be adjusted nose down.
TRIM UP	Elevator Trim Up – Autopilot is holding elevator nose up force. The pitch trim needs to be adjusted nose up.

LIGHTING

When the aircraft's dimming bus is selected off, or full dim, GMC 507 mode control panel lighting is controlled by integrated photocells which sense the ambient cockpit lighting.

TABLE OF CONTENTS

SECTION 10

OPERATING TIPS

SECTION 10

OPERATING TIPS

10.1 GENERAL

This section provides operating tips of particular value in the operation of Archer II.

10.3 OPERATING TIPS

(a) Learn to trim for takeoff so that only a very light back pressure on the control wheel is required to lift the airplane off the ground.

(b) The best speed for takeoff is about 53 KIAS under normal conditions. Trying to pull the airplane off the ground at too low an airspeed decreases the controllability of the airplane in the event of engine failure.

(c) Flaps may be lowered at airspeeds up to 102 KIAS. To reduce flap operating loads, it is desirable to have the airplane at a slower speed before extending the flaps. The flap step will not support weight if the flaps are in any extended position. The flaps must be placed in the "UP" position before they will lock and support weight on the step.

(d) Before attempting to reset any circuit breaker, allow a two to five minute cooling off period.

(e) Before starting the engine, check that all radio switches, light switches and the pitot heat switch are in the off position so as not to create an overloaded condition when the starter is engaged.

(f) Anti-collision lights should not be operating when flying through cloud, fog or haze, since reflected light can produce spacial disorientation. Strobe lights should not be used in close proximity to the ground such as during taxiing, takeoff or landing.

(g) The rudder pedals are suspended from a torque tube which extends across the fuselage. The pilot should become familiar with the proper positioning of his feet on the rudder pedals so as to avoid interference with the torque tube when moving the rudder pedals or operating the toe brakes.

(h) In an effort to avoid accidents, pilots should obtain and study the safety related information made available in FAA publications such as regulations, advisory circulars, Aviation News, AIM and safety aids.

(i) Prolonged slips or skids which result in excess of 2000 ft. of altitude loss, or other radical or extreme maneuvers which could cause uncovering of the fuel outlet must be avoided as fuel flow interruption may occur when tank being used is not full.

(j) Hand starting of the engine is not recommended, however, should hand starting of the engine be required, only experienced personnel should attempt this procedure. The magneto selector should be placed to "LEFT" during the starting procedure to reduce the probability of "kick back." Place the ignition switch to "BOTH" position after the engine has started.

CHARTERWARE
Flottenmanagement für die allgemeine Luftfahrt

charterware UG (haftungsbeschränkt)

Otmar Ripp, Tel: +49 6502 9385667

otmar.ripp@charterware.net

Doc No.: CS23var-010715-01-ASM-01, Rev.01

Aircraft
Flight Manual Supplement

Aircraft Interface for Flight Logger
Charterware OBU

in

Aircraft Type and Model: Piper PA-28-181

Serial No.: 28-8390087

This Aircraft Flight Manual Supplement is approved by EASA under Approval No.: 10054165

List of effective Pages

Page	Title	Issue Date
1	Title Sheet	09.07.2015
2	List of effective Pages, Revision History	09.07.2015
3	Sections I to VIII	09.07.2015
4	Annex 1	09.07.2015

Revision History

Issue	Date	Revision Items
Initial	09.07.2015	n/a

Section I: General

This document describes an electrical interface (jack) mounted in the right half of the front panel. That jack is dedicated to connect a Charterware flight logger also called OBU (OnBoardUnit). The flight logger itself is not part of this installation. That device has to be handled as a PED. The pilot/operator must make sure that the applicable European respectively national operating rules (and the associated guidance material) are met.

Section II: Limitations

Do not use the interface jack for other purposes than connecting a Charterware flight logger OBU

Section III: Emergency Procedures

no change to basic flight manual

Section IV: Abnormal Procedures

In case of interference between the flight logger and aircraft instruments:

Pull the Sub-D connector out of the front panel mounted jack.

Section V: Normal Procedures

Additional items for pre-flight check:

Ensure that the flight logger and its associated wiring is properly stowed and fixed. Check the flight logger plug for proper connection to the jack. Tighten the screws of the Sub-D connector only by hand without gloves. Do not use screwdrivers or other tools! Ensure that the plug can be removed immediately if necessary (see IV).

Section VI: Performance

no change to basic flight manual

Section VII: Weight and Balance

no change to basic flight manual

Section VIII: Technical Description

For details concerning the flight logger see Charterware document User's Manual OBU..
For details concerning the installation see Charterware Installation and Continued Airworthiness Manual **CS23var-010715-01-INM-01Rev.01**.
For an installation example see annex 1.

Annex 1: Example Photographs of the mounted Flight Logger

Figure 1.1.: Jack for OBU Logger mounted within metallic faceblade of an instrument slot

Figure 1.2.: OBU Logger during a flight in a typical Cockpit on Top Environment